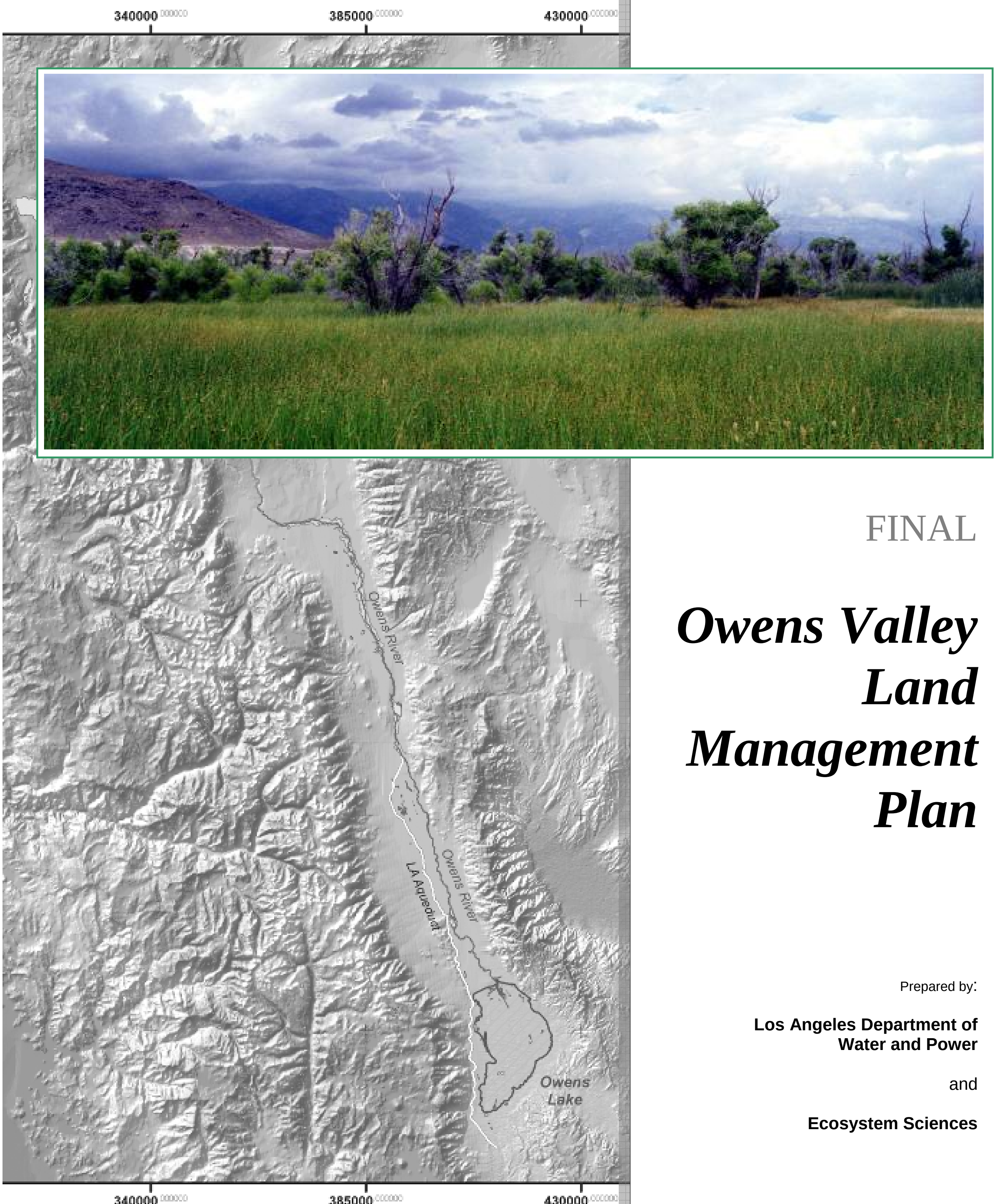

FINAL

Owens Valley Land Management Plan

Prepared by:

Los Angeles Department of Water and Power

and

Ecosystem Sciences

ISSUE DATE: April 28, 2010

Preface

This Owens Valley Land Management Plan (OVLMP) describes the major management actions for lands covered by this plan under the direction of the Memorandum of Understanding (MOU). Most of the land management and river management actions are specific and are described in detail. The development of the OVLMP is a collaborative effort between the Los Angeles Department of Water and Power (LADWP) and Ecosystem Sciences. Personnel from both entities who were most familiar with the resource area or specific components of the OVLMP took the lead for that resource area and were supported as necessary by other staff members.

Generally, LADWP was the lead author for: Chapter 3, Grazing Management; Chapter 4, Recreation Management; Chapter 7, Fire Management; Chapter 8, Commercial Use Management; and Chapter 10, Special Management Areas. Ecosystem Sciences was the lead author for: Chapter 2, River Management; Chapter 5, Habitat Conservation Planning; Chapter 6, Cultural Resources Management; and the Appendices. Both LADWP and Ecosystem Sciences worked collaboratively, with stakeholder and MOU party input, to develop the overall composition and organization of the OVLMP, including Chapter 1, Introduction and Plan organization; and Chapter 9, Monitoring (LADWP authored the Land Use Monitoring while Ecosystem Sciences authored the Riverine Riparian Monitoring and Methods).

Some sections of the Owens Valley Land Management Plan are not yet complete. Chapter 10, Special Management Areas, will describe the management of several areas in the Owens Valley. These areas are separated out from the rest of the management plan as being unique areas of concern with specific management goals and objectives. These unique environments include Baker and Hogback Creeks, Hines Spring, and additional sites for the 1600 acre feet mitigation. All of the management plans for these special management areas are currently being worked on by several participating MOU parties. Once completed a description and review of those plans will make up Chapter 10 and will be incorporated by reference into the OVLMP. Additionally, Chapter 5, Habitat Conservation Planning (HCP), is a separate planning process from the OVLMP with distinct milestones and procedural obligations; thus, the HCP will be incorporated into the OVLMP by reference, with this chapter describing the overall HCP purpose and actions. When the HCP is completed it will be included as part of the OVLMP as an appendices to the plan.

The MOU provides that the LADWP develop a Land Management Plan for Los Angeles-owned, non-urban lands in the Owens River Watershed in Inyo County (excluding the Lower Owens River Project [LORP] planning area). The OVLMP does not supersede the Inyo/LA Long-Term Water Agreement, the 1991 EIR, the 1997 MOU, or the 2003 LORP EIR. Scientists from LADWP and Ecosystem Sciences who developed the OVLMP are confident that none of the management actions or mapping efforts contained within the plan are inconsistent or in conflict with any provision contained within these guiding documents.

A first draft plan of the OVLMP was released to the MOU parties in February of 2007. Comments were received on the plan from Inyo County Water Department and California Department of Fish and Game. These comments and responses are included in the appendices of this plan. Some changes and edits were made to the plan based on this feedback.

Executive Summary

The Owens Valley Land Management Plan (OVLMP) provides management direction for resources on all city of Los Angeles owned lands in Inyo County, California, excluding the Lower Owens River Project (LORP) area. Resource management issues include water supply, habitat, recreation and land use. The OVLMP provides a framework for implementing management prescriptions through time, monitoring the resources, and adaptively managing changed land and water conditions. The OVLMP is an overarching resource management plan that will complement the LORP Plans for monitoring and managing resources from Pleasant Valley Reservoir to Owens Lake. The city of Los Angeles is the primary land owner in the Owens Valley with over 310,497 acres. Within the OVLMP area, the city owns approximately 250,000 acres, including the LORP area.

The OVLMP consists of 10 chapters that describe current conditions and future management of grazing, riverine-riparian ecosystems, recreation, cultural resources, fire, commercial uses, threatened and endangered species, and areas of special management concern.

The fundamental role of resource management is to assess and evaluate the effects of existing land and water-use practices, and recommend flow management and land management improvements. The condition of grasslands, desert scrublands, riparian corridors and habitats, as well as the river itself, must be continuously evaluated. The outcome is a multiple-use management approach that serves to balance the needs of a healthy ecosystem with optimal use of resources. The OVLMP must, therefore, be robust, flexible and meet the test of time as a management tool to meet MOU goals.

The two most important management tools for the ecosystem are stream flow and land use. Together, water and land use management exert the greatest influence on biotic and abiotic environmental components and, ultimately, the degree of functional state attained by the total ecosystem. The focus of management to improve and maintain ecological conditions on City of Los Angeles owned lands in Inyo County will be by leases. All of LADWP lands are permitted under one form of agricultural lease or another; thus, proper management of leases will determine how well the riverine and upland ecosystems are improved and maintained.

The management plans are not isolated, stand-alone efforts, but involve cross-cutting goals and objectives that are shared, to one degree or another, by each resource area. Each of the goals and objectives are reflected in the plans to supply water to the City, better manage livestock grazing, reduce recreation impacts yet allow for continued and sustainable recreation and other resource uses; while enhancing ecosystem health, biodiversity, and T&E species habitat. Implementing the objectives to achieve the goals for each management area will meet the expectations of the MOU. A principle tool of adaptive management is monitoring, which measures progress over time toward a desired goal. Monitoring will be conducted as part of this plan.

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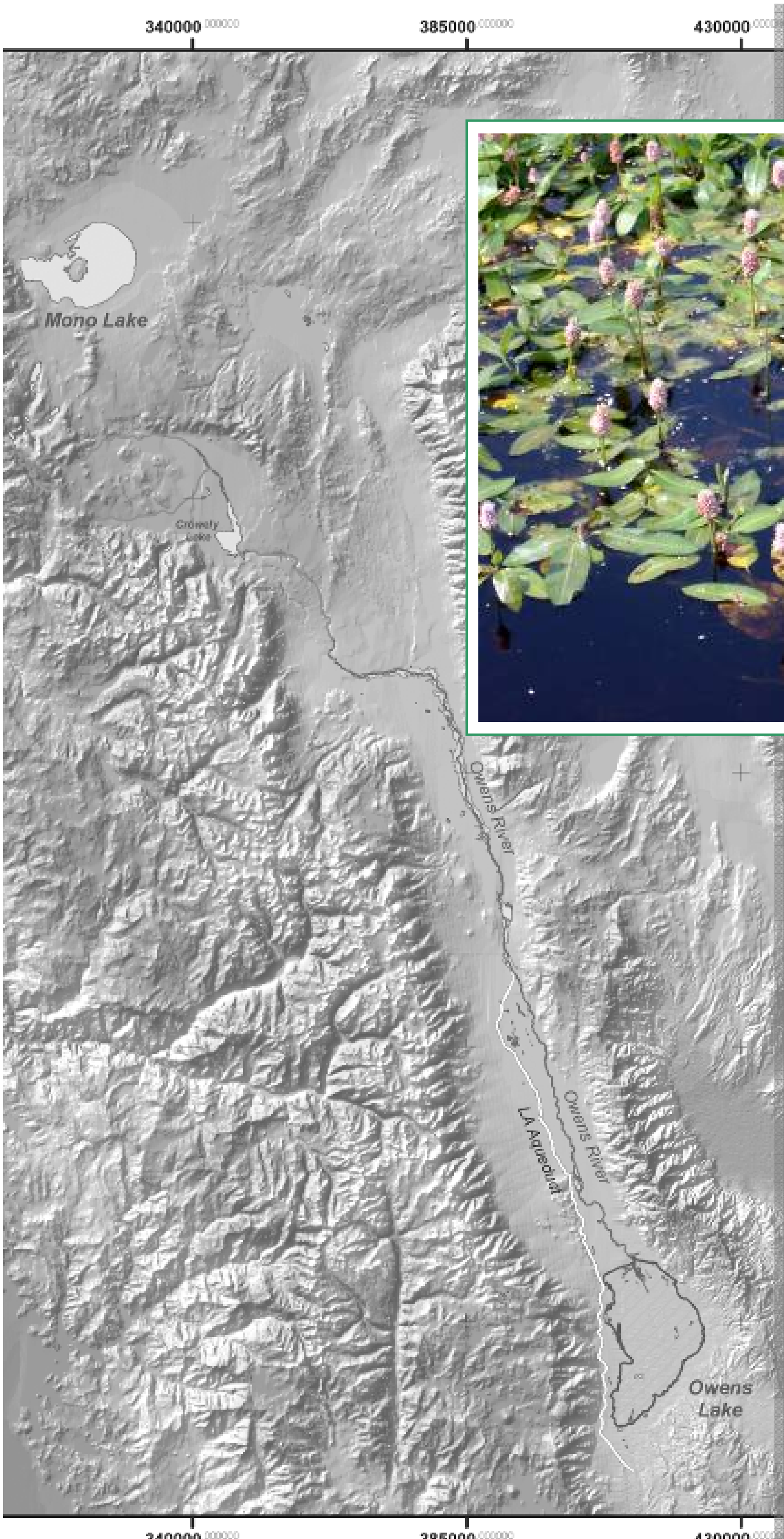
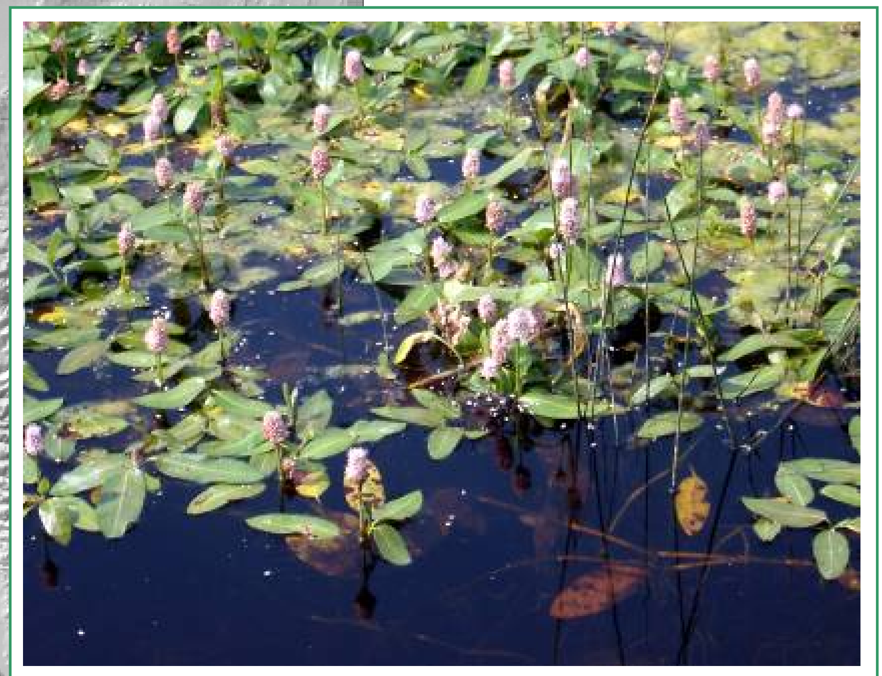
Abbreviations List

ACOE- United States Army Corps of Engineers
ARMR- Archaeological Resource Management Report
AUMs- Animal Unit Months
BBS- Breeding Bird Survey
BLM- Bureau of Land Management
BMPs- Best Management Practices
BP- Before Present
BSD- Bird Species Diversity
BWMA - Blackrock Waterfowl Management Area
CEQA- California Environmental Quality Act
CDF- California Department of Forestry
CDFG- California Department of Fish and Game
CFR- Code of Federal Regulations
CFS- cubic feet (per second)
CNDDB- California Natural Diversity Database
CRHP- California Register of Historic Places
CSC- California Species of Concern
CSLC- California State Lands Commission
CWHR- California Wildlife Habitat Relationship
DEM- Digital Elevation Model
DFG- Department of Fish and Game
DGPS- Digital Global Positioning System
DHA - Delta Habitat Area
DPA- Designated Protection Area
DTM- Digital Terrain Model
DWP- Department of Water and Power
EA- Environmental Assessment
E/M- Enhancement and Mitigation
EPA - Environmental Protection Agency
EIR- Environmental Impact Report
EIS- Environmental Impact Statement
ES - Ecosystem Sciences
ESA- Endangered Species Act
ESWMA- Eastern Sierra Weed Management Association
ET- evapotranspiration
FAC - Facultative
FACW - Facultative wetland
FEIR- Final Environmental Impact Report
FIES- Final Environmental Impact Statement
FHD- foliage height diversity
GIS- Geographic Information System
GPS- Global Positioning System
HCP- Habitat Conservation Plan
HEP- Habitat Evaluation Procedure
IC- Inyo County
ICWD- Inyo County Water Department
INF- Inyo National Forest
LAA- Los Angeles Aqueduct
LADWP- Los Angeles Department of Water and Power
LORP- Lower Owens River Project
LRMP- Land and Resource Management Plan
MIST- Minimum Impact Suppression Tactics
MORP- Middle Owens River Project

MOU- Memorandum of Understanding
NEPA- National Environmental Policy Act
NRCS- Natural Resource Conservation Service
NRHP- National Register of Historic Places
OBL – Obligate
OHP- Office of Historical Preservation
OHV- Off Highway Vehicle
OVC- Owens Valley Committee
OVMA- Owens Valley Management Area
OVMP- Owens Valley Management Plan
OVLMP- Owens Valley Land Management Plan
OVV- Owens Valley vole
QAZ- Qualitative Assessment Zone
ROS- Recreation Opportunity Spectrum
RPGPs- Remedial Pasture Grazing Prescriptions
SC- Sierra Club
SDI- Shannon's Diversity Index
SEI- Shannon's Evenness Index
SHPO- State Office of Historic Preservation in Sacramento
SRA – State Responsibility Area
UNESCO- United Nations Educational and Scientific Cultural Organization
USDA- United States Department of Agriculture
USEPA- United States Environmental Protection Agency
USFS- United States Forest Service
USFWS- United States Fish and Wildlife Service
T&E- Threatened and Endangered
THPO- Tribal Historic Preservation Officer
TVV- total vegetation volume
WHA- White Horse Associates
WSE- water surface elevation
YBC- Yellow-billed Cuckoo





CHAPTER 1

Introduction

1.1 Introduction

1

The Owens Valley Land Management Plan (OVLMP) provides management direction for resources on all city of Los Angeles-owned lands in Inyo County, California, excluding the Lower Owens River Project (LORP) area. Resource management issues include water supply, habitat, recreation and land use. The OVLMP provides a framework for implementing management prescriptions through time, monitoring the resources, and adaptively managing changed land and water conditions.

OVLMP goals, objectives, and management strategies have been shaped by the geographic and geopolitical characteristics of the Owens Valley. The resource management priorities are derived from the 1997 Memorandum of Understanding and are intended to build analytical, institutional, and empirical understanding about the resources and how they will be managed in the future.

1.1 Project Purpose and Scope

The 1997 Memorandum of Understanding (MOU) between the city of Los Angeles Department of Water and Power (LADWP), the County of Inyo (IC), the California Department of Fish and Game (CDFG), the California State Lands Commission (CSLC), the Sierra Club (SC), and the Owens Valley Committee (OVC) provides for the resolution of conflicts over the LORP and other provisions of LADWP's 1991 Environmental Impact Report[1] concerning groundwater pumping operations and related activities in the Owens Valley, California.

The MOU directs that resource management plans be prepared for city of Los Angeles-owned, non-urban lands in the Owens River watershed in Inyo County that are not included in the LORP planning area.[2] These plans are referred to as the Owens Valley Land Management Plans (OVLMP). This project area encompasses the Middle Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake and includes the adjacent terraces and uplands along with Yellow-billed Cuckoo habitat, Hines Spring, and additional mitigation sites (Figure 1.1, Figure 1.2). The project area for the Grazing Management Plans is larger than the Middle Owens River area and encompasses all grazing leases managed by LADWP in Inyo County.

The OVLMP is an overarching resource management plan and it will complement the LORP Ecosystem Management Plan for monitoring and managing resources from Pleasant Valley Reservoir to Owens Lake.

Uplands on the east side of the Owens Valley near Tinemaha Reservoir.

[1] EIR, 1991. Prepared by the City of Los Angeles Department of Water and Power and the County of Inyo. Water from the Owens Valley to Supply the Second Los Angeles Aqueduct, 1970 to 1990, 1990 Onward, Pursuant to a Long-Term Groundwater Management Plan. State Clearinghouse #89080705.

[2] Page 26, paragraph 1 of the MOU, 1997: "…DWP will commence the preparation of management plans for Los Angeles owned, non-urban lands within the portion of the Owens River watershed located in Inyo County not included in the LORP…"

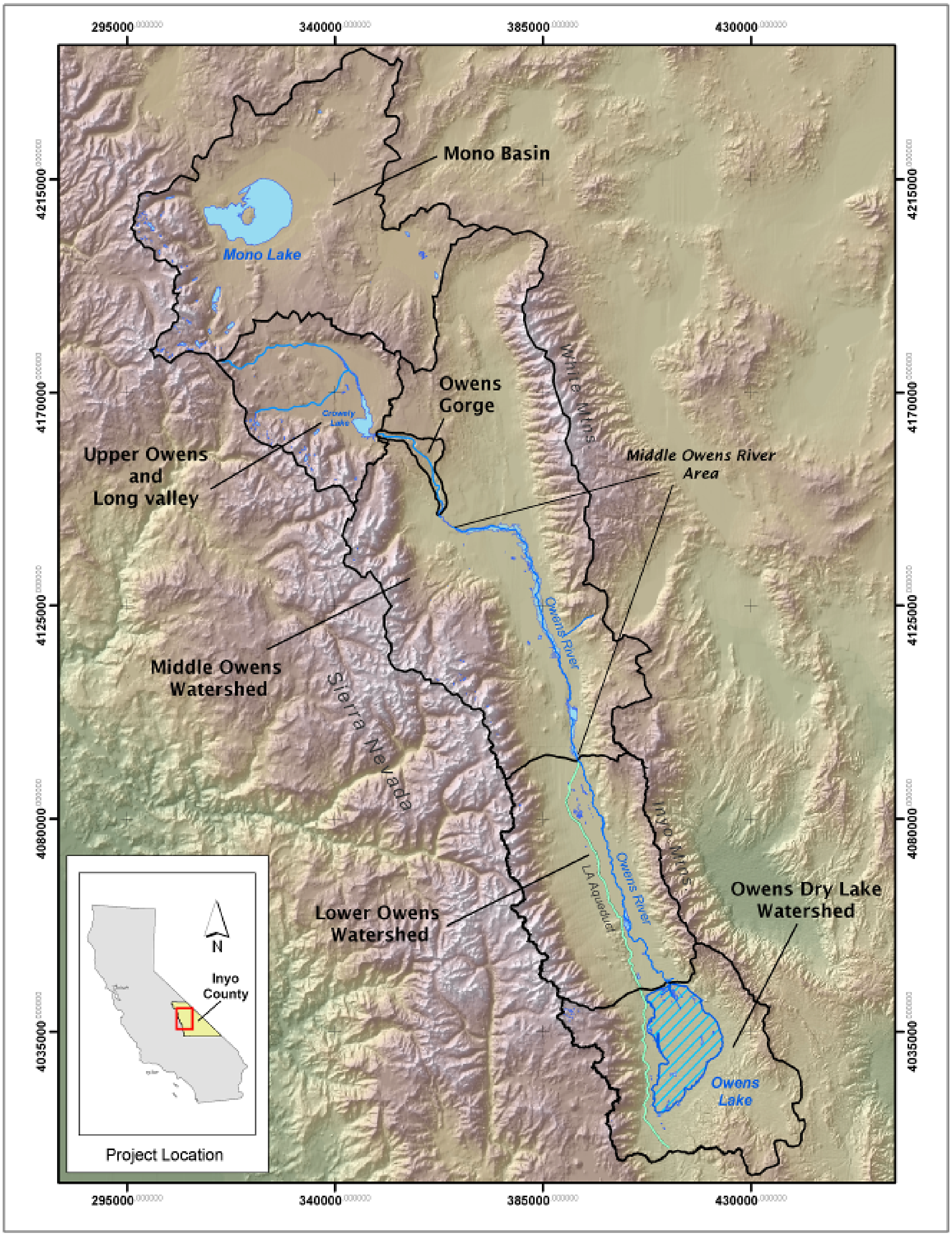


Figure 1.1 Owens River Watershed

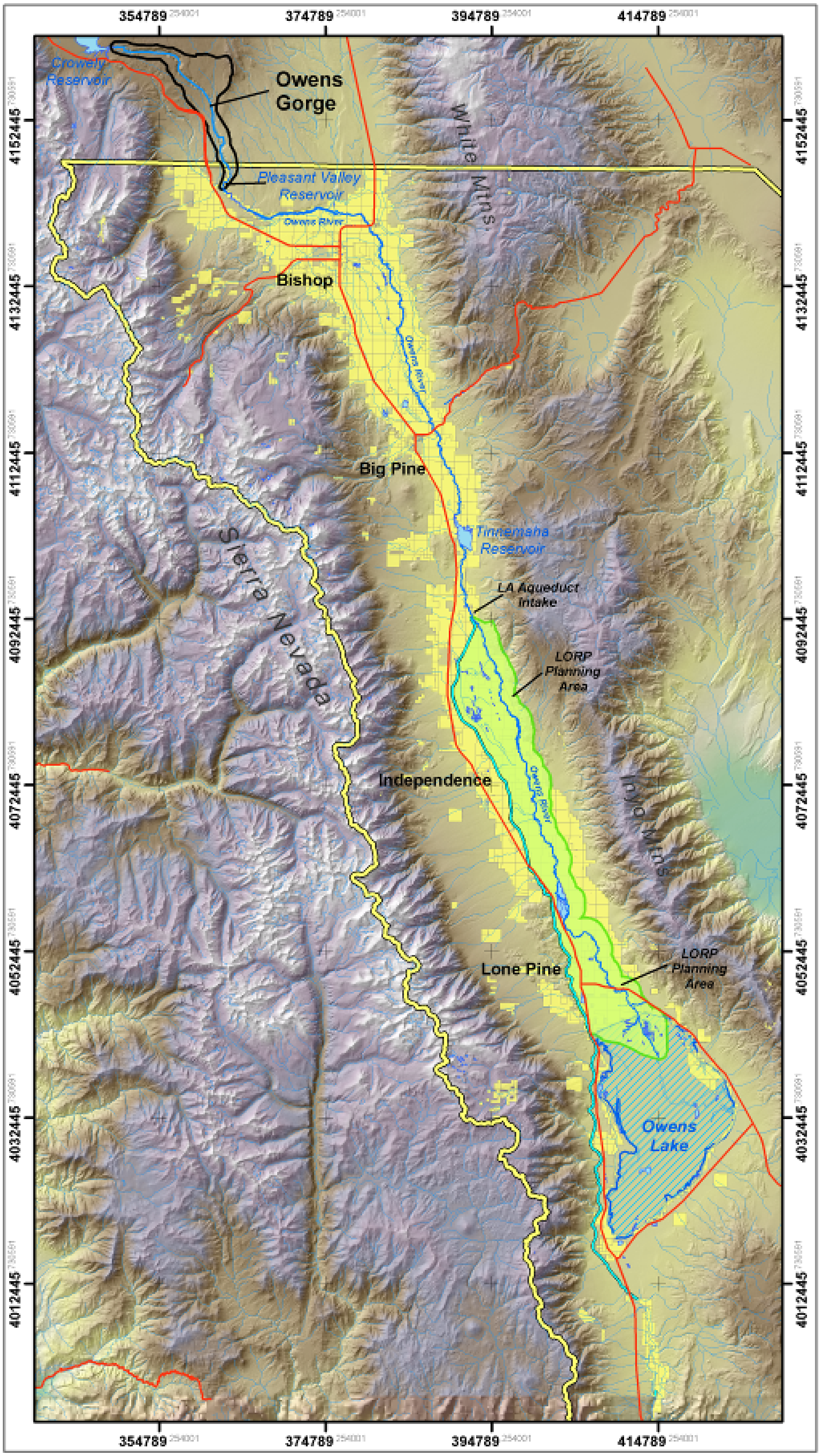


Figure 1.2 Owens River Watershed

LADWP Owned Lands in Inyo County and LORP Planning Area

Project Location

As with the LORP, the OVLMP considers multiple resource values in its management direction. The MOU requires that, while providing for the primary purpose for which the city of Los Angeles owns the land in the Owens Valley (protecting the water resources used by the citizens of Los Angeles), it must also consider the sustainable uses and health of the Owens Valley ecosystem, and the enhancement of threatened and endangered (T&E) species habitat. The 1997 MOU states:

> *"…the plans will also provide for the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities), will promote biodiversity and a healthy ecosystem, and will consider the enhancement of Threatened and Endangered species habitat. Habitat conservation plans [HCP][3] for Threatened and Endangered Species will be incorporated if and where appropriate".*[4]

Floodplain along the Middle Owens River during high summer flows in 2006.

[3] The term HCP refers to a specific federal process that is provided for in a 1982 amendment to the Endangered Species Act (section 10[a][1][B]), and its implementing regulations and amendments (50 CFR, parts 17 and 222; 63 FR 8859). This is a formal process between the USFWS and LADWP to address T&E species and their habitat on all city-owned lands throughout the Owens River Valley. Successful implementation of an HCP allows LADWP to continue water delivery and land management operations while also offering protection for T&E species.

While these goals are broad and far-reaching, the OVLMP must provide a detailed framework to adequately manage land and water resources for sustainability (water export as well as grazing, recreation and other land uses), promotion of biodiversity, and enhancement of habitat for biodiversity as well as T&E species. The plan must also adequately measure and monitor the environmental components that promote a healthy and sustainable ecosystem.

1.1.1. Mandatory Documents

There are mandatory documents that guide the OVLMP. This subsection summarizes how these documents are related and how each defines the conditions and directives for managing and monitoring the OVLMP.

In the 1980s, Inyo County and the Los Angeles Department of Water and Power collaborated to develop a cooperative water management plan. An interim agreement was executed in 1984 between Inyo County and LADWP, which called for more cooperative studies, certain environmental enhancement projects, and continued negotiations on a long-term agreement. In 1989, a draft long-term agreement was released to the public. In October 1991, the County and LADWP approved the Inyo County/Los Angeles Long Term Water Agreement (Agreement). The overall goal of the Agreement is to manage the water resources within Inyo County.

Subsequently, an Environmental Impact Report (EIR) was completed in 1991 by LADWP. It addressed the impacts of all water management practices and facilities associated with the second Aqueduct from 1970-1990, and the impacts of projects and water management practices that would occur after 1990 under the Agreement.

The 1997 MOU augmented the Agreement and the 1991 EIR. The MOU states that:

The overall goal of the Agreement is to manage water resources within Inyo County to avoid certain described decreases and changes

[4] MOU, 1997. OVLMP – Page 27, Paragraph 2

in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated, while providing a reliable supply of water for delivery to Los Angeles and for use in Inyo County. Except as it modifies the scope of the Lower Owens River Project as described in the Inyo County/Los Angeles Long Term Water Agreement approved in October 1991 ("Inyo-Los Angeles Agreement"), nothing in this MOU affects any other provision of that agreement.

The MOU provides that the LADWP generate a Land Management Plan for Los Angeles-owned, non-urban lands in the Owens River Watershed in Inyo County (excluding the Lower Owens River Project [LORP] planning area). The OVLMP does not supersede the Inyo/LA Long-Term Water Agreement, the 1991 EIR, the 1997 MOU, or the 2004 LORP FEIR. The OVLMP presents no management actions or efforts that are inconsistent or in conflict with any provision contained within these guiding documents.

The MOU Section III B. *OWENS VALLEY MANAGEMENT PLANS*, states in part:

The City of Los Angeles retains land holdings in the Owens Valley primarily to ensure protection of both surface and groundwater resources, and to enable sustained water supply to meet the needs of the citizens of Los Angeles. …. DWP will commence the preparation of management plans for Los Angeles-owned, non-urban lands within the portion of the Owens River watershed located in Inyo County not included in the LORP Planning Area. (These lands are hereinafter collectively referred to as the "Management Area.") Within the Management Area, DWP, in consultation with the Parties and others, will identify and prioritize for plan development, those areas where problems exist from the effects of livestock grazing and other land uses. The Parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. The first level of priority will be given to riparian areas, irrigated meadows and sensitive plant or animal habitats. The plans will use the work done and underway in the Long Valley and Upper Owens River areas as a model where appropriate. Opportunity for Party, agency and public review of the proposed plans will be provided. The process will comply with applicable provisions of CEQA.

1.2. Description of OVLMP Region

The Owens Valley is located in Eastern California in Mono and Inyo counties (Figure 1.1 and 1.2), and occupies the western terminus of the Great Basin Geologic Province.[5] Like other Great Basin valleys, the Owens is a long narrow north-south trending valley. The valley is a graben between two large fault blocks that form the Sierra Nevada Range to the west and the White and Inyo Mountains to the east. These mountains rise more than 9,000 feet above the valley floor with the Sierra Nevada and the White Mountains achieving heights greater than 14,000 feet. The valley floor ranges from 4,500 feet elevation near Bishop to nearly 3,500 feet above sea level near Owens Lake.[6]

The Sierra Nevada greatly influences the climate of the Owens Valley. The orographic effect of the Sierra Nevada creates a rain shadow east of the crest (on the valley floor and in the White/Inyo Mountains), where precipitation is appreciably less. Average precipitation ranges from more than 30 inches per year (in/yr) at the crest of the Sierra Nevada to about seven to 14 in/yr in the Inyo and White Mountains, to approximately five in/yr on the valley floor.[7] Consequently, the climate in the Owens Valley is characterized by low precipitation, abundant sunshine, frequent winds, moderate to low humidity and high potential evapotranspiration. Monthly air temperature ranges from near freezing in winter to more than 100^{o}F in summer.[8]

The Owens Valley is incised by one major trunk stream, the Owens River, which meanders southward through the valley. Prior

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[5] Danskin 1998
[6] Danskin 1998
[7] Hollett et al. 1997
[8] Danskin 1998

to the construction of the Los Angeles Aqueduct, the Owens River drained to Owens Lake. Today, only a fraction of the Owens River reaches the lake as the majority of its flow is diverted into the Los Angeles Aqueduct and transferred to Southern California. Streams originating in the alpine areas of the Sierra Nevada drain east to Owens Valley where they confluence with the Owens River and eventually the Los Angeles Aqueduct. In contrast, streams originating in the White and Inyo Ranges, which are often ephemeral due to the lack of precipitation, do not provide much water to the Owens River or the Aqueduct. Historically, streams draining from the Sierra Nevada west of the Owens Valley fed the Owens River. Today, the few streams that do confluence with the Owens River occur primarily in the northern portion of the valley.

In the southern part of the valley, the Los Angeles Aqueduct intercepts stream flows prior to their historic confluence with the Owens River. Many streams draining to the Owens Valley are vital to the LADWP's water delivery system to Los Angeles via the Los Angeles Aqueduct. A few of these streams support hydroelectric facilities such as those at Cottonwood Creek, Big Pine Creek and Division Creek.

The valley is characterized as high desert, thus vegetation is controlled largely by the arid and semiarid conditions of the region, salinity of soil in many locations, and the presence of a shallow water table. Common vegetation communities of the valley include alkaline meadow, alkaline scrub, nonalkaline scrub and where water is available, riparian and wetland communities.[9]

As of 2000 the population of the Owens Valley was roughly 18,000 people. The main urban centers are Bishop, Big Pine, Independence, and Lone Pine. Bishop is home to over 70% of the area's population while Independence serves as the county seat for Inyo County.

The city of Los Angeles is the primary land owner in the Owens Valley with over 310,497 acres. Within the OVLMP area, the city owns approximately 250,000 acres, including the LORP area.

[9] Danskin 1998

1.3. Plan Organization

The OVLMP is organized into ten chapters for management of key resource areas and includes appendices that describe in detail the landscape and habitat conditions of the project area.

- *Chapter 2, River-Riparian Management:* This chapter describes the riverine-riparian corridor from Pleasant Valley Reservoir downstream to the Los Angeles Aqueduct intake and addresses present and future flow management.

- *Chapter 3, Grazing Management:* This chapter describes plans for livestock management on each of the ranch leases within the management area. Grazing plans focus on timing of grazing, utilization rates by pasture and lease.

- *Chapter 4, Recreation Management:* This chapter addresses the impacts of recreational activities on city of Los Angeles lands and provides strategies to minimize impacts. It proposes projects to re-direct access and activities where impacts are causing significant resource damage.

- *Chapter 5, Habitat Conservation Planning:* The HCP, as described previously, is a separate planning and management effort that is associated with the OVLMP as an integral part of resource management to protect T&E species. This chapter outlines the HCP effort and provides a project description. When the HCP is completed, it will be included as an appendix to the OVLMP.

- *Chapter 6, Cultural Resource Management:* This chapter describes the cultural resources found throughout the riverine-riparian area of the OVLMP and is intended to maintain and protect historic sites and culture resource areas.

These sites are usually associated with Native American pre-history and/or pre-European settlement sites and artifacts.

- *Chapter 7, Fire Management:* This chapter describes fire management and protocols. Because of the frequency of fires in the Owens Valley it is an important component of the resource plan. This chapter provides an overview of fire ecology, along with response protocols for fires and fire suppression.

- *Chapter 8, Commercial Use Management:* This chapter describes guidelines and processes for land uses other than grazing and agriculture. LADWP allots certain areas for such commercial uses as gravel extraction and business sites; it is essential that commercial uses not conflict with other resource management actions.

- *Chapter 9, Monitoring and Adaptive Management:* This chapter describes the monitoring plan for the different aspects of the OVLMP and the adaptive management protocols based on the monitoring results. The monitoring and adaptive management will dovetail with HCP monitoring and complement LORP monitoring.

- *Chapter 10, Special Areas Management:* This chapter describes Baker and Hogback Creek Yellow-billed Cuckoo habitat enhancement areas and the sites selected or allocated for additional mitigation.

- *Appendices:* The appendices include references cited for the OVLMP, GIS metadata information for all of the maps included in the OVLMP, and the BLM Fire Management Plan guidance for the Owens Valley Fire Management Unit. Additionally, it includes the Middle Owens River assessments of the landscape, and riverine-riparian, vegetation and habitat conditions. This baseline information will be used to monitor and measure change in the future. The appendices also include the comments and response to comments received on the first draft OVLMP.

The fundamental role of resource management is to assess and evaluate the effects of existing land and water-use practices, and recommend flow management and land management improvements. The condition of grasslands, desert scrub-lands, and riparian corridors as well as the river itself must be continuously evaluated. The outcome is a multiple-use management approach that serves to balance the needs of a healthy ecosystem with optimal use of resources. The OVLMP must, therefore, be robust, flexible and meet the test of time as a management tool to meet MOU goals.

1.4. MOU Goals and Objectives

Goals for the OVLMP were derived from the MOU (see MOU language in Section 1.2). These goals are based on the premise that sustainable land and water use management will protect existing resources and lead to more desirable ecological conditions for both upland and riverine-riparian systems on city-owned lands in Inyo County. These goals are tracked through the different chapters of the OVLMP.

Middle Owens River near the Five Bridges area.

The objectives, which were developed during the planning process, were derived to meet these resource goals. Integrating the MOU goals and the objectives (see Figure 1.3), establishes a vision for management of the Middle Owens River and provides a framework for viewing resource management more holistically. Future management decisions will be made with the understanding that what affects one element of a plan may also affect other plans. The goals and objectives are described below and are listed in Table 1.1.

The goals include:

1. *Continue to supply water to the city of Los Angeles.* The volume of water exported each year by LADWP to the city of Los Angeles is regulated by other agreements, and the OVLMP cannot conflict with or supersede these agreements.

2. *Implement sustainable land management practices for agriculture (grazing) and other resource uses.* The principle agricultural activity on city of Los Angeles-owned lands is livestock grazing and raising of hay and alfalfa and irrigated pastures for livestock. Other resource uses include gravel mining, municipal dumps, and other non-agriculture activities. The OVLMP will implement grazing standards (utilization rates, animal unit months [AUMs], and timing for the first time on all city-owned lands and establish commercial land use protocols. In addition to these established land uses, the OVLMP must account for and protect cultural and historical resources from future changes in recreation, commercial uses (e.g., rock and seed collection, film and commercial permits, bee hives, fire wood cutting), or other land management activities.

Upland scrub characterizes some of the arid conditions of the landscape outside the riparian corridor.

3. *Continue to provide recreational opportunities on all city of Los Angeles-owned lands.* Recreational activities such as off-highway vehicle use (OHV) impact the riverine-riparian ecosystems and upland areas. The OVLMP establishes guidelines and identifies opportunities to enhance recreational uses for the protection of the environment.

4. *Improve biodiversity and ecosystem health (condition).* Land management plans will ensure the continuation of sustainable agriculture while improving upland and riparian biodiversity. River flow management will also work to enhance ecological conditions both instream and within the riverine-riparian corridor. Fire management prescriptions will also assist in protecting existing habitat and promoting ecosystem recovery after fires.

5. *Protect and enhance habitat for threatened and endangered (T&E) species.* Implementation of a Habitat Conservation Plan for T&E species will protect existing habitat while land management (grazing practices) and water management improvements will enhance habitat for T&E species. Fire management prescriptions will also assist in protecting existing habitat and promoting recovery after fires.

The two most important management tools for the Owens River ecosystem are stream flow management and land use. Together, water and land use management exert the greatest influence on the river's biotic and abiotic components and, ultimately, the degree of functional state attained by the total ecosystem. However, the requirement to meet the water needs of Los Angeles limits

LADWP's ability to manipulate flows in the Middle Owens River for riverine-riparian management.

As explained in the following chapters, operational changes (particularly ramping rates, average in-channel flows, and seasonal out-of-channel flows) will maintain existing wetland and riparian habitats, but any net increases in wetland/riparian habitat will be a consequence of land management actions (including improved recreation management) that encourage recruitment of new vegetation and plant community diversity.

Objectives

The following objectives were developed in order to achieve the OVLMP goals described above and meet MOU expectations:

1. *Maintain existing average, in-channel flows.* This ensures continued delivery of water to Los Angeles while maintaining existing instream habitat for aquatic biota. The average annual flow in the Middle Owens River since 1991 has been 295 cfs. This provides sufficient habitat and water quality conditions to maintain a quality fishery throughout the river.

2. *Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats.* Current freshet flows associated with spring runoff and water operations have been of sufficient magnitude and duration to create and maintain 4,092 acres of wetland/riparian habitat throughout the riverine-riparian system.

3. *Initiate ramping rates to minimize rapid water level changes.* LADWP implemented ramping rates in 2007 of 25cfs/day to reduce stream bank sloughing and associated erosion and sedimentation. An incremental daily change will also benefit fish and their habitat.

4. *Implement grazing strategies within riparian and upland pastures.* Grazing strategies were developed with each lessee in order to protect water quality, enhance range conditions, promote biodiversity, and increase the sustainability of grazing by improving the overall forage base.

5. *Establish a fire response plan.* Vegetation vigor and diversity is dependent upon periodic disturbances such as fire. As such, fire is an integral part of an ecosystem. A fire management response plan provides management direction for responding to fires and promoting ecosystem recovery in the OVLMP area.


Areas of riparian and mesic vegetation communities along the Middle Owens River.


Middle Owens River near the tailwaters of Tinemaha Reservoir.

GOALS	1. Continue to supply water to the city of Los Angeles.
	2. Implement sustainable land management practices for agriculture (grazing) and other resource uses.
	3. Continue to provide recreational opportunities on all city-owned lands.
	4. Improve biodiversity and ecosystem health (condition).
	5. Protect and enhance habitat for T&E species.
OBJECTIVES	1. Maintain existing average in-channel flows.
	2. Allow for annual out-of-channel or pulse flows to maintain existing riparian/wetland habitats.
	3. Initiate ramping rates to minimize rapid water level changes.
	4. Implement grazing strategies within riparian and upland pastures.
	5. Establish a fire response plan.
	6. Modify the location and intensity of recreational activities.
	7. Establish guidelines to protect cultural resources.
	8. Establish commercial use protocols.
	9. Initiate habitat conservation strategies to enhance and protect T&E species habitat.
	10. Monitor and use adaptive management through time

Table 1.1. MOU Goals and Objectives of the OVLMP.

6. *Modify the location and intensity of recreational activities.* The major recreational impacts are associated with roads and parking areas. Management actions to remediate impacts include road closures and designated parking areas; and guidelines for OHV use and stream bank access will prevent additional resource impacts.
7. *Establish guidelines to protect cultural resources.* There are many historical sites and cultural resource areas that have been identified throughout the Middle Owens River. Any land management activities such as new roads, parking areas, and access points must take into account these sites and the potential impacts to them.

8. *Establish commercial use protocols.* LADWP emphasizes multiple resource uses on their lands such as livestock grazing, recreation, gravel extraction, business sites, parks, home leases, municipal dumps, and other agricultural activities such as bee-keeping, hobby ranching, orchards, and field crops. Commercial use management protocols for approving such activities include duration, extent, limitation, and review. Managing commercial uses ensures protection of habitat and avoids conflicts with other uses and management goals.

9. *Initiate habitat conservation strategies to enhance and protect T&E species habitat.* Implementation of the HCP is intended to allow LADWP to continue existing activities that could potentially result in the take of particular T&E species. The HCP takes into consideration activities such as habitat enhancement, water diversion, water extraction, water conveyance, livestock grazing, gravel extraction, various recreational activities, fire management, and road construction and maintenance.

10. *Monitor and use adaptive management through time.* Short-term and long-term management of the Owens River should be adaptive in order to account for unforeseen results and natural changes to the system. Management plans are intended to be flexible. As such, strategies can be altered and revised through adaptive management decisions and interventions.

1.5. Monitoring, Adaptive Management and Decision Making

Adaptive management is widely recognized as an intelligent, if not essential, approach to the management of natural resources under uncertainty.[10] Adaptive management is a common element in many large-scale resource management projects. Adaptive management can be defined as the systematic acquisition and application of reliable information to improve management over time. The MOU defines adaptive management as a method for managing the OVLMP that provides for modifying project management to ensure the project's successful implementation, and/or the attainment of the project goals, should ongoing data collection and analysis reveal that such modifications are necessary.[11]

How monitoring will be conducted and adaptive management actions decided upon and implemented is not defined in any detail in the MOU.

1997 MOU Section III, H. ANNUAL REPORT ON OWENS VALLEY states:
DWP and the County will prepare an annual report describing environmental conditions in the Owens Valley and studies, projects, and activities conducted under the Inyo-Los Angeles Agreement and this MOU. Copies of the report will be distributed to the other Parties and made available to the public. The report will be released on or about May 1 of each year. The report will either be in the form of an executive summary, or it will contain an executive summary.

1997 MOU Section III, I. REPORTS states:
Reports, studies, evaluations, and analyses prepared pursuant to this MOU, together with supporting data, will be made available to the public. As draft and final documents and data become available, one copy of the document or data will be provided to each party. The public will be notified as final documents become available for review and copying.

A team approach is needed for all phases of monitoring and adaptive management that includes field personnel and lead scientists.

Mature galleries of willow and some cottonwoods define the riparian community along the river channel near Tinemaha Reservoir and in additional locations.

LADWP and the MOU Consultant will be responsible for conducting monitoring, analyzing the data and making recommendations. The first level will be joint staff efforts to collect data under appropriate field supervision for adherence to the protocols and quality control of data. Staff will compile and tabulate the data and assist with the preparation and summary of monitoring data.

The Scientific Team will include scientists from the LADWP, and scientists and staff from the MOU Consultant's group. It will be the responsibility of LADWP and the MOU Consultant to analyze the data between years and baseline conditions and reference sites to: 1.) identify problems or conditions which are not meeting goals or expectations; 2.) determine if contingency monitoring is needed; 3.) determine the most appropriate adaptive management action(s); 4.) compile this information and present their conclusions and recommendations to the LADWP managers, and; 5.) oversee the implementation of adaptive management measures. The principle scientists may consult with the CDFG, other agencies or individual experts as needed. This process is further discussed in Chapter 9.0.

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[10] Holling 1978, Walters and Holling 1990, Irwin and Wigley 1993, Parma et al. 1998
[11] MOU, Section 1, D

Recommendations and the summarized data will be forwarded to LADWP managers for inclusion in the Annual Report.

An effective system that reports results from OVLMP monitoring surveys will be implemented in order to provide for timely adaptive management considerations and responses. The monitoring will be conducted by LADWP and MOU Consultant staffs (according to the methods and schedules described under each monitoring method in Chapter 9.0). The MOU requires that Inyo County and LADWP provide annual reports describing the environmental conditions in the Owens Valley, along with studies, projects and activities conducted under the Inyo-Los Angeles Agreement and the MOU. The LADWP will prepare the annual report and LADWP will include the summarized monitoring data collected, the results of analysis, along with recommendations regarding the need to modify project actions. Copies of the annual report will be distributed to the other MOU parties (CDFG, California State Lands Commission, Sierra Club, Owens Valley Committee) and made available to the public. Any reports, studies, evaluations and analyses prepared pursuant to the MOU, along with supporting data, will be made available to the public.[12] As draft and final documents and data become available, one copy will be provided to each party; the public will be notified as final documents become available for review and comment.[12]

Further discussion of monitoring protocols and process are described in Chapter 9.0.

1.6. Summary

Having established adaptive management as the operative management tool, the purpose of the OVLMP is to assess existing land and water use practices, evaluate the effects of such practices and recommend flow and land management improvements, if necessary. The condition of grasslands, desert scrub-lands, and riparian corridors as well as the river itself is evaluated. The outcome is a multiple-use management approach that serves to balance the needs of a healthy ecosystem with optimal use of resources.

The two most important management tools for the Middle Owens River ecosystem are stream flow and land use. Together, water and land use management exert the greatest influence on the river's biotic and abiotic components and, ultimately, the degree of functional state attained by the entire ecosystem.

A principle tool of adaptive management is monitoring, which measures progress over time toward a desired goal. Monitoring will be conducted as part of this plan; monitoring activities and adaptive management procedures for the entire OVLMP are described in Chapter 9.0, *Monitoring and Adaptive Management*.

[12] MOU 1997, Section III

Figure 1.3

Integration of MOU Goals and Objectives for the OVLMP

Objectives

Goal:

Continue to supply water to the city of Los Angeles

- Maintain existing average in-channel flows
- Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats
- Initiate ramping rates to minimize rapid water level changes
- Monitor and use adaptive management through time

Goal:

Continue to provide recreational opportunities on all LADWP-owned lands

- Maintain existing average in-channel flows
- Establish a fire response plan
- Modify the location and intensity of recreational activities
- Establish guidelines to protect cultural resources
- Establish commercial use protocols
- Monitor and use adaptive management through time

Goal:

Improve biodiversity and ecosystem health (condition)

- Maintain existing average in-channel flows
- Initiate ramping rates to minimize rapid water level changes
- Establish a fire response plan
- Modify the location and intensity of recreational activities
- Initiate habitat conservation strategies to enhance and protect threatened and endangered species habitat
- Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats
- Implement grazing strategies within riparian and upland pastures
- Monitor and use adaptive management through time

Integration of MOU Goals and Objectives for the OVLMP

Goal:

Protect and enhance habitat for threatened and endangered species

Objectives

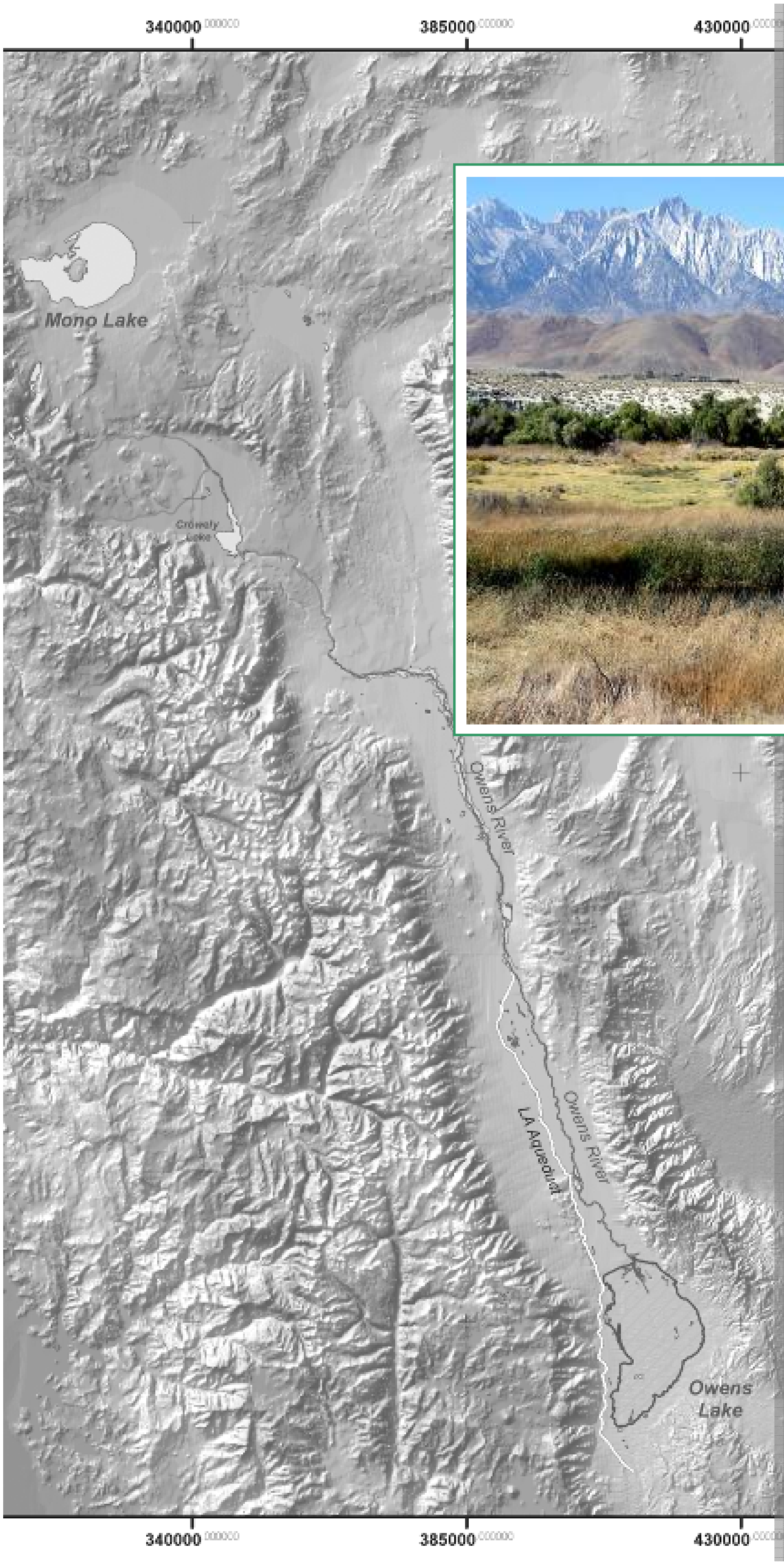
- Establish commercial use protocols
- Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats
- Implement grazing strategies within riparian and upland pastures
- Establish a fire response plan
- Modify the location and intensity of recreational activities
- Initiate habitat conservation strategies to enhance and protect threatened and endangered species habitat
- Monitor and use adaptive management through time

Goal:

Implement sustainable land management practices for agriculture (grazing) and other resource uses.

Objectives

- Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats
- Implement grazing strategies within riparian and upland pastures
- Establish a fire response plan
- Establish guidelines to protect cultural resources
- Establish commercial use protocols
- Monitor and use adaptive management through time



CHAPTER 2

River Management

CHAPTER 2

2.1 Introduction

The Middle Owens River area extends from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake and includes the riverine-riparian corridor (Figures 1.2 and 2.1).

The Owens Valley Land Management Plan (OVLMP) is an overarching resource management plan that provides management direction for many different ecosystem components on city of Los Angeles-owned lands in Inyo County. Management of the riverine-riparian area is a critical component of this plan.

This chapter describes the key resource areas of the river; habitat, wildlife and land uses. This chapter and the associated appendices describe ecological components such as surface water, physical land characteristics, riparian habitat, fisheries, and wildlife within the river resource area (physical land impacts through grazing and recreation are described in subsequent chapters). The river conditions are presented by eight reaches in the project area that extend from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake. These resource components are the principal interactive and manageable elements of the ecosystem; they are interactive in that they exchange energy in response to stimuli. A management action that alters one component will affect one or more other components. By describing these components as manageable, it is assumed that active intervention to achieve a desired goal will result in a measurable response.

This chapter describes the riverine-riparian management prescriptions for the Middle Owens River. The MOU specifies:

> *"The City of Los Angeles retains land holdings in the Owens Valley primarily to ensure protection of both surface and groundwater resources, and to enable sustained water supply to meet the needs of the citizens of Los Angeles…DWP will commence the preparation of management plans for Los Angeles-owned, non-urban lands within the portion of the Owens River watershed located in Inyo County not included in the LORP Planning Area…The first level of priority will be given to riparian areas, irrigated meadows, and sensitive plant or animal habitats."*[1]

2.1.1 Riverine-Riparian Goals and Objectives

The two most important management tools for the Middle Owens River ecosystem are stream flow and land use. Together, water and land use management exert the greatest influences on the river's biotic and abiotic components and ultimately the degree of functional state attained by the entire ecosystem.

All of the MOU goals for the OVLMP listed in Chapter 1 are pertinent to the riverine-riparian area and River Management Plan, and include:

1. Continue to supply water to the city of Los Angeles.
2. Implement sustainable land management practices for agriculture (grazing) and other resource uses.
3. Continue to provide recreational opportunities on all LADWP-owned lands.
4. Improve biodiversity and ecosystem health (condition).
5. Protect and enhance habitat for threatened and endangered (T&E) species.

Middle Owens River near Collins Road

[1] MOU, 1997.

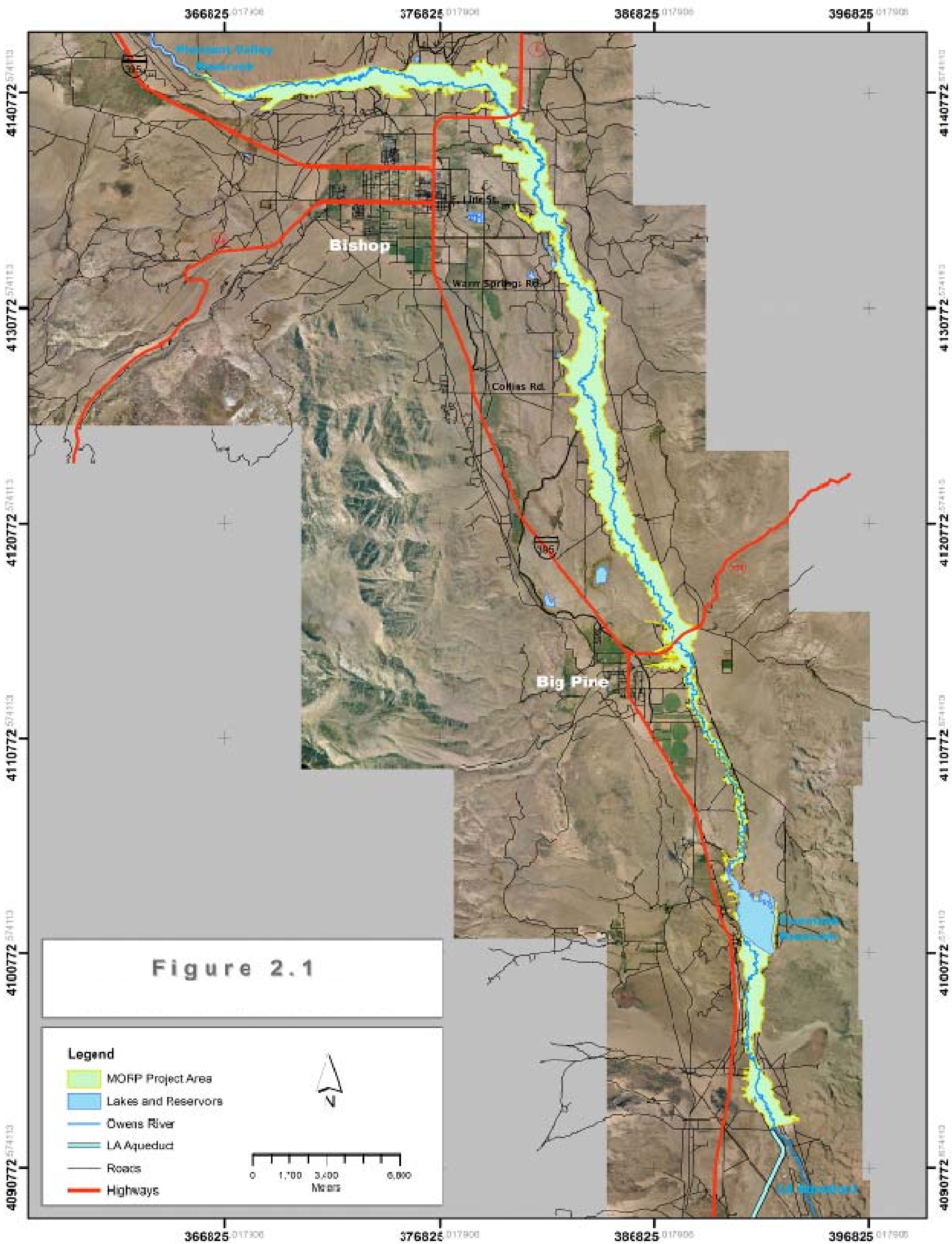


Figure 2.1. Middle Owens Riverine-Riparian Area.

The lateral boundaries of the riparian area generally correspond with transitions from stream terraces, landforms that are capable of supporting wetland/riparian habitat, to higher terraces with upland habitat.

The objectives that are applicable to the riverine-riparian area and are used to meet the goals identified in the MOU include:

1. Maintain existing average in-channel flows.
2. Allow for annual out-of-channel flows to maintain existing riparian/wetland habitats (manage the timing, magnitude, duration, and frequency of high river flows)
3. Initiate ramping rates to minimize rapid water level changes.
4. Implement grazing strategies within riparian and upland pastures.
5. Modify the location and intensity of recreational activities (in the riverine-riparian system)
6. Initiate habitat conservation strategies to enhance and protect T&E species habitat.
7. Monitor and use adaptive management through time.

A principle tool of adaptive management is monitoring, which measures progress over time toward a desired goal. Monitoring will be conducted as part of this plan; monitoring activities and adaptive management procedures for the entire OVLMP are described in Chapter 9, *Monitoring and Adaptive Management*.

2.2 Environmental Setting

This River Management Plan encompasses the 102 kilometer (km) riparian corridor along the Middle Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake (Figure 2.1). The lateral boundaries of the riparian area generally correspond with transitions from stream terraces, landforms that are capable of supporting wetland/riparian habitat, to higher terraces with upland habitat. The riparian area was identified during the year 2000 mapping effort[2] and is approximately 14,735 acres. The major tributaries to the Middle Owens flow from the Sierra Mountains on the west and include Bishop Creek, Horton Creek, Big Pine Creek, Birch Creek, Taboose Creek, and Tinemaha Creek. Numerous other tributaries, including those from the White Mountains to the east, provide ephemeral flows generally during the wet season.

Quaternary pyroclastic and mudflow deposits (Bishop tuff) occur along the north side of the riparian area north of Highway 6 (Figure 2.1). Vast expanses of unconsolidated alluvium and lacustrine deposits flank most of the riparian area.[3] Volcanic and granitic rocks flank the MORP riparian area near Tinemaha Reservoir.

Hydrologic features in the MORP riparian area (Figure 2.9) include perennial streams, canals, flowing wells and springs. Stream gages on major streams and canals are monitored by LADWP. Flow is released to the Owens River below Pleasant Valley Reservoir. Average annual flow below Pleasant Valley Reservoir is 384 cubic feet per second (cfs). Downstream of the reservoir the Owens River flow is augmented by several creeks, ditch returns and canals. Average annual flow of the Owens River just below the Tinemaha Reservoir dam is 459 cfs.

The dominant geomorphologic processes of this river reach are characterized by the migration of meanders, erosion at the cut banks and deposition at the point bars. The active channel is generally inset into a larger historic channel. The channel is actively downcutting in some reaches. This is likely a consequence of the changes in water surface elevation (wse) at Tinemaha Reservoir and a flow regime that is dictated by water and power management needs. Mid-channel islands and contemporary areas of deposition forming the current floodplain comprise much of the riparian habitat.

Major vegetation types that comprise at least one percent of the project area include *water, marsh, wet alkali meadow, alkali meadow, riparian shrub (willow), riparian forest (willow), rabbitbrush-saltbush scrub/meadow, rabbitbrush-saltbush scrub,* and *abandoned agriculture.* Hydrophytic vegetation (albeit sometimes scant) was dominant in all of these major vegetation types. Hydric soil, wetland

[2] WHA 2003. MORP Riparian Vegetation Inventory.

[3] Division of Mines and Geology 2000

hydrology and hydrophytic vegetation definitive of jurisdictional wetlands were present in about one-third of the riparian area.

2.3 Baseline Studies

Several studies of the Middle Owens River have been conducted that provide baseline data for the river, habitat, flows, and landscape conditions. These data also serve as the basis for future riverine-riparian management and monitoring. These studies are summarized below and are provided in the appendices.

2.3.1 Middle Owens River Study Design and Protocols

This document was prepared by Ecosystem Sciences and describes the overall study design for collecting baseline information for the Middle Owens River. This document describes how all of the baseline studies (described below) are integrated into a cohesive design for collecting and analyzing baseline data.

The study design divided the Middle Owens River into specific reaches. The riparian area was divided into eight reaches with distinctive valley forms or land forms, stream channel morphology, vegetation community and condition, and hydrologic character.

Reaches generally denote areas of distinctive ecological potential and existing condition. For example, the distribution of land forms in a confined tuff canyon forming the north part of the MORP riparian area is different from the distribution in unconfined lacustrine valley in the south. The distribution of water regimes in reaches with incised stream channel morphology is different than in reaches with graded channel morphology.

Reach types were further defined by ecological differentiation in habitat (both instream and riparian) and vegetation conditions and communities. The reach definitions correspond with distinctive assemblages of land forms, water flow, vegetation types and landscape conditions. The river reaches are expected to respond to management applications in specific ways and can serve as an integrated unit that can guide adaptive management. The protocol for sampling a number of variables within each river reach is described in this study design document.

2.3.2 Middle Owens River, Riparian Vegetation Inventory, 2000 Conditions

Prepared by Whitehorse Associates, this document maps the character of the riverine-riparian area at the landscape scale with a high degree of definition.

Existing information pertinent to vegetation resources in the area was reviewed and assembled. Mapping was conducted from high-resolution digital orthophotos. Mapping denotes areas of distinctive soil, hydrologic and vegetative character. Field descriptions of soil, hydrologic and vegetative attributes were conducted. Vegetative, soil and hydrologic criteria were used to determine the wetland status of map units. The distribution of landtypes, water regimes, and vegetation types were mapped and described as valley form, channel/floodplain morphology, and hydrologic variables. The Middle Owens River riparian area was divided into 6,562 parcels, each consisting of a dominant landtype, water regime and vegetation type. Five major landtypes were identified based on soil, morphology and position relative to environmental gradients. Water regimes for the MORP riparian area were determined by the frequency and duration of flooding, and/or depth to saturated conditions. Vegetation types were identified based on community physiognomy and species composition. The overall accuracy of the final mapping approached 95%.

2.3.3 Middle Owens River Habitat Assessment

This document, prepared by Oxbow Environmental, describes the scope, objectives, and methods used to characterize wildlife habitats within the Middle Owens River. These methods were used in 2005-2006 to conduct a ground-based habitat assessment that describes baseline habitat conditions in the Middle Owens River. Habitat characteristics that were measured have the potential to change in response to land-use, water flow regimes, and management practices over time.

Wildlife habitat characteristics were evaluated at the landscape scale and fine scale using proven research methods and rigorous analytical techniques. At the landscape scale, habitat conditions (size and stage class) were assessed at data collection points throughout the project area. These values were then incorporated into the California Wildlife Habitat Relationship (CWHR) software system to define habitat suitability for wildlife indicator species and guilds. The CWHR habitat suitability values were then entered into a Geographic Information System and summarized for the entire Middle Owens River project area based on habitat composition and configuration. Bird point counts were conducted at the landscape scale at the same data collection points to assess overall bird diversity and evenness, as well the frequency of occurrence and abundance of indicator species.

At the fine scale, the following vegetation characteristics were recorded at data collection points: foliage volume, vertical structure, cover and residual biomass, presence of invasive species, age structure and recruitment, vigor and reproductive potential, and width of the woody riparian canopy. From these data, total vegetation volume and foliage height diversity were derived and compared to bird diversity and abundance within the same areas.

Results from this assessment can be used to indicate the direction and magnitude of natural resource trends in the Middle Owens River as they relate to wildlife and their habitat. As such, it can provide feedback to the adaptive management process and be used to evaluate and possibly alter Middle Owens River resource prescriptions over time.

2.3.4 Middle Owens River Baseline Data; Site Scale Vegetation, Habitat and Channel Morphology

This document, prepared by Ecosystem Sciences, describes site scale monitoring methodology, protocols and data collected. This information provides managers with detailed vegetation and habitat data capable of detecting discreet change over time. The vegetation and habitat components were measured at six 500 meter long sites along the river. Site scale vegetation monitoring consisted of mapping, sub-plots, and transects. Site scale mapping identified vegetation plant communities $5m^2$ in size and mapped the boundaries of all stands. For each patch ($5m^2$) the dominant species in the tallest layer (overstory) and the understory (if possible) were determined.

Subplot sampling, which involved intensively sampling small plots within the polygons, was conducted in order to describe more accurately the vegetation community polygons identified during the mapping. At each site, 40 vegetation polygons were randomly selected. The dominant species for each structural layer of the selected vegetation community was evaluated and recorded along with canopy cover and ground cover.

Transect sampling was also conducted. The purpose of the vegetation transect data, in conjunction with site mapping, subplot sampling and other sampling efforts (landforms and water flow), is to describe the site characteristics. Transects were sampled at the same site locations as the site scale mapping and sub plots. Study sites were aligned with the river channel. Sites were 500 m in length, and transects occurred every 50 m within each site (11 transects over 500 m). Each transect extended away from both sides of the wetted area of the channel through the riparian zone toward the upland zone. Along each transect, the area covered by unique plant communities was determined and recorded via a line-intercept method. Dominant species were ranked by percent cover within each community patch (sample unit) in each of six vegetation layers (upper canopy, lower canopy, high shrub, low shrub, high grass/herb, low grass/herb).

Terrain modeling of the channel and riparian landforms was conducted. The physical condition of the river channel and adjacent landforms was assessed by surveying and modeling the entire site area. The site was surveyed from the upland terrace across the channel to the opposite upland terrace. The terrain models capture all of the features within the site. This data is used to provide information regarding the effects of varying hydrologic discharges, as well as information pertaining to ecological trends in disturbance and succession within the riparian corridor. Measurement of the height above water level and length (along the transect) of each riparian landform was recorded. Landform elevation and dimension data was correlated with discharge measurements, and will be used to develop water surface elevation models that reflect the channel conditions of the MORP.

2.3.5 HEC-2 Modeling

The HEC-2 document, prepared by Ecosystem Sciences, describes the HEC-2 analysis of the Middle Owens River. Terrain models were surveyed and constructed for six selected sites in the riverine-riparian area. After building the terrain models of the existing topography and water surface elevations a flow model or HEC-2 simulation was run.

The HEC-2 modeling uses AutoCAD for computing water surface profiles for the river channel, floodplain delineation and out of bank flows. Modeling software in conjunction with AutoCAD offers a variety of input methods to define the cross-sections to be modeled.

After a water surface profile analysis was performed, the model overlaid the water surface profile on top of the contour map, showing the extent of the water surface with regard to the ground topography. Cross-section, profile, and summary profile plots were constructed, allowing for quick interpretation of the analysis results.

The HEC-2 Interface Module of this modeling software provides a graphical AutoCAD interface to the U.S. Army Corps of Engineers industry-standard HEC-2 water surface profile analysis engine. The HEC-2 Interface Module includes the HEC-2 analysis engine, and provides all of the tools to perform HEC-2 water surface profile modeling within AutoCAD. The model allows the user to instantly perform a HEC-RAS analysis from the defined HEC-2 input data.

The HEC-2 analysis engine is a one-dimensional, steady state, gradually varied flow model. Subcritical and supercritical profiles can be computed separately. The model was used to evaluate out of channel flows, floodplain flows, manage floodplains, design and evaluate channel systems, and determine extent and character of channel flow quantity and velocity. In addition to importing GIS data, the GIS Interface Module exports GIS information as ESRI Shapefiles

2.4 River Reach Descriptions

The Middle Owens River can be divided into eight reaches that have distinct valley forms or land forms, stream channel morphology, vegetation community, and hydrologic character. As described in Section 2.3.1, reaches generally denote areas with distinct existing conditions and ecological potential. Because of this variation in environmental conditions, reaches will respond to both natural (e.g. fire or weather) and anthropogenic (e.g. recreation impacts or management actions) perturbations in dynamic ways. The first six reaches are above Tinemaha Reservoir and provide the best opportunity for improvement in riparian habitat. Reach 7 is the reservoir itself and Reach 8 is the area between the dam and the intake to the aqueduct (Figure 2.2).

The distribution of land forms, water surface and flow, and vegetation community types are influenced by valley form, channel/floodplain morphology, and hydrologic variables. These three parameters were used to define the reach types in the riparian area. The dominant valley form within the Middle Owens River is an alluvial/lacustrine valley, either graded or incised. Five dominant geomorphic characteristics are present:

1) Confined shallow tuff canyon, graded (first .9 km of Reach 1)
2) Unconfined shallow tuff canyon, graded (Reach 1)
3) Alluvial/lacustrine valley, graded (Reaches 2,3,4 and 6)
4) Alluvial/lacustrine valley, incised (Reaches 5 and 8)
5) Alluvial/lacustrine valley, impounded (Reach 7, Tinemaha Reservoir).

Reach types are further defined by ecological differentiation in habitat (both instream and riparian) and vegetation communities and conditions. The river reaches are expected to respond to management actions in unique ways and can serve as an integrated unit for interpretations guiding adaptive management.

Reaches of the Middle Owens River were determined using several methods such as direct field observation, longitudinal river profiles and cross-sections, hydrology and remote imaging analysis. The entire Middle Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake was observed in the field by boat and foot to verify existing ecological conditions. Aerial photography, satellite imagery and mapping were used to determine landscape character, and infrastructure divisions such as roadways, bridges, weirs, canals, and recreational access.

2.4.1 Reach 1: Pleasant Valley Reservoir to Five Bridges: Wild Trout Reach

This 23.6 km graded, unconfined reach (Figure 2.3) is flanked by residual (tuff) canyon slopes on the north and by land types typical of alluvial/lacustrine valleys on the south. It spans from the Pleasant Valley Reservoir down to the crossing of Five Bridges Road. Average bottom width is approximately 370 meters. Stream gradient is low (0.3%) and sinuosity is moderate (1.80). The surface morphology of this graded, unconfined, shallow tuff canyon is similar to graded, alluvial/lacustrine valley reaches (2 and 6).

This reach includes the confluence of Fish Slough from the north. This stretch of river is designated a Wild Trout reach by the California Department of Fish and Game. It includes Pleasant Valley Campground and popular fishing areas and is therefore subject to recreational impacts. In the upper part of the reach (around the campground area) the river is somewhat confined within a shallow tuff canyon until Horton Creek enters and the floodplain widens.

Channel, floodplain and terraces are confined by colluvial canyon slopes and an upland bench along the east side of the river that probably served as the staging area for construction of Pleasant Valley Reservoir dam.

2.4.2 Reach 2: Five Bridges to East Line Street

This 14.1 km unconfined alluvial/lacustrine valley (Figure 2.4) spans from Five Bridges to East Line Street and includes the confluence of South Fork Bishop Creek. The river bottom is graded relative to adjacent floodplains and has low terraces. Average bottom width is approximately 520 meters. Stream gradient is low (0.2%) and stream sinuosity is high (2.08)[4]. The character of this reach is similar to Reaches 1 and 6.

[4] Sinuosity is a ratio and is equal to channel length divided by river length

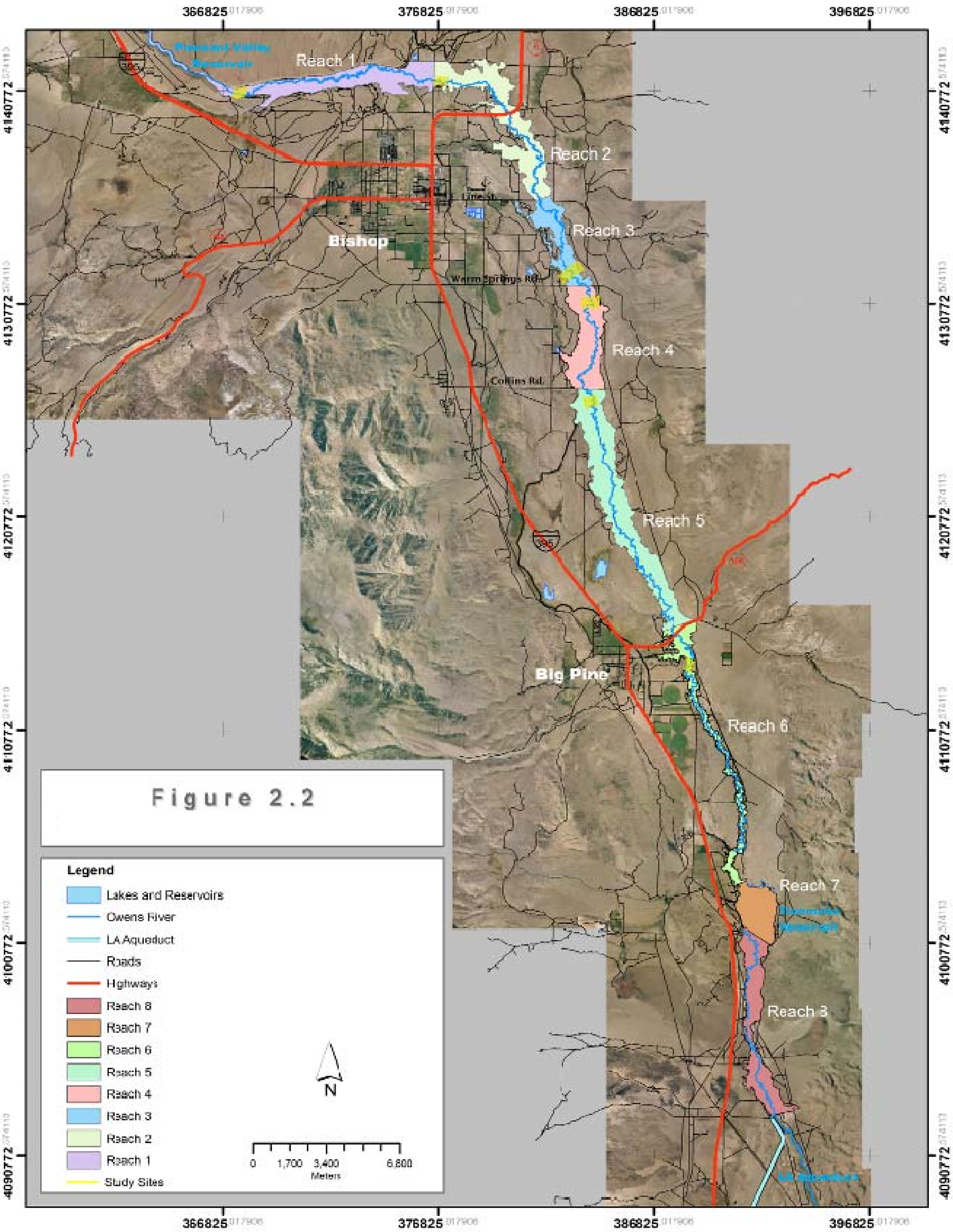


Figure 2.2. Middle Owens Riverine-Riparian Reach Designation.

Reach	River km's		Length	Gradient	Sinuosity	Valley-form	Channel	Hydrologic
	From	To	(km)	(%)	Ratio		Morphology	Character
1	0.0	23.6	23.6	0.3	1.80	Unconfined, shallow tuff canyon	Graded	Unconfined floodplain
2	23.6	37.7	14.1	0.2	2.08	Alluvial/lacustrine valley	Graded	Unconfined floodplain
3	37.7	45.3	7.6	0.1	1.80	Alluvial/lacustrine valley	Graded	Unconfined floodplain
4	45.3	52.2	6.9	0.1	1.70	Alluvial/lacustrine valley	Graded	Unconfined floodplain
5	52.2	70.7	18.5	0.1	1.96	Alluvial/lacustrine valley	Incised	Unconfined floodplain
6	70.7	87.9	17.2	0.1	1.64	Alluvial/lacustrine valley	Incised	Unconfined floodplain
7	87.9	91.1	3.2	0.2	--	Alluvial/lacustrine valley	Impounded	Reservoir
8	91.1	102.1	11	0.1	1.66	Alluvial/lacustrine valley	Incised	Confined floodplain
TOTAL	**0.0**	**102.1**	**102.1**	**0.15**	**1.81**	**--**	**--**	**--**

Table 2.1. Middle Owens River Reaches

Cut banks in this reach are not a dominant feature and only three significant cut banks were observed. Consequently, streambank sloughing was not observed. The gradient is low and flow velocities are high in some places (>3fps). The riparian vegetation is generally dense and vigorous, and in some places extends considerable distances laterally from the river. Cottonwood trees are infrequent, as the riparian tree communities are dominated by willow, predominantly red willow (*Salix laevigata)*. Grazing impacts on riparian vegetation are evident in this reach, especially around Laws. Oxbows are relatively common, and riparian vegetation is most pronounced adjacent to oxbows. Fish habitat consists of frequent deep pools, a small number of riffles and gravel-cobble substrate. There were no significant amounts of fine sediment deposits on bars or river bottoms.

2.4.3 Reach 3: East Line Street to Warm Springs Road

This reach is characterized by an unconfined alluvial/lacustrine valley type. The reach spans from East Line Street to Warm Springs Road. Average bottom width is about 550 meters. Stream gradient is low (0.1%) and stream sinuosity is moderate-to-high (1.96).

In this reach the river is mostly run-type fish habitat with a gravel bottom. The riparian vegetation forms a narrow fringe along the banks but has little depth moving laterally from the river. There were no significant cut banks or water surface separation from streambanks. Bank sloughing was minimal at a flow of 500 cfs.

2.4.4 Reach 4: Warm Springs Road to Big Pine Canal Diversion

This reach is characterized by an unconfined alluvial/lacustrine valley type. The reach spans from Warm Springs Road to Big Pine Canal diversion. Average bottom width is about 550 meters. Stream gradient is low (0.1%) and stream sinuosity is moderate-to-high (1.96).

Large, wide floodplains are the dominant landform throughout this reach. The river gradient lowers and there is less flow velocity than upstream. The water level is set high and often reaches bank full, likely because of the backwater effect from Big Pine Canal diversion. This reach has few cut banks and generally streambanks exhibit low elevation relative to water surface.

Figure 2.3. Reach 1: Pleasant Valley Reservoir to Five Bridges

Figure 2.4. Reach 2: Five Bridges to East Line Road

Figure 2.5. Reach 5: Big Pine Canal Diversion to Zurich

Fish habitat consists of meander pools, mid-channel deep pools, and gravel bottom and streambars that are relatively free of fine sediment deposits. Riparian vegetation is broad, moving laterally from the channel. The vegetation is heavily grazed. The riparian vegetation in this reach includes many cottonwoods and gallery forests.

2.4.5 Reach 5: Big Pine Canal Diversion to Zurich

This reach is characterized by unconfined alluvial/lacustrine valley. The river bottom is incised (Figure 2.5) relative to adjacent terraces. Average bottom width is about 550 meters. Stream gradient is low (0.1%) and stream sinuosity is moderate-to-high (1.96). The character of this reach is similar to Reach 8.

This reach exhibits numerous steep, extremely high cut banks and considerable bank sloughing. Water surface elevation of Tinemaha Reservoir is possibly the cause of the extreme downcutting. Flow control upstream has attenuated flood flows that would allow the river to jump to new or historic channels and abandon the cut banks. This reach of the river is permanently set in the incised channel. The hyporehic zones are separated from river flow in most places. This reach exhibits poor riparian vegetation conditions. The lack of riparian vegetation in this reach indicates a low water table. There is substantial sediment deposition on streambars, shallow pools, and in backwater areas. Fish habitat is confined primarily to deep mid-channel runs.

2.4.6 Reach 6: Zurich to Tinemaha Reservoir Tailwater

This reach is characterized by an unconfined alluvial/lacustrine valley and spans from Zurich to the upstream extent of Tinemaha Reservoir. The stream bottom is graded (Figure 2.6) relative to adjacent floodplains and terraces in the upstream part and tending towards aggraded in the downstream part. Average bottom width is approximately 230 meters. Stream gradient is low (0.1%) and sinuosity is moderate (1.64).

This reach supports a relatively dense cottonwood forest. The river channel contains a number of log and debris jams throughout its course. The riparian canopy approaches 80% closure. The reach contains a few steep cut banks, but streambanks are well vegetated and generally in good condition. The water surface elevation meets the channel such that the adjacent water table supports dense, deep riparian vegetation with a hyporheic zone that is adequate for riparian conditions to persist. The river channel bifurcates in many locations, creating islands. The microhabitat for fish is good with meander pools and channel runs.

2.4.7 Reach 7: Tinemaha Reservoir

This 3.2 km unconfined alluvial/lacustrine valley corresponds with the area that is impounded by Tinemaha Reservoir (Figure 2.7). This reach consists entirely of the reservoir area. Bare shoreline and tamarisk dominate the non-inundated areas around the reservoir.

2.4.8 Reach 8: Tinemaha Reservoir to Los Angles Aqueduct intake

This 11 km unconfined alluvial/lacustrine valley spans from the Tinemaha Reservoir outlet to the Los Angeles Aqueduct intake. The stream bottom is incised (Figure 2.8) relative to adjacent terraces. Average bottom width is 450 meters. Stream gradient is low (0.1%) and sinuosity is moderate (1.66). The character of this reach is similar to Reach 5. This reach is characterized by incised meanders and a low-gradient stream channel.

Figure 2.6. Reach 6: Zurich to Tinemaha Reservoir Tailwater

Figure 2.7. Reach 7: Tinemaha Reservoir

Figure 2.8. Reach 8: Tinemaha Reservoir to LAA Intake.

2.5 Landforms and Geomorphology

The Owens Valley below the Gorge is a 90 mile long graben (depressed block of land bordered by parallel faults) that has descended into the earth's crust while the two towering mountain ranges, the White Mountains and the Sierra Nevada, have risen to heights over 14,000 feet. The riparian area begins at the northern end of this valley where the Owens River emerges from Pleasant Valley Reservoir at the mouth of the Owens River Gorge. The Owens River Gorge is a 16 mile long notched canyon in which the river has cut through the volcanic tableland to depths over 700 feet. Quaternary pyroclastic and mudflow deposits (Bishop tuff) occur along the north side of the riparian area in Reach 1 north of Highway 6 (Figure 2.2). These cliffs, called the Chalk Bluffs, rise up to 200 feet above the north side of the riparian area. Vast expanses of unconsolidated alluvium and lacustrine deposits flank most of the riparian area.[5] Volcanic and granitic rocks flank the riparian area near Tinemaha Reservoir.[6]

The riparian area consists of several dominant land forms, water regimes and vegetation types. Five major land forms were identified in the year 2000 during a study based on soil, morphology and position relative to environmental gradients. The number of these landforms, their area, perimeter and perimeter/area ratio are found in Table 2.2.

The *channel land form* includes permanently and semi-permanently flooded stream courses. The *floodplain land form* includes low surfaces influenced by contemporary stream processes; surfaces were typically less than 0.5 meters above alluvial groundwater level; hydric soils were evident. The *low terrace land form* includes historic floodplains that have been left high-and-dry by channel incision; surfaces were typically 0.5 to 2 meters above alluvial groundwater level except in the vicinity of springs, flowing wells, and other unique water sources. Hydric soil was not evident. *High terraces* were typically greater than 2 meters above alluvial groundwater level; except in unique hydrologic settings, hydric soil was not present. *Alluvial fans* occur where low order streams intersect higher order streams; except in unique hydrologic settings, hydric soil was not present. The *reservoir basin land form* corresponds with areas principally influenced by reservoir management.

Landtype		N	Area		Perimeter	Per/Area[7]
Code	**Name**		**(acres)**	**(%)**	**(ft)**	**Ratio**
1	Channel	71	397	2.7	274874	5.2
1b	Ditch/Canal	1	5	0.0	4933	7.0
3	Floodplain	720	2763	18.8	618103	1.7
4	Low terrace	648	2665	18.1	389956	1.1
5	High terrace	251	7203	48.9	384869	0.4
6	Alluvial fan	17	710	4.8	32371	0.3
9	Reservoir	3	992	6.7	11627	0.1
	TOTAL	**1711**	**14735**	**100.0**	**--**	**--**

Table 2.2. Middle Owens River Landtypes

[5] Division of Mines and Geology 2000

[6] WHA 2003. MORP Riparian Vegetation Inventory.

[7] Perimeter/area ratio was calculated as (perimeter [ft]/area [square feet])*100 and is a relative measure of the complexity of the boundary. Landtypes with high ratios are smaller and/or have a more complex boundary than landtypes with low ratios. Landtypes with a high ratio (>2) are expected to have a high proportion of contrasting inclusions; those with a moderate ratio (1 to 2) are expected to have a moderate proportion of contrasting inclusions; those with a low ratio (<1) are expected to have a low proportion of contrasting inclusions.

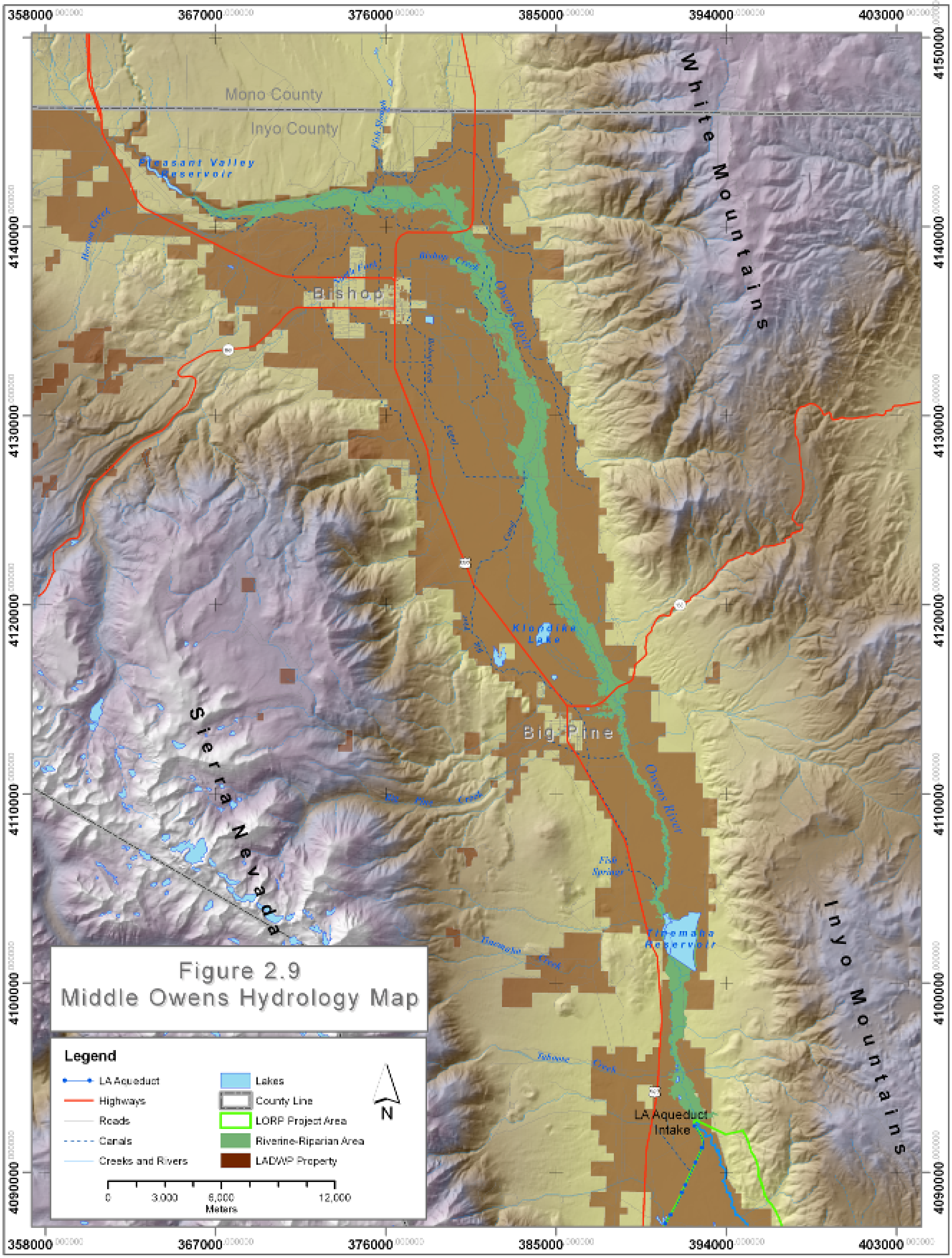


Figure 2.9. Middle Owens River Hydrology Map

2.6 Vegetation Conditions

Vegetation Type		N	Area		Perimeter	Per/Area
Code	Name		(acres)	(%)	(ft)	Ratio[8]
9	Rabbitbrush-NV saltbush scrub	273	4194	28.5	1029233	0.6
8	Rabbitbrush-NV saltbush scrub/meadow	813	3505	23.8	2262357	1.5
4	Alkali meadow	753	1787	12.1	1320277	1.7
1	Water	130	1069	7.3	1024557	2.2
6a	Riparian shrub (willow)	626	955	6.5	1080313	2.6
2	Marsh	683	824	5.6	924570	2.6
3a	Wet alkali meadow	600	675	4.6	778972	2.6
7a	Riparian forest (willow)	1435	641	4.3	918591	3.3
11b	Abandoned agriculture	4	309	2.1	37126	0.3
18	Reservoir shoreline	7	175	1.2	59999	0.8
6b	Riparian shrub (rose)	135	121	0.8	128854	2.4
23	Gravel pit	1	101	0.7	28140	0.6
12	Streambar	539	89	0.6	225889	5.8
5	Irrigated meadow	6	79	0.5	36030	1
7b	Riparian forest (cottonwood)	297	57	0.4	102340	4.1
10	Tamarisk	37	45	0.3	49734	2.5
15	Developed land	1	46	0.3	10903	0.5
19	Structure (dam)	1	22	0.2	11166	1.1
3b	Reedgrass	28	11	0.1	20339	4.4
11a	Cut/fill	21	21	0.1	19469	2.1
7c	Riparian forest (locust)	3	2	0	3256	3.1
16	Runway	1	5	0	3390	1.6
	TOTAL		**14735**	**100**	**--**	**--**

Table 2.3. Middle Owens River Vegetation Types

Riparian vegetation composition and condition were considered during reach designation. The influence of riparian vegetation on channel stability, water temperature, and floodplain development are well understood.[9] Each reach has characteristic vegetation patterns.

For example, the upper part of the Wild Trout Reach (Reach 1) is virtually devoid of woody streamside vegetation for the first few kilometers, while Reach 6, just upstream of the Tinemaha tail waters, is characterized by a dense riparian gallery forest.

Vegetation types were identified in a 2000 mapping effort[10] and are based on community physiognomy and species composition. The names of vegetation types were modified from those used by Holland and reported in the Green Book (1991)[11]. Major vegetation types that made up at least one percent of the project area include *water, marsh, wet alkali meadow, alkali meadow, riparian shrub (willow), riparian forest (willow), rabbitbrush-NV saltbush scrub/meadow, rabbitbrush-NV saltbush scrub,* and *abandoned agriculture.* Hydrophytic vegetation (albeit sometimes scant) was dominant in all of these major vegetation types. Hydric soil, wetland hydrology and hydrophytic vegetation definitive of jurisdictional wetlands were present in about 4,092 acres (27.8 percent) of the riparian area.

Rabbitbrush-NV saltbush scrub/meadow and rabbitbrush-NV saltbush scrub vegetation types comprise over 50% of the Middle Owens riparian area. The vegetation type, number of mapping units, acres, percent of total area, perimeter, and perimeter to area ratio are provided in Table 2.3.

8 Perimeter/area ratio was calculated as (perimeter [ft]/area [square feet])*100 and is a relative measure of the complexity of the boundary. Vegetation types with high ratios are smaller and/or have a more complex boundary than vegetation types with low ratios. Vegetation types with a high ratio (>2) are expected to have a high proportion of contrasting inclusions; those with a moderate ratio (1 to 2) are expected to have a moderate proportion of contrasting inclusions; those with a low ratio (<1) are expected to have a low proportion of contrasting inclusions.

9 Gregory et al. 1991, Melanson 1993.

10 WHA 2003. MORP Riparian Vegetation Inventory.

11 Green Book (1991)

2.7 Aquatic Biota

The aquatic biota found in the Middle Owens River is a mix of both introduced and native fish and invertebrate species. Numerous exotic game fish species have been introduced over time along with invading species such as Lahontan tui chub (from adjacent watersheds) and mud snails. Many of the invading species pose current and future management problems. Nevertheless, the Middle Owens is a very popular fishery and supports considerable angling throughout the year. Thus, while many species are not native, the mix of introduced fish species has been successful in terms of creating a successful, recreational fishery. The following sections describe the native, introduced, and invading species that make up the Middle Owens aquatic biota.

2.7.1 Fish

The California Department of Fish and Game (CDFG) stocks the Middle Owens River with rainbow trout (*Oncorhynchus mykiss*), an important recreational fishery in the Owens Valley. The Middle Owens River also supports a healthy population of brown trout (*Salmo trutta*). The Middle Owens River contains a variety of unique fish species such as the endangered Owens pupfish (*Cyprinodon radiosus*) and Owens tui chub (*Siphateles bicolor snyderi*), which have been extirpated from most river reaches as a result of the introduction of non-native species and other factors (tui chub are present along eight miles of the Owens River below Long Valley Dam/Crowley Reservoir). Other native species, Owens sucker (*Catostomus fumeiventris)* and Owens speckled dace (*Rhinichthys osculus* spp.) may be able to persist in very shallow, backwater areas around Tinemaha Reservoir and in tule beds as well as in tributaries.

In 2002 the CDFG conducted fish surveys in two sections of Horton Creek. The lower section was immediately below the Pleasant Valley Dam road crossing in a shallow beaver pond heavily shaded with willow and wild rose on overhanging streambanks. The upper section flows as a set of swift runs and two small pools bordered by dense willow, rabbitbrush, and wild rose. A single sucker measuring 210 millimeters (mm) in length was found in the upper section and one in the lower section measured 185 mm. Combined sampling in both upper and lower reaches resulted in 17 speckled dace. This indicates that these two native fish species are able to persist in habitat that provides good cover and protection from brown trout; thus, it can be assumed that Owens sucker and speckled dace probably occupy other tributaries.

Historical records indicate that the decline of native fish assemblages occurred during the period from 1930 to 1970.[12] The rapid decline of native fish species is attributed to introductions of exotic predatory fishes and loss of habitat. While pupfish are rare, they have been kept in a relatively stable condition in small refuge sites in the Owens Valley.

Extirpation of native species occurred before biological surveys of their populations were performed, thus quantitative descriptions of their historical natural distribution and abundance is not possible. It has been suggested that Owens dace would have historically been the dominant fish in the headwaters of the Owens system and the riffles of the lower sections.[13] Pupfish are thought to have originally inhabited springs and marsh areas, while suckers and tui chub dominated the slow-flowing lower sections of the river. In recent years Lahontan tui chub (*Siphateles bicolor obesa)* have been introduced into the Owens Basin; hybridization with the Owens tui chub is threatening the genetic purity of Owens tui chub populations in the system.

Owens pupfish and the Owens tui chub are both listed as threatened and endangered (T&E) species by federal and state governments. Owens speckled dace is a California species of special concern and has been listed as a species of concern in the draft federal species recovery plan for the Owens

[12] Sada, D. W. 1989. Status and distribution of speckled dace (Rhinichthys osculus) in the Owens River system, Inyo and Mono Counties, California. Unpublished report to California Department of Fish and Game, Rancho Cordova. 33 pp.
[13] Moyle 1976a

Basin; Owens sucker is a species of special concern in the State of California.

Introduction of exotic fish species into the Owens Valley is well documented. Western mosquito fish (*Gambusia affinis*) were introduced in recent years as a control mechanism for mosquitoes. Listed below are exotic fish species that are present in the LORP area along with their dates of introduction:

- Largemouth Bass (1908)
- Smallmouth Bass (1874)
- Catfish (1875)
- Bluegill and sunfish (1930)
- Carp (1881)
- Brown Trout (1877-present)

Although detailed surveys have not been conducted by river reach, it can be assumed that most of the exotic species will occur to one degree or another throughout the river.

2.7.2 Benthic Invertebrates

Benthic macroinvertebrates are aquatic insects that inhabit stream and pond bottoms during the larval and nymphal stages of their development. The benthos provides a major food source for fish and other organisms inhabiting the stream or pond. The principal issue with the benthos in the Middle Owens River is the effect of flow changes.

The effect of river flow on macroinvertebrate communities depends to a great degree on the magnitude of the flow changes, the length of the channel affected, the size of substrate, and the morphology of the channel. It has been reported that habitat factors such as substrate type, food availability, and winter flow conditions may have equal or greater impact on macroinvertebrate communities than do low flows.[14]

Hafele (1978) and White et al.[15] concluded that flow changes of 50 to 95% had no substantial effect on macroinvertebrate densities. In both studies the number of macroinvertebrates per unit of substrate remained the same under control and test conditions in experiments conducted during spring, fall, and summer months. In the 1981 White et al. study, the artificial channels used were trapezoidal in cross section, and flow reductions of up to 95 percent did not cause significant changes in macroinvertebrate habitat availability or total macroinvertebrate production. In the Hafele study (1978), a flow reduction of 75% in a natural stream channel resulted in an 83% loss of riffle habitat and an 18% loss of pool habitat. Hafele only reported that there were no changes in density; changes in the total macroinvertebrate productivity of the stream were not reported. Flow reductions did not significantly reduce macroinvertebrate densities in these two studies because of the channel morphology of the study streams. The study sites were located in wide and relatively uniform channel conditions which, when subjected to flow reductions, caused a loss of water depth but did not necessarily cause a reduction in the total wetted perimeter.

Flow changes often trigger a dramatic increase in insect drift rates. Minshall and Winger [16] hypothesized that an initial increase in insect drift rate is the larvae's response to unacceptable water depth and current velocity conditions brought about by the flow changes. Actively drifting insect larvae are believed to be searching for acceptable microhabitats under the new low flow stream conditions (Minshall and Winger 1968, White et al. 1981). The magnitude and duration of increased drift rates varied with the season, the extent of flow changes, and the insect taxa affected (White et al. 1981). Insect drift and flow changes cause and effect relationships are not characteristic of ponds, lakes, springs and

[14] Hafele, R. 1978. Effects of Controlled Flow Reductions on the Insect Community of an Oregon Coastal Stream. Masters Thesis. Oregon State Uni. Corvallis.
Egglishaw, H. 1984. The distribution of invertebrates in stream flow on substrata of fast-flowing streams. J. of Animal Ecol. 38:19-33

[15] White, R.G., et. al. 1981. Effects of Reduced Stream Discharge on Fish and Aquatic Macroinvertebrate Populations. Idaho Water and Energy Resources Res. Instit. University of Idaho, Moscow

[16] Minshall, G. and P. Winger. 1968. The effects of a reduction in stream flow on invertebrate drift. Ecol. 49:580-582

seeps, but is a common phenomenon in streams.

Substrate composition is considered an important factor in macroinvertebrate production. Generally, riffle areas having course gravel and cobble substrates are considered the most productive sections of streams for macroinvertebrates[17]. Flow reductions typically slow current velocities, cause streams to become more shallow, and reduce a stream's ability to move fine sediments. Without periodic flushing flows, fine sediment accumulations can fill the interstitial spaces in coarse gravel and cobble areas that are vital to the survival of myriad macroinvertebrate taxa. Flow reductions, therefore, can cause changes in the composition of substrate. In riffles this substrate alteration would result in a shift in the macroinvertebrate community from erosional habitat taxa (Psephenus, Rithrogena, Hydropsychidae, Simuliidae, Deuterophlebiidae, Perlidae) to intermediate (Ephemera, Pychnopsyche, Sialis, Sphaerium) or depositional (Hexagenia, Caenidae, Amphiopoda, Leptoceridae, Limnophilidae) taxa.[18] In addition, with substrate conditions below optimal levels, there would be a reduction in the productivity of the affected area. The effects of current velocity reductions and increased sedimentation on pool dwelling macroinvertebrates would be minimal.

This review of the scientific literature indicates that flow reductions and the attenuate changes in wetted perimeter, velocity, turn-over rate, etc., may or may not result in a change in species assemblage of benthic macroinvertebrates. However, the greatest threat to the benthic community in the Middle Owens River comes from the rapid invasion and expansion of an invasive mud snail.

[17] Stalnaker, C. and J. Arnette. 1976. Methodologies for determination of stream resource flow requirements: an assessment. USFWS. Off. Biol. Svc. Utah State Uni. Logan

[18] Cummins, K.W. l972. What is a River? River Ecology and Man. Academic Press, Inc. New York.

2.7.3 New Zealand Mud Snail

New Zealand mud snails (*Potamopyrgus antipodarum*) are nearly impossible to contain once they have invaded an aquatic ecosystem. For instance they are so small (only up to 6 mm in length) that they cannot be skimmed from waters. Highly resilient, the snails can survive several days out of water and can withstand a wide range of temperatures. The tiny invertebrates can even pass unscathed through the digestive tracts of fish. Because they are self-reproducing “livebearers” that give birth to well-developed clones, it only takes one New Zealand mud snail to start a new colony in a stream or river.

Although these snails can tolerate a wide range of temperatures (from near 0º C to 32º C in laboratory tests), they prefer thermally stable streams with moderate flow variability in the western United States. Regulated rivers, springs, or geothermal-driven streams, and low gradient, foothills streams better fit the habitat requirements of the mud snail than high elevation, cold and turbulent mountain streams or canyon-bound, flash-flooding creeks. Because of desiccation resistance and salinity tolerance of the New Zealand mud snail, streams that temporarily dry out or have high salinity in some reaches cannot be excluded as potential habitats. Within a stream, the omnivorous New Zealand mud snail can be found consuming diatoms, periphyton, or decaying plant material in cobble and gravel substrates or on aquatic vegetation. Like most of our native “grazing” invertebrates, they are less common in sandy or silty areas.

Any new biotic component to an aquatic ecosystem, including invasive species such as the New Zealand mud snail, must carve a niche for itself. In doing so, the structure (e.g., species diversity) and function (e.g., energy flow) of the native food web is disrupted. The invasive snail competes with native invertebrates, including native mollusks, for space and food resources. Because of their prolific nature, mud snails can compromise up to 80% of invertebrate biomass and can consume more than 75% of the gross primary production in the stream. Thus, they control the energy dynamics and nutrient cycling in the aquatic ecosystem. Adverse impacts to lower levels of the food web may have implications for organisms at higher levels, such as fish, which rely on lower-level organisms as a food source. Mud snails may reduce the availability of native invertebrate prey for fish such as trout and dace, and at the same time, are not viable food sources themselves. Their hard shell and resistance to digestion allow them to pass through a fish gut unscathed, thus lending no nutrition or calorie input to the fish. Interestingly, negative impacts on fish populations have not yet been documented in areas of high mud snail densities. While fish can still swim to un-invaded reaches to seek food, many biologists feel that it is only a matter of time until the mud snail spreads far enough within invaded streams to begin having a negative impact on fish growth. In general, it often takes decades for the impacts of an invasive species on native biota to fully manifest.

How the New Zealand mud snail first arrived in western Unite States water bodies is still somewhat of a mystery, but the spread is clearly tied to trout fly-fishing anglers. Fish aquaculture operations and fish stocking have also been implicated as potential invasion vectors for the snail in some streams and rivers of California. Biologists indicate that other human-related vectors have played a large role. Potential "human" modes of invasion include the snails "hitchhiking" on gear of aquatic recreationists, such as boats, rafts, fishing equipment, and waders/boots/sandals; even spreading via clinging to fire-fighting and earth-moving equipment. As a consequence, LADWP has initiated a rigid program of cleaning any equipment (including shoes) that is used in the mud snail infestation areas.

2.8 Wildlife Habitat

A multi-scale habitat assessment was conducted in 2006 to assess the Middle Owens River riparian area.[19] This assessment is located in the appendices. The habitat assessment includes a detailed discussion of the parameters summarized here as well as mapping, definition of the habitat types and guilds, and descriptions of how suitability values were determined. The assessment also describes all of the reaches and habitat areas, dominant habitat types, number of indicator species observed, and a list of indicator species (a species whose presence, absence, or relative well-being in a given environment is indicative of the health of the ecosystem as a whole).

Assessments were conducted for each of the eight reaches of the Middle Owens River. The sections below summarize the major findings with respect to vegetation structure, composition and configuration, habitat quality and condition, and avian diversity. Each reach is individually discussed, with the exception of Reach 7 (Tinemaha Reservoir), which was not evaluated.

2.8.1 Reach 1: Pleasant Valley Reservoir to Five Bridges: Wild Trout Reach

Reach 1 was the third largest reach (2,091 acres) and had the highest diversity and evenness of all California Wildlife Habitat Relationship (CWHR) habitat types. It had the highest proportion of Desert Riparian and Perennial Grassland habitat relative to other reaches. In terms of spatial arrangement of habitat patches, Reach 1, along with Reach 2, had the largest amount of core area and by far the most contiguous and least fragmented Perennial Grassland habitat, based on results for all patch metrics. Along with Reaches 2 and 6, it also had the most contiguous and least fragmented Desert Riparian and Fresh Emergent Wetland habitat. The Desert Riparian habitat within Reach 1 was comprised of a small number of large patches that had the largest core area of all other reaches.

In terms of bird diversity, Reach 1 had the second highest value (along with Reaches 2 and 3 that had equal value). Reach 1 had an intermediate number of indicator species present within bird point counts compared to other reaches. The abundance of indicator species at this reach was the third highest, with

[19] Oxbow Environmental 2006. Middle Owens River Habitat Assessment.

14 individuals observed during counts. A Great Blue Heron rookery with at least 8 occupied nests was observed at a point count within this reach. The rookery was within the largest contiguous patch of Desert Riparian habitat in the project area. A Northern Harrier nest was also observed within this reach.

An active bank swallow colony (a state threatened species) was located within Reach 1 off of Chalk Bluff Road on the north side of the reach. A Northern Harrier and fledglings were also observed within Site 1 of Reach 1 in 2005. Brown-headed Cowbird abundance was the second highest at Reach 1. This was most likely due to this reach being dominated by mesic grasslands adjacent to patches of Desert Riparian, which is preferred nesting and foraging habitat. Habitat quality and condition assessments at the landscape scale revealed that shrub vigor was the lowest in Reach 1. Reach 1 had the highest suitability for the successional scrub/forest and woodland guilds of birds most likely because of the health of its Desert Riparian community and proximity to open areas. It also had very high suitability for the grassland guild of birds and grassland associated wildlife.

2.8.2 Reach 2: Five Bridges to East Line Road

Reach 2 provided the highest habitat value for the grassland associated indicator species, such as the Owens Valley Vole, Swainson's Hawk, and Northern Harrier. It was the second largest reach overall (2,412 acres) and had the largest area of Perennial Grassland. Based on the patch analysis, Reach 2 had the largest amount of core area, and along with Reach 1, had the most contiguous and least fragmented Perennial Grassland habitat. Along with Reaches 1 and 6, it also had the most contiguous and least fragmented Desert Riparian and Fresh Emergent Wetland habitats. This reach had the highest habitat suitability for the grassland guild compared to all other reaches. Total area of potentially suitable Owens Valley vole habitat was also largest in Reach 2, due to the large amount of Perennial Grassland habitat. Reach 2 had the second highest bird diversity (along with Reaches 1 and 3 that had equal value). Relative to other reaches, Reach 2 had an intermediate number of indicator species present within bird point counts. The abundance of indicator species was also an intermediate value, with 12 individuals observed during counts. A Willow Flycatcher territory was observed in this reach during a point count in the 2006 field season.

Reach 2 had the lowest overall condition quality, but it was still positive when averaged across all condition class types. Erosion was least extreme at Reach 2. North of Site 4 there was an active quarry which had torn up the Alkali Desert Scrub habitat in that area. However, the new mounds of dirt situated by small ponds provided suitable nesting habitat for Bank Swallows where an active Bank Swallow colony was located. Reach 2 had the highest suitability for grassland associated wildlife and very good suitability for wetland-open water, woodland, and successional scrub/forest guilds of birds.

2.8.3 Reach 3: East Line Road to Warm Springs Road

Reach 3 had the smallest total area (1,110 acres) and had the smallest amount of Perennial Grassland habitat. Total core area for both Perennial Grassland and Fresh Emergent Wetland habitats were very low in this reach, and all other patch metrics indicated these habitats were fragmented.

Although total core area of Desert Riparian habitat was the fourth largest at this reach, it had the largest average patch size for Desert Riparian (1.7 acres) with the lowest edge to area ratio. It also had the smallest number of patches, given the total amount of habitat. Thus, this reach was comprised of few, large patches of Desert Riparian habitat, which may explain why it had the highest suitability values for the successional scrub/forest guild group.

Reach 3 had the second highest value for bird diversity, although it was very close to the values for Reaches 1 and 2. Reach 3 also had the second highest number of indicator species (after Reach 6) occurring in point counts. The abundance of indicator species at this reach was also second highest, with 17 individuals observed during counts.

In terms of habitat quality and condition, Reach 3 had the highest average condition quality value, which was due to relatively high vigor values, the shrub, tree, and herbaceous vegetation layers, low herbivory on vegetation, and minimal erosion. Shrub vigor was highest in Reach 3. Herbivory on vegetation was lowest in Reach 3. This is logical, given that shrubs are healthier when they are not subject to heavy browsing.

Reach 3 had excellent suitability for the successional scrub/forest, and woodland guilds of birds. This was evidenced at multiple levels of analysis. This reach had the least fragmented and most contiguous Desert Riparian habitat, the highest suitability values for the successional scrub/forest guild, and the best quality and condition values, with high vegetation vigor and minimal erosion. It follows that this reach would have high bird diversity with a high abundance of indicator species. However, due to the highly fragmented and low proportion of Perennial Grassland and Fresh Emergent Wetland habitats, Reach 3, compared to Reaches 1 and 2, provides poor suitability for the grassland and wetland-open water guilds of species.

2.8.4 Reach 4: Warm Springs Road to Big Pine Canal Diversion

Along with Reach 8, Reach 4 provided the poorest habitat quality for wildlife, evidenced consistently at all levels of analysis. This reach had the highest proportion of Alkali Desert Scrub, the lowest proportion of Desert Riparian, and very low proportions of Fresh Emergent Wetland and Perennial Grassland habitats. It also had the smallest total area of Desert Riparian habitat. It was intermediate in terms of size compared to all other reaches (1,693 acres). Overall diversity of all habitat types was lowest at this reach.

Reach 4 had among the lowest suitability values for all guild groups, especially the wetland-open water, successional scrub / forest, and woodland guilds. Overall suitability was very low, second only to Reach 8.

As would be expected, given the above findings, Reach 4 had the second lowest number of individuals and abundance of indicator species as well as total bird diversity. Overall habitat suitability was among the lowest of all reaches, second only to Reach 8. Reach 4 had some of the lowest suitability values for all guild groups, especially the wetland-open water, successional scrub / forest, and woodland guilds. Potential vole habitat was minimal at this reach due to the small areas of Perennial Grassland and Fresh Emergent Wetland habitats.

Reach 4 had the second poorest overall condition quality value. This reach was dominated by dense Alkali Desert Scrub habitat that had positive values for herb and shrub vigor. Shrub recruitment was poorest and erosion was most extreme within this reach.

2.8.5 Reach 5: Big Pine Canal Diversion to Zurich

Reach 5 had the largest total area (3,373 acres). Although it had the third lowest percentage of Alkali Desert Scrub of all reaches, it had the greatest total area of Alkali Desert Scrub compared to all other reaches in the project area. Reach 5 had the second lowest proportion of Fresh Emergent Wetland, Perennial Grassland, and Desert Riparian habitats. However, the amount of core area for Perennial Grassland was the third largest, compared to all other reaches. Perennial Grassland habitat in Reach 5 was comprised of many small patches with high edge to area ratios. This reach had the greatest number of Desert Riparian patches that were smallest in size, indicating highly fragmented habitat. Despite this, the amount of core area of Desert Riparian habitat was relatively high.

In terms of bird diversity, Reach 5 had the third lowest value, but it was still relatively high. Reach 5 had a moderate number of indicator species present (same as Reaches 1 and 2). The abundance of indicator species was the third lowest, with 13 individuals observed during counts. A Willow Flycatcher pair presumed to be the federally endangered southwestern subspecies was recorded singing and calling in the 2006 field season within this reach. An occupied Long-eared Owl nest was also recorded in this reach.

Given the relatively high bird diversity and incidence of indicator species within this reach, it does not follow that Reach 5 had the lowest suitability value for the woodland guild group. Suitability values for all other guild groups were also among the lowest within this reach. As such, overall habitat suitability was very low. This reach had the highest proportion of Pasture habitat and was also the only reach with Urban habitat present, which may have contributed to these low suitability values. Reach 5 had the second highest overall habitat quality and condition value, although the extent of erosion was third highest at this reach. These findings are difficult to synthesize into a meaningful conclusion regarding the overall habitat value provided to wildlife within this reach.

2.8.6 Reach 6: Zurich to Tinemaha Reservoir Tailwater

Reach 6 provided the highest habitat quality for wildlife compared to all other reaches at all levels of analysis. This reach was unique in that it was located just upstream of Tinemaha Reservoir and became increasingly wet and dense with decreasing distance to the reservoir. Reach 6 occupied the third smallest area (1,292 acres), but had the highest proportion and total area of Fresh Emergent Wetland and the lowest proportion and total area of Alkali Desert Scrub habitats. It had the most contiguous and least fragmented Fresh Emergent Wetland habitat.

It also had among the highest proportion of Desert Riparian habitat that was characterized by few total patches with a large average patch size, and the third largest amount of core area. The Desert Riparian habitat within Reach 6 comprised of a small number of large patches that had the largest core area of all other reaches. Reach 6 had a relatively low proportion of Perennial Grassland habitat, which was comprised of a large number of patches, with a small average patch size and fairly small core areas. Overall diversity of all habitat types was the second highest in this reach.

Reach 6 had the highest suitability values for all guild groups except the successional scrub/forest guild which had an intermediate value (similar to Reaches 1 and 2). Overall suitability was the highest of all reaches. Available area of potential vole habitat was large due to the extensive amount of Fresh Emergent Wetland habitat; Perennial Grassland, which may provide higher quality habitat for voles, was relatively small in this reach.

Based on avian point counts, Reach 6 had the highest bird diversity, the highest number of indicator species, and by far the greatest abundance of indicator species. Two indicator species, the Wood Duck and Virginia Rail, were observed only in this reach. Yellow Warblers and Marsh Wrens were also more abundant in this reach than in all others.

Two Swainson’s Hawk nests were recorded in this reach. This makes sense given Swainson’s Hawk’s preference for nesting in wooded areas within close proximity to grassy meadows or fields for foraging. Fresh Emergent Wetland habitat is comprised of wet alkali meadow and marsh vegetation communities, and there is a high proportion of this habitat type situated near healthy Desert Riparian habitats. This configuration of Fresh Emergent Wetland and Desert Riparian habitats may also explain why Brown-headed Cowbird abundance was the highest at Reach 6, given that cowbirds prefer to nest and forage in the grassland-forest interface. An unknown swallow colony was also located within Site 17 of Reach 6. Bank Swallows were observed in the vicinity of the colony, but not confirmed to be using the nest cavities.

The herbaceous vegetation community had the highest values for vigor at Reach 6. This was due to large stands of vigorous tules and cattails associated with the Fresh Emergent Wetland in this reach. Shrub recruitment was greatest, woody vegetation herbivory was lowest, and extent and severity of erosion was also lowest at Reach 6.

Reach 6 most likely provided the greatest habitat value for all guilds of birds, and particularly the wetland-open water, woodland, and grassland guilds, due to the abundance of healthy Fresh Emergent Wetland habitat adjacent to large Desert Riparian patches.

2.8.7 Reach 8: Tinemaha Reservoir to Los Angles Aqueduct intake

Reach 8 provided very poor value for wildlife habitat, similar to Reach 4. This reach was different from other reaches in its geographic location immediately downstream of the Tinemaha Reservoir dam. This reach had a very high proportion of Alkali Desert Scrub (just slightly lower than in Reach 4), the lowest proportion and total area of Fresh Emergent Wetland and Perennial Grassland habitats, and a very low proportion of Desert Riparian habitat. It was intermediate in terms of size compared to all other reaches (1,774 acres). Overall diversity of all habitat types was second lowest at this reach.

Reach 8 had the lowest habitat suitability values for indicator species within all guilds of birds, with only Reach 5 having a slightly lower value for the woodland guild. Overall suitability was the lowest within Reach 8. Potential vole habitat area was negligible at this reach, given the small areas of Perennial Grassland and Fresh Emergent Wetland habitats.

Accordingly, Reach 8 had the lowest total bird diversity and number and abundance of indicator species. Only three types of indicator species occurred in this reach, the Nuttall's Woodpecker, which was most abundant, the Blue Grosbeak, and the Yellow Warbler. However, an active Bank Swallow colony was located within the northern part of the reach. Other than Reach 8 having the lowest herb vigor, the habitat and quality of this reach was intermediate in all other values.

2.9 Riverine-Riparian Area Hydrology

2.9.1 Introduction

Flow management of the Owens River since the early 1900's has primarily depended on the water needs of the city of Los Angeles. Owens River water is provided to the City through its aqueduct system. Beyond providing water for Los Angeles, LADWP manages flow in most Owens Valley canals and ditches to support ranching, agricultural operations (run by lessees on LADWP lands), and environmental projects (Klondike, Macs, and Buckley Ponds). To adequately and efficiently provide water to their lessees LADWP must monitor stream flow in creeks, canals, ditches, and the Owens River. In fact, surface-water monitoring in the Owens River watershed is more complicated and complete than in most basins in the United States, with LADWP maintaining more than 600 continuous gaging stations in the Owens Valley.[20]

2.9.2 River Hydrology

Hydrologic features of the Middle Owens River riparian area include the Owens River, several perennial streams, canals, flowing wells and springs (Figure 2.9, map of hydrologic features). These perennial streams, canals, flowing wells and springs augment and diminish the flow of the Owens River as it courses through the Owens Valley from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake. Flows are released to the Owens River below Pleasant Valley Reservoir at an average annual flow of roughly 295 cfs (1991-2005). Downstream of Pleasant Valley Reservoir the Owens River is first augmented by Horton Creek (16 cfs); then diminished by the Bishop Creek Canal (32 cfs), Upper McNally Canal (12 cfs), Lower McNally Canal (7 cfs); augmented by Fish Slough (7 cfs), Laws Ditch return (13 cfs), North Fork Bishop Creek (39 cfs), 17 flowing wells between Bishop Creek and Collins Road (about 14 cfs

[20] Danskin 1998

total), Rawson Pond return (2 cfs), and Sanders Pond return (1 cfs); diminished by the Big Pine Canal (25 cfs); then augmented by A-drain return (13 cfs) and Big Pine Creek (48 cfs) (WHA 2003). Average annual flow of the Owens River below Big Pine Creek from 1991-2005 was 355 cfs. Flow is then augmented by Fish Springs (30 cfs) and Tinemaha Creek (11 cfs). Average annual flow of the Owens River just below the Tinemaha Reservoir dam from 1991-2005 was 359 cfs. Flow is subsequently augmented by two pumping wells (7 cfs) and Taboose Creek (10 cfs). Average annual flow is estimated to be roughly 360 cfs at the Los Angeles Aqueduct intake (WHA 2003).

Average monthly flows (1991-2005) for the three gauging stations on the Owens River (Figure 2.11) vary from about 240 cfs in January and February to about 450 cfs in July and August. Flow generally increases downstream, especially in winter months (WHA 2003). Average summer flows vary from 392 cfs at Pleasant Valley Dam to 445 cfs at Tinemaha Dam. Average winter flows vary from 173 at Pleasant Valley Dam to 292 cfs at Tinemaha Dam (1991– 2005).

In 2003, White Horse Associates completed a water balance for the Owens River within the boundaries of the OVLMP (WHA 2003). WHA's (2003) average monthly water balance (inflow minus outflow) was estimated from stream, canal, and flowing well monitoring data (1998-2002) for two reaches of the Owens River and the combination of those reaches: 1) Pleasant Valley Dam to below Big Pine Creek (55.4 river miles); 2) Below Big Pine Creek to the Tinemaha Dam outlet (13.2 river miles); and 3) Pleasant Valley Reservoir to the Tinemaha Dam outlet (68.6 river miles). Positive water balance values indicate unaccounted water loss attributed to evapotranspiration (ET), bedloss, and increased bank storage during summer months, reservoir storage, other losses, and errors in flow monitoring. Negative values indicate unaccounted water gain attributed to local runoff, decreased bank storage during winter months, reservoir drainage, other sources, and errors in flow monitoring (WHA 2003).

A longitudinal profile of Middle Owens River from Pleasant Valley to Tinemaha Reservoir can be found in Figure 2.10.

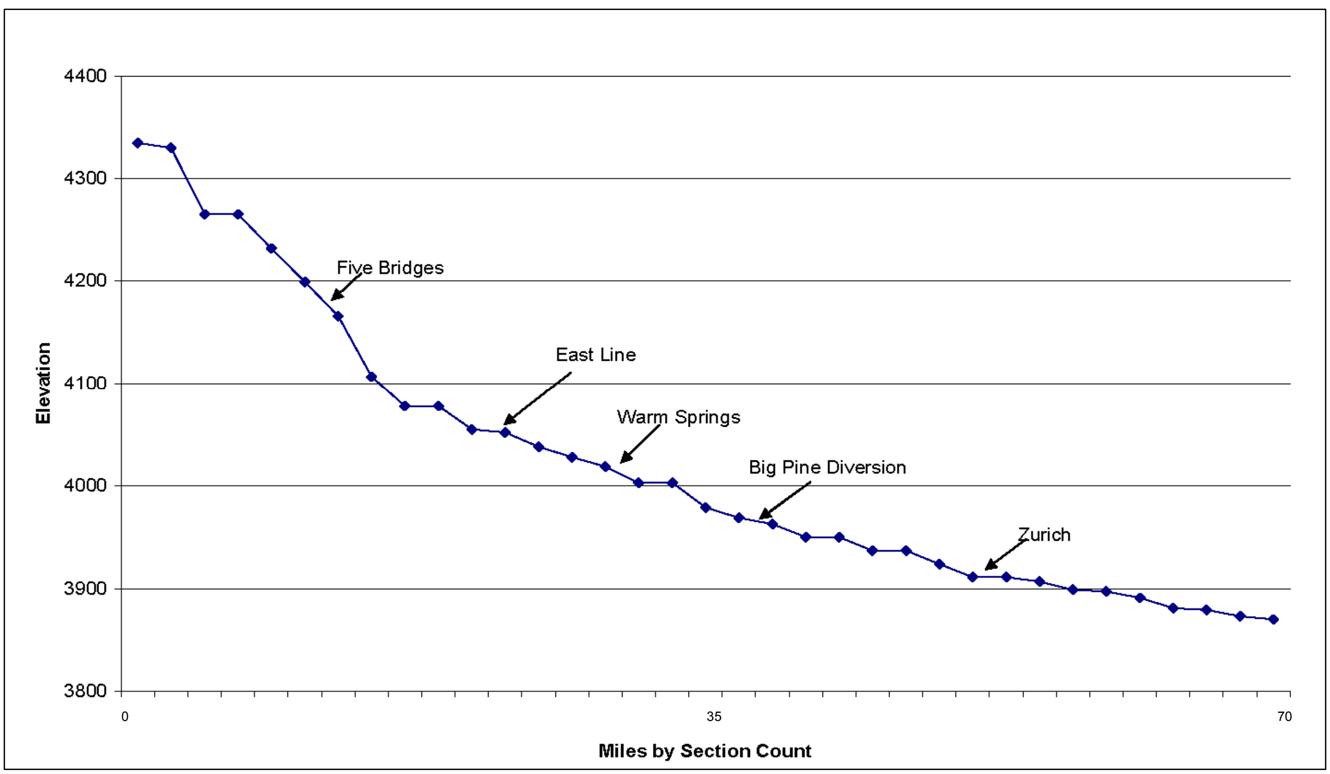
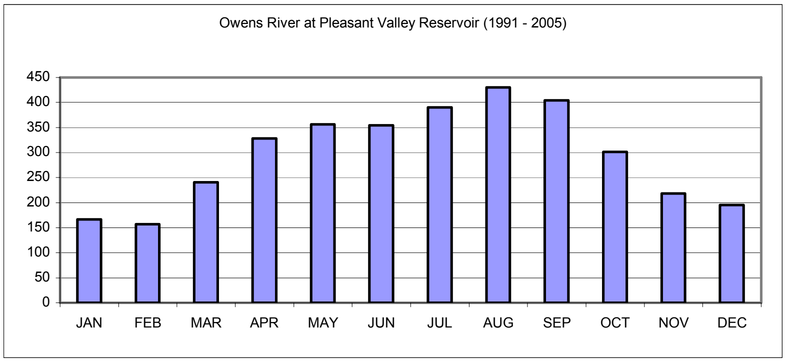
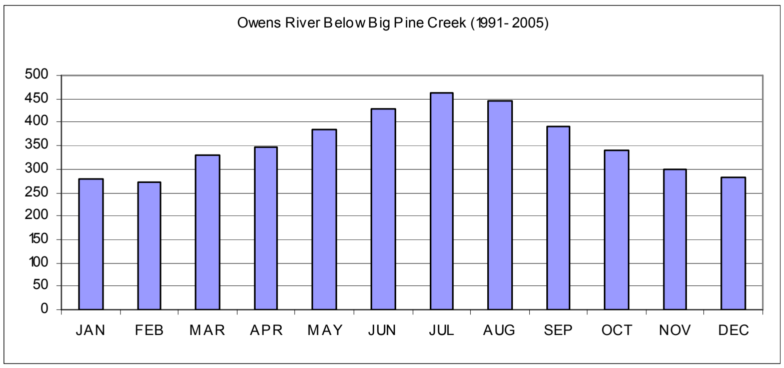


Figure 2.10. Longitudinal Profile of Middle Owens River: Pleasant Valley to Tinemaha Reservoir.





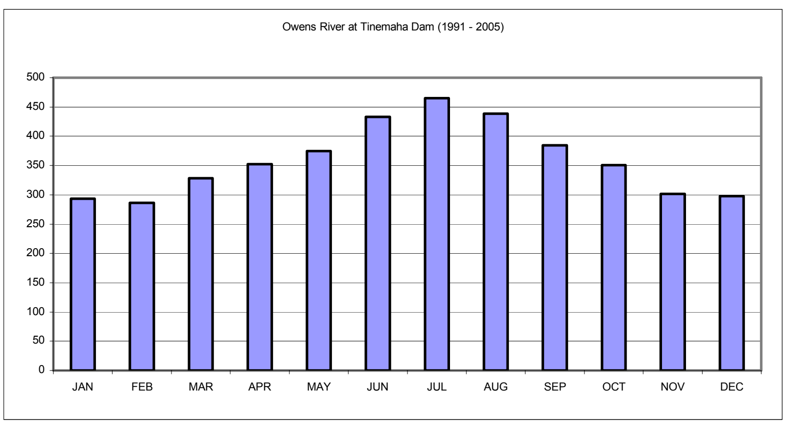


Figure 2.11. Average Monthly Flow (cfs) for three Owens River gaging stations (1991 – 2005).

Average summer water loss from Pleasant Valley Reservoir to below Big Pine, was 23 cfs (0.4 cfs/river mile); average monthly loss varied from 1 cfs (<0.1 cfs/river mile) in April to 41 cfs (0.7cfs/river mile) in August. Average summer loss was 11 cfs (0.2 cfs/river mile) in 1998-1999 when flows were higher than normal. Average winter water gain for this reach was 7 cfs (0.1 cfs/river mile); average monthly values varied from 16 cfs (0.3 cfs/river mile) loss in October to 23 cfs (0.4 cfs/river mile) gain in January. The average annual loss of 8 cfs (0.1 cfs/mile) amounts to a net loss of 2.3 feet of water per unit area of wetland vegetation types in the reach (WHA 2003).

Interpretation of water balances for below Big Pine Creek to Tinemaha Dam outlet and for Pleasant Valley Reservoir to Tinemaha Dam outlet are complicated by the management of Tinemaha Reservoir. The average annual loss of 42 cfs (3.2 cfs/mile) from below Big Pine Creek to Tinemaha Dam outlet amounts to an average annual net loss of 22 feet of water per unit area of wetland and open water (Tinemaha Reservoir) in the 13.2 mile reach. The average annual loss of 50 cfs (0.7 cfs/mile) between Pleasant Valley Reservoir and the Tinemaha Dam outlet amounts to a net loss of 9.2 feet of water per unit area of wetland in the 68.6 mile reach (WHA 2003).

2.10 River Flow Management

2.10.1 Historic River Flow Management

As mentioned above, flow has been managed in the Owens River, especially since the early 1900s, to provide water for the needs of the city of Los Angeles. With the completion of the Los Angeles Aqueduct in 1913, the LADWP began using the Owens River, specifically the reach from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake, as the northern extension of the aqueduct (Figure 2.1.).

Water from the northern reaches of the Owens River watershed, (primarily Long Valley, and the Mono Basin) flowed in the Owens River channel from Pleasant Valley Reservoir downstream to Tinemaha Reservoir and then on to the Los Angeles Aqueduct Intake. Thus, the Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake functions as a large canal with flows fluctuating based on the water needs of Los Angeles.

Historically, the Owens River channel experienced higher flows than it would have normally due to water from the Mono Basin being transported through the Owens River channel to the aqueduct. Mono basin water began flowing through the Owens River channel around 1940 as part of the Mono Basin Project. The goal of the project was to provide a larger and more reliable flow in the aqueduct, and in turn provide more water to Los Angeles. The project tapped four of Mono Lake's seven tributary streams (Lee Vining, Parker, Walker and Rush creeks) for export to Los Angeles. The water flowed from Grant Lake, in the Mono Basin, through an 11.3 mile tunnel to the Owens River Watershed in Long Valley.[21]

The full Mono Basin entitlement equated to roughly 96.6 cfs/day increased flow in the Owens River channel from 1970–1989. Thus, during this time, the Owens River channel experienced higher flows and transported more water than it would normally or naturally due to the increased water from the Mono Basin Project. During this same period, the Owens River's channel capacity increased. As a result of the increased capacity, the Owens River's fluvial landforms (channel, banks, point bars, cut banks, floodplain, oxbows, etc.) adjusted to the larger flows.

2.10.2 Current River Flow Management

The full export of Mono Basin water through the Owens River to the aqueduct ended in 1989. Years of court proceedings related to the deterioration of Mono Lake and groundwater pumping in the Owens Valley led to the City relinquishing the majority of its Mono Basin exports. The net result of the court action required LADWP to release approximately 60,000 acre-feet of water to Mono Lake, primarily by diverting less water out of Mono Lake's tributaries. Mono Basin exports to the Owens River and the aqueduct were reduced by 164 acre-feet/day, the equivalent of a continuous daily flow of 82.8 cfs.[22] The reduction is most noticeable in the frequency of high flows in the Owens River. For example, for 13 of the 20 years between 1970 and 1990, average monthly flows in the Owens River exceeded 650 cfs. Yet, from 1991 to 2005 a flow of greater than 650 cfs occurred only once (Figure 2.11).

The reduced Mono Basin water export decreased the amount of water flowing through the Owens River channel (Table 2.4). Significant changes in flow, whether they are reductions or increases over long periods of time, cause modifications in the channel morphology of a river. The most common change in channel morphology due to reductions in flow is reduced channel capacity due to vegetation encroachment. Thus, it is expected that the channel capacity of the Owens River is less due to the reduced flow. Examining the historic flow management of the Owens River to project current needs is

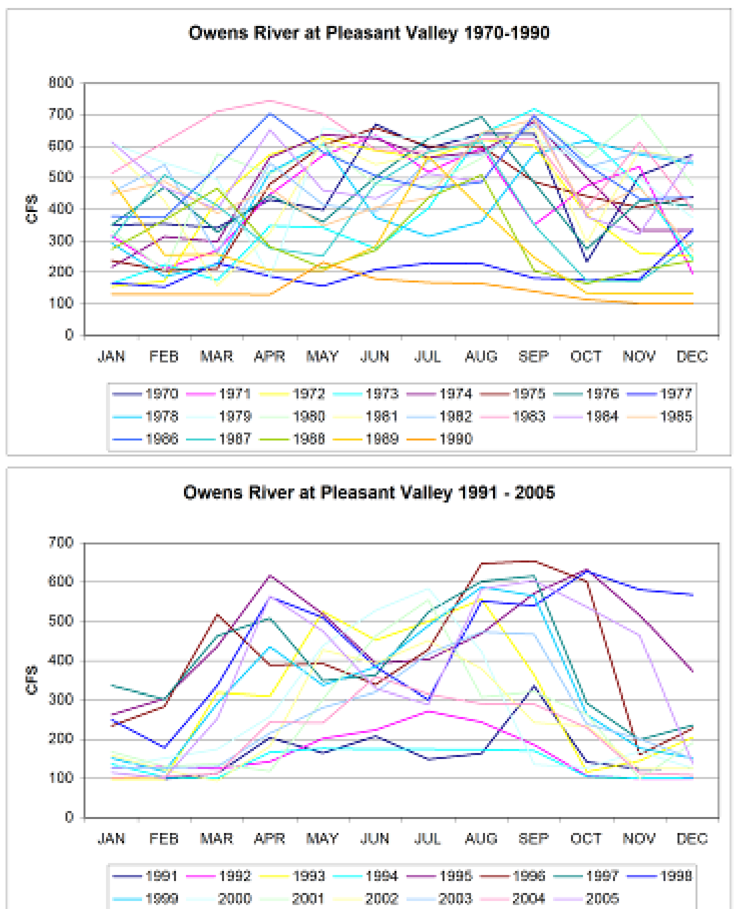


Figure 2.12. Owens River Flow Comparison:
1970 to 1990 full Mono Basin Export and 1991 to 2005 reduced Mono Basin export.

[21] LADWP website http://www.ladwp.com/ladwp/cms/ladwp001006.jsp, Danskin 1998
[22] Danskin 1998

most appropriate using the time period after the Mono Basin Settlement, from 1991–2005.

A HEC-2 analysis (described below) of the Owens River was conducted to assess the channel morphology changes and examine how the river responded to the reduced flow.

	1970 – 1990 (Full Mono Basin Entitlement)	1991 – 2005 (Reduced Mono Basin Entitlement)	Difference between Full and Reduced Mono Basin Entitlement
AVG Monthly CFS	425.0	295.2	129.8
AVG Annual Acre-Feet	307,670.0	213,701.5	93,968.5

Table 2.4. Owens River at Pleasant Valley Outflow
Difference between full Mono Basin Entitlement (1970 – 1990) and Reduced Mono basin Entitlement (1991 – 2005). Data provided by Wayne Hopper LADWP.

Year	Pleasant Valley Reservoir	Below Big Pine Creek	Tinemaha Dam	Los Angeles Aqueduct Intake
2005	371.1	436.8	447.3	448.3
2004	209.4	258.5	265.8	267.5
2003	262.3	303.8	308.3	310.0
2002	244.5	269.8	282.0	283.6
2001	255.1	304.9	314.3	315.4
2000	270.3	316.7	322.1	323.3
1999	329.4	387.5	390.8	391.8
1998	449.3	524.5	527.9	528.3
1997	399.3	504.2	501.8	502.4
1996	406.4	526.9	523.0	524.0
1995	458.2	554.0	541.8	542.6
1994	140.8	185.3	186.7	187.8
1993	307.6	367.8	369.3	370.1
1992	163.3	183.9	191.8	192.8
1991	160.7	197.3	209.2	210.2

Table 2.5. Average Monthly Flow
at four Owens River Gages 1991 – 2005

Like most rivers, flow in the Owens River increases downstream (Table 2.5). The largest increase occurs between the gage at Pleasant Valley Reservoir and the gage below Big Pine Creek. This stretch encompasses over 60 percent of the Owens River within the OVLMP boundaries. In between the two gages the Owens River demonstrated an average increase of roughly 60 cfs between 1991 and 2005. This increase can be attributed to the large tributaries (Bishop and Big Pine creeks) and canals (Big Pine) that augment the flow between the two gages.

The stretch of the Owens River from the gage below Big Pine Creek to the Los Angeles Aqueduct intake demonstrated a smaller average increase of roughly 5.1 cfs between 1991 and 2005.

In addition to the flow ramping rates and pulse flows, other objectives that may be implemented to meet MOU goals for the riverine-riparian area include: modification of schedules for maintenance and mechanical intervention activities, conducting exotic plant control activities, modification of tule removal activities, modification of fencing or adding new fencing for riparian pastures, modification of utilization rates and timing in riparian areas, installation of grazing exclosures, modification of livestock management following wildfire, and modification of recreational management. These objectives are described in more detail in Chapter 9, Table 9.8.

2.10.3 Flow Ramping Rates

LADWP manages the reach of the Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct Intake as though it is the northern extension of the aqueduct. Flow fluctuations in the reach are dependent on LADWP operational needs rather than natural conditions. Thus, LADWP manages flow in the Owens River by ramping up the flow during times of high water demand and ramping down the flow during periods of low water demand. LADWP may not ramp flows up more than 50 cfs per day or ramp flows down more than 25 cfs per day. Ramping rate changes may be implemented to meet habitat and vegetation needs, as long as City of Los Angeles water needs are being met.

Natural flow fluctuations in Eastern Sierra streams exhibit a distinct pattern; low flow in late summer through early winter, increasing flows through winter and into early spring, and high flows occurring in late spring through mid-summer (Figure 2.18). The Owens River does not exhibit a natural hydrograph like its tributaries because of the need to meet city of Los Angeles water demands (Figure 2.19).

Ramping rates affect channel morphology in rivers. In the Owens River, a common problem with ramping rates is bank sloughing. Bank sloughing occurs when high flows are reduced over a short period of time. This dramatic decrease in water levels causes saturated banks to collapse into the river. Bank sloughing causes cut banks, loss of riparian habitat, and increased sediment loads in the river. In addition, rapidly ramping up flows can disturb aquatic organisms through dislodgement, stress fish through water temperature and water quality changes, and result in greater sediment transport. LADWP's flow management of the Owens River has had significant impacts on water quality and extent of riparian habitat.

Examples of ramping rates that are detrimental to channel morphology are presented in Table 2.7. As mentioned above, such large fluctuations are detrimental to the Owens River's channel morphology, habitat and water quality. To alleviate the problems caused by large flow fluctuations over short periods of time, LADWP imposed a ramping rate limit in 2007 (50 cfs/day up and 25 cfs/day down). Allowing flows to ramp up and down slowly will alleviate many of the problems caused by past flow management.

2.10.4 Pulse Flows

Pulse flows in excess of 600 cfs are released most years in April or May from Pleasant Valley Reservoir to prevent the reservoir from spilling. Pulse flows are not released in less than average water years. The objectives of the pulse flows are to scour stream banks and bars within the river channel and promote riparian and wetland plant development in the low floodplain areas adjacent to the river through inundation.

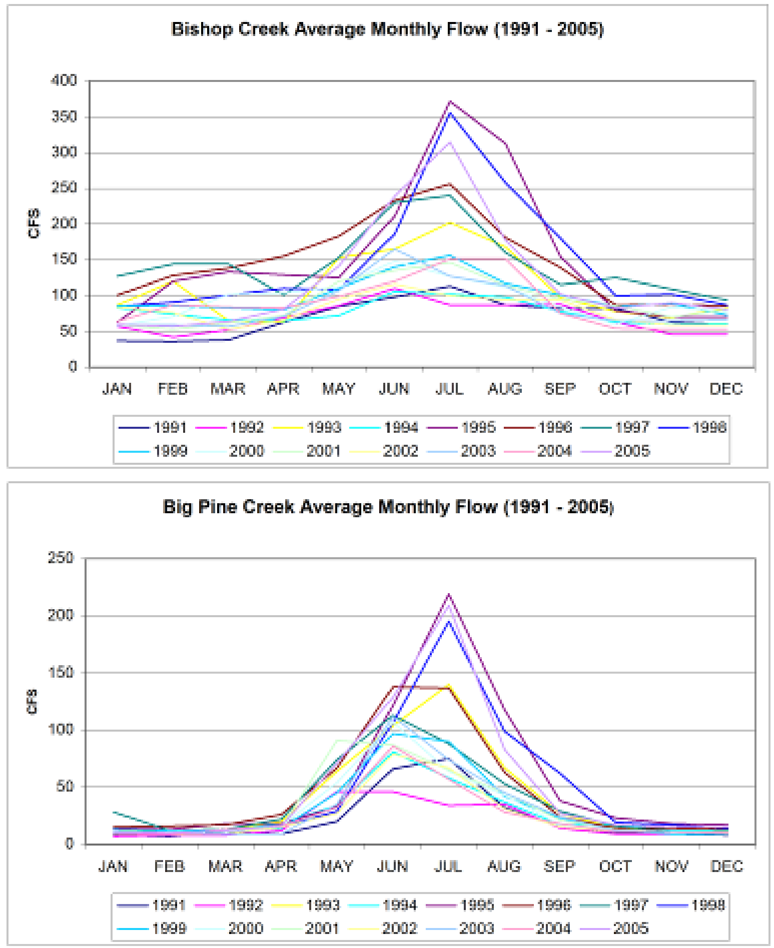


Figure 2.18. Natural Hydrograph for two Eastern Sierra Streams
Big Pine Creek and Bishop Creek

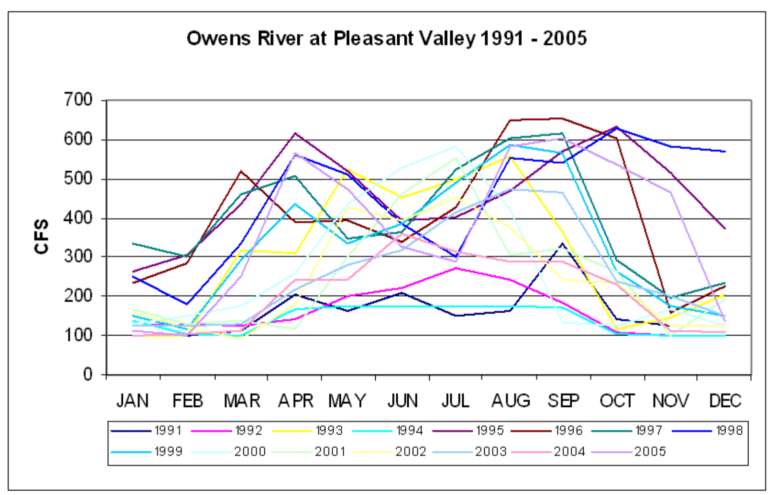


Figure 2.19. Owens River at Pleasant Valley Hydrograph. 1991-2005

2.11 HEC-2 Analysis

The purpose of the HEC-2 analysis is to model the instream flow conditions of the Owens River over a range of discharges. The HEC-2 was created by the United States Army Corps of Engineers (ACOE) and is used to model instream flow conditions of a river.[23] The HEC-2 model analysis provides information on the depth, velocity and water surface elevation of the Owens River over a range of discharge or flows. The HEC-2 analysis also provides information about how the Owens River channel has responded to the reduced flow since the Mono Basin Settlement; demonstrates the effect LADWP flow management has on the Owens River's channel and adjacent floodplains; predicts how future changes in flow management will affect the river; and aids in determining adequate flow management actions aimed at promoting riparian vegetation growth and riverine health commensurate with LADWP water delivery obligations.

The HEC-2 model is commonly used to derive water surface profiles in natural streams.[24] Biologists use the model to examine appropriate channel flows in relation to real-time conditions.[25]

The HEC-2 is a one-dimensional, steady state, gradually varied flow model, in which both sub-critical and supercritical profiles can be computed separately from the same input data (ACOE 1991). The model can account for backwater created by bridges, culverts, weirs, and other structures and can evaluate floodplain encroachments, identify flood hazard zones, manage floodplains, design and evaluate channel improvements, and determine split flows. The computational procedure is based on the one-dimensional energy equation with energy loss due to friction evaluated with Manning's equation (see Section 2.10.2 below).

[23] ACOE 1991
[24] Gordon 1992; ACOE 1991
[25] Gordon 1992

2.11.1 HEC-2 Modeling Inputs

The data required to perform the HEC-2 analysis includes: flow regime, starting elevation, discharge, loss coefficients, cross section geometry, and reach lengths.[26] The data was gathered from a channel survey conducted from September 2004 to October 2006. Data was collected at three 500 meter long sites along the Owens River (Figure 2.13). The three sites correspond to the OVLMP sites where vegetation and habitat data was collected. The sites used in the HEC-2 modeling were Site 1 (downstream of Pleasant Valley), Site 4 (downstream of Five Bridges), and Site 17 (downstream of the Owens River flow gage below Big Pine Creek) (Figure 2.13).

The data requirements for the model (starting elevation, cross section geometry, and reach lengths) were obtained by creating a detailed digital elevation model (DEM) of each Owens River site. The DEMs were created by surveying each site using a DGPS (Digital Global Positioning System). A Trimble GeoExplorer Series Handheld running ESRI's ArcPad was used to collect the channel depth measurements. The channel depth measurements were merged with the Owens Valley DTM (Digital Terrain Model) created by Intermap Technologies to create a site DEM. Intermap's DTMs did not represent the depth of the Owens River correctly, thus it was necessary to add the channel measurements to accurately model the Owens River.

The channel depth data was collected using a patch antennae connected to the top of a four meter range pole. Channel measurements were taken by two field technicians from an inflatable kayak. One field technician steered and powered the kayak while the other technician used the pole to take depth measurements. Several in-channel passes were completed to ensure sufficient depth measurements were taken to accurately model the channel. Bank elevation data was also taken using the DGPS.

[26] ACOE 1991

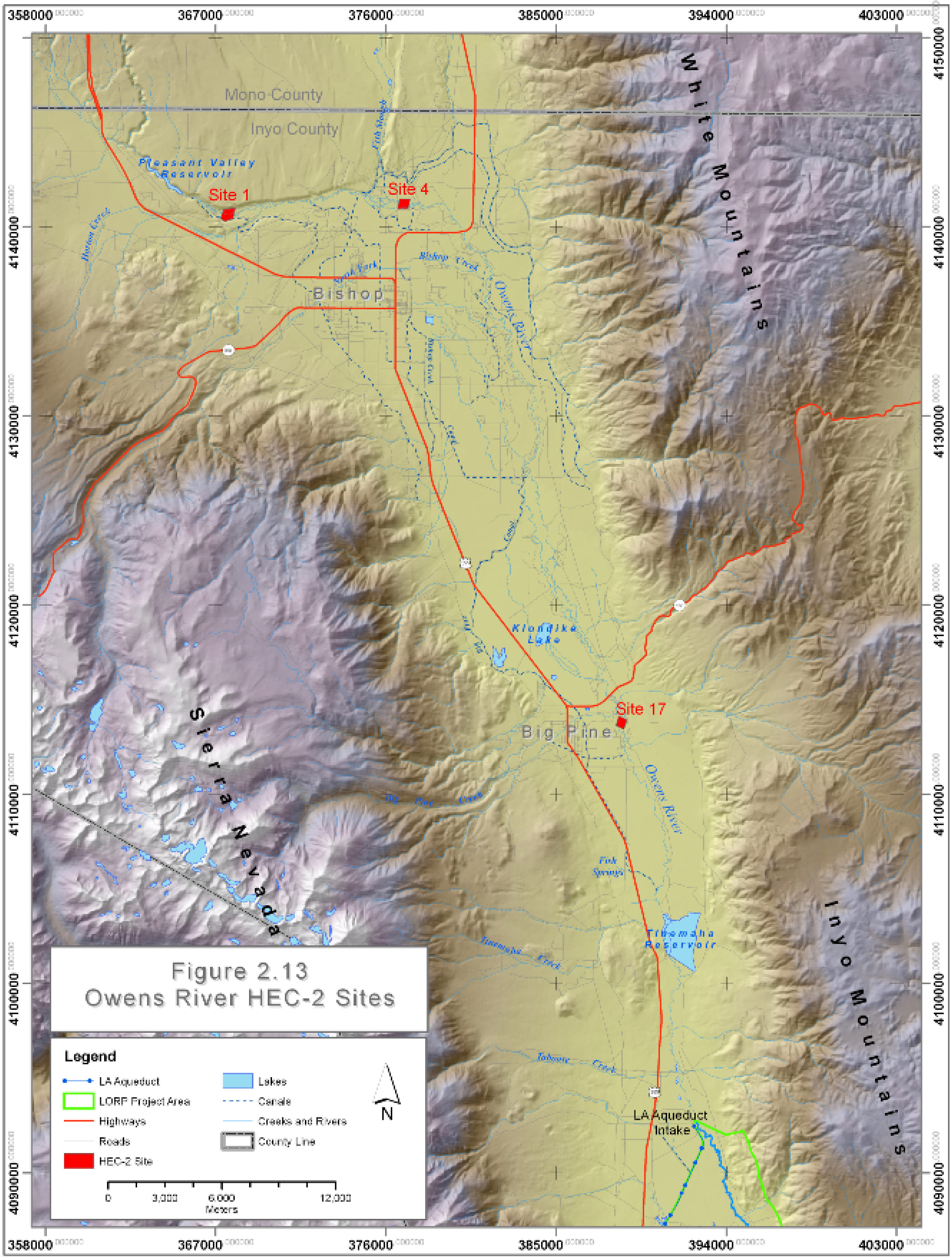


Figure 2.13. Middle Owens River. HEC-2 Sites

Bank elevation data defined the channel and aided in creating an accurate model when the DGPS data was merged with the DTM. The DGPS differentially corrected all GPS data and accounted for the four meter pole offset. The channel and bank elevation data was merged with the DTMs in ESRI's ArcMap 9.2 and resampled to smooth out inconsistencies. The result of this process is an accurate floodplain and channel map of each Owens River site (Figure 2.14).

Each Owens River site DEM was converted to a contour map and imported into AutoCad 2000. AutoCAD 2000 runs the HEC-2 model. Once the contour maps were imported into AutoCAD cross-channel transects were cut (Figure 2.15). Cross-channel transects describe the channel geometry at each transect, with landforms adjacent to the channel, water surface elevation and depths. The number of transects per site varied, ranging from 76 to 81. Transects were placed 10 meters apart and were perpendicular to the channel.

A range of flows were examined (150 cfs, 200 cfs, 250 cfs, 300 cfs, 400 cfs, 500 cfs, 600 cfs, 700 cfs, and 750 cfs) to analyze their effect on the Owens River's channel and floodplains.

2.11.2 HEC-2 Manning's n

The computational procedure for the HEC-2 model is based on the one-dimensional energy equation with energy loss due to friction evaluated with Manning's equation (ACOE 1991). The HEC-2 model is an engineering model that is applied to natural systems. For the model to reflect natural conditions the Manning's n, a roughness coefficient, is applied to account for friction and energy loss due to the roughness of the channel.

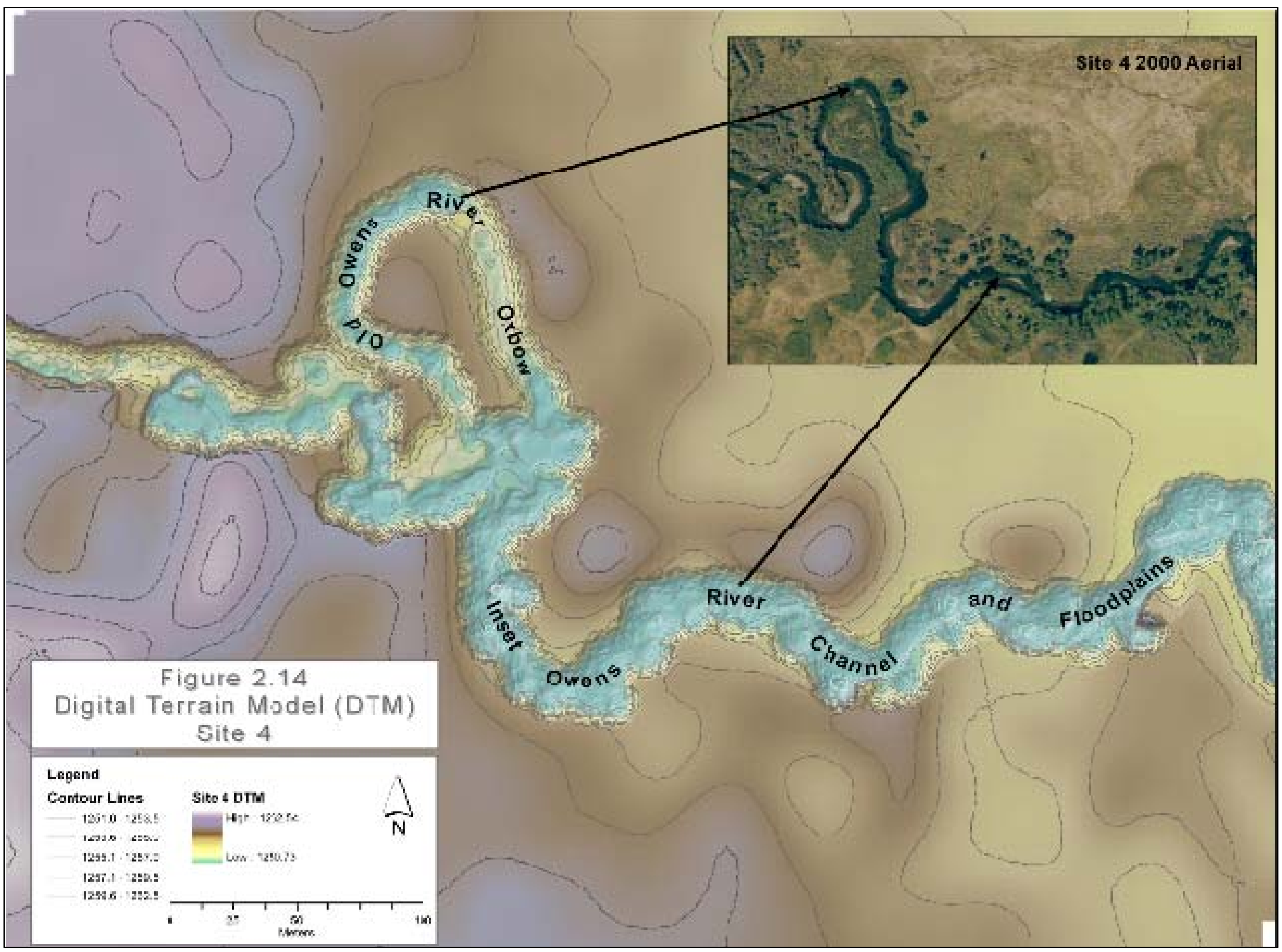


Figure 2.14. DEM of Owens River Site 4

The Manning's n is an extremely important component of the HEC-2 and accurate modeling hinges on choosing an appropriate N or roughness coefficient.

Roughness coefficients were determined for the Owens River from Pleasant Valley Reservoir to the Los Angeles Aqueduct by comparing the reach to two previous studies (the Owens River Gorge and the LORP), and then adjusting the coefficient based on actual Owens River flow data collected in September 2005.[27]

For all sites, Manning's n values are entered at the most downstream cross section (usually at transect 100 unless a change in the n value was warranted further upstream). The HEC-2 is a backwater model that begins with the most downstream transect and works upstream.[28]

2.11.3 HEC-2 Modeling Results

Although a range of flows was modeled (150 cfs, 200 cfs, 250 cfs, 300 cfs, 400 cfs, 500 cfs, 600 cfs, 700 cfs, and 750 cfs), only three are examined here. Table 2.6 contains the average velocities, depths, and wetted widths for the three flows: a low flow of 150 cfs, a medium flow of 300 cfs and a typical high flow in the Owens River from Pleasant Valley to the aqueduct intake of 600 cfs. The 150 cfs was modeled as the average low flow in this reach from Pleasant Valley to the aqueduct intake. Between 1991 and 2005 average monthly flows were rarely under 100 cfs (five months, but four of those were 99 cfs), and often between 125 cfs and 175 cfs (34 months), thus a low flow of 150 cfs was selected. The 300 cfs was modeled to represent the average monthly flow (296 cfs was the average monthly flow from 1991–2005). The 600 cfs was the modeled high flow in the Owens River within this reach. For nine of the 180 months between 1991 and 2005, flows averaged over 600 cfs in the Owens River. High flows often exert the greatest influence on channel morphology and floodplain development.

[27] Ecosystem Sciences 2000, Gebhardt 1994

[28] ACOE 1991

In general, velocities, depths and widths increased as flow increased. Velocities were highest at Site 1, which is just downstream of Pleasant Valley Reservoir (Table 2.6). Velocities decreased further downstream, as Sites 4 and 17 had lower average velocities than Site 1. Depth increased as flow increased for all sites. Site 4, downstream of Five Bridges, exhibited the highest average depths. Average wetted width varied per site and per flow. Site 1 exhibited the greatest change in average wetted width, as width increased roughly 38 feet from 150 cfs to 600 cfs. Site 17 exhibited the smallest change in average wetted width as it increased roughly five feet from 150 cfs to 600 cfs.

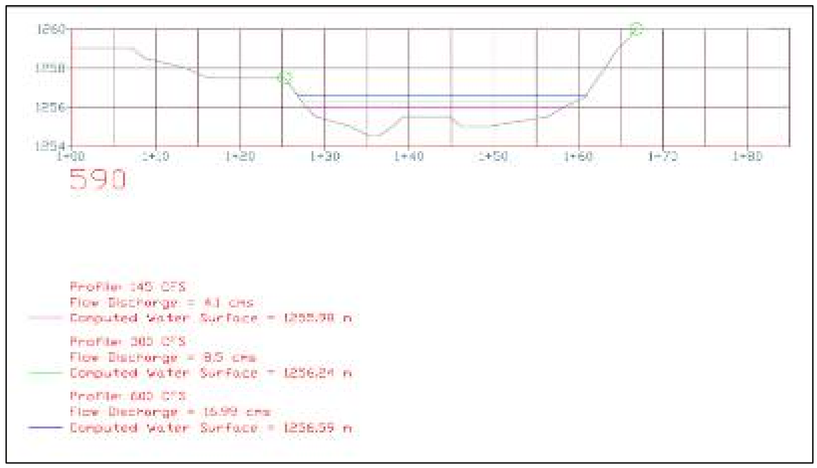


Figure 2.15 – Cross Channel Transect of Selected Owens River Site.

2.11.4 HEC-2 Modeling Discussion

The results of the HEC-2 analysis indicate that the Owens River's channel and floodplains from Pleasant Valley Reservoir to the Los Angeles Aqueduct intake have been shaped by LADWP's flow management. This can be verified by comparing the HEC-2 model results with the Owens River landtypes mapped by White Horse Associates in 2003. WHA identified six landtypes adjacent to the Owens River: alluvial fan, channel, floodplain, high terrace, low terrace, and reservoir basin.[29]

[29] WHA 2003

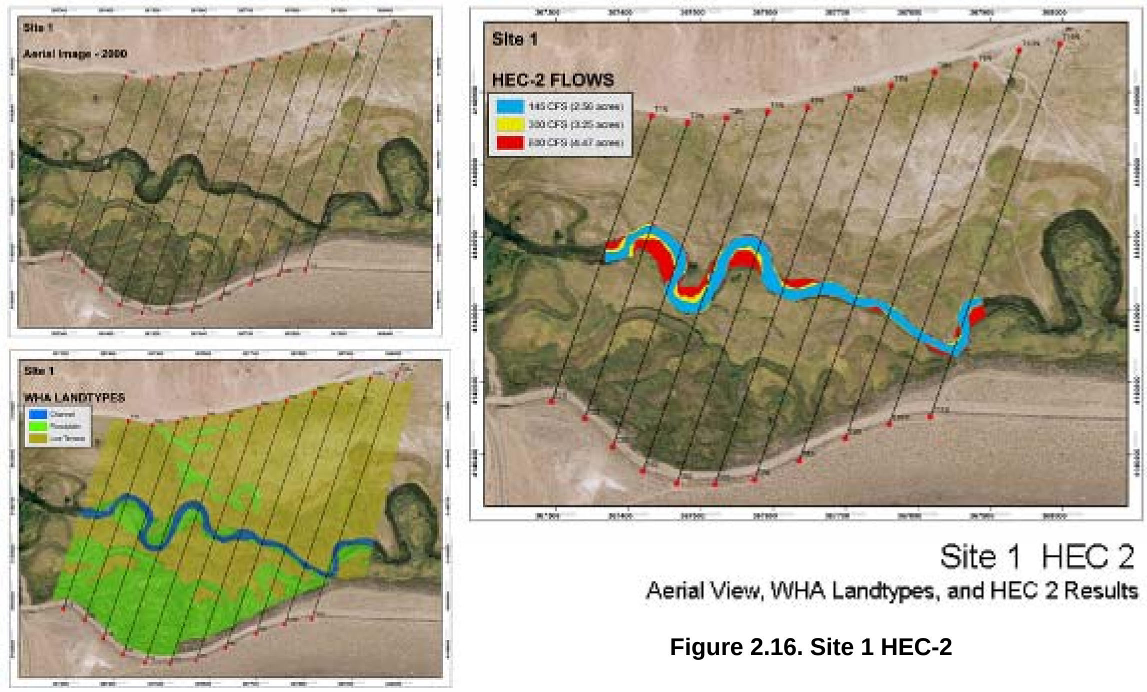


Figure 2.16. Site 1 HEC-2

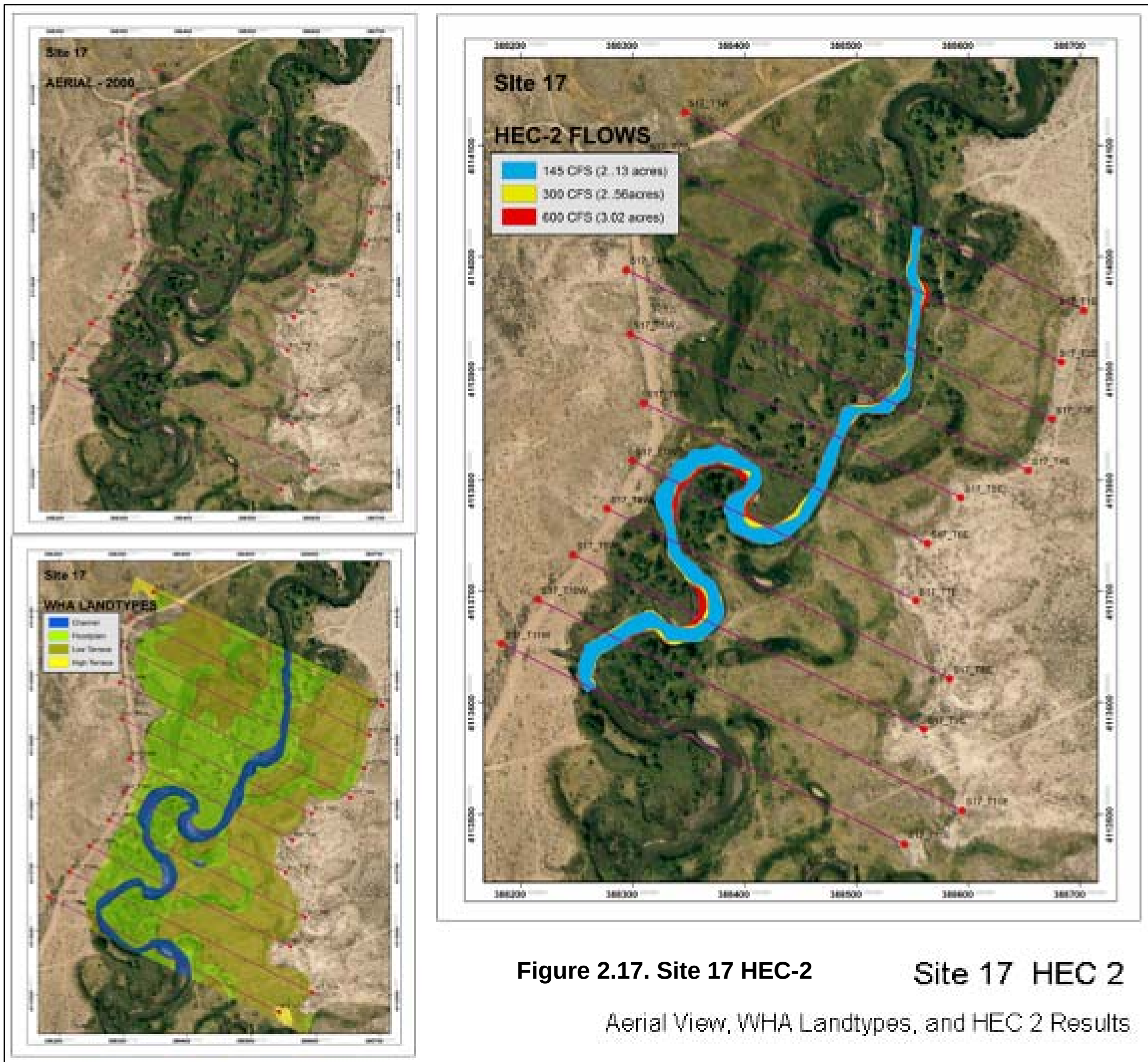


Figure 2.17. Site 17 HEC-2

Three of these landtypes (channel, floodplain, and low terrace) are pertinent to the HEC-2 discussion. WHA definitions for each pertinent land type are provided below:

Channel: Permanently, semi-permanently, and intermittently flooded stream courses, as viewed from orthophotos.

Floodplain: Land shaped by contemporary stream (fluvial) processes. Ground surfaces are typically less than two feet above stream and/or alluvial groundwater levels.

Low terrace: Historic floodplains of the Owens River that were left high-and-dry when the stream channel cut to a lower base level. Ground surfaces were typically two to four feet above stream level.

In short, the channel is the lowest landtype in elevation and is often or permanently flooded. Floodplains are located adjacent to or near the channel but are slightly higher in elevation. Low terraces are adjacent to the channel and floodplains but considerably higher in elevation.

Examining the HEC-2 results in comparison to the landtype mapping gives a clear indication of how the Owens River has responded to LADWP's flow management since 1991. The 150 cfs model results depict flow in the Owens River confined to the channel landtype. These results indicate that low flows in the Owens River are confined to the channel and do not access the floodplain or low terrace areas adjacent to the river. At such low flows, point bars and gravel bars are exposed in the river and adjacent to the channel. The 300 cfs model results indicate that floodplains adjacent to the channel begin to be flooded, but that the Owens River is still primarily confined within the channel landtype.

At 300 cfs most point bars and gravel bars are covered with water and some riparian and wetland areas adjacent to the channel are flooded. Since 1991, 300 cfs is the average flow in the Owens River and thus it would be expected that this area would primarily adhere to the channel landtype, which the model indicates. The 600 cfs model results indicate that most floodplains directly adjacent to the channel are accessed and some are completely flooded.

FLOW: 150 CFS	Average Velocity (ft/sec)	Average Depth (ft)	Average Width (ft)
Site1	2.53	2.72	44.98
Site 4	1.87	3.90	50.16
Site 17	1.44	3.64	50.26
FLOW: 300 CFS	**Average Velocity (ft/sec)**	**Average Depth (ft)**	**Average Width (ft)**
Site 1	3.25	3.44	57.15
Site 4	2.49	4.72	57.51
Site 17	2.00	4.46	52.72
FLOW: 600 CFS	**Average Velocity (ft/sec)**	**Average Depth (ft)**	**Average Width (ft)**
Site 1	4.07	4.40	82.35
Site 4	3.18	5.91	67.16
Site 17	2.79	5.68	55.31

Table 2.6. Results for three flows
Velocities, Depths, and Widths

At 600 cfs the Owens River widens to engulf the adjacent floodplains, but does not raise the water level high enough to access the low terraces. Thus, the 600 cfs modeled wetted extent represents the active channel of the Owens River, the area where deposition and erosion occurs within the Owens River system. The capacity of the Owens River's active channel is smaller today than prior to 1991 when Mono Basin exports were reduced. Average monthly flow in the Owens River prior to 1991 was 130 cfs more than at present. Thus, the capacity of the Owens River channel has been reduced because such high flows no longer disturb, erode and widen the river channel. The HEC-2 model results indicate that the Owens River has responded to LADWP flow management by narrowing its active channel capacity to meet the yearly high flows of 600 cfs.

2.12 Future River Flow Management

Future flow management in the Owens River will depend on how much flexibility LADWP has to alter its current management. LADWP has many demands for Owens River water. For example, LADWP must provide water to the city of Los Angeles, its lessees, meet mitigation obligations, and provide a suitable flow in the Owens River for fish and recreation. Significantly altering LADWP's current operational flow management could affect any number of these existing obligations.

Year	Month	Day	Flow Change*
1991	August	25	-106
1993	March	23	104
1995	March	11	153
1996	January	2	-232
1997	April	7	269
1998	September	11	-105
1999	March	9	116
2001	November	30	148
2002	May	4	-100
2003	May	8	108
2004	October	15	-243
2005	July	28	-136

Table 2.7. Selected Ramping Rates Owens River at Pleasant Valley Reservoir. Change from previous days flow.

The only feasible recommendation for changing LADWP's flow management in the Owens River is to continue to manage ramping rates. Ramping up at a maximum rate of 50 cfs per day and ramping down at a maximum of 25 cfs per day allows LADWP to meet its water supply obligations and alleviates the huge fluctuations in flow that are detrimental to river systems.

In addition to the ramping rate changes, LADWP must balance its water demand and use with future downstream obligations. Specifically, meeting the mitigation obligations of the Lower Owens River Project (LORP) will exert a significant influence on the management of flow in the reach of the Owens River from Pleasant Valley to the Los Angeles Aqueduct intake.

The flow regime for the LORP is described in the Ecosystem Management Plan (Ecosystem Sciences 2002) and was agreed upon by the MOU signatories. The base flow in the LORP is set at 40 cfs. Balancing the 40 cfs base flow in the LORP with flows in the OVLMP will not cause significant operational changes for LADWP. In wet years, when normal runoff is greater than or equal to 100%, seasonal habitat flows will be 200 cfs in the LORP (Figure 2.20). In these years, LADWP must balance flow in the Owens River to provide for the 200 cfs LORP flow while maintaining adequate flow in the aqueduct to ensure Los Angeles is receiving their allotted water. This will entail releasing higher flows from Tinemaha Reservoir. Future flow management in the OVLMP must balance the water needs of the city of Los Angeles, local lessees, and the myriad of mitigation and restoration projects that LADWP has underway in the Eastern Sierra.

There are 4,092 acres of riparian/wetland habitat (marsh, wet alkali meadow, riparian shrub, riparian forest, and reed grass) within the riverine-riparian area of the OVLMP (WHA 2003). This riparian/wetland was created by and will continue to be maintained by LADWP's flow management of the Owens River. The yearly cycle of low and high flows will continue to provide the fluvial processes required to keep the Owens River a functioning and dynamic ecosystem. During periods of low flow (less than 150 cfs), vegetation will colonize bare stream bars and stream banks allowing riparian and wetland species to encroach on the river channel. The pulse flow (exceeding 600 cfs) will scour stream banks and bars within the river channel and promote riparian and wetland plant development in the low floodplain areas adjacent to the river through inundation. This cycle of encroachment, scour and inundation is what makes a river system dynamic and provides habitat for aquatic and terrestrial species.

The ramping rate described above will reduce the deleterious effects of large flow fluctuations. The gradually changing water levels will allow saturated stream banks to slowly release the water they hold. This gradual loss of water will prevent a saturated bank from sloughing into the river when flow changes occur.

While flow management will maintain the riparian and wetlands of the OVLMP, LADWP's land management will enhance them. Land management strategies such as maintaining stubble heights, fencing riparian areas, rotational grazing, and recreation management will promote riparian and wetland vegetation to colonize previously heavily disturbed areas, which will result in increased acreage of riparian and wetland vegetation.

2.13 Conclusion

River flow management in the Middle Owens focuses on ramping rates and pulse (freshet) flows. However, in order to meet LADWP's downstream water demands and obligations, an unimpaired base flow cannot be set. As described in the modeling and water balance analysis presented in this chapter, the average daily and monthly flows vary, but are modified by the 25 cfs daily ramping rate to reduce bank sloughing and prevent other impacts to the river system.

The high, spring or pulse flow is also implemented in the Middle Owens River most years. Some reaches of the Middle Owens River are deeply incised and the residual cut banks are too high and disconnected for pulse flows of any feasible magnitude to match top of banks or overflow to other landforms. There are also many reaches where landforms (channel bank, oxbows, floodplains, etc.) are well within the reach of usual high flows. These landforms support riparian vegetation and benefit from continued high flow flooding events. The continued high flows and ramping rates coupled with land use and grazing management will enhance the riparian system and habitat conditions throughout the river.

Flow management on the Middle Owens River allows for a good recreational fishery throughout the river. Better riparian vegetation with more bank stability and increased vegetation overhang on streambanks, for example, will improve fish habitat and, thus, the overall health of the fishery (see Hill and Platts (1998) *Ecosystem Restoration: A Case Study in the Owens River Gorge, California* for related information in support of this conclusion). Enhanced riparian vegetation, along with reduced bank erosion and sloughing will decrease sediment loading and improve some water quality parameters.

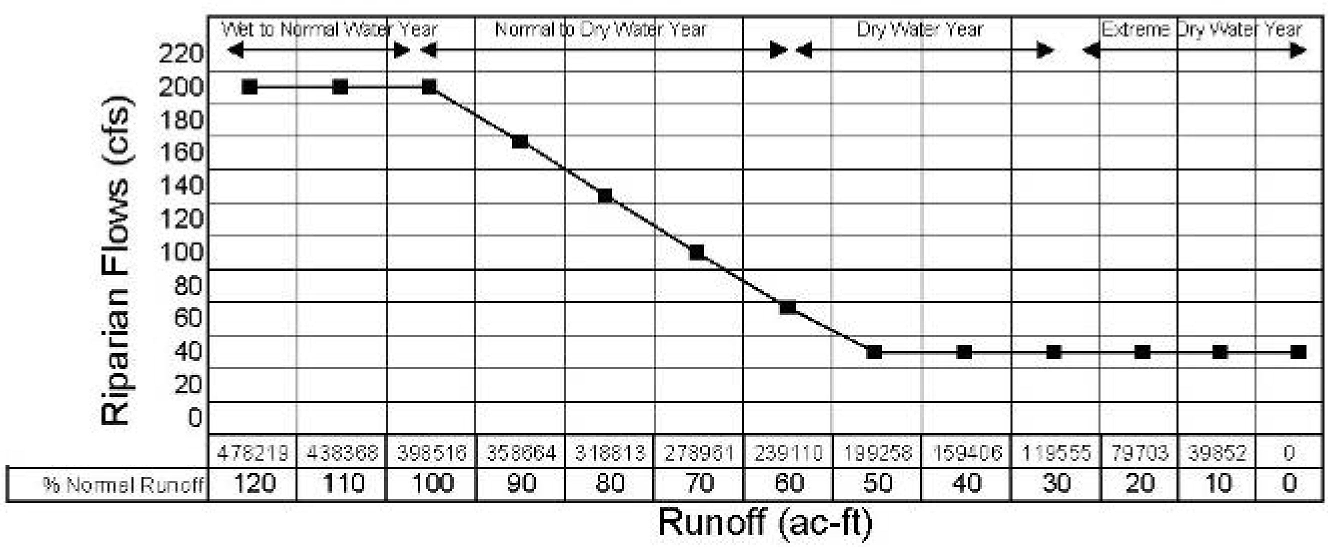


Figure 2.20. LORP Flow Nomograph

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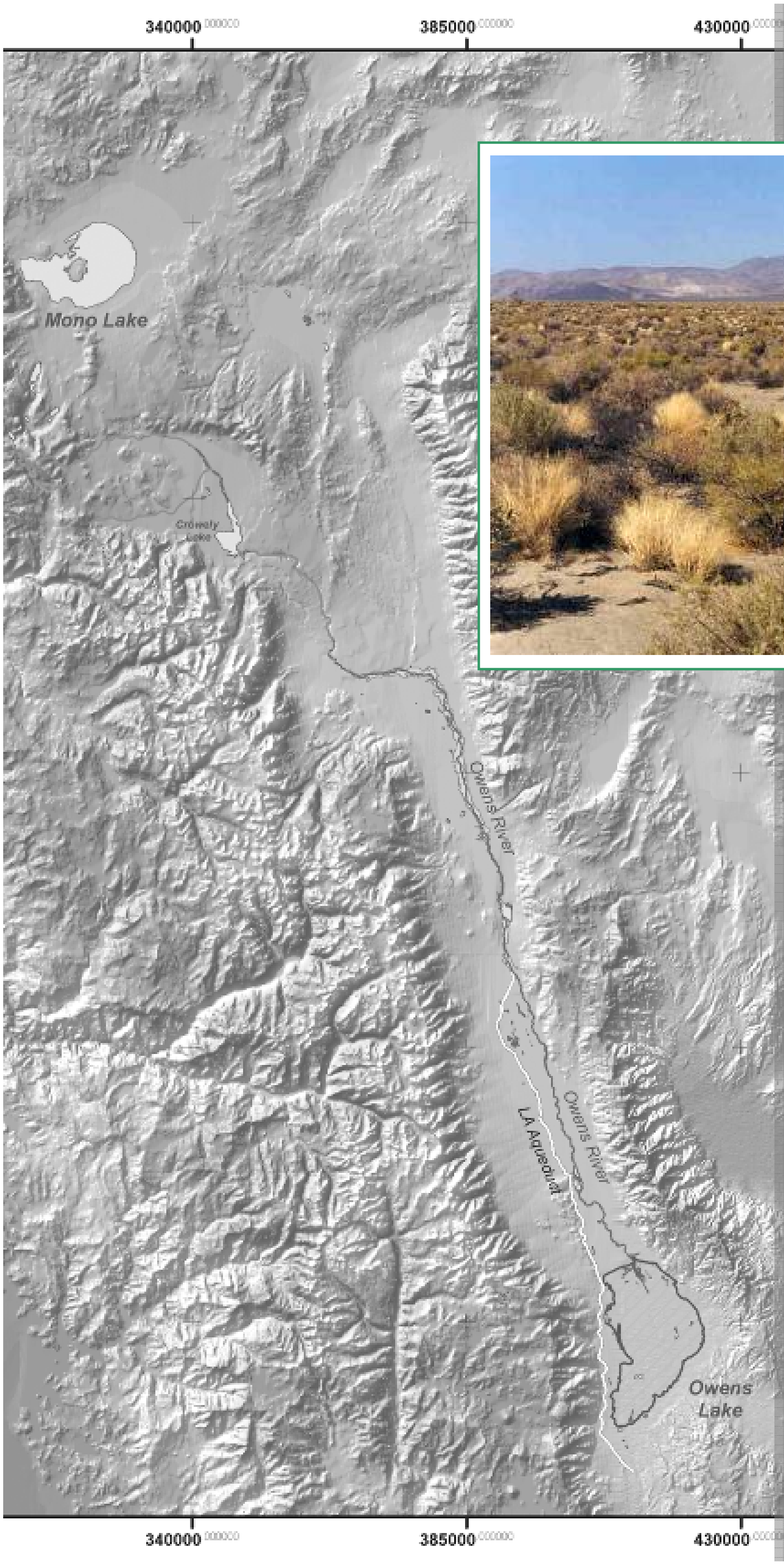

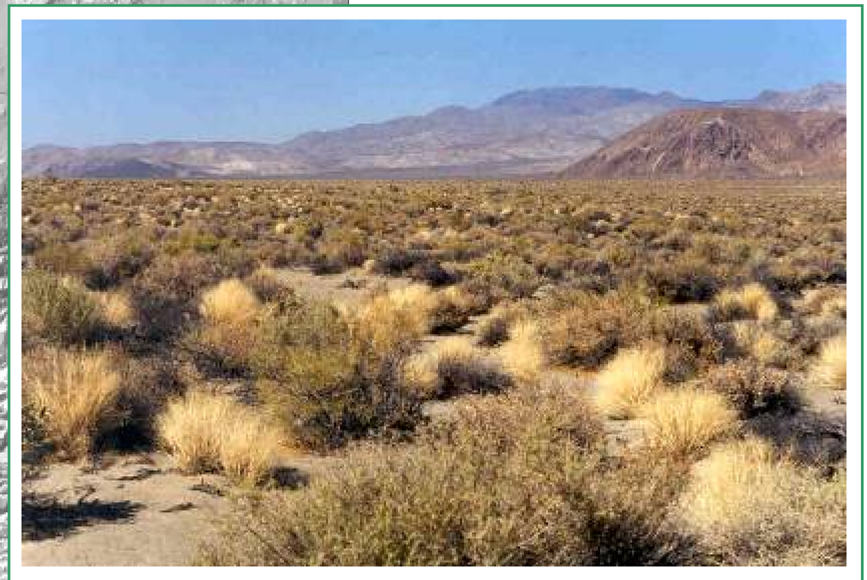

CHAPTER 3

Grazing Management

CHAPTER
3

3.1 Purpose and Process

Grazing management plans for each of the 50 leases in Inyo County were developed in consultation with lessees (Table 3.1). Grazing plans were developed to address livestock management issues and to develop guidelines for better watershed management. The MOU emphasizes the need to maintain sustainable levels of agriculture, livestock grazing, recreation, and other activities. Thus, the plans took into consideration the needs of multiple users.

The grazing management plans identify and describe the Best Management Practices (BMPs) that will be implemented in order to reduce the impacts from livestock grazing and maintain a healthy watershed. Rangeland management outlined in each plan is expected to improve water quality, improve water use efficiency, maintain compatibility with water gathering activities, and support LADWP's goal of continuing a cost-effective aqueduct operation. Good watershed management will minimize resource conflicts that may threaten LADWP's water supply while benefiting fish, wildlife, and other natural resources. Applying BMPs, with needed land treatments, will maintain already healthy rangelands and improve those that have been degraded. Over time, the BMPs outlined in the grazing plans will be fine-tuned as needed through adaptive management to meet OVLMP goals.

3.2 Map Series Explanation

Leases on city of Los Angeles-owned lands in the Owens Valley are displayed in the following map series (Figures 3.1 – 3.13). Figure 3.1 is a map index that divides the Owens Valley into 6 rows (labeled 1 – 6) and 4 columns (labeled A – D). Not all cells in the map index correspond to a map. Some cells, D-1 for example, do not contain city of Los Angeles-owned lands and thus, do not have a lease on it. The map series is aligned from north to south, thus Map A-1 covers the northwest corner of the Owens Valley and map D-6 covers the southeastern corner of the Owens Valley. An additional map, which is not covered in the map index, depicts the leases on LADWP land south of Owens Lake and is located after map D-6. This map shows the location and extent of the Homeplace, Archie Adjunct and Olancha Leases. Leases on LADWP land are labeled with their RLI-# and lease name. All of the lease maps and ranch plan maps for each individual of the fifty individual leases are displayed in Section 3.5.

3.3 Grazing Management Goals and Objectives

The MOU goals for the OVLMP that are pertinent to grazing management include:

1. Implement sustainable land management practices for agriculture (grazing) and other resource uses.
2. Improve biodiversity and ecosystem health (condition).
3. Protect and enhance habitat for threatened and endangered (T&E) species.

The objectives that are applicable to grazing management and meet the above stated goals as identified in the MOU include:

Grazing in the Owens Valley.

1. Implement grazing strategies within riparian and upland pastures.
2. Initiate habitat conservation strategies to enhance and protect threatened and endangered species habitat.
3. Monitor and use adaptive management through time.

Implementation of these objectives will ensure that livestock grazing is sustained, will provide productive wildlife and fish habitat, maintain desired healthy rangeland conditions, and maintain or increase rangeland condition trend. Different management strategies (also referred to as measures or actions) that may be implemented on the grazing leases are described in the grazing management plans and include:

1. Implement Best Management Practices.
2. Manage cattle using the "Best Pasture Rotation".
3. Implement grazing utilization standards.
4. Do not allow livestock grazing in riparian habitat areas along the Owens River corridor from May 1 to October 1 as per direction in the *Conservation Strategy for the Southwestern Willow Flycatcher*.
5. In areas that contain rare plant species, prevent livestock grazing during flowering periods.
6. Implement grazing exclosures.
7. Install fences to control the movement of livestock herds.
8. Construct fences to protect riparian trees and springs and seeps.
9. Reduce herd size.
10. Improve the maintenance of irrigation ditches and head gates.
11. Apply improved and more intensive irrigation practices.
12. Improve pasture maintenance practices, including mowing, dragging, and fertilization.
13. Implement Remedial Pasture Grazing Prescriptions (RPGP).
14. Provide supplemental feed when necessary to control herbaceous utilization and keep riparian, uplands, and irrigated pastures in healthy condition.

3.3.1 Uplands

To reduce the impacts to uplands from grazing, maximum annual average herbaceous livestock grazing utilization allowed on upland vegetation is 65 percent, if grazing occurs only during the plant dormancy period. Maximum average herbaceous plant utilization allowed on upland areas is 50 percent if livestock grazing occurs during the plant "active growing period" (defined as that period when plants are "active" in putting on green growth). However, if no livestock grazing occurs during the "active plant growing period" or the pasture or field is completely non-grazed for a minimum of 60 continuous days during the later part of the "active plant growing period" to allow seed set, allowable forage utilization can be increased from 50 to 65 percent. Livestock grazing ceases when the above grazing utilization criteria are met or the end of the specified grazing period occurs, as specified in the plan, which ever happens first.

3.3.2 Riparian

Riparian pastures can be grazed until 40 percent of the herbaceous forage on the riparian area is utilized (including elk use), or until the end of the specified grazing period, whichever criteria occurs first. Within the specified active grazing window, "on-and-off" dates for livestock (also applies to upland forage use) can vary ±10 days each year in response to climatic conditions, forage availability, and herd management needs; however, the total grazing days allotted and the percent forage utilization will not be exceeded. This riparian prescription will enhance the survival of riparian shrubs and trees during their first three years of growth and work towards achieving riparian objectives. Clary and Webster[1] (1989) found that riparian shrub abundance can be reduced by grazing young shrub age classes. As described in these plans, future grazing management methods will minimize impacts to the young age classes of riparian shrubs and trees.

Riparian pastures may also contain upland habitat. If significant amounts of upland vegetation occur

[1] Clary, Warren P. and Bert F. Webster. 1989. Managing grazing areas in the Intermountain Region. General Technical Report INT-263. USDA Forest Service, Rocky Mountain Research Station. Ogden UT.

within a riparian pasture or field, upland grazing utilization standards will also apply to these upland habitat areas. Livestock will be removed from a riparian pasture when either the riparian or the upland grazing utilization standard is met.

3.3.3 Irrigated Pastures

Irrigated pastures are those portions of a lease where the lessee receives an irrigation duty and is charged an additional fee. Water allotment for the lease is based on the irrigated acreage as mapped in 1981-82. LADWP and the ranch lessees jointly determine irrigated field or pasture condition. The evaluation method utilizes the Natural Resource Conservation Service (NRCS) Pasture Condition Assessment. This assessment is designed to ensure that both desirable plant and livestock productivity are optimized while detrimental effects to soil or water resources are minimized as much as possible.

Pasture condition scoring involves the visual evaluation of 10 indicators, each having five environmental sub-conditions. Each indicator is rated separately and the scores are combined into an overall pasture score. The overall pasture score can then be divided by the total possible score to give a percent rating (overall score ÷ total possible score × 100 = percent rating). Not all 10 indicators may be appropriate for each individual pasture. In this case, the total possible score will be reduced, but the percent rating will still be comparable.

Irrigated fields or pastures that score 80 percent or greater will be considered in good to excellent condition. They will not be subject to any changes in grazing management. Any irrigated field or pasture scoring less than 80 percent will receive a change of management prescription (i.e., changes in forage utilization, livestock numbers, grazing season, or duration of use). Necessary management changes will be determined by LADWP in consultation with the lessee. The condition scoring is only applicable to those portions of pastures or fields that are classified as irrigated on LADWP lease maps. If rare plants occur on irrigated pastures or fields, forage utilization criteria, timing of grazing, and duration of grazing may be modified to allow these species to set seed. Rangeland monitoring and adaptive management are described in detail in Chapter 9, *Monitoring and Adaptive Management.*

Irrigated pastures are designated Type E vegetation lands. Type E vegetation is based on a classification system (A to E, with A vegetation using water supplied by precipitation, and E dependent on irrigation) defined for Owens Valley vegetation according to the vegetation's water dependence. Type E vegetation is dependent upon water supplied by irrigation and is comprised of areas where water is provided to city of Los Angeles-owned lands for alfalfa production, pasture, recreation uses, wildlife habitats, livestock, and enhancement and mitigation projects.

3.3.4 Special Conditions

If a serious, temporary (one year or less) grazing emergency occurs on the lessee's federal allotment(s) or on the lessee's private lands that, in turn, results in serious reductions in the lessees allotted livestock numbers, or change in duration and timing of grazing, then temporary deviations in grazing lease protocols on LADWP lands may be made to lessen the lessee's emergency situation. Circumstances that may necessitate emergency changes in LADWP lease grazing practices are forage or grazing use reductions from fires, high snow conditions, and drought conditions. During the attempt by LADWP to provide grazing relief to the lessees, all grazing management direction for riparian and upland vegetation included in the Grazing Lease Management Plans must be abided by.

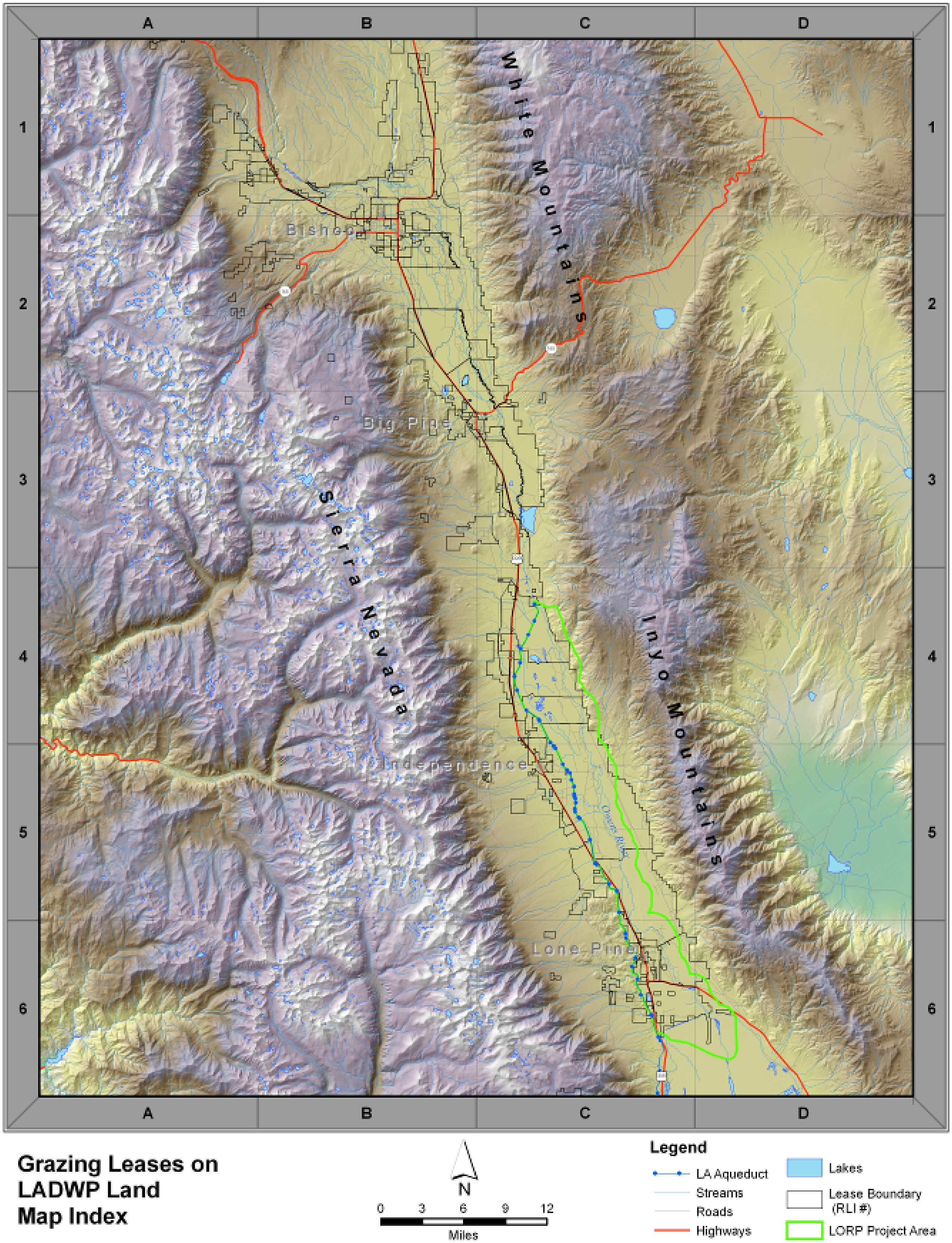

Figure 3.1. Grazing Lease Map Series

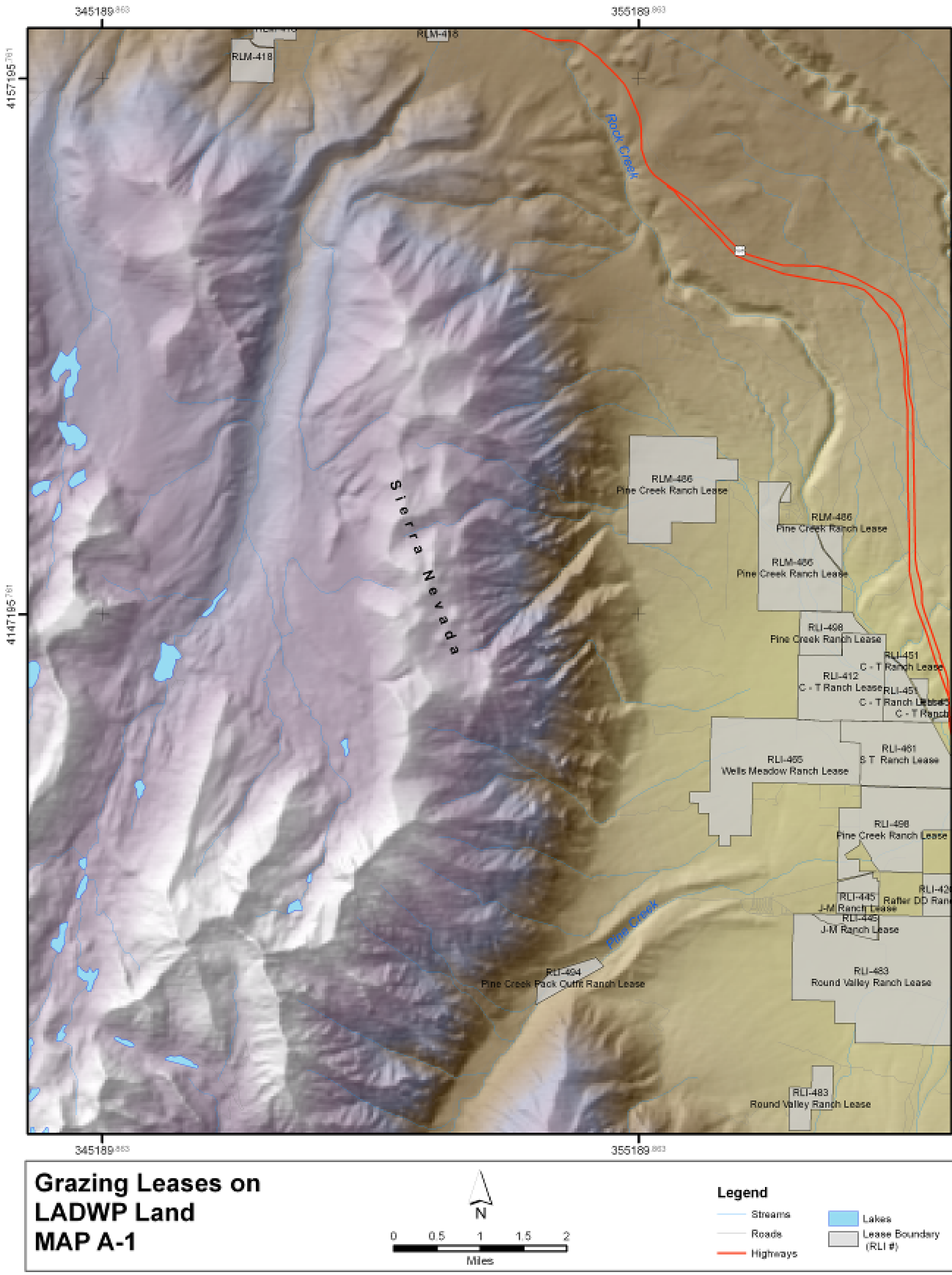

Figure 3.2. Grazing Lease Map Series

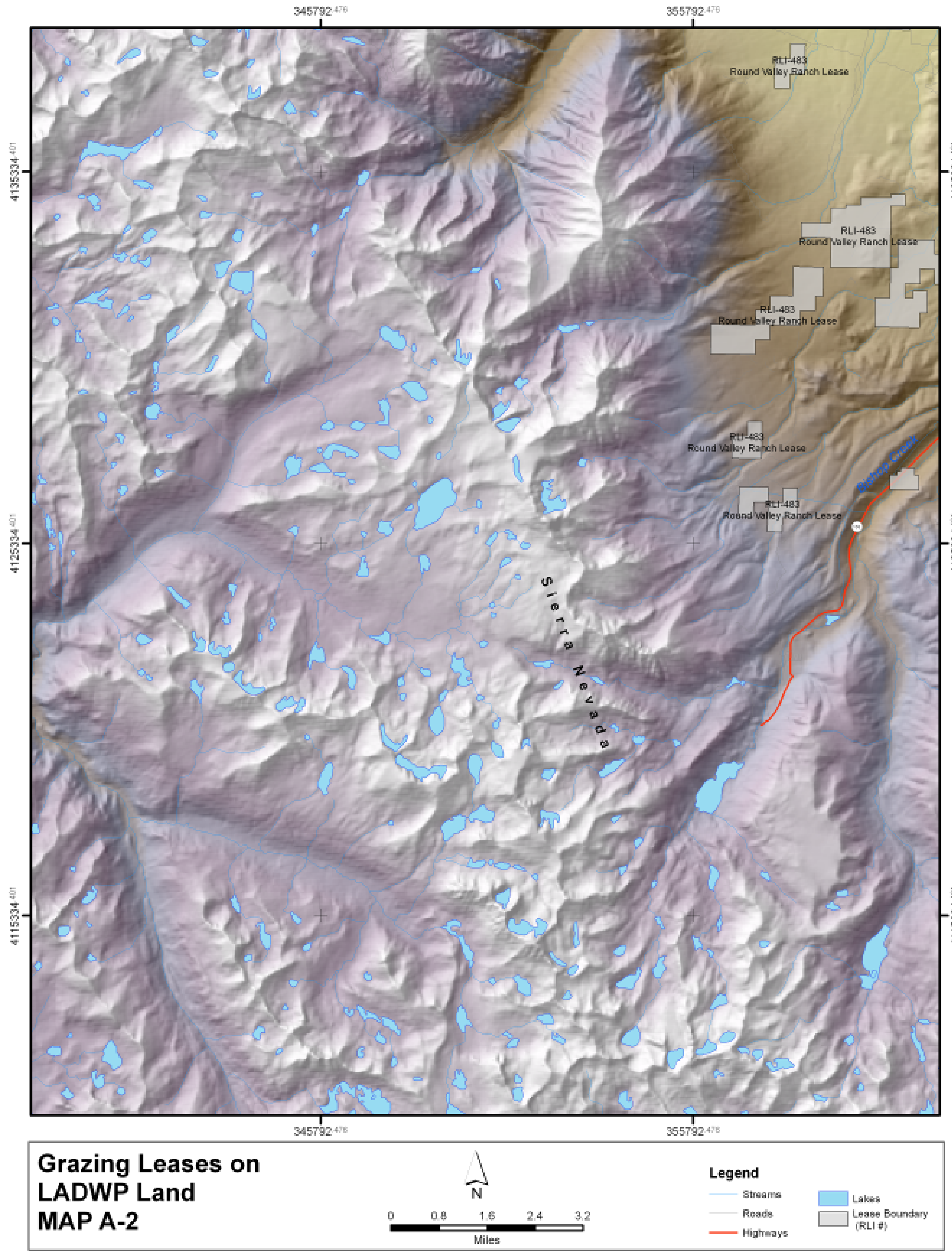

Figure 3.3. Grazing Lease Map Series

Figure 3.4. Grazing Lease Map Series

Figure 3.5. Grazing Lease Map Series

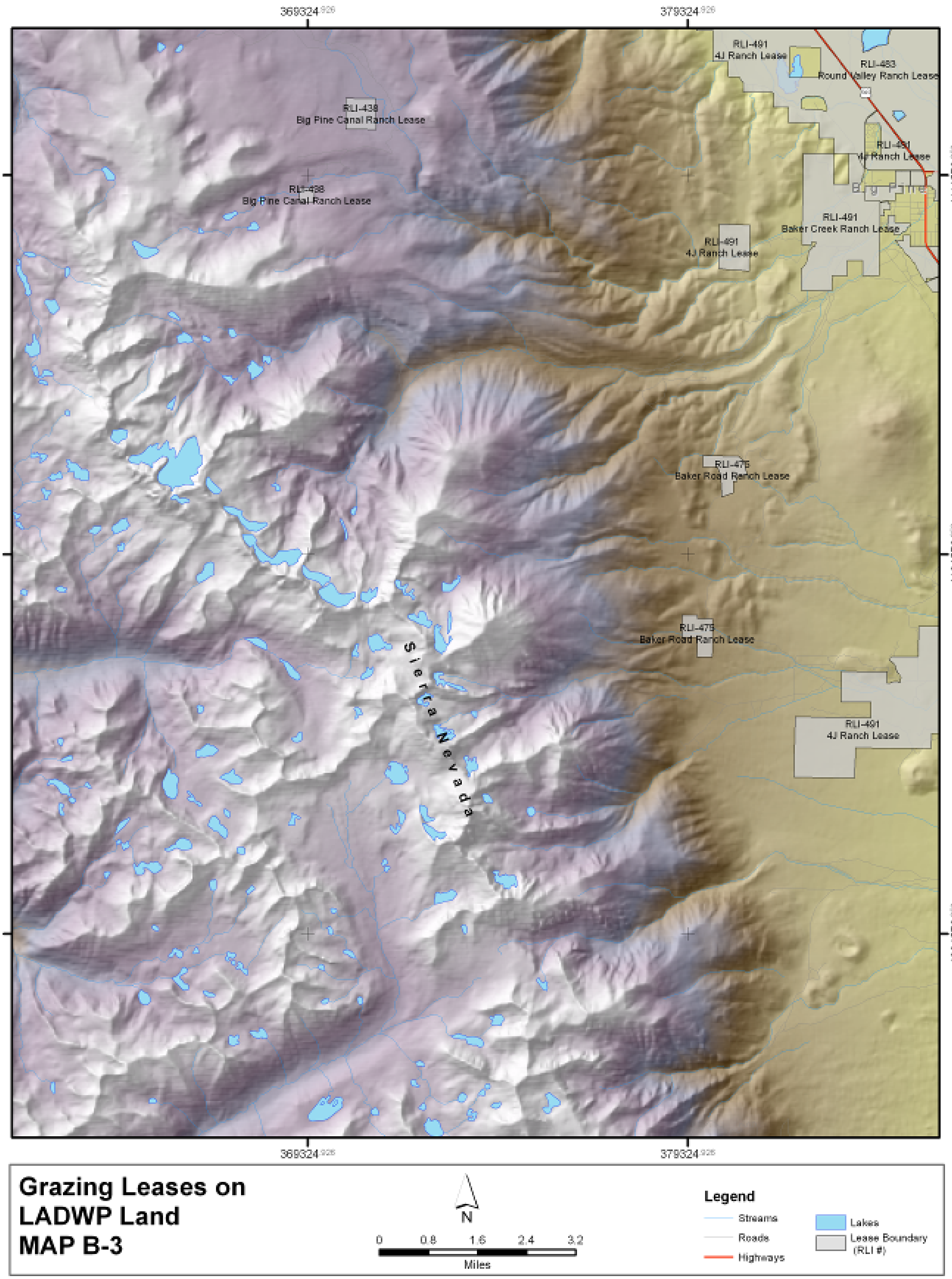

Figure 3.6. Grazing Lease Map Series

Figure 3.7. Grazing Lease Map Series

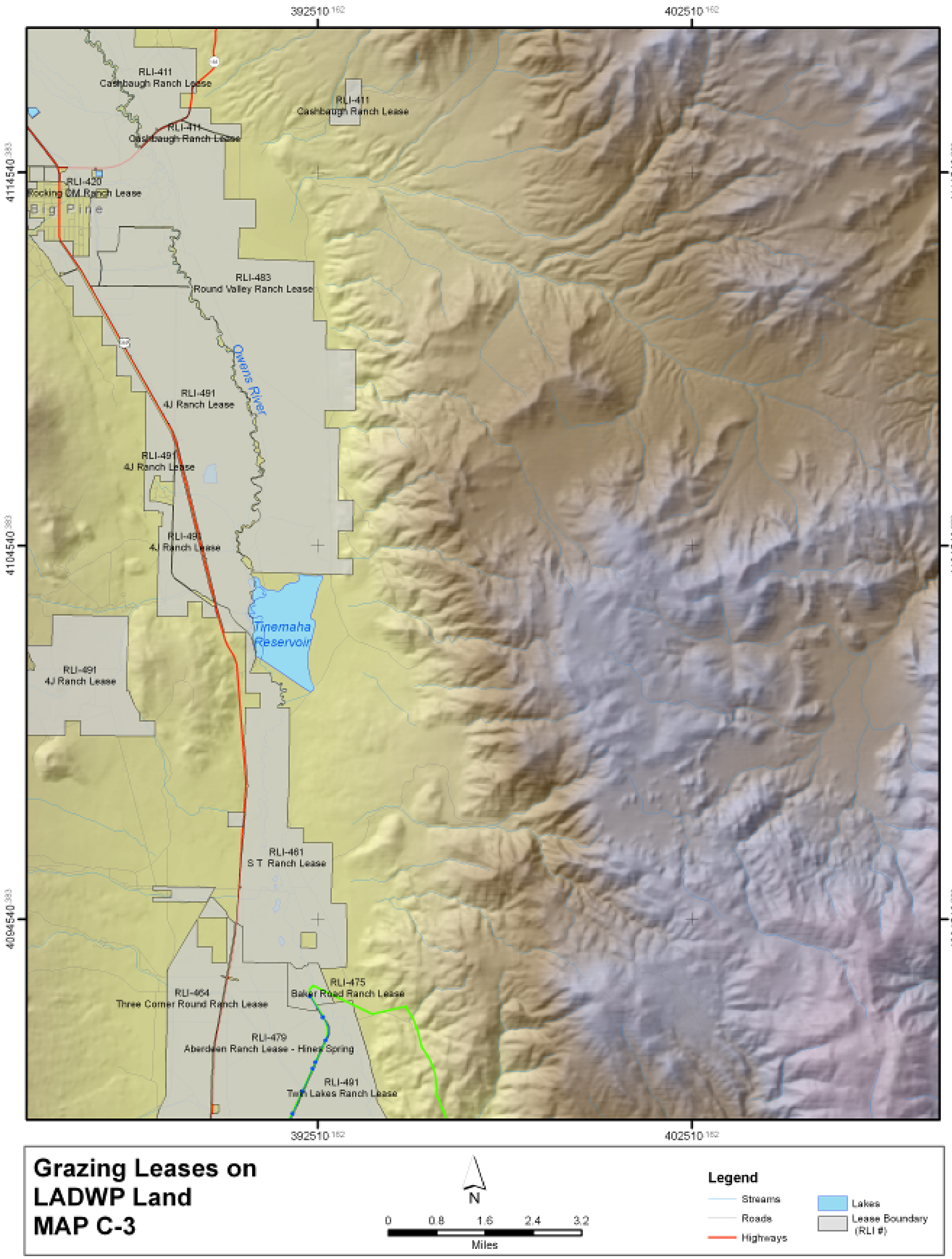

Figure 3.8. Grazing Lease Map Series

Figure 3.9. Grazing Lease Map Series

Figure 3.10. Grazing Lease Map Series

Figure 3.11. Grazing Lease Map Series

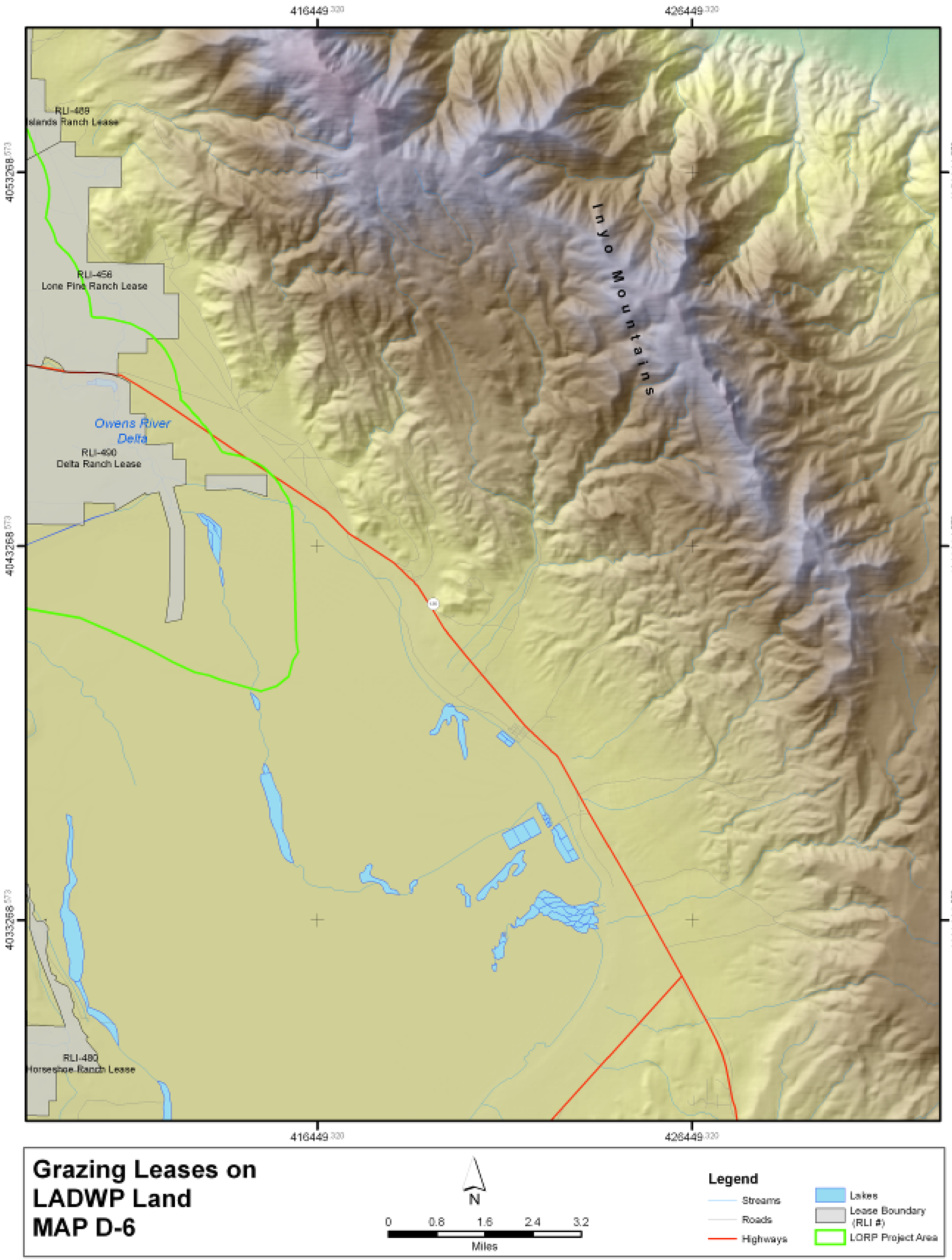

Figure 3.12. Grazing Lease Map Series

Figure 3.13. Grazing Lease Map Series

Table 3.1. List of Leases, Lease Identification Numbers, Lease size and responsible Lessee (s)

Lease Name	Lease #	Acres	Lessee (s)
3V Ranch Livestock Grazing Lease	RLI-435	33	Kenneth, Kenny, and Venneta Johnson; managed by Kenneth and Kenny Partridge
4-J Ranch Livestock Grazing Lease	RLI-491, RLI-499	20,800	4-J Cattle Company, Inc.; managed by Mark Johns
Aberdeen Livestock Grazing Lease	RLI 479	3,077	Dennis Winchester
Archie Adjunct Livestock Grazing Lease	RLI-490	426	Scott Kemp
Baker Creek Livestock Grazing Lease	RLI-491	1,426	4-J Cattle Company, Inc.; managed by Mark Johns
Baker Road Ranch Livestock Grazing Lease	RLI-475	391	Murton Stewart, Jr. and Jean Stewart; managed by Murton Stewart, Jr. and Murton Stewart III
Big Pine Canal Livestock Grazing Lease	RLI-438	9,177	Ron and Cathy Yribarren, Kathleen Landers
Blackrock Livestock Grazing Lease	RLI-428	32,987	Lacey Livestock
Brockman Ranch Livestock Grazing Lease	RLI-401	183	Fred and Ruth Aubrey II, Dick and Daris Moxley
C-T Ranch Livestock Grazing Lease	RLI-412, RLI-451, RLI-500, RLM-441	4,766	William, Sharon, Thomas and Laura Talbot; managed by Mickey Jarvis and Dick Weller.
Cashbaugh Livestock Grazing Lease	RLI-411	23,602	James W. Cashbaugh, Dorothy Cashbaugh, James A. Cashbaugh and Alonna Giacomini; managed by Gary Giacomini, James W. Cashbaugh and James A. Cashbaugh
Coloseum Livestock Grazing Lease	RLI-407	2,645	Rod Ayers
Eight Mile Livestock Grazing Lease	RLI-408	770	John Ketcham; managed by Mr. and Mrs. Lee Roeser
Fish Slough Livestock Grazing Lease	RLM-488	2,058	Managed by Tom Peek and Ken Zimmerman
Fort Independence Ranch Livestock Grazing Lease	RLI-406, RLI-489, RLI-454	5,375	Keith and Eleanor Bright, Donald Bright, and Scott Kemp; managed by Scott Kemp
Georges Creek Parcel Livestock Grazing Lease	RLI-489	4,025	Scott Kemp
Hogback Creek Livestock Grazing Lease	RLI-429	910	Red's Meadow Pack Station
Homeplace Adjunct Livestock Grazing Lease	RLI-428	587	Lacey Livestock, managed by Mark Lacey
Horseshoe Bar Ranch Livestock Grazing Lease	RLI-462	336	Jim and Lee Tatum; managed by Jim Tatum
Horseshoe Livestock Grazing Lease	RLI-480	3000	Roy Hunter and John Hunter
Independence Livestock Grazing Lease	RLI-416, RLI-454, RLI-455	5,268	Smith Trust, John and Tansy Smith
Intake Livestock Grazing Lease	RLI-475	284	Murton Stewart Jr., Jean Stewart, Murton Stewart III, Steven Stewart, and Lachlan Stewart
Islands and Delta Livestock Grazing Lease	RLI-489, RLI-490	26,065	Scott Kemp
J-M Ranch Livestock Grazing Lease	RLI-445	152	Jim Coats, Coats Family Trust
JR Ranch Livestock Grazing Lease	RLI-436	976	Ralph Ruiz

LI-Bar Ranch Lease	RLI-487	681	Giacomini Trust; managed by Gary and Alonna Giacomini
Lone Pine Dairy Livestock Grazing Lease	RLI-452	80	Lewis W. Schou, Robert D. Munis, and Phyllis L. Munis; managed by Lewis Schou
Lone Pine Livestock Grazing Lease	RLI-456	7,926	Spainhower Anchor Ranch, Inc
Lubkin Adjunct Livestock Grazing Lease	RLI-489	1,182	Scott Kemp
Mandich Ranch Livestock Grazing Lease	RLI-424	168	Chance Rossi, Holly Rossi, Justin Rossi, and Tami Rossi
Mount Whitney Ranch Livestock Grazing Lease	RLI-495	626	Rock Creek Pack Station
Olancha Creek Adjunct Livestock Grazing Lease	RLI 427	269	Spainhower Anchor Ranch, Inc
Pine Creek Pack Outfit Livestock Grazing Lease	RLI-494, RLM-466	267	Brian and Danica Berner
Pine Creek Ranch Livestock Grazing Lease	RLI-498, RLM-486	2,632	Emilio and Dorothy Collado, Reina Flores
Quarter B Circle Ranch Livestock Grazing Lease	RLI-404, RLI-413	1,250	Dan Boyd and Troy Oney
Rafter DD Ranch Livestock Grazing Lease	RLI-426, RLI-439	240	Dave Dohnel and Shannon Dohnel; managed by Kent Dohnel
Rainbow Pack Outfit Livestock Grazing Lease	RLI-460	144	Greg Allen; managed by Greg and Ruby Allen
Reata Ranch Livestock Grazing Lease	RLI-453	139	Kathleen Hadeler, Amanda Miloradich, and John McMurtrie; managed by John McMurtrie
Reinhackle Ranch Livestock Grazing Lease	RLI-492	5,947	Lacey Livestock; managed by Mark Lacey and Leo Hertz.
Riverside Ranch Livestock Grazing Lease	RLI-501	613	Fred and Ruth Aubrey II and Fred Aubrey III
Rockin C Ranch Livestock Grazing Lease	RLI-493	320	Cathy Caballero, Chance and Rebecca Johnson
Rockin DM Ranch Livestock Grazing Lease	RLI-420	110	Don Morton; managed by Don and Bev Morton
Round Valley Ranch Livestock Grazing Lease	RLI-483	19,780	Joe C. Mendiburu, Danielle Mendiburu and Nicole Dobrzanski; managed by Joe Mendiburu
S-T Ranch Livestock Grazing Lease	RLI-461	10,925	Jack and Todd Tatum
Thibaut Livestock Grazing Lease	RLI-430	5,259	Herbert London and Robert C. Tanner
Three-Corner-Round Ranch Livestock Grazing Lease	RLI-464	681	Three-Corner-Round Pack Outfit; managed by Jennifer Roeser
Twin Lakes Livestock Grazing Lease	RLI-491	4,912	4-J Cattle Company, managed by Mark Johns
U-Bar Ranch Livestock Grazing Lease	RLI-402	404	Alice J., Roy, Beverly, and Jeff Boothe
Warm Springs Livestock Grazing Lease	RLI-497	4,200	Giacomini Trust; managed by Gary and Alonna Giacomini
Wells Meadow Ranch Livestock Grazing Lease	RLI-465	1,041	Stanley and Kay Voget; managed by Don Perea

3.4 Grazing Lease Management Plans

Following are descriptions of the fifty grazing management leases. Some grazing leases may be modified in the near future to comply with the Yellow-billed Cuckoo Management Plan and other special management area plans, once they are completed. Any modifications will be added to the Grazing Lease Management Plans and incorporated into the OVLMP.

3.4.1 3V RANCH LIVESTOCK GRAZING LEASE (RLI-435)

This lease (33 acres) lies west of Bishop and is held by Kenneth, Kenny, and Venneta Johnson. Kenneth and Kenny Partridge manage the lease. The lease is managed as a cow/calf operation that runs cow/calf pairs, bulls, and horses. All pastures (30 acres) are irrigated and are designated Type E vegetation lands. No riparian, wetlands, seeps, springs or any known special status wildlife species occur on the lease.

Grazing Management
Future grazing management on this lease will be conducted much the same as present grazing management. All pastures scored greater than 90 percent in 2004; therefore, no changes in grazing management will be made at this time. The four irrigated pastures will be managed using the "Best Pasture Rotation." Livestock movement throughout the pastures will be encouraged through the use of molasses supplements.

The Front and Horse Pastures were hayed until 2001. This practice ended because custom farming operators are not available to process the hay. At least four times a year all pastures will be "drug" with a harrow. Once pastures are grazed by cows and horses, they will be mowed with a brush hog.

Irrigation "tail-water" enters the Swamp Field from the adjacent Reinhackle and Brockman leases. Since Reinhackle lease management was transferred, tail-water entering the Swamp Field has declined by 50 percent. During winter months, the Swamp Field now dries up. Stock-water is supplied, via irrigation ditches, to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.2 4-J RANCH LIVESTOCCK GRAZING LEASE (RLI-491 AND RLI-499)

This lease is held by the 4-J Cattle Company, Inc., and managed by Mark Johns. The lease supports a commercial cow/calf operation and is managed in conjunction with the lessees' other LADWP grazing leases. Some lease cattle also spend part of the year grazing USFS lands.

The lease consists of two parcels. The Big Pine parcel (RLI-491) contains 20,800 acres, (14, 587 of these acres are covered in this plan) and is located near the town of Big Pine. The Laws parcel (RLI-499) contains 1,197 acres and lies north of Laws, between U.S. Highway 6 and the upper McNally Canal. The lessee also holds LADWP leases in the Baker Creek area near Big Pine, in the Twin Lakes area near Independence, and in Long Valley; these leases are covered in separate grazing management plans.

Riparian/wetland lands in the lease are associated with the Owens River from Tinemaha Reservoir to Bartel Lane. Riparian lands also occur around Baker, Big Pine, Birch, Tinemaha, and Red Mountain Creeks. Type E designated vegetation land comprises 3,212-acres. Six springs (DG 81, DG 82, G 83, WP 18, WP 35, and DWP 36) and 2,896-acres of irrigated pasture occur on the lease: 1,108 of these acres are in irrigated grass pasture, 954 acres are in alfalfa in the Big Pine Parcel, and 956 acres of grass pasture are in the Laws Parcel. The Laws/Poleta Native Pastureland Project is a 130-acre Enhancement and Mitigation (E/M) project that lies north of Laws and east of U.S. Highway 6. The E/M project goal is to revegetate the site to native pasture.

No known T&E species occur on the lease, but other special status species may be present. Southwestern Willow Flycatchers (*Empidonax traillii extimus*) were detected during the breeding season on the Owens River in 1993 and 1999, but their current status on the lease is unknown. Future river flows and changes in livestock management will enhance habitats for this species. Swainson's Hawks (*Buteo swainsoni*) have been identified in and around the lease. No special management needs have been identified for this species.

Grazing Management

No issues were found with current grazing management. Therefore, future grazing management will be conducted much the same as present grazing management. Cattle will be managed using the "Best Pasture Rotation." The *Conservation Strategy for the Southwestern Willow Flycatcher* requires that no livestock grazing occur in riparian habitat areas along the Owens River corridor from May 1 to October 1. All livestock grazing management, directed by this plan, meets this requirement.

In addition to calves, the lessee raises replacement heifers. The actual number of heifers allowed depends upon feed conditions and is influenced by the number of cattle culled and sold during the previous two years. Heifers can be placed in the feedlot for the winter and then taken to Long Valley for the summer. In the fall, heifers can be placed in the Ranch Pasture and the South Field at the Big Pine Ranch until they have their calves. Heifer calves, kept for replacement heifers, can stay in the feedlot for the winter or they may be shipped to Bakersfield for the winter. In the fall, all calves are weaned and can be kept in the feedlot for a minimum of 45 days before being shipped out of the valley. A sufficient number of bulls can be grazed on the lease, which are needed to maintain a successful breeding program.

The majority of the lease cattle usually spend the summer in Long Valley. Cows with calves from Long Valley can be shipped to the lease between October 20 and November 1. Actual shipping dates depend upon climate and vegetation conditions in Long Valley. The herd can enter the Canal pasture first, with some cows put into the Front pasture. Both pastures can be used to carry these animals until June 1 to June 15, when they are shipped back to Long Valley.

Cows can be placed in the Cottonwoods Field in the fall. Additional cows can be added to this field by January 1. All animals can remain until June 15 when they will then be shipped to Long Valley. During dry years, when available forage is reduced in Long Valley, some cows can remain in the Cottonwoods Field. This pasture is irrigated and produces good forage.

Some cows can be placed on the Hessian and the Triangle Pastures. They can remain in these pastures until April 15, when they join cattle already in the Lower Canal, Middle Canal, and Lake Fields. They can remain in these fields until June 1 to June 15, when they are shipped to Long Valley.

Remaining cattle can be moved into the Elk Field where they can graze November 1 to December 1. After grazing the Elk Field cattle can then be moved to the alfalfa fields where they can graze alfalfa stubble until January 1. In January they can be moved to the North and South River fields. All cattle must be removed from the North River field by April 1. On years with good spring "green up", cattle can remain in the South River field until late May. On December 1, bulls, now separated from the cows, can be placed in the Lake Field. These bulls will be fed sufficient alfalfa hay so bulls remain in good shape until turned back with the cows April 1.

Those lease cattle, not summering in Long Valley, can stay on the Big Pine Ranch during the summer using the Tinemaha, Fish Springs, Orchard, and Lake Pastures. All grazing standards and direction, however, must be met. Other cattle can summer on the Baker Creek Parcel if needed.

All irrigated pastures, with the exception of those in the Laws area, scored greater than 80 percent in 2004. Laws pastures were not rated because these pastures were only recently tilled and planted to vegetation. All pastures not rated will be assessed within five years. No grazing management changes will be made for these irrigated pastures at this time.

The Locust Grove Spring (DWP 36) exclosure, south of the Pear Orchard Field, will have the current fence replaced. The new fence will begin 50 feet north of the head spring and will extend 200 feet down stream. A walk-through gate will be constructed on the north-east corner of the exclosure to accommodate people getting spring water for personal use. No grazing management changes were identified for any other spring areas.

Springs, irrigation water, and the Owens River supply adequate stock-water to all fields and pastures on the lease. The Owens River provides adequate stock-water for the River pasture. Stock-water is supplied, via irrigation ditches, to all irrigated pastures. No new stock-water facilities will be developed at this time. Livestock management fences are all in good condition.

3.4.3 ABERDEEN LIVESTOCK GRAZING LEASE (RLI-479)

The Aberdeen Lease (3,081 acres) is held and managed by Dennis Winchester. The lease is used to graze horses and mules used in a commercial packer operation. Hines Spring and Haystack parcels make up the lease. The Bairs parcel is a “use permit” and not part of the Aberdeen Lease; but, it is included herein for over-all planning purposes.

Hines Spring Parcel
This parcel (2,878 acres) includes the area from the Blackrock Fish Hatchery north to the now dry Hines Spring. Hatchery Pasture (194 acres), Division Pasture (1,509 acres), and Pipeline Pasture (1167 acres) comprise most of the parcel. The Little Blackrock Spring E/M project lies within the Division Pasture. Four well field vegetation monitoring sites and three revegetation sites (totaling 7.1 acres) occur in this parcel.

Haystack Parcel
This parcel borders the east side of the town of Independence. The Independence sewer treatment facilities border the northeast corner of the parcel. The lessee uses this parcel to raise alfalfa and graze pack stock. All alfalfa fields are authorized 5 acre-feet per acre of irrigation water annually.

Sixteen pastures and a few operating structures form the parcel. Major fields are Mazourka (55 acres), South Mazourka (31 acres), Sewer (36 acres), Tree Farm (32 acres), Feeding Area (21 acres), Haystack (7 acres), North (6 acres), South (5 acres), Middle (4 acres), and Feedlot (2 acres). Alfalfa is raised in an E/M Project area that includes the Independence sewer treatment facilities. The Tree Farm, part of the Mazourka Fields and all E/M Fields, receive 3 to 5 acre-feet of irrigation water annually. Part of the Mazourka Pasture (45 acres) is dry land shrub. The North, Middle, South, Feedlot, and Haystack Pastures are mainly in irrigated alfalfa and are all Type E designated vegetation lands.

Bairs Parcel
This parcel, consisting of a single pasture, is located south of Independence, east of U.S. Highway 395, and west of the Los Angeles Aqueduct. The lessee grazes pack stock on this parcel, which is made up solely of the Bairs Pasture. Bairs Creek, flowing through the north end of the parcel, empties directly into the Los Angeles Aqueduct. The parcel is composed mainly of upland habitat, except for a small area of riparian habitat bordering Bairs Creek and along a sand trap at the mouth of Bairs Creek. No irrigated lands, E/M Project lands, or any revegetation sites occur within this parcel.

The California Department of Transportation proposes to take most of this parcel to reconstruct and widen U.S. Highway 395. Thus, this parcel may or may not be able to support grazing, depending upon how much of the parcel remains available for grazing. Based on preliminary plan designs, the parcel will probably not support any grazing during or after the proposed highway construction.

Grazing Management

Hines Spring Parcel
A grazing exclosure (10-acre) will be established on the Hines Spring parcel to facilitate the reestablishment of the Hines Spring area. No livestock grazing will be allowed in this exclosure for at least the first 10 years after lease implementation.

Little riparian vegetation presently exists on this parcel. No functional natural springs or seeps occur at the present time, to produce riparian vegetation. Little Blackrock Spring, while not naturally functioning, receives some surface water and has bordering riparian vegetation. Most of the existing riparian vegetation borders the ditch supplying water to the Blackrock Fish Hatchery. No adverse effects from livestock grazing on riparian vegetation were observed. Willows grow so dense along the Goodale and Aberdeen/Blackrock bypass ditches that they interfere with water delivery to the Los Angeles Aqueduct. These willows will continue to be mowed and cleared to maintain flows.

The new grazing strategy closely follows the lessee's present grazing methods. The "Best Pasture Rotation", applied to the lease in 1994, is producing favorable results. The Pipeline Pasture will be fenced into two separate entities. The north portion will be fenced (1.1 miles of new fence) to create the Hines Spring exclosure. Hines Spring (now dry) lies in the northwest corner of this pasture. Reduction in pack stock numbers will be necessary to compensate for forage reductions caused by the loss of Hines Spring exclosure to grazing. Tule elk can continue to use the exclosure on a regular basis.

The southern boundary of the exclosure will be fenced along the north side of the Aqueduct Intake Road starting at the U.S. Highway 395 fence and continuing east to the west Aqueduct fence. The Hines Spring area will be rehabilitated resulting in open water, wetlands, and riparian habitat[2]. Cessation of livestock grazing will allow riparian/wetland rehabilitation to progress unaffected. The contrast between the exclosure and the adjacent grazed areas, over time, will allow the effectiveness of the "Best Pasture Rotation" to be evaluated.

The exclosure will eliminate five percent of the available livestock forage in the Hines Spring parcel. Livestock numbers will be reduced to compensate. Grazing can begin October 1 and end on May 15. No livestock grazing will be allowed after May 15, unless monitoring and evaluation supports there will be no detrimental effects if grazing is continued beyond this date.

The Pipeline Pasture will be grazed first on odd years, and the Division Pasture will be grazed first on even years. The Hatchery Pasture will always be grazed last. Annual pasture condition evaluations will determine when stock needs to be moved from one pasture to another.

Haystack Parcel
Because this parcel is mainly in alfalfa, no grazing management changes are needed. On November 1, mules and horses can enter the fields (North, Middle, South, and Haystack) to graze; all stock will leave by January 31. During this grazing period, stock will be fed the necessary food supplements so grazing pressure applied will protect upland habitats.

Bairs Parcel
This parcel can continue to be grazed under present grazing guidelines except for the addition of new upland plant utilization criteria and set grazing duration periods. The short time remaining, before the parcel will be heavily modified by highway construction, does not warrant making management changes at this time.

All stock in the parcel will be fed hay and other food supplements to control herbaceous utilization and keep animals in good condition. All feeding will take place on the north end of the parcel. Most of the natural feed, however, is in the southern portion of the parcel. This

[2] Ecosystem Sciences. 2000-A. Lower Owens River Projects; Seeps and Springs Inventory Phase 1. Boise, ID.

situation will not be addressed at this time. If the parcel is grazed, after the highway construction is completed, this feeding issue and all other management needs will be revisited.

3.4.4 ARCHIE ADJUNCT LIVESTOCK GRAZING LEASE (RLI-490)

Livestock (mainly cattle) have grazed the Archie Adjunct Lease and surrounding areas for the past century and half. The lease is used as a staging area for cattle coming to and from the Lower Owens River area on their way to summer graze the southern Sierras. The herd returns to the Archie Lease in the fall, from the Sierras, before going to private, other LADWP, and BLM lands to winter graze. The lease consists of three parcels, but only the Archie Pasture is grazed by livestock.

The Archie Lease (426 acres) is managed in conjunction with the much larger Islands Lease (14,845 acres). The Archie Lease is managed by Scott Kemp, in conjunction with the Islands, Delta, Georges Creek, Fort Independence, and Lubkin Leases. The lessee also grazes livestock on his own private land.

The lease lies north of Olancha, on both sides of U.S. Highway 395 and is south of the Crystal Geyser Water Bottling Plant. The lease borders the Homeplace Lease to the south and BLM land to the west and north. The lease is divided into one pasture, two fields, a corral, and holding pen. The Archie Pasture has formed in response to irrigation run-off conditions. In 1989, mudslides covered large parts of the North Field, eliminating large forage areas.

The Owens Valley checkerbloom (*Sidalcea covillei*), a State endangered species, occurs on dry to moist alkali meadows in part of the lease. Other special status species may be present. Future livestock management improvements are expected to enhance habitats for all species of concern. One hundred twenty acres of irrigated lands occur on the lease, all designated as Type E vegetation land, and all located in the Archie Pasture.

Seventeen acres of tule-marsh wetlands occur along the east border of the Archie Pasture. These wetlands were formed and now continually sustained by irrigation runoff from the Cartago Creek pipeline. A few tree willows and a small area of wet meadow occur in association with an intermittent spring on the northwest corner of the pasture. Small pockets of tule-marsh also occur in the pasture in response to irrigation and intermittent spring flow.

<u>Grazing Management</u>

Cows with calves can enter the Archie Pasture on April 20, and graze until July 1. On June 20, additional cows with calves (depending on forage availability) can be added to the existing animals and also graze until July 1. Part of the herd can remain in the Pasture from July 1 to October 1, as long as forage conditions remain adequate. On July 1, livestock will be moved to a Forest Service grazing allotment. Cows with calves can return to the Archie Pasture on October 1 and graze until November 20. No livestock grazing will occur on the lease November 21 to April 19 on any year. The Bull and North Fields may be grazed by livestock from 1-5 days when cows first return from the Forest Service allotment. The North Field may also be grazed during spring “green up” periods if conditions warrant.

The California Department of Transportation is constructing a four-lane highway near or through the lease. One alternative proposes acquiring the west side of the Archie Lease for road right-of-way. If this alternative is implemented little effect would occur since the two west-side pastures are not proposed to be grazed in the future.

Small pockets of tule-marsh on the Archie Pasture developed in response to irrigation and intermittent spring flow. Livestock grazing does not impact these boggy wetlands; therefore, no changes will be made in grazing management on these wetlands. Flows in the historic channel of Cartago Creek, which once flowed through the North Field, are now entirely diverted into a pipe. Thus, only remnant riparian vegetation is now present below the diversion along the dry channel. Remnant vegetation remaining will be protected by irrigated pasture grazing prescriptions.

Upland habitat within the North and Bull Fields will not be grazed. Irrigated pasture grazing requirements will protect the small amount of upland habitat on the Archie Pasture as no livestock grazing will occur from November 21 to April 19 of each year.

3.4.5 BAKER CREEK PARCEL LIVESTOCK GRAZING LEASE (RL- 491)

The Four-J Cattle Corporation leases the parcel (1,426 acres) and is managed by Mark Johns as a cow/calf operation. The parcel is located 1.5 miles west of the town of Big Pine, bordered on the west by BLM land, and divided into 5 pastures. One hundred acres of irrigated pasture, 182 acres of riparian/meadow complex, 1,143 acres of arid shrub land and one acre of nonproductive land make up the parcel. Two hundred twelve acres of Type E vegetation occur on the parcel.

Riparian/wetland lands are associated with Baker Creek, divergent historical channels of Baker Creek, around a spring (DWP26), and along irrigation ditches. Riparian and wetland habitats are supported mainly by local seeps and springs and not by Baker Creek. Irrigated areas in the Baker Creek pasture resemble wetlands. Riparian trees (mainly willow, locust and cottonwood) cover large parts of the Brown and Apple Orchard pastures.

Prior to the 1995 and 1999 fires, older age trees dominated the canopy. Since the fires, younger trees and shrubs have replaced older trees. The 1995 fire burned a quarter of the forested lands in the parcel and the 1999 fire burned an additional 24 acres of woodland riparian habitat. These burns altered one of the two main activity areas for Yellow-billed Cuckoo[3].

The Brown, Apple Orchard, and the Baker Creek Meadow Pastures make up the main part of the parcel. These pastures produce almost all of the livestock forage harvested. The North and Big Pine Pastures are dry uplands receiving very little grazing use because of low forage production. Giroux Ditch runs through the parcel's western boundary carrying water from Big Pine Creek to augment flows in Baker Creek. The Apple Orchard and Brown Pastures contain areas of dry uplands consisting primarily of semi-desert shrub-lands.

No known federal T&E animal or fish species occur in the parcel. The Yellow-billed Cuckoo occurs in the parcel, mainly between Baker and Big Pine Creeks. This cuckoo is listed as endangered by the California Department of Fish and Game, as sensitive by the United States Forest Service, and is under consideration for listing as endangered by the U.S. Fish and Wildlife Service. Suitable cuckoo habitat occurs in the Apple Orchard pasture and south of Sugar Loaf Road in the Brown Pasture. The Baker Creek Meadow Pasture provides very little cuckoo habitat. The main area of concern for cuckoo habitat is centered on 420 acres within the parcel. Owens Valley checkerbloom populations are robust and thriving in the parcel[4] under current grazing management and will continue to thrive under new grazing management.

<u>Grazing Management</u>

Grazing management changes are made to protect cuckoo habitat, maintain healthy riparian habitat, improve upland rangeland health, improve Baker Creek, and increase vegetation condition of irrigated pastures. These changes will be accomplished by decreasing animal numbers, changing the timing and duration of grazing, and setting vegetation grazing utilization criteria.

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[3] Ecosystem Sciences. 2000. Owens Gorge Permanent Flow Recommendations (Owens River Gorge Rewatering Project). Prepared for the Las Angeles Department of Water and Power.

[4] Ecosystem Sciences. 2000. Owens Gorge Permanent Flow Recommendations (Owens River Gorge Rewatering Project). Prepared for the Las Angeles Department of Water and Power.

A riparian exclosure will be constructed and all livestock grazing excluded along Baker Creek to protect the creek and associated riparian habitats. The riparian exclosure will encompass the southern part of the Baker Creek Meadow pasture and the northern part of the Apple Orchard Pasture. Livestock numbers and duration of grazing will be modified, as needed, to account for the loss of available livestock forage by the exclosure. This exclosure will eliminate problems developed by past and present grazing that degraded soils and vegetation (especially cottonwood expansion) along the Baker Creek corridor.

A spring exclosure (~5 acres) will be constructed in the Brown Pasture. Cattle can graze the Baker Creek Meadow Pasture May through December, provided all grazing criteria are abided by. There will be no grazing in this pasture from January 1 through April 30. The only exception to this is if there is a need to graze cheat grass ("green up") early in the season. The lessee can request permission from LADWP to graze during this "green up" period if needed. The Apple Orchard Pasture will be closed to all livestock grazing May through August 15. No cuckoo issues have developed in this pasture because of past and present livestock grazing management. In the years that plant "green up" does not occur on BLM lands, cattle can only graze the Apple Orchard Pasture, though only during the allotted grazing period and only as long as all grazing criteria are abided by.

The Apple Orchard Pasture can be grazed August 15 through December 31. The Brown Pasture can be grazed August 15 through November 15. The August 15 entry date will be compatible with rare plant needs as their flowering period is mainly over. The North and Big Pine Pastures can be grazed in conjunction and under criteria authorized for surrounding BLM lands. Livestock grazing will abide by all guidelines provided in the BLM Warren Bench Grazing Allotment Management Plan[5]. No known rare plant or cuckoo issues occur in either of these pastures at the present time.

[5] (BLM 2000)

No cuckoo habitat has been identified in the open irrigated portion of the Baker Creek Meadow Pasture. The smaller Baker Creek Meadow Pasture (minus the exclosure area) will include these irrigated areas. A new fence will be constructed along the southern pasture boundary to separate the newly formed exclosure from the new smaller Baker Creek Meadow Pasture.

The lessee will not provide food supplements. The parcel is well watered and no additional livestock watering facilities will be constructed at this time. New exterior fences will be constructed, as needed, to create the riparian exclosure. Additional inside fencing will be done in small plots designated to protect riparian trees. Fences will accommodate recreational access with walk-throughs as needed. All fences, and repair of existing fences required to manage the lease, will be constructed by LADWP. The fence separating the Baker Creek Pasture from the Apple Orchard Pasture will be strengthened so livestock cannot get through it. No additional fencing is required in the Brown Pasture and the present perimeter fence is in good condition.

3.4.6 BAKER ROAD RANCH LIVESTOCK GRAZING LEASE (RLI-475)

This lease (391 acres) lies west of Big Pine and is held by Murton Stewart, Jr. and Jean Stewart, and managed by Murton Stewart, Jr. and Murton Stewart III. The commercial Glacier Pack Trains operation grazes horses and mules during the non-pack season on the Baker Road Ranch Lease. Their pack stock also spends part of the year on USFS lands.

One hundred twenty acres (all Type E designated vegetation land) of irrigated pasture occur on the Baker Road Lease, and includes 40 acres at Fuller Meadow, 10 acres at Salque Meadow, and 70 acres at the Baker Road Parcel. No riparian or wetland areas occur on the lease. Springs occur in the Salque and Fuller Meadow areas. No known special status wildlife species are present.

Grazing Management

Glacier Pack Trains
All irrigated pastures scored greater than 80 percent on the Glacier Pack Trains Station portion of the lease. As long as these pastures score above 80 percent, no management changes will be made.

Cattle Operation
Issues were identified on the cattle grazed areas of the lease that necessitate changes in cattle grazing methods. Salque meadow has not recovered from the Big Pine fire of 2003. Therefore, this meadow will not be grazed until at least 2010. At that time, the meadow will be re-evaluated to determine if livestock grazing can be resumed. When grazing does resume, maximum plant utilization will be 50 percent annually.

Fuller meadow is also overgrazed by cattle. Livestock are not being moved from the meadow to the adjacent USFS grazing allotment at the proper time. This plan dictates that the cow/calf pairs can only graze this meadow each year until 50 percent of the forage is utilized. If the utilization criteria are not successfully met, the LADWP portion of Fuller Meadow will be fenced and managed separately from the adjacent USFS allotment.

All head springs in Salque and Fuller Meadows will be fenced and livestock grazing will be eliminated within the fenced exclosures. Stock-water will be made available in the meadows.

New fencing will separate LADWP property in Fuller Meadow from the adjacent USFS allotment. New fencing in Salque and Fuller Meadows will be constructed to ensure that wildlife have safe access to the springs and will not suffer injury. All other livestock management fences are in good condition.

3.4.7 BIG PINE CANAL LIVESTOCK GRAZING LEASE (RLI-438)

This lease is held and managed by Ron Yribarren and used for a cow-calf operation with spring calving. The lease also supports the required number of bulls and horses to make the grazing operation successful. The lessee received many awards for the grazing plan he developed and implemented to manage the lease. Implementation of the plan created excellent rangeland and pasture conditions; therefore, his grazing plan is used to develop this new grazing plan, with only slight modification.

The lease consists of the Canal (9,177 acres) and Coyote Mountain (302 acres) Parcels. The Canal Parcel lies north of the town of Big Pine, along U.S. Highway 395 and includes 13 fields. The Coyote Mountain Parcel includes three fields north of Baker Creek that are surrounded by USFS lands.

Type E designated vegetation lands in the Canal Parcels total 949 acres. Riparian/wetland vegetation in the Canal Parcels is associated with the Owens River, Lyman Slough, and a spring located in the South 40 Pasture. Riparian/wetland vegetation (60 acres) in the Coyote Mountain Parcels is associated with numerous springs and Baker, East Fork Coyote, and Cow creeks. The Owens Valley checkerbloom (*Sidalcea covellei*), a state of California endangered species, occurs on the Canal Parcel. The current status of the Southwestern Willow Flycatcher (*Empidomax trailli extimus*) is unknown. The mountain yellow-legged frog occurs in the north and south units. These units were fenced in 2002.

Riparian and wetland habitat is associated with Partridge Slough in the North 40 Pasture. Seventy one acres of marsh vegetation is associated with Lyman Slough. Eight acres of mesic meadow, riparian shrub, wet meadow, and marsh vegetation are associated with Spring DWP23. Riparian/wetland vegetation along the Owens River consists primarily of alkali meadows and riparian shrub.

Grazing Management

The lessee's current grazing management plan will become the new grazing management plan with minor modifications. A "Best Pasture Rotation" will be used to graze all irrigated pastures. Fields and pastures can be mowed in late fall to allow better utilization of the coarse forage and allow new succulent grass to grow. Past annual mowing, in combination with proper plant utilization, has increased plant vigor, production, and diversity in all fields and pastures.

The lease contains high quality productive range and agriculture lands. No issues were found in the lessee's management of irrigated pastures, upland habitat, riparian habitat, or any detrimental influences to the Owens River. The lessee recently modified herd composition by eliminating the raising of replacement heifers. The lessee now purchases the needed number of high quality preg-tested cows each year to maintain herd numbers and calf production. All necessary structural range improvements (e.g., corrals, water developments, feeding areas, mangers, driveways, windbreaks, and rubbing posts) are in place. The herd will be supplemented, when needed, with molasses, nutrients, salt, and 10 to 15 pounds of hay per head per day.

North 40 and South 40 Fields
These two fields are very large, with the Owens River as their eastern boundary. The Big Pine Canal runs through both fields and provides stock-water. The herd can graze these fields December through February. The herd can enter the South 40 Field on December 1. In the past the herd mainly grazed the west side, staying near Lyman Slough. About February 1, the herd can be moved to the North 40 Field and graze until March 1. The herd can then be moved to the Horse and Heifer Fields.

Horse Pasture, North Big and South Big Meadows, Heifer and Alfalfa Fields
A "Best Pasture Rotation" will be used to graze these fields in combination with the Canal and 4C Fields. The herd can be moved from the North 40 Field into the Horse and Heifer Fields on March 1 and graze until April 1. The herd will leave the Heifer Field and Horse Pasture in the spring, after having been fed supplements for 30 to 40 days, and can enter the South Big Meadow Field. The main herd can again use the Horse Pasture (August 15 to September 15) during the late summer rotation.

The Heifer, South Big Meadow, 4C, and Canal Fields can be mowed in late fall to allow better grazing utilization of the coarse forage and promote new succulent grass growth. Little soil is exposed in any of these fields. A thick mat of litter covers the soil surface, reducing soil erosion and evapo-transpiration.

South Big, 4C and Canal Fields
The herd can leave the Heifer Field April 1 to graze the South Big Meadow Field for one or two days. The "pairs" (cows with calf) can be moved to the 4C Field for branding. The "drys" (non-pregnant cows) can go to the Canal Field and graze until the end of June. The "pairs" can graze the 4C Field until May 31, and can then be moved to other pastures (Heifer, North Big Meadow, and South Big Meadow) to graze June through August. The herd can return to the South Big Meadow Field and graze the month of September. If any surrounding field contains better forage conditions than the field being grazed, the herd can be moved to graze the better forage field during September ("Best Pasture Rotation"). In October, the herd can be moved to the 4C and Canal Fields. Most calves will usually be separated, sold, and shipped by the end of October or first part of November. The 4C and Old Bull Fields can also be "rotation grazed" using brood mares.

Bull #1, Bull #2 and Home Ranch Fields
These small fields surround the home ranch and can be used to graze and train horses. Bulls can graze the Bull Fields #1 and #2 October 1 to March 31 when they are not with the cow-calf herd. Bulls can then rejoin the main cow herd. Cows with calves can graze Bull Fields #1 and #2 May 15 to June 15. Bull Field #1 will be grazed the first two weeks and Bull Field #2 the following two weeks of this period. The herd can move between fields located east and west of U.S. Highway 395 using an underpass.

Canal and Old Bull Fields
Cows can leave the Bull Fields June 15, depending upon forage conditions, to again graze the east side fields. These cows previously grazed the Canal Field from May 1 to June 20. If forage runs short in the Canal Field, which it seldom does, the herd can go early to the Old Bull Field. The Old Bull Field will not be grazed unless some other field needs a nongrazed period. The Bull Field will be held in reserve to provide options during poor grass growing seasons. The Old Bull Field will be the only field that receives true rest from grazing over time. All other fields and pastures have nongrazed deferred periods.

Coyote Mountain Parcel
These LADWP in-holdings will be managed in common with the surrounding USFS grazing allotment. Grazing prescriptions for the parcel will abide by adjacent USFS grazing guidelines. The parcel contains a legume plant (*Astragalus whitneyi*), which is poisonous to cattle. The lessee is well aware of this situation.

Livestock can graze this parcel June 15 to September 15, in conjunction with the adjacent USFS grazing allotment. LADWP, and surrounding USFS lands, are in excellent condition because of past low grazing intensity and good control of animal distribution. Grazing duration, animal stocking levels, and plant utilization standards will abide by those listed in the surrounding USFS Allotment Grazing Management Plan.

Seeps, Springs, and Livestock Watering
Lyman Slough and a spring are located in the south part of the South 40 Field. Past controlled animal numbers, low plant utilization rates, and proper timing of grazing protected these areas. Springs and seeps will continue to be protected under the future grazing strategy. No springs will be fenced at this time. No other fields or pastures in the parcel contain springs or seeps.

Livestock can water from troughs, streams, springs, sloughs, ponds, and the Owens River. The lease is well watered for stock-water needs year-round. Flood irrigation also provides stock-water. The Hot Ditch, which flows into Freeman Creek, continues into Bull Field #1. These streams provide ample stock-water for Bull Field #1. A pipe diverts water from Freeman Creek to Bull Field #2 for stock-water. The pipe delivers water to four water troughs spaced across Bull Field #2. Freeman Creek flows under U.S. Highway 395 in a pipe providing stock-water to all fields around the south corrals. Freeman Creek is perennial and provides stock-water year-round for the 4C, Corral, Old Bull, and Canal Fields. The Rawson Canal provides stock-water for the 4C Field, Bull Field #2 and Bull Field #3. LADWP will install a windmill in the Canal Field to provide stock-water during those periods the Big Pine Canal flow is shut down for maintenance.

The Big Pine Canal and the Owens River provide stock-water for the Canal and North and South 40 Fields. Meadows around the ranch area “sub” all winter providing winter stock-water. Other than the new windmill in the Canal Field, no additional stock-water sources will be developed at this time.

Fencing
All fences are in good condition and only need minor maintenance to bring them up to LADWP standards. Lease fences bordering U.S. Highway 395, on both east and west sides, will be maintained by the California Department of Transportation. The Owens River forms an eastern barrier to livestock movement because of high flows and deep water in this reach. Therefore, no fence will be constructed along the east boundary. No fence separates Bull Field #1 from BLM lands west of U.S. Highway 395. The lessee has not used the BLM lands for grazing since the mid 1980s. Livestock, if allowed to graze, can move freely between the two lands and no fencing is proposed.

A new cattle guard will be installed along Collins Road to enhance recreation access. A cattle guard will also be installed along the road between the Alfalfa and Heifer fields, near the Collins Road intersection, to allow easier access and keep cattle off Collins Road. Cattle getting out and onto the Collins Road creates a constant safety problem because recreationists, especially duck hunters, often leave gates open.

3.4.8 BLACKROCK LIVESTOCK GRAZING LEASE (RLI-428)

This lease is the largest lease in the LORP area and is held and managed by Lacey Livestock. Goose Lake, in the White Meadow Pasture, and Billy Lake, in the Reservation Pasture, are Enhancement/Mitigation Projects. 588 acres of Type E designated vegetation land, all in irrigated pasture, occur on the lease. Alkali shrubs, complimented with scattered riparian shrubs and alkali meadow, are prevalent along dry portions of the Owens River in the White Meadow and Reservation Pastures. Riparian shrubs, marsh, and alkali meadow are prevalent along wetted portions of the Owens River channel below Billy Lake.

Riparian/wetland vegetation occurs on the historic floodplain of the Owens River, around Goose Lake in the White Meadow Pasture, and Billy Lake in the Reservation Pasture. Riparian/wetland vegetation also occurs in the vicinities of four springs associated with the Owens Valley Fault and around another spring in Robinson Pasture.

The Owens River (18.2 miles of channel within the Lease) is the central feature in the lease. The river channel in the White Meadow and upper part of the Reservation Pastures has recently received permanent flows. Below Billy Lake, water has been present in the historic Owens River channel for many years. 13,795 acres of moist vegetation types (saltgrass/sacaton meadow, rush/sacaton meadow, tule marsh, and riparian vegetation), 17,751 acres of arid shrub land, and 1,441 acres of nonproductive land make up the lease. LADWP credits the lessee for 982 AUMs of elk use annually.

Four springs associated with the Owens Valley Fault and another spring in Robinson Pasture (IND215, IND102, IND182, IND163, and DWP 10) occur on the lease. The Owens Valley checkerbloom (*Sidalcea covillei*), a State endangered species, occurs in alkali meadows. The only special livestock management strategy, applied to date, to protect the checkerbloom is a plant exclosure in the Reservation Pasture.

Owens pupfish (*Cyprinodon radiosus*), a state and federally listed endangered species, occupies flows from artesian Well Site #368. This well lies west of the river, south of Mazourka Canyon road, in the River Pasture. The well flows 200 to 300 feet before disappearing. Pupfish occupy the shallow flows, as well as deeper water areas near the well. This well will be managed for the continued existence of Owens pupfish as long as the well flows.

<u>Grazing Management</u>

The new best pasture rotation outlined in this plan for upland habitats closely follows the strategy the lessee is presently using. Because numerous rare plant sites occur on the lease, five of these plant sites will be excluded from livestock grazing during the flowering periods for the Inyo County star-tulip (*Calochortus excavatus*) and the Owens Valley checkerbloom (*Sidalcea covillei).* Five new riparian pastures will be established to protect riverine/riparian habitat. The lease will be divided into 22 pastures and four corrals. Creation of the five riparian pastures will require 20 miles of new fence. Livestock can graze these riparian pastures for only a short period in the spring. Spring grazing will also allow livestock to use spring forbs during "green up" on alluvial fans east of the Owens River. Grazing can begin in late March in selected riparian pastures. Livestock will be removed from these pastures by mid-May.

The lessee will continue to manage his livestock using five separate herds--Blackrock, Reservation, Independence sire, first-calf heifers, and bull herds. The portion of the Blackrock herd grazing west of the aqueduct, the portion of the Blackrock herd grazing east of the aqueduct, and the Reservation Pasture herd have common sires. Cows from these herds can be mixed. First-calf heifers will be run separately, fed hay, and given special attention until calving. Mature cattle will graze during the fall, winter, and spring periods. From mid-March through early June, cattle will utilize new plant growth ("green up") in upland pastures when available.

After the fall grazing period, first-calf heifers in the Wrinkle Pasture can be moved to the Springer Pasture to calve. Heifers can graze the Springer Pasture January 1 through February 28. When calves are strong enough, the herd can be moved to the West and Wrinkle Riparian Pastures and graze until May 1. Mature cows usually calve February through April. Cows will not be moved until calves are strong enough to trail successfully with their mothers. Calves will be “worked” in April. The Blackrock herd will be “worked” first, the heifer herd second, and the other herds last.

On April 1, the bulls will begin the 80- to 90-day breeding period, grazing with the cows through May. Some bulls will go with the cows to summer range off the lease. The remaining bulls can summer on the lease. From November until spring "green up," cattle grazing nutrient-deficient dormant forage in upland pastures will be supplemented with syrup or a similar product to maintain health and production. Similarly, heifers will be supplemented with hay to enhance growth, increase conception success, and produce healthy calves.

Five new riparian pastures will be created to protect 18 miles of the Owens River and associated riparian habitat. New fences (20 miles) will be constructed by LADWP along the west side of the Owens River to create the White Meadow, Reservation, North River, South River, and Wrinkle Riparian Pastures.

The White Meadow Riparian Pasture (1,738 acres) can be grazed April 1 to May 15; the Reservation Riparian Pasture (2,450 acres) April 1 through May 31; the North River Riparian Pasture (3,361 acres) April 1 to April 30; the South River Riparian Pasture (6,346 acres) April 1 to April 30; and the Wrinkle Riparian Pasture (646 acres) March 1 through April 30. This controlled duration of grazing, in combination with plant utilization standards, should ensure survival of riparian shrubs and trees during the first three years of growth, which is the period they are most susceptible to livestock damage. Spring grazing on alluvial fans east of the Owens River will help reduce saltgrass and sacaton use in riparian areas.

Additional stock-water sources will be developed on uplands east of the Owens River and in the Reservation and White Meadow Pastures to draw livestock away from riparian areas. Future river flow increases may or may not restrict cattle from crossing the Owens River. The lessee may have to trail cattle from pasture to pasture using the Manzanar and Mazourka Bridges when river flows are high.

Four springs are associated with the Owens Valley Fault (IND215, IND102, IND182, and IND163) and one spring is in the Robinson Pasture (DWP 10). No special grazing management changes are proposed for areas around these springs at this time.

The Owens River, irrigation water, ditches, flowing wells, springs, and ponds supply stock-water. Additional stock-water sources will be developed on uplands east of the Owens River in the Reservation Riparian, North River Riparian, and South River Riparian Pastures to encourage livestock away from riparian areas. Additional stock-water sources will also be developed west of the river in the White Meadow and Reservation Pastures.

Constructing five new riparian pastures will require 20 miles of new fence. The five rare plant exclosures will require an additional 5 miles of fence. The Owens River bottoms are very important to elk during summer and winter. During winter, many elk use the desert shrub lands east of the Owens River. Vegetation types and dense cover along the Owens River provide excellent elk calving habitat. Specially designed “elk friendly” fence sections will be built where new or old fences cross major known elk travel routes.

3.4.9 BROCKMAN RANCH LIVESTOCK GRAZING LEASE (RLI-401)

This lease (183 acres) lies west of Bishop and west of Brockman Lane between West Line Street (to the south) and U.S. Highway 395 (to the north). The lease is held and managed by Dick Moxley. The lease is used as a cow/calf operation running registered Red Angus cattle. No wetland areas, seeps, springs or any known special status wildlife species occur on the lease. Riparian vegetation borders the North Fork Bishop Creek. One hundred acres (all Type E designated vegetation lands) of irrigated land occurs on the lease.

Grazing Management

Future livestock grazing on the irrigated portion of the lease will be conducted much the same as present grazing management is being applied. Grazing management methods will continue to be at the discretion of the lessee. New fencing in Field #8 will create a new riparian pasture along Bishop Creek. South Field will continue to be managed as an upland field. Grazing management in all irrigated pastures will continue to utilize the "Best Pasture Rotation." A riparian/upland pasture will be created in the South Pasture. All irrigated pastures scored greater than 80 percent; therefore, no changes in grazing management will be made as long as all pastures maintain an 80 percent condition rating or higher.

3.4.10 C-T RANCH LIVESTOCCK GRAZING LEASE (RLI-412, 451, 500, RLM-441)

This lease (6,081 acres) consists of several different parcels. The Chance Ranch Parcel (569 acres) is 10 miles northwest of Bishop, east of Rock Creek Road, and north of Birchim Road. The Schober Parcel (471 acres) consists of the Roberts Ranch, north of Pine Creek Road and west of Rock Creek Road; and the Evans Ranch west of U.S. Highway 395 and south of Pine Creek Road. The Sunland Parcel (275 acres) is southwest of Bishop and west of Sunland Road. The Patch Parcel (4,766 acres) is 13 miles northeast of Bishop near Chalfant Valley. The leases are held by William, Sharon, Thomas and Laura Talbot and managed by Mickey Jarvis and Dick Weller. The lease supports a commercial cow/calf operation.

Riparian/wetland areas are associated with Rock Creek, which runs through the Chance and Schober Parcels. Type E designated vegetation land comprises 1,110 acres. No wetland, springs, seeps or any known wildlife species of concern occur on the lease.

Grazing Management

No major issues with current livestock management practices were found. Therefore, future grazing management will be conducted much the same as present grazing management. Livestock management fences are all in good condition. A new riparian exclosure will be constructed by LADWP to protect Rock Creek in Pasture A of the Roberts Ranch Parcel. Another riparian exclosure will be constructed by LADWP in the southwest corner of the Bull Pasture.

Most pastures are irrigated and livestock are rotated through these pastures using the "Best Pasture Rotation." The lessees steadily improved pasture conditions by mowing, dragging, resting from livestock grazing, and using intense grazing for short periods. These methods have been used on the Chance Ranch Parcel for over 40 years. Methods have been so successful the entire parcel will now adopt these practices. The timing and duration grazing goal is to remove all cattle from the pasture by July 15th in those areas that will be used later for winter grazing. The Patch Parcel brushy uplands can be used on the average of one out of every seven years when good spring "green up" occurs.

All weaned calves can be placed on Chance Ranch irrigated fields for 45 days starting September 30. On occasion in the fall, the lessee can hold "open cows" until sold. These "open cows" can remain on Chance Ranch until December.

Chance Ranch Parcel

Replacement heifers and cows can graze this parcel January 1 to June 15. If winter forage "drops off" in either the Sunland or Patch Parcels, cattle grazing these parcels will be moved to the Chance Ranch or Evans Parcels. All lease cattle can graze these parcels mid June to mid July. These cows can remain on the Chance Ranch until they are "worked" in the fall. "Open cows", once separated from "bred cows", can be sent to the Evans Ranch. "Open cows" held on the Evans Ranch can remain until Christmas, when they are usually sold.

Roberts Ranch

This ranch was recently leased by the Schobers, who sold part of their operation called the Bishop Creek Pack Trains. As a sale condition, the new owners of the Bishop Creek Pack Trains retain the use of the Packer Pasture for winter grazing. The new owner can graze horses and mules in this pasture September 15 to June 15. Future grazing use, on the Packer Pasture, will decrease because the Bishop Creek Pack Trains are constantly wintering more of their stock on the west side of the Sierras. After November 1, all pack stock on the Ranch will be fed 20 pounds of hay per animal per day.

The Roberts Ranch can be grazed by cows January 1 to June 15. The only riparian areas of concern border Rock Creek on the Chance and Roberts Ranches. The Rock Creek Pasture can be grazed February 1 to May 1. This pasture can also be grazed in the summer, for short durations, until August 1. The Packer Pasture can be used to graze pack stock during the winter as long as all grazing criteria are met.

The Patch Parcel can be grazed January 1 to July 15. If forage conditions "drop off" in this parcel before May, cattle can be moved to the Chance or Evans Ranches. If winter-spring forage remains good in the Patch Parcel, cattle can be shipped to the Chance or Evans Ranches in June and July.

The Sunland Parcel can be grazed January 1 to July 15. If forage conditions "drop off" before May, cattle can be moved to the Chance or Evans Ranches. If forage conditions in the Sunland Parcel remain good through the winter-spring, cattle may not have to be shipped to the Chance or Evans Ranches in June and July.

As cows start to calve, they will all be fed the necessary supplements at all locations they winter. If significant snow conditions occur, a complete daily ration of alfalfa hay will be fed to all animals until the snow is melted. Adequate stock-water is supplied via irrigation ditches to all irrigated pastures. A new stock-water source in the Bull Pasture on the Roberts Ranch will be considered.

3.4.11 CASHBAUGH LIVESTOCK GRAZING LEASE (RLI-411)

This 23,602 acre lease is held by James W. Cashbaugh, Dorthy Cashbaugh, James A. Cashbaugh and Alonna Giacomini. The lease is managed by Gary Giacomini, James W. Cashbaugh and James A. Cashbaugh. The livestock program is a commercial cow/calf operation. The Cashbaugh Family also manages two grazing leases in Mono County, as well as a partnership with the Giacomini Trust Lease; however, the Cashbaugh Lease is operated separately from the Giacomini Trust Lease. The only things currently shared, in lease management between lessees, are corrals and employees.

Riparian/wetlands are associated with the Owens River between U.S. Highway 168 and U.S. Highway 6. Riparian habitat occurs along Bishop Creek, through the area known as "Williams Waste". Type E designated vegetation land comprises 1,033 acres and is all in irrigated pasture. Warm Springs (DWP 28) is on the east side of the lease at the base of an alluvial fan. The springs (100 acres) support two open water areas[6]. The spring area supports two small stands of mature riparian trees with approximately 20 percent

[6] Ecosystem Sciences. 2001. Fisheries in the Lower Owens River; revised version issued April 2001. Technical Memorandum No. 14. Ecosystem Sciences, Boise, ID.

canopy cover. Emergent and wet herbaceous vegetation occupies the open water shoreline.

Marsh areas and surrounding alkali meadows are moderately impacted by livestock grazing. The spring area is also disturbed by campers, swimmers, and other recreational users. Roads and irrigation ditches have altered the hydrology in the upper marsh area. A majority of the spring site is in mesic meadow, with smaller areas of marsh, alkali shrub, alkali meadow, and small stands of mature trees.

Owens Valley pupfish (*Cyprinodon radiosus*) occupy Warm Springs. Southwestern Willow Flycatchers (*Empidonax traillii extimus*) were detected during the breeding season along the Owens River in 1993 and 1999. Their current status on the lease is unknown. Improvements from future river flows and changes in livestock management will enhance flycatcher habitat. The Owens Valley checkerbloom (*Sidalcea covillei*), a state endangered species, occurs in four areas in the Bishop Creek Field.

Three hundred and sixty acres of E/M projects occur on the lease. The 200 acre McNally Ponds Native Pasturelands site is south of the Lower McNally Canal and east of the Laws-Poleta Road. The 160 acre Laws-Poleta Native Pasture Project, referred to as the Upper and Lower Symons Pastures, is also south of the Lower McNally Canal and east of the Laws-Poleta Road.

Spring DWP 23 (8.2 acres) is ½ mile east of the Owens River, near the California Institute of Technology Radio Observatory. The site is moderately grazed and the spring's hydrology is not altered. No exclosure fencing is needed to protect this spring. Uhlmeyer Spring (DWP 012), northeast of Big Pine, has been moderately impacted by recreationists and livestock grazing. This spring area will be fenced to eliminate livestock grazing and reduce recreation use.

<u>Grazing Management</u>

Lease vegetation is mainly in good condition. All irrigated pastures, assessed in 2004, scored greater than 80 percent. No grazing management changes will be made at this time for these pastures. Grazing management changes will be made, however, to comply with the *Conservation Strategy for the Southwestern Willow Flycatcher*. Management efforts to comply with the *Strategy* requirements will utilize traditional animal husbandry techniques. These include herding, day riding, food supplement control and food placement. All upland and riparian vegetation use criteria will be met. If management practices are unsuccessful, fences will be constructed within existing fields to create riparian pastures along the river. Timing of grazing use will be altered as needed.

On November 1, cows can be placed in the Warm Springs Corrals and dispersed to fields east of the river (White Mountain, Poleta, East of River, Warm Springs, and the Ears Fields). Cows can remain in these fields until they return to Long Valley, or when riparian or upland utilization standards are met. If plant utilization criteria are exceeded in any field, prior to the end of the grazing season, or the May 1 date to be off of the river area arrives before the cows can be shipped to Long Valley, adaptive management will be applied to determine changes that will ensure all standards, irrigation criteria and LADWP goals are met.

Initial management changes include reconstructing, to LADWP standards, the existing fence along the East Collins Road. Lessees will rebuild this fence with LADWP supplied materials and LADWP will install cattle guards needed to make this fence functional. Livestock grazing timing allowed north and south of this fence will alternate over time. On odd years, the north area can be grazed first and gates along the new lease left open. Grazing will end on January 1. After January 1, the herd can graze the area south of East Collins Road fence. On even years, the herd can be moved to the Warm Springs corrals and distributed south of the East Collins Road fence by November 10. Most of the herd will be moved south of the Ears Field.

On dry years, the herd will be moved to Long Valley by May 1. On good precipitation years, to better utilize spring "green up" in upland and alluvial fan areas and allow Long Valley pastures to gain vegetation readiness, the herd can remain on the Lease after May 1. However, all upland, riparian and irrigated pasture criteria will have to be met. To retain the herd on the lease after May 1, the lessee will utilize necessary herding control and feed the necessary supplements needed to reduce grazing in riparian areas. Three additional stock-water facilities will be developed by LADWP to help keep cattle out of riparian areas. These off-river watering sites can help minimize riparian vegetation grazing and maximize use of upland forage while maintaining the integrity of the livestock operations.

Poleta Field
The Poleta Field will continue to be used as a buffer area for drift animals. This field can also be used as a "grass bank". If rangeland evaluations determine grazing management changes are needed in fields east of the river, some cattle will be moved to the East River Field prior to being moved to the south area on January 1. On even years, when cattle can be moved to the north area on January 1, some cattle can be put into the Poleta Field.

Laws Area
The Laws Area will continue to support livestock grazing as long as upland grazing prescriptions are not exceeded before scheduled grazing "off dates". Cows usually arrive on the Laws Area November 1. LADWP will fence the Upper and Lower Symons Pastures. Cows can be placed in the Symons Pastures for 30 to 60 days. Stock-water will be provided until January 1. When cows begin calving, they can be moved to the river area for better protective cover. Calving success in the Symons Fields is not good because severe weather conditions will cause a high death loss. Cows and calves can remain on the river area until spring. On wet years, with good "green up," cattle can utilize the brush areas to the east until time to move to Long Valley. On dry years, cows can go to the Symons fields after these fields are irrigated starting April 1. If problems occur in livestock grazing meeting management prescriptions and LADWP goals, the need for riparian fence control on the east side of the river will be evaluated.

Williams Field
This field can receive heifers November 10 through November 20 after coming off the Winters Pasture. Heifers can remain in the Williams Field until they start calving, which occurs about January 1. During their stay in the Williams Field, heifers will receive 1 to 5 pounds of protein supplement per head per day. After pasture irrigation starts, those heifer fed in the Lake Field, will be rotated back to the Williams Field.

McCloud Field
This field will be permanently rested from all livestock grazing until sufficient stock-water is available.

Seeps, Springs, Watering and Fencing
Existing fences, exclosing Warm Springs, will be repaired and brought up to LADWP standards. Spring DWP-23 will not be fenced at this time. Uhlmeyer Spring (DWP 012), northeast of Big Pine, has been moderately impacted by recreation use and livestock grazing. This spring area will be fenced by LADWP and all livestock grazing excluded.

Springs, irrigation water, and the Owens River supply adequate stock-water to most pastures. A new solar-powered stock-water well, with holding tank and troughs, will be located along the fence line between the Upper and Lower Symons E/M Project Pastures to provide additional stock-water. Existing livestock management fences are all in good condition. All old fences in the Poleta Field, not been maintained or used for livestock management purposes, will be removed.

3.4.12 COLOSEUM LIVESTOCK GRAZING LEASE (RLI-407)

This lease (2,645 acres) is held and managed by Rod Ayers and consists of the Sawmill Creek and Mt. Whitney Portal Parcels. LADWP lands immediately north of the

Sawmill Creek Parcel (Power House Area) will be added to the Lease.

In the past, cows and calves grazed the Sawmill Creek Parcel, and mules and/or horses grazed the Mt. Whitney Portal Parcel. The Sawmill Creek Parcel is bisected by U.S. Highway 395 and bordered by the Coloseum Road to the east and the LADWP property to the west. The Mt. Whitney Portal Parcel is north of the Alabama Hills housing development. The lessee uses the Inyo National Forest Service Wacouba Grazing Allotment for summer range. During drought years, or during dry cycles, pack stock have been fed additional hay to compensate for the reduced forage production on the lease. The Owens Valley checkerbloom (*Sidalcea covillei*), a state-listed endangered plant species, occurs on the lease.

Riparian/wetland vegetation is associated with springs and borders Lone Pine Creek in the Mt. Whitney Portal Parcel. In the Sawmill Creek Parcel, only a small riparian /wetland vegetation area (less than 0.1 acre) occurs along Sawmill Creek. Sawmill Creek water is delivered to the East Pasture via a pipeline for stock-water. Division and Black Canyon Creeks flow intermittently through the West Pasture of the Sawmill Creek Parcel and riparian/wetland vegetation is essentially absent along both creeks. Black Canyon Creek flows only during and immediately after snowmelt, and supports no riparian vegetation in the West Pasture. Two springs occur on the Mt. Whitney Portal Parcel.

<u>Grazing Management</u>

The East Pasture, in the Sawmill Creek Parcel, will be fenced to form two separate pastures. Each pasture will have equal forage production. The new fence (1,500-feet) will divide the pasture into the Southeast and Northeast Pastures. These pastures will be grazed using a "Best Pasture Rotation". The Southeast Pasture will be grazed first on even years (e.g., 2008) and the Northeast Pasture will be grazed first on odd years.

The Sawmill Creek Parcel can be grazed September 1 through January 1, if plant utilization criteria are met. The West Pasture can also be grazed for a short period during "green up," but no summer grazing will occur anywhere on the parcel when plants are maturing and producing seed.

On even years cows with calves and also mules can graze the Southeast Pasture September 1 to November 15. Stock will then be rotated to the Northeast Pasture and graze until herbaceous vegetation utilization standards have been met or the grazing period ends on February 1, whichever occurs first. Stock can return to graze the Southeast Pasture, if needed, as long as the 65 percent plant utilization criterion is not exceeded. The order of pastures grazed will be reversed the following year and the same grazing prescriptions applied.

Within the Mt. Whitney Portal Parcel, only the Movie Field will be grazed. This field can be grazed November 1 through March 1. This field will not be grazed after March 1 to protect rare plants. The lessee, in the past, did not graze livestock in this parcel every year. The duration of grazing allowed in this plan may have to be reduced if, in the future, livestock begin grazing the field every year.

The past long periods of complete rest from grazing in the Movie Field have been compatible with upland and riparian habitat needs. In the future, the parcel can be used to hold weaner calves and heifers October 1 to December 1. Heifers may remain in the parcel after December 1, and graze until March 1, as long as vegetation condition trend does not decline.

Meadows surrounding all springs and seeps are in good condition[7]. However, two spring-seep areas in the Movie Field will still be fenced and grazing eliminated from the fenced exclosures. The amount of forage lost due to these non-grazed exclosures is so small no reductions in stock numbers or grazing duration will be required. A toxic plant in the pea family (*Astragalus sp.*) grows in the

[7] Ecosystem Sciences. 2000-B. California Yellow-billed Cuckoo Habitat Evaluation and Enhancement Plans for Hogback and Baker Creeks. June 2000. Technical Memo #21. Lower Owens River Project. DWP Northern Regional Office, Bishop, CA.

Whitney Portal Parcel. This plant can be lethal to mules and horses during certain periods. The lessee will need to monitor this situation.

Lone Pine Creek contains trout habitat and has not been impacted by past grazing practices. This stream should not be affected under the new grazing prescriptions. A range evaluation each December by LADWP will evaluate Lone Pine Creek conditions and its associated riparian vegetation to make sure the new grazing strategy is compatible and is being managed properly.

The East Pasture of the Sawmill Creek Parcel has abundant stock-water. The north portion of the East Pasture receives stock-water year-round from the Sawmill Creek pipeline. A pipe outlet near the Aqueduct also provides a stock-water area. Two LADWP wells (#103 and #104) also provide stock-water in the East Pasture when wells are in operation. The West Pasture is poorly watered. Additional stock-water facilities will be constructed in the West Pasture using the existing Thibaut Creek pipeline for the water source.

The Mt. Whitney Portal Parcel has numerous springs and seeps along with Lone Pine Creek that provides sufficient stock-water during the grazing period. No additional stock-water sources will be considered at this time.

The fence separating the Coloseum Lease (West Pasture) from the Eight Mile Lease is in good condition. The west side of the West Pasture will remain unfenced along the LADWP-BLM boundary. The present drift fence in the southern corner of the West pasture will be improved. Three miles of old unused fence on the west side of Coloseum Road will be removed and the area cleaned up. All fences along U.S. Highway 395 and the Coloseum Road are in good shape. Four gates along the fence between the Coloseum and Blackrock Leases will be replaced by cattle guards to eliminate past problems resulting from these gates being left open. Two permanent vegetation monitoring sites and a micrometeorological site are located in the East Pasture. Fences around these sites are in poor condition. LADWP will replace these fences (0.4 mile).

In the Mt. Whitney Parcel a small section of interior fence, now lying on the ground, will be disposed of. In addition, old irrigation pipe, wire, and other garbage items around the spring-seep areas will be cleaned up. Two new fences will be constructed to protect two springs.

The Movie Field is fenced on two sides. The lower northeast side has a deep brushy draw (Lone Pine Creek) running through the field from northwest to southeast. This brushy draw is a barrier to all stock movement, as mules have not been known to cross the stream or the draw. Mules have not been known to ever get on the Whitney Portal Road, even though there is no fence. The south side of the Movie Field is not fenced because the existing north-to-south fence section intersects a large impassable rocky hill that blocks any livestock movements to the south and east; thus, the parcel functions as if it was completely fenced.

3.4.13 EIGHT MILE LIVESTOCK GRAZING LEASE (RLI -408)

This 770 acre lease lies west of U.S. Highway 395, south of Aberdeen and borders the Coloseum Lease. The lease is held and managed by John Ketcham and Mr. and Mrs. Lee Roeser. Alfalfa fields are winter grazed to support a livestock pack business. The lease contains 103 acres of irrigated alfalfa, 4 acres of irrigated pasture, 44 acres of meadow, 602 acres of arid shrubland, and 17 acres of nonproductive land. The lessees recently added 4 additional acres of irrigated alfalfa in the Yearling Field. Thirty six acres in the Laws Museum Enhancement/Mitigation Project are also part of the lease.

The lease includes an irrigated Alfalfa Field, a small partially irrigated field (Tree Lot), and two small fields (Yearling and Feed Lot). Five large fields (Upper North, Lower North, West, South, and Willow Fields) are not irrigated. A corral and a stock yard complete the lease. No natural riparian vegetation, wetlands, springs or seeps are present. No species of concern are known to occur. Stock-water is adequate and all fences are in good condition.

The Alfalfa Field (103 acres) is sprinkle-irrigated, from Sawmill Creek. During part of the early water runoff period, stream flows are not diverted for alfalfa irrigation because high sediment loads risk blocking pipe and sprinkler systems. In 1985, the lessees shifted from irrigating the South Pasture to irrigating alfalfa in the Alfalfa Field.

The dry grazing cover type is composed of saltgrass/sacaton meadow (44 acres), rabbit/Nevada saltbush/saltgrass (183 acres), semi-desert shrublands/grass (419 acres), and urban and industrial areas (16 acres). The South Field provides the bulk of the dryland saltgrass/sacaton meadow type. This field produces more forage in wet years, when tail-water is received from Black Canyon Creek. The West and North Fields are mostly arid shrub and only produce desirable livestock forage during spring "green up" periods.

Sawmill Creek, flowing into the north end of the lease, is diverted into a pipeline and used for irrigation. The South Field is periodically irrigated with Black Canyon flows. Designated Type E vegetation lands comprise 107 acres.

Grazing Management

Stock can graze the irrigated Laws E/M parcel at the lessee's discretion, as long as pasture scores do not go below 80 percent. The Upper North, Lower North, and West Fields will be grazed only on those years spring "green up" occurs and vegetation conditions are good.

The Tree Lot Field can be grazed January 5 to April 15. The Yearling Field can be used to graze stock in the summer, as long as the field is irrigated. January 5 to May 1, mares and colts can be fed in the Yearling Field. Horses and mules can graze the Willow Field in the spring and again in the fall for a short period. October 1 to June 1, stock can be fed in the Feed Lot Field. The Alfalfa Field can be grazed during the winter at the discretion of the lessee. Stock will be fed needed supplements to keep uplands in healthy condition and meet plant utilization standards. Typically, horses and mules graze both dry and irrigated lands. During drought years, the same number of animals can be grazed, but additional hay must be fed to compensate for the reduction in available forage.

The Alfalfa and Yearling Fields will be irrigated to maintain 107 acres of designated Type E vegetation land. After the final yearly harvest of alfalfa, these fields can be grazed at the discretion of the lessee. Heavy grazing has damaged vegetation in the South field. As a result this field is losing topsoil because needed plant cover to control wind and rain erosion is lacking. This field was rested for 15 months and lightly stocked for grazing in October 2002. When rangeland conditions warrant, a "deferred two-pasture rotation grazing strategy" will be applied. A new east/west fence will be constructed to split the South field into the Upper and Lower South Fields.

Livestock can enter the Upper South Field early on even years and the Lower South Field will be grazed last. On odd years, field selection for early and late grazing will be reversed. Grazing can occur December 1 to May 1. December 1 to April 1, the lessees will feed the stock at least 16 pounds of hay per head per day, and April 1 to May 1 at least 20 pounds of hay per head per day.

Laws E/M Use Permit Parcel

Irrigation of the Laws Pastures has not been fully implemented because of difficulties with water conveyance. A new sprinkler irrigation system will be installed. Irrigation will begin on April 1 of each year. All 35 acres of this parcel will receive full irrigation. These pastures will be evaluated when ready and future animal numbers, timing, and duration of grazing will be refined.

Stock can be brought into the Laws Pastures in mid- April and remain until the first part of July. Stock can return on September 15 and remain until November 15, as long as pasture condition scoring does not drop below 80 percent. Animal numbers presently grazing the lease will not be increased. The Laws Pastures will provide additional non-grazing periods for other pastures/fields on the lease.

<u>*Upper North, Lower North, and West Fields*</u>
These fields produce little livestock forage and will only be grazed on those years spring "green up" occurs and vegetation conditions are good. Stock will graze during these "green up" periods using the "Best Pasture Rotation".

3.4.14 FORT INDEPENDENCE RANCH LIVESTOCK GRAZING LEASE (RLI-406, RLI-489)

The Ft. Independence Lease (3,849 acres) covered by RLI-406 is leased to Keith and Eleanor Bright, Donald Bright, and Scott Kemp. The 1,526 acres covered by RLI-489 is leased to Scott Kemp and W. F. Marshall. Both areas are managed by Scott Kemp in conjunction with the Islands (north of Lone Pine); Delta (south of Lone Pine); Georges Creek (northwest of Lone Pine); Archie Adjunct (south of Owens Lake); and Lubkin Adjunct (south of Lone Pine) Leases. The lease supports a commercial cow/calf operation that grazes calves from the lessees other operations in the Owens Valley. Three hundred twenty nine acres of irrigated pasture (all Type E designated vegetation land) occur on the lease. No riparian, wetlands, seeps, springs, or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Future livestock grazing management will be conducted much the same as present grazing management. All irrigated pastures scored greater than 80 percent condition in 2004; therefore, no grazing management changes will be made at this time. The Ft. Independence Unit can be used to graze heifers October 1 to October 10. The Clarence Clover Field and the L&L, and Oasis Pastures can be grazed by steer calves. Calves will be rotated through these pastures, using the "Best Pasture Rotation", and graze 45 to 50 days.

October 1 to October 10, the Garden, Desert, Plot, and Zucco Pastures can be grazed by heifer calves. These calves will be rotated through the remaining pastures using the "Best Pasture Rotation" and graze 45 to 50 days. Part of the calves are then usually shipped to market. Remaining heifers will be shipped to the Lubkin Ranch. These heifers can return to the Heifer Haven Pasture the following January as bred heifers. Older bred heifers calving in the Heifer Haven pasture can be moved into the Orchard and Pampas Pastures. April 1 through April 15, cow/calf pairs can be moved to the L&L, Willow, Clover, and Cane pastures. During the remainder of the grazing period, cow/calf pairs can be moved through all pastures using the "Best Pasture Rotation."

In November, all cows are pregnancy checked. Those cows over 10 years and determined pregnant will be shipped to the Ft. Independence Lease. If feed is available, these cows can be held on the lease and sold in April with calves. If feed is not available, these cows will be sold as soon as possible. The Orchard and Pampas Pastures are in native grass. These pastures, therefore, need to be grazed early and often or the forage gets rough and unpalatable in some areas causing animal distribution problems. These pastures will be rested fall and winter months. The lessee can keep horses in the Horse Haven and Hectare Pastures year-round if vegetation conditions warrant. The Oasis and Pampas Pastures can receive new bulls in the fall before they are shipped to other bull bands. Irrigation supplies stock-water to all pastures; therefore, no new stock-water facilities are necessary at this time. All livestock management fences are in good condition.

3.4.15 GEORGES CREEK PARCEL LIVESTOCK GRAZING LEASE (RLI-489)

This parcel (4,025 acres) is held and managed by Scott Kemp in conjunction with his Islands and Delta Leases. Cattle graze the parcel annually in conjunction with surrounding BLM land. The parcel borders BLM land to the west, U.S. Highway 395 to the east, the Moffat Ranch to the south, and the Shepherd Creek Alfalfa Fields to the north.

Designated irrigated land comprises 287 acres. Georges Pastures #1 and #2 are irrigated and their perimeters are fenced. Water is diverted from Georges Creek to irrigate Georges Pastures #1 and #2. When Georges Creek flows decrease to between 0.5 to 1 cfs, LADWP Well #343 is turned on to supplement irrigation and maintain flows for fish in the creek.

The North Pasture, north and west of Manzanar, is not fenced separate from adjacent BLM lands. The only portion of the parcel presently fenced is around the irrigated pasture in the center and western edge of the parcel. A small corral near Georges Creek along the west boundary is used to "work" cattle.

Riparian vegetation borders Bairs Creek on the North Pasture and Georges Creek on the Georges and South Pastures. Riparian trees and shrubs are prevalent along a narrow corridor (50 feet wide) bordering Bairs Creek on the upper third of the North Pasture and on a wider corridor (up to 250 feet wide) in the lower two-thirds of the pasture. Designated Type E vegetation land comprises 287 acres on the parcel.

The willow canopy bordering Georges Creek is dominated by older-age willow, with some younger-age willow in the under-story. Year-round grazing has reduced herbaceous vegetation. Damaged stream banks are common with annual accelerated sediment recruited into the stream. Riparian tree and shrub canopies help control stream temperatures and supplies some cover for wildlife.
The Owens Valley checkerbloom (*Sidalcea covillei*), a State-listed endangered plant, occurs on the parcel. Four rare plant areas (225 acres) occur on the Georges and South Pastures and are monitored by LADWP.

Grazing Management

The parcel will be managed as five separate pastures. A permanent riparian exclosure (37 acres) will enclose Georges Creek on the Georges Pasture and also include the stream running through the South Pasture. The exclosure will divide the existing Georges Pasture #1 into two pastures (Georges Pasture #1, north of Georges Creek, and Georges Pasture #3, south of Georges Creek). An Arizona stream crossing will be constructed by LADWP to provide stock-water and a route for moving cattle between the three Georges pastures. The South and North Pastures can be grazed during spring "green up" (February 15 to May 1) in conjunction with an adjacent BLM allotment. Grazing management on these pastures will abide by those prescribed in the surrounding BLM allotment management guidelines.

The three Georges Pastures all produce excellent livestock forage because of irrigation. Cows with calves can graze these pastures May 1 through February 15. Cattle will be held in one pasture until they are ready to go to one of the other Georges Pastures. Cattle numbers can be distributed among the three pastures at the lessees' discretion. These pastures will be managed under the irrigated pasture guidelines; therefore, no utilization standards will be applied as long as the pastures continue meet or exceed 80 percent condition requirements.

Livestock do not leave the Georges Pastures during the grazing period (May 1 to February 15) except for short periods during good precipitation years when surrounding BLM lands acquire good "green up" conditions. The lessee will be able to better control livestock distribution, numbers, and forage use in the three pastures with the new fencing.

The North Pasture will be grazed in conjunction with and under the same guidelines as used on the surrounding BLM grazing allotment. Current BLM guidelines require that no more than 60 percent plant utilization can occur on upland areas and only 20 percent on riparian areas. Cows with calves can graze this pasture February 15 to May 1, depending upon what window period plant "green up" occurs. Loss of available forage because of the new non-grazed exclosure should have no effect on future allowable livestock numbers.

The South Pasture will be grazed (February 15 to May 1) in conjunction with surrounding BLM lands and the lessee will abide by all BLM guidelines outlined in the adjacent BLM Allotment Management Plan. Rare plants should not be impacted because all livestock grazing occurs early during spring plant "green up" periods and all grazing is terminated by May 2. Georges Creek, flowing through the South Pasture, will not be completely fenced off from all livestock use. No livestock grazing in selected years, and the short grazing period on the other years, adequately protects this stream reach. Georges Creek, in the unfenced stream reach, will supply stock-water. Because of the small size of the stream corridor excluded from grazing, there should be no need to reduce livestock numbers.

3.4.16 HOGBACK CREEK PARCEL LIVESTOCK GRAZING LEASE (RLI-429)

This lease is held and managed by the Red's Meadow Pack Station. The lease supports a commercial horse and mule packer operation in the Sierras. The lease is northwest of the Alabama Hills, west of U.S. Highway 395, and south of Manzanar, between the towns of Independence and Lone Pine. The lease lies north of the Moffet Ranch Road and is 1.5 miles long and 0.5 mile wide. Springs arise on the lease and drain toward Hogback Creek. This spring complex is covered with riparian shrub vegetation (111 acres) and mesic saltgrass meadow (50 acres). Scattered trees and a couple small areas of wet meadow are also present.

Hogback Creek and a major spring complex flow through the lease. Riparian/wetland habitat (280 acres) is associated with Hogback Creek and spring drainages. Spring drainage and associated riparian habitat occupies two main corridors running southwest to northeast, with dry uplands between riparian corridors. The largest contiguous riparian habitat area is 40 acres, and the next is 20 acres. Hogback Creek and surrounding springs were flowing from the lease and reaching the Aqueduct on June 30, 2000.

Most of the lease vegetation burned in 1987 when a controlled fire, intended to improve surrounding rangelands, grew out of control. A 1999 field evaluation found riparian trees and shrubs recovering well from fire effects, largely from root sprouting[8]. Riparian-wetland vegetation is associated with Hogback Creek and spring complex (DWP 6).

Southwestern Yellow-billed Cuckoo has been observed on the lease. This cuckoo is a state-listed endangered species and is a candidate for listing by the U.S. Fish and Wildlife Service. The lease provides enough habitat to support a maximum of two pairs of cuckoo[9]. Within the cuckoo area, two main riparian corridors are separated by an upland-habitat opening 400 to 1,000 feet in width. The largest individual riparian area has a maximum width of 1,400 feet. 70 percent of the riparian area is 500 feet or less in width[10]. Riparian areas are dominated by willow and a few cottonwood trees. The Owens Valley checkerbloom occurs on the lease. Three rare plant areas (12 acres) are identified.

<u>Grazing Management</u>

This grazing plan was developed based on the evaluation of the condition of designated cuckoo habitats outlined in Technical Memorandum #21[11]. This grazing plan fulfills part of the requirement stipulated in the MOU by identifying reasonable and feasible actions (new grazing management strategies) to maintain and improve cuckoo habitat.

In normal and above normal precipitation years, mules and horses can graze December 1 through March 31. During below normal precipitation years, animal numbers, grazing

[8] (Ecosystem Sciences, no date)

[9] Ecosystem Sciences. 2000. Owens Gorge Permanent Flow Recommendations (Owens River Gorge Rewatering Project). Prepared for the Las Angeles Department of Water and Power.

[10] Laymon, S. A. and P. L. Williams. 1999. Yellow-billed Cuckoo in the Owens Valley. In: Tech Memo #21, Appendix 1. Ecosystem Sciences, Boise, ID.

[11] Ecosystem Sciences. 2000-B. California Yellow-billed Cuckoo Habitat Evaluation and Enhancement Plans for Hogback and Baker Creeks. June 2000. Technical Memo #21. Lower Owens River Project. DWP Northern Regional Office, Bishop, CA.

duration, and timing of grazing will be altered, if needed to maintain good rangeland health. Reduced livestock numbers, vegetation use criteria, controlled duration and timing of grazing, along with the elimination of trespass cattle grazing, will protect cuckoo and rare plant habitats. Grazing effects will be evaluated annually to determine if further changes in grazing management will be necessary to protect rare animals and plants. The time and duration of grazing (mainly winter grazing) will maintain and improve cuckoo habitat. Laymon and Williams[12] (1999) recommended that spring and summer grazing be reduced or eliminated on the lease; this grazing plan meets their recommendation.

Tree high-lining by livestock is a concern for cuckoo habitat needs, since cuckoos require a well-developed understory for nesting[13]. Observations in 1993 and 1999 by Laymon and Williams[14] found the lease did not appear to be overgrazed. High-lining of trees did not seem to be a problem. The opportunity for livestock to high-line trees and shrubs is minimal during spring and summer periods.

Rare plants occur in riparian/wetland habitats associated with the spring-seep complex. Implementation of this Plan will protect all springs and seeps. Stock-water is sufficient throughout the lease. No additional watering sites will be developed. Winter grazing (December through March) should result in no adverse impacts on rare plant populations. Livestock grazing will not occur during active plant growth and plant reproduction periods. Elimination of all trespass cattle grazing will provide additional reduction in vegetation use and trampling.

[12] Laymon, S. A. and P. L. Williams. 1999. Yellow-billed Cuckoo in the Owens Valley. In: Tech Memo #21, Appendix 1. Ecosystem Sciences, Boise, ID.
[13] Ecosystem Sciences. 2000-B. California Yellow-billed Cuckoo Habitat Evaluation and Enhancement Plans for Hogback and Baker Creeks. June 2000. Technical Memo #21. Lower Owens River Project. DWP Northern Regional Office, Bishop, CA.
[14] Laymon, S. A. and P. L. Williams. 1999. Yellow-billed Cuckoo in the Owens Valley. In: Tech Memo #21, Appendix 1. Ecosystem Sciences, Boise, ID.

3.4.17 HOMEPLACE ADJUNCT LIVESTOCK GRAZING LEASE (RLI-428)

This lease (587 acres) is a small part of the 33,285-acre Blackrock Lease. Mark Lacey holds and operates both leases. Historically, the Homeplace Lease was used as a holding area for cattle herds going to and coming from Forest Service lands in the southern Sierras. Historically, the lease was nearly vacant most of the summer and fall when the lessee's livestock were grazing Forest Service allotments. Presently, however, cattle must either remain on the Homeplace Lease year-round or go to some other grazing property, because the lessee sold the Forest Service permits.

The lease contains 207 acres of irrigated Type E designated vegetation land. A wetland vegetation complex, including a tule marsh, comprises 45 acres of the Poverty Pasture. A series of five small "vent" springs occur in the northwest part of this pasture; four of these vents are on BLM land. The Owens Valley checkerbloom occurs on the lease. Special status wildlife species may be present. Improvements in livestock management are expected to enhance habitats for these species if they exist. One-third of the lease (199 acres), east of U.S. Highway 395, is presently in irrigated grass pasture. Olancha Creek and LADWP Well #404 provide pasture irrigation and stock-water.

<u>Grazing Management</u>

Heifers can graze the lease during the summer. Cows, calves and bulls can graze during the winter and weaner calves in the fall. All pastures and fields will continue to be grazed rotationally (using the "Best Pasture Rotation") depending upon which pasture has the best forage condition. Brood mares will not be allowed in the Woven Wire pasture from March 15 to October 1 to protect rare plants. Selected pastures will not be grazed during the summer to allow development of forage needed to sustain the coming fall and winter grazing. If summer forage develops satisfactorily, incoming livestock, under controlled designated numbers, can graze the pastures through the winter, as long as all grazing standards are abided by.

As long as irrigated pasture and field ratings are 80 percent or greater, the following grazing guidelines will apply: Heifers can graze May 1 to October 1 and cows with calves can graze October 1 to June 30. Bulls can graze December 1 through April 30 if forage is available and pasture condition warrants. Weaner calves can graze October 1 to December 31, if forage is adequate. If forage is sufficient, broodmares can continue to graze the lease year-round except on special status plant areas. Brood mares will graze only the "L," East Stud, Store, and Hayfield Pastures.

Very little natural riparian habitat occurs within the lease. Olancha Creek has lost its riparian habitat prior to reaching U.S. Highway 395 and produces little natural riparian habitat within the lease. The Olancha Creek channel does not continue on the east side of Highway 395, where most of the irrigated forage is harvested. Most of the grazing pressure allowed will occur on irrigated pastures. Dry uplands will receive much less grazing pressure.

Pastures can continue to be flood irrigated April 1 to October 1 to increase forage production. Allowable pasture irrigation and stock-water can continue to be diverted from Olancha Creek. When Olancha Creek flows cannot meet irrigation and/or stock-water needs, the lessees have the option of supplementing with well water. Gus Walker Ditch recently washed out and no longer delivers water to the lease; therefore, well water will likely be used more than in the past.

One vent spring occurs on LADWP land in the Poverty Pasture. Four additional vent springs occur on BLM land in this same pasture. No spring area is being impacted by livestock grazing and no spring will be fenced. The other wet areas, and standing surface waters occurring because of high artificial water tables, will receive needed protection under irrigated pasture criteria and guidelines.

3.4.18 HORSESHOE BAR RANCH LIVESTOCK GRAZING LEASE (RLI-462)

This lease (336 acres) consists of two separate parcels: the 141-acre Sewer Parcel east of Bishop; and the 195-acre Dairy Parcel west of Bishop. The lease is held by Jim and Lee Tatum and managed by Jim Tatum as a cow/calf operation. Seventy seven acres (all designated Type E vegetation land) of irrigated pasture occur on the lease. These irrigated lands occur on the West and Front Pastures on the Dairy Parcel, and on the East and West Sewer Pastures on the Sewer Parcel. No riparian habitat, wetland areas, seeps, springs, or any special status wildlife species occur on the lease.

Grazing Management

Livestock management fences are all in good condition. Stock-water is supplied via irrigation ditches to all irrigated pastures. No new livestock watering facilities will be developed at this time.

The primary use of the Sewer Farm Parcel is to receive treated waste-water from the Eastern Sierra Community Service District and the City of Bishop waste-water treatment facilities. The area is subleased to and managed by Cathy Caballero and Roy Boothe. They graze cow/calf pairs on the parcel from mid April to mid November. The lessees are presently involved in large-scale management effort to improve irrigated pastures. This includes eradicating weeds, improving ditches, and mowing vegetation when needed. All irrigated pastures in the Sewer Farm Parcel scored greater than 80 percent; therefore, little change is necessary from presently used grazing management methods.

The Dairy Parcel is similar to the Sewer Farm Parcel in that cow/calf pairs are brought to the parcel in mid April and remain until mid November. Internal gates within the parcel are left open during most of the grazing period so cattle can distribute themselves throughout the parcel. The only exception is during

Memorial Day weekend. A large portion of the lease is used as a vehicle parking area for the Mule Days holiday. During Mule Days, the gates between School and Middle Fields are closed. Cows are kept during Mule Days in the West and School Pastures, and the Middle Field is used as an RV parking area. All irrigated pastures scored greater than 80 percent condition. Therefore, no management changes will be implemented.

3.4.19 HORESESHOE LIVESTOCK GRAZING LEASE (RLI 480)

This lease (3,000 acres) is held and managed by Roy Hunter. The lease is comprised of the Lake and Cottonwood Parcels. The Cottonwood Parcel, on the Kern Plateau at 10,000 feet elevation, is grazed under USDA Forest Service grazing prescriptions. The lower elevation Lake Parcel, bordering the south and eastern side of the Owens Lake bed, will be grazed under LADWP prescriptions.

Fifteen years of severe drought has reduced plant vigor, vegetation productivity, and the ability of the Cottonwood Parcel meadows to produce forage. Streams flowing through this parcel are badly degraded from past livestock grazing. The parcel is surrounded by the Golden Trout Wilderness and borders a trailhead to the John Muir Wilderness.

<u>Lake Parcel</u>

The Lake Parcel (1,953 acres) includes a portion of what was once the Owens lakebed and later the shoreline of “old” Owens Lake. The parcel lies west and east of U.S. Highway 395, about 24 miles south of Lone Pine near lower Cottonwood Creek. Most of the parcel lies west of U.S. Highway 395 in the West Field, while most of the livestock forage lies east of U.S. Highway 395, in the East Field. Only very dry vegetation types (i.e., creosote bush) survive on the west side. The eastern part of the Lease lies along a remnant wind wave-formed shoreline of “old” Owens Lake. Most of the livestock forage occurs along a north-south running fault that forces underground water to the surface along an old lakeshore contour. Springs emerge from the fault forming open water ponds, marshes, and wet and dry meadows. The springs all drain eastward and flows sink into the "old" lakebed. Charcoal Kiln Pond, near the border of the parcel, contains 5 acres of standing water. This spring/pond and the adjacent surrounding area have high potential for the production of fish and wildlife. Remnants of old charcoal production kilns within the parcel may have significant historic value. An old railroad bed, with tracks and ties removed, runs south to north through the parcel.

<u>Cottonwood Parcel</u>

This parcel lies in rolling high elevation hills with topography heavily modified by snow and ice during past glacial periods. These rolling hills enclose grassy, high elevation meadows. A Forest Service trailhead and campground borders the parcel on the north and serves as a "jump-off" point for recreationists to the Golden Trout Wilderness. LADWP lands (1,092 acres) abut the south end of the trailhead parking and camping area. LADWP lands are scattered in separate sub-parcels surrounded by Forest Service lands. Three sub-parcels lie in and around Horseshoe Meadows—two parcels are in or around Round Valley Meadows, and the last and largest sub-parcel is in Last Chance Meadow, with Cottonwood Creek flowing through it. The Last Chance Meadow area is classified as a "Research Natural Area." The Golden Trout Wilderness, created under the Endangered American Wilderness Act, surrounds LADWP lands. LADWP meadows being grazed are about 10,000 feet in elevation.

Seven of the eight years between 1987 and 1995 were much drier than normal on the Kern Plateau. The drought caused losses in plant vigor and vegetation production reducing the ability of wet meadows to produce forage. As a result, the watershed’s ability to recover from past grazing impacts was lessened. Increasing plant indicators showed increased watershed instability during the period[15]. Because of the

[15] United States Department of Agriculture (USDA) Forest Service. 1995. Allotment Management Plan. Inyo

inability of these glacial land-types to rehabilitate, many landforms (i.e., stream banks and channels) will never recover from the past damage caused by improper livestock grazing.

Horseshoe and Round Valley Creeks flow through LADWP lands and merge downstream with Cottonwood Creek. Past livestock grazing widened both streams, and their channels and stream banks are badly damaged. Detrimental effects of past heavy sheep grazing, especially on meadows and near old bedding areas, are still evident[16].

The California golden trout (*Oncorhynchus mykiss aguabonita*) occupies streams in the Cottonwood Parcel, and is native to the Kern Plateau and the Golden Trout Wilderness. Continued conservation of golden trout habitat within and around the Golden Trout Wilderness Area is a major concern for the public[17]; therefore, LADWP lands and streams within the parcel could become an area of concern for protecting this trout. The mountain yellow-legged frog (*Rana muscosa*), a state listed threatened species, also occurs on the lease.

Because of past heavy livestock grazing impacts[18], Cottonwood Creek and especially Round Valley Creek have been badly damaged. These streams have been damaged to the extent that their once productive deep "E" type channels[19] are now modified to present shallow and over-widened and less productive "C" channels that have head cuts. Meadow fringes (uplands) are very dry and composed mainly of dry soils, which produce very little forage for livestock. The overhead conifer forest is underlined mainly by bare soils. Meadows are dry to boggy, especially boggy in the spring immediately after snow melt. Riparian vegetation, bordering the streams, is green and succulent during spring, summer, and fall. Most meadow areas are under-laid by four to six feet of organic peat. These meadows were previously lakes, ponds, or marshes.

No springs or major seeps are known to occur in the Cottonwood Parcel. Seventy eight acres of irrigated pasture occur on the Horseshoe Lease.

Grazing Management

Future grazing management in the Lake and Cottonwood Parcels will be quite similar to past grazing management practices. Future animal numbers allotted and potential AUM's of forage harvested can remain about the same as present.

Cottonwood Parcel

This parcel will be grazed under Forest Service standards and guides outlined in the Mulkey Grazing Allotment Management Plan[20] under Grazing Permit #21407. Authorized grazing on the Mulkey Grazing Allotment is July 1 (depending upon range readiness) to September 30[21]. The lessee will be responsible for the timely relocation of livestock or complete removal of livestock to avoid exceeding permitted grazing standards. This includes the lessee assuring that range readiness and forage allowable use standards are not exceeded[22].

The lessee will also comply with the Inyo National Forest Land and Resource Management Plan (LRMP). Standards, guidelines, permit terms, and conditions in the

National Forest, Bishop, CA.

16 Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

17 Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

California Trout. 2000. The Golden Trout Wilderness: An angler's view of grazing from the ground up. Unpublished Report, Camp Nelson, CA.

18 Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

19 Rosgen, Dave. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs CO.

20 USDA Forest Service. 1996. Term grazing permit Mulkey Allotment, Inyo National Forest. Bishop, CA.

21 USDA Forest Service. 2002. Mulkey Allotment annual operating instructions. Inyo National Forest. Bishop, CA.

22 USDA Forest Service. 2002. Mulkey Allotment annual operating instructions. Inyo National Forest. Bishop, CA.

LRMP, and the USFS Annual Operating Instructions will govern all grazing use. On the Mulkey Allotment, which includes the LADWP Cottonwood Parcel, the allowable amount of stream bank disturbance is 20 percent. The lessee has the responsibility to recognize when stream bank disturbance is reaching allowable levels and must move livestock, as needed, to avoid stream bank stability problems. Key plant species can be grazed up to 35 percent utilization during the early part of the grazing season and 25 percent during the late part of the grazing season. Annual allowable use on annual willow growth will not exceed that identified in Appendix A-16 of the LRMP, Amendment #6.

Because large amounts of bed load sediment is being delivered to and transported through streams flowing through the lease[23], upland vegetation utilization will be monitored very closely. Early spring forage utilization can cause bank shearing, and late fall grazing can decrease vegetation needed for future stream bank and channel maintenance protection. Proper forage utilization levels become very important toward the end of the plant growing season in this hydrologic regime (Kern Plateau). Proper utilization levels ensure sufficient bank protection and upland and meadow sediment retention during higher flows in the coming spring[24]. Upland Management Grazing guidelines, as outlined in the Forest Service AMP, will be abided by.

The stream in Round Valley Meadow is badly head-cut. The stream contains little of its original (natural) channel and stream bank condition. This is critical as degradation of these streams to a nonfunctional condition is inevitable if these head-cuts are not stabilized[25]. The water table under the meadow, especially in the lower half, has been lowered by this head-cut. Large amounts of time and money were expended to try and correct this over-grazing problem but with no success.

<u>Lake Parcel</u>

This parcel can be grazed with calves for 15 days in June, or until upland and riparian herbaceous forage utilization criteria have been met, whichever occurs first. This same herd can again graze the parcel starting October 1 and graze until December 25, or until 50 percent of the herbaceous upland forage is utilized, or until 40 percent of the riparian herbaceous forage is utilized, whichever occurs first. Calves will be removed from the lease by October 15 and the cows can remain to graze. This parcel will not be grazed by livestock December 26 through June 1 and July 1 through September 31. Spring, pond, marsh, and seep margins are so boggy that their bordering areas receive only light grazing. Therefore, application of the above grazing guidelines will protect these areas. Additional stock-water will be developed near the Polymer Plant, located on the west side of U.S. Highway 395.

3.4.20 INDEPENDENCE LIVESTOCK GRAZING LEASE (RLI-416, RLI-454, AND RLI-455)

This lease (4,968 acres) consists of the Bishop, Springfields and Shepherds Creek Parcels. The Bishop Parcel (300 acres) consists of 8 irrigated alfalfa pastures, located south and southwest of Bishop. The Springfields Parcel (4,724 acres) consists of 13 pastures, east of U.S. Highway 395 and west of the Los Angeles Aqueduct near the town of Independence. The Shepherds Creek Parcel (244 acres) is an alfalfa field and hay yard west of U.S. Highway 395 and north of the Manzanar National Monument. Zachary Smith leases and manages the Shepherds Creek Parcel, and John and Tansy Smith lease and manage the Springfields Parcel. Proposed reconstruction of U.S. Highway 395 will require additional right-of-ways along the west side of Manzanar and the Manzanar Airport

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[23] Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

[24] United States Department of Agriculture (USDA) Forest Service. 1995. Allotment Management Plan. Inyo National Forest, Bishop, CA.

[25] Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

Fields. If this highway reconstruction takes place, this grazing plan will be revised.

The Springfields Parcel contains part of the Independence pastureland's E/M project. This project revegetates abandoned agricultural lands. A second E/M project consists of the irrigated alfalfa field in the Shepherds Creek Parcel. This project eliminates blowing dust from abandoned agricultural land. Livestock are excluded from four revegetation sites in the Springfields Parcel. Five hundred eighty nine acres of Type E designated vegetation land occurs in the Springfields Parcel and 157 acres in the Shepherds Creek Parcel. Additional fields classified as Type E designated vegetation land include the Airport, North 40, Arena, Right Hand, and Left Hand Fields.

Shepherds Creek flows through the Shepherds Creek and Manzanar Fields. Independence Creek flows into a series of fields, just west and north of the town of Independence, but sinks within the lease. This stream does not always flow to the Los Angeles Aqueduct.

Three areas within the Springfields Parcel were identified for revegetation to mitigate for past impacts from groundwater pumping or abandoned agriculture. Sites #105, #131, and #123 (totaling 116.4-acres) are in the Manzanar Field. All sites are fenced and excluded from livestock grazing.

Riparian vegetation is associated with Shepherds Creek, a trout stream forming the southern boundary of the Shepherds Creek Parcel. The parcel extends south almost to Bairs Creek and lies between the Los Angeles Aqueduct and U.S. Highway 395. A minimum stream flow (12 cfs) is maintained in lower Shepherds Creek by LADWP to provide fisheries benefits. This minimum flow occurs as long as natural flows would equal or exceed this flow. No wetlands, seeps, springs, or any known threatened or endangered wildlife species occur in the lease.

<u>Grazing Management</u>

Portions of the lease have been owned or leased by the Smith family since 1910. The lessees have maintained good wildlife habitat. The Smiths are excellent cattle managers and put special effort into being good stewards of the land. The Smiths developed their own cropland and livestock grazing management plan that included new innovations in rangeland management. Because this grazing management has been very successful, their management plan, with slight modifications, will be used for the lease plan.

Livestock will be separated into three separate herds and then rotated between 13 pastures in the Springfields parcel. First and second calf cows form one herd and replacement heifers form the second herd. Older cows (third calf and up) form the third herd. Bulls are added to each herd in April and removed in late August. Alfalfa will continue to be grown in the Shepherds Creek and Bishop Parcels. Livestock can graze the alfalfa stubble in these parcels November and December.

The only part of the Shepherds Creek riparian area that will be grazed by livestock is the water gap in the Shepherds Creek Parcel. In the Springfields parcel, a new fence north of Shepherds Creek and east of U.S. Highway 395 will exclude the stream corridor from all livestock grazing. Independence Creek is so modified by ditches and stream diversions that little of the stream is in its natural condition; therefore, no fencing is proposed to protect this stream within the lease at this time.

A new North Field will be created by separating the present Middle Field into two fields. A cross-fence (2,300-feet), constructed west to east, will form the small triangular North Field. Excellent forage grows in the North Field because irrigation tail water enters from the lease to the north. The Middle and North Fields can be grazed using the same prescriptions presently used for the Middle Field. The herd will be split between the two fields.

The four revegetation sites will continue to be fenced and managed for mitigation purposes. Grazing use of the Manzanar Field will be reduced by eliminating grazing May 1 to June 1. No spring grazing will be allowed. This field will be evaluated annually to determine if further grazing reductions are necessary. Bulls will no longer graze the Manzanar Airport Field in May and June.

In the Springfields Parcel, a fence will be constructed north of Shepherds Creek and east of U.S. Highway 395, to protect the stream and its bordering riparian habitat from livestock grazing. If Independence Creek, or its surrounding riparian habitat, is impacted in the future by livestock grazing, this stream will be corridor fenced.

Upland habitats in the Manzanar and Airport Fields will not be grazed during plant development and seeding stages. No vegetation utilization criteria will be applied to upland habitats in the Shepherds Creek Parcel because upland areas are small and the timing of grazing favors upland habitats. The two-month (November 1 to January 1) grazing period will be evaluated for any future upland effects. The small areas around hay yards may become “sacrifice areas” to graze alfalfa stubble.

The Shepherds Creek Parcel has abundant stock-water from the Shepherds Creek water gap. No additional watering facilities are being considered at this time. The Springfields Parcel streams, active wells, and abundant irrigation water provide all stock-water necessary. During non-irrigation periods, Independence and Shepherds Creeks supply stock-water to selected fields. Four LADWP wells deliver stock-water to those fields not receiving irrigation water or stock-water from Independence and Shepherds Creeks. No additional stock-water facilities are being considered for these fields at this time.

The west and east fences bordering U.S. Highway 395 are in good condition and are maintained by the California Department of Transportation. The Shepherds Creek Field is completely fenced and all fences are in good condition.

A north fence separates the Independence lease from the Fort Independence lease along the Arena, Airport, Right, Left Hand, and North 40 Fields. The Independence lessees will maintain this fence. A fence separates the Independence lease from the Fort Independence Lease along the Middle and North Fields. Inyo County is responsible for maintaining the fence, all gates, and all cattle guards around the sanitary landfill. LADWP will be responsible for maintaining all fences around the revegetation sites. A 3,500 foot fence will be constructed along the southern part of the Manzanar Field to protect Shepherds Creek as it crosses the parcel from west to east.

3.4.21 INTAKE LIVESTOCK GRAZING LEASE (RLI-475)

Murton Stewart Jr., Jean Stewart, Murton Stewart III, Steven Stewart, and Lachlan Stewart hold and manages the Intake Lease in conjunction with the lessees other LADWP lease in the Big Pine area. The lessee grazes horses and mules for a commercial packer operation. The lease (284 acres) is made up of the Intake Pasture (182 acres) and Big Meadow Pasture (102 acres). The Intake Pasture lies to the west of the Owens River and the Los Angeles Aqueduct. The Big Meadow Pasture lies to the east of the Owens River north of the Los Angeles Aqueduct intake and east of the Los Angeles Aqueduct, below the intake.

Riparian/wetland vegetation is present on the historic floodplain of the Owens River. Marsh, wet meadow, alkali meadow, and riparian shrub vegetation are prominent. A seep that parallels the Owens Valley Fault creates approximately 2 acres of marginal wetland habitat consisting of alkali meadow, playa and upland shrub vegetation types. No known T&E species occur on the lease, but other special status species may be present. Improvements from future river flows and changes in livestock management are expected to enhance habitats for these species. No E/M projects occur on the Intake Lease.

<u>Grazing Management</u>

The new grazing strategy on upland habitats will closely follow the strategy the lessee is presently using. Changes will be made that will enable the lessee to utilize both pastures within the lease on a more consistent basis. The new formal arrangement for livestock movement between pastures on the adjacent Aberdeen Lease will be made. This will ensure that that the Intake Lease lessee will be able to move livestock from the Big Meadow Pasture without having to worry that his livestock will still be in the Aberdeen Lease's Pipeline Pasture. In odd numbered years, the Aberdeen Lease livestock will use the Pipeline Pasture first. Intake Lease livestock will first go to the Big Meadow Pasture. In even numbered years Intake Lease livestock will be turned into the Intake Pasture first.

The Big Meadow Pasture will be managed as a riparian pasture. A short reach of the Owens River is located in the Intake Pasture. The majority of the river and its associated riparian vegetation in this reach are modified by cleaning activities associated with the LADWP intake facility. As a consequence, the Intake Pasture will be managed as an upland pasture. Springs and the Owens River supply adequate livestock water to all pastures. No new stock-water sites will be developed at this time. Two miles of new fence will be constructed to better control livestock distribution.

3.4.22 ISLANDS AND DELTA LIVESTOCK GRAZING LEASES (RLI-489 AND RLI-490)

These leases are held and managed by the Kemp family and are considered together as one plan. The Kemp family also manages the Archie Adjunct, Fort Independence, Georges Creek, and Lubkin Adjunct Leases.

Riparian/wetland vegetation is present on the historic floodplain of the Owens River and in the vicinity of two springs (Reinhackle [DWP7] and DWP9) on the Islands Lease, and adjacent to one spring (IPT11) on the Delta Lease. No adverse affects to these springs occur under current livestock management; therefore, no fencing will be constructed at this time to protect these springs. Reinhackle Spring will continue to be used to irrigate pastures north and east of the spring. Riparian trees, shrubs, marsh, and saltgrass meadow are prominent on the Owens River floodplain. Marsh and alkali meadow occur around Reinhackle Spring (DWP7). Riparian shrub, meadow, and marsh are prominent around spring DWP9. Meadows surround spring IPT11. Designated Type E vegetation land comprises 388 acres on the Islands Lease and 72 acres on the Delta Lease. No known T&E species occur on the leases.

The Islands Lease is currently managed as nine separate pastures. The Owens River (11.2 miles of channel within the lease) is the central feature of the Carasco Riparian, Depot, and River pastures. Bull Field is east of U.S. Highway 395 and the Depot Pasture lies north of the Lone Pine Depot Road. The Reinhackle-Carasco Pastures include the New Meadow, Big Meadow, Old Corral Meadow, Reservation, and Holding Pastures. The Reinhackle-Carasco Pasture includes two holding pens and a corral. The Delta Lease (7,040 acres) is south of Highway 136 and runs south to Owens Dry Lake and east to the Los Angeles Aqueduct. The northern lease boundary fence, along Highway 136, extends only to the eastern edge of the LADWP property line. Cows occasionally go around this fence, across the highway, and forage on fans north and east of the highway.

<u>Grazing Management</u>

The lessees typically stock cows and calves on the lease. Part of the lessee's cattle is grazed year-round on private irrigated pasture and some winter on rangelands leased from LADWP. Part of the herd grazes BLM grazing allotments March 1 to May 15. Cattle are moved from the Islands and Delta Leases to Monache Meadows (U.S. Forest Service) to graze July 1 to October 1. The actual number of cattle the lessees maintain in any given year varies with cattle market conditions, forage availability, and the availability of summer grazing on LADWP lands.

The Delta Lease is managed as five major pastures. U.S. Highway 395 divides the Bolin Fields. The Dearborn Fields include part of past Owens Lake shorelines. The Delta Pasture is mostly alkali lake terrace and four miles of the Owens River flows through it. The Lake Field includes irrigated pasture and alkali fans. The East Parcel is unfenced. A 29-acre riparian exclosure will be established on the Delta Pasture that will include a reach of the Owens River.

ISLANDS LEASE (RLI-489)

Management changes include establishing two new riparian pastures, applying new grazing prescriptions, and creating a riparian exclosure. The two new riparian pastures will be grazed only in the spring. Grazing will not begin before February 1 for the Depot or Carasco Riparian Pastures. Livestock will be removed from both pastures by the end of March.

Cattle can enter the Bull Field on August 1 and graze until April 15. Cattle can begin grazing the Reinhackle-Carasco Pastures on May 1 and remain until October 31. Cattle can begin grazing the River Pasture on November 1 and remain until March 31, or until vegetation utilization criteria are met, whichever occurs first.

The Depot Riparian Pasture will be grazed by cows with calves only in February and March. This pasture will require two miles of new fence along its northeast boundary, one mile of new fence along the east boundary, and a short fence closure along the south boundary. All new and existing fences, within the lease, crossing the Owens River will be upgraded to be compatible with 40 cfs base flows and up to a 200 cfs seasonal high flow.

The Carasco Riparian Pasture (406 acres) will be grazed by cows with calves only in February and March. A water gap at the north end of the Carasco Riparian Pasture provides livestock access to water when grazing the north and east parts of the River Pasture. Establishing the Carasco Riparian Pasture will require connecting existing fences on the east side of the Owens River with one-half mile of new fencing and constructing about two miles of new fence to form the western boundary on the west side of the river. All fences on the lease will be constructed to be "passage-friendly" to elk, as needed. Special fence H-braces will be installed at known elk crossings to minimize damage to the fence and prevent injury to the animals.

Reinhackle (DWP9) and IPT11 Springs occur within the lease boundaries[26]. Current livestock management has no adverse affects on these springs; therefore, no fencing will be constructed for livestock control. A water gap on the Owens River will be created adjacent to the Carasco Riparian Pasture so livestock on the east side of the valley can continue to be watered in this area.

DELTA LEASE (RLI-490)

Cattle can enter the Delta Pasture on November 15 and graze until April 30. This pasture will be managed as a riparian pasture that contains a large inclusion of upland habitat. The Lake Field contains the only working corrals within the Delta Lease. When cattle are worked in the fall, calves are separated and shipped the same day. Cows can remain for an additional week while the herd is culled, vaccinated, and pregnancy tested. The Lake Field is nearly all irrigated pasture. Therefore, use by cattle in this field is at the discretion of the lessee as long as Field Condition Scoring remains greater than 80 percent. On May 1, cattle can enter the Bolin and Lake Fields and graze until June 20.

The Delta riparian exclosure (29 acres) will straddle the Owens River on the central part of the Delta Pasture. This exclosure will serve as a monitoring control for evaluating riparian and upland conditions on the Delta Pasture.

Springs, irrigation water, and the Owens River supply adequate stock-water to all pastures on the lease. No new stock-water facilities will be developed at this time. Irrigation supplies stock-water on the Lake and Bolin Fields. For the most part, the Owens River provides adequate stock-water for the Delta Pasture. A new stock-water facility is proposed near the Lone Pine Interagency Visitor's Center.

[26] Ecosystem Sciences. 2000. Owens Gorge Permanent Flow Recommendations (Owens River Gorge Rewatering Project). Prepared for the Las Angeles Department of Water and Power.

Five miles of fence will be constructed by LADWP or rebuilt to LADWP standards by the lessees. One-half mile of old fence will be removed by LADWP. The Owens River bottoms are very important to elk during both summer and winter. Vegetation types and dense cover bordering the Owens River provide excellent elk calving habitat. Many elk use the desert shrub lands east of the Owens River for wintering. Specially designed "elk friendly" fence sections will be built where fences cross major known elk trails.

3.4.23 J-M RANCH LIVESTOCK GRAZING LEASE (RLI-445)

This lease (152 acres), northwest of Bishop in Round Valley, is held and managed by Jim Coats. The lessee grazes cow/calf pairs and the necessary bulls. Sixty five acres (all Type E designated vegetation land) of irrigated pasture occur on the lease. Riparian vegetation is present along the Mill Creek Ditch and in the Behind the Barn Pasture. No seeps, wetlands, springs, or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Grazing management will be conducted the same as present grazing management with slight modifications. All pastures and fields will be grazed using the “Best Pasture Rotation.” All cattle will be combined into one herd and the herd rotated through the pastures together. The two Dry Fields were grazed more heavily in the past when they received “tail water” from private property in Rovana. Since private property irrigation ceased, these fields have been drying up and there is no longer any stock-water for Dry Field #1. These fields will be minimally grazed during spring “green up” periods and grazing must meet upland plant utilization standards. All irrigated pastures scored greater than 80 percent in 2004. Therefore, no changes in grazing management on irrigated pastures will be made at this time.

Stock-water supply is adequate in all fields, except Dry Field #1. Stock-water is supplied via irrigation ditches in all irrigated pastures. No new stock-water sites will be developed at this time. All livestock management fences are in good condition.

3.4.24 JR RANCH GRAZING LEASE (RLI-436)

This lease (976 acres) is northwest of the town of Lone Pine and is held and managed by Ralph Ruiz. The lease was grazed by cattle until 2001, but is now grazed only by horses. Type E designated vegetation land comprises 34 acres. Eighteen of these acres are irrigated. The Lone Pine West Side Regreening E/M project (9 acres) occurs on the lease. No riparian, wetlands, springs, seeps or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Horses are grazed on the lease year-round. Horses are typically held in the Lone Pine E/M, Portal, Lone Pine, and Olivas irrigated Pastures. Most of these horses, however, are held in the Olivas Field. When forage is available, the horses are moved to the Windmill Field for a short period in the spring. The Olivas Field is rested during this period. The Windmill Field will receive an upland utilization standard of 65 percent because the field receives a minimum of 60 continuous days rest during the plant growing season.

No irrigated pasture scored greater than 80 percent condition in 2004. Management changes will need to be made. Reduction in animal numbers, reduced grazing duration, and increased fertilization application changes will be made. Irrigated pastures will be evaluated annually until all pastures score greater than 80 percent. If implemented management changes do not bring the pastures up to the 80 percent standard, additional management changes will be made.

The Portagi Field has not been used by the lessee for grazing livestock for several years.

During Team field evaluations there was evidence of recent livestock use by adjacent Islands Lease livestock in this field. Islands Lease fences will be brought up to standard and this animal drift problem will be eliminated. Mamies and Ranger Station Fields have also been in grazing nonuse for a number of years. These fields will remain in nonuse in the future.

Vegetation growing along the 1872 fault line in the Wind Mill Field is indicative of seeps occurring in the vicinity of the fault line. Field evaluations, however did not find any surface water at the ground surface. No livestock impacts were observed within this fault line area. No stock-water is available in the west end of the Olivas Field. The gate in the Olivas Field fence used to separate this field into two pastures is currently left open. This reduces livestock management options. The Lone Pine West Side Regreening E/M project supports horse grazing year-round. The Lone Pine Pasture (7 acres) also supports horse grazing year-round. The Portal Pasture (1 acre) is used to hold horses from one of the other pastures for short periods of time.

Stock-water is supplied, via irrigation ditches, to all irrigated pastures and is adequate in all pastures. No additional stock-water sites will be developed at this time. Livestock management fences are in good condition.

3.4.25 L-I BAR RANCH LIVESTOCK GRAZING LEASE (RLI-487)

This lease (681 acres) lies southeast of Bishop, north of the Warm Springs Road, and is between U.S. Highway 395 and the Owens River. The lease is held by Giacomini Trust, Gary and Alonna Giacomini. The livestock program used is a commercial cow/calf operation.

The lease consists of two separate parcels: the South Bishop Place, which lies to the southeast of Bishop, east of U.S. Highway 395; and the Hess Place, which is west of Bishop, south of west Line Street, and east of Barlow Lane. Type E designated vegetation land comprises 457 acres; 125 of these acres are classified as irrigated agriculture. Irrigated lands occur on the West Line, Barlow, and Sheep Pastures. No riparian/wetland areas, seeps, springs, or any known special status wildlife species occur on the lease. The Owens Valley checkerbloom (*Sidalcea covillei*) occurs on the Hess Place. These plants are currently located in a small exclosure in the southeast portion of the lease.

Grazing Management

No issues were found with current grazing management, therefore, future grazing management will be conducted much the same as present grazing management. All irrigated pastures assessed in 2004 scored greater than 80 percent; therefore, no management changes will be made in irrigated pastures.

Cows can graze the Hess Place year-round and then rotated through the pastures using the "Best Pasture Rotation." In March, additional cows from the South Bishop Place can be added to the Hess Place. These same animals will be moved back to the South Bishop Place in May and can then graze through June. In July and August, the animals will be moved to private lands. These animals can return in September and remain through March. Sheep can graze the Sheep Pasture at the South Bishop Place year-round.

Livestock water is supplied via irrigation ditches to all irrigated pastures. The South Bishop Parcel is watered by the Bishop Creek Canal and the A-Drain. Stock-water supply is adequate for all pastures. No new stock-water sites will be developed at this time. Livestock management fences are in all good condition.

3.4.26 LONE PINE DIARY LIVESTOCK GRAZING LEASE (RLI-452)

This lease (80 acres) is south of Lone Pine, north of the Lone Pine Golf Course, and west of U.S. Highway 395. The lease is held by Lewis W. Schou, Robert D. Munis, and Phyllis L. Munis and managed by Lewis Schou. The lease is used to graze purebred Red Angus cattle. Designated Type E vegetation land comprises 77 acres. Operating structure areas are the only portions of the lease not irrigated. No riparian habitat, wetland areas, seeps, springs or any known special status wildlife species are present on the lease.

Grazing Management

The lessees use the “Best Pasture Rotation” to graze the five pastures on the lease. The entire herd is moved from pasture to pasture depending on the vegetative condition of each pasture. Future grazing management will be conducted much the same as present grazing management. Livestock will continue to graze any time of the year, if pasture and forage conditions allow it. All irrigated pastures were assessed in 2004 and all scored 94 percent or greater. Therefore, no grazing management changes will be made at this time. Grazing management remains the option of the lessee, as long as all grazing standards are met.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures and no new stock-water facilities will be developed at this time. All livestock management fences are in good condition.

3.4.27 LONE PINE LIVESTOCK GRAZING LEASE (RLI-456)

This lease (7,926 acres) is held and managed by the Spainhower Anchor Ranch, Inc. The lease is located in and around the town of Lone Pine. The northern lease boundary is north of the Lone Pine Depot Road and the southern boundary is State Highway 190 to Keeler. The western boundary is the Los Angeles Aqueduct and the eastern boundary follows the LADWP/BLM boundary line east of the Owens River.

The Island Lease is to the north and the Delta Lease is to the south of the Lone Pine Lease. About 4.7 miles of the Owens River lies within the lease and presently flows about 40 cfs. Previously, the Lone Pine Lease was 3,207 acres. Approximately 4,324 acres on the east side of the Owens River has been utilized by the lessee but was not included in the lease. These 4,324 acres will now be included in the lease, bringing the total lease area to 7,926 acres.

The lease is managed as 10 major pastures. A 7-acre parcel, used as a garbage dump for the town of Lone Pine, is included in the 576-acre Dump Pasture. A 113-acre area along the Los Angeles Aqueduct is used occasionally for one day each year. The adjacent use permit, near Keeler Road, along the Owens River in the south portion of the lease, will be divided. A 10-acre riparian exclosure will be established. The River Pasture (6,016 acres) will now include the area east of the Owens River not previously part of the lease. Some fences are in poor condition.

Three pastures contain E/M projects. The Richards and the Van Norman Pastures each contain 160-acre E/M projects. The Adolofo field is an additional 11-acre E/M project managed within the Richards Field. Type E designated vegetation lands (252 acres) occur in the Miller, Smith, Old Place, and Edwards Pastures.

Riparian/wetland vegetation (550 acres) is present on the historic floodplain of the Owens River. Marsh, wet meadow, alkali meadow, ponds, and riparian shrub vegetation are prominent. No known special status plant or animal species occur on the lease.

Grazing Management

Management changes include the improvement of an existing riparian pasture, new grazing prescriptions, and additional fencing to enhance riparian vegetation. The creation of the riparian pastures, exclosures, and other improvements will require one mile of new fence and 4.5 miles of reconstructed fence. This fencing includes improving the Keeler Road riparian exclosure in the southeastern corner of the lease.

The fence along the west side of the Owens River, in the River Pasture, will be reconstructed. The River Pasture, under previous management, was grazed January 1 through March 30 and again May 28 through June 12. This plan only allows cows to graze the River Pasture January 1 to March 30, or until plant utilization standards are met, whichever occurs first. By March 30, all livestock will be removed from the River Pasture and sent to the Johnson Pasture for 10 days. These cattle can then go to the Richard and Van Norman Pastures for an additional 15 days. On April 25, all cows will leave the lease and go to private lands.

The Smith-Miller Pastures can be grazed April 1 to May 20. On May 20, cows can enter the Edwards Pasture. After cattle leave the River Riparian Pasture, they can be moved to the next pasture in the rotation, which, in the past, has been the Johnson Pasture. The present May/June grazing period will be changed for the River Riparian Pasture as follows: livestock can remain in the Edwards Pasture May 20 through June 5, and then moved to the Johnson Pasture June 6 through June 12, before being moved to Olancha. Upon return from Olancha, the herd can begin grazing the Richard and Van Norman Pastures November 15 to December 31. Cattle can graze the Edwards Pasture November 15 to March 31. Bulls can graze the Old Place Pasture November 15 to March 31.

A riparian exclosure (10 acres) will be established in the River Pasture to assist in monitoring long-term livestock effects on riparian vegetation. No seeps or springs occur on the lease.

The 3.6-mile fence along the west side of the Owens River in the River Pasture will be reconstructed by LADWP. Recreationists continually leave gates open, particularly those gates along the fence that separates the River Pasture from the Dump Pasture. Therefore, some gates will be replaced by cattle guards, to improve recreation access and better control livestock.

The River Pasture fence encompasses the Owens River near the confluence of Lone Pine Creek. A short section of fence will be constructed starting at the River Pasture fence where it crosses Lone Pine Creek, and then run east to the Owens River. This fence will prevent cattle from trailing through the riparian zone on the west side of the river in route to and from northern and southern parts of the River Pasture. Better grazing control in this portion of the pasture will help ensure that cattle are removed on time when plant utilization targets have been reached. A new fence will be constructed separating the Richards Pasture from the Van Norman Pasture. This fence will run along the southern boundary of Section 22.

3.4.28 LUBKIN ADJUNCT LIVESTOCK GRAZING LEASE (RLI-489)

This lease is held and managed by Scott Kemp and lies west and south of Diaz Lake and east of U.S. Highway 395. This lease is managed in conjunction with the Islands, Delta, Georges Creek, Archie Adjunct, and Fort Independence Leases. The lease contains three separate grazing units: Diaz Creek unit (310 acres); Indian unit (156 acres), consisting of North Indian (76 acres) and the South Indian Fields (80 acres); and the Lubkin unit (716 acres). The Lubkin unit borders the Los Angeles Aqueduct, with Lubkin Creek flowing through the unit. No unit is connected to any other unit and each unit functions as a separate grazing area.

The Diaz Creek unit has the ephemeral Diaz Creek flowing through it and also contains two springs. One spring, on the west border of the Unit, may actually be just outside of LADWP lands. The North Indian Field contains no streams, but does contain a spring. The South Indian Field contains five springs. The Lubkin unit contains seven springs and seeps. The over-all lease contains 14 springs. No irrigated lands occur on the lease.

Riparian/wetland vegetation occurs along Lubkin Creek, along a spring drainage on the Diaz Creek unit, around a vent spring on the North Indian Field, in the immediate vicinity of vent springs on the South Indian Field, and around spring drainages on the Lubkin unit. One spring, arising on the Diaz Creek unit, forms a small stream that flows through and outside the unit. Populations of Owens Valley checkerbloom have been documented here.

Grazing Management

The Diaz Creek unit can only be grazed during those years the lessee also grazes livestock on adjacent BLM lands. No livestock grazing strategy will be developed for this unit and no new fences will be constructed. In the future, if riparian vegetation surrounding any spring or riparian area is degraded, the complete spring and riparian area will be fenced and all livestock grazing eliminated from the exclosed area.

The North Indian Field will not be grazed intentionally. Unauthorized livestock grazing from surrounding private lands may still occur. No grazing strategy will be developed for this field at this time. Existing fences are in poor condition and will not keep out trespass livestock. To try and solve the cattle trespass problem, the North Indian unit exterior fence was recently reconditioned by LADWP. In the future, all lease fences will be maintained annually by the lessee to eliminate trespass grazing and unauthorized OHV use.

One spring-seep complex occurs along the unit north perimeter fence. This area will not be intentionally grazed in the future; therefore, no grazing criteria will be set. About five percent of the field supports rare plants. The no grazing strategy will protect these plants. No irrigated lands occur within the unit. The South Indian Field will receive occasional grazing by a few non-authorized cattle.

The lessee can graze cows and calves, in the Lubkin unit October 15 through March 1. These animals can remain up to an additional 14 days, while the herd is separated and sent to the Delta and Island leases. Cows and calves can graze August and September if vegetative conditions warrant.

If monitoring shows any of the seven spring and seep areas receive more than 40 percent plant utilization in riparian areas, the area(s) will be fenced and permanently excluded from livestock grazing. Field analysis showed that the Lubkin Creek riparian habitat was not being impacted by present grazing practices. The new grazing strategy should continue to protect Lubkin Creek because of its dense border of willow and herbaceous vegetation cover. Springs and surrounding areas on the Diaz Creek unit will not be intentionally grazed. The several "vent springs" on the Indian unit will be protected by livestock exclusion. Only small areas of wetland/riparian vegetation are present around vent springs on the South Indian Field. Herbaceous plants on these areas will not be grazed more than 40 percent annually. Two springs on the Lubkin unit, however, will be fenced to exclude livestock grazing.

Several springs supply sufficient stock-water to the South Indian Field. Lubkin Creek and seven scattered springs supply sufficient stock-water to the Lubkin unit. No other watering sources or facilities are considered for construction at this time. The complete North Indian unit exterior fence was upgraded by LADWP in 2001. This fence will be maintained annually by the lessee to eliminate all future drift grazing and OHV use. Two gates on the south fence bordering the Lubkin access road will be permanently blocked or locked. The lessee will also maintain fences around the South Indian Field and the Lubkin unit. No other new fences are being considered at this time.

3.4.29 MANDICH RANCH LIVESTOCK GRAZING LEASE (RLI-424)

This 168-acre lease is held by Chance Rossi, Holly Rossi, Justin Rossi, and Tami Rossi. Andi Rossi manages the lease. The manager “runs” cows, bulls, horses, and sheep. Type E designated vegetation land comprises 163 acres. The lease is almost entirely in irrigated grass pasture (in 11 fenced pastures). No riparian, wetland, seeps, springs, or known special status wildlife species occur on the lease.

Grazing Management

Future livestock grazing management will be conducted much the same as present grazing management. All irrigated pastures evaluated in 2004 scored greater than 80 percent, therefore, no management changes on irrigated pastures will be made at this time. The manager will use the “Best Pasture Rotation” to graze the 11 pastures. The Goat, Sheep, South Horse, North Horse, and Trap Pastures can be grazed by sheep and horses. The East 80, West 80, East Schober, West Schober and Heifer Pastures, and the Jack in the Box Field can be grazed by cows, calves, and bulls.

Livestock water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate and no new stock-water facilities will be developed at this time. Livestock management fences are all in good condition.

3.4.30 MOUNT WHITNEY RANCH LIVESTOCK GRAZING LEASE (RLI-495)

This lease (626 acres) consists of the Diaz Parcel (146 acres), south of Diaz Lake and Lone Pine; and the Tuttle Parcel (480 acres), west of Lone Pine. The lease is held and managed by Craig London, and used to support a horse-mule pack operation. Irrigated pastures (50 acres) are all Type E designated vegetation land and occur on the Diaz Parcel in the East Diaz and West Diaz Pastures. Riparian and wetland areas occur throughout the Tuttle Creek Parcel. No seeps, wetlands, springs, or known special status wildlife species are present on the lease.

<u>Grazing Management</u>

The lessee grazes different animals at different locations based on forage condition and availability. Each location has different food supplement requirements. The number of animals stocked at each location is based on animal feed requirements. Animals will also be moved among various pastures/fields based on climate and vegetation conditons. When thermal inversions occur, causing higher elevations to become hot, animals can be moved to cooler lower elevation areas in the Diaz Parcel. When thermal conditions reverse, animals can be moved to the cooler higher elevation Tuttle Parcel.

Livestock can graze the Diaz Pastures October 1 through May 31. Animal numbers may be increased with LADWP approval and forage conditions warrant it. This occurs when the lessee needs more stock for additional pack trips outside the normal pack season. The normal pack operation starts the end of June and ends in September. During the pack season, the Diaz Parcel can be used as an operations base for the Mount Whitney Pack Station. In heavy snow years, more animals can be held on the Diaz Parcel if vegetation conditions warrant. The lessee recently began improving parcel conditions by doing weed and brush control, increasing irrigation and improving fences. These efforts will continue. Livestock can graze the Tuttle Parcel November 1 to February 1. Occasionally this parcel, with LADWP approval, can be used to hold-over animals during summer pack trips.

Stock will be fed supplements, as needed, to keep riparian, uplands, and irrigated pastures in a healthy condition and to make sure forage utilization standards are met. Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures. No additional stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.31 OLANCHA CREEK ADJUNCT LIVESTOCK GRAZING LEASE (RLI 427)

This lease (269 acres) is managed by the lessee in conjunction with his Lone Pine Lease. The Olancha Creek Lease is in the Olancha area and bisected by U.S. Highway 395. One of the owners (Tom Noland) of the Spainhower Anchor Ranch near Lone Pine manages the lease in combination with their Ash Creek BLM and Monache Meadows Forest Service Allotments. The lease is made up of seven fields and pastures and shares a common boundary with the Homeplace Lease to the north.

Saltgrass-sacaton meadow, irrigated pasture, and semi-desert shrub vegetation types are prominent. Stringers of riparian vegetation occur along Olancha Creek and the Olancha

Creek Diversion Ditch. Irrigation and stock-water are diverted from Olancha Creek and supplemented with well water as needed. Fifty six acres of pasture (all Type E designated vegetation land) are irrigated. All four East Fields and most of the two West Fields are irrigated. Irrigated pastures are used to grow livestock forage; no alfalfa or grass hay is produced on the lease. The Brush Field, east of the Olancha Creek Diversion Ditch, is abandoned agricultural land that is not grazed except for two days in October and one day in the spring for weed control. The Brush Field, west of the diversion ditch, is semi-desert shrub land. Most of the upland and riparian habitat is in the Brush Field. No special wildlife status species are known to be present.

Grazing Management

The lease has been used and is still used today as a staging area for cattle coming to and from the Lower Owens River area on their way to graze Forest Service lands in the southern Sierras. The lessee typically sends cows with calves to the Forest Service's Monache Meadows on July 1, and grazes this allotment until October 1. Livestock are then taken to the Lone Pine area to winter. The lessee participates in the "Harris Program" and raises Black Angus bulls and "beef master" cows.

Cows with calves can begin grazing the lease on June 15. The animals will be distributed among the pastures and fields using the "Best Pasture Rotation." This method calls for moving cattle from one pasture to another pasture depending on forage condition in each pasture. Cows with calves can remain on the lease until mid-October. No livestock will graze the lease from mid-October to mid-June.

Some cows with calves from the original herd to be moved, can remain on the lease until October 18 on those years the Forest Service does not allow the lessee the full allotted animal numbers at Monache Meadows. Bulls can graze with these remaining cows until August 27, when the bulls will be moved to the Lone Pine Lease. The cows with calves remaining from the original herd, will be moved off the lease on July 2 to the Forest Service Monache Grazing Allotment or to other grazing areas. These animals can again return to the lease on September 15. This recombined herd (cows with calves) can then graze until October 18. The Brush Field can be used two days in the fall (about October 1) and one day in the spring each year for herd management needs.

Most of the upland habitat occurs in the Brush Field, but produces little livestock forage. The West Field can be used for two days in early October for gathering cows and one day in the spring for weed control. This field will be rested the remainder of the year to protect riparian habitat along Olancha Creek. Remaining pastures contain little upland vegetation. Irrigated pastures can continue to be flood irrigated during the LADWP designated irrigation season. Irrigation and livestock water can continue to be diverted from Olancha Creek and can be supplemented from the existing well when needed.

The East Pastures are all irrigated and stock-water can be supplemented from LADWP Well #405 when needed. Water control structures and irrigation ditches deliver stock-water to all East Pastures on demand. The West #1 and #2 Fields can receive stock water via a ditch on the east side of the fields along U.S. Highway 395. A water trough, located in the southeast corner of West #2 Field, can be used. No additional stock-water facilities will be considered at this time.

3.4.32 PINE CREEK PACK OUTFIT LIVESTOCK GRAZING LEASE (RLI-494)

This lease (267 acres) is held and managed by Brian and Danica Berner. They manage the Pine Creek Pack Outfit, a commercial pack operation that operates the Pine Creek Pack and Sequoia Kings Pack Stations in the Sierras. The lease consists of eight pastures on two sub-leases and two use permits located in the Lone Pine, Bishop, Round Valley, and Long Valley areas.

Riparian areas occur along Rock Creek, the North Pasture, Pine Creek, and on the South Pasture in the Round Valley Parcel.

Forty four acres (all Type E designated vegetation land) of irrigated pasture occur on the lease. No seeps, wetlands, springs, or any known special status wildlife species occur on the lease.

Grazing Management

Grazing management will be similar to past management with the addition of grazing timing, plant utilization requirements, and the addition of irrigated pasture criteria. Irrigated pastures scored in the lower to upper 70s so changes in grazing management will be made.

The lessee can graze horses and mules. When their pack season slows in late summer or early fall, stock can enter the Hilton Pastures and graze until the first week of November. As the Hilton Pasture forage is used, animals can be moved to graze the Birchim Fields. The animals will be removed from these fields before the 40 percent maximum riparian utilization criteria is reached or December 1, whichever occurs first. No livestock will return to these fields until the following year. Animals can be removed from the Hilton Pasture and placed in the George Field as needed. Stock will be removed from the field before the 65 percent maximum upland utilization is reached or December 1, whichever occurs first.

On December 1, or when stock is removed from Birchim and George Fields, the Brockman and Wye Road Pastures can receive animals. When forage utilization reaches a 2-inch average stubble height in these pastures, all animals must be removed. Based on past use, the Wye Road Pasture should reach the maximum allowed utilization criteria in 15 to 20 days of grazing. Once animals leave the pasture, they will not be allowed to return until the following fall.

Animals placed in the Brockman Pasture can graze until the 2-inch average stubble height criteria is reached. In recent years, the lessee removed some stock when a 6-inch average stubble height was reached and then kept a few animals in the pasture all winter, feeding full rations. This management procedure will be allowed to continue if pasture score rating is above 80 percent.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.33 PINE CREEK RANCH LIVESTOCK GRAZING LEASE (RLI-498 AND RLM-486)

This lease (2,632 acres) consists of two separate parcels: the Round Valley Parcel (1,174 acres), northwest of Bishop and west of U.S. Highway 395; and the Paradise Field (1,457 acres), west of Paradise. This lease supports a commercial cow/calf operation and is held by Emilio Collado and Lorenzo Iturriria and managed by Emilio Collado.
Three hundred eighty two acres (all Type E designated vegetation land) are in irrigated pasture. Irrigated lands occur on all pastures of the Round Valley Parcel except Field A, Field C, the Upper Field, and the Rock Field. No irrigated lands occur on the Paradise Field. Riparian/wetland areas occur along Pine Creek. A spring occurs in the Ainsley Field.

Grazing Management

Future grazing management direction will be much the same as present grazing management except for added grazing criteria for upland areas and irrigated pastures. The lessee can graze bulls and horses year round. Generally, all stock can remain on irrigated fields at all times and moved between fields using a “Best Pasture Rotation.” In those years adequate spring “green up” occurs, the entire herd can be moved to the Upper and Paradise Fields for 60 days using the “Best Pasture Rotation.” During winter months, 300 tons of alfalfa hay will be distributed for feeding purposes in all pastures as needed. Bulls can be held in the Strip Pasture during the winter. All irrigated pastures scored greater than 90 percent in 2004. Therefore, no grazing management changes in irrigated pastures will be made at this time.

Several problems occur with Pine Creek as it flows through the lease, including excess pasture irrigation. If water flow problems are not corrected, Pine Creek could jump from its current channel into one of the irrigation diversions running across the lease. LADWP Resource Staff and Engineering will work with the lessees to develop solutions to this problem. Additionally, the corrals located along the creek will be moved. Livestock water is supplied via irrigation ditches to all irrigated pastures. A spring supplies water to the Ainsley Field. The spring area will not be used for livestock grazing. Stock-water supply is adequate and no new stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.34 QUARTER B CIRCLE RANCH LIVESTOCK GRAZING LEASE (RLI-404 AND RLI-413)

This lease (1,250 acres), west of Bishop, is held and managed by Dan Boyd and Troy Oney to operate a cow/calf operation with necessary bulls. One hundred seventy five acres (all is Type E Designated Vegetation Land) of irrigated pasture occur on the lease. Irrigated lands occur in all pastures, all use permits, and are located in the Tumbleweed Field. No irrigated land occurs in the Red Hill Field. No riparian or wetlands habitat occur, but, riparian-like vegetation is present along the South Indian and Hall Ditches. No wetlands, seeps, springs, or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Three irrigated pastures on the Boyd Parcel are seeded with a Triticoides Hay mixture producing two cuttings of grass hay each growing season. After the last grass cutting has been harvested, livestock can enter the pastures and graze December through March. April through October, all animals can graze the Oney Parcel using the “Best Pasture Rotation.”

On favorable precipitation years, the entire herd can enter the Red Hill Field and graze February through May to take advantage of the spring “green up.” Because of irrigation problems, the Tumbleweed Pasture has not been grazed for several years. This is partly the reason neither the Mumy nor Reata West Pastures scored greater than 80 percent in 2004. The lessees are implementing management changes to remedy the problems at this time. Follow up condition evaluations will be conducted. If improvements in pasture conditions do not occur, LADWP will add additional management actions to improve these pastures. These actions may include, but, are not limited to, complete rest from grazing for a year or longer, vegetation reseeding, and additional improvements in irrigation practices.

Stock-water is supplied, via irrigation ditches, to all irrigated pastures. Stock-water is adequate in all pastures and no new stock-water facilities will be developed at this time. Livestock management fences are all in good condition.

3.4.35 RAFTER DD RANCH LIVESTOCK GRAZING LEASE (RLI-426, RLI-439)

This lease (240 acres) consists of two parcels. The Round Valley Parcel (160 acres), north of Bishop, is leased to Dave and Kent Dohnel and managed by Kent Dohnel. The Bishop Parcel (80 acres), east of Bishop, is leased to Dave and Shannon Dohnel and managed by Dave Dohnel. The lease is used to support a commercial pack operation (Frontier Packers), grazing horses and mules.

Type E vegetation comprises 159-acres on the Round Valley Parcel and 39-acres on the Bishop Parcel. No riparian, wetlands, seeps, springs, or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Future livestock grazing management will be much the same as present grazing management except for additional grazing criteria. The Round Valley Parcel is grazed by horses and mules from the Frontier Pack Station. Stock can enter the parcel in mid October and remain until April 1. Animal movement between pastures will be determined using the "Best Pasture Rotation." By April, most of the stock will be moved off the lease to private property.

From mid October until April 1, stock can be fed in the Bishop Fields. From mid June through mid October, no pack stock will be allowed on the Bishop Parcel. All irrigated pastures in the Bishop Parcel scored greater than 80 percent in 2004. Therefore, no grazing management changes will be made at this time. The irrigated pasture in the Round Valley Parcel will be evaluated. Once evaluated, needed changes in grazing management will be made at that time.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.36 RAINBOW PACK OUTFIT LIVESTOCK GRAZING LEASE (RLI-460)

This lease (144 acres), is held by Greg Allen, and managed by Greg and Ruby Allen. The lease supports a commercial pack operation grazing horses and mules. The lease consists of the Wye Road, Brockman, and Dutch John Parcels, all located in the Bishop area. The Wye Road Parcel consists of the Spruce Street and Wye Road Fields, which are separated by a irrigation ditch.

Fifteen acres (all Type E designated vegetation land) of irrigated pasture occur in the Brockman Pasture. Riparian habitat occurs along Bishop Creek in the Dutch John Parcel. No wetlands, seeps, springs or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

The lessees can graze horses and mules on five pastures on three separate parcels. Future livestock grazing management will be conducted as in the past with the addition of plant utilization and irrigated pasture condition standards.

The lessees' pack operations begin after Memorial Day, depending on snow conditions in the mountains. Typically, the pack season is in full swing and all animals removed from the lease between June 15 and July 1. In 2005, due to heavy snows in the mountains, all animals were not removed from the lease until August 1. The date animals are removed from the lease is at the lessee's discretion as long as all pastures receive 60 continuous days of non-use during the plant growing season. This non-use requirement is necessary because the Brockman Pasture is in poor condition.

After Labor Day, the need for pack animals in the mountain operation starts dropping off. September 20, the pack season ends. Until the lessees secure fall feed off the lease, pack animals will remain at the pack station until November 1 to November 15, or until snow forces the operation to move. Horses and mules can then enter the Brockman Pasture and remain until January 1 to January 20. Pack stock can be supplemented, in an adjacent corral, to lengthen their time on the pasture.

During January, pack stock can be moved to the Spruce field, where they can remain until average stubble height of palatable herbaceous forage reaches 2 inches, or rare plants begin growing, which ever occurs first. The need to move the animals typically occurs in mid March. When it is necessary to move the animals, they can return to the Brockman Pasture. Additional animals can be moved to the Wye Road and CT Fields. When average stubble height is reduced to 2 inches in the pasture-fields, all stock will be moved to the Brockman Pasture.

The Dutch John Field can be used for one day in the spring and one day in the fall as stock are trailed to and from the pack station. The lessees and LADWP have agreed that not enough forage is available on this lease to successfully run this operation solely on LADWP land. The lessees must find additional grazing land, if they are to manage this lease operation properly.

The irrigated pasture area on the Brockman Pasture scored greater than 80 percent, but, the condition trend is moving downward. Management changes will be made in the future to eliminate this downward trend. Stock-water is supplied, via irrigation ditches, to all irrigated pastures. Stock-water is adequate in all pastures and fields. No new stock-water sites will be developed at this time. Livestock management fences are all in good condition.

3.4.37 REATA RANCH LIVESTOCK GRAZING LEASE (RLI-453)

This lease (139 acres) consists of the Fish Slough Parcel (84 acres) north of Bishop, and the Reata Parcel (55 acres) west of Bishop. The lease is held by Kathleen Hadeler, Amanda Miloradich, and John McMurtrie and managed by John McMurtrie. The lease supports a commercial cow/calf operation with lease livestock spending summer months on private property. Livestock graze winter-spring months on the Reata Parcel. The Fish Slough Parcel is not being grazed at the present time.

Thirty eight acres of irrigated pasture (all Type E designated vegetation land) occur on the lease. All Reata Parcel pastures contain irrigated areas. Riparian areas border the North Fork Bishop Creek. The riparian exclosure fence, previously constructed to protect Bishop Creek, has not been maintained for many years and is in poor condition. No seeps, springs, wetlands or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

Future grazing management will be conducted much the same as present grazing management except for needed fence improvements. The Fish Slough Parcel currently is non-grazed and will remain non-grazed. If, in the future, the parcel is authorized by LADWP to be grazed this plan will be modified to include all necessary changes and requirements.

Five irrigated pastures make up the Reata Parcel. These pastures can be grazed October 1 through May 31 using the “Best Pasture Rotation.” All irrigated pastures scored greater than 90 percent in 2004; therefore, no grazing management changes will be made at this time.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water facilities will be developed at this time. The existing riparian exclosure fence bordering North Fork Bishop Creek will be brought up to LADWP standards. All other livestock management fences are in good condition.

3.4.38 REINHACKLE RANCH LIVESTOCK GRAZING LEASE (RLI-492)

This lease (5,947 acres) consists of three separate parcels: the Reinhackle Place, east of Bishop and south of U.S. Highway 395; the Five Bridges Parcel, north of Bishop and west of Five Bridges Road; and the Laws Parcel, west of U.S. Highway 6 and east of Five Bridges Road. The lease is held by Lacey Livestock and managed by Mark Lacey and Leo Hertz to support a commercial cow/calf operation. Designated Type E vegetation land comprises 812 acres with 240 acres of these classified as irrigated agriculture land. All irrigated lands occur on the Reinhackle Parcel. The West, East, Horse Holding, and South Field Pastures are all irrigated.

A number of E/M projects occur on the lease. The Five Bridges E/M Project (300 acres) is irrigated through a combination of historic ditches and river meander channels. All fields in the Five Bridges area, with the exception of the Fish Slough Field, contain portions of this E/M Project. The Farmer Ponds E/M Project, in the Triangle Field, is supplied with water October 1 through January 1. The McNally Ponds and the Native Pasture Land E/M Projects cover 100 acres.

Riparian/wetland lands occur along the Owens River. No seeps or springs occur. The Owens Valley checkerbloom (*Sidalcea covillei*) has been identified in the South Restricted field of the Five Bridges area. Southwestern Willow Flycatchers (*Empidonax traillii extimus*) were detected during the breeding season in riparian areas along the Owens River in 1993 and 1999. The current status of this flycatcher on the lease is unknown.

Grazing Management

Livestock can graze the lease primarily in the winter and early spring. Cattle can begin grazing November 1, and end June 1. Cattle can graze the Five Bridges area and the Triangle Field on the west side of the Owens River first. Cows can graze the North Restricted, South Restricted, and North Five Bridges Fields using a "three-pasture double-rest rotation." Each field will be grazed only once every third year.

Cows can be placed in the Triangle Field on November 1 and graze until January 1. On January 1, these cows can be moved into the Laws Holding Field or the new Laws Riparian Field. These two fields will be grazed on an alternating basis. Cattle will be moved into whichever field was not used first during the last grazing cycle. In mid April to early May, part of the herd can be moved into the Laws Field and the remainder moved into the Fish Slough Field. This timing will allow cattle to take advantage of spring "green up" on upland areas.

The Pole Corral and South Five Bridges Fields can be used to hold bulls. The North Hay Field will only be grazed on those years that livestock are already present during spring "green up." The Multiple Completion Meadow Pasture will continue to be excluded from all livestock grazing until on-going restoration activities are completed. All pastures on the Reinhackle Place can be grazed April through August by cows or yearlings using the "Best Pasture Rotation."

All irrigated pastures were assessed in 2004 and scored greater than 80 percent. A new riparian pasture, the Five Bridges Riparian, will be created near the current Desert Aggregates facility in what is currently the Laws Field.

Stock-water is supplied to pastures and fields via irrigation ditches or the Owens River. Stock-water is adequate for all pastures and fields. However, one new stock-water facility may be developed in the Laws Field to improve grazing distribution.

Two new fences will be constructed. One fence will separate the Desert Aggregates Business Lease from the Laws Field, creating the Laws Riparian Pasture. The second fence will be located below the bluff on the south side of the Owens River. All other livestock management fences are in good condition.

3.4.39 RIVERSIDE RANCH LIVESTOCK GRAZING LEASE (RLI-501)

This lease (613 acres) lies north of Bishop (south of Dixon Lane, north of Riverside Drive, west of Five Bridges Road, and east of Brockman Lane) and is held and managed by Fred Aubrey. The lease supports a commercial cow/calf operation. All fields are composed entirely of upland habitat. No irrigated lands occur. Fourteen acres of Type E vegetation occur on the lease. No riparian, wetland, seeps, springs or any known special status wildlife species occur on the lease.

Grazing Management

Future grazing will be managed much the same as present grazing management. The lessee will continue to manage the fields using the "Best Pasture Rotation." Upland utilization standards will be in effect. Because no riparian habitat occurs, no riparian criteria will be applied.

Stock-water is supplied via the A-Drain and Bishop Creek Canal. Stock-water is adequate in all fields. No new stock-water sites will be developed at this time. Lease fences are in need of repair. The lessee will bring all exterior fences up to LADWP standards annually prior to any livestock grazing occurring. No riparian, wetlands, seeps, springs or any known special status wildlife species occur on the lease.

3.4.40 ROCKIN C RANCH LIVESTOCK GRAZING LEASE (RLI-493)

This lease (320 acres) is east of Bishop and is held and managed by Cathy Caballero, Chance and Rebecca Johnson to graze cows and horses. Designated Type E vegetation land comprises 18 acres. No riparian habitat, wetland, seeps, or springs or any known special status wildlife species are present on the lease.

Grazing Management

Cows can be trailed from the Sewer Farm Lease and stocked on the Rockin C Ranch Lease in mid to late October. Cows with calves can be placed on this same date in the Canal pasture. Dry cows can be placed in the Back and Airport Fields and graze until mid-May. When calves are weaned, they can be moved to holding pens on the lease. If the lessee keeps heifers, they can be kept separately in the Big Horse Pasture and rotated between the Big and Little Horse Pastures along with the horses. Horses can be kept in the corrals and the holding field year-round. At the end of the grazing period, cows will be moved from the lease to the Sewer Farm between mid-May to mid-June.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Stock water is adequate in all grazed pastures. No new stock-water facilities will be developed at this time. The irrigated portion of the Little Horse Pasture was seeded in 2005. This pasture will not be evaluated for condition until 2008. Once evaluated, management decisions will be made as to whether any changes in grazing management are necessary. Livestock management fences are all in good condition.

3.4.41 ROCKIN D-M RANCH LIVESTOCK GRAZING LEASE (RLI-420)

This lease (110 acre) lies west of Big Pine and is held by Don Morton and managed by Don and Bev Morton. The lease is managed as a commercial cow/calf operation with needed bulls. Thirty five acres of irrigated pasture (all Type E designated vegetation land) occur in the Whistler Pasture. No riparian, wetlands, seeps, springs or any known special status wildlife species occur on the lease. All irrigated pastures are in good condition.

Grazing Management

Most of the year, lease cattle are on the adjacent County Farm that is leased by the lessee from Inyo County. The lessee’s goal is to stock the appropriate number of cows on the lease to ensure sufficient natural feed is available in both wet and dry years. The lessee does not want to feed hay in the winter.

The irrigated portion of the Whistler Pasture can be used by steers May 31 to September 1 in those years heifers are not held over. Typically, every 3 to 4 years, the lessee retains replacement heifers. These heifers can also graze the Whistler Pasture during the same period steers do. Therefore, heifers and/or steers can be in the pasture May through September.

In late September, all cows will be moved to the County Farm and the Whistler Pasture will be non-grazed until October 15. On October 15, dry cows can enter the Whistler Pasture and remain until mid-December at the start of the calving season. The Whistler Pasture will remain un-grazed from mid-December until the end of May, when the grazing rotation begins again. The Georges Field will remain non-grazed and not used at any time for livestock grazing.

The Whistler Pasture scored greater than 90 percent in 2004; therefore, no management changes will be made at this time. Upland portions of the Whistler Pasture, however, will have a maximum plant utilization standard of 50 percent. Stock-water is supplied, via irrigation ditches, to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water facilities will be developed at this time. Livestock management fences are all in good condition.

3.4.42 ROUND VALLEY RANCH LIVESTOCK GRAZING LEASE (RLI-483)

This lease (19,780 acres) is held by Joe C. Mendiburu, Danielle Mendiburu, and Nicole Dobrzanski. Joe Mendiburu manages the lease as a commercial cow/calf operation. The lease (Round Valley Ranch) covers an extensive area in several different locations within the Owens Valley. In the Big Pine area, the lease consists of 13 separate pastures/fields; the Buttermilk portion of the lease consists of eight separate pastures/fields; and the Round Valley portion of the lease consists of 22 separate pastures/fields.

The southern pasture lies on the east side of the Owens River and extends from Tinemaha Reservoir, on the south, to U. S. Highway 168, on the north. On the east side of the Owens River, the lease extends from north of Steward Lane to north of Klondike Lake.

Riparian/wetland lands border the Owens River, and Horton, Mill, and Big Pine Creeks. About 1,541 acres (all Type E designated vegetation land) of irrigated pasture occur on the lease. Irrigated lands occur on all portions of the lease with the exception of the East Side River field, south of Big Pine and fields east of the Owens River.

Three E/M projects are in the Big Pine portion of the lease. The Klondike Lake Project is north of Big Pine, and east of U.S. Highway 395. This project sustains a year-round supply of water to a 160-acre lakebed that provides nesting and feeding areas for waterfowl and also supports recreation use. The Big Pine NE Project (Re-greening) is northeast of Big Pine, west of the Big Pine Canal, and north of Big Pine Creek in the Big Pine field. The 20-acre Big Pine East Mitigation Project is east of the Big Pine Indian Reservation, north of Bartell Road, and west of the Big Pine Canal in the Big Pine field.

One natural spring (DWP 31) occurs on the lease. This spring and its surrounding area are in good condition with minimal impacts from human activities or livestock grazing. This spring is located on a steep slope at the base of Mount Tom. The spring actually consists of three separate springs, which support several riparian species such as *Salix exigua, Carex douglasii, Salix laevigata,* and *Typha domingensis*. The southern-most and largest riparian area, associated with the springs, supports a small pond of open water 3 feet in width and less than 1 foot in depth.

The Owens Valley checkerbloom (*Sidalcea covillei*), a State endangered species, occurs in Tony's, Rock House, and Freeway Pastures on the Round Valley portion of the lease. This rare plant also occurs along the Owens River in the Big Pine portion of the lease. The current status of the Southwestern Willow Flycatcher population on the lease is unknown.

<u>Grazing Management</u>

A number of issues necessitate grazing management changes on the lease. Changes range from removing areas from grazing to resting selected pastures. These changes, once implemented, will require a reduction in livestock numbers. Management changes include resting portions of the lease in the Big Pine and Buttermilk areas and removing areas from grazing in Round Valley. Other changes include the initiation of riparian and upland plant utilization standards and changes in "on/off" livestock grazing dates.

In the Buttermilk portion, meadows in the Upper Wells Meadow Pasture are severely overgrazed. These meadows need a minimum of five years of complete rest from grazing. A series of serious head-cuts exist in various stages through lower meadow areas. These head-cuts were repaired, but, with very little or no success. The lower meadow desperately needs some type of rehabilitation. At the end of the five-year non-grazing rest period and possibly some attempts at meadow rehabilitation, meadow conditions will again be assessed. If this assessment warrants resuming livestock grazing, standard riparian prescriptions will be applied. Riparian prescriptions will also be applied to meadows in the East and West Dutch John Pastures.

In Round Valley the Horton Creek Field has not been grazed for several years because of a

BLM grazing closure on their adjacent lands. This field along with the Millpond Field will be removed from the lease for all future grazing purposes. The Millpond Field produces dust and needs to be re-vegetated. Livestock grazing will be excluded from this field to speed re-vegetation. The Round Valley Parcel corrals will be moved away from Horton Creek.

In the Big Pine area, the East Side River Field has experienced very heavy grazing use. Both upland and riparian areas are in poor condition. This field will not be grazed for five continuous years. At the end of this five year period, conditions will again be reassessed. If conditions improve sufficiently, standard upland/riparian prescriptions will be applied and livestock grazing can resume.

A poor conditioned fence in the East Side River Field will be upgraded to LADWP standards to create a riverine/upland exclosure. Cattle guards will be installed across the road passing through the exclosure. The southern lease boundary in this field will also be fenced. The fence in the Little Pasture surrounding the permanent vegetation monitoring site will be brought up to standard. The exclosure fence in the Hole Pasture will also be repaired.

Three new riparian pastures (Klondike Lake, Little Pasture, and the North Big Pine) will be created in the Big Pine area to protect Southwestern Willow Flycatcher habitat. New and existing fences will allow proper winter grazing in riparian areas. This grazing can continue until riparian utilization standards are met or the grazing period ends on May 1, whichever occurs first.

All irrigated pastures were assessed in 2004. In Round Valley, the Freeway Pasture scored less than 80 percent. In the Big Pine area, no pasture scored over 80 percent. Two of the four pastures in the Buttermilk area also scored less than 80 percent. Management changes will be made to improve irrigated pasture condition in all pastures not meeting the minimum 80 percent score.

Stock-water is supplied via irrigation ditches to all irrigated pastures. Springs, irrigation water, and the Owens River supply adequate stock-water to all Pastures. No new stock-water facilities will be developed at this time.

3.4.43 S-T RANCH LIVESTOCK GRAZING LEASE (RLI-461)

This lease (10,925 acre) is held and managed by Jack and Todd Tatum. The lease consists of parcels located in the Aberdeen, Bishop, and Round Valley areas. The lease supports a commercial cow/calf operation with necessary bulls, brood mares, and saddle horses.

Riparian lands are associated with the Owens River, North Fork Bishop Creek, McGee and Horton Creeks. Wetlands occur at Calvert Slough, Charlie's Butte/West River, Horton Slough, and in the Upper and Lower McCumber Fields. Type E designated vegetation land comprises 1,043 acres. Eleven partially irrigation pastures make up these 1,043 acres. No irrigated pasture scored 80 percent or greater in 2004, and no pasture scored much better in 2005. A small (0.1 acre) revegetation site is located at Charlie's Butte. No seeps, wetlands, or springs occur on the lease.

The Owens Valley checkerbloom (*Sidalcea covillei*) has been identified in a number of locations on the Round Valley and the Bishop parcels. The current status of the Southwestern Willow Flycatcher population on the lease is unknown.

<u>Grazing Management</u>

Except for some limited grazing on BLM lands in the Aberdeen area, lease livestock remain exclusively on LADWP lands year-round. Livestock can be rotated between lease pastures using the "Best Pasture Rotation."

A number of issues were identified that necessitates changes in grazing management. All exterior and interior fences are in poor condition and must be completely rebuilt. This need excludes those fences repaired or replaced in 2004 and 2005. No irrigated pasture met the minimum condition score of 80 percent. All pastures have areas showing signs of over-use. Under present animal stocking levels, problem areas will not recover and the downward negative condition trend will continue. To remedy these problems, management changes will be made by initiating Remedial Pasture Grazing Prescriptions (RPGP). These prescriptions are:

1) Reduce herd size
2) Improve condition and maintenance of irrigation ditches and head gates
3) Improve irrigation practices
4) Increase and improve pasture maintenance practices including mowing, dragging, and fertilization
5) Implement the "Best Pasture Rotation," that requires a minimum of 30 continuous days of no grazing during the plant growing season

Implementing these prescriptions will require a reduction in current cattle stocking numbers, exclude grazing from selected areas, improve grazing rotations, improve irrigation practices, and improve fences.

Aberdeen Area
The overgrazed East River Field will be rested from all livestock grazing for a minimum of five years. Charlie's Butte/West River and Calvert Slough Fields can continue to be grazed October through April. The reduction in livestock numbers should enable cattle to remain until April. A new fence will be constructed along the Aberdeen Station Road so livestock distribution can be better managed. Both fields contain riparian and upland habitats. No cattle will use the Charlie's Butt/West River or Calvert Slough fields after May 1. This will enhance riparian habitat along the Owens River.

The Red Hill Field lies wholly within the BLM Aberdeen Grazing Permit #6049. This field can be grazed March 15 to May 31, abiding by all BLM plant utilization prescriptions. BLM allows 40 percent use on riparian herbaceous species, 20 percent use on shrubs and trees, and 35 percent use in upland areas annually. If good "green up" occurs before the allowed March 15 entry date, cattle can be moved into this field earlier. BLM grazing standards remain applicable and the designated animal stocking rates will not be exceeded. When cattle are removed from the Red Hill Field, they can return to the Calvert Slough Pasture, if the forage utilization standard in this pasture has not already been met. If grazing in the Calvert Slough Pasture has met upland or riparian utilization criteria, cows will need to be returned to the Dixon Place.

Dixon Place
The Dixon Place will be stratified into four additional pastures, two fields, and one riparian exclosure. Although Dixon Place Pastures almost pass or slightly pass irrigated pasture condition score criteria, all pastures are border line. To improve pasture condition scores, these irrigated pastures-fields will be put under RPGPs. The prescriptions are:

1) Reduce herd size
2) Improve maintenance of irrigation ditches and head gates
3) Apply improved and more intensive irrigation practices
4) Construct needed interior fences and repair all other existing fences to allow better rotational grazing

These RPGPs will be implemented until all irrigated pastures meet minimum pasture condition score for three consecutive years. Once these conditions are met, the lessee may modify grazing management with LADWP approval. Pasture condition scores must remain above 80 percent or RPGPs will again be applied. When grazing is reintroduced to the East River Field in the Aberdeen area, cattle numbers may be increased if conditions warrant.

Horses can use the North Horse, Middle Horse, and South Horse Pastures. Continuous over-grazing of these small pastures, however, is causing serious problems. Many desirable grasses and forbs are being "spot-grazed out", leaving very short-grazed patches resembling a mowed lawn. Bare spots are expanding and invasive plant species increasing. To improve pasture condition scores, these irrigated pastures will be put under RPGPs. The prescriptions are:

1) Reduce herd size

2) Improve maintenance of irrigation ditches and head gates
3) Apply improved irrigation practices
4) Apply improved pasture maintenance practices including mowing, dragging, and fertilization
5) Implement the "Best Pasture Rotation" that will allow a minimum of 30 continuous days of non-grazing during the plant growing season

These RPGPs will be followed until all irrigated pastures meet or exceed minimum pasture condition score (80 percent) for three consecutive years. Once this pasture condition occurs, the lessee may be able to modify grazing management, with LADWP approval. Pasture condition scores must continue to remain, over-time, above 80 percent or necessary RPGPs will again be applied.

Round Valley

Round Valley vegetative conditions remain satisfactory even though pasture condition scores are only marginally acceptable. Other pastures, however, that Round Valley cattle will rotate to are in an unsatisfactory condition. To improve pasture condition a "pasture rotation method" will be implemented and cattle numbers reduced. The Round Valley Pastures, along with North Horton Slough, South Horton Slough, Castanay Riparian, Northwest McCumber, and Northeast McCumber Riparian Pastures, will be used in the "pasture rotation method".

Beginning December 1, cattle can enter the Castanay Riparian Pasture (on even numbered years) or the Northeast McCumber Riparian Pasture (on odd numbered years). Cattle will rotate to the next riparian pasture prior to utilization standards being exceeded in the pasture they are grazing. Once cattle have cycled through the complete pasture rotation, cattle will return to the irrigated pastures in Round Valley. Cattle will not return to graze any of the riparian pastures until the following year. All cattle will be removed from all riparian pastures by May 1 to comply with the *Southwestern Willow Flycatcher Conservation Strategy*.

White, West Horton, and East Horton Riparian Pastures will be rested from all grazing for a minimum of 10 years. After 10 years, the pastures will again be evaluated to determine if grazing will be allowed. A new fence will be constructed at the north end of the East Horton Riparian Pasture to stop drifting cows. If cows continue drifting into excluded areas, this new fenceline will be extended.

The Pleasant Valley Campground and the Spawning Channel Riparian Field will be removed from the lease and livestock grazing will cease. The new lease boundary will be the fence on the east side of the campground terminating at cattle guards on the Pleasant Valley-Chalk Bluff Roads.

The Mare and Horse Trap Pastures are over-grazed by horses and these problems will be fixed. To improve pasture condition scores, these irrigated pastures will be put under RPGPs. The prescriptions are:

1) Remove all cattle grazing from the horse pastures
2) Improve the maintenance of irrigation ditches and head gates
3) Apply improved irrigation practices
4) Apply additional pasture maintenance, including mowing, dragging, and fertilization
5) Implement the "Best Pasture Rotation" that will require a minimum of 30 continuous days of non-grazing during the plant growing season

These RPGPs will be followed until all irrigated pastures meet minimum pasture condition score requirements for three consecutive years. Once pasture score requirements are met, the lessee may modify grazing management with LADWP approval. Pasture condition scores must remain, over-time, above 80 percent or RPGPs will again be initiated.

Steward & Wonocott Place

The Steward and Wonocott Places consist of two large irrigated pastures, three horse pastures, and "working" corrals. These pastures are grazed in conjunction with

Southeast McCumber and Southwest McCumber Riparian Pastures, located on the south side of the Owens River and bordering the Brockman Field.

Pasture conditions on the Steward and Wonocott Places is mediocre. Pasture condition scores, over the past few years, are just above the minimum allowable. To improve pasture condition scores, these irrigated pastures will be put under RPGPs.

The prescriptions are:

1) Reduce herd size
2) Improve the maintenance of irrigation ditches and head gates
3) Apply improved irrigation practices
4) Apply additional pasture maintenance, including mowing, dragging, and fertilization
5) Implement the “Best Pasture Rotation” that requires a minimum of 30 continuous days of non-grazing during the plant growing season

These RPGPs will be followed until irrigated pastures meet minimum pasture condition score for three consecutive years. Once required condition score occurs, the lessee may modify grazing management, with LADWP approval. Pasture condition scores, however, must remain above 80 percent, over-time, or RPGPs will again be initiated.

Cattle will rotationally graze the riparian pastures along the river using an even/odd year timing to determine rotation direction. Grazing can begin on riparian pastures on December 1, in the Southwest McCumber (on even years) or the Southeast McCumber (on odd years). Cattle can then be rotated to the next pasture and graze until utilization standards are met. Once cattle have cycled through the riparian pasture rotation, they can then graze the Steward and Wonocott Places.

Cattle will not return to any previously grazed riparian pasture until the following year. All cattle will be removed from all the above riparian pastures by May 1 to comply with the *Southwestern Willow Flycatcher Conservation Strategy*. On good spring “green up” years, the herd can graze the Brockman Field as long as the herd is out of this field before May 1. This will prevent herd drift back into riparian pastures.

The horse pastures on this part of the lease are the Wonocott Horse, West Horse, and East Horse Pastures. Continuous over-grazing of these small pastures is causing problems. Many desirable grasses and forbs are being “spot-grazed” out, leaving very short-grazed patches resembling a mown lawn. This allows undesirable species like wild iris to move in. To improve pasture condition scores, these irrigated pastures will be put under RPGPs.

The prescriptions are:

1) Reduce herd size
2) Improve the maintenance of irrigation ditches and head gates
3) Apply improved irrigation practices

RPGPs will be followed until all irrigated pastures meet minimum pasture condition score for three consecutive years. Once this occurs, the lessee may modify grazing management with LADWP approval. Pasture condition scores must, however, remain above 80 percent over-time, or RPGPs will again be initiated.

Livestock Watering and Fencing

Irrigation water and the Owens River supply adequate stock-water to all pastures on the lease. Stock-water is supplied via irrigation ditches to all irrigated pastures. No new stock-water facilities will be developed at this time. All livestock management fences are in poor condition and will be brought up to LADWP standards. Old fences that are not being maintained and are no longer used for livestock management purposes occur in the Bogie Field. These fences will be removed.

3.4.44 THIBAUT LIVESTOCK GRAZING LEASE (RIL-430)

This lease (5,259 acres) is held and managed by Herbert London and Robert C. Tanner and used for livestock grazing. The lessees operate horseback riding and packing services in the Sierras. Horses and mules are stocked in the lease for grazing when the summer recreation pack season closes in mid-September. Stock graze on the lease until packing operations resume the following June.

The lease is currently managed as one large pasture. The lease is bordered by the Blackrock Lease to the north and south, and the Los Angeles Aqueduct on the west. The Owens River channel (2 miles) within the lease is currently running at 40 cfs. Tamarisk is the dominant plant along the Owens River channel, but willows, which are more desirable, are also present. A large tamarisk removal project has been conducted along the river corridor. The lease perimeter is fenced except for the eastern boundary.

Saline/alkali soils are prevalent. Surface water is most prevalent and livestock forage most abundant in the northwestern part of the lease. Southern and eastern portions of the lease are progressively dryer with lower forage production. Type E designated vegetation lands (80 acres) are all irrigated and occur in the northwest corner of the lease where a Waterfowl Management Area will be established.

Riparian/wetland vegetation is present on some areas of the historic Owens River floodplain. Saltgrass, scattered tamarisk, and a few willows are dominant where the floodplain is moist. Shallow groundwater tables and subirrigation from the Los Angeles Aqueduct sustain extensive saltgrass/sacaton meadows along the west side of the lease.

A spring (IND56) is located on the Owens Valley Fault, near the center of the lease, which sustains surrounding riparian/wetland vegetation. The Owens Valley checkerbloom (*Sidalcea covillei*) occurs on the northwest part of the lease.

Grazing Management

Management changes include a reduction in herd size, establishing grazing utilization standards, creating two additional pastures, and constructing a large riparian/riverine exclosure. Livestock grazing will be excluded from the exclosure to ensure future riparian/riverine values are protected. A 247-acre pasture will be created for waterfowl management purposes in the northwest corner of the lease. A second 211-acre area along the western border of the lease will be fenced to protect rare plants. Livestock in these two special management areas will be managed so waterfowl habitat and rare plant goals are met.

The entire Owens River riparian area will be fenced and the formed exclosure will not be grazed for at least 10 years. After 10 years, LADWP will evaluate whether vegetation goals have been met and then decide future management for the area. Livestock numbers will be reduced; a large, non-grazed riparian pasture (846 acres) will be developed; and two new pastures will be fenced to allow restricted and controlled livestock use. Shod horses and mules will no longer be allowed on the lease to reduce damage to vegetation. Shoes must be off all animals before they can be turned into the lease.

The planned Thibaut Management Unit (unit 17) of the Blackrock Waterfowl Management Area (BWMA) is within the lease. Most of the management unit is in the western portion of the Thibaut Pasture. A Waterfowl Management Area (247 acres) will be fenced as a separate pasture and contain the Thibaut Marsh area and the area known as the Thibaut Ponds. The Thibaut Ponds are a component of the "Off-River Lakes and Ponds" part of the LORP. Water will be maintained in the ponds on a continual basis.

The Waterfowl Habitat Area can be grazed every other year during the applied wet cycle. Livestock will be excluded from the area the first year following plan implementation. Grazing can occur the second year from October 1 to March 1. The pasture will be rested the third year. This prescription will allow plant regrowth after stock removal. Change in livestock duration and timing of grazing will reduce mechanical damage and disturbance to waterfowl nesting areas and brood cover. The Waterfowl Habitat Area will be evaluated each year and prescriptions altered, as necessary, to promote desirable habitat conditions. In some years, the Waterfowl Habitat Area, or areas within, will receive less water when the Thibaut Unit is not being actively flooded. During non-irrigated years, the area can be grazed from September 1 through June.

During the applied "wet cycle", when some or the entire Thibaut Management Unit is being flooded, riparian grazing utilization standards will apply. During the applied "dry cycle", upland grazing utilization standards will apply. Livestock may be used to assist in decreasing tule biomass during "dry cycles".

Rare Plant Management

A Rare Plant Management Area (211 acres) will be established along the east side of the aqueduct and south of the Waterfowl Management Area. This area will be fenced to allow management and grazing flexibility needed to enhance the Owens Valley checkerbloom. The Rare Plant Management Area can be grazed October 1 to March 1. From March 1 to September 30 the area will be closed to livestock grazing so rare plants can complete their life cycles. Rare plant populations will be monitored to determine if the "Best Pasture Rotation" is beneficial. No management changes are needed or will be made at the present time for the spring site.

The lease is presently fenced on the south, west, and north perimeters. Many fence sections have not been maintained and need to be rebuilt. Fences to be built or rebuilt are:

- LADWP will construct 2.4 miles of new fence along the western boundary of the Thibaut Riparian Exclosure. After construction, the lessees will maintain this fence annually to LADWP standards prior to any stock entering the lease.
- LADWP will reconstruct 6 miles of fence along the northern and southern boundaries of the lease, including the Thibaut Riparian Exclosure. After construction, the lessees will maintain all boundary and exclosure fences annually to LADWP standards prior to any stock entering the Lease.
- LADWP will construct 3.5 miles of fence to create the Waterfowl Management and Rare Plant Management Areas. After construction, the lessees will maintain all interior fences annually to LADWP standards. Sections of this fence will be designed to allow easy access during designated grazing periods.

3.4.45 THREE-CORNER-ROUND RANCH LIVESTOCK GRAZING LEASE (RLI-464)

This lease (681 acres) is east of Aberdeen, between new and old U.S. Highway 395. The lease is held by the Three-Corner-Round Pack Outfit and managed by Jennifer Roeser. Burros graze the lease during summer months and are used in a commercial pack operation in the Sierra Nevada Mountains.

Fields within the lease support mainly upland vegetation. Riparian vegetation occurs along the Goodale Ditch and Taboose Creek. No damage to riparian habitat is occurring from livestock grazing at this time. A 100 to 300-foot water gap allows livestock to water from Taboose Creek. No irrigated lands, Type E designated vegetation lands, wetlands, seeps, springs or any known special status wildlife species occur on the lease.

Grazing Management

New fencing will separate the lease into three upland fields (North, Middle, and South). In August, burros returning from the mountains can go into the Middle Field joining burros that already spent the summer in the field. On December 1, all burros can be moved to the South Field where they will be fed until February 1. On February 1, all burros can be moved to the North Field, where they can remain until April 15. Burros can then be moved to the Middle Field, where they can be "worked" prior to some animals being pulled for summer use in the mountains. Remaining burros can stay in the Middle Field.

All burros will be fed supplements necessary to keep riparian, uplands, and irrigated pastures in healthy condition and to help abide by plant utilization standards. The South Field has stock-water available from the Division Creek Pipeline. This pipeline will be maintained by the lessee in the future. A new water trough, float, and water gap will be put in place after new fencing creates the Middle Field. All existing livestock management fences are in good condition.

3.4.46 *TWIN LAKES LIVESTOCK GRAZING LEASE (RLI-491)*

This lease (4,912 acres) is held and managed by the 4-J Cattle Company. The lease is situated between the Inyo Mountains on the east, the Los Angeles Aqueduct on the west, and the Blackrock Lease on the south. The lease includes a 6.1-mile reach of the Owens River channel. The lease is divided into the Blackrock Riparian and Blackrock Pastures, including a holding pasture, an exclosure, and a corral. Upper and Lower Twin Lakes lie within the south central portion of the lease and provide fishing for largemouth bass, bluegill, and catfish. The Lower Owens River is presently flowing at about 40 cfs.

Riparian/wetland lands are associated with the Owens River, Upper and Lower Twin Lakes, and a spring (BLK133). These lakes comprise a 24-acre E/M Project. Wet meadow is present on low floodplains, alkali meadow is prominent on higher floodplains and low terraces, and alkali shrubs occur on higher river terraces. Riparian/wetland habitat is limited to patches of emergent marsh vegetation and scattered willows. Herbaceous wetlands are also present in the vicinity of Drew Slough, bordering Twin Lakes, and around a spring north of Upper Twin Lake.

An isolated spring (BLK 133) occurs along the Owens Valley Fault, just north of Upper Twin Lake. Open water, tule marsh, riparian shrub, wet meadow, and alkali meadow vegetation comprise about 96 acres in the vicinity of the spring. Flow from the spring does not reach the river. No adverse effects to the spring areas occur under current livestock management; therefore, no protective fencing is required.

<u>Grazing Management</u>

A major management change includes the establishment of a large riparian pasture (1,700 acres), which includes 4.7 miles of new fence and four new cattle guards will be required to create the new pasture. An existing rare plant exclosure for Nevada oryctes (*Oryctes nevadensis*) will also be reconstructed, requiring 0.25 mile of new fence.

The new Blackrock Riparian Pasture will protect 6.1 miles of the Owens River and associated riparian habitats. This pasture can be grazed until mid-May. Under the Blackrock Waterfowl Habitat Management Plan, the Drew Slough Unit will occasionally be flooded and managed as waterfowl and shorebird habitat. A temporary loss of grazing area will occur because of flooding. This forage reduction may be offset by surrounding increased forage production due to increased water availability.

Cows with calves can enter the Blackrock Pasture in two batches. The first batch can enter the Blackrock Pasture on November 1 and graze until March 31. A second batch can enter the pasture on January 1 and graze until March 31. The entire herd can then be moved to the Blackrock Riparian Pasture on April 1 and graze until May 15. The lessee does not contemplate any problems getting livestock to cross the river under regular flows, as the herd is accustomed to crossing rivers.

The Owens River supplies stock-water in the Blackrock Riparian pasture. Two water gaps, one in the north part of Section 25 and another in the middle of Section 31, combined with Drew Slough, Twin Lakes, and the spring, will supply adequate stock-water for the Blackrock Pasture. No additional stock-water sources are being considered at this time.

LADWP will build 4.7 miles of new fence to create the Blackrock Riparian Pasture. The fence will be located mainly along the west side of the Owens River, aligned with an existing road between the electric power line and the river. Four cattle guards and two gates will be installed along this fence. Three fence crossings over the Owens River will be constructed to be compatible with the 200 cfs seasonal flow releases. The fence around the rare plant exclosure (0.6 mile) is in poor condition and will be rebuilt by LADWP. The non-functional existing east-west cross-fence (1.7 miles) north of the exclosure will be removed by LADWP.

Bottom lands along the Owens River in this lease are important to elk. Specially designed “elk friendly” fence sections will be built across major known elk trails within the lease.

3.4.47 U-BAR RANCH LIVESTOCK GRAZING LEASE (RLI-402)

This lease (404 acres) lies south of Bishop, east of U.S. Highway 395, and is owned and managed by Alice J., Roy, and Beverly Boothe. Cow/calf pairs and bulls graze the lease. One hundred sixty seven acres of irrigated pasture (all Type E designated vegetation land) occur on the lease. These pastures include the Highway, Upper Middle, Lower Middle, Upper North 40, Lower North 40, and Bull. All pastures scored greater than 80 percent condition.

No riparian habitat, wetlands, seeps, springs, or any known special status wildlife species occur on the lease.

<u>Grazing Management</u>

In the past, lessees grazed their livestock on U.S. Bureau of Indian Affairs lands March through September. In the future, all lease livestock will graze private lands in the Benton area March through May.

All irrigated pastures assessed in 2004 scored greater than 80 percent. No grazing management issues were identified. Therefore, future livestock grazing methods will be much the same as present grazing methods.

Cow/calf pairs can graze the lease year-around, except March through May. Cows will graze using the “Best Pasture Rotation.” Cow/calf pairs will graze the Highway, South, Upper Middle, Lower Middle, Upper North 40, Lower North 40, Upper Old Alfalfa, and Lower Old Alfalfa Pastures June through February. Grazing timing and animal movement will be determined by the lessees. Horses can graze the Horse Pasture October through June. Bulls can graze the Bull Pasture October through January.

Livestock water is supplied via irrigation ditches to all irrigated pastures. Stock-water is adequate in all pastures. No new stock-water facilities will be developed at this time. Livestock management fences are all in good condition.

3.4.48 WARM SPRINGS LIVESTOCK GRAZING LEASE (RLI-497)

This lease is held by the Giacomini Trust and managed by Gary and Alonna Giacomini. Prior to 2002, this lease was part of another lease owned and operated by Lorenzo Iturriria. The lease is used to support a commercial cow/calf operation. The Giacomini Family also has a partnership with the Cashbaugh Livestock Leases; however, this Warm Springs Lease is managed separately and the only things shared are corrals and employees.

Since acquiring the lease, the lessees have tested different grazing “rotation strategies” to determine which worked best. The grazing plan developed by the lessees, with minor modification, will be used for the final plan. Future modifications will be made as needed.

Riparian/wetland lands are associated with the Owens River and the Buckley, Duck, and Rawson Ponds. No grazing management changes are recommended for these areas. Riparian and upland utilization standards will be applicable. Type E designated vegetation land comprises 492 acres. Artesian wells near the Owens River are the only spring-like habitat on the lease.

The current status of the Southwestern Willow Flycatcher on the lease is not known. Livestock grazing will not occur along the river riparian habitat during the flycatcher breeding and nesting season (May 1 to 0ctober 1). Habitat improvements from future river flows and improved livestock management will enhance habitat for this species.

The Beacon Curve Revegetation E/M Project (12 acres) occurs on the lease. This area raised alfalfa until 1968, when alfalfa production ceased. The area was identified as a re-vegetation site attributable to abandonment of agriculture in the 1991 Environmental Impact Report (EIR). The site was fenced to eliminate livestock grazing in 1999. The goal is to re-vegetate this site with native plants.

Grazing Management

Most lease cattle spend the summer in Long Valley off the lease. Cattle typically return to the lease the first week of November. Calves are weaned mid-September, while still in the Long Valley area, and shipped to a buyer.

No issues were found with current grazing management. Therefore, future livestock grazing management will be conducted much the same as present grazing management. Cows can be placed in different pastures depending on when these cows are expected to calve. Between November 1 and November 15, cows can be placed in the Watterson Tract North Pasture. Cows can calve in this pasture until January 15. Cow/calf pairs can be placed in the Watterson Tract South Pasture, and will be fed 10-20 pounds of hay per day per pair until April 15. Cattle can then be moved back to the Watterson Tract North Pasture after the start of irrigation season on April 1. They can stay in this pasture until May 1, when they return to Long Valley.

November 1 through November 15, cows can be placed in the River Field. Between January 1 and January 15, cows from the Watterson Tract North Pasture can also be added to the River Field. Gates between the Watterson Tract North Pasture and the River Field will be left open. Cows graze mainly in the Watterson Tract North Pasture because of better forage conditions. Beginning March 1, until spring “green up” (usually early April), cows will be fed hay in the Watterson Tract North Pasture. After “green up,” cows can be moved to the River Field for 30 to 60 days, and then moved to the North Watterson Pasture between May 1 and June 1. These cows can stay in the North Pasture until July 1, when they are shipped to Long Valley.

Remaining cows can be moved to the Alfalfa and Old Alfalfa Fields. Cows with first calf heifers can be separated and put in the Calving Field on November 15. Replacement heifers will be fed hay December 1 through April 1. Heifers can be calved in Calving Field and on January 1, put in with the rest of the cows in the Alfalfa Fields. The “pairs” will be fed 20 pounds of hay per day per pair until April 1 through April 15. The “pairs” usually go to Long Valley by May 1. The Beacon Field is presently in nonuse and has been since 1999. This field was identified in the EIR as an area to be re-vegetated due to abandonment of agriculture.

All irrigated pastures, with exception of the Alfalfa Pasture, were assessed in 2004 and all scored greater than 80 percent. The Alfalfa Pasture only scored 64 percent because large quantities of alfalfa still grow in the pasture. The lessee is aware of this problem and is working to improve pasture condition. No grazing management changes are recommended for any irrigated pasture at this time.

Field assessment found no livestock management concerns for the artesian well habitats along the Owens River. Stock will be fed supplements, as needed, to keep riparian, uplands, and irrigated pastures in a healthy condition and to help meet plant utilization standards. Springs, irrigation water, and the Owens River supply adequate stock-water to all pastures. Stock-water is supplied via irrigation ditches to all irrigated pastures. The Owens River provides adequate stock-water for the River Pasture. No new stock-water facilities will be developed at this time.

3.4.49 WELLS MEADOW RANCH LIVESTOCK GRAZING LEASE (RLI-465)

This lease (1,041 acres), located on the west edge of Round Valley and north of Bishop, is held by Stanley and Kay Voget, and Don Perea. Don Perea manages the lease as a commercial cow/calf operation. The lease consists of three fields and four corrals on LADWP lands and four fields on adjacent BLM land. No Type E designated vegetation lands, irrigated land, riparian habitat, wetlands, seeps, springs or any known special status wildlife species occur on the lease.

Grazing Management

All lease cattle will be on private property November through April. Lease cows will use a BLM grazing allotment April through August, if stock-water is sufficient. The herd can then enter LADWP lands. The herd can first enter the County Road East field for 20 to 35 days. Cows can then go to Corrals 1, 2, 3, and 4 where they will be fed a full ration of hay. While in the Corrals, cows can have access to Field 2, as gates between the corrals and the field can be left open.

During 2003 and 2004, the only portions of LADWP lands grazed were the Corrals, Field 2, and County Road East Fields. No other LADWP Fields (County Road West) have been used the past seven years, because there was no spring "green up." Stock- water supply is adequate in all pastures and fields. No new stock-water facilities will be developed at this time. All livestock management fences are in good condition.

3.5 Grazing Lease Maps

The following pages contain the lease and ranch plan maps for the OVLMP grazing management leases. Most leases have a lease map (location, extent, acreage, etc.) and a ranch plan map (fencing, gates, physical features, etc.). The maps are organized by RLI# and lease name. These maps were originally developed and exported in a tabloid, or 11x17 size, and have been formatted to fit the letter size pages of this document. The maps represent the graphic output of a large and detailed GIS database.


Legend
Brockman Ranch
RLI-401
Locator Map
Bishop
Independence
Lone Pine
N
0
500
1,000
Feet
372000
373000
374000
4136000
4137000
LINE ST - HWY 168

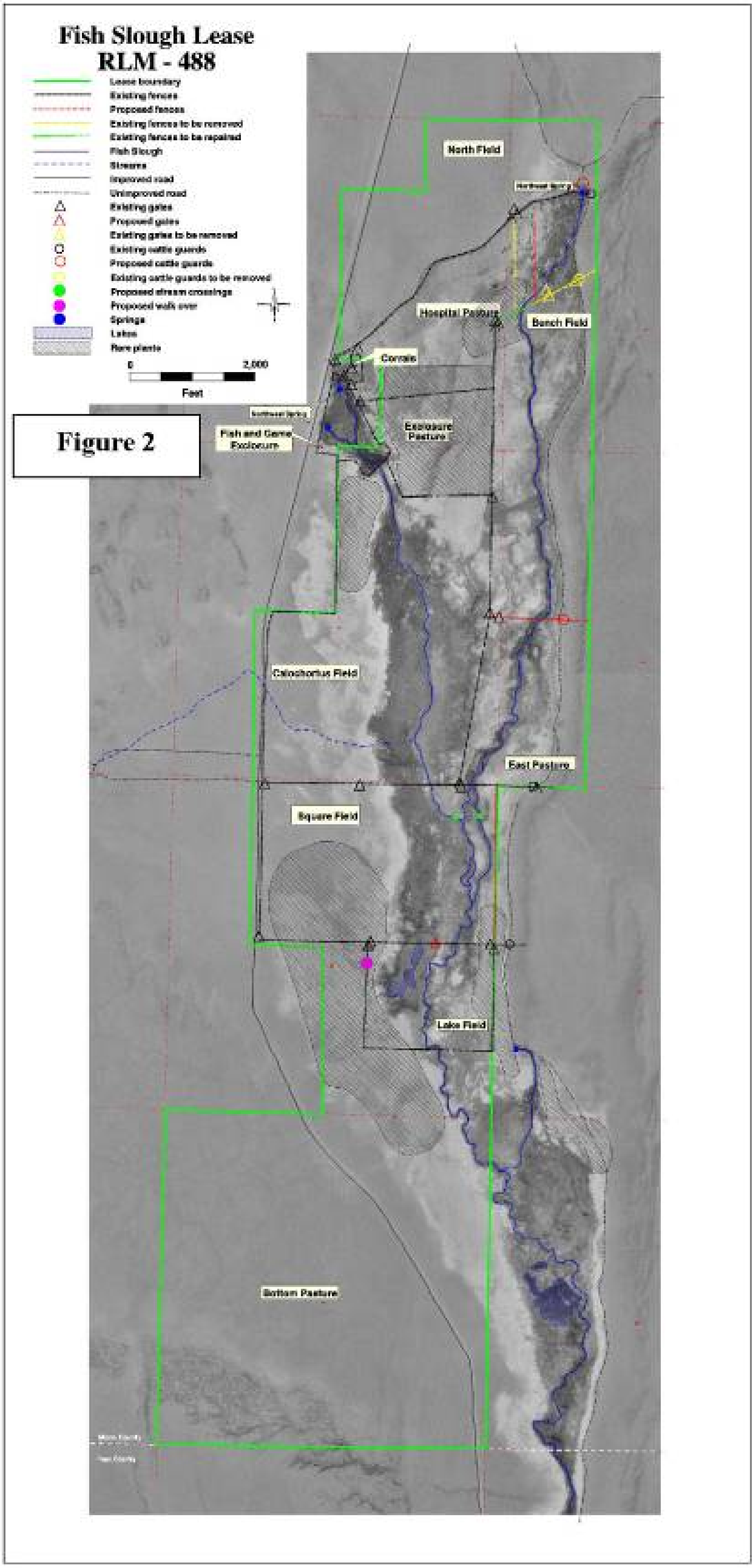
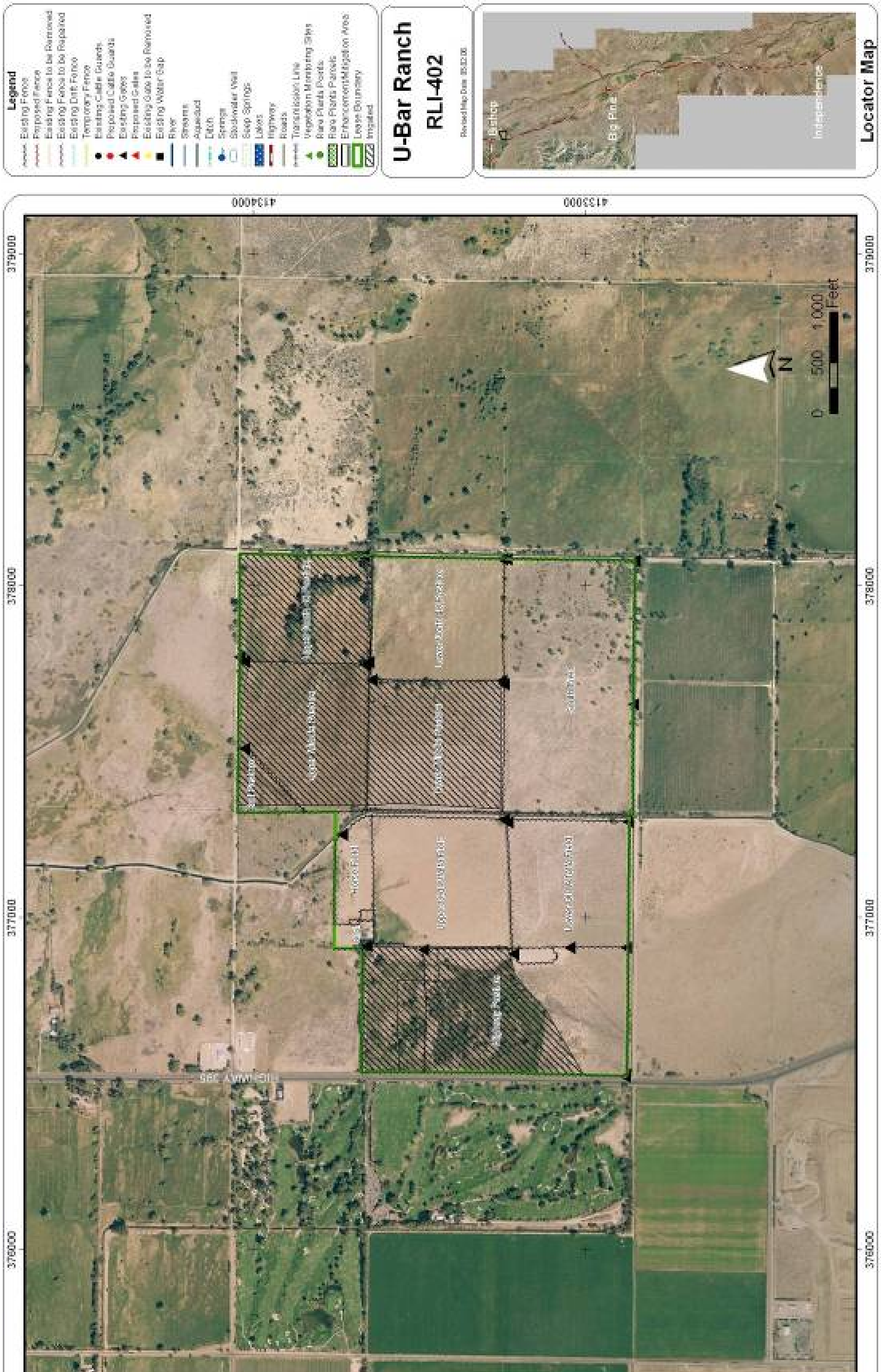
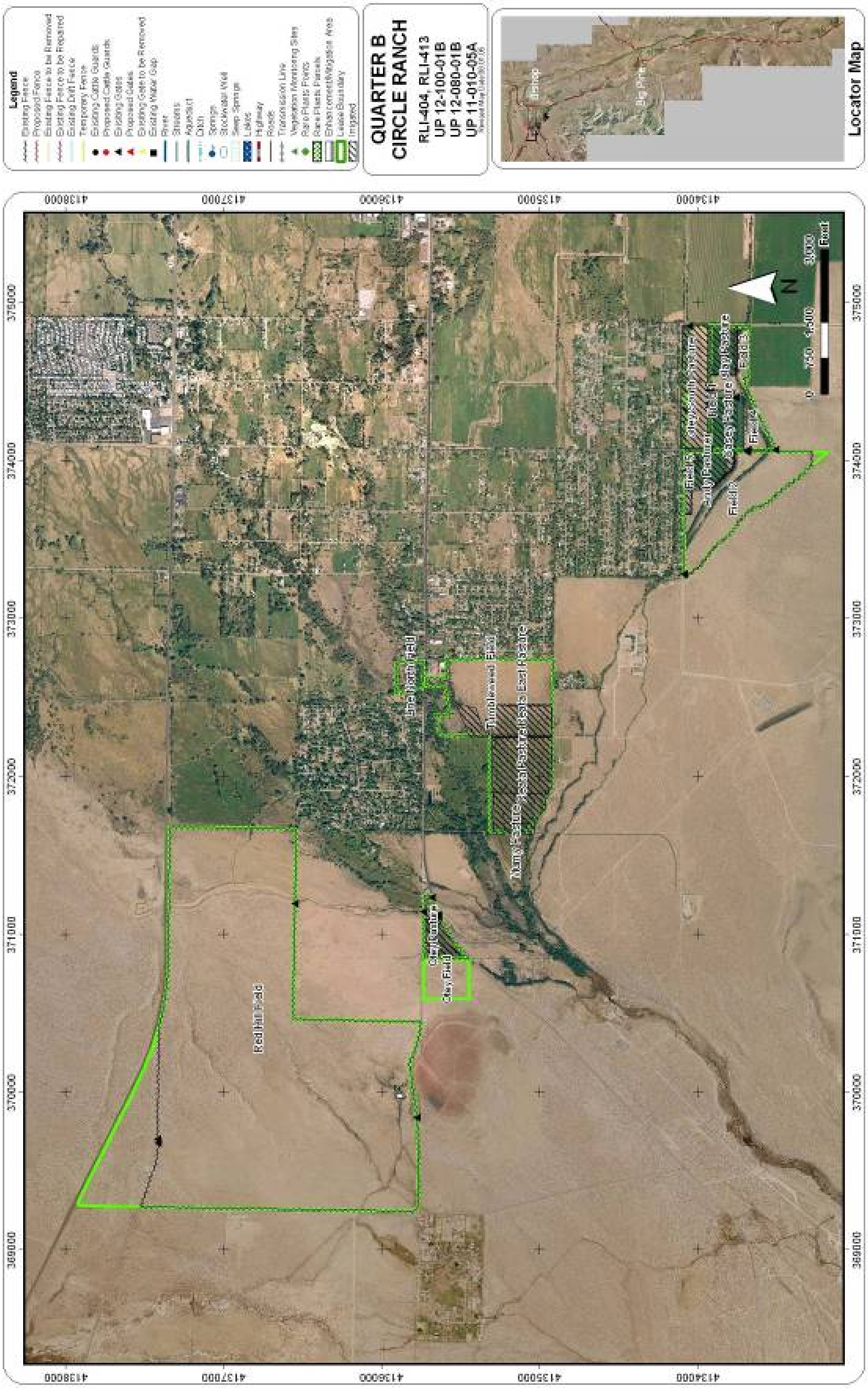

Fish Slough Lease
RLM - 488
Lease boundary
Existing fences
Proposed fences
Existing fences to be removed
Existing fences to be repaired
Fish Slough
Streams
Improved road
Unimproved road
Existing gates
Proposed gates
Existing gates to be removed
Existing cattle guards
Proposed cattle guards
Existing cattle guards to be removed
Proposed stream crossings
Proposed walk over
Springs
Lakes
Rare plants
0
2,000
Feet
North Field
Hospital Pasture
Bench Field
Corrals
Exclosure Pasture
Fish and Game Exclosure
Calochortus Field
East Pasture
Square Field
Lake Field
Bottom Pasture

Figure 2


U-Bar Ranch
RLI-402
Locator Map
Legend
Bishop
Big Pine
Independence
N
0 500 1,000
Feet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Proposed Fence
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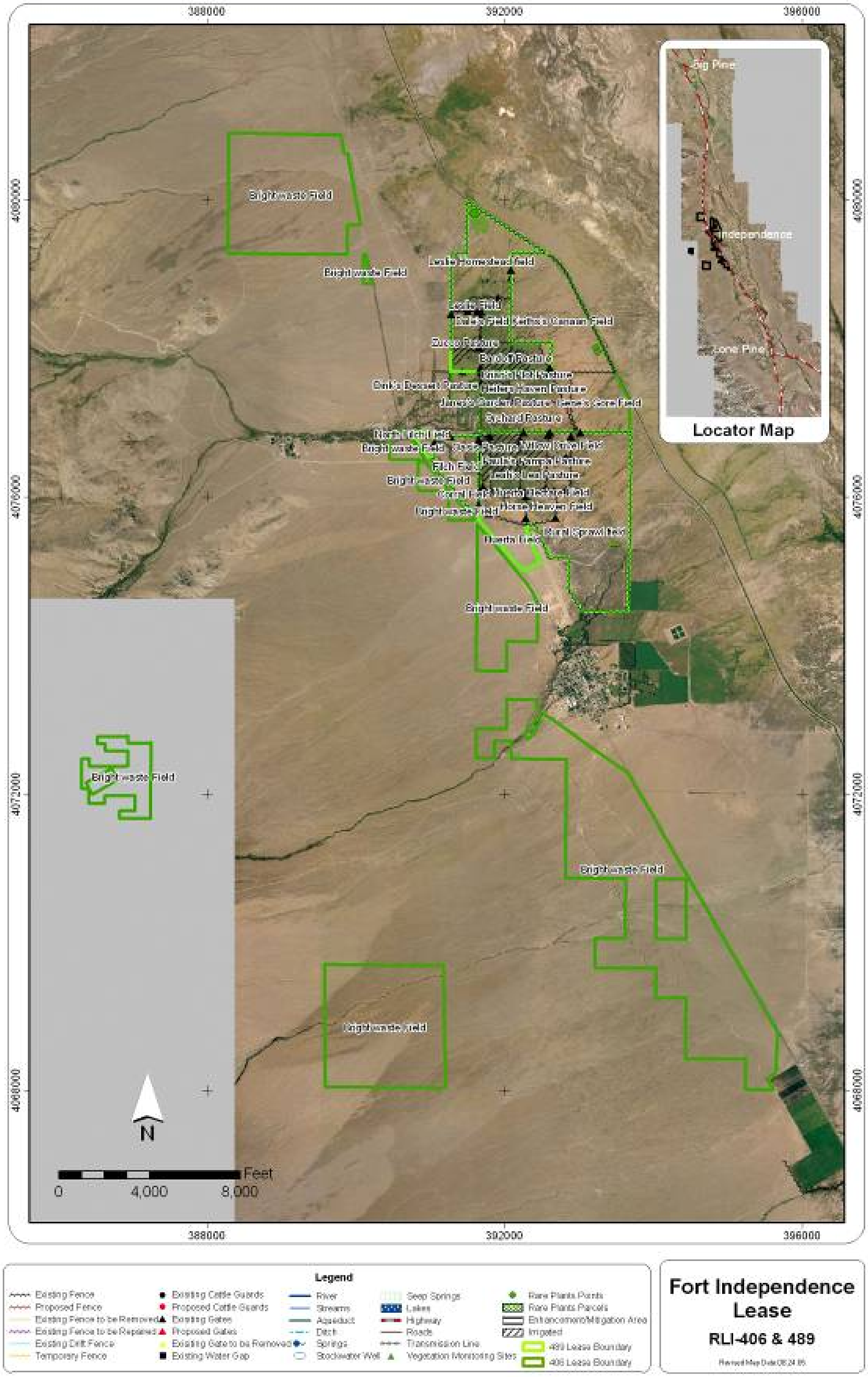
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
QUARTER B
CIRCLE RANCH
RLI-404, RLI-413
UP 12-100-01B
UP 12-080-01B
UP 11-010-05A
Bishop
Big Pine
Locator Map
Red Hill Field
Clay Field
Clay Pasture
Tumbleweed Field
N
0 750 1,500 3,000 Feet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392000
396000
4080000
4076000
4072000
4068000
Brightwaste Field
Leslie Homestead field
Leslie Field
Dirk's Field
Zucco Pasture
Dirk's Dessert Pasture
Orchard Pasture
North Bright field
Fish Field
Corral Field
Horse Heaven Field
Huerta Field
Locator Map
Big Pine
Independence
Lone Pine
N
Feet
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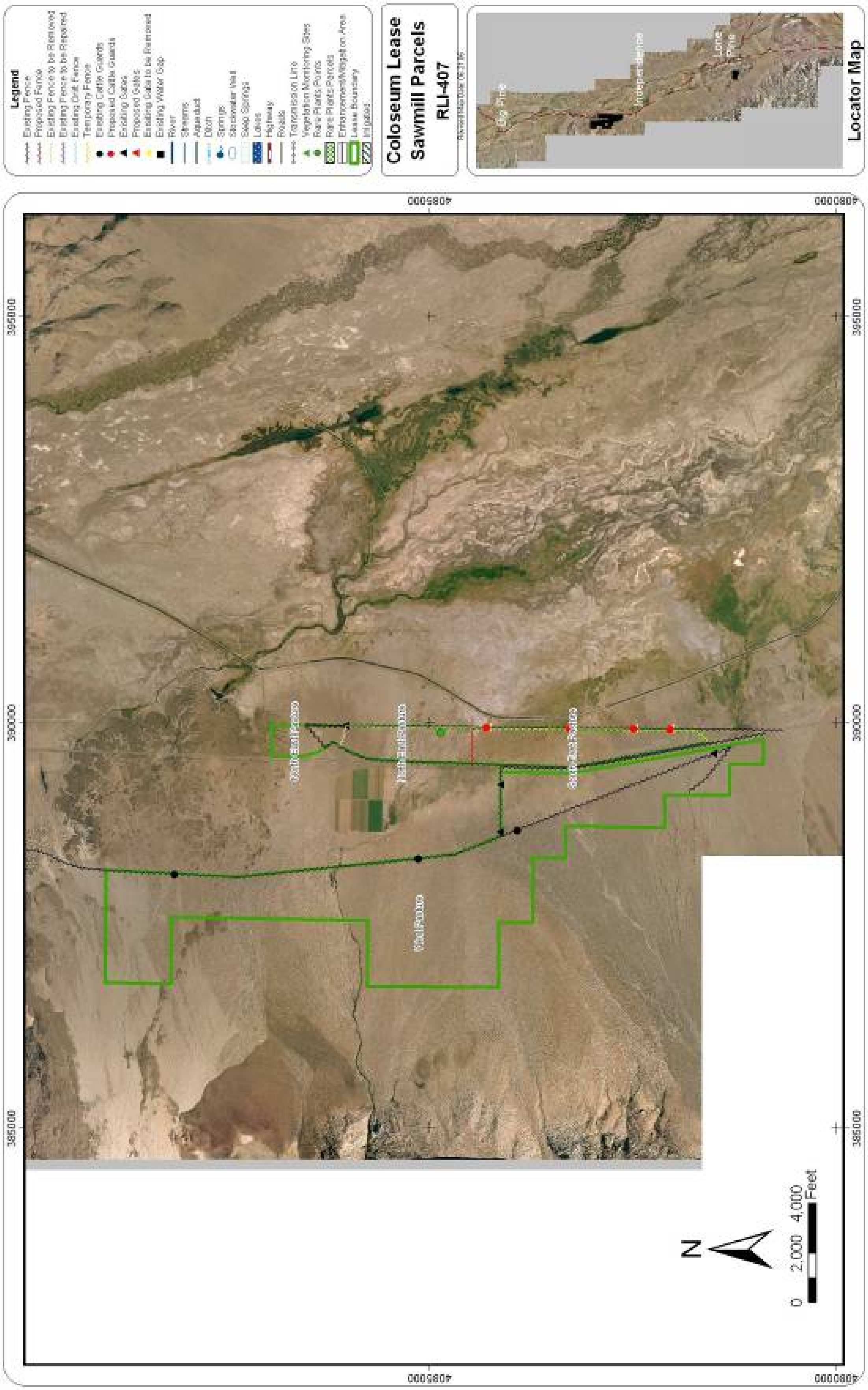
4,000
8,000
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
489 Lease Boundary
406 Lease Boundary
Fort Independence Lease
RLI-406 & 489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Existing Fence to be Repaired
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Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Coloseum Lease
Sawmill Parcels
RLI-407
Locator Map
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Independence
Lone Pine
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4080000
395000
390000
385000
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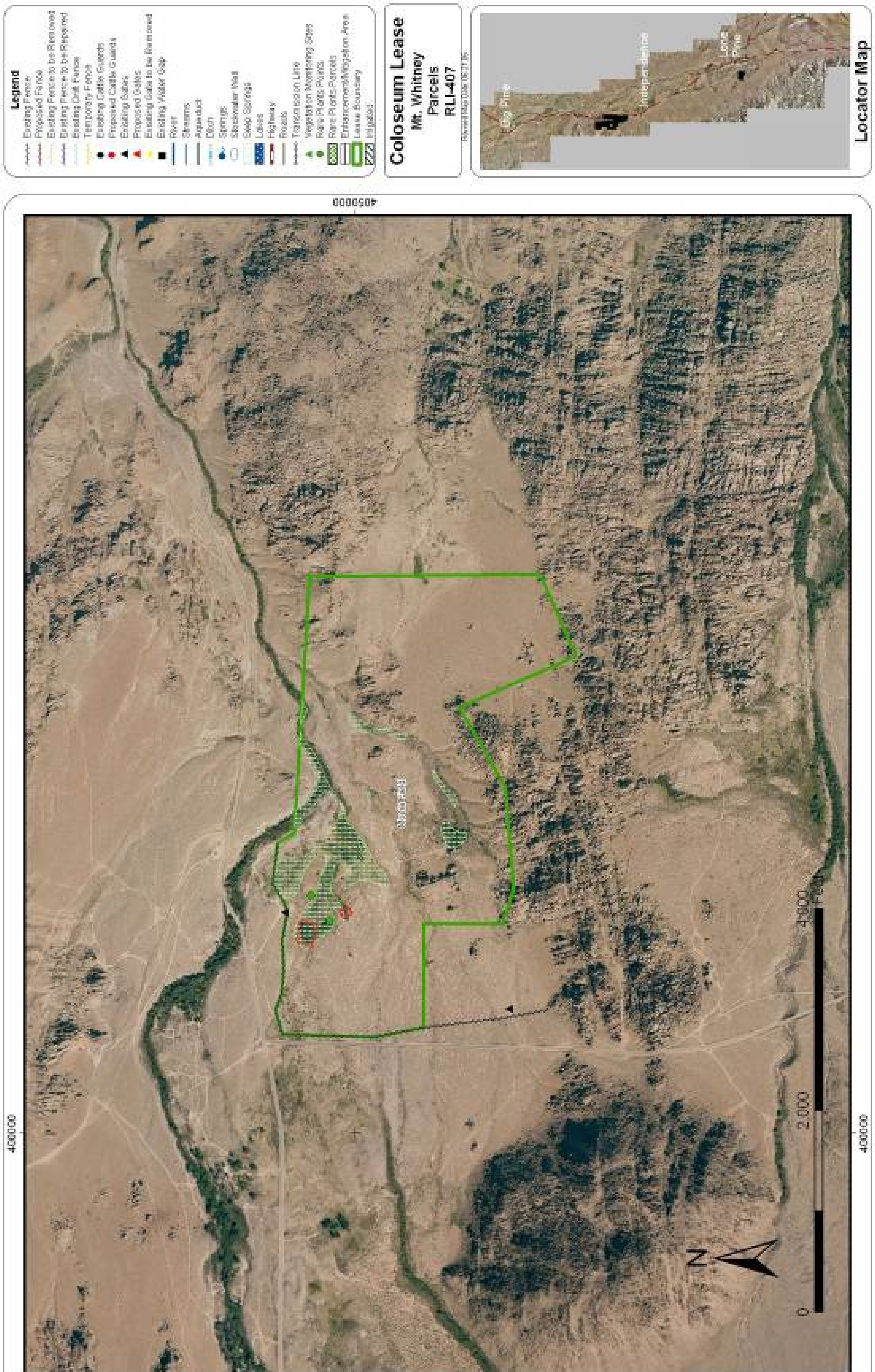
2,000
4,000
Feet
N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Proposed Fence
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Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Coloseum Lease
Mt. Whitney
Parcels
RLI-407
Locator Map
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Independence
Lone Pine
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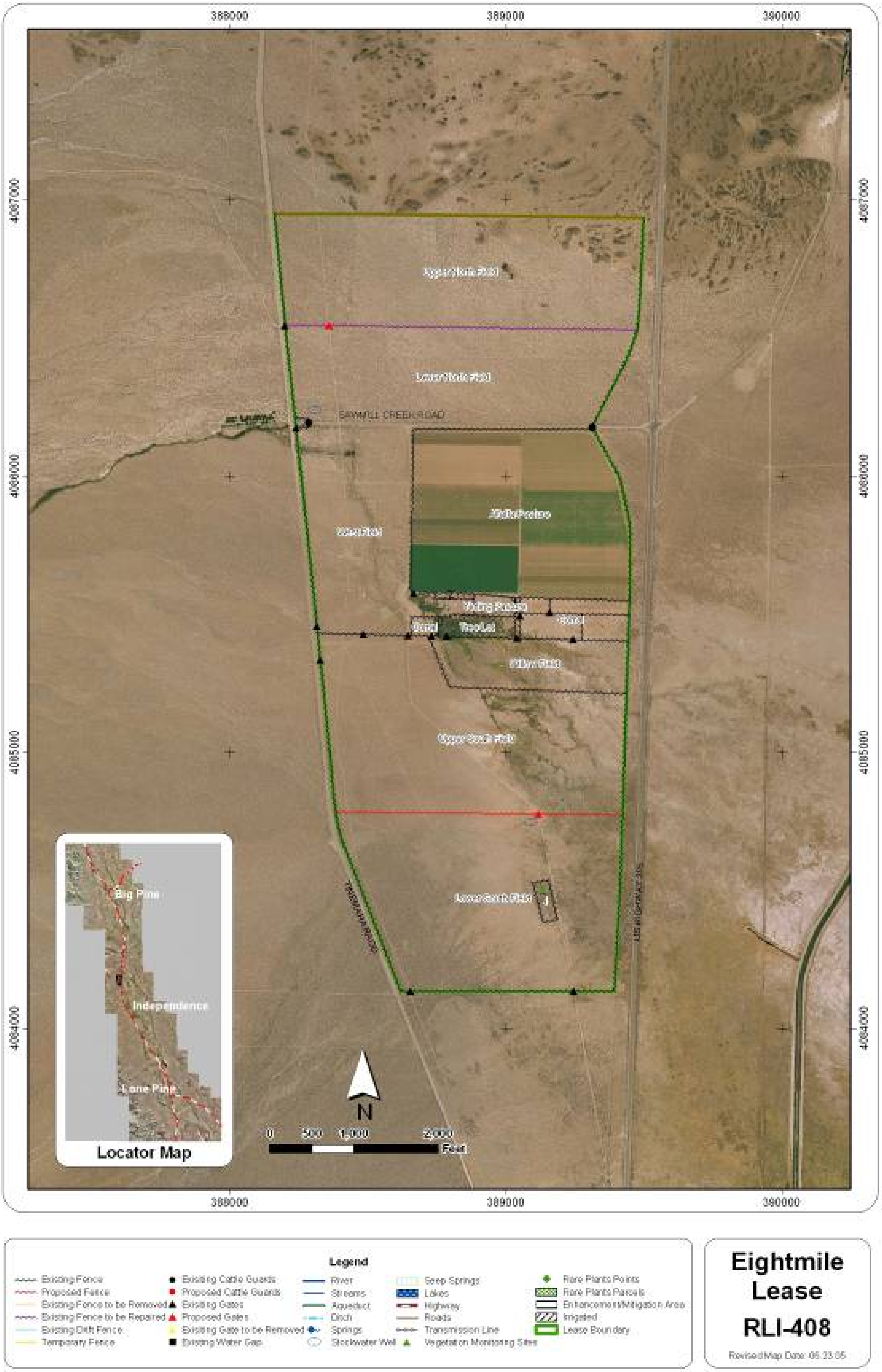
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4084000
SAWMILL CREEK ROAD
Big Pine
Independence
Lone Pine
Locator Map
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0 500 1,000 2,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
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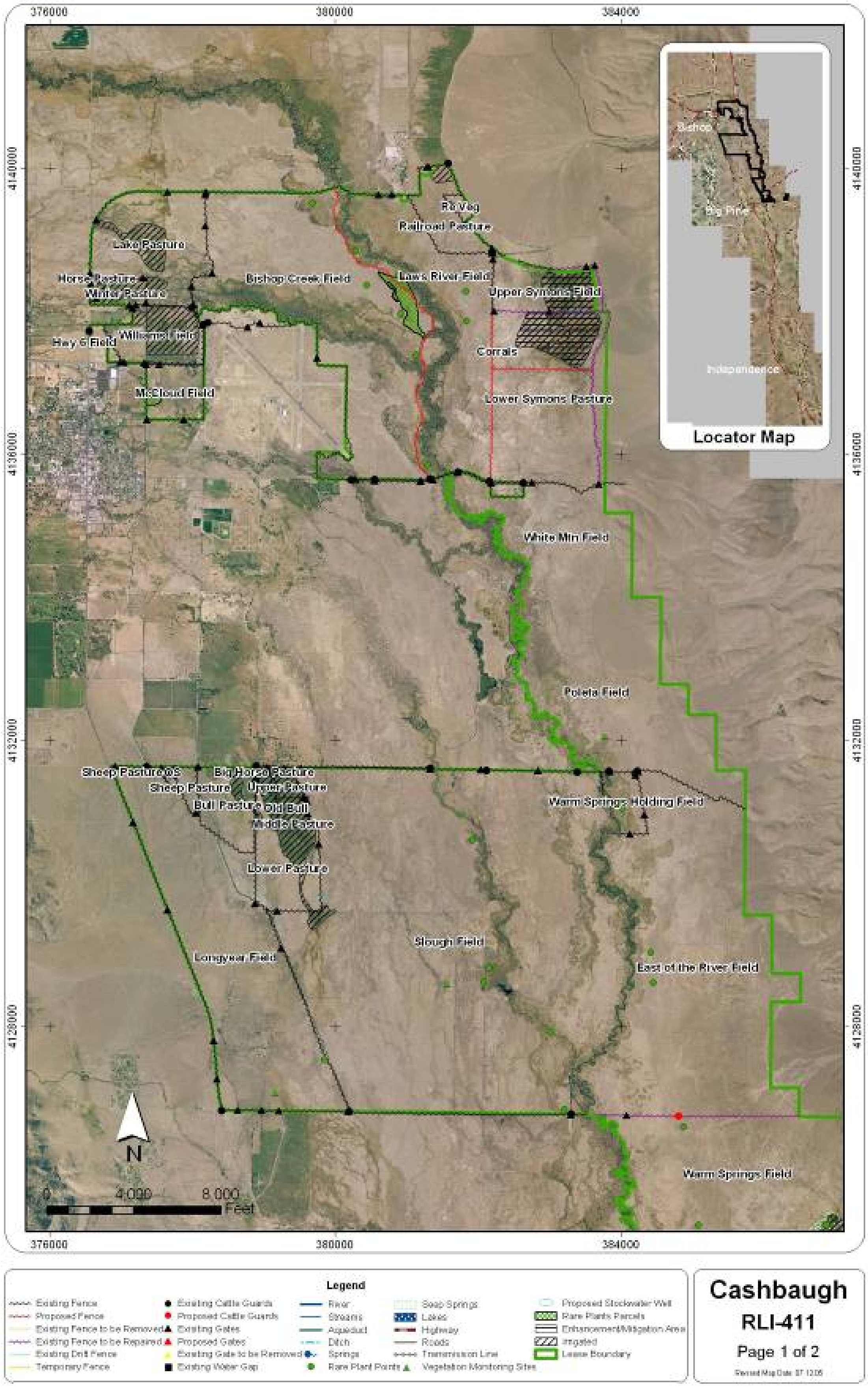
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Eightmile Lease
RLI-408
Revised Map Date 06.23.05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Locator Map
Bishop
Big Pine
Independence
Rb Veg
Railroad Pasture
Lake Pasture
Horse Pasture
Winter Pasture
Bishop Creek Field
Laws River Field
Upper Symons Field
Hay 5 Field
Williams Field
Corrals
McCloud Field
Lower Symons Pasture
White Mtn Field
Poleta Field
Sheep Pasture OS
Big Horse Pasture
Sheep Pasture
Upper Pasture
Bull Pasture
Old Bull
Middle Pasture
Warm Springs Holding Field
Lower Pasture
Slough Field
Longyear Field
East of the River Field
Warm Springs Field
N
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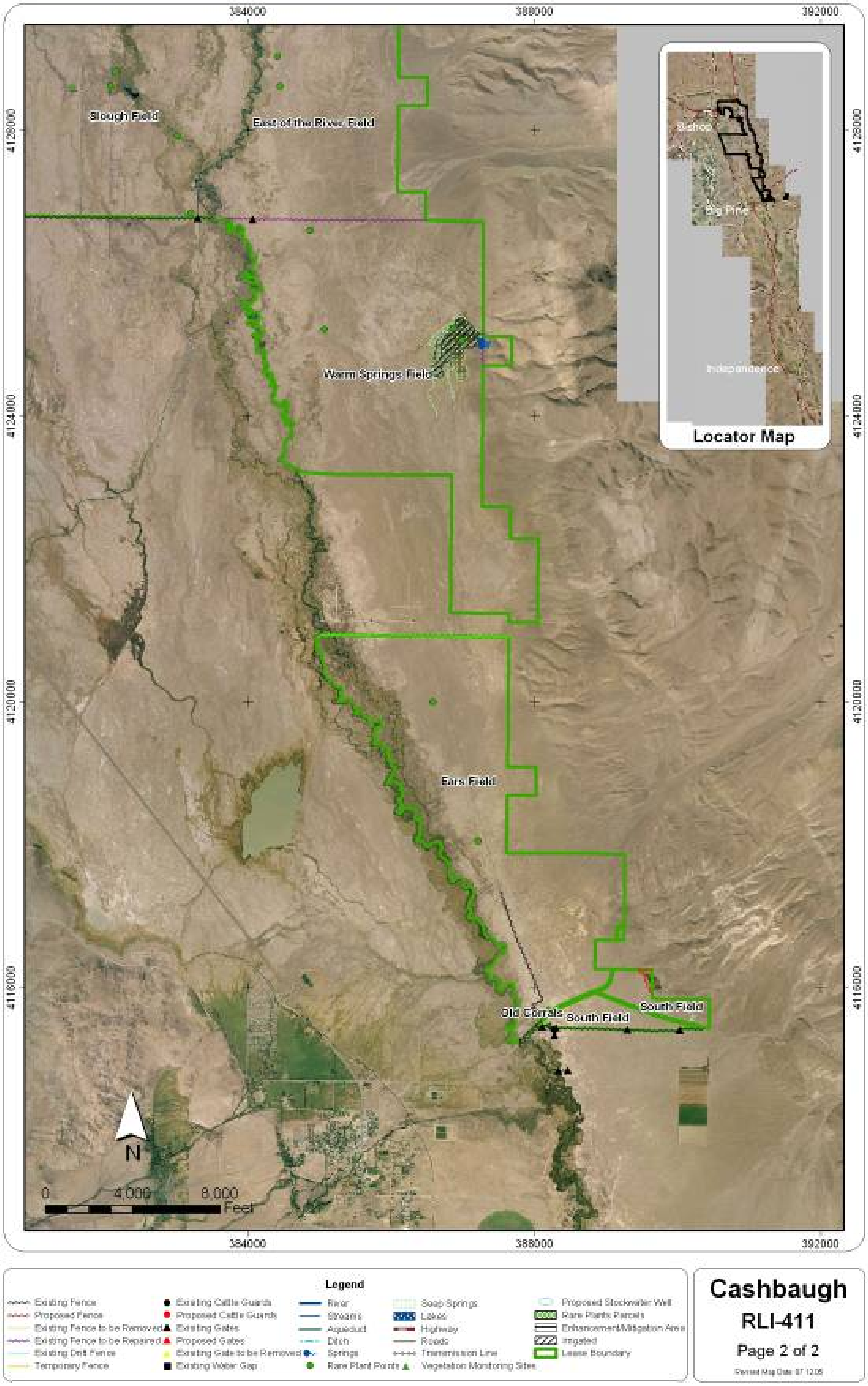
4,000
8,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Rare Plant Points
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Proposed Stockwater Well
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Cashbaugh
RLI-411
Page 1 of 2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4116000
Slough Field
East of the River Field
Warm Springs Field
Ears Field
Old Corrals
South Field
South Field
Bishop
Big Pine
Independence
Locator Map
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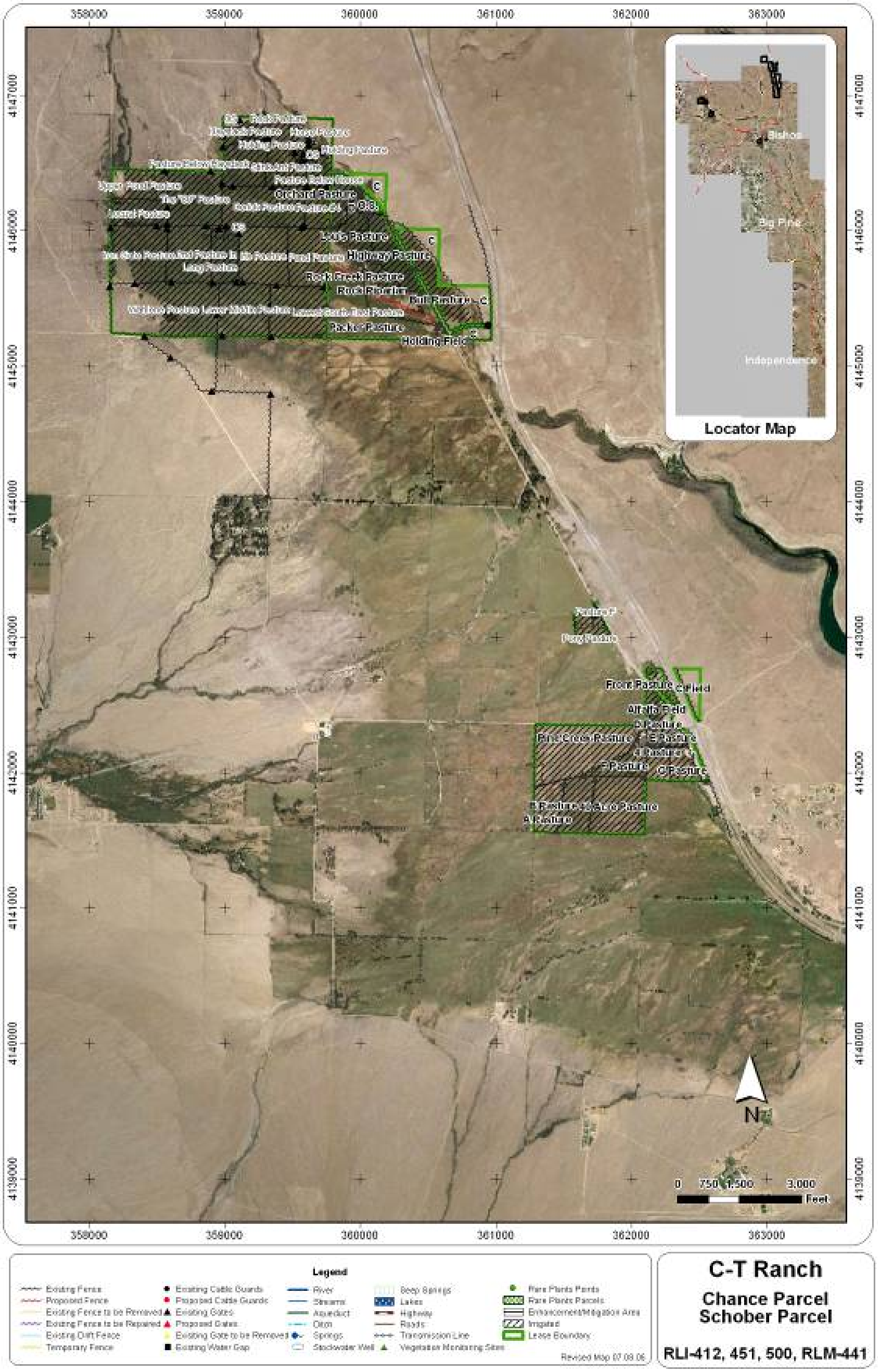
0 4,000 8,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Rare Plant Points
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Proposed Stockwater Well
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Cashbaugh
RLI-411
Page 2 of 2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4143000
4142000
4141000
4140000
4139000
Orchard Pasture
Lou's Pasture
Highway Pasture
Rock Creek Pasture
Bull Pasture
Packer Pasture
Holding Field
Front Pasture
C Field
Alfalfa Field
Pine Creek Pasture
E Pasture
F Pasture
C Pasture
B Pasture
A Pasture
Bishop
Big Pine
Independence
Locator Map
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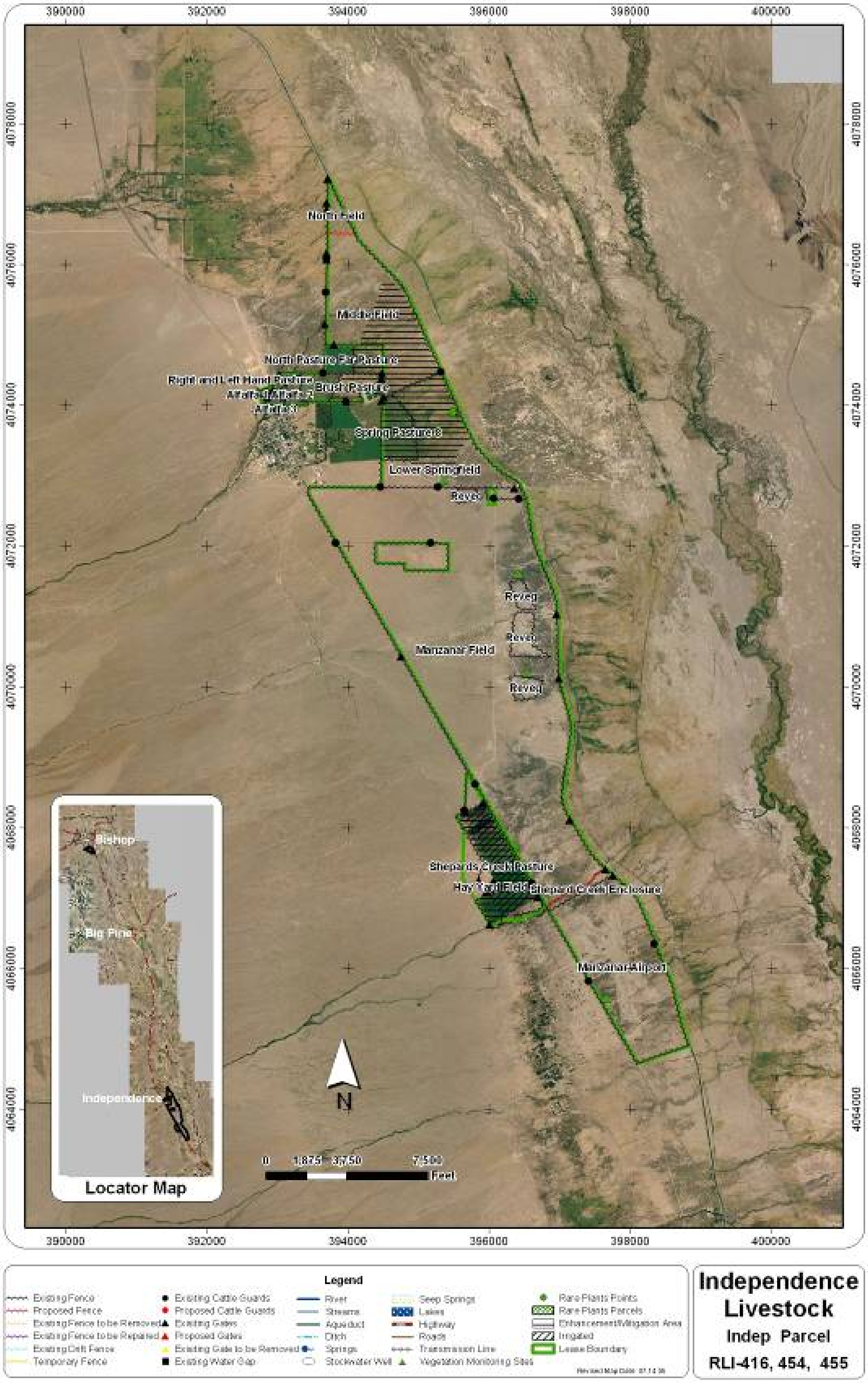
3,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Revised Map 07.08.06
C-T Ranch
Chance Parcel
Schober Parcel
RLI-412, 451, 500, RLM-441


North Field
Middle Field
North Pasture Far Pasture
Right and Left Hand Pasture
Brush Pasture
Alfalfa 1 Alfalfa 2
Alfalfa 3
Spring Pasture 8
Lower Springfield
Reveg
Manzanar Field
Shepards Creek Pasture
Hay Yard Field
Shepard Creek Enclosure
Manzanar Airport
Bishop
Big Pine
Independence
Locator Map
0 1,875 3,750 7,500 Feet
N
390000
392000
394000
396000
398000
400000
4064000
4066000
4068000
4070000
4072000
4074000
4076000
4078000
Legend
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Proposed Fence
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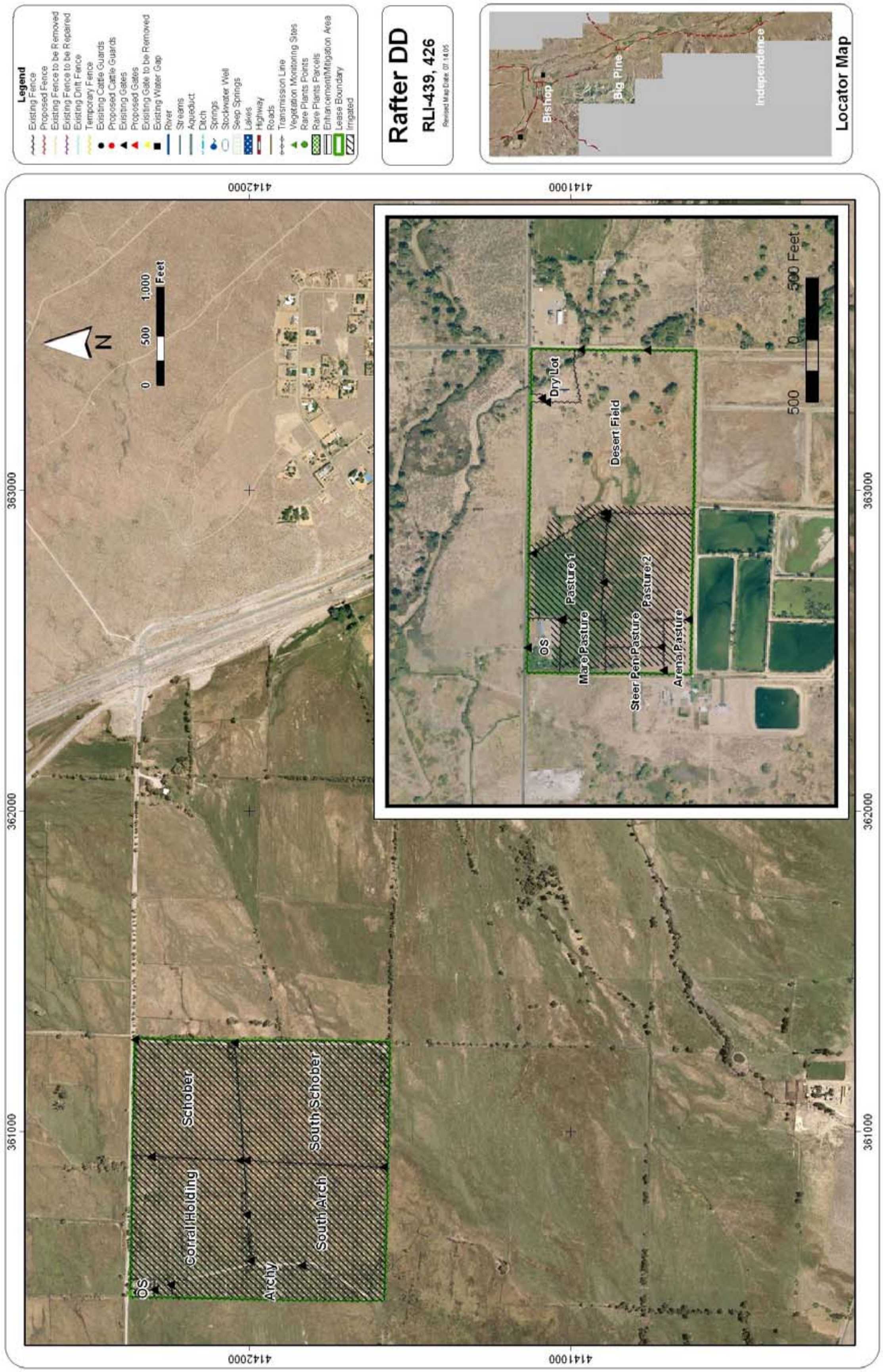
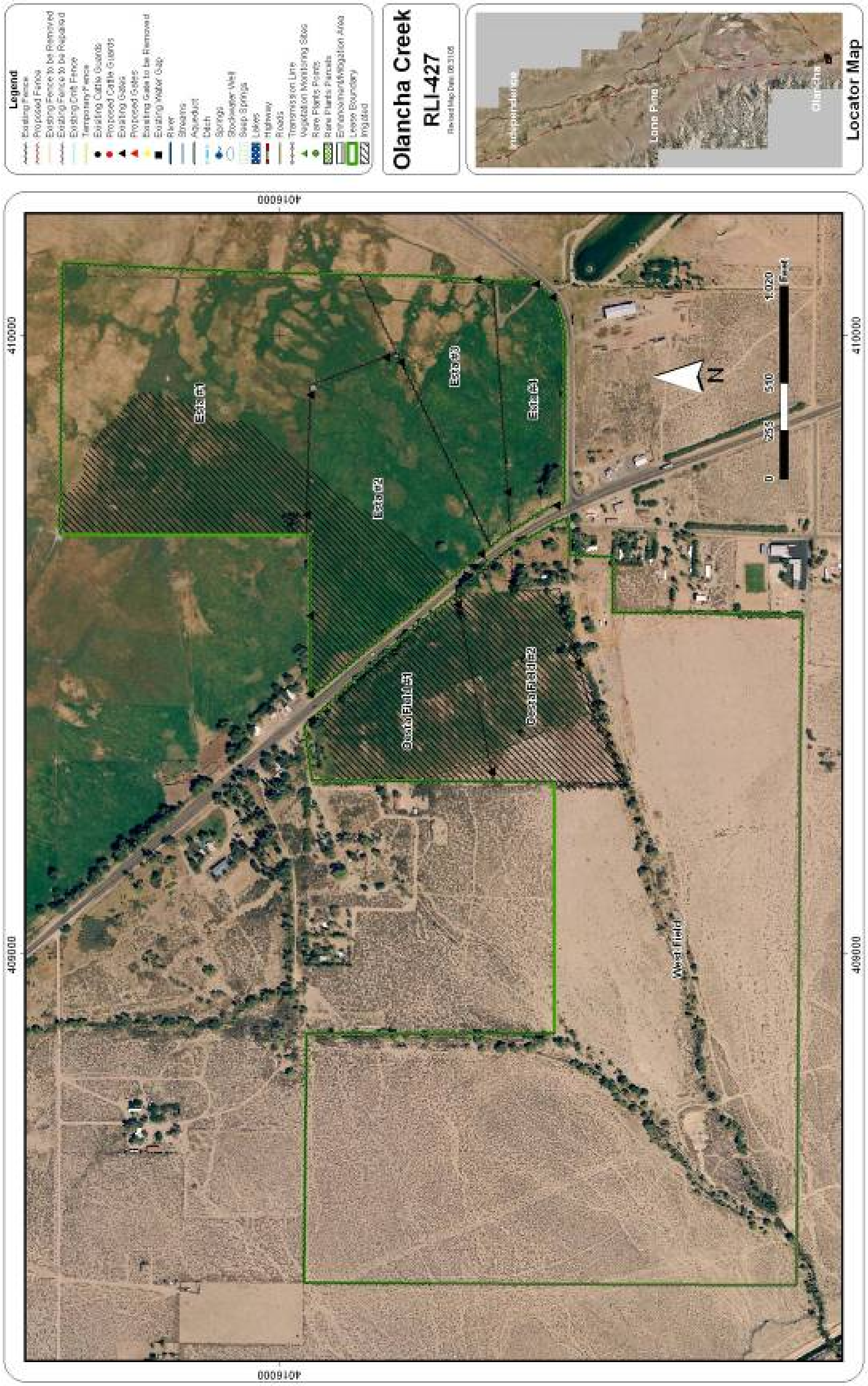
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Independence
Livestock
Indep Parcel
RLI-416, 454, 455


Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Rockin DM
RLI-420
Bishop
Big Pine
Independence
Locator Map
4114000
4113500
385000
384500
384000
Whistler
George
N
0
125
250
500
Feet


Legend
Mandich
RLI-424
Locator Map


Rafter DD
RLI-439, 426
Locator Map
Bishop
Big Pine
Independence
Legend
Schober
South Schober
Corral Holding
South Arch
Archy
OS
Dry Lot
Desert Field
Pasture 1
Pasture 2
Mare Pasture
Steer Pen Pasture
Arena Pasture
363000
362000
361000
4142000
4141000


Legend
Olancha Creek
RLI-427
Locator Map
Independence
Lone Pine
Olancha
West Field
N
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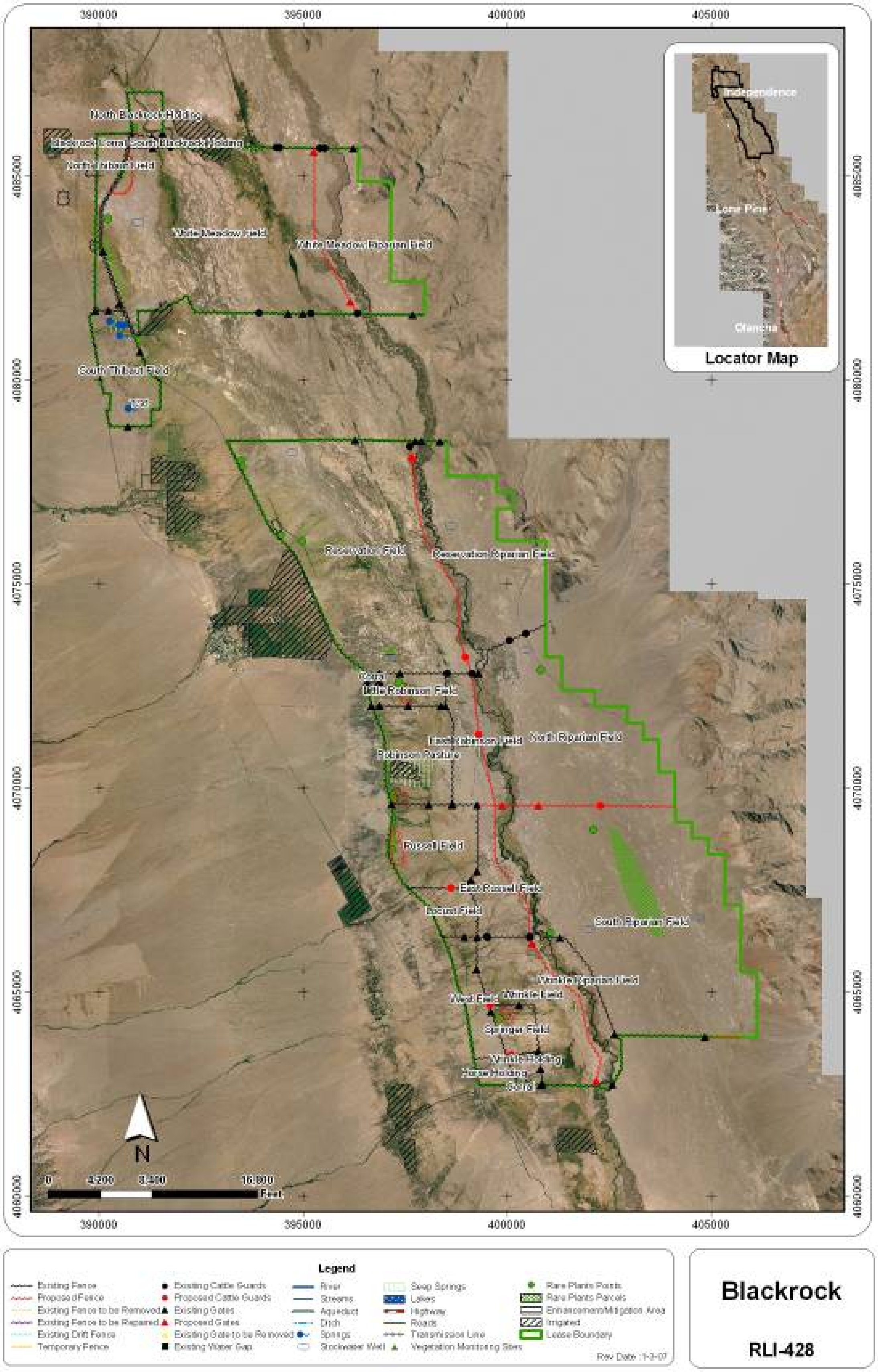
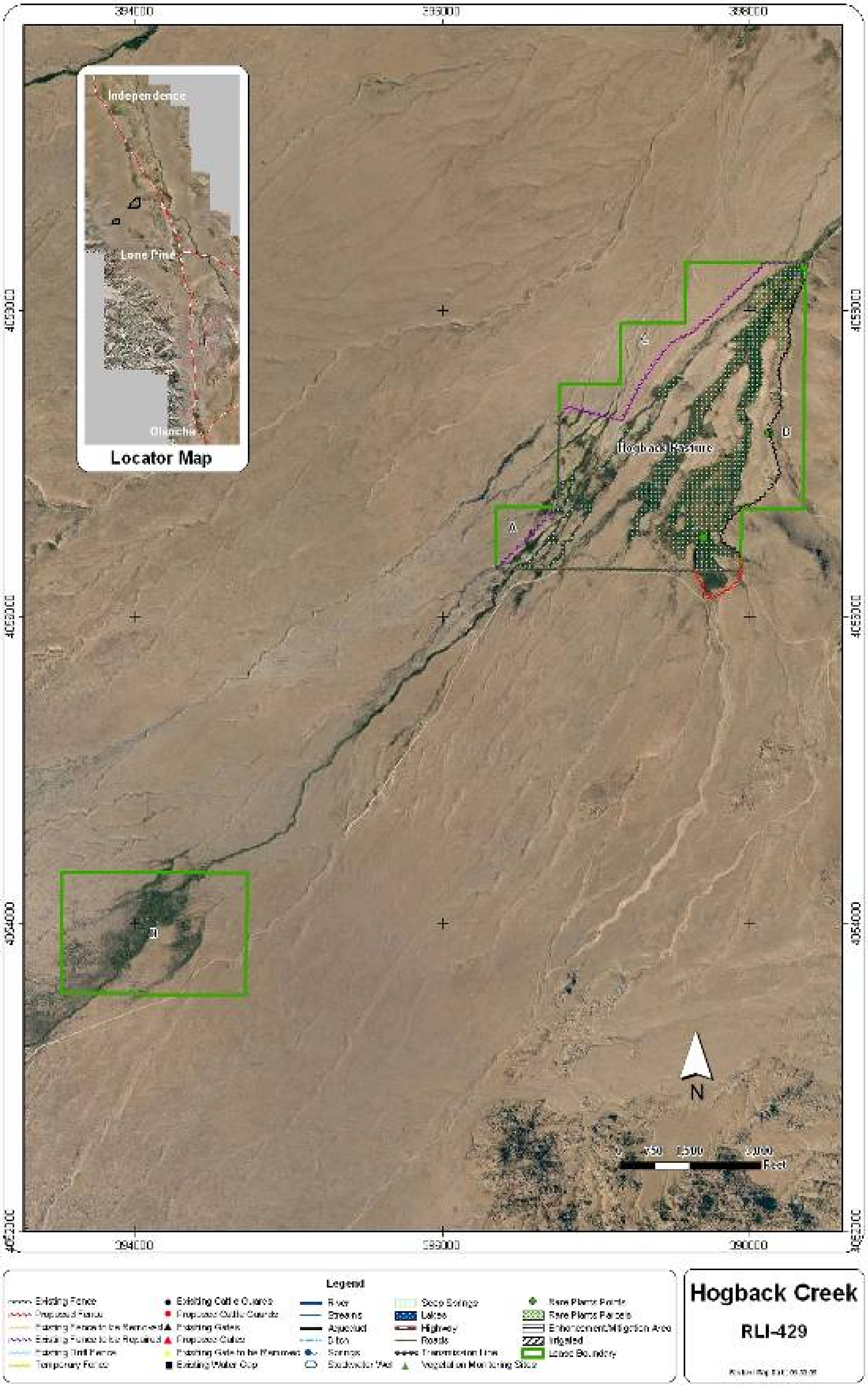
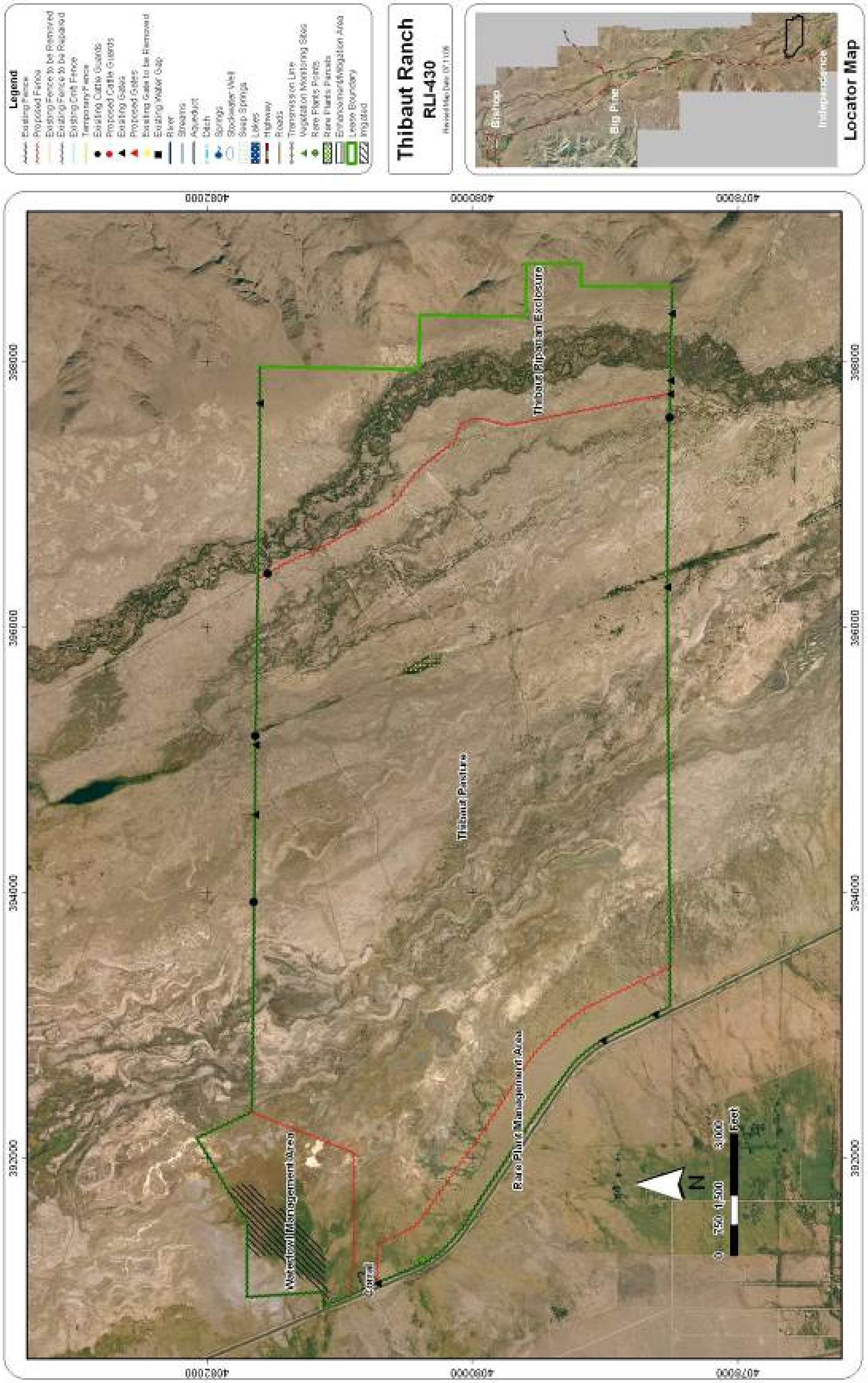
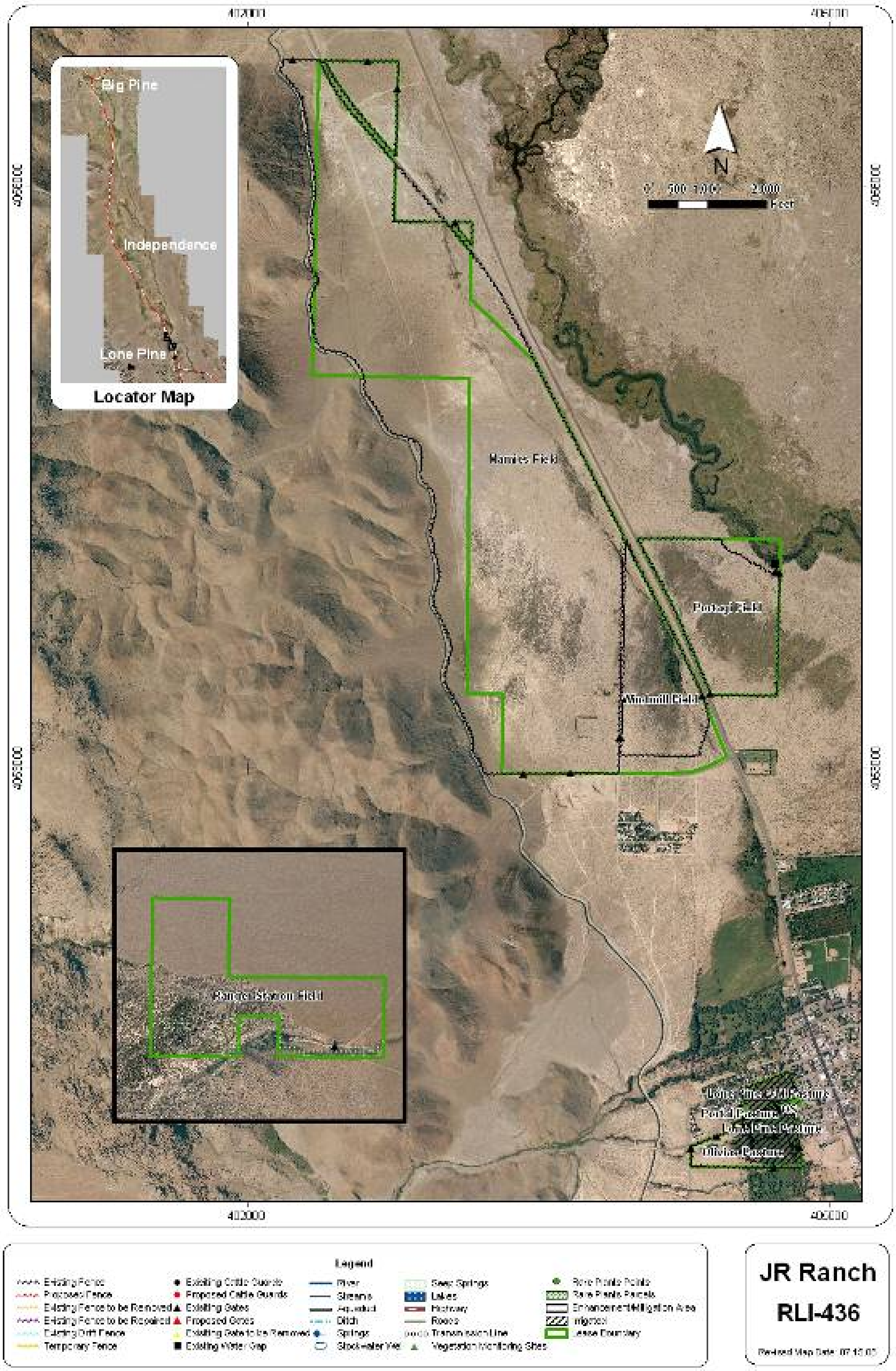
255
510
1,020
Feet
410000
409000
4016000


North Blackrock Holding
Blackrock Corral
South Blackrock Holding
North Thibaut Field
White Meadow Field
White Meadow Riparian Field
South Thibaut Field
Reservation Field
Reservation Riparian Field
Corral
Little Robinson Field
East Robinson Field
North Riparian Field
Robinson Pasture
Russell Field
East Russell Field
Locust Field
South Riparian Field
Winkle Riparian Field
West Field
Winkle Field
Springer Field
Horse Holding
Corral
Locator Map
Independence
Lone Pine
Olancha
N
0
4,200
8,400
16,800
Feet
390000
395000
400000
405000
4060000
4065000
4070000
4075000
4080000
4085000
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Rev Date : 1-3-07
Blackrock
RLI-428


Independence
Lone Pine
Olancha
Locator Map
Hogback Pasture
A
C
D
N
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Water Cup
River
Streams
Aqueduct
Ditch
Springs
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Hogback Creek
RLI-429


Legend
Thibaut Ranch
RLI-430
Locator Map
Thibaut Pasture
Thibaut Riparian Exclosure
Rare Plant Management Area
Waterfowl Management Area


Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
3V Ranch
RLI-435
Bishop
Big Pine
Independence
Locator Map
373000
4137000
N
0 125 250 500 Feet


Big Pine
Independence
Lone Pine
Locator Map
N
Feet
Legend
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Proposed Fence
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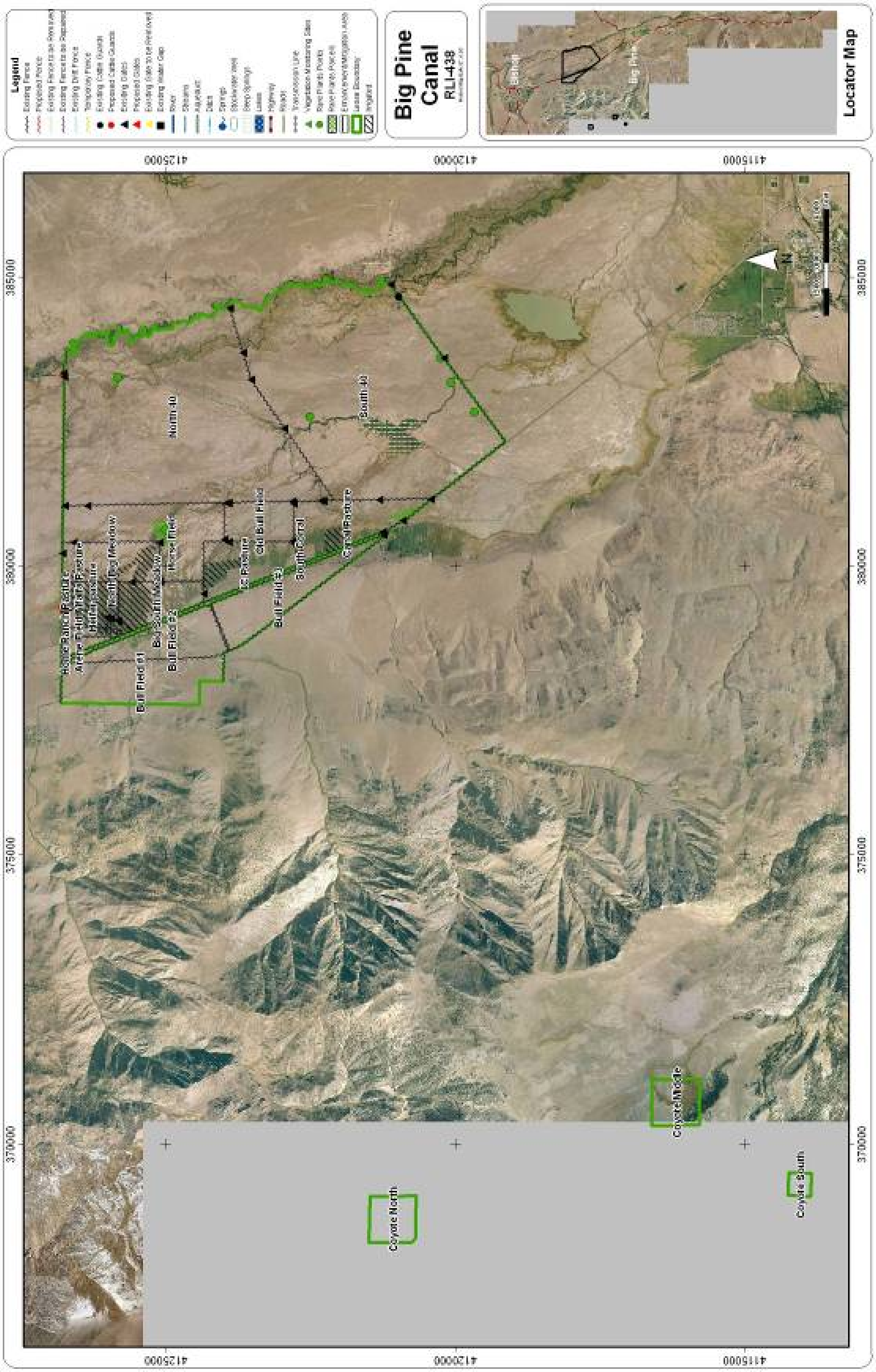
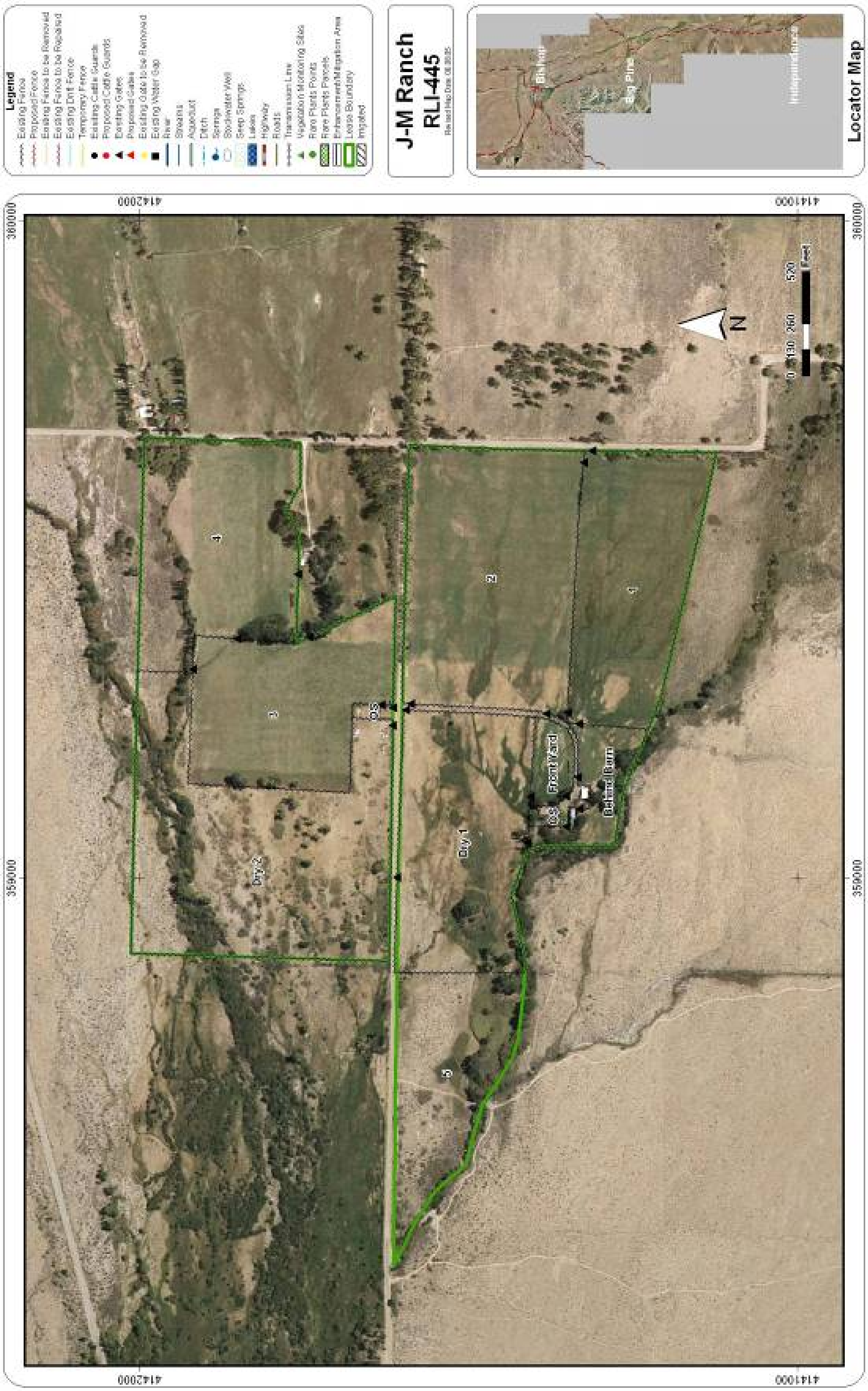
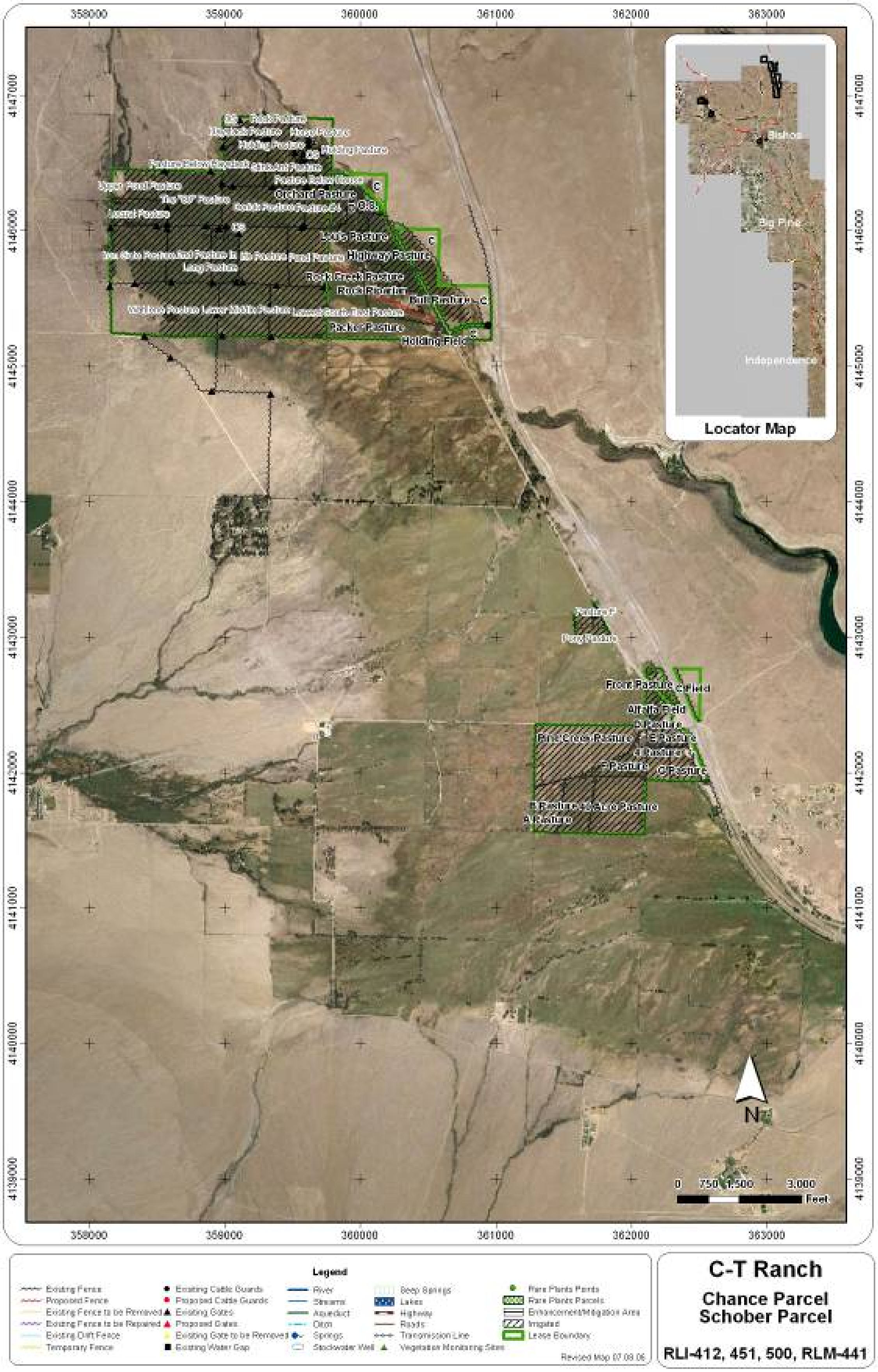
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Water Gap
River
Stream
Aqueduct
Ditch
Springs
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Irrigated
Lease Boundary
JR Ranch
RLI-436


Legend
Big Pine Canal
RLI-438
Locator Map
North 40
South 40
Coyote North
Coyote Middle
Coyote South


Rafter DD
RLI-439, 426
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Locator Map
Bishop
Big Pine
Independence
N
0 500 1,000 Feet
500 0 500 Feet
4142000
4141000
361000
362000
363000
Schober
South Schober
Corral Holding
South Arch
Archy
OS
Dry Lot
Desert Field
Pasture 1
Pasture 2
Mare Pasture
Steer Pen Pasture
Arena Pasture

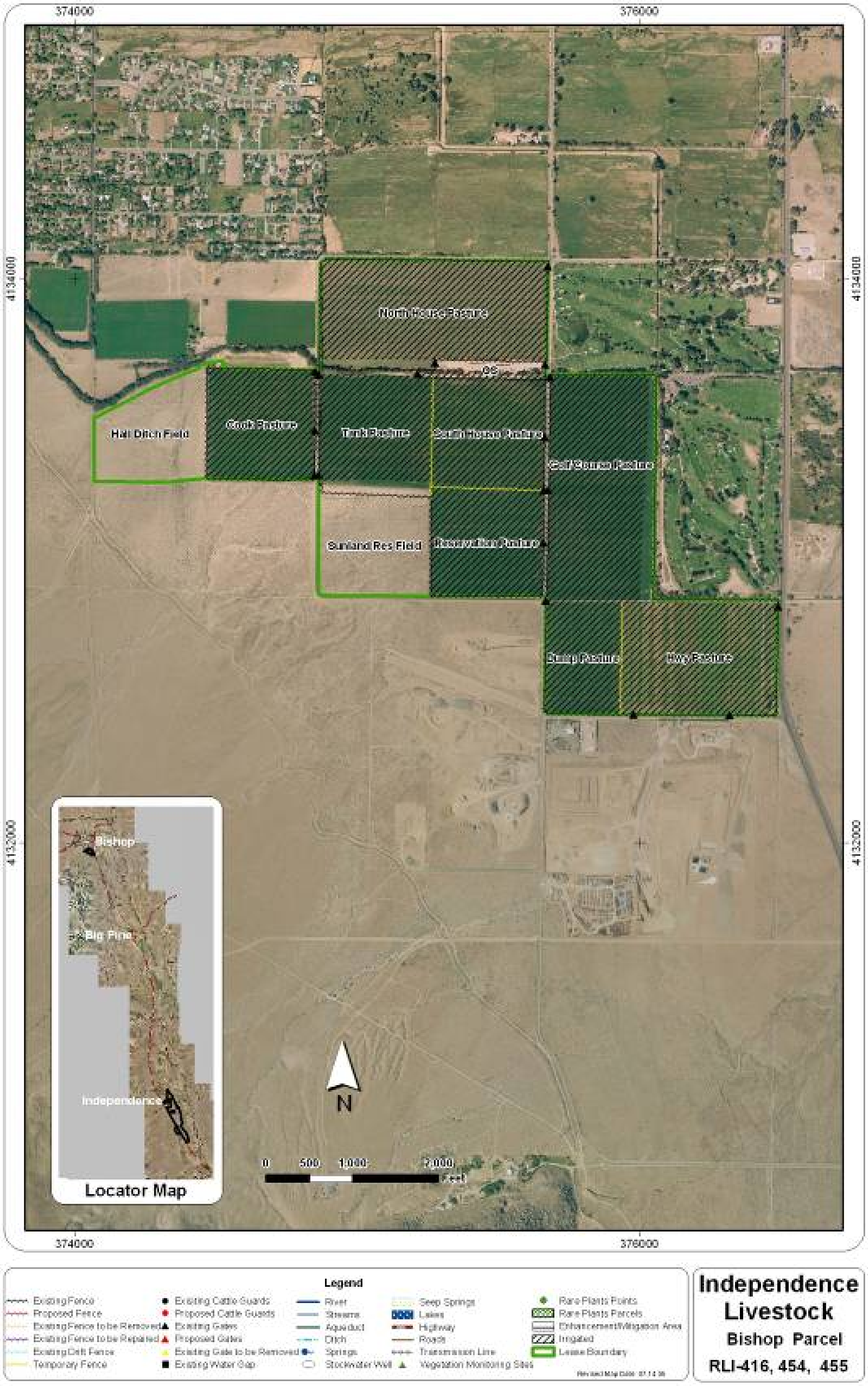

Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
J-M Ranch
RLI-445
Bishop
Big Pine
Independence
Locator Map
4142000
4141000
360000
359000
N
0 130 260 520
Feet
4
2
1
3
Dry 2
Dry 1
Front Yard
Behind Barn
5


358000
359000
360000
361000
362000
363000
4147000
4146000
4145000
4144000
4143000
4142000
4141000
4140000
4139000
Orchard Pasture
Lou's Pasture
Highway Pasture
Rock Creek Pasture
Packer Pasture
Holding Field
Front Pasture
Alfalfa Field
Locator Map
Bishop
Big Pine
Independence
N
0 750 1,500 3,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Revised Map 07.08.06
C-T Ranch
Chance Parcel
Schober Parcel
RLI-412, 451, 500, RLM-441

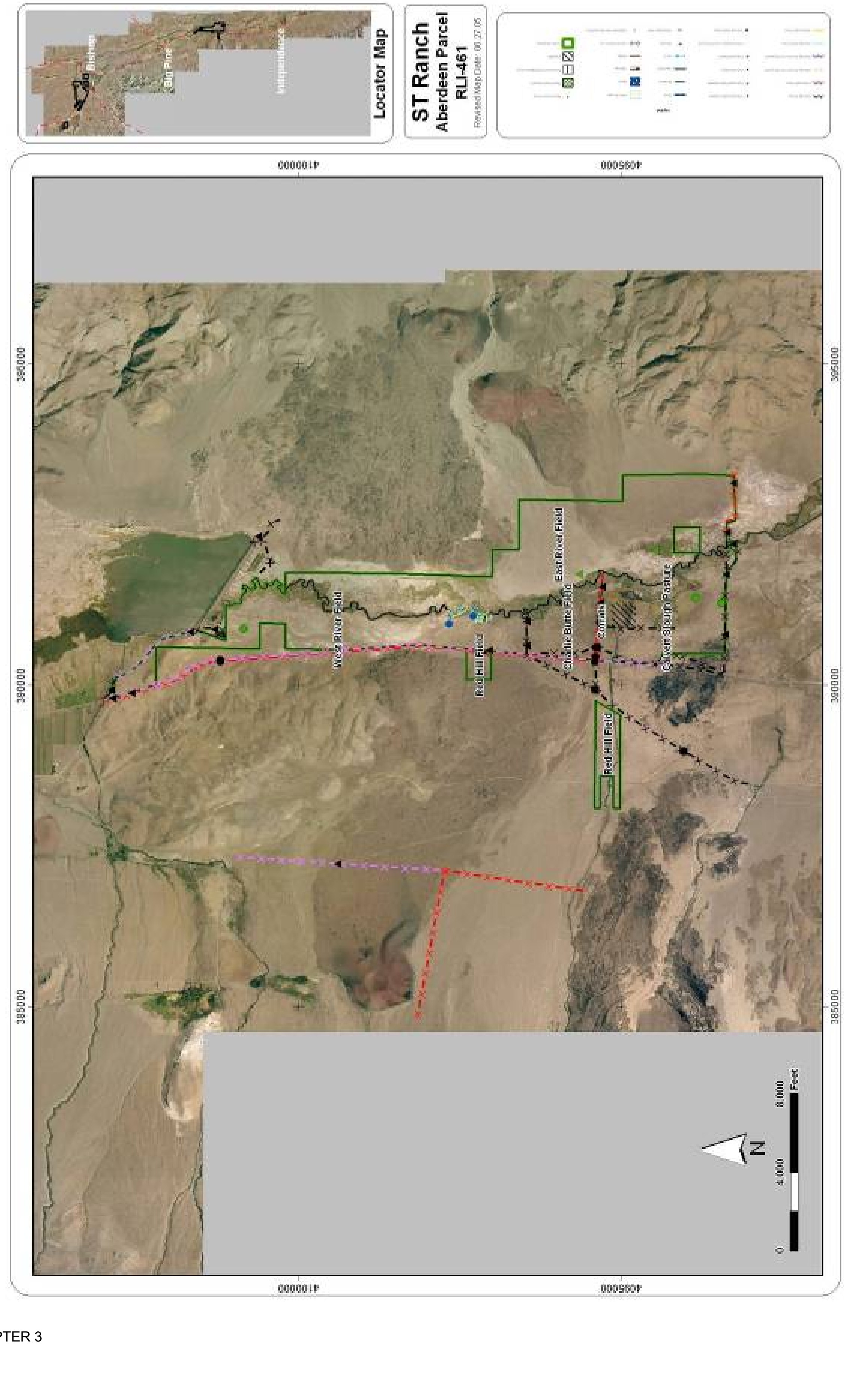

Lone Pine Dairy
RLI-452
Locator Map
Big Pine
Independence
Lone Pine
Legend
N


Legend
Reata Ranch
RLI-453 1 of 2
Locator Map

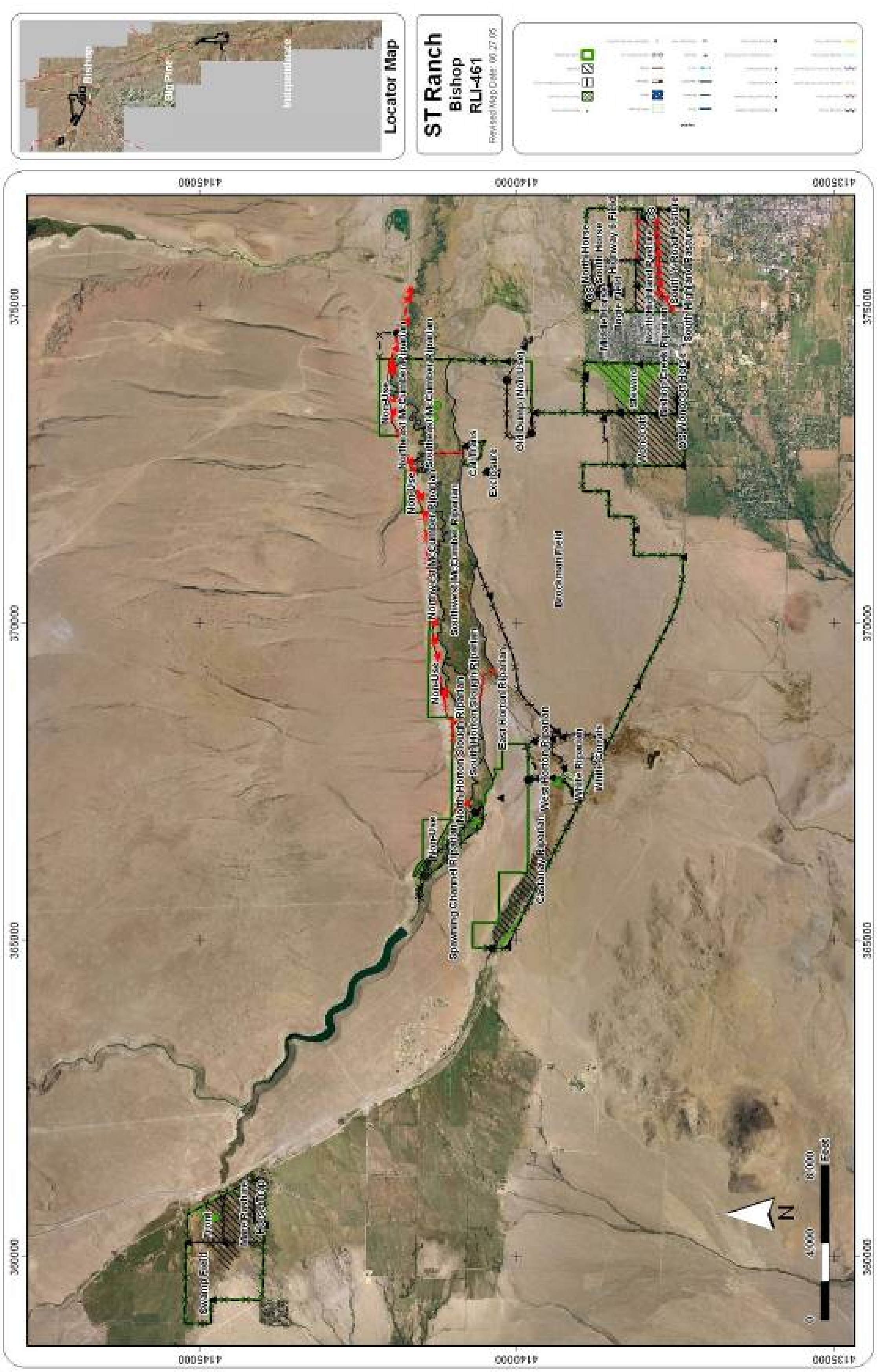

Legend
Reata Ranch
RLI-453 2 of 2
Locator Map
Bishop
Big Pine
Fish Slough


374000
376000
4134000
4132000
North House Pasture
Hall Ditch Field
Cook Pasture
Tank Pasture
South House Pasture
Golf Course Pasture
Sunland Res Field
Reservation Pasture
Dump Pasture
Hwy Pasture
Bishop
Big Pine
Independence
Locator Map
N
0 500 1,000 2,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Independence Livestock
Bishop Parcel
RLI-416, 454, 455

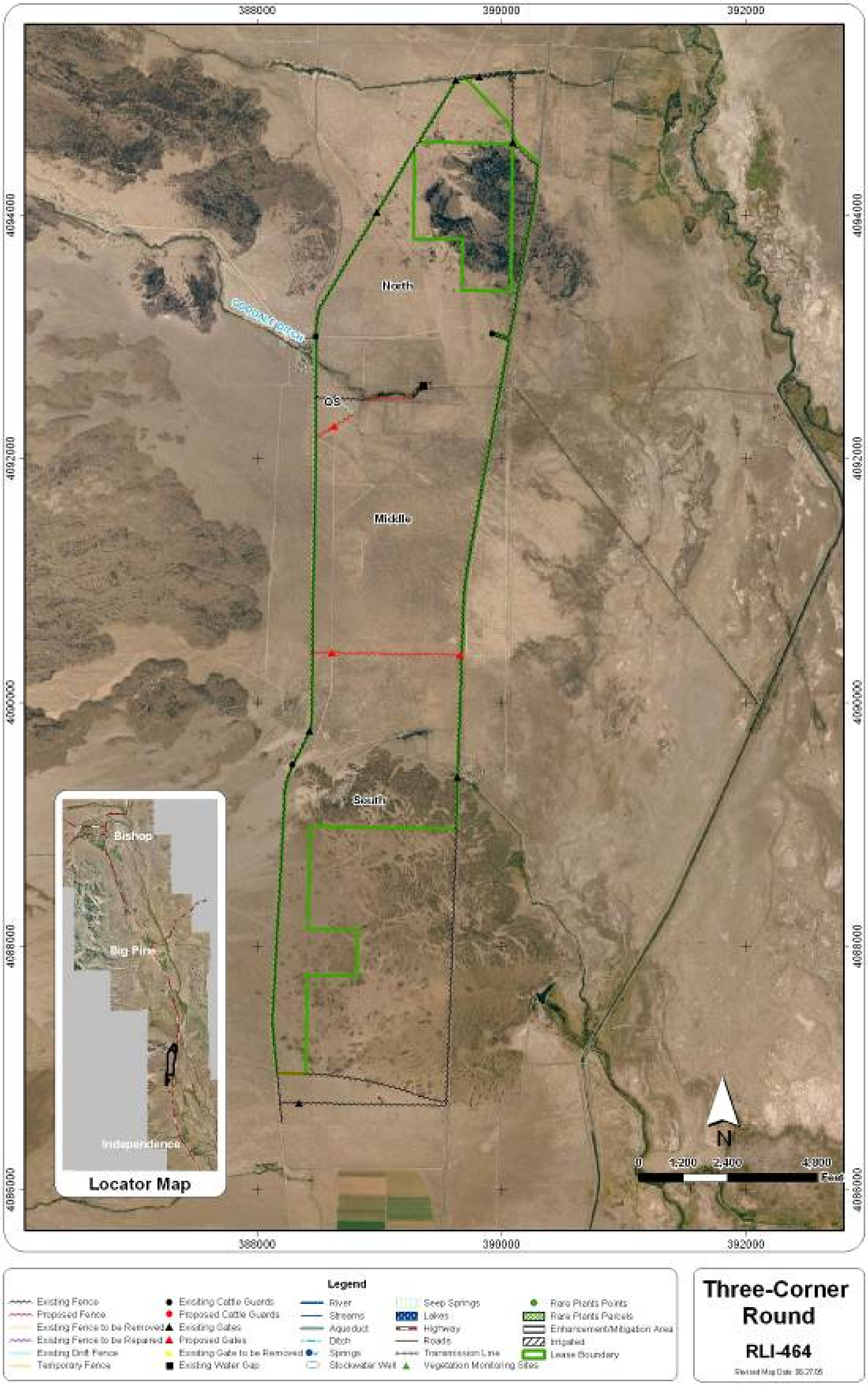

Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Rainbow Pack
RLI-460
Bishop
Big Pine
Independence
Locator Map
Wye Road Field
CT Field
Spruce Street Field
Brockman Pasture
Dutch John Meadow Field
Dutch John Field
N
0
700
1,400
2,800
Feet
372000
373000
374000
375000
376000
377000
4134000
4135000
4136000
4137000

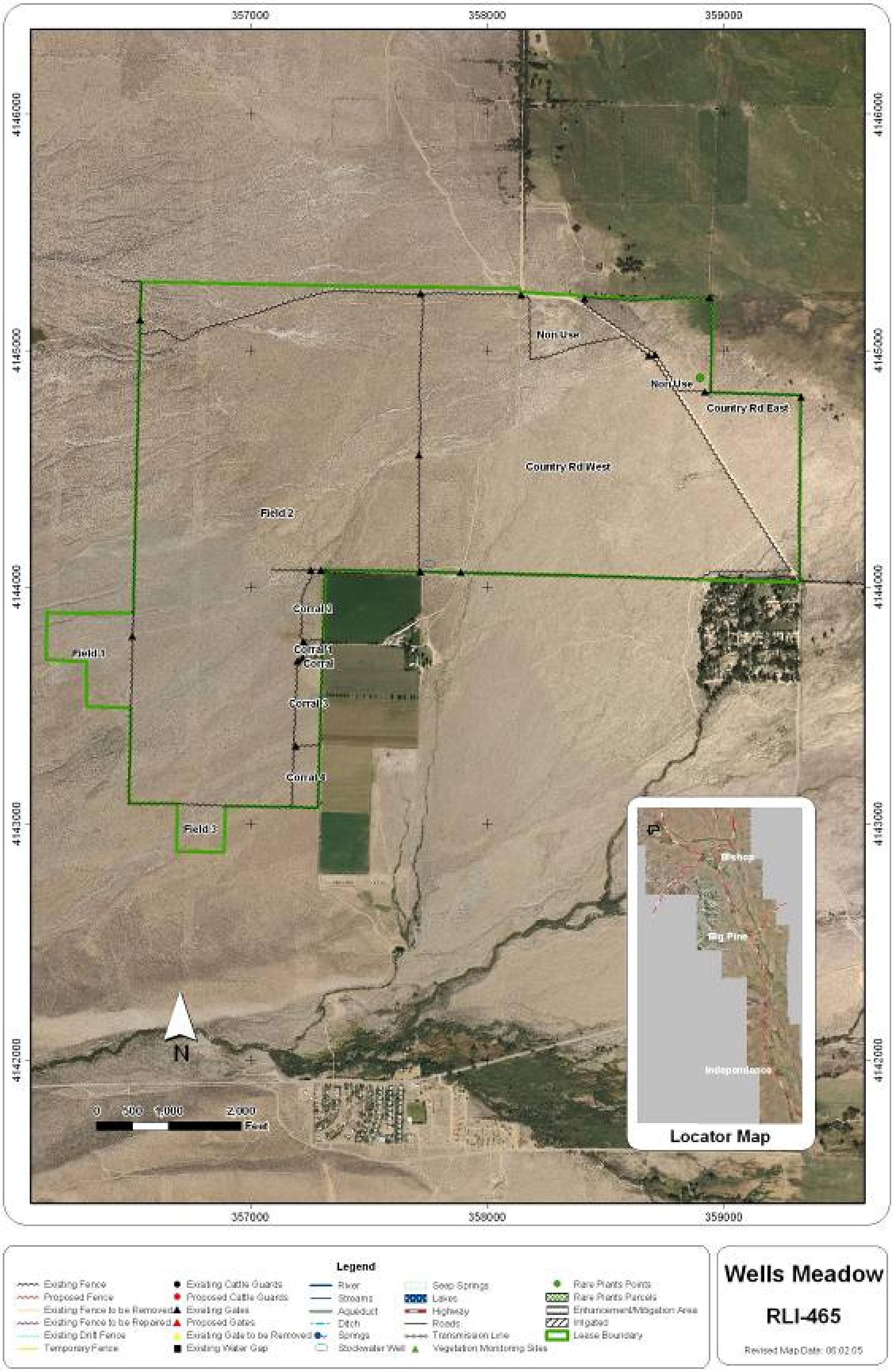


Locator Map
Bishop
Big Pine
Independence
ST Ranch
Aberdeen Parcel
RLI-461
West River Field
Red Hill Field
East River Field
Charlie Butte Field
Corrals
Calvert Slough Pasture
Red Hill Field
N
0
4,000
8,000
Feet
4100000
4095000
395000
390000
385000

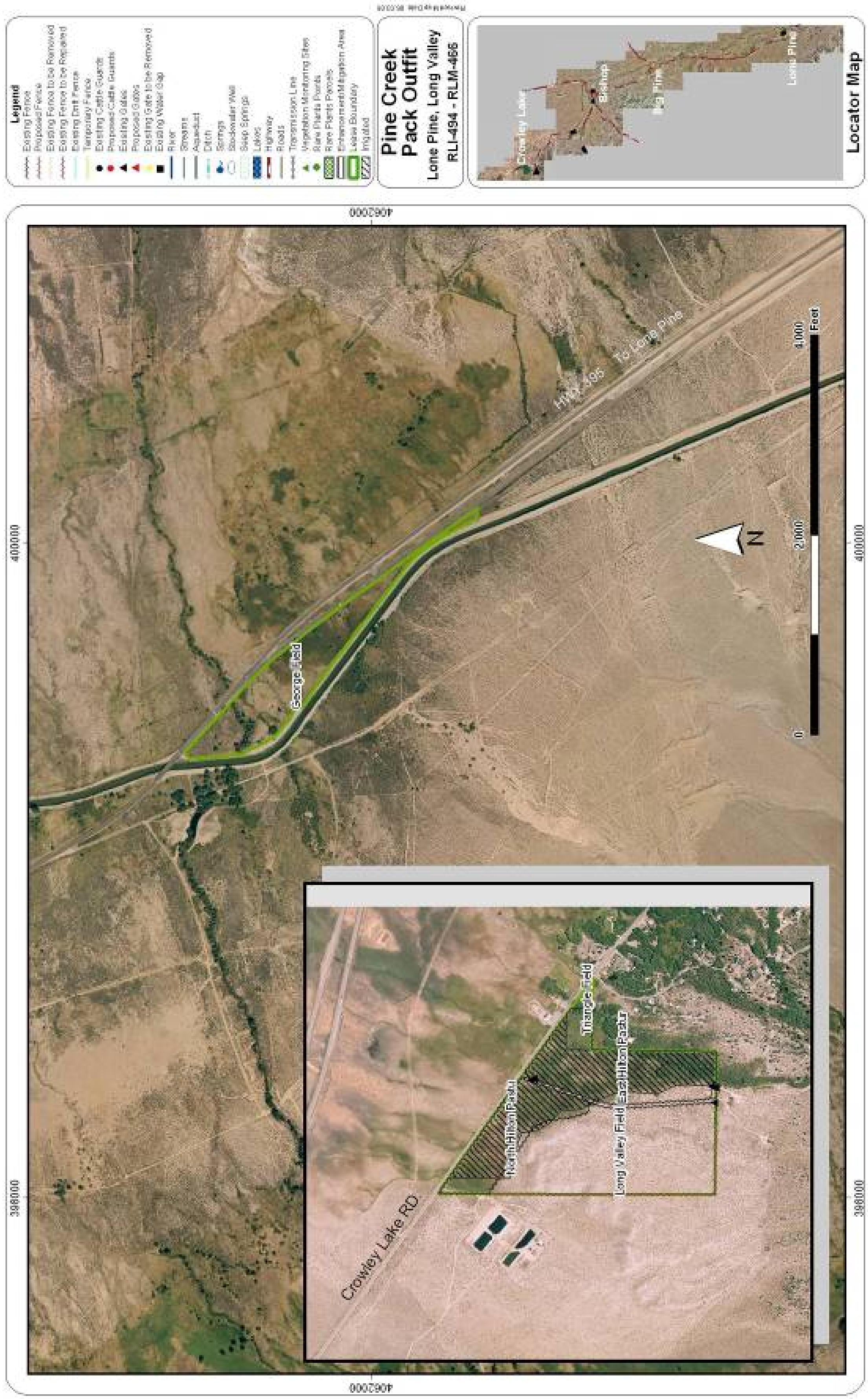

ST Ranch
Bishop
RLI-461
Locator Map

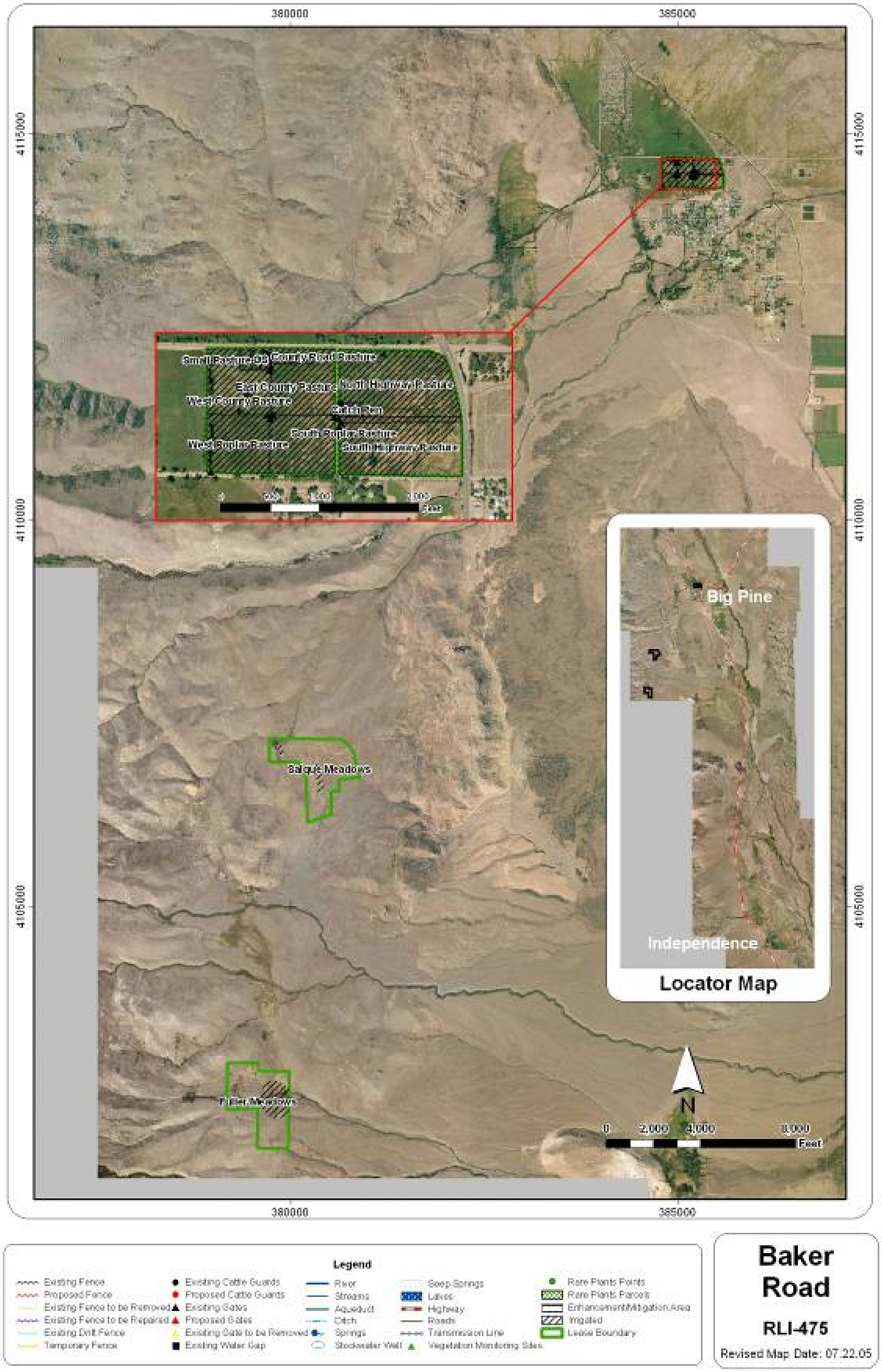

Horseshoe
Bar Ranch
RLI-462
Locator Map
Legend
N
0
1,000
2,000
Feet
4136111
4134111
377925
375925
A-Drain Field
School Field
Middle Field

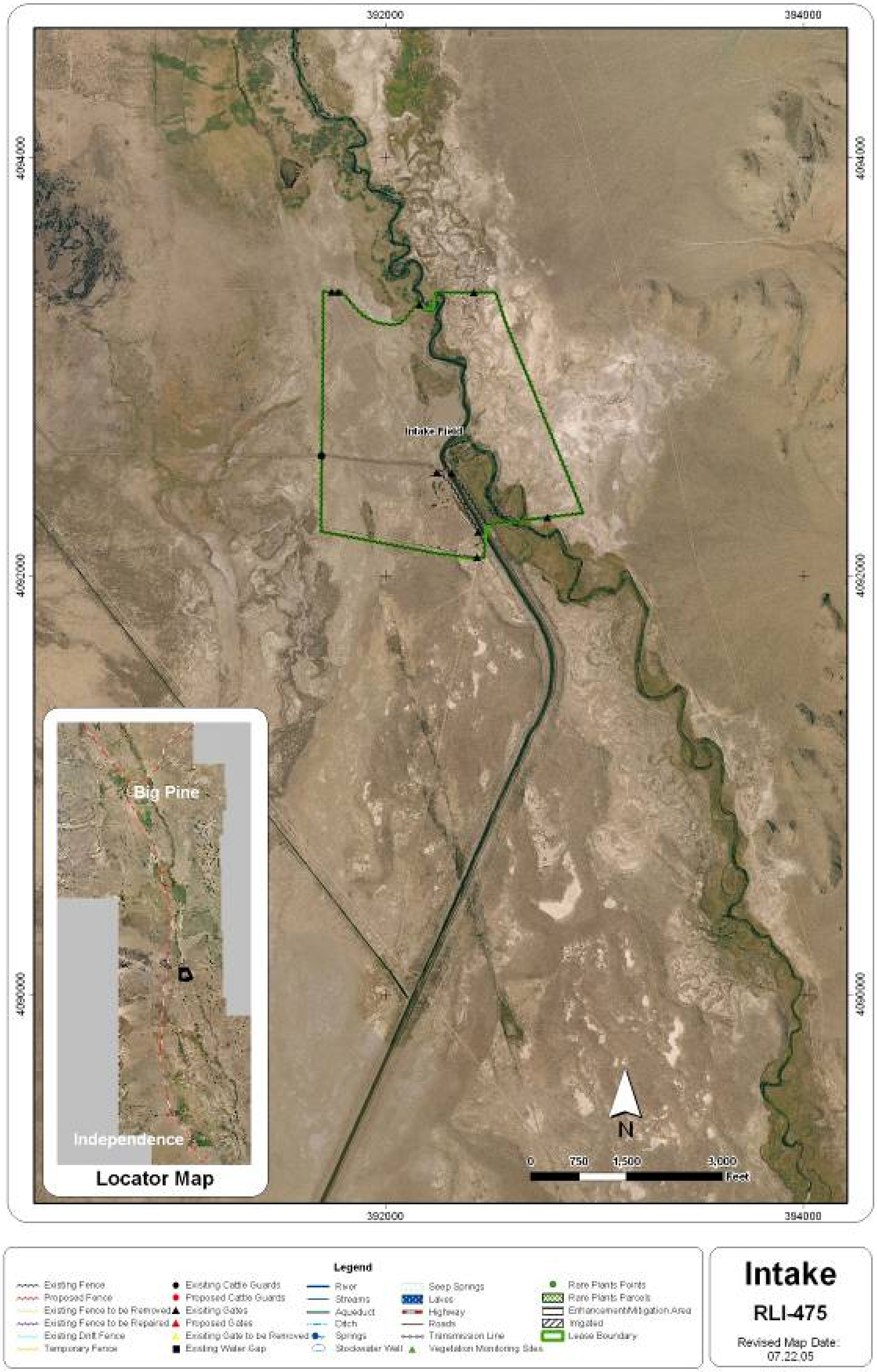

388000
390000
392000
4094000
4092000
4090000
4088000
4086000
North
OS
Middle
South
Bishop
Big Pine
Independence
Locator Map
N
0
1,200
2,400
4,800
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Three-Corner Round
RLI-464

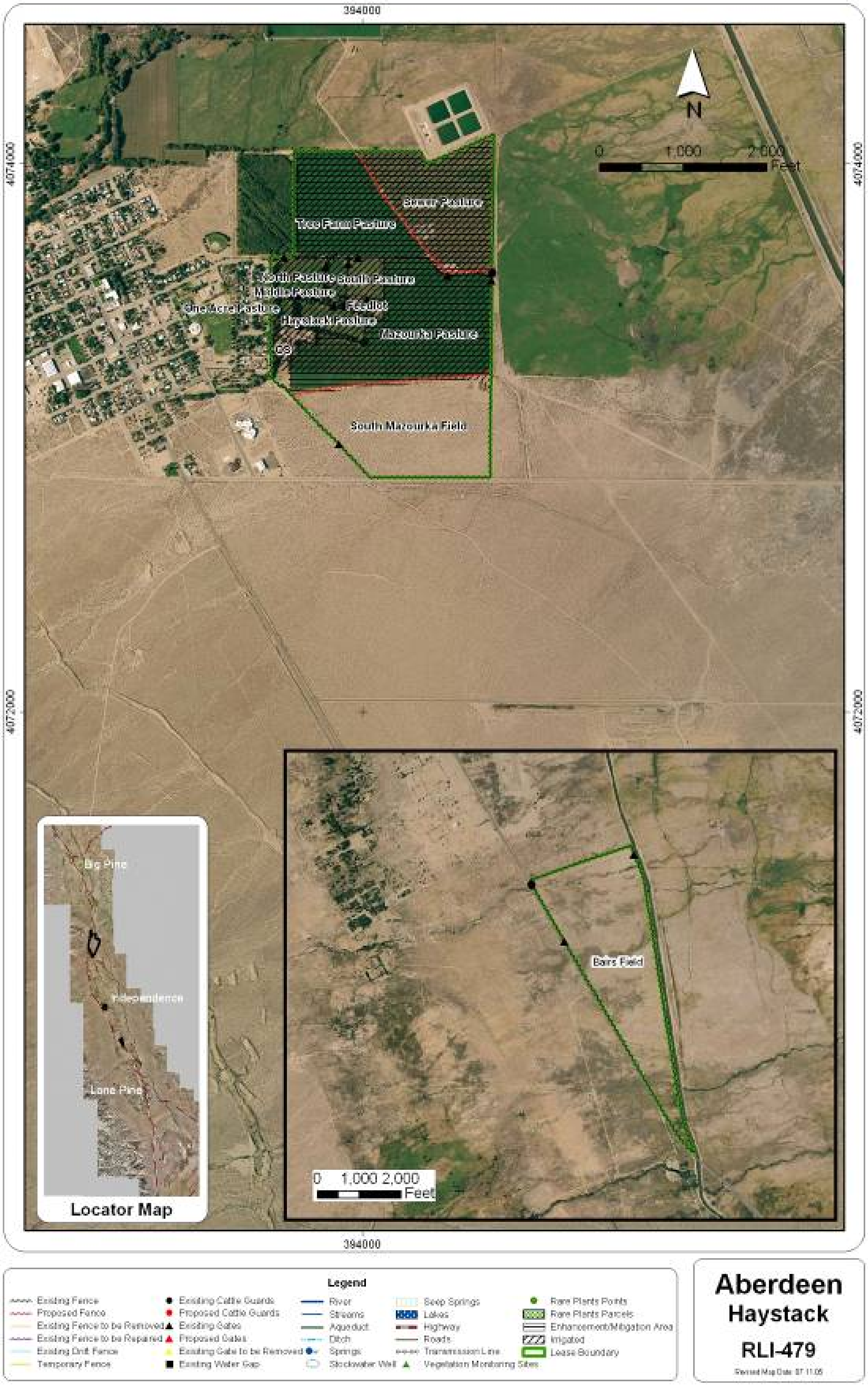

357000
358000
359000
4146000
4145000
4144000
4143000
4142000
Non Use
Non Use
Country Rd East
Country Rd West
Field 2
Corral 2
Field 1
Corral 1
Corral
Corral 3
Corral 4
Field 3
N
0 500 1,000 2,000
Feet
Bishop
Big Pine
Independence
Locator Map
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Wells Meadow
RLI-465
Revised Map Date: 06.02.05

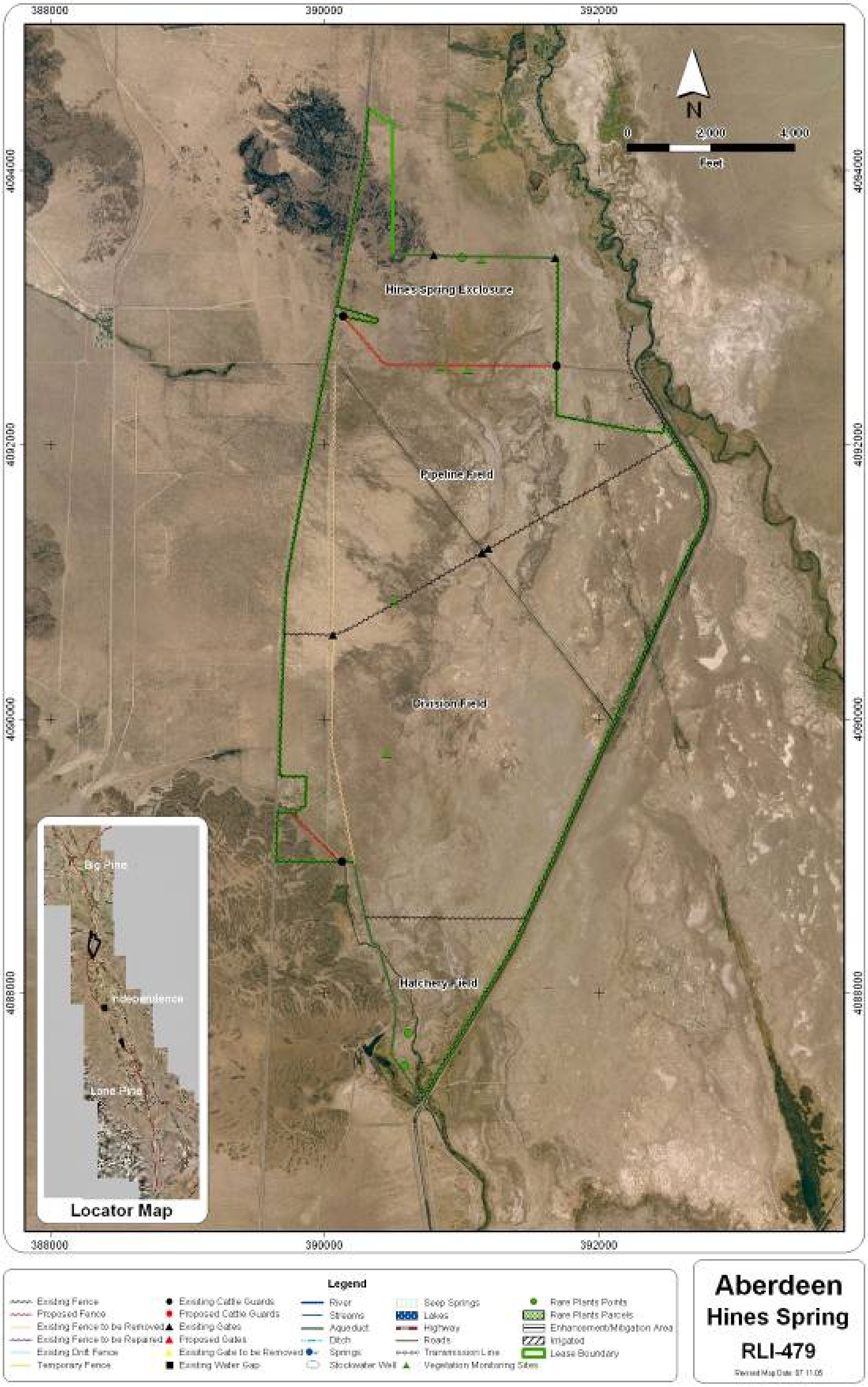

Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Replaced
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Pine Creek Pack Outfit
Bishop
RLI-494 - RLM-466
Crowley Lake
Bishop
Big Pine
Lone Pine
Locator Map
4138000
4136000
376000
374000
Wye Road Field
Highway Pasture
Strip Pasture
N
0
2,000
4,000
Feet

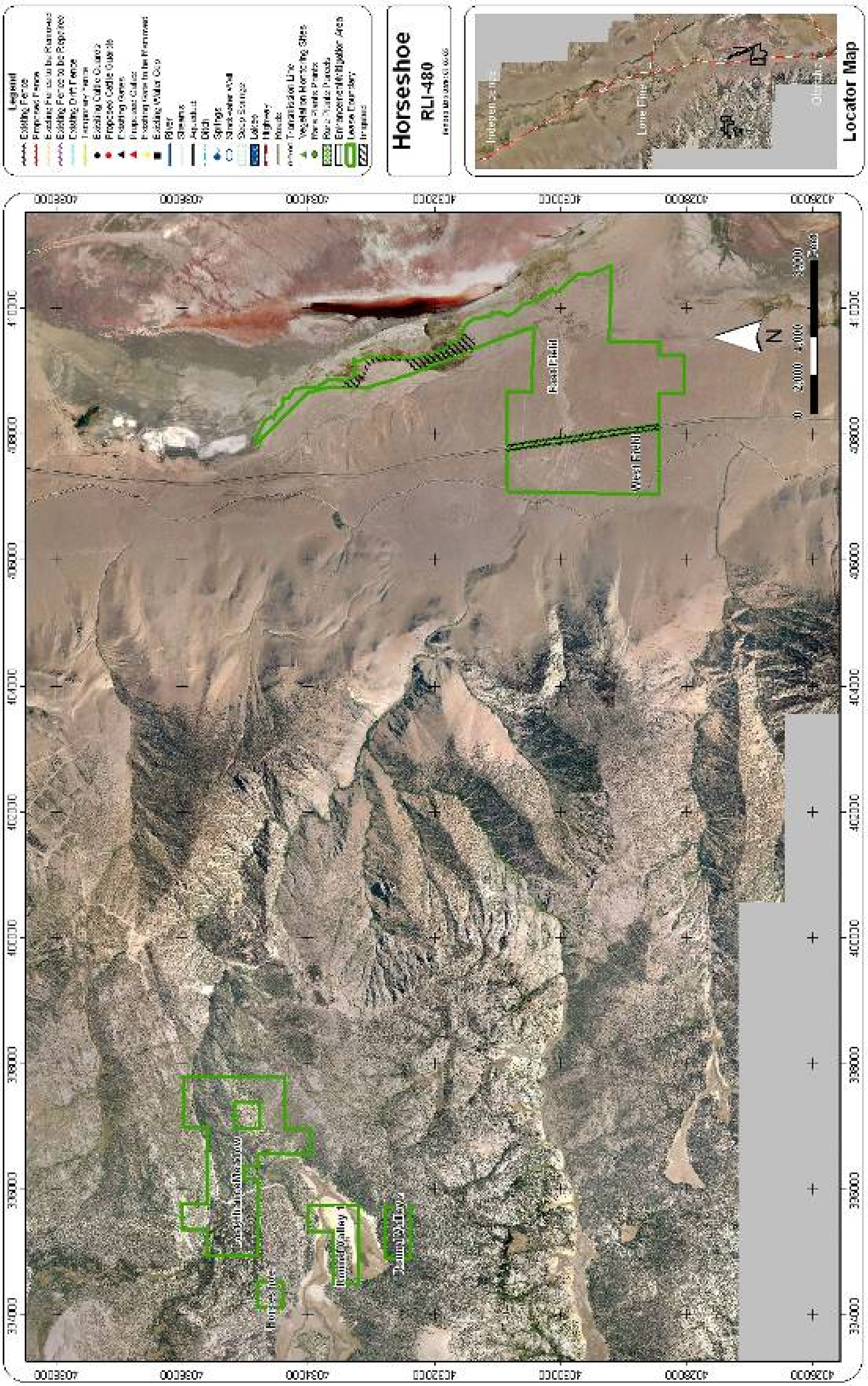

Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Polygons
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Pine Creek
Pack Outfit
Lone Pine, Long Valley
RLI-494 - RLM-466
Crowley Lake
Bishop
Big Pine
Lone Pine
Locator Map
4062000
400000
398000
HWY 395
To Lone Pine
George Field
N
0
2,000
4,000
Feet
Triangle Field
North Hilton Pastu
East Hilton Pastur
Long Valley Field
Crowley Lake RD

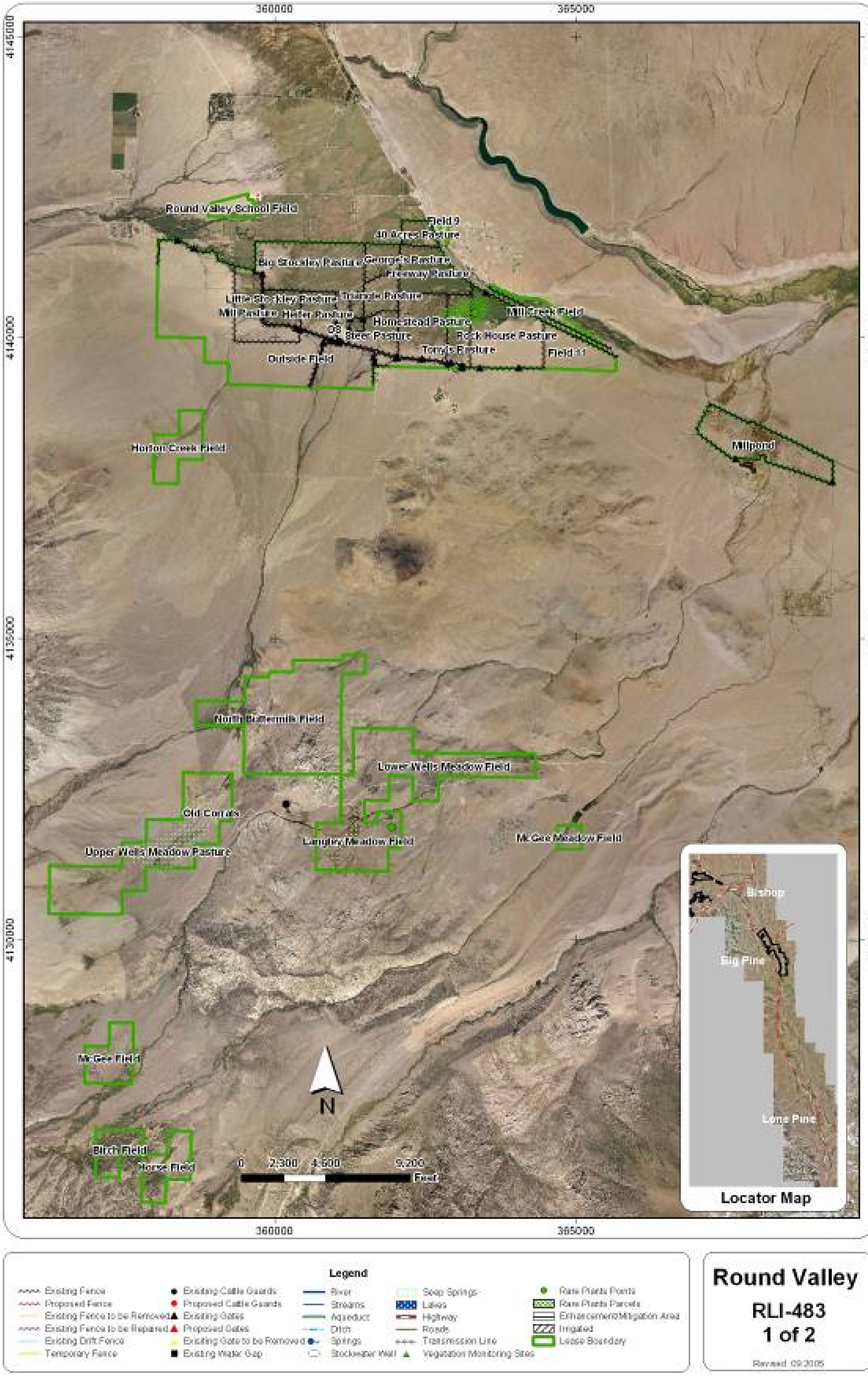

380000
385000
4115000
4110000
4105000
Small Pasture 06
County Road Pasture
East County Pasture
North Highway Pasture
West County Pasture
Catch Pen
South Poplar Pasture
West Poplar Pasture
South Highway Pasture
Feet
Big Pine
Independence
Locator Map
Salque Meadows
Miller Meadows
N
0
2,000
4,000
8,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Baker Road
RLI-475
Revised Map Date: 07.22.05

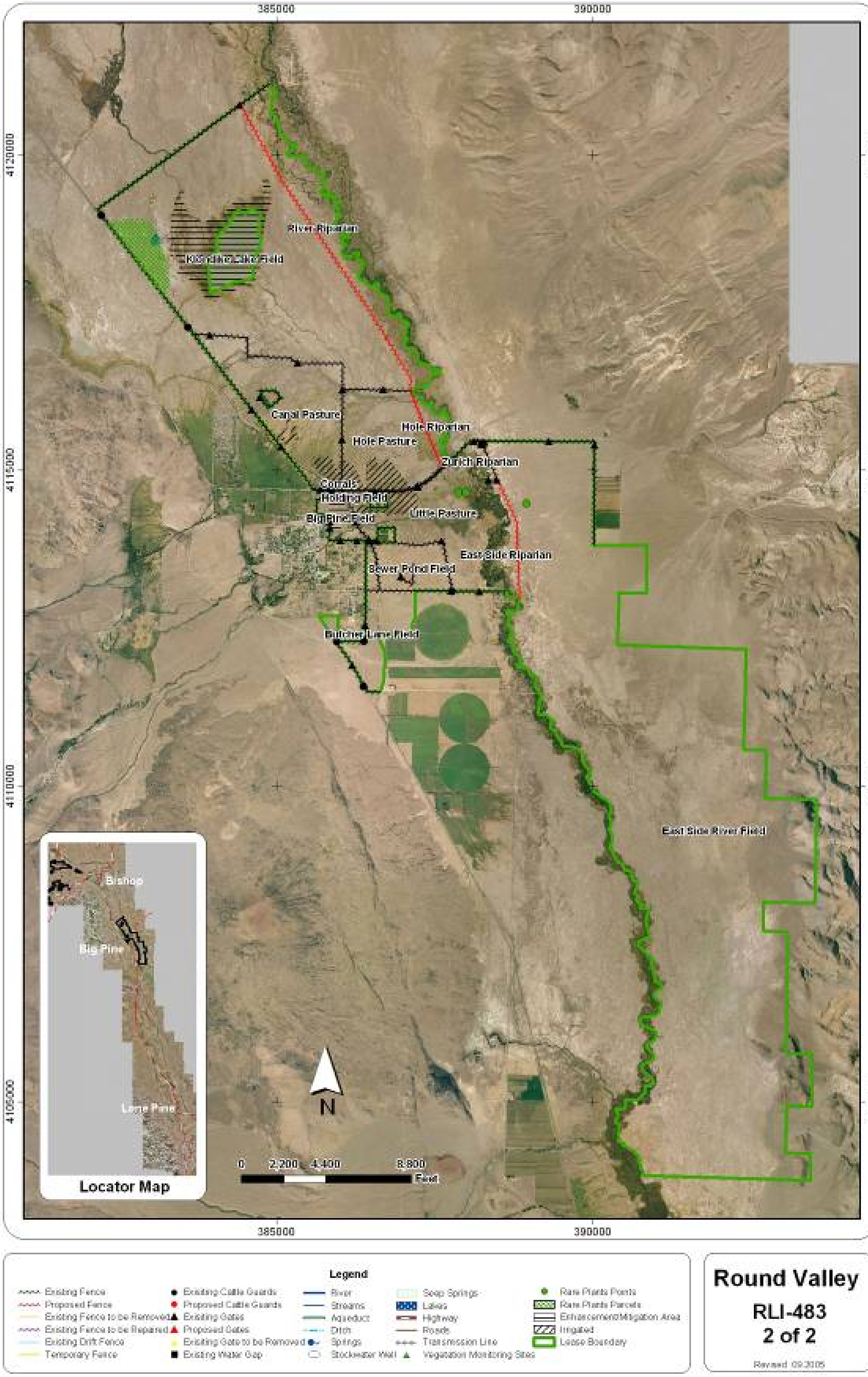

392000
394000
4094000
4092000
4090000
Intake Field
Big Pine
Independence
Locator Map
N
0
750
1,500
3,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Intake
RLI-475
Revised Map Date:
07.22.05

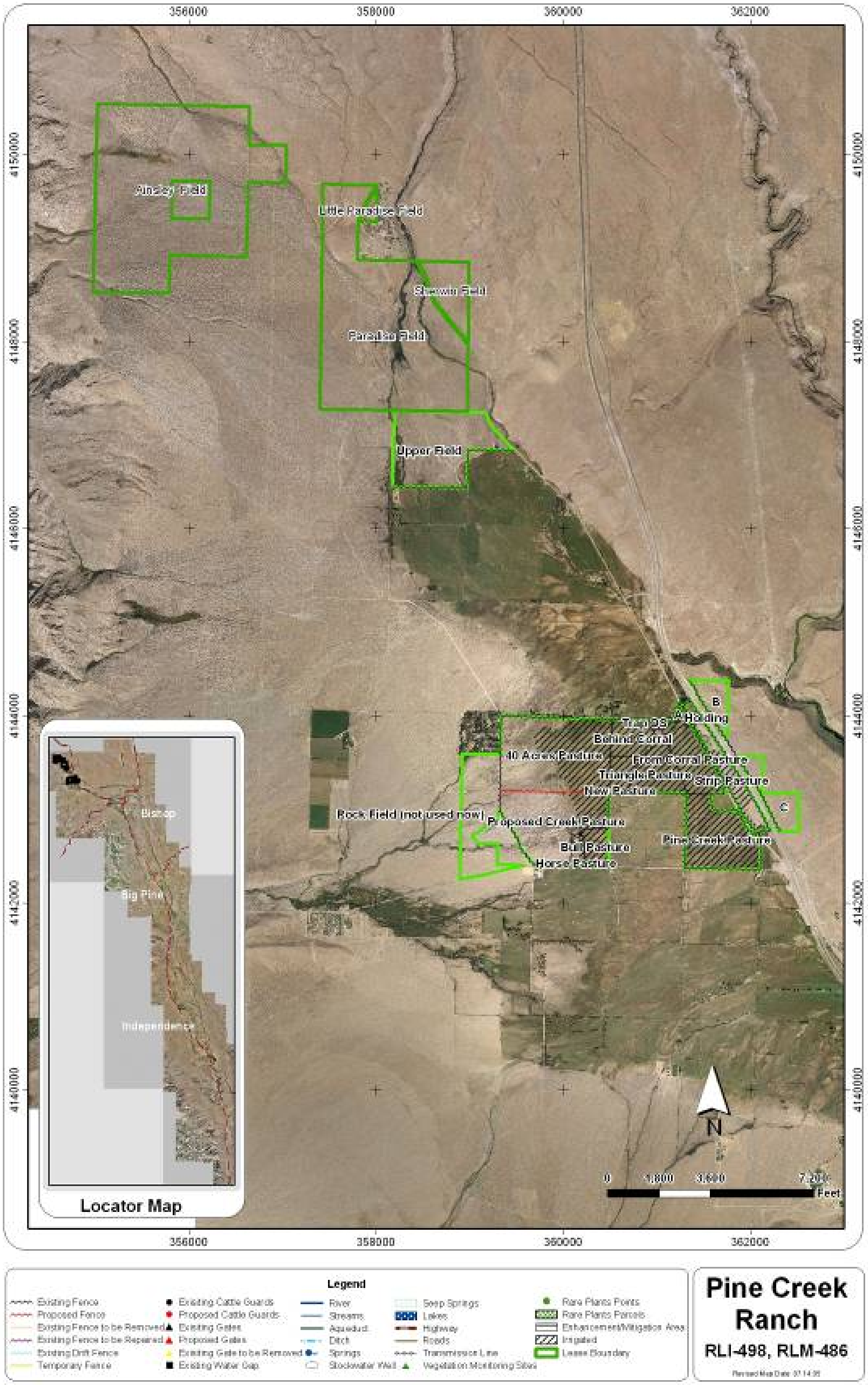

394000
4074000
4072000
N
0 1,000 2,000 Feet
Sewer Pasture
Tree Farm Pasture
North Pasture
South Pasture
Middle Pasture
Feedlot
One Acre Pasture
Haystack Pasture
Mazourka Pasture
CG
South Mazourka Field
Bairs Field
0 1,000 2,000 Feet
Big Pine
Independence
Lone Pine
Locator Map
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Aberdeen
Haystack
RLI-479

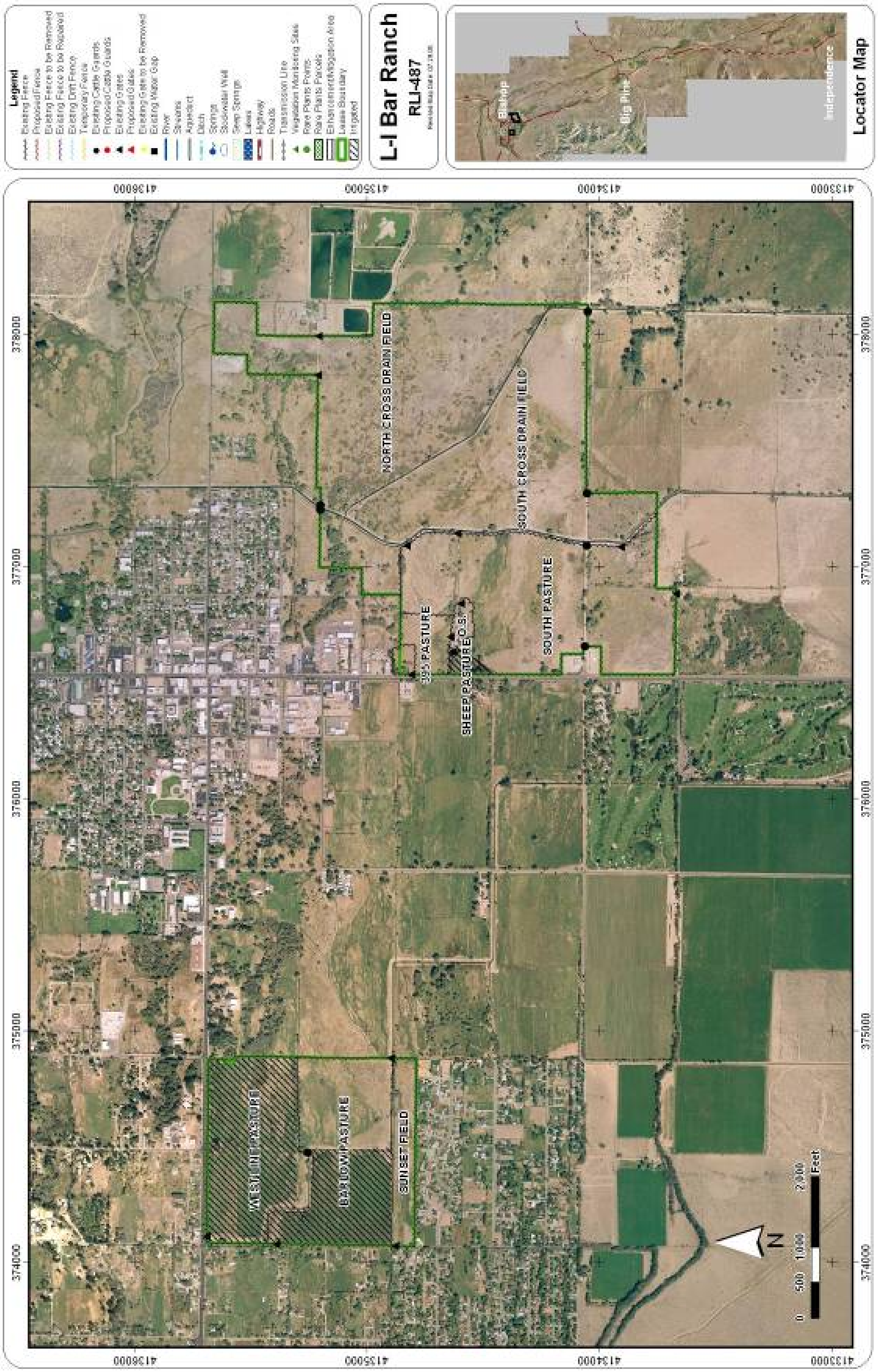

388000
390000
392000
4094000
4092000
4090000
4088000
N
0
2,000
4,000
Feet
Hines Spring Exclosure
Pipeline Field
Division Field
Hatchery Field
Big Pine
Independence
Lone Pine
Locator Map
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Aberdeen
Hines Spring
RLI-479

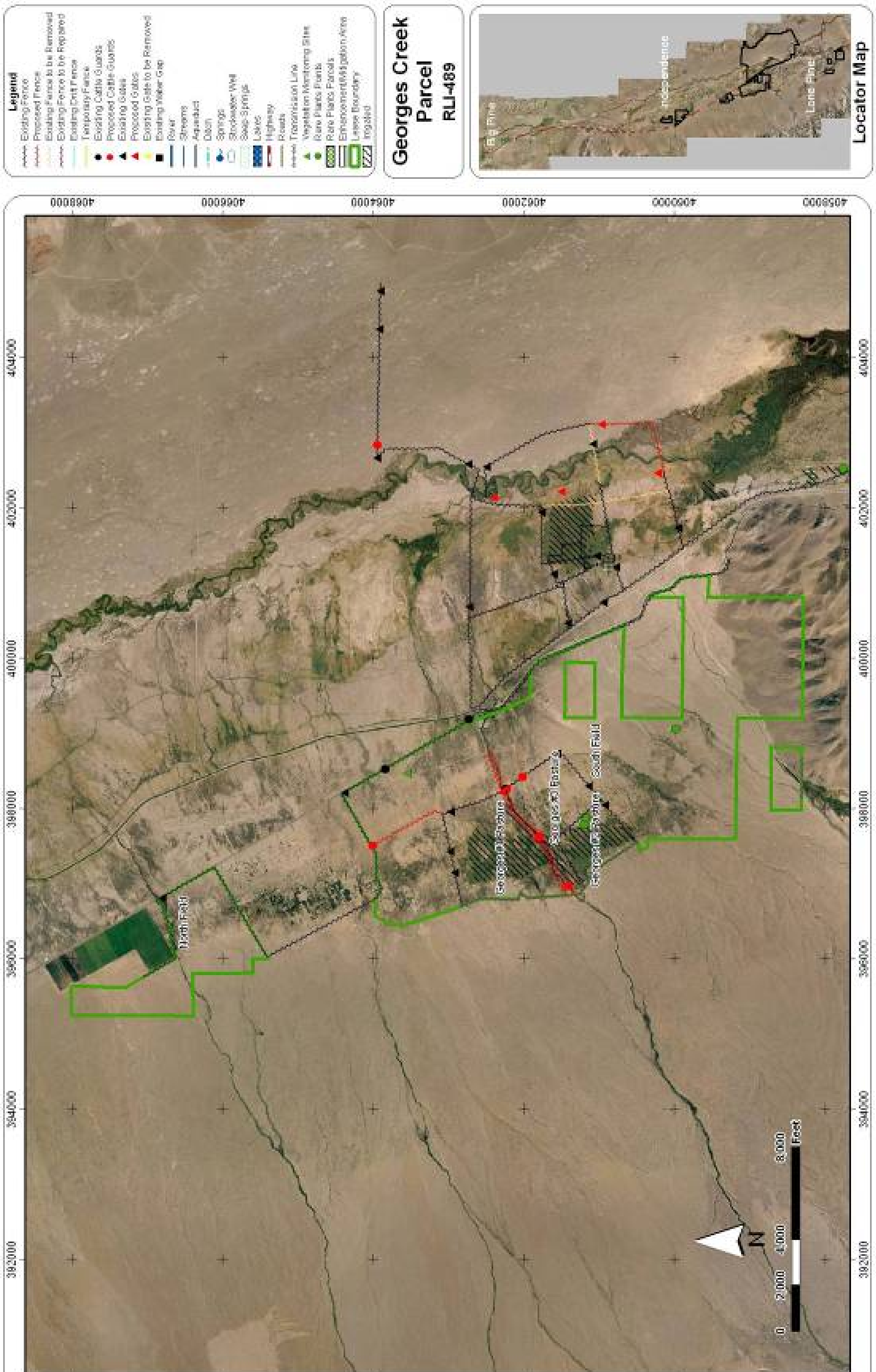

Legend
Horseshoe
RLI-480
Locator Map
East Field
West Field

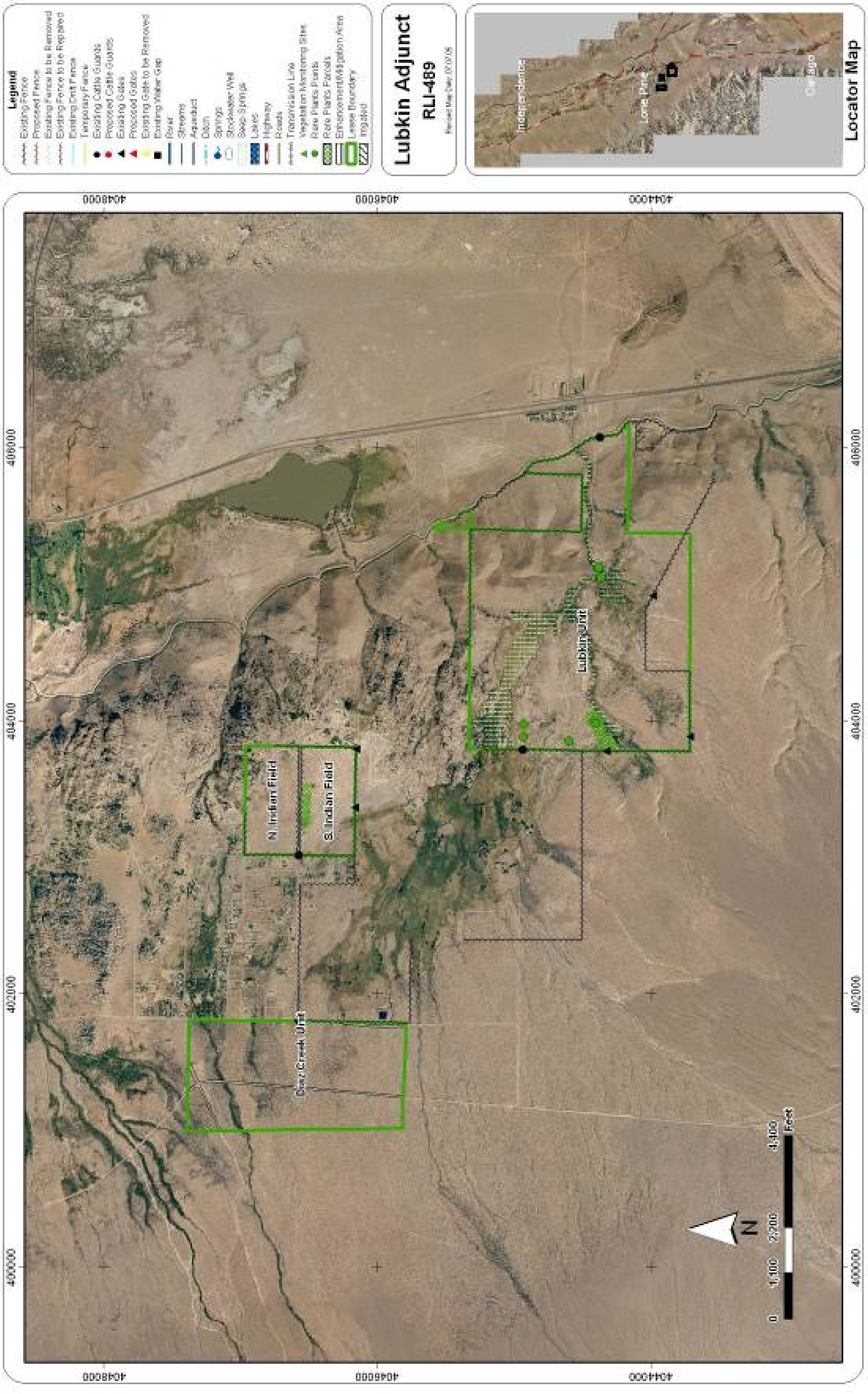

360000
365000
4145000
4140000
4135000
4130000
Round Valley School Field
Field 9
40 Acres Pasture
Big Stockley Pasture
George's Pasture
Freeway Pasture
Little Stockley Pasture
Triangle Pasture
Mill Pasture
Heifer Pasture
Homestead Pasture
Mill Creek Field
Steer Pasture
Rock House Pasture
Tony's Pasture
Field 11
Outside Field
Horton Creek Field
Millpond
North Buttermilk Field
Lower Wells Meadow Field
Old Corrals
Langley Meadow Field
McGee Meadow Field
Upper Wells Meadow Pasture
McGee Field
Birch Field
Horse Field
N
0
2,300
4,600
9,200
Feet
Bishop
Big Pine
Lone Pine
Locator Map
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Round Valley
RLI-483
1 of 2
Revised 09.2005

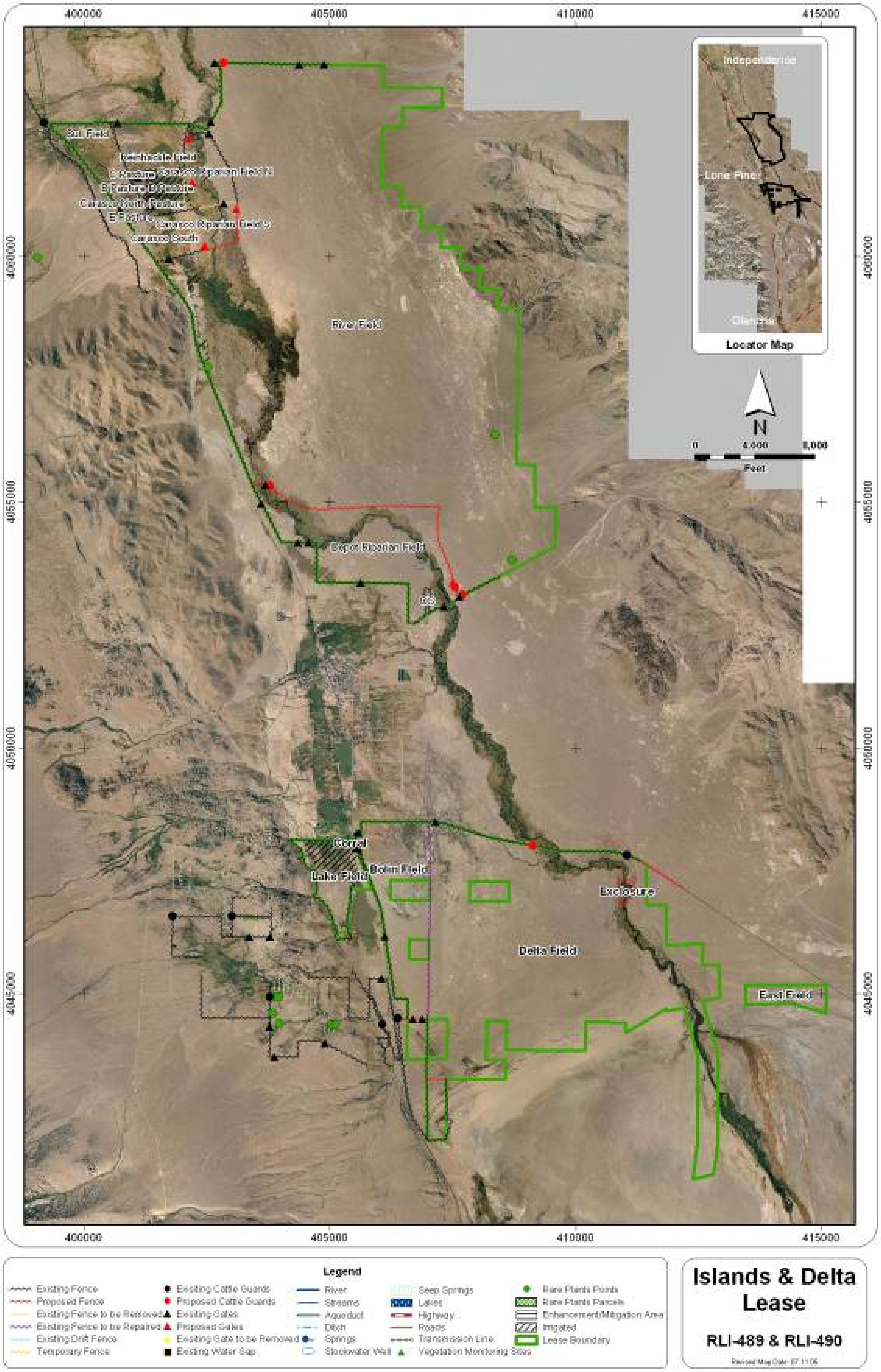

385000
390000
4120000
4115000
4110000
4105000
River Riparian
Klondike Lake Field
Canal Pasture
Hole Riparian
Hole Pasture
Zurich Riparian
Corrals
Holding Field
Big Pine Field
Little Pasture
East Side Riparian
Sewer Pond Field
Butcher Lane Field
East Side River Field
Bishop
Big Pine
Lone Pine
Locator Map
N
0 2,200 4,400 8,800
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Round Valley
RLI-483
2 of 2
Revised 09.2005

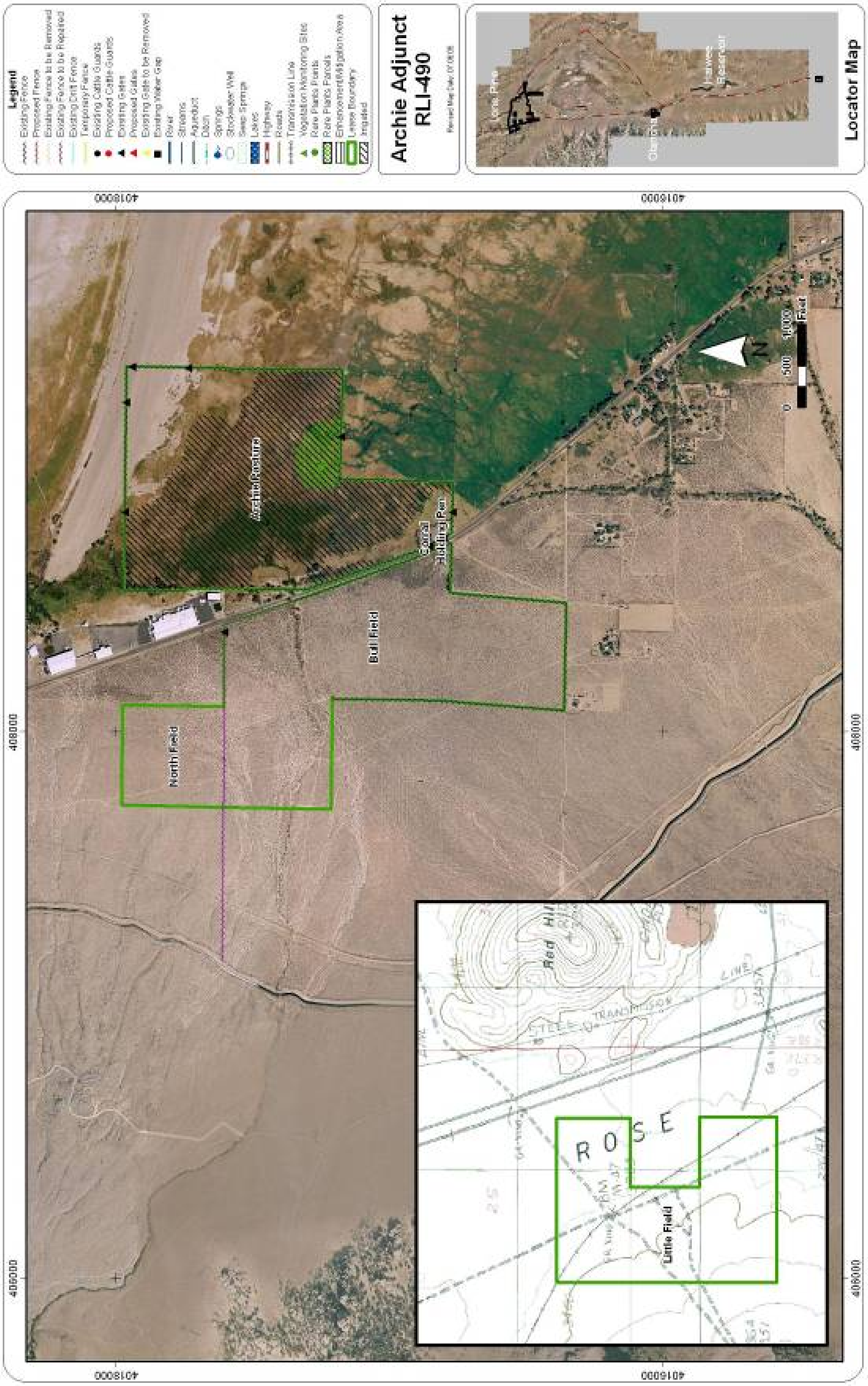

Ainsley Field
Little Paradise Field
Sherwin Field
Paradise Field
Upper Field
Trap OS
A Holding
B
Behind Corral
40 Acres Pasture
Front Corral Pasture
Triangle Pasture
Strip Pasture
New Pasture
C
Rock Field (not used now)
Proposed Creek Pasture
Pine Creek Pasture
Bull Pasture
Horse Pasture
Bishop
Big Pine
Independence
Locator Map
N
0
1,800
3,600
7,200
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Pine Creek Ranch
RLI-498, RLM-486


L-I Bar Ranch
RLI-487
Locator Map
Bishop
Big Pine
Independence
NORTH CROSS DRAIN FIELD
SOUTH CROSS DRAIN FIELD
395 PASTURE
SHEEP PASTURE O.S.
SHEEP PASTURE
SOUTH PASTURE
SUNSET FIELD
BARLOW PASTURE
WESTLINE PASTURE
N
0 500 1,000 2,000 Feet


Georges Creek
Parcel
RLI-489
Locator Map
Legend
N
Feet


Legend
Lubkin Adjunct
RLI-489
Locator Map
Independence
Lone Pine
N. Indian Field
S. Indian Field
Lubkin Unit
Diaz Creek Unit
N
0 1,100 2,200 4,400
Feet


400000
405000
410000
415000
4060000
4055000
4050000
4045000
River Field
Depot Riparian Field
Corral
Lake Field
Bolin Field
Exclosure
Delta Field
East Field
Independence
Lone Pine
Locator Map
N
0
4,000
8,000
Feet
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Irrigated
Lease Boundary
Islands & Delta Lease
RLI-489 & RLI-490


Archie Adjunct
RLI-490
Legend
Existing Fence
Proposed Fence
Existing Fence to be Removed
Existing Fence to be Repaired
Existing Drift Fence
Temporary Fence
Existing Cattle Guards
Proposed Cattle Guards
Existing Gates
Proposed Gates
Existing Gate to be Removed
Existing Water Gap
River
Streams
Aqueduct
Ditch
Springs
Stockwater Well
Seep Springs
Lakes
Highway
Roads
Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
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Locator Map
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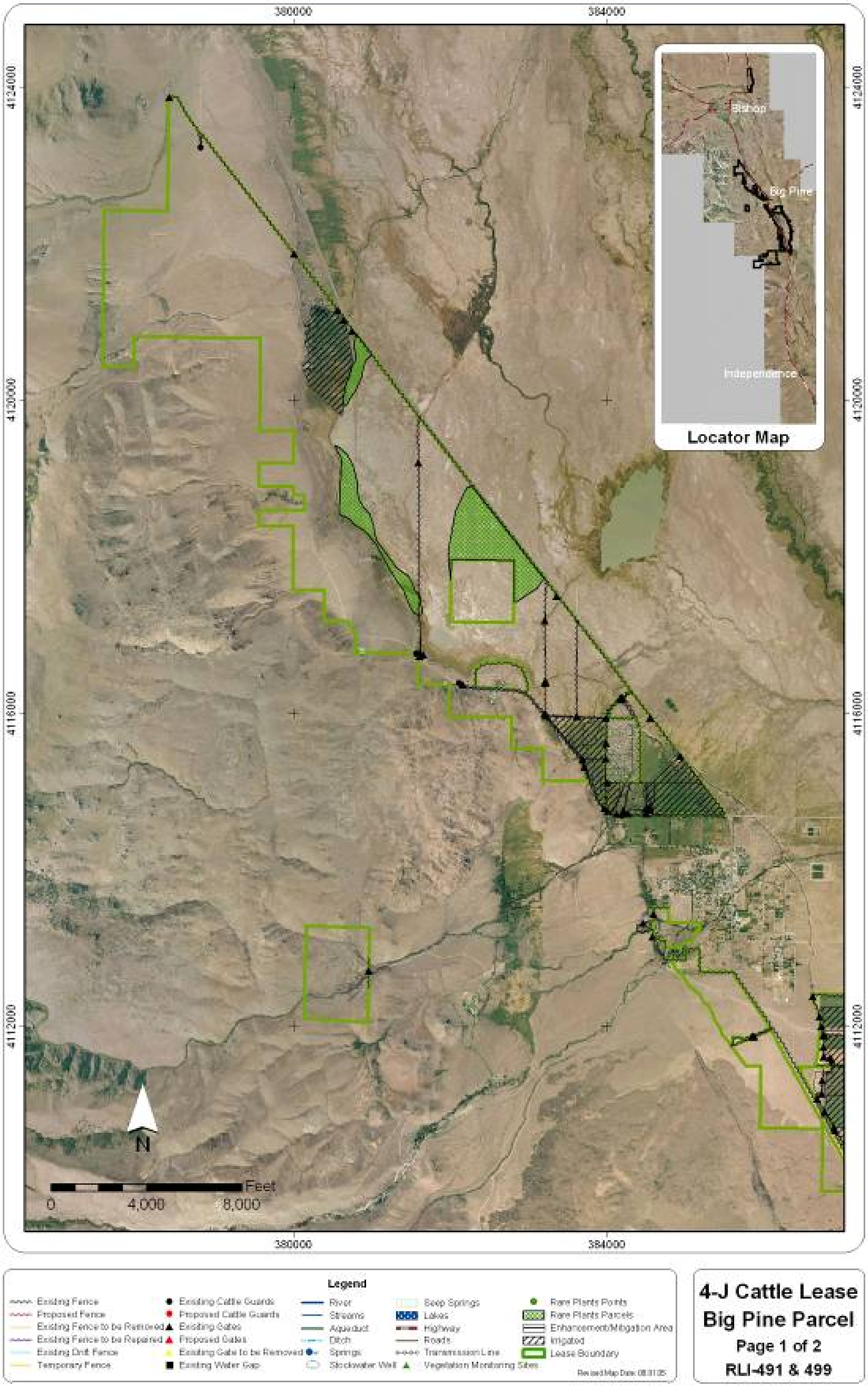
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Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
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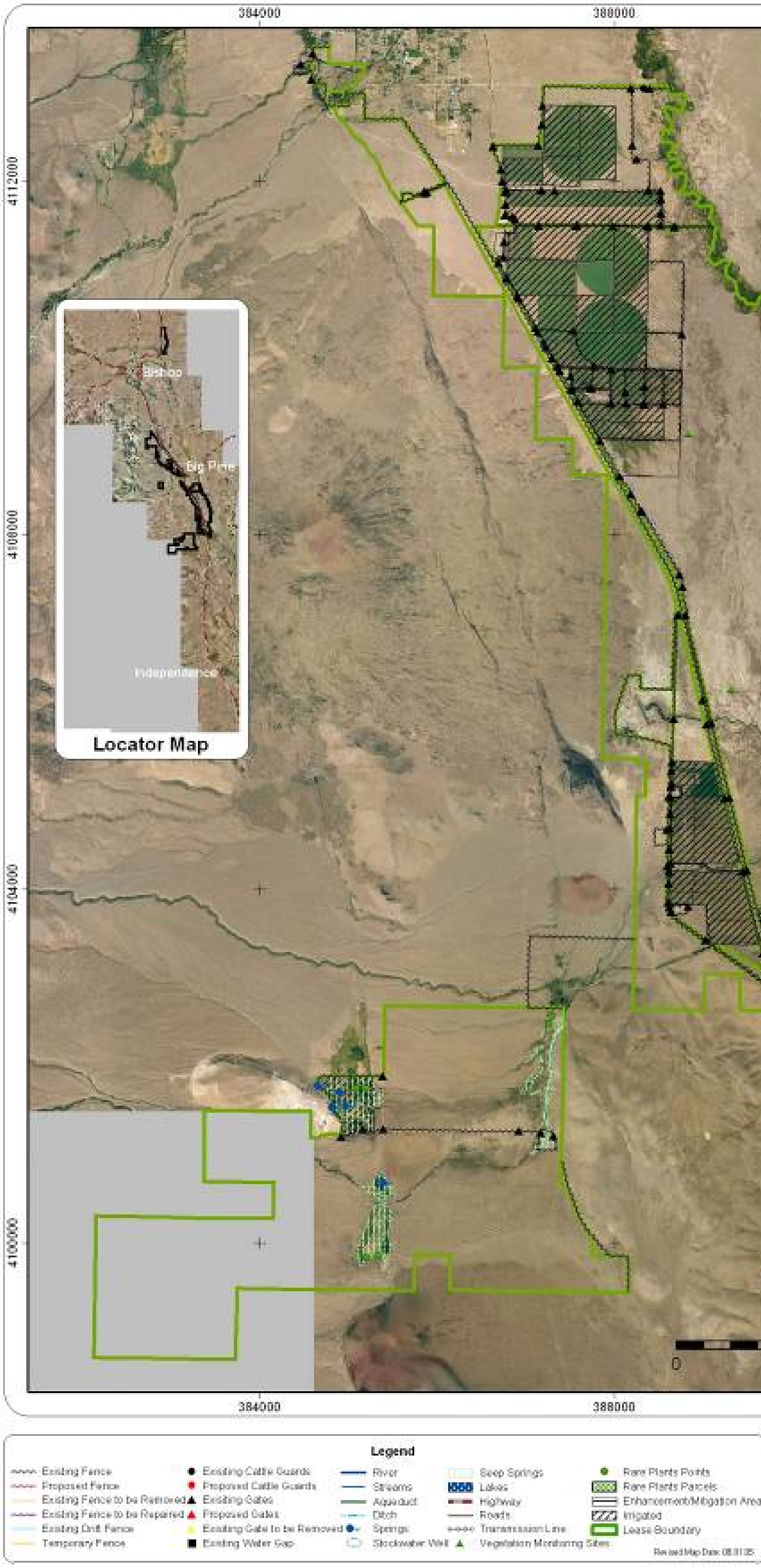
Lease Boundary
4-J Cattle Lease
Big Pine Parcel
Page 1 of 2
RLI-491 & 499



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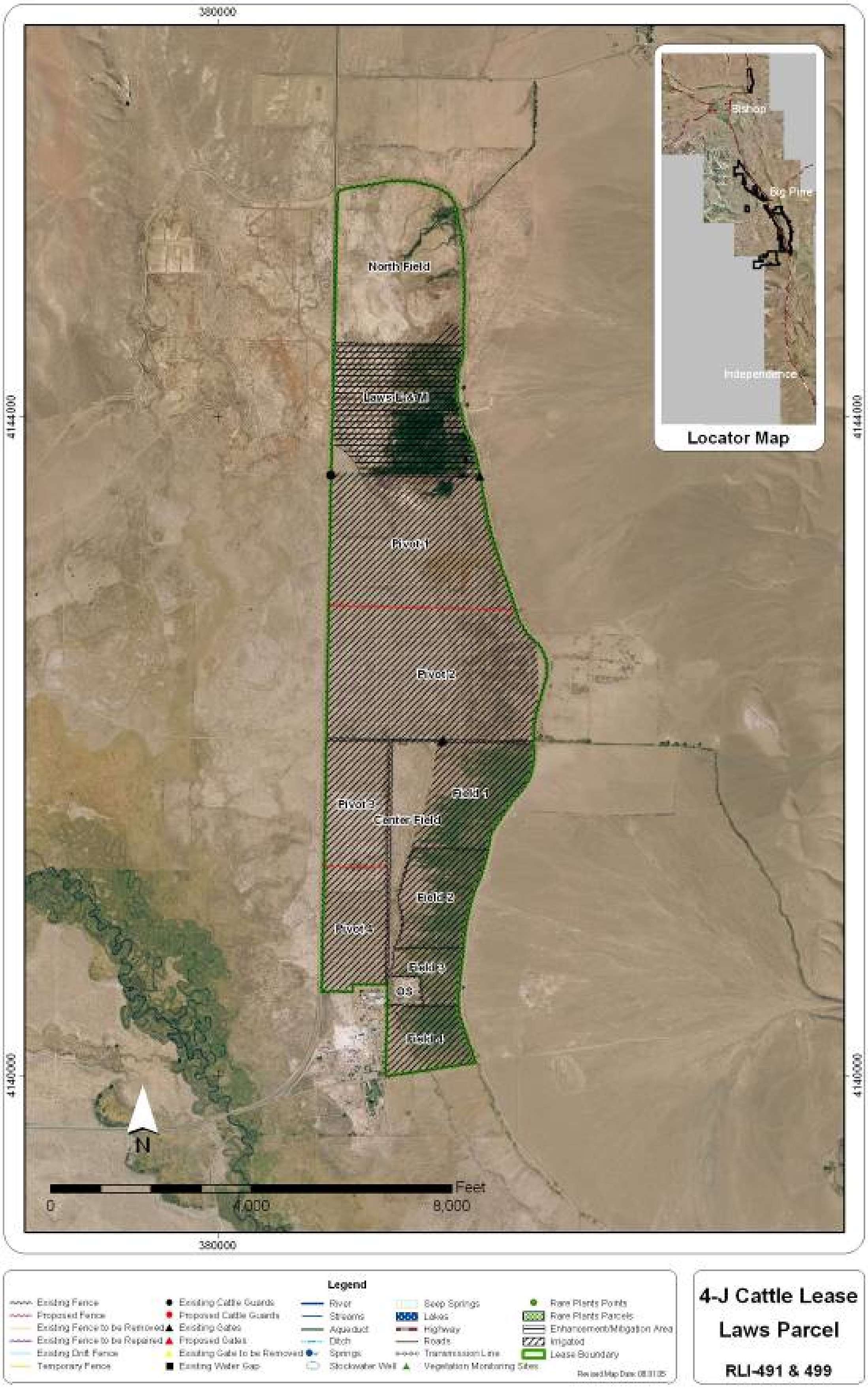
Page 2 of 2
RLI-491 & 499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Transmission Line
Vegetation Monitoring Sites
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Enhancement/Mitigation Area
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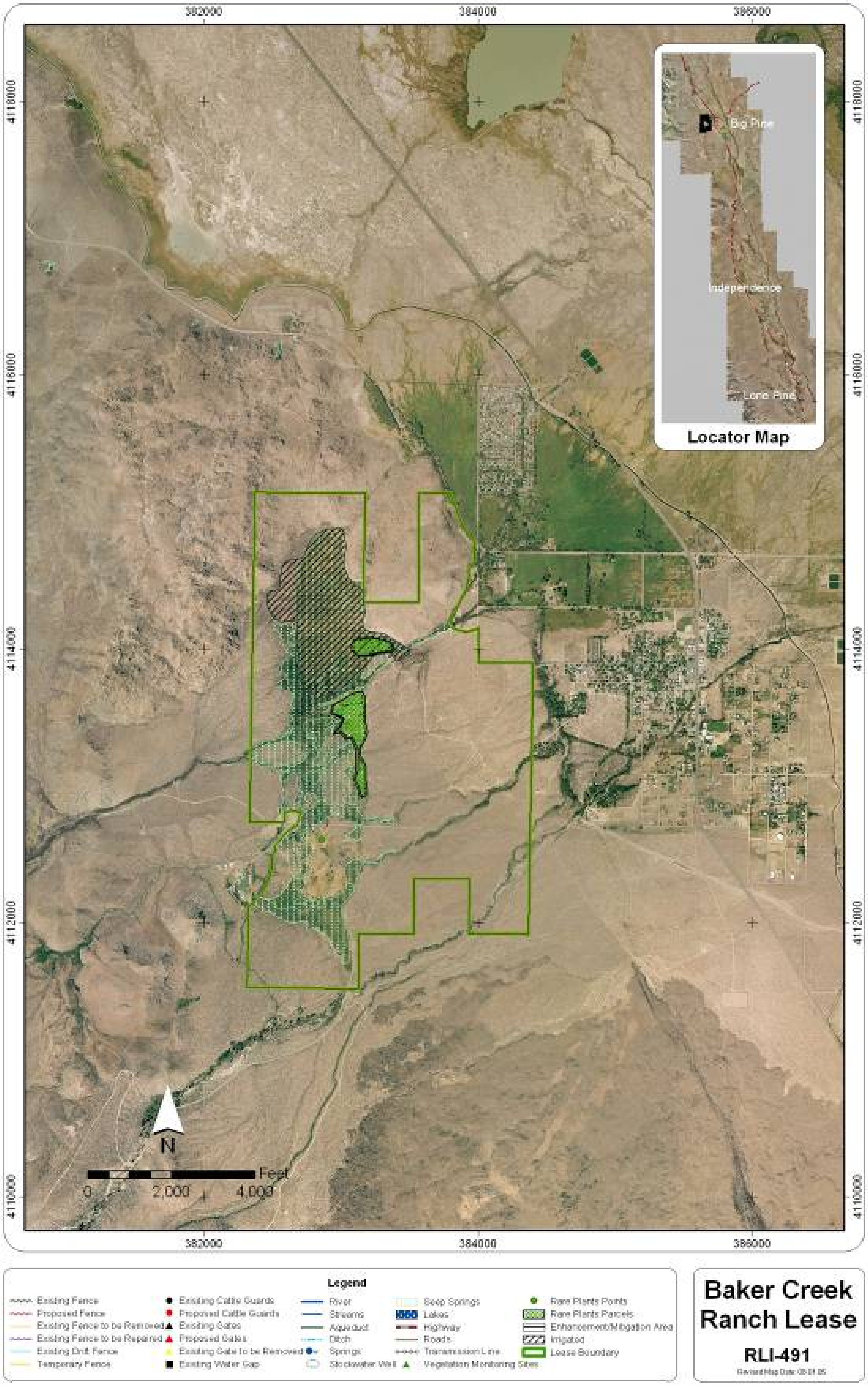
4-J Cattle Lease
Laws Parcel
RLI-491 & 499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Seep Springs
Lakes
Highway
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Irrigated
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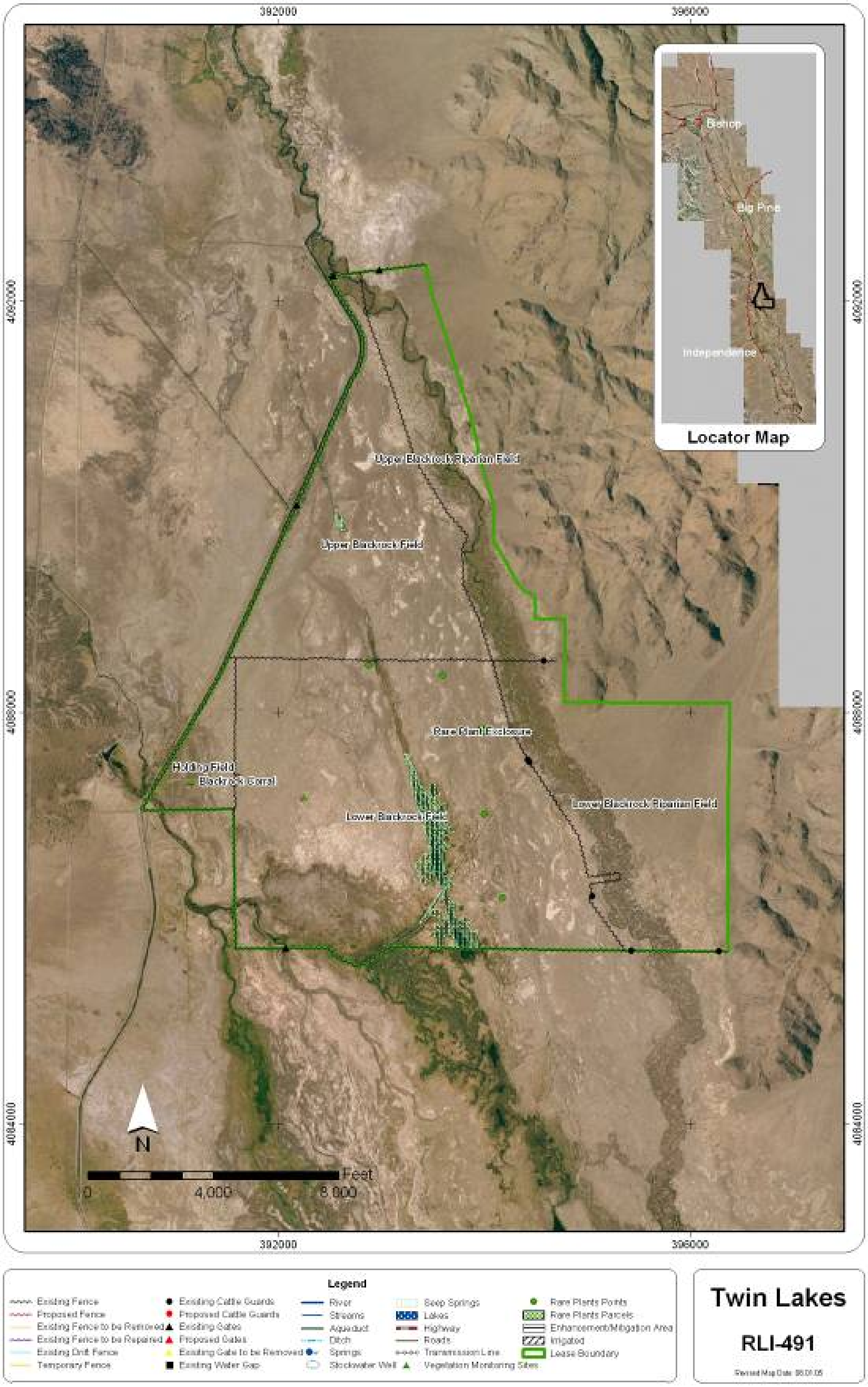
Baker Creek Ranch Lease
RLI-491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Stockwater Well
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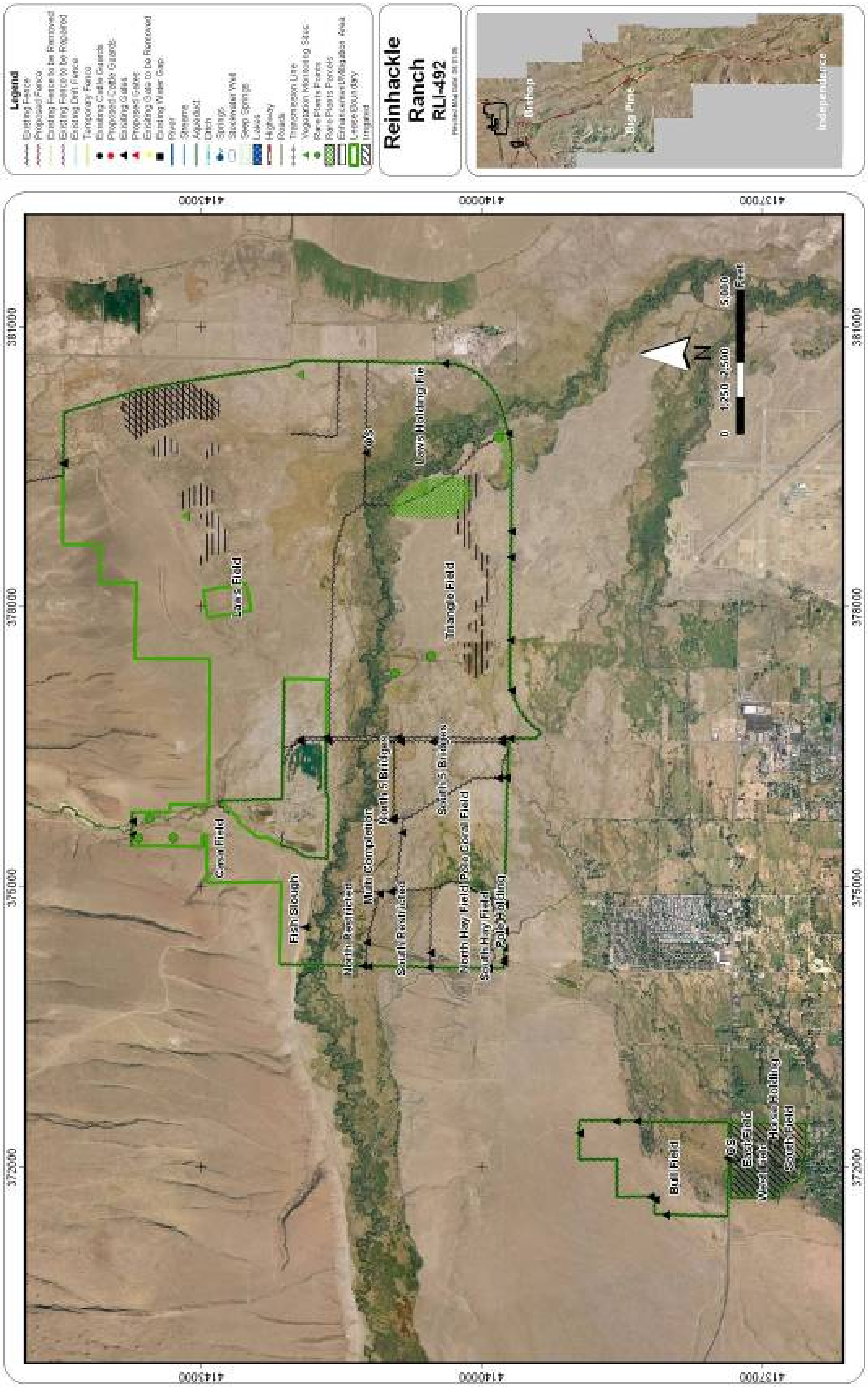
Irrigated
Lease Boundary
Twin Lakes
RLI-491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Corral Field
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North 5 Bridges
South 5 Bridges
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North Hay Field
South Hay Field
Pole Holding
Bull Field
East Field
West Field
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RLI-493
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Little Horse Pasture
Cattle Trap
Back Field
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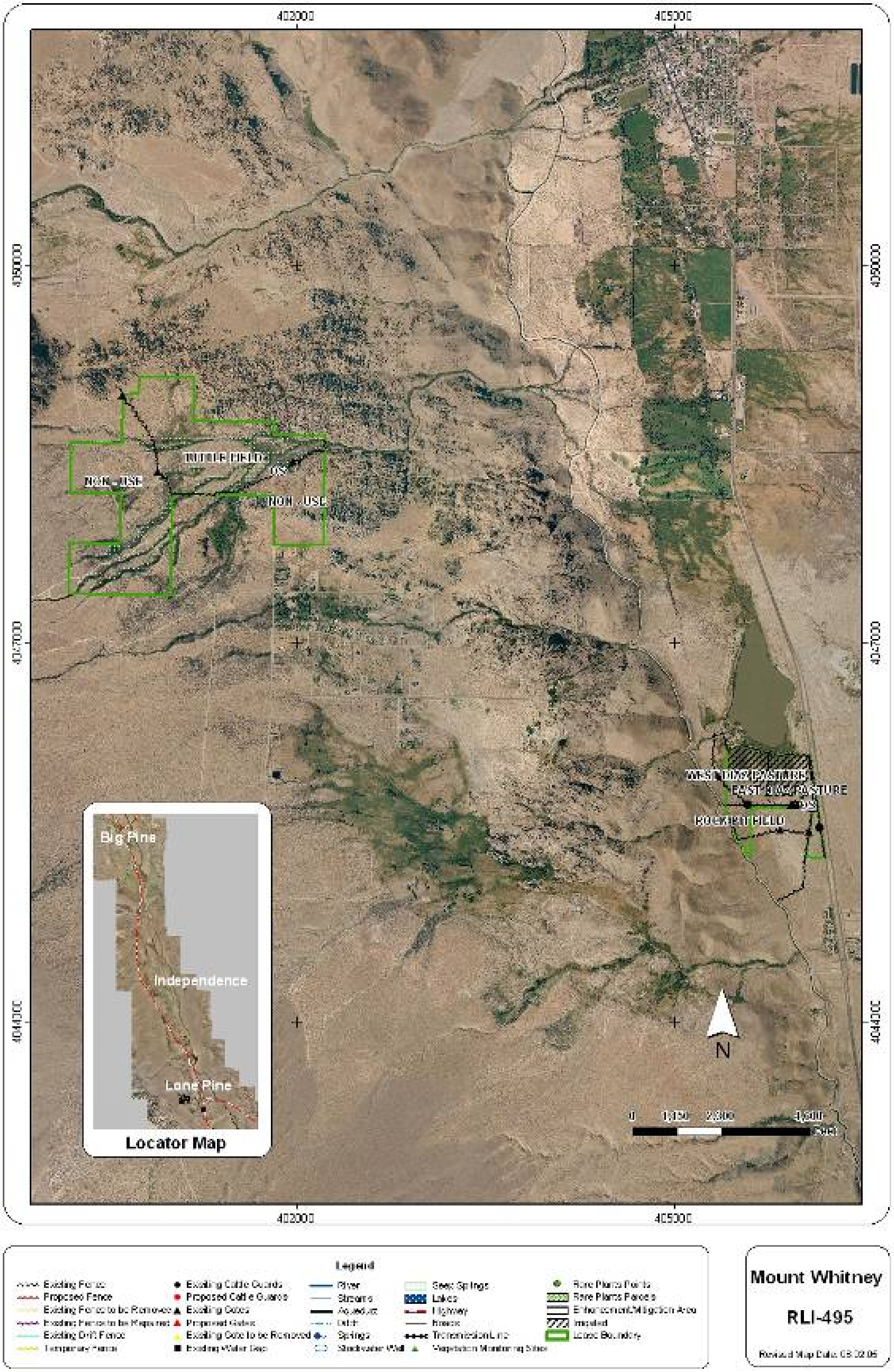
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Transmission Line
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Irrigated
Lease Boundary
Mount Whitney
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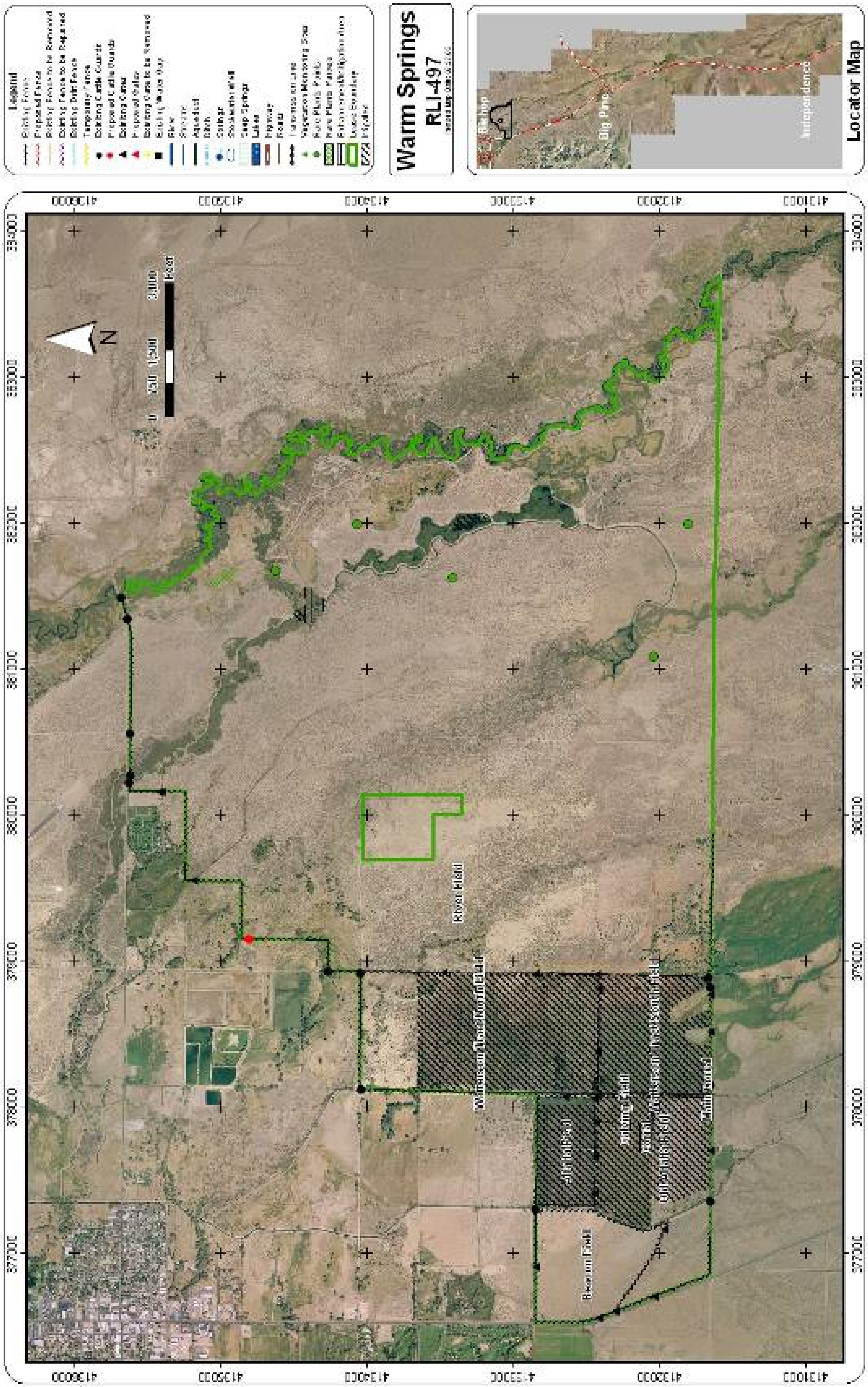
Revised Map Date: 08.02.06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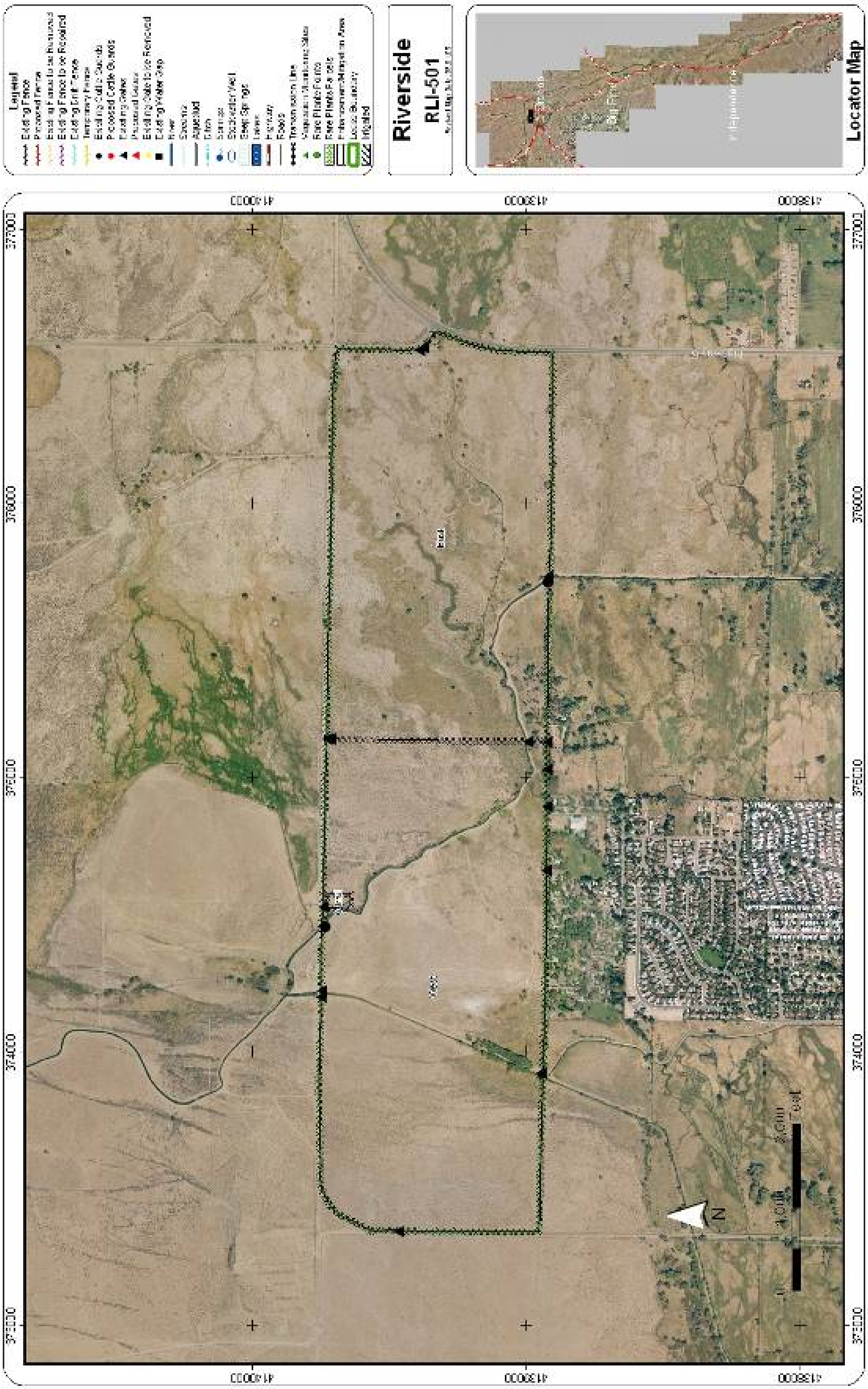
River Field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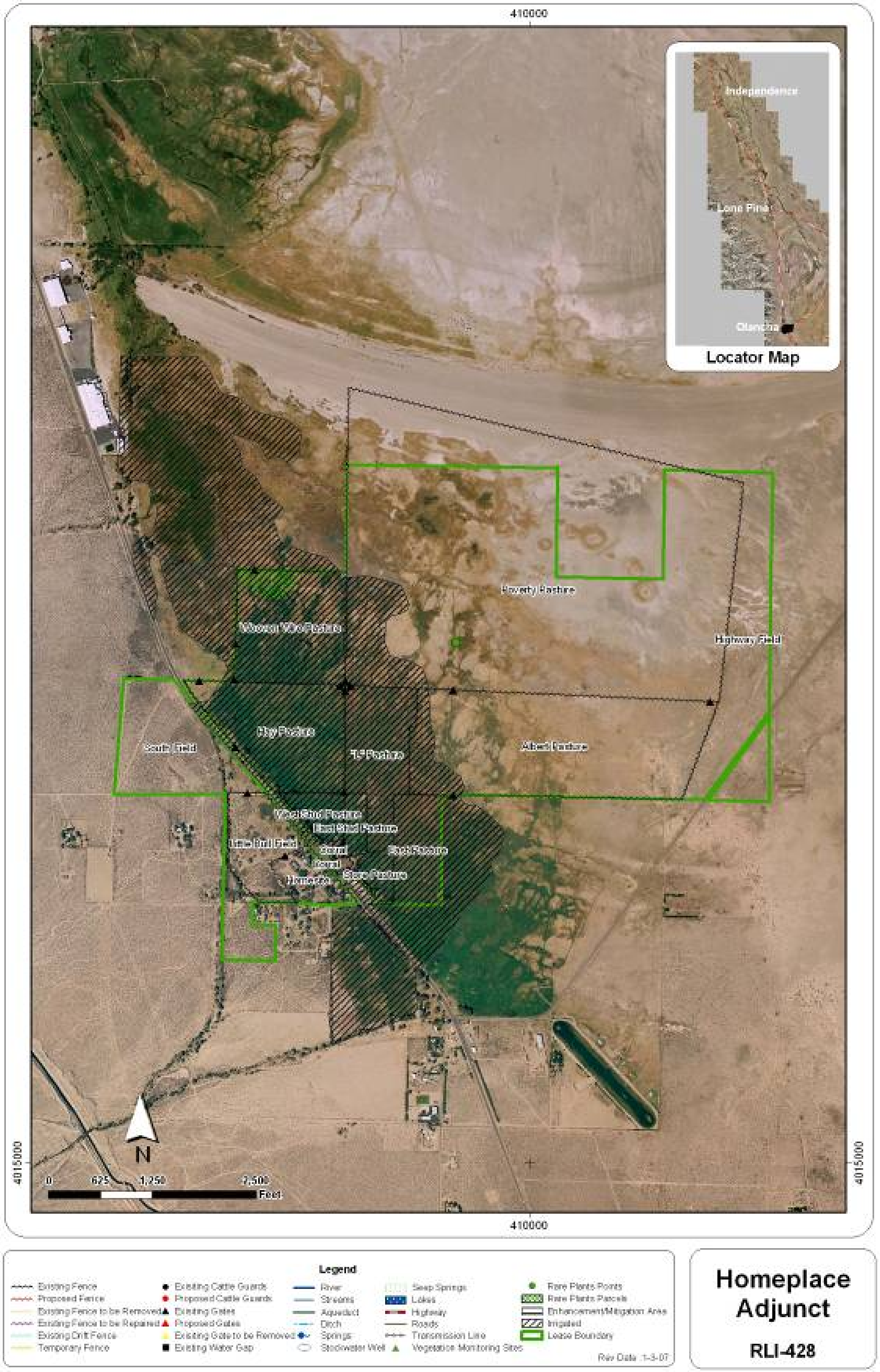
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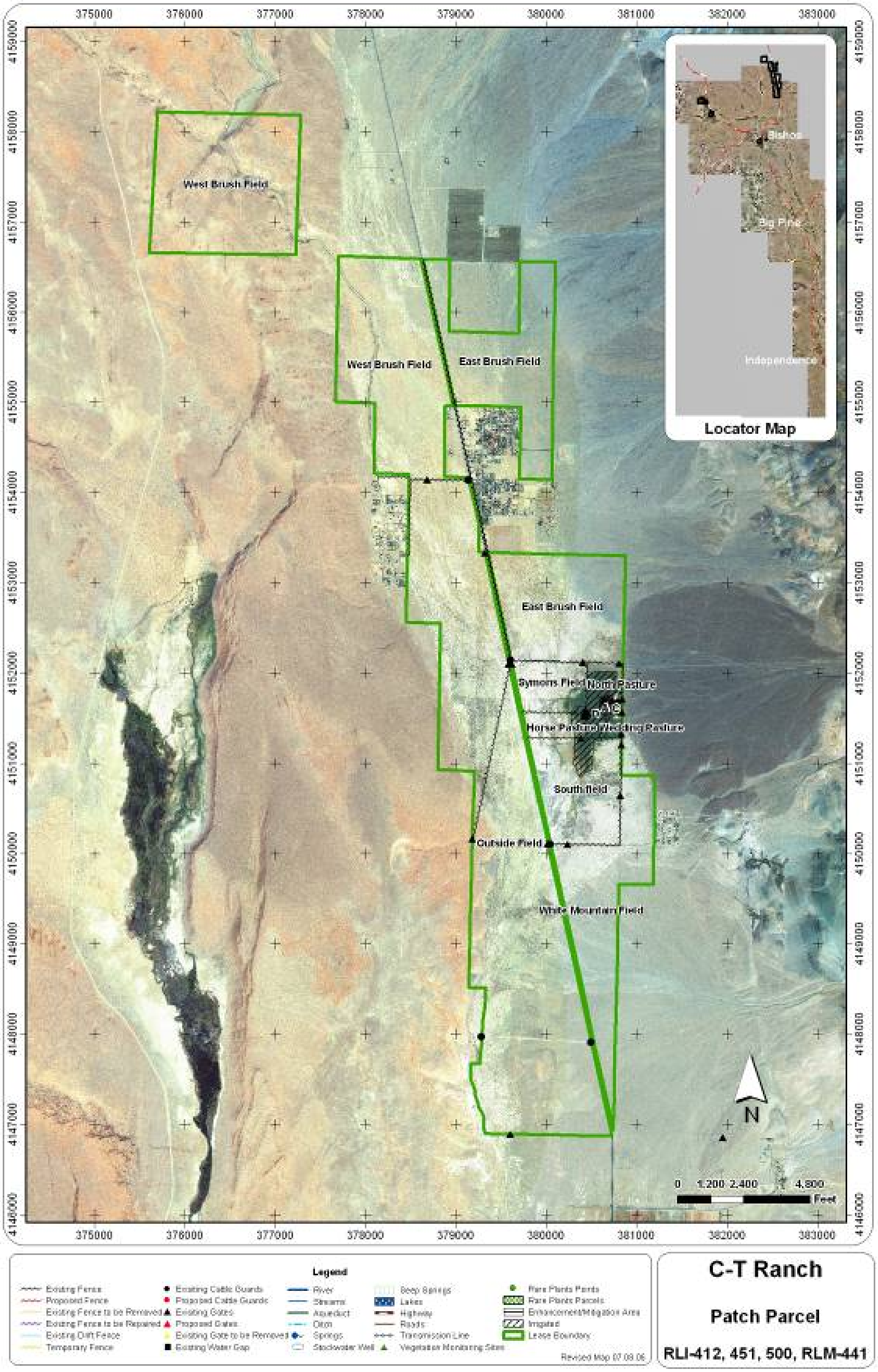
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Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
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Irrigated
Lease Boundary
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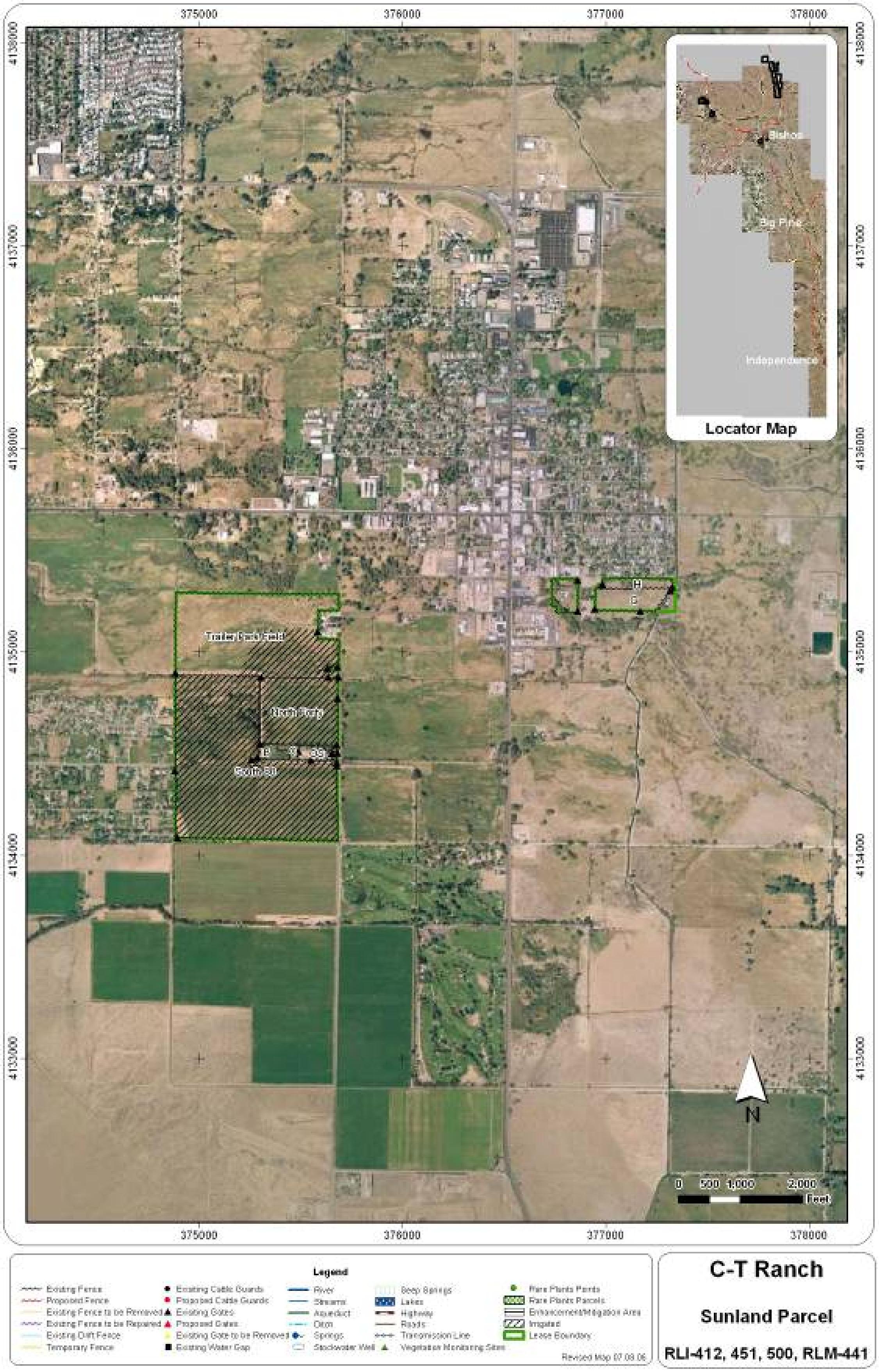
C-T Ranch
Patch Parcel
RLI-412, 451, 500, RLM-441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Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
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Irrigated
Lease Boundary
Revised Map 07.08.06
C-T Ranch
Sunland Parcel
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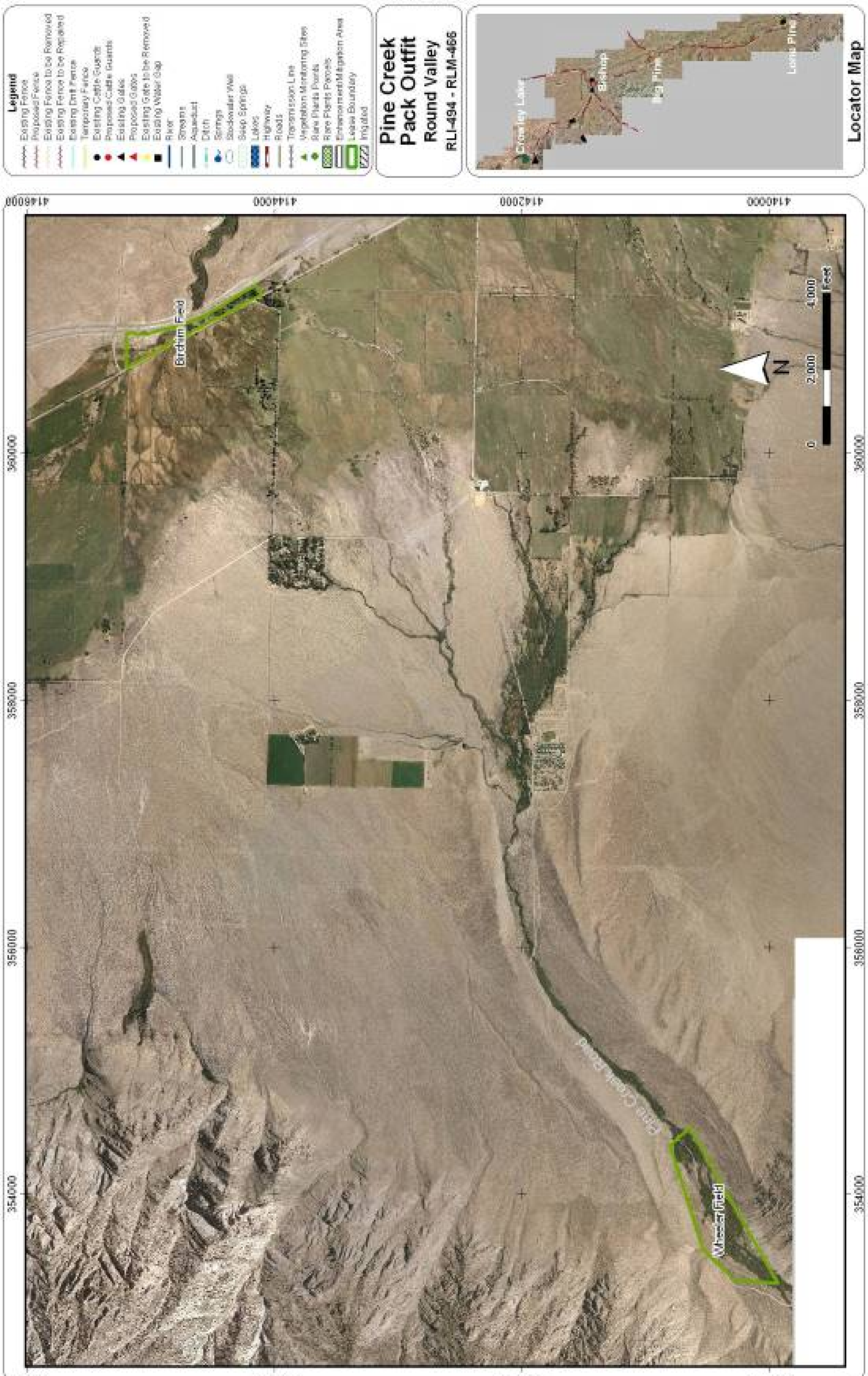
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Transmission Line
Vegetation Monitoring Sites
Rare Plants Points
Rare Plants Parcels
Enhancement/Mitigation Area
Lease Boundary
Irrigated
Pine Creek
Pack Outfit
Round Valley
RLI-494 - RLM-466
Crowley Lake
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Wheeler Field
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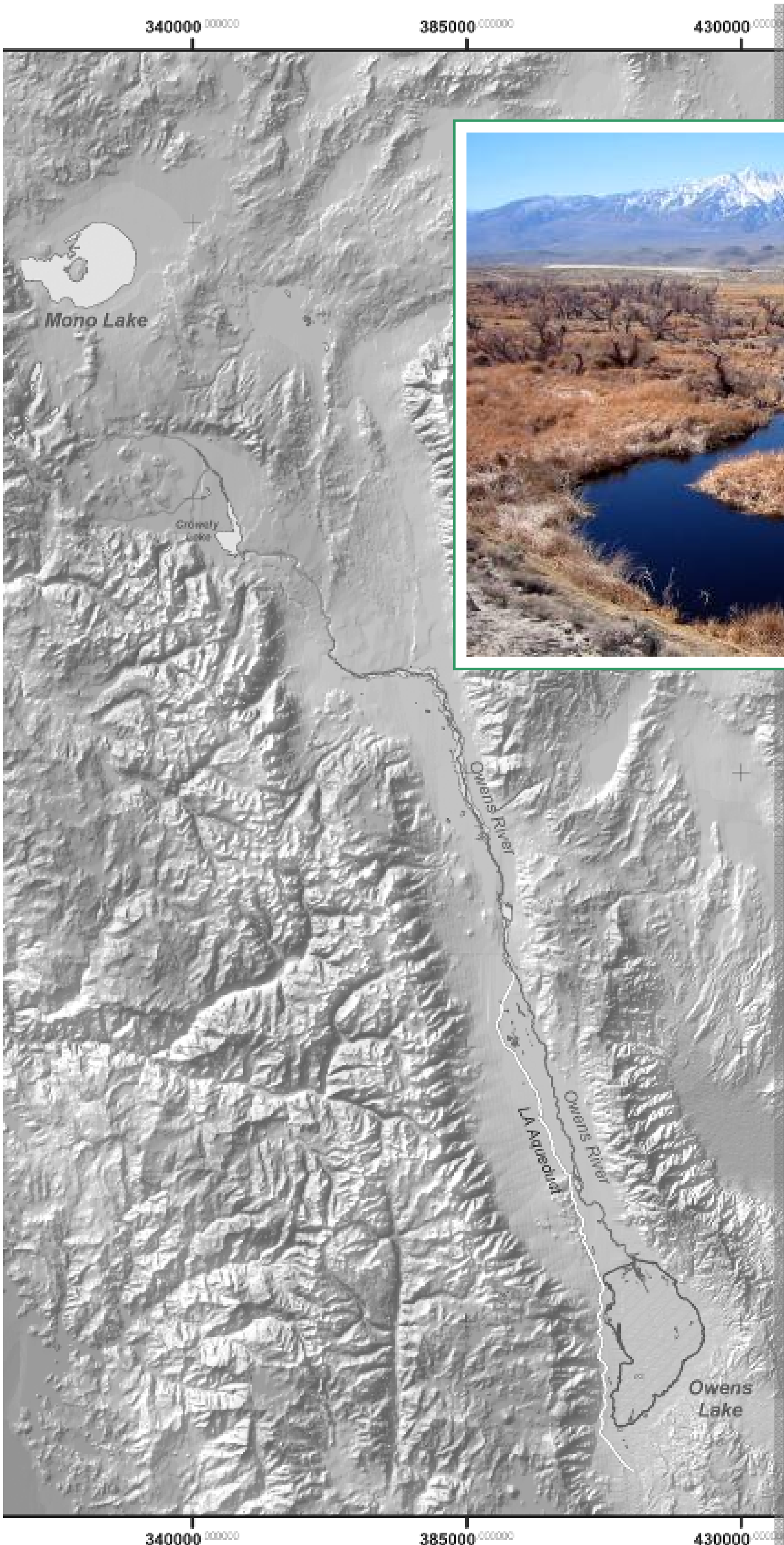


CHAPTER 4

Recreation Management

CHAPTER 4

4.1 Introduction

The LADWP owns a substantial portion of land in the Owens Valley that is largely open for public recreational use. City of Los Angeles-owned lands offer a broad array of recreational opportunities to Owens Valley residents and have also become a recreational destination for domestic and international travelers. Recreational use in the Eastern Sierra has grown rapidly in recent years, largely due to the wide range of recreational pursuits available, including rock climbing, fishing, hunting, hiking, biking, Off-Highway Vehicle (OHV) driving, and wildlife viewing. The valley bottoms, riparian, and upland areas of LADWP lands are host to tens of thousands of recreationists seasonally. This unique recreational experience helps support the local economy. However, the increased recreational use also results in overcrowding and potential overuse of natural resources. Consequently, there is a need for sound land management practices to manage the natural resources of the area, limit impacts, and preserve the semi-primitive recreational experience that visitors and local residents enjoy. LADWP is an agency that manages for multiple uses and recreation is one of the encouraged values.

4.1.1 Purpose and Need

Management of recreationally-used lands is a balance between meeting the needs and expectations of the land users and upholding environmentally sound resource management guidelines. Those who recreate on LADWP lands have certain values and expectations for their recreational experience. However, a limited supply of resources exists in the Owens Valley, and land managers must bridge the gap between making environmentally conscious decisions and utilizing resources.

In addition to upholding sensible resource management goals in managing city of Los Angeles-owned lands in the Owens Valley, it is essential to maintain the goals and mission of the LADWP. The goals of the LADWP are to ensure a reliable supply of high quality water to the city of Los Angeles and to do so in an environmentally responsible manner. Land management decisions to meet water supply goals must be compatible with maintaining a healthy watershed in the Owens Valley.

Moreover, land management decisions in the Owens Valley must also be in compliance with obligations set forth in the 1997 Memorandum of Understanding (MOU) between the city of Los Angeles, Inyo County, California Department of Fish and Game, California State Lands Commission, the Sierra Club, and the Owens Valley Committee concerning the Lower Owens River Project (LORP) and other projects related to mitigation for water exports.[1] This Recreation Management Plan will aid in ensuring the health of the Owens Valley watershed, and will also fulfill the Department's 1997 MOU obligation regarding the preparation of Owens Valley Management Plans.

Figure 4.1. Fishing is a popular activity throughout the watershed.

[1] LADWP, et al. 1997

This Recreation Management Plan encompasses all city of Los Angeles-owned non-urban lands within the portion of the Owens River watershed located in Inyo County not included in the LORP Planning Area (see Figure 1.2, Chapter 1 of the OVLMP).[2] This Plan will supplement recreation direction contained in the Lower Owens River Project (LORP) Final Environmental Impact Report (FEIR).[3] The LORP is a large-scale habitat restoration project on city of Los Angeles-owned lands in the Owens Valley that will restore 62 miles of river channel, and enhance and maintain wetlands in the Owens River Delta and Blackrock areas.[4]

4.1.2 Plan Development

In the 1990s, LADWP implemented several watershed restoration projects in Mono County along the Upper Owens River and its tributaries in Long Valley (Mammoth Creek, Convict Creek, and McGee Creek). The success of these projects was the driving force behind developing projects in Inyo County. The Mono County project components included installing pasture fencing along stream corridors to improve streamside habitat by allowing riparian vegetation to flourish, and protecting downstream water quality and quantity to the Owens River and Crowley Lake. The objective was to reduce impacts to stream banks from grazing and vehicles and allow the ecosystem to recover naturally without using more invasive methods (i.e. heavy equipment). The fencing allows both recreational and livestock use of the areas. The primary purpose of fencing is to allow a riparian corridor to develop so that the stream can be restored to a functional condition. Riparian fencing provides ranchers with the means to effectively control livestock use patterns such as timing and distribution, and also provides the public with parking areas and walkthrough access points to reduce human impacts to streams and wet meadows.[5] Several years later, the success of this management is clearly evident along the Upper Owens River and Mammoth, Convict, and McGee creeks. In most areas the banks are rich with diverse riparian vegetation, including rushes, sedges, and native grasses, and there is substantial willow recruitment and growth along the tributaries and the Owens River. The stream banks are stabilizing with the increased vegetation and reduced livestock and human impacts. LADWP's lessees are successfully using the program, and the public, recognizing that these management measures have improved their recreational experience, has generally welcomed the use of certain access points and designated parking areas.

Prior to plan development, LADWP Watershed Resources Staff solicited comments from all MOU Parties regarding recreationally based issues and concerns on city of Los Angeles-owned property. All Parties had the opportunity to comment and provide input to the Plan. LADWP, using information from MOU Parties and LADWP Watershed Resources Staff, prioritized recreational issues and areas of concern on city of Los Angeles-owned lands. LADWP also solicited input from the public through public interviews and focus group meetings to gain the public's perspective on recreation on city of Los Angeles-owned lands. All procedures in plan development were coordinated by LADWP Watershed Resources Staff with direction from Ecosystem Sciences, and are in compliance with the 1997 MOU and applicable provisions of CEQA.

4.1.3 Public Involvement

The development of this Recreation Management Plan involved (1) a series of public interviews evaluating the social, cultural, legal, and economic impacts to the Owens Valley with the implementation of the OVLMP, including the advent of potentially more recreational use;[6] and (2) focus group meetings representing specific recreational uses throughout Inyo County (e.g., hunting, fishing, rock climbing, etc.) to obtain additional information regarding uses of city of

[2] LADWP et al. 1997
[3] LADWP, USEPA, and ICWD 2004
[4] Ecosystem Sciences 2002
[5] LADWP, FEIR 2004

[6] Ecosystem Sciences 1997

Los Angeles-owned lands in the Owens Valley.

The findings of these interviews and public meetings were incorporated into plan development in order to produce a Recreation Management Plan that considers and protects the users of the resource. LADWP acknowledges that a well designed plan can preserve the value of the recreational resource already enjoyed by the public, while also enhancing ecosystem qualities that might otherwise be destroyed because of overuse or misuse. Further, a successful plan needs substantial user acceptance to be effective in practice.[7]

4.2 Recreation Management Goals and Objectives

4.2.1 MOU Goals and Objectives

Based on the findings from public outreach, LADWP recognizes that continued access on its lands is desired for multiple interests, along with guidelines for resource protection. Public interests wish to maintain the rural atmosphere that currently exists in the Owens Valley while continuing to participate in a wide array of activities. The MOU recognizes the main reason the city of Los Angeles owns the land, stating that LADWP shall continue to protect water resources used by the citizens of Los Angeles while providing for the continuation of sustainable uses such as recreation, livestock grazing, agriculture, and other activities. In doing so, LADWP shall promote biodiversity and healthy ecosystems, and address situations or problems that occur from the effects of various land uses on city of Los Angeles-owned property. The MOU states that priority is to be given to riparian areas, irrigated meadows, and sensitive plant and animal habitats, and that the work done in Long Valley and Upper Owens River areas will be used as models where appropriate.[8]

The riparian restoration efforts implemented in Long Valley and the Upper Owens River (see Section 4.1.2) were very successful; the riparian ecosystem was reestablished and reconnected with river, wetland, and upland habitats. Designated parking areas, walkthrough access, and signage have been effective management tools to regulate the impacts of recreational use in these areas, and users have adapted and welcomed these changes to protect the resources. These positive management actions developed and implemented by LADWP will be implemented on city of Los Angeles-owned lands in Inyo County as part of this Recreation Management Plan.

The MOU goals that pertain to recreation management are described below, along with the objectives. The management tools described under Section 4.3 will be implemented as part of this Recreation Management Plan to meet these goals and objectives.

1. *Continue to provide recreational opportunities on all LADWP-owned lands*. The Recreation Management Plan will continue to provide public access to LADWP lands and support the local tourist economy, and be managed for multiple uses, while maintaining a diversity of quality recreational opportunities.

2. *Implement sustainable land management practices for agriculture (grazing) and other resource uses.* The Recreation Management Plan will consider the need to maintain irrigated meadows/pastures in good to excellent condition (as specified in the Grazing Management Plans), and safeguard and minimize impacts to cultural resources.

3. *Improve biodiversity and ecosystem health (condition).* The Recreation Management Plan will implement actions to protect and/or restore riparian areas to minimize erosion, improve bank stability, optimize water quality benefits, and enhance plant biodiversity.

7 Stankey, et al. 1985
8 LADWP et al. 1997

4. *Protect and enhance habitat for threatened and endangered species.* This plan will provide for the protection of wildlife and sensitive plant species in riparian areas, meadows, and other locations of importance.

The objectives that were developed for the Recreation Management Plan to meet MOU goals include:

1. Modify the location and intensity of recreational activities.
2. Maintain a natural environment with minimal development to benefit the recreational experience on LADWP lands.
3. Monitor and use adaptive management through time.

This management direction is intended to accommodate the competing interests of preserving the primitive and undeveloped character of the resource, satisfying legal and organizational commitments, and supporting the local economy.

4.2.2 Multiple Use Approach to Recreation Management

City of Los Angeles-owned lands in Inyo County are currently managed under a multiple use concept with a substantial portion leased for agriculture, livestock, and other uses. LADWP allows approximately 75% of its leased lands to remain open to the public for recreation and enjoyment (with the exception of critical areas such as irrigated pastures). All lands that are not open to recreational use are currently posted.[9] Gates should be left as they are found—either open or closed so as not to interfere in livestock or agricultural activities. LADWP intends to maintain this recreational access but acknowledges that some restrictions may need to be implemented if impacts to watershed resources become too severe or public safety becomes a concern. OHV use, use of firearms, and any other potentially disturbing recreational activities are not permitted near livestock or in their pastures.[10]

[9] LADWP 2004
[10] Ecosystem Sciences 2002

LADWP property is and will continue to be managed for multiple uses, while maintaining a quality recreational experience for those who choose to recreate in the Eastern Sierra.

4.2.3 Recreation Opportunity Spectrum (ROS)

Recreation management on city of Los Angeles-owned lands is largely based on the Recreation Opportunity Spectrum (ROS), a nationally recognized recreation management tool that is adopted by many land management agencies, including the Inyo National Forest and the Bureau of Land Management's Bishop Field Office. The ROS provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. These experiences and opportunities are arranged along a continuum or spectrum divided into six classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban.[11] The ROS classes that apply to recreation opportunities on LADWP-managed lands include semi-primitive motorized and roaded natural areas, which are characterized by:

- Maintaining a natural appearing environment, with few, if any, developments.
- Hosting a low to moderate concentration of users, with little evidence of human use (including litter, formal parking areas, and sanitation facilities, etc.).
- Providing adequate management and controls with minimal signage and/or formal facilities (if facilities such as toilets, kiosks, etc., are needed, they shall blend with the surrounding environment).
- Permitting vehicle use on designated roadways only; prohibiting off-road vehicle use.[12]

LADWP will continue to coordinate their recreation management with local agencies in the Owens Valley such as the Inyo National Forest and the Bureau of Land Management

[11] USFS 2004
[12] INF and BLM 1996

(BLM) since these agencies share both natural resource and community interests in the Eastern Sierra.

LADWP anticipates greater recreation pressures on its lands in Inyo County over time, including the 62 miles of river channel restored by the LORP. LADWP recognizes that increased active management may be necessary given this expected increase in recreational use. LADWP will strive to uphold a "natural" environment for those who recreate in the Eastern Sierra, while maintaining a healthy watershed and continuing to provide quality water to the city of Los Angeles.

4.3 Recreation Management

A description of the recreational opportunities available on city of Los Angeles-owned lands is provided below, along with the regulations that users must comply with.

Artifact Gathering/Pot Hunting
City of Los Angeles-owned lands are open for day use and exploring; however, it is prohibited by law to disturb or remove any artifacts such as Native American arrowheads, bones, petroglyphs, and relics from ceremonial or burial grounds. It is also unlawful to disturb structures or artifacts of historical significance, such as those used for mining or agricultural purposes.

Camping
City of Los Angeles-owned lands in the Owens Valley are open for day use only. Camping on Department property is only allowed in thirteen designated campgrounds in the Eastern Sierra. No dispersed camping is permitted on LADWP-managed lands. Ten of the thirteen campgrounds are located in Inyo County (Baker Creek, Brown's Schober Lane, Diaz Lake, Glacier View, Independence Creek, Millpond, and Pleasant Valley, Portagee Joe, Taboose Creek, and Tinemaha Campgrounds). These facilities provide hundreds of campsites for visitors, and are located on or near lakes or streams. LADWP remains receptive to the future development of formal camping facilities if such opportunities are presented and can be done in an ecologically sound manner.

Fires
The risk of catastrophic wildfires to the environment and local communities can be severe, especially in the dry climate of the Eastern Sierra. As such, campfires are allowed in designated campgrounds only, and only where barbeques or fire rings are provided. Campfires must not be left unattended and must be completely extinguished before leaving the campsite. Creation of fire rings outside designated areas on Department lands is prohibited.

Fishing
Fishing is open to the public on all LADWP waters except where posted. All fishing is subject to the regulations of the California Department of Fish and Game, and violations are punishable by law. When utilizing LADWP resources for fishing, care should be taken to protect the water bodies by not leaving trash or waste behind, and not driving directly into the river, creek, or stream banks.

Hiking and Biking
LADWP lands are used for both hiking and biking for day use purposes. Areas that are off limits to hiking and biking will be posted, and all users must not disturb wildlife, vegetation, build fires, or leave trash behind. Biking is limited to existing trails.

Hunting
Hunting on LADWP lands is allowed where permitted by state law except where posted. The various hunting seasons (deer, game birds, etc.) and applicable regulations are under the jurisdiction of the California Department of Fish and Game. Firearms are not to be discharged within 150 yards of occupied buildings, farm structures, livestock, public roads, or highways. Much of the property owned by the city of Los Angeles in the Owens Valley is leased for livestock and agriculture; thus, all gates used for access are to be left the way they are found- either open or closed.

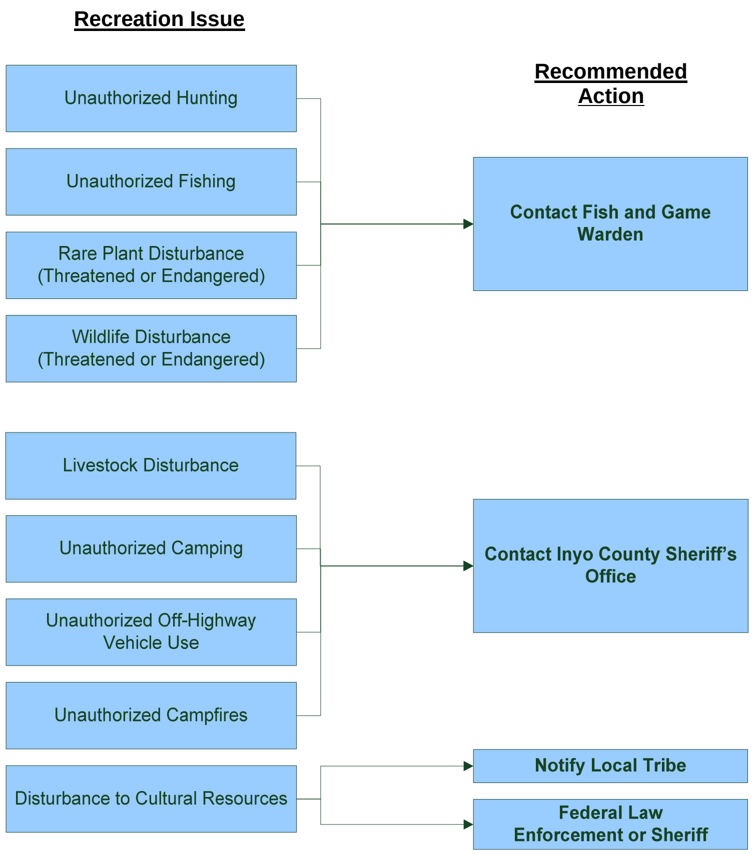


Figure 4.2. LADWP Protocol for Handling Problematic Recreation Issues in the Field

Off Highway Vehicle (OHV) Use

OHV use on city of Los Angeles-owned lands is limited to existing roads and trails, away from residential areas. OHVs are not to be used to create new roads and trails or cause damage to existing vegetation. Extra caution should be taken when using OHVs in areas where livestock are present. OHV use, like any recreational use on city of Los Angeles-owned lands, is done at the user's risk.

Rock climbing and Bouldering

Rock climbing and bouldering are allowed on city of Los Angeles-owned lands as part of day use recreation. Climbers are not to leave chalk marks and hardware on or in rocks and crevasses, and are to minimize damage to vegetation if using crash pads. Climbers are not to drive off road to get to climbing locations. All climbing and bouldering is done at the user's own risk.

4.3.1 Recreation Management Tools

LADWP is committed to managing recreation in a way that will provide for continued use while protecting watershed and cultural resources in the Owens Valley. This section of the Recreation Management Plan describes the tools that LADWP will use to manage recreation on city of Los Angeles-owned lands. This list may not be all-encompassing, as the Department cannot foresee all future needs and applicable management methods. All recreation management tools used by LADWP will be implemented on a site-specific basis.

Education about natural resources will be used as a vital management tool to inform users about their impacts to the resource, and to encourage proper use of the land. For example, the Department may install kiosks with informational materials about LADWP's recreation opportunities and policies to encourage recreators to tread lightly and handle waste accordingly, or provide brochures that are available in key public locations (e.g., Chambers of Commerce, visitor centers, etc.).

When recreation is impacting (or has the potential to significantly affect) a threatened or endangered species or cultural resource, LADWP may install barriers to modify use and protect the affected resource(s). If use patterns threaten riparian or meadow vegetation, critical bird nesting areas, rare plant populations, or cultural resource areas, physical barriers may be installed to restrict access to the threatened resource. These barriers include fencing, boulders, and railroad ties, which will be installed to eliminate vehicular impacts to streambanks, and to provide closure to roads that are no longer needed or have other resource related concerns (e.g., road runs through a rare plant population or access threatens a cultural resource). Gates and walkthroughs will also be installed to alter access points and use patterns, where necessary.

LADWP will pursue violations such as trespassing or unlawful hunting and fishing to the fullest extent of the law. LADWP staff, including aqueduct and reservoir keepers, construction crews, biologists, and hydrographers will continue to patrol and monitor the area, and will notify authorities of violations. Ranch lessees will serve as additional eyes and ears in the field and can report recreation misuse or other types of violations. (Figure 4.2 above contains a diagram that outlines the Department's protocols for handling problematic recreation situations in the field.)

The tools for managing recreation on city of Los Angeles-owned lands in Inyo County to meet the recreation goals and objectives are listed in Table 4.1. Figure 4.17 (located at the end of this chapter) contains a series of flow charts that illustrate how LADWP can use these management tools as options in handling particular recreation situations. Management actions will be prescribed that considers a multitude of factors specific to that particular area.

4.3.2 Management Protocol for Individual or Group Events

Activities such as charity events (i.e., run/walks), equestrian events, hot air balloon and model airplane use, and scientific research occur on city of Los Angeles-owned lands. The protocol for handling requests for individual or group events is to require the requesting party to submit a proposal to LADWP in writing and apply for permission to conduct the activity. The appropriate division of the LADWP (i.e., Watershed Resources, Real Estate, and Engineering) will review the proposal and issue a Letter of Permission if approved. This Letter of Permission contains a series of conditions that parties must adhere to while conducting activities on Department lands. The letter also contains an expiration date and may require fees. The Letter of Permission is not valid until a signed copy is returned to LADWP agreeing to the specified conditions.

Table 4.1. Recreation Management Tools for LADWP Property

Educational Tools
▪ Post signage to inform users of relevant policies, especially where repeated violations occur. These may include signage to designate camping areas, OHV-use, hunting, protected areas, etc.
▪ Install kiosks in key locations to display Department policies and other useful information. These may be placed near popular intersections, parking areas, or access points.
▪ Produce brochures or flyers to educate recreational users on LADWP policies, access points, and opportunities and make available in community locations.
▪ Post Department Recreation Policies on the LADWP website.
▪ Host volunteer events to facilitate the cleanup of waste on LADWP property.
Active Management Tools
▪ Install barriers, such as fencing, boulders and gates to redirect user patterns or prevent access to sensitive resources (e.g., boulders may be placed in closed roadways, fencing may be installed along the riparian corridor, etc.).
▪ Create designated parking areas, if necessary, to maintain access to recreation areas and to direct users away from sensitive resources.
▪ Create walkthrough structures (and possibly trails) in key locations to allow continued recreational access and to deter users from damaging sensitive resources.
▪ Close roads that are rarely used or that are damaging natural or cultural resources on Department lands based on a Roads Analysis.
▪ Create sanitation facilities if or when usage becomes too high, and waste/sanitation becomes a problem.
Regulatory Tools
▪ Contact the Fish and Game Warden to handle any violations of Fish and Game Codes (e.g., unauthorized hunting or fishing, rare plant disturbance, or wildlife harassment).
▪ Notify local law enforcement (Inyo County Sheriff's Department) for any violations of LADWP policies and livestock harassment.
▪ Seek new county ordinances to enforce no camping policy on LADWP property.

4.4 Proposed Projects for Areas of Specific Concern

There are areas of specific concern on LADWP lands that have experienced resource damage as a result of recreational use. This section identifies those areas, describes the impacts, and summarizes the proposed projects that will be implemented to improve the condition of the affected resource(s). The projects are also listed in Table 4.2.

Project 1	Riparian fencing between Pleasant Valley Reservoir and Hwy. 6.
Project 2	Fencing, parking areas, and sign installation at Hwy. 6 and Owens River.
Project 3	Parking area and road modifications at East Line Street and Owens River.
Project 4	Parking area improvements at Warm Springs Road and Owens River.
Project 5	Parking area and road modifications at Hwy. 168 and Owens River.
Project 6	Streambank protection at Stewart Lane and Owens River.
Project 7	Parking area improvements, road closure and sign installation along Owens River south of Tinemaha Reservoir.
Project 8	Fencing installation and road improvements along certain parts of the Owens River to Los Angeles Aqueduct intake.
Project 9	OHV management and signage off Reata Lane southwest of Bishop.
Project 10	Cooperate with BLM and USFS agencies to implement road and campsite management strategies in the Buttermilk area.
Project 11	Coordinate with Inyo County to install trash and toilet facilities at Klondike Lake.

Table 4.2 Proposed recreation management projects.

Figure 4.3. Owens River bank impacted by vehicle use.

Implementation of these projects will be conducted in a phased approach, allowing the agency to manage the most critical needs identified in the MOU and/or by other jurisdictional agencies first. LADWP will begin implementing projects along the Middle Owens River corridor (Pleasant Valley Reservoir to Tinemaha Reservoir) over the first three years following the adoption of this plan, in accordance with LADWP's *Conservation Strategy for the Southwestern Willow Flycatcher* (refer to Chapter 5 for more information). Following the completion of these projects, projects in the southern portion of the management area (Tinemaha Reservoir to the Los Angeles Aqueduct intake structure) will be implemented. Finally, areas with less urgency from a natural resources and/or public safety standpoint will be addressed, including much of the area's uplands. LADWP will continue to manage recreation on a daily basis using the management tools described in Table 4.1 and methods illustrated in Figure 4.17, along with implementing the projects described below. Implementation of these projects will be contingent on funding and available personnel.

Following the implementation of the projects described below, LADWP will monitor to evaluate their effectiveness. Monitoring efforts should not incur high costs, nor should they demand significant energy input to be accomplished regularly. Due to the amount of lands being managed, highly intensive monitoring programs are not practical. As such, monitoring for small projects will be conducted through periodic patrols by LADWP staff as part of their daily tasks to note if violations have occurred and to measure the success of management measures. For longer term projects (e.g., riparian fencing, or other multiple phase projects), a series of photo points will be established prior to project completion to provide baseline information. These locations will be periodically reevaluated over time to note changes and the need, if any, for a change in management prescription. Reporting will be based on annual monitoring efforts and will include photos from monitoring locations, general information on noted changes, and any further information regarding management modifications, if applicable. The construction of any new facilities for recreation management may be subject to CEQA and other state/federal regulations, which will be complied with prior to implementation.

4.4.1 Owens River: Pleasant Valley Reservoir to Highway 6

The Volcanic Tablelands north of Chalk Bluffs Road (northwest of Bishop) receives a substantial amount of recreational use from rock climbers and those exploring nearby Native American petroglyphs. The majority of popular climbing destinations are located on BLM lands adjacent to LADWP property; however, access to these areas, including Happy and Sad Boulders is on LADWP land along Chalk Bluffs Road. The LADWP and BLM worked together in the late 1990s to establish a designated parking area and kiosk for access to the Happy Boulders. Based on the success of this interagency effort to support recreational uses, the BLM and LADWP established a second parking area at the base of Sad Boulders in 2005. A kiosk was constructed along with a toilet facility in order to minimize impacts and assist in regulating use. Informational flyers (produced by the BLM) have also been placed in key locations in the area to inform climbers of agency rules and regulations. LADWP will continue to collaborate with the BLM to manage recreation in this area.

The section of the Owens River between Pleasant Valley Reservoir and Highway 6 northwest of Bishop (Figure 4.3) also receives a considerable amount of fishing, camping, and exploring. As a result, the cumulative impacts of scattered vehicular use and the multiple roads leading to the same destination have caused significant impacts to the riparian areas. This locale is also marked by the continued action of vehicles driving directly up to the banks of the river, rendering many areas of the river bank unstable and devoid of vegetation (Figure 4.4).

Figure 4.4. Junction of the Owens River and Highway 6 showing degraded bank from high use.

The section of the Owens River between Five Bridges Road and Highway 6 has some areas of concentrated recreational use. If these areas begin to degrade and resources become significantly impacted, LADWP will implement the management tools discussed in Section 4.3.

Project 1.

LADWP will implement a riparian fencing project between Pleasant Valley Reservoir and Highway 6 to improve the riparian health along the Owens River.

Fencing along this section of the Middle Owens River corridor will be installed in a phased approach. Fencing will be installed parallel to Chalk Bluffs Road and extend from the Pleasant Valley Campground to just west of Desert Aggregates. (This fence line is the same as the one proposed in LADWP’s Grazing Management Plans.) Boulders may be used in lieu of fencing where the river is adjacent to the road. Designated parking areas, walkthrough access points (handicapped and otherwise), and informational signs will also be established along the new fence line. The size of the parking areas will vary depending on the location. Walkthrough and/or other handicapped access will be provided at each parking area, and at supplemental locations along Chalk Bluffs Road.

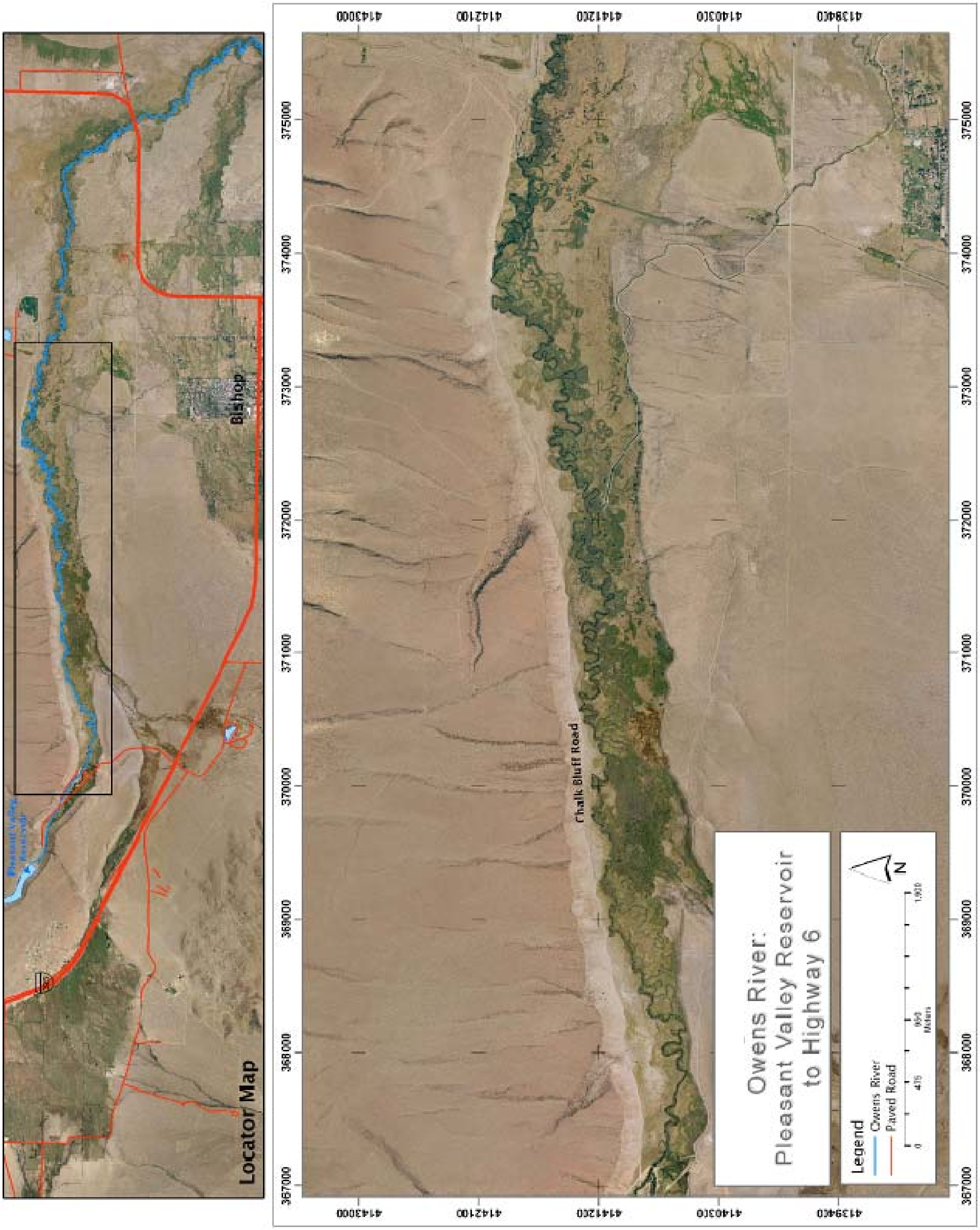


Figure 4.5 Pleasant Valley Reservoir to Highway 6

The fence installation will reduce the recreational impacts along the river banks, allowing stream banks to stabilize and riparian vegetation to flourish. The riparian fencing will also eliminate access to some of the roads in this area. Roads that are closed will be restored to a more natural condition, and vegetation will be reestablished through natural seed dispersal and germination. In some cases, it may be necessary to lightly rip the road surface and physically revegetate the area through seeding.

This project will be coordinated in conjunction with LADWP's Grazing Management Plans to meet grazing management and recreational use goals along the river. There may be additional cross fences and gates installed along this stretch of the river for range management purposes. This project will also benefit species protection efforts under LADWP's *Conservation Strategy for the Southwestern Willow Flycatcher*. It is considered a high priority project and will be fully implemented by 2010.

Monitoring for this project will be conducted through a series of photo points that encompass this section of the Middle Owens River and will be able to capture changes in landform, banks, roads, vegetation, etc. of the area over time. These photo points will be established prior to project implementation and a series of baseline photos will be documented. These photo points will be recaptured and reevaluated each year for the first two years following complete implementation of the project, as well as years seven and 12 thereafter. Reporting for this project will be based on photo point documentation of changes over time. Reports will include photos from monitoring locations, general information on noted changes, and any further information regarding management modifications, if applicable.

4.4.2 Owens River: Highway 6 to Tinemaha Reservoir

The Owens River between Highway 6 and Tinemaha Reservoir (Figure 4.5) has several areas that have extensive resource damage due to high levels of recreational use. These problem areas occur where the river intersects Highway 6, East Line Street, Warm Springs Road, Highway 168, and Stewart Lane. The resource damage in these locations varies, but is largely a result of vehicles parking directly on the banks to access the river for fishing, float tubing, and other recreational pursuits.

LADWP will use boulders or other barrier devices if necessary, to obstruct direct vehicular access to the banks of the river. The Department may also install designated parking areas (with walkthrough access points) that blend with the landscape, where appropriate. Though LADWP does not intend to restrict recreational access in these areas, the Department recognizes the need to manage these sections of the river since they sustain high recreational use. LADWP will install minimal signage in key locations, if needed, to inform users about management procedures and recreational uses on its lands.

In areas along the river where there is less recreational impacts but where potential resource concerns occur (e.g., impacts to rare plant populations or degradation of the riparian ecosystem), LADWP will implement the applicable management tools described in Section 4.3.

Project 2. Highway 6 and the Owens River

Managing this high use recreation area will require fencing to protect sensitive natural resources, designated parking areas, walkthroughs that enable handicapped access, and if necessary, appropriate signage. This project will be implemented by 2010 in accordance with LADWP's *Conservation Strategy for the Southwestern Willow Flycatcher*, and all fence lines will be constructed in conjunction with LADWP's Grazing Management Plans.

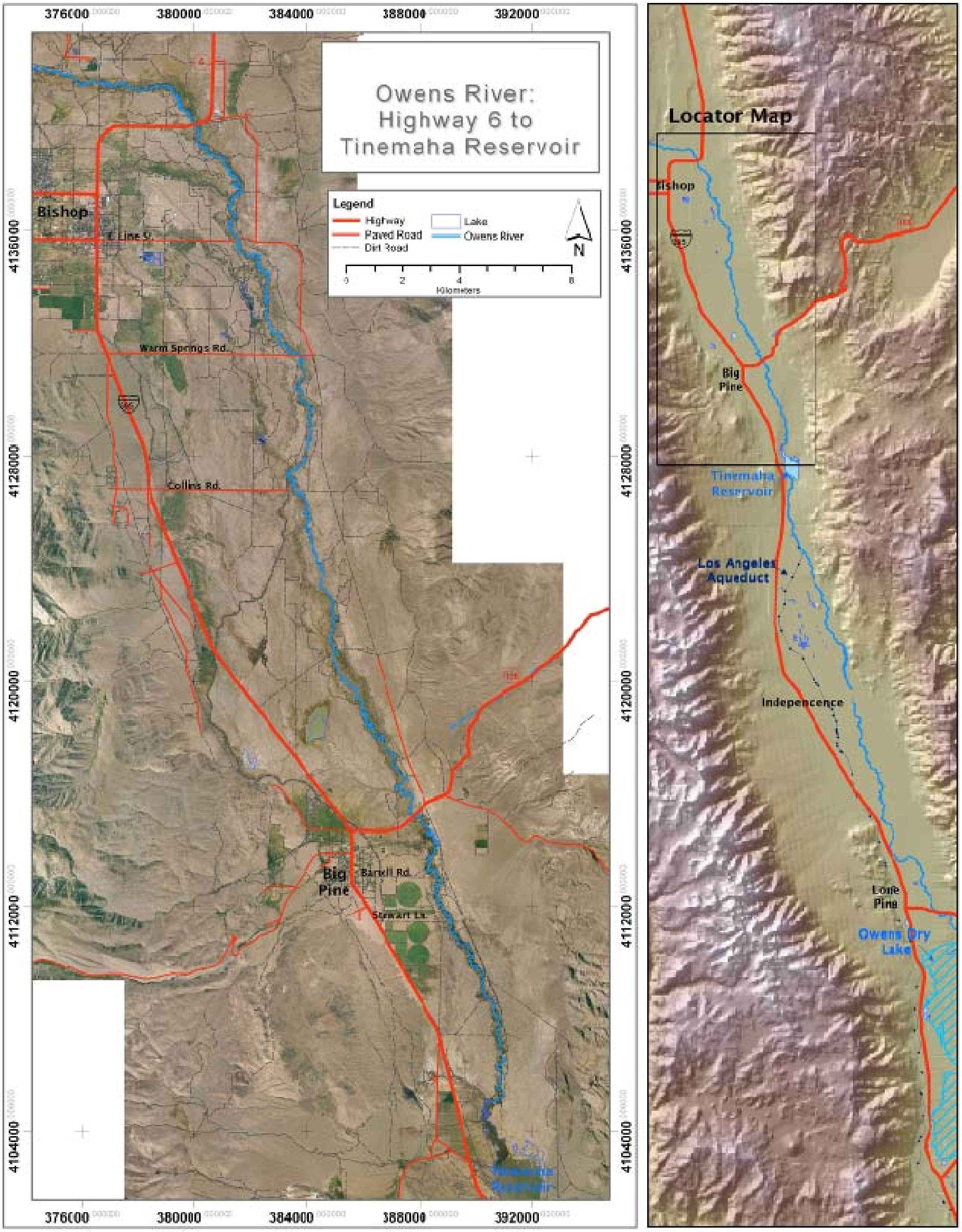


Figure 4.6 Highway 6 to Tinemaha Reservoir

Fencing will be installed to reduce the existing vehicular impacts to stream banks by setting vehicular access back to one of the existing roads. A designated parking area will be established off of Highway 6 due to public safety concerns, and will provide walkthrough access to the river. Signage will be installed, where appropriate, to encourage proper use of the land. To encourage revegetation of the road surfaces that are closed due to the fencing, roads may be ripped and/or seeded, if necessary.

Monitoring will include a series of photo points that will be established prior to project implementation. Photos in these locations will be recaptured for the first two years following completion of the project, and years seven and 12 thereafter. Reporting will be based on photo point documentation of changes over time. Reports will include photos from monitoring locations, general information on noted changes, and any information regarding management modifications, if applicable.

Project 3. East Line Street and the Owens River

The junction of East Line Street and the Owens River experiences a high degree of recreational use throughout the year, including fishing, float tubing, and OHV use. Resource damage is largely due to vehicles parking on the banks and unauthorized OHV use on the sand dunes directly west of this junction. Figures 4.7 and 4.8 show the impacted banks at the junction of the river and the East Line Street Bridge. Trash is also a byproduct of this heavy use.

Recreation management in this area is a high priority since the river is sustaining a direct impact from recreational uses. Recreational uses will not be restricted in this area, as it is a popular location throughout the year. This proposed project will focus on the existing impacts along the river.

LADWP will install boulders or railroad ties in the existing parking area to discourage vehicles from driving directly to the stream banks, while maintaining a large enough area for a turnaround and parking area for several vehicles. The use of boulders or ties in this location makes structural walkthroughs unnecessary. Signage will also be installed in key locations to educate users about the restoration efforts and the proper uses of LADWP-managed lands. By lessening the impacts from recreational uses, native vegetation will likely naturally revegetate; however, if affected banks are too compacted, they may be ripped and/or seeded. LADWP Watershed Resources staff will make this determination.

Figure 4.7. Looking south at the Owens River from the East Line Street bridge.

Monitoring will include a series of photo points that will be established prior to project implementation. Photos will be retaken for the first two years following completion of the project as well as years seven and 12 thereafter. Reporting will include photo point documentation of changes over time, and include photos from monitoring locations, general information on noted changes, and any management modifications, if applicable.

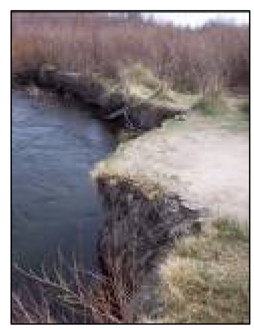


Figure 4.8. Impacted river bank on the west side of the Owens River at junction depicted in Figure 4.7.

Project 4. Warm Springs Road and the Owens River

The Owens River at the junction of Warm Springs Road receives a fair amount of recreational use and is impacted by vehicles parking directly on the stream banks. Although this is a small area, LADWP will place boulders or railroad ties in specific locations to prevent vehicles from parking directly on the riverbank- parking will be

Figure 4.9. Existing conditions at Stewart Lane and the Owens River.

provided for a few vehicles. Foot access to the river will be maintained.

Monitoring and reporting for this project will be done by LADWP Watershed Resources staff through periodic patrols. Reporting will only be completed if there are changes in management activities.

Project 5. Highway 168 and the Owens River

The Owens River at Highway 168 receives a fair amount of use north of the highway on the west side of the river. Currently, vehicles are allowed up to the river banks. LADWP will place boulders or railroad ties to keep vehicles off of the stream banks, while maintaining the existing turnaround and parking for a few vehicles. Foot access will be maintained, and signs may be placed to educate users about the resources and proper use guidelines, if needed.

Monitoring and reporting for this project will be conducted by LADWP Watershed Resources staff through periodic patrols. Reporting for this project will only be completed if an alteration in management activities occurs.

Project 6. Stewart Lane and the Owens River

Stewart Lane (south of Big Pine) dead ends at the Owens River, where there is a large turnaround and a single railroad tie with reflectors to signify the end of the road. This is another area where vehicles access the stream banks, and as a result, the stream banks are devoid of vegetation (Figure 4.9).

LADWP will install railroad ties (or another barrier device) to connect the existing tie with the adjacent fence line. This will discourage vehicles from driving directly up to the banks of the river, and will maintain a large enough area for parking. Foot and handicapped access to the river will also be maintained.

Monitoring and reporting for this project will be conducted by LADWP Watershed Resources staff through periodic patrols. Reporting will only be completed if there are changes in management activities.

4.4.3 Owens River: Tinemaha Reservoir to Los Angeles Aqueduct intake

The Owens River from Tinemaha Reservoir to the Los Angeles Aqueduct intake (Figure 4.10) is another section of river that is greatly impacted by vehicle use. The high use has resulted in multiple roads, which has impacted the riparian areas. In many areas, banks are cut and unstable, and devoid of vegetation.

Project 7. Owens River directly south of Tinemaha Reservoir

The section of the Owens River directly south of Tinemaha Reservoir receives high use for fishing and other types of recreation. Currently, there is a parking area just below the dam that accommodates a number of vehicles, and allows walking access to the river upstream of this location. Those who wish to use the river downstream of this location mainly drive to their chosen locale.

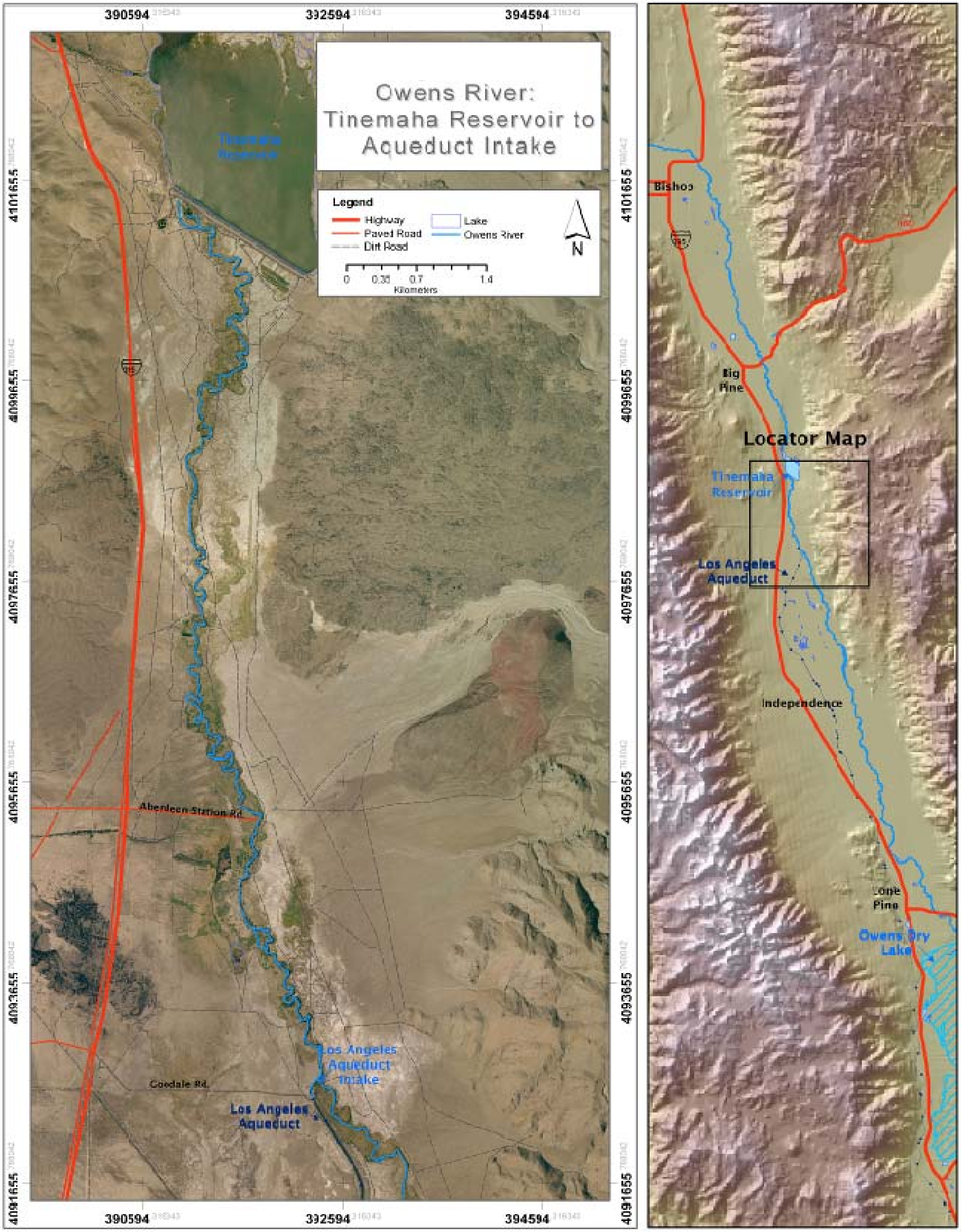


Figure 4.10 Tinemaha Reservoir to Aqueduct Intake

As a result, there is a network of roads along the river banks, which are now largely devoid of vegetation; an accumulation of trash is also a by-product of this heavy use (Figures 4.11 and 4.12). Most of these roads have been created over the years possibly due to different seasonal road conditions (e.g., driver moves to higher, drier ground to avoid wet, muddy ruts) or to maneuver vehicles in a crowded area. These additional roads are unnecessary if primary roads are maintained.

To manage for current and future uses in this area, LADWP will install boulders or railroad ties along the north and east side of the existing parking area to discourage vehicles from driving directly up to the stream banks. The steepness of the stream banks in some areas is a safety concern. The designated parking area will continue to accommodate many vehicles, and will provide additional walkthrough access to the river east of this parking area. The existing roads that lead directly east to a bend in the river will be closed to motor vehicles, along with roads that connect with it, but foot and handicapped access will be maintained. Users who wish to use this section of the river will only have to walk 50 to 80 yards. The road extending southeast from this parking area will remain open for travel.

Signage will be installed in key locations to educate users about the riparian ecosystem restoration efforts and encourage proper use of LADWP lands for recreation. By lessening the recreational use impacts, native vegetation will likely become reestablished in the area and stabilize the riverbanks. However, some impacted banks may be ripped and/or seeded, if recommended by LADWP Watershed Resources staff.

Monitoring for this project will include a series of photo points that will be established prior to project implementation. Photos in these locations will be recaptured for the first two years following completion of the project, as well as years seven and 12 thereafter. Reporting for this project will be based on photo point documentation of changes over time, and include photos from monitoring locations, general information on noted changes, and information regarding management modifications, if applicable.

Project 8. Additional Riparian Recreation Management from Tinemaha Reservoir to the Los Angeles Aqueduct Intake Structure

In order to improve the riparian health of the Owens River between Tinemaha Reservoir and the Los Angeles Aqueduct intake structure, LADWP will assess and manage the network of roads in and around the riverine ecosystem that are problematic from a resource standpoint or present a safety concern for users. Unlike the section of the Owens River between Highway 6 and Tinemaha Reservoir, there are no problematic junctions with major roadways on this portion of the river. Instead, impacts to the riverbanks occur from continued use of roads that parallel both the west and east sides of the river. There are areas of these roads that are being eroded as the river channel changes over time, presenting safety concerns. Impacts from driving directly on the stream banks to access the river are also apparent in some areas.

LADWP will maintain access to the river for recreation, but will install boulders, railroad ties, or fencing in appropriate areas to reduce vehicular impacts to the banks. Management approaches will be in conjunction with LADWP’s grazing improvements. Parking areas will be dispersed along the existing main roadways in coordination with the above measures. In addition, walkthrough or handicapped access and applicable signage will be provided at each designated parking area to allow continued access for recreation on LADWP lands. Since this project includes a large area and many locations, it must be treated on a case by case basis; implementation of this project will be phased over time, executing the most critical needs first from a public safety and watershed health standpoint.

Monitoring and reporting for this project will be conducted by LADWP Watershed Resources staff through periodic patrols. Reporting for this project will only be completed if an alteration in management activities is required.

4.4.4 Off-River Areas

Project 9. Motocross Use off of Reata Lane

LADWP lands southwest of Bishop off of Reata Lane have become a popular location for motocross use over the years. Though in the past local area groups have leased this land for motocross events, this area is not currently leased and is used by OHV enthusiasts at their own risk.

Recognizing that this area is already disturbed and not in close proximity to sensitive water resources, the Department will sign the area as LADWP property to notify users of restrictions and that LADWP will not assume liability for this use of the area. LADWP will remain open to leasing this area to private entities as it has in the past, with the understanding that interested parties can provide a proposal along with the appropriate insurance to cover activities conducted on Department lands. For special motocross events, the Department will make the area available with the understanding that interested parties must submit their request in writing to use the area and a Letter of Permission will be granted if approved by the appropriate LADWP staff. All requests for use must be made in writing and have proof of insurance. This strategy promotes the use of this area by OHV enthusiasts over in order to curtail the impacts to more sensitive resource areas in other locations.

Monitoring and reporting for this project will be conducted by Watershed Resources staff through periodic patrols. Staff will review aerial photos to determine if any new roads and trails have been established, and note when/if vandalism occurs. Formal reporting will only be conducted if there are changes to management activities.

Project 10. Buttermilk

Located southwest of Bishop off of Highway 168, the Buttermilk Country has become a popular destination for recreation such as camping, rock climbing and bouldering, and is also a popular high school party location (Figures 4.13 and 4.14). The cumulative impacts of these uses over time have caused significant damage to resources, including human sanitation problems, vegetation trampling, soil compaction, and potential water quality problems. Camping in this area is unauthorized and users often camp very close to the stream banks, resulting in resource damage to the banks. In addition, rock climbing and bouldering have become very popular in this area in recent years due to marketing in guidebooks and word of mouth. The increased use has brought more vehicles to the area, which does not have adequate parking facilities or restroom facilities. The property

Figure 4.11. Aerial photo of Owens River downstream of Tinemaha Reservoir.

Figure 4.12. Photo of bank south of Tinemaha Reservoir. This area receives considerable recreational use.

Figure 4.13. Unauthorized camping on LADWP lands in the Buttermilk.

Figure 4.14. Fire ring created on LADWP lands in the Buttermilk.

along Buttermilk Road that accesses popular climbing or bouldering areas is owned by LADWP and the Inyo National Forest. The Inyo National Forest completed an Environmental Assessment in 2004 to construct a toilet facility and parking structure on their property in the Buttermilk Country. To manage appropriately for the above impacts, LADWP will implement actions to be completed by 2015.

LADWP will continue to coordinate with the Inyo National Forest and the Bureau of Land Management (BLM) to discourage dispersed camping on Department lands. If necessary, boulders or other barrier devices will be placed to prevent vehicle access to the waterways and prevent unauthorized camping. LADWP will increase signage in the area to educate visitors about the camping policies on LADWP property and proper use of the land. Campers will be encouraged to use the BLM's winter climbing facility known as the Pit, near Pleasant Valley Reservoir (northwest of Bishop) or on National Forest lands where dispersed camping is authorized. Fire rings will be removed, as fires are only allowed in the Department's thirteen designated campgrounds.

LADWP will also place a permanent informational kiosk in the Buttermilk Country to educate the public about recreation policies as well as property boundaries between private (LADWP) and public (National Forest and BLM) lands. LADWP will work jointly with these agencies on the content of the information provided at the kiosk and explore cost sharing opportunities.

Monitoring and reporting for this project will be conducted by LADWP Watershed Resources staff. Reporting will only be conducted if an alteration in management activities is required.

Project 11. Klondike Lake

Klondike Lake (east of Highway 395 and north of Big Pine) is used heavily for water sports. The Klondike Lake Project is an Enhancement/Mitigation Project that was adopted in 1986 to enhance an alkali sink north of Big Pine that was intermittently filled with water throughout the year. The project used water management to provide and enhance nesting and feeding habitat for waterfowl, while maintaining a lake level to support a variety of recreational activities such as boating, water skiing, swimming, and other water sports. Klondike Lake has become a popular recreation area, and has consequently become a problem area for trash and human waste.

The 1991 Water Agreement (City of Los Angeles vs. County of Inyo 1991) states that the Department is to provide funds to Inyo County to rehabilitate existing parks and campgrounds, develop new campgrounds, parks, recreational facilities and programs, and fund annual operation and maintenance of existing and new facilities and programs located on Department property. LADWP will coordinate with Inyo County to explore options for waste management at Klondike Lake and may pursue trash and toilet facilities (operation and maintenance would be the responsibility of Inyo County).

4.4.5 Projects Applicable to the Entire Management Area

In the Owens Valley, vehicle access is integral to the recreational experience but also results in the greatest impacts to resources. Networks of access roads are used and often created by recreationists during or en route to their respective activities. This road creation is often the result of attempting to avoid lengthy walks or obstacles; therefore, there are numerous places where multiple roads lead to the same destination.

Many roads are in need of repair, closing and/or rerouting; surrounding vegetation has been trampled (or in some cases, eliminated) where excessive roads have been created. Soil and sediments may also be washed into water bodies where roads are directly adjacent to waterways and/or vehicles are too close to stream banks. Figure 4.15 and 4.16 illustrate the excessive road problems that exist on LADWP lands.

Figures 4.15 and 4.16. Photos of multiple road networks near the Owens River, Inyo County, California.

To manage the many roads on LADWP lands in the Owens Valley, Ecosystem Sciences is conducting a Roads Analysis to determine which roads (in addition to those discussed previously) are in need of repair, rerouting, or closure. The analysis will also prioritize road repair and road closure projects. The Roads Analysis uses a combination of GIS and satellite technologies, as well as ground truthing for data collection and verification. GIS data completed by the BLM on interagency road networks in Inyo and Mono counties in fall of 2004 (BLM 2004) is used in conjunction with aerial photographs and field data to analyze road use, quality, and proximity to recreational sites and sensitive resources.

Rerouting and closing of roads will encourage recreational access and use that is more ecologically sound than current practices, and will reduce the localized impacts to native vegetation and other natural resources. Roads that are in need of repair or maintenance will provide a better, safer means of travel for those who recreate on LADWP lands. A combination of passive and active road improvements will be prescribed depending on location, uses, and objectives. In some cases, ripping and seeding reclaimed road surfaces is recommended in order to achieve particular goals; in other cases, simply blocking access to a road is more appropriate.

Based on Ecosystem Sciences' recommendations, LADWP will implement changes in road networks on LADWP lands that are financially feasible and can be conducted with current Department Watershed Resources and Construction personnel. These changes will be implemented on a priority basis, and will be monitored periodically by LADWP personnel. Goals in monitoring will be to evaluate the effectiveness of the management measures. Reporting for this project will only be conducted if an alteration to management activities is required.

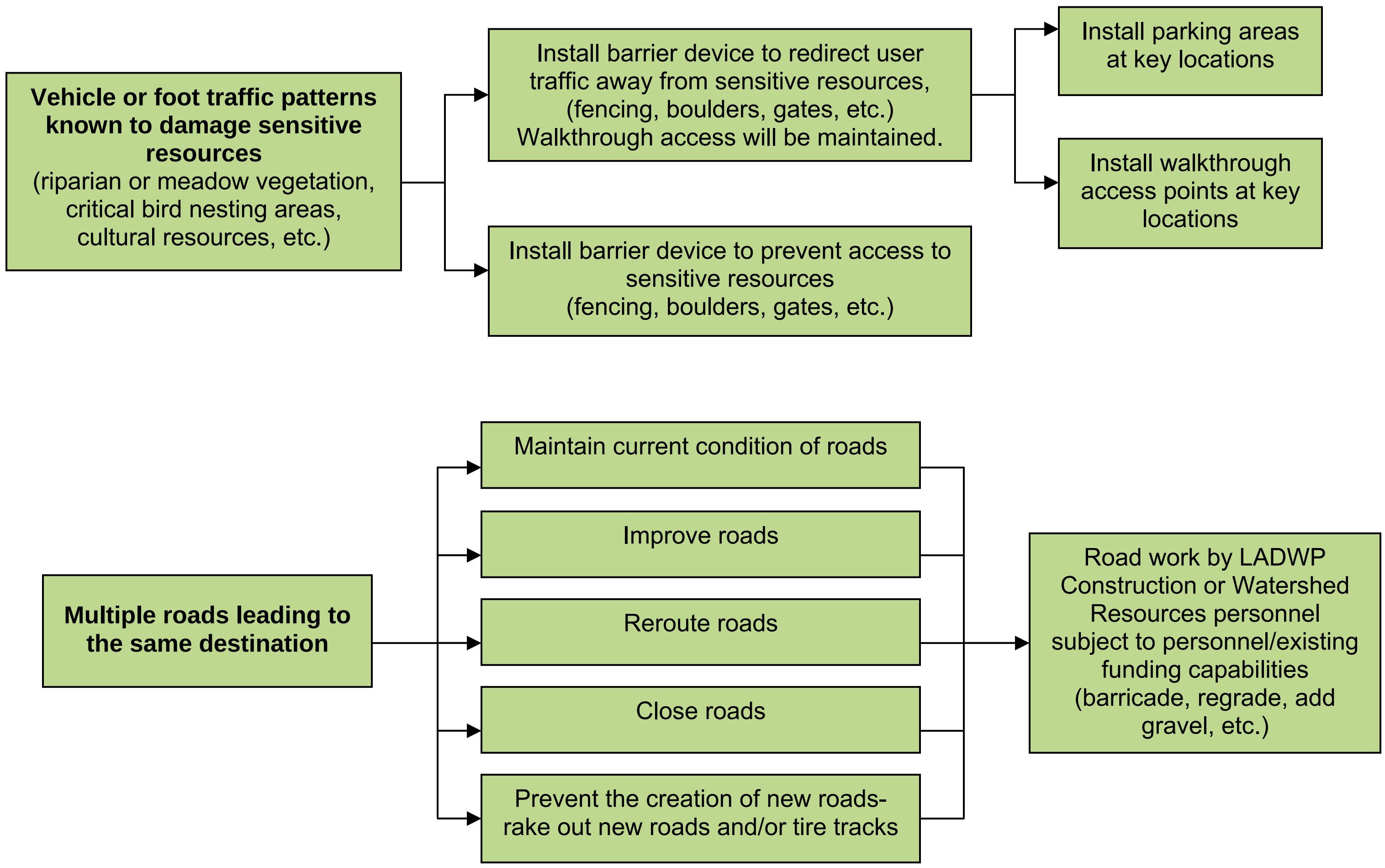


Figure 4.17 Management Options in Handling Recreation Issues on LADWP Property

These four flow charts illustrate how LADWP may use the recreation management tools described in Section 4.3 of this Recreation Management Plan. The rectangles on the left represent general situations (resource damage or other recreation problems/issue) that may arise on LADWP lands. The series of boxes on the right represent the management tools that may be applied, singly or collectively, to rectify the situation and improve recreation management on Department lands.

- **Unauthorized Camping**
  - Work with Inyo County to establish new campsites
  - Install and maintain appropriate signage where violations are known to occur
  - Produce and distribute educational brochures and flyers about LADWP policies and resource concerns
  - Post recreational policies on LADWP website
  - Conduct periodic controls of problem areas and report violations to local authorities
  - Install barricades to prevent access to problem areas
  - Redirect camping to designated camping areas on LADWP lands or authorized federal land

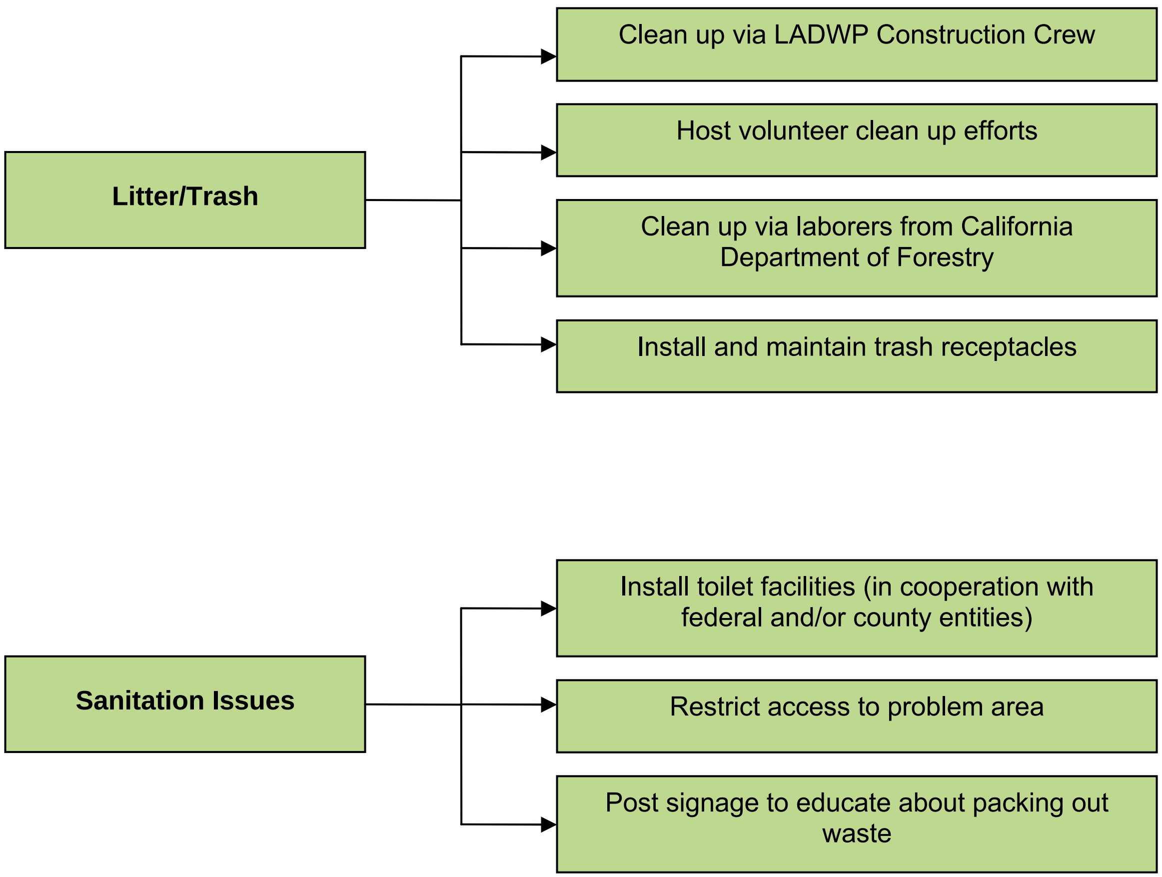
- **Unauthorized Campfire**
  - Install and maintain appropriate signage where violations are known to occur
  - Post recreation policies on LADWP website
  - Conduct periodic controls of problem areas and report violations to local authorities
  - Install barricades to prevent access to problem areas
  - Dispose of fire rings to prevent further use

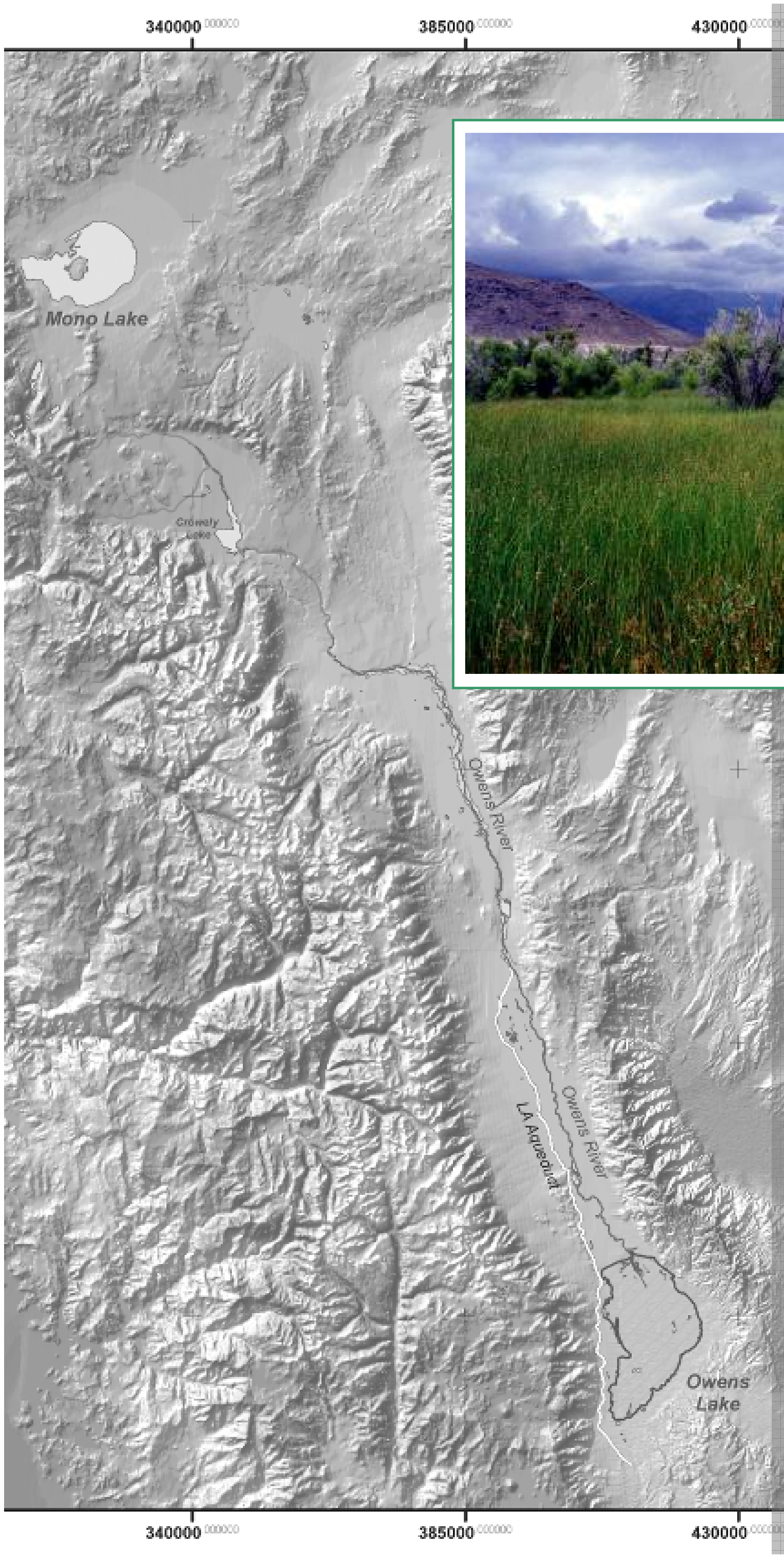
Unauthorized Off-Highway Vehicle Use

- Install and maintain appropriate signage where violations are known to occur
- Produce and distribute educational brochures and flyers about LADWP policies and resource concerns
- Post recreational policies on LADWP website
- Conduct periodic controls of problem areas and report violations to local authorities
- Install barricades to prevent access to problem areas
- Designate area for localized OHV use

Party Locations

- Install and maintain appropriate signage where violations are known to occur
- Conduct periodic controls of problem areas and report violations to local authorities
- Install barricades to prevent access to problem areas
- Coordinate with local Sheriff's Office


Litter/Trash
Clean up via LADWP Construction Crew
Host volunteer clean up efforts
Clean up via laborers from California Department of Forestry
Install and maintain trash receptacles
Sanitation Issues
Install toilet facilities (in cooperation with federal and/or county entities)
Restrict access to problem area
Post signage to educate about packing out waste



CHAPTER 5

Habitat Conservation Planning

CHAPTER 5

5.1 Introduction

The MOU requires that Habitat Conservation Plans (HCP) for state and federally listed threatened and endangered (T&E) species be incorporated into the OVLMP. The MOU parties agreed that the meaning of HCPs in the document would refer to the federal process that is provided for in the 1982 amendment to the Endangered Species Act Section 10(a)(1)(B) requiring an “incidental take permit”, as well as the California Endangered Species Act Section 2080. This process authorizes the U.S. Fish and Wildlife Service (USFWS) to issue permits for the “incidental take” of T&E species. It allows a non-federal landowner to legally proceed with an activity that would otherwise result in the illegal take of a listed species. Prior to 1982, non-federal landowners conducting otherwise lawful activities that were likely to take listed species, risked violating section 9 of the ESA, which prohibits “taking” of an endangered species. An HCP must accompany an application for an incidental take permit.

The purpose of the HCP is to ensure that the effects of the permitted action on listed species are adequately minimized and mitigated. It is also used to provide landowners with incentives to integrate conservation measures into the management of their land. In order to proceed with their proposed activities under an incidental take permit, a landowner must provide a long-term commitment to species conservation through the development of an HCP.

The government provides “No Surprises” assurances to non-federal landowners through section 10(a)(1)(B) so that if “unforeseen circumstances” arise, the USFWS will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed to in the HCP without the consent of the permittee[1]. These assurances are honored by the government as long as the permittee is implementing the terms and conditions of the HCP and permit in good faith.

The HCP is a separate planning process from the OVLMP with distinct milestones and procedural obligations; thus, the HCP will be incorporated into the OVLMP by reference, with this chapter describing the overall HCP purpose and actions. When the HCP is completed it will be included as part of the OVLMP as an appendices to the plan.

The project area for the HCP covers all city of Los Angeles-owned lands in Inyo and Mono counties from the Upper Owens River south to Owens Dry Lake (Figure 5.2). This chapter outlines and briefly describes the purpose, scope, goals and objectives, activities, and species covered under the HCP (Owens pupfish, Owens tui chub, Least Bell’s Vireo, Yellow-billed Cuckoo, Southwestern Willow Flycatcher and Swainson’s Hawk).

Figure 5.1. Yellow-billed Cuckoo.
Photo printed with permission from Michael Kolakowski

[1] USFWS 2008.

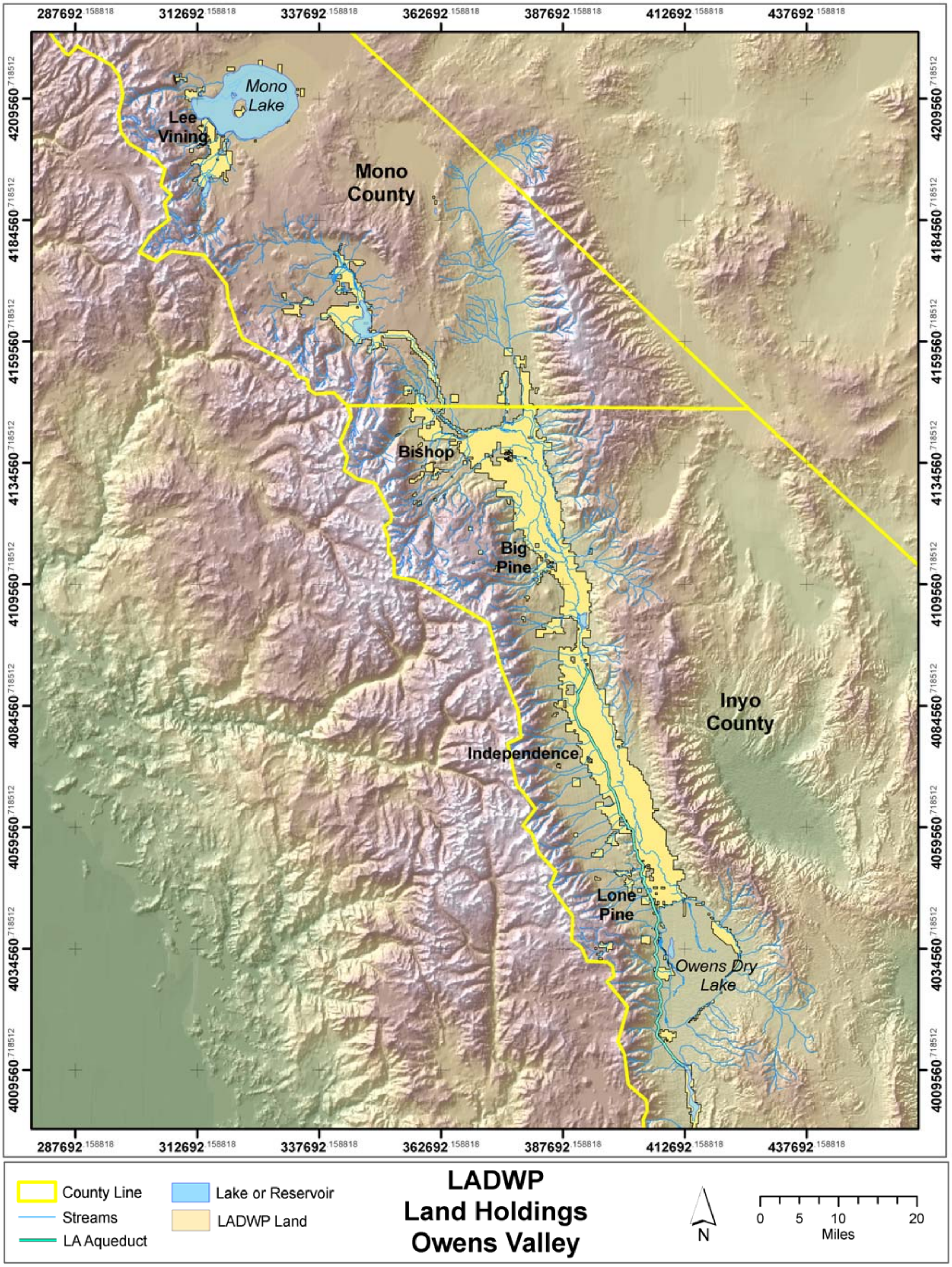


Figure 5.2. City of Los Angeles-owned lands within the HCP boundary

All of these species are riparian-obligates that are federally listed as endangered, with the exception of the cuckoo (state listed as endangered) and the Swainson's Hawk (state listed as threatened). Actions to minimize the effects of implementing the OVLMP will also be described in the HCP.

The HCP is habitat-based rather than species-based, which means that the HCP will address a specific habitat, in this case, riverine-riparian areas, and the target species will be used to manage that habitat. The HCP incorporates the *Owens Basin Wetland and Aquatic Species Recovery Plan* (1998) to describe specific actions and sites that have the greatest potential for recovery and delisting of species. The HCP will also relate to other existing recovery plans and species conservation efforts already drafted for areas that overlap the project area boundaries, including the *Draft Recovery Plan for the Least Bell's Vireo* (1998), and the *Recovery Plan for the Southwestern Willow Flycatcher* (2002).

5.2 HCP Goals and Objectives

The MOU goal that pertains to the HCP includes:

1. Protect and enhance habitat for threatened and endangered species.

A low-effect, habitat-based HCP will be developed and implemented for the project area that protects the covered species while allowing LADWP to continue their operations. The objectives designed to meet this MOU goal include:

1. Initiate habitat conservation strategies to enhance and protect T&E species habitat.
2. Monitor and use adaptive management through time.

Objective 1: Project Scope
The HCP will be developed and implemented to meet the objective of initiating habitat conservation strategies to enhance and protect T&E species habitat on city of Los Angeles-owned lands in Inyo and Mono counties. Following are the steps that will be taken to develop and implement the plan:

Step 1: Project Scope
Since all target species use riparian habitat, the project area will be focused on riparian systems (rivers, tributaries, wetlands) that occur on city of Los Angeles-owned lands in Inyo and Mono counties from the Upper Owens River south to Owens Dry Lake.

Step 2: Describe Biological Conditions
Existing habitat conditions for the covered species will be determined using riparian mapping and habitat evaluations. This information will be included in a report that describes baseline ecological conditions for T&E species. Current baseline conditions will include a description of riparian vegetation and involve habitat mapping of streams within the project area.

Step 3: Identify Resource Impacts
Activities that may impact natural resources and have an effect on project area biological conditions will be described and include: hydropower development, water supply and distribution, and land uses.

Step 4: Analyze Resource Impacts
Detailed analyses of various resource impacts as they relate to specific T&E species' habitats will be performed and reported.

Step 5: Depict Effects of Resource Impacts
The effects of impacts on resources as they relate to T&E species habitat will be described and analyzed.

Step 6: Describe Minimization of Taking Impact Strategies
Determine if "takings" will occur and describe efforts to minimize T&E species takings in relation to LADWP operations and management requirements.

Step 7: Identify Impact Mitigation
Methods used to mitigate "takings" impacts will be developed and described. Describe costs and availability of funding for impact mitigation activities. Describe costs and

availability of funding for T&E species' habitat monitoring activities.

Step 8: Outline Procedures to Deal with Unforeseen or Changed Circumstances
Create a solution matrix to procedural problems that may arise at any time during the term of the HCP. Apply 'No Surprises' rule to unforeseen or changed circumstances.

Step 9: Identify Alternative Actions
Model outcomes of several alternative scenarios used to mitigate impacts to listed species and describe reasons for selection.

Step 10: Identify Adaptive Management Actions
Outline monitoring needs and adaptive management in the HCP. Minimize scientific uncertainty, test hypotheses, review thresholds. Alter mitigation strategies to suit long-term biological objectives.

Step 11: Environmental Assessment
Conduct the appropriate National Environmental Policy Act (NEPA) analysis: an Environmental Assessment and Finding of No Significant Impact, Environmental Impact Statement or Report and Record of Decision, or a categorical exclusion. Comply with the California Environmental Quality Act (CEQA) with a Negative Finding of Impact or categorical exclusion.

Step 12: Facilitate Implementation Agreement
Facilitate development of an implementation agreement with LADWP and USFWS.

Step 13: Facilitate Safe Harbor Agreement (if appropriate)
Assess and describe voluntary conservation efforts and effects upon listed species' habitats. Protect LADWP from further regulatory requirements on lands that attract endangered species as a result of conservation efforts.

Objective 2: Monitoring and Adaptive Management
This will be developed over the course of the HCP process. See the discussion in section 5.8.

5.3 Project Description

The city of Los Angeles retains land holdings in the Owens Valley primarily to ensure protection of both surface and groundwater resources, and to enable sustained water supply to meet the needs of the citizens of Los Angeles. The 1997 MOU between the City, Inyo County, State Lands Commission, California Department of Fish and Game, the Sierra Club, and the Owens Valley Committee obligates the City to prepare management plans for Los Angeles-owned, non-urban lands within the portion of the Owens River watershed located in Inyo County. This area is the Owens Valley Management Area (OVMA). The HCP project area includes the OVMA and city of Los Angeles-owned lands in the Upper Owens River in Mono County.

Management plans for the OVMA consider multiple resource values, and provide for management based upon holistic management principles. While providing for the primary purpose for which Los Angeles owns the lands, including the protection of water resources utilized by the citizens of Los Angeles, the plans also ensure the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities), promote biodiversity and a healthy ecosystem, and consider the enhancement of T&E species habitats.

5.3.1 Activities Covered by the HCP

Implementation of the HCP will allow LADWP to continue existing activities that could potentially result in the take of particular T&E species. The activities the HCP will cover include habitat enhancements, water diversions, water extraction, water conveyance, livestock grazing, gravel extraction, various recreational activities, fire management, road construction and maintenance, and weed management.

Habitat Enhancements

Habitat enhancements, such as those planned in the OVMA, are intended to improve habitat conditions for a variety of plant and wildlife species, and not solely for listed species. In the course of these enhancement projects, habitat for listed species may be unintentionally impacted. The purpose of including habitat enhancement activities under the HCP is to protect LADWP from liability that could result from a short-term reduction in the quality of habitat for listed species.

LADWP manages a variety of habitat enhancement areas and projects in the Owens Valley that include the Blackrock Waterfowl Management Area, Yellow-billed Cuckoo Management Areas at Baker and Hogback Creeks, Klondike Lake, and Buckley Ponds. There are sensitive plant exclosure and management areas for Inyo County star-tulip (*Calochortus excavatus*), Owens Valley checkerbloom (*Sidalcea covillei*), and Nevada oryctes (*Oryctes nevadensis*). Additionally, the Lower Owens River Project is an enhancement project that will benefit habitat through flow and land management activities. The Grazing Management Plans described in Chapter 3 also implement activities that protect riparian systems, and the Owens Gorge Rewatering Project is being implemented to assist in tui chub recovery efforts.

Water Diversion, Extraction and Conveyance

LADWP diverts surface waters from numerous locations in the Owens Valley. Water is diverted from natural or other water bodies and conveyed via canals, ditches, or pipe for water delivery. Diversion of water is integral to LADWP interests in the Owens Valley; its uses are for municipal, grazing, agriculture, fish hatcheries, and industrial purposes in the Owens Valley and beyond. Maintenance and modification of the surface water diversion infrastructure is important to ensure safe and efficient delivery. The inclusion of water diversion activities in the HCP protects LADWP from liability as a result of potential impacts to listed species habitat. The amount of water diverted throughout the Owens Valley varies depending upon seasonal supply and demand.

LADWP also augments water delivery with seasonal groundwater pumping from various locations in the Owens Valley. Pumps are used to draw water from the ground, and that water is conveyed via ditches, pipes, and canals to serve water delivery needs. Maintenance of the water pumping infrastructure is important to ensure the accuracy and efficiency of water pumping; access to and prompt maintenance of water pumping mechanisms secures efficiency of operations as well. For example, LADWP utilizes groundwater pumped during winter months to provide freeze protection for the Los Angeles Aqueduct. Access to and the ability to quickly modify the water delivery infrastructure is essential to LADWP's operations. Groundwater pumping activities are included in this HCP to protect LADWP from liability resulting from potential impacts to listed species habitat.

Quantities of pumped water are determined by the Water Agreement (1991) between the County of Inyo and the city of Los Angeles. The Water Agreement states: *"The overall goal of managing the water resources within Inyo County is to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County."*

Grazing

A large portion of LADWP lands in the Owens Valley are leased for livestock grazing. Grazing leases are offered to ranchers by LADWP. Grazing and the maintenance of grazing operations are important in maintaining the multiple-use and sustainable-use goals on LADWP lands. Grazing has occurred on LADWP lands since European descendents colonized the area. The location and acreage of grazing allotments will be identified in the HCP (also see Chapter 3 of this OVLMP). Maintenance of grazing operations includes fencing, corrals, ditch cleaning, stock water developments, and road construction and maintenance. The ability to promptly attend to and access grazing operations is important to ensure safety and to avoid negative impacts to other resources in the Owens Valley.

Wood Cutting

LADWP carefully controls woodcutting on all their lands through a permit system. As a rule only dead and downed trees are available for woodcutting. Sensitive areas are not included as woodcutting areas.

Recreation

Recreation is widespread throughout LADWP lands in the Owens Valley. Fishing, hiking, biking, Off-Highway Vehicle (OHV) use, sightseeing, camping, hunting, and bird watching all occur at various locations on LADWP lands, and are important in maintaining the multiple-use nature of LADWP lands in the Owens Valley. In addition, the tourists who come to the Owens Valley to recreate on LADWP lands are important to the local economies. Potential impacts to wildlife habitat from recreation include erosion, presence of litter and garbage, minor pollution of air and water, illegal campfires, and trampling of vegetation.

Fire Management

A portion of LADWP lands are within a Designated Protection Area, so that the California Department of Forestry (CDF) responds to fires first in this area. The LADWP provides a resource representative on all fires to work with the fire suppression staff so that resource management objectives can be met. The LADWP Fire Risk and Control Management Plan includes guidelines for fire suppression to protect riparian and in-stream habitats. Tactics that minimize impacts to wildlife and wildlife habitat (i.e. minimal felling of trees and snags, spraying of heavy equipment to prevent noxious weed spread) are encouraged. If fire affects significant portions of the riparian areas along the Owens River, the LADWP has management actions it will take to encourage the quick rehabilitation of these areas such as adjusting recreation access, river flows, and grazing.

Road Construction and Maintenance

While many of the roads were constructed to provide LADWP access to their water delivery and hydropower facilities, today the road network is used extensively for recreation by local residents and visitors. Although some roads are physically blocked to prevent access, the majority are open. This road network creates a significant impact on the resources of the Owens Valley.

Weed Management

LADWP documents, identifies, treats, and monitors exotic weed infestations on LADWP lands and provides information to the Eastern Sierra Weed Management Association (ESWMA) database. LADWP arranges for the control of infestations on LADWP administered lands through the pesticide permitting process of the Inyo/Mono Counties Agricultural Commissioner's Office and ESWMA.[2]

Weed management on LADWP lands in the Owens Valley targets primarily saltcedar (also referred to as tamarisk) (*Tamarix ramosissima*) and perennial pepperweed (also known as tall whitetop) (*Lepidium latifolium*) populations. The known distribution of saltcedar is the Owens Valley floor water-spreading basins, Upper and Lower Owens River channel, Tinemaha Reservoir, Diaz Lake, Owens Lake, and springs in the White and Inyo Mountains.[3] Known distributions of perennial pepperweed occur in the Owens Valley in pastures, canals, and ditches and in some isolated spring sites in the Inyo Mountains.[4] Russian olive is another exotic species that has established in the project area. Weed management on city of Los Angeles-owned lands will be described in greater detail in the HCP.

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[2] Excepted from the *Conservation Strategy for the Southwestern Willow Flycatcher on the City of Los Angeles Department of Water and Power Lands in the Owens Management Unit,* p. 19

[3] ESWMA Noxious Weed Identification Handbook 1999 (p. 32)

[4] ESWMA Noxious Weed Identification Handbook 1999 (p. 24)

5.4 HCP Scope

Most of the species to be covered under the HCP have specific habitat requirements. The Owens pupfish and Owens tui chub are water dependent, while the Southwestern Willow Flycatcher, Yellow-billed Cuckoo and the Least Bell's Vireo are riparian obligates. The Swainson's Hawk inhabits a wide variety of open habitats and breeds in and adjacent to riparian areas, as well as in desert, shrub-steppe, grassland and agricultural habitats. A thorough evaluation and mapping of the riparian and aquatic habitats of each stream managed by the LADWP in Inyo and Mono counties is the initial step in identifying important habitat for the covered species.

A comprehensive description of Owens Valley vegetation was conducted from 1984-1987, resulting in an inventory described in the Green Book[5]. Although several vegetation mapping projects have been conducted in the Owens Valley, they were primarily site-specific and relegated to the Owens River and its adjacent areas. All vegetation mapping projects utilize the Holland classification to describe the vegetation communities of the Owens Valley.[6] The riparian vegetation mapped from the 1984-87 inventory was to determine possible habitat for the species covered in the HCP. The following vegetation communities were identified as possible habitat: Great Basin riparian scrub, Modoc-Great Basin riparian forest, Mojave riparian forest, and Transmontane alkali marsh.

5.5 Project Area Description

The Owens Valley, located in Eastern California, is a graben between two large fault blocks which form the Sierra Nevada Mountains to the west and the White and Inyo ranges to the east. The Sierra Nevada and the White Mountains rise to over 14,000 feet. The climate of the Owens Valley is greatly influenced by the Sierra Nevada Mountains. Because of the orographic effect of the Sierra Nevada, a rain shadow is present east of the crest; precipitation on the valley floor and on the Inyo and White Mountains is appreciably less than that west of the crest.[7] Thus, streams originating in the alpine areas of the Sierra Nevada drain east to Owens Valley where they provide the majority of the water flowing into the Owens River and the Los Angeles Aqueduct. In contrast, streams originating in the White and Inyo Ranges, which are often ephemeral due to the lack of precipitation, do not provide much water to the Owens River and the Los Angeles Aqueduct; hence, the majority of the streams that the LADWP manages, flow out of the Sierra Nevada (Figures 1.2, 2.1 and 2.9).

Historically, streams draining from the Sierra Nevada Mountains west of the Owens Valley fed the Owens River. Today, the few streams that do confluence with the Owens River occur primarily in the northern portion of the valley. In the southern part of the valley, the Los Angeles Aqueduct intercepts stream flows prior to their historic confluence with the Owens River. Many streams draining to the Owens Valley are vital to the LADWP's water delivery system to Los Angeles via the Los Angeles Aqueduct. A few of these streams support hydroelectric facilities such as those at Cottonwood Creek, Big Pine Creek and Division Creek.

5.6 Species Covered by the HCP

The LADWP is covering multiple species in the HCP for their land holdings in the Owens Valley. These species are federally listed as endangered (with the exception of the Yellow-billed Cuckoo and Swainson's Hawk, which are state of California endangered and threatened species, respectively) and are discussed in detail below.

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[5] ICWD and LADWP 1990
[6] Holland 1986
[7] Danskin 1998

5.6.1 Owens Pupfish

The Owens pupfish (*Cyprinodon radiosus*) was listed as endangered in 1967 (32 FR 4001). It is a small (less than 2.5 inches in length), non-migratory freshwater fish found only in the Owens Valley (Figure 5.3). It occupies shallow, warm waters but can withstand cold winter water temperatures. Breeding males are bright blue with broad vertical bars on the side. Females are generally brownish above and silvery below, with several irregular brownish vertical bars. Non-breeding males generally resemble females.[8] Female pupfish will spawn multiple times an extended period of 7 or 8 months. Eggs incubate only 2-4 months, depending upon water temperature.

Figure 5.3. Owens pupfish

The Owens pupfish feed on zooplankton and aquatic insects and congregate in small schools. According to the CDFG, the Owens pupfish:

> "…*historically occurred in the clear, warm waters of spring pools, sloughs, irrigation ditches, swamps, and flooded pastures along the Owens River from Fish Slough in Mono County to Lone Pine in Inyo County. Habitat alteration associated with the introduction of non-native trout and bass, along with historic water resources development has greatly reduced the distribution and abundance of this species. Currently, this fish is confined to five populations in the Owens Valley. The Fish Slough ACEC is a system of springs and marshes cooperatively managed by the DFG, BLM, Los Angeles Department of Water and Power (LADWP), University of California Natural Reserve System, and United States Fish and Wildlife Service (USFWS). Two sites within Fish Slough, "BLM Spring" and the Owens Valley Native Fishes Sanctuary, have lost pupfish populations following illegal introductions of largemouth bass. These sites are to be restored and repopulated in 1998 to 2000. Two additional populations tenuously persist in marshy areas of Fish Slough. Additional pupfish populations occur in Inyo County at Mule Spring on BLM land, at Warm Springs and below an artesian well on LADWP land (CDFG 2000a).*"

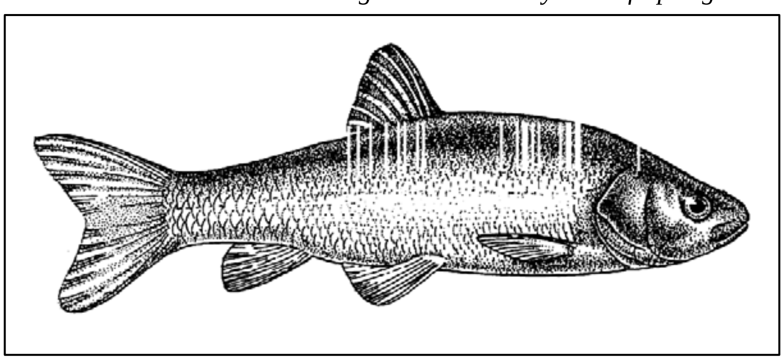


Figure 5.4. Owens tui chub
Image from USFWS 1998

Population declines are attributed to competition and predation by non-native species, and adverse habitat modifications caused by water diversions from the Owens River and its tributaries for agricultural and municipal purposes.[9]

5.6.2 Owens Tui Chub

The Owens tui chub (*Gila bicolor snyderi*) was listed as endangered in 1985 (50 FR 31592) throughout its range because of factors adversely affecting the biotic and abiotic characteristics of the Owens Basin aquatic habitat, including: 1) introduction of non-native fish that affect Owens tui chub through competition, predation, and hybridization; and 2) diversion and impoundment of water for agricultural and municipal use.[10]

The Owens tui chub resembles other tui chub such as the Mohave tui chub, and requires microscopic examination to distinguish it (Figure 5.4). It is a large-scaled, small, chunky fish that is olive-colored on the dorsal surface and bluish or creamy-white below. The maximum body length is approximately eight inches. They spawn from spring through late fall. Females lay adhesive eggs on vegetation or other available substrates, such as rocks and gravel. The Owens tui chub eats insect larvae,

[8] CDFG 2000a

[9] Ecosystem Sciences 2001

[10] Miller 1973

algae, and detritus. The historic distribution was throughout standing waters and low gradient reaches of the Owens River and its larger tributaries extending from the river's headspring to Owens Lake.[11]

Five non-introgressed populations of Owens tui chub occur in the Owens River watershed and three additional populations have been introduced at off-river sites; one of them was introduced at the University of California White Mountain Research Station, located on LADWP property. LADWP is assisting tui chub recovery efforts with its Owens Gorge Rewatering Project.[12] Critical habitat for the Owens tui chub has been designated at two different sites, one of which is the upper Owens Gorge, immediately below the Long Valley Dam.

5.6.3 Least Bell's Vireo

The Least Bell's Vireo *(Vireo bellii pusillus)* occupies primarily riverine-riparian habitats that feature dense cover within one to two meters of the ground and a dense, stratified canopy (Figure 5.5). It inhabits low, dense riparian growth adjacent to water or along dry parts of intermittent streams. It is usually associated with southern willow scrub, cottonwood forest, mule fat scrub, sycamore alluvial woodland, coast live oak riparian forest, arroyo willow riparian forest, wild blackberry, or mesquite in desert localities.[13] It nests mostly in small, remnant segments of vegetation typically dominated by willows and mule fat but may also use other shrubs, trees, and vines. They forage primarily in riparian habitats and adjoining chaparral habitat.

The breeding distribution of the Least Bell's Vireo is currently restricted to eight southern counties in California and portions of northern Baja California, Mexico.[14] Vireo distribution is expanding eastward in San Diego County and northward into Riverside and Ventura counties.[15] Available census data indicate that the Least Bell's Vireo population in southern California increased from an estimated 300 pairs in 1986 to an estimated 1,346 pairs in 1996. Overall, the California population in 2007 was 10 times larger than it was at the time of its listing as endangered. Cowbird eradication programs are an effective short-term management tool that have resulted in significant increases in vireo populations in southern California in the Camp Pendleton, San Luis Rey River, and San Diego River areas.[16]

Figure 5.5. Least Bell's Vireo in Mono Basin, circa 1981
Photo copyright: Jim Greaves

Least Bell's Vireos winter in southern Baja California, Mexico. They arrive in southern California from Mexican wintering areas in the

[11] CDFG 2000b
[12] CDFG 2000b
[13] Western Riverside County MSHCP 2003
[14] Kus 2002 and USFWS 1998
[15] Kus 2002 and USFWS 1998
[16] Kus and Whitfield 2005 and USFWS 1998

spring (end of March to early April), and depart by the end of September. Like the Southwestern Willow Flycatcher, the males arrive earlier than the females to establish their territory. There are currently no known Bell's Vireo territories in the Owens Valley.

Little is known about the Least Bell's Vireo's winter habitat requirements, but they are not exclusively dependent on willow-dominated riparian woodland habitat for their wintering grounds. In winter, most of these birds occur in mesquite scrub vegetation in arroyos, but some also use palm groves and hedgerows associated with agricultural fields and rural residential areas.

The Least Bell's Vireo feed primarily on insects and spiders, and forage primarily within willow (*Salix spp.*) stands or associated riparian vegetation, but also use non-riparian vegetation later in the breeding season.[17] They produce a high number of fledglings (1.8 to 2.5 per pair), however the survival rate of those who return to breeding habitat is low.[18]

The historical range of the Least Bell's Vireo was in areas below 600 meters (2,000 feet) in western Sierra Nevada, throughout Sacramento and San Joaquin valleys, and in the coastal valleys and foothills from Santa Clara County south. The birds were also somewhat common in coastal southern California from Santa Barbara County south, below about 1,200 meters (4,000 feet) east of the Sierra Nevada, in the Owens and Benton valleys, along the Mojave River and other streams at the western edge of southeastern deserts, and along the entire length of the Colorado River.

Figure 5.6. Southwestern Willow Flycatcher
Photo courtesy of USGS-Arizona Ecological Field Office

The Least Bell's Vireo was listed as endangered on May 2, 1986, and critical habitat for the species was designated on February 2, 1994. Extensive breeding habitat loss and degradation, and brood parasitism by the Brown-headed Cowbird *(Molothrus ater)* have resulted in a rangewide decline of the Least Bell's Vireo. According to the *Riparian Bird Conservation Plan (2002)*, flood restrictions due to upstream dams have affected the riparian habitat that the Least Bell's Vireo depends upon. Urbanization and agriculture and the associated runoff, traffic noise, habitat fragmentation, and recreational use of habitat have also contributed to the decline of vireo populations.[19] Exotic species invasions into riparian ecosystems has decreased suitable nesting habitat for the Least Bell's Vireo. In addition, livestock grazing in riparian areas negatively impacts vireo habitat by reducing the lower strata of vegetation preferred by the vireo; grazing also provides favorable conditions for the Brown-headed Cowbird.[20]

5.6.4 Southwestern Willow Flycatcher

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) breeds in dense riparian habitats in southwestern North America (Figure 5.6). These riparian tree and shrub communities are associated with rivers, swamps, and other wetlands, including lakes and reservoirs. Most of these habitats are classified as forested wetlands or scrub-shrub wetlands. This flycatcher nests in dense thickets of willows (*Salix sp.*) and other trees and shrubs that are four to seven meters in height. The thickets are often associated with

[17] Western Riverside County MSHCP 2003
[18] USFWS 1998
[19] Kus 2002
[20] USFWS, Draft Recovery Plan for the Least Bell's Vireo, 1998

a scattered overstory of cottonwood (*Populus fremontii*), and other riparian trees. The Southwestern Willow Flycatcher has also been found nesting in southern California in relatively narrow bands of riparian habitat and can utilize extremely small remnant riparian areas during migration.[21] It almost always nests near surface water or saturated soil. Its breeding range includes far western Texas, New Mexico, Arizona, southern California, southern portions of Nevada and Utah, southwestern Colorado, and possibly extreme northern portions of the Mexican States of Baja California del Norte, Sonora, and Chihuahua.[22]

The Southwestern Willow Flycatcher winters in southern Mexico, Central America, and northern South America. Habitat requirements for wintering are not well known, but include brushy savanna edges, second growth, shrubby clearings and pastures, and woodlands near water. It feeds on insects, foraging in and above dense riparian vegetation.

Migration to southern California for breeding begins late in the spring, generally after May 15. In mid-May, males establish and defend territories (territory size varies from 0.24 to 0.45 hectares); most birds begin nesting within one week after pair formation, which occurs 10 to 14 days after their arrival. The young fledge in early July and begin to disperse about two weeks after leaving the nest.[23] On average, the Southwestern Willow Flycatchers raise one brood per year. The clutch size ranges from two to five; the average clutch size is 3.4 eggs in coastal southern California. The flycatcher usually has a monogamous mating system within one nesting season although not all territorial males are mated.[24] According to the Final Recovery Plan for the Southwestern *Willow Flycatcher (2002)*, there were 28 known Southwestern Willow Flycatcher territories in the Owens Management Unit.

[21] Draft Coachella Valley MSHCP 2004
[22] USFWS 2002
[23] Draft Coachella Valley MSHCP 2004
[24] Draft Coachella Valley MSHCP 2004

The historic range of the Southwestern Willow Flycatcher in California included riparian areas throughout the southern parts of the state; it was reported as common in the Los Angeles basin, the San Bernardino/Riverside area, and in San Diego County. It was also a common breeder along the lower Colorado River, near Yuma.

Its current distribution includes stable nesting groups reported at two locations along the South Fork of the Kern River and along the Santa Margarita River on Camp Pendleton.[25] In other areas they tend to occur in small scattered, remnant and isolated populations. A relatively large breeding population of Southwestern Willow Flycatchers exists on LADWP-owned lands along the Owens River and adjacent tributaries in northern Inyo County.[26] Additional isolated territories have been documented along Lone Pine Creek (1999); the Owens River north of Tinemaha (1999 and 2006) and south of Collins Road, near Bishop (2006); from Long Valley Dam to about 1.5 miles south of Line Street in Bishop; along the Owens River from Pleasant Valley to south of Poleta Road east of Bishop (2001). Southwestern Willow Flycatchers have also recently recolonized areas of Rush Creek in Mono County.[27]

The Southwestern Willow Flycatcher has experienced extensive loss and modification of breeding habitat, with subsequent reductions in population levels. Destruction and modification of riparian habitats have been caused mainly by: reduction or elimination of surface and subsurface water due to diversion and groundwater pumping; changes in flood and fire regimes due to dams and stream channelization; clearing and controlling vegetation; livestock grazing; changes in water and soil chemistry due to disruption of natural hydrologic cycles; and establishment of invasive non-native plants.

Concurrent with habitat loss have been increases in brood parasitism by the Brown-

[25] Draft Coachella Valley MSHCP 2004
[26] LADWP 2005
[27] Heath et al. 2001 and McCreedy and Heath 2004

headed Cowbird (*Molothrus ater*) in some populations, which inhibit reproductive success and further reduce population levels.[28] The effect of cowbird parasitism on flycatcher populations on LADWP lands is unknown. On LADWP lands, livestock grazing, recreation, and fire have the greatest potential for causing adverse effects to the flycatcher. The *Conservation Strategy for the Southwestern Willow Flycatcher on the City of Los Angeles Department of Water and Power Lands in the Owens Management Unit* (pp. 7-9) contains more detailed information on the adverse effects that these activities may have on the flycatcher.

The *Conservation Strategy for the Southwestern Willow Flycatcher on the City of Los Angeles Department of Water and Power Lands in the Owens Management Unit* outlines conservation strategies and actions for the Southwestern Willow Flycatcher on 49,000 acres of land along the Owens River that comply with the USFWS 2002 *Final Recovery Plan for the Southwestern Willow Flycatcher*. The conservation strategy was developed because the LADWP owns property within the Owens Management Unit (a 69-mile long reach of the Owens River and a 0.9 mile long reach of Rock Creek in Inyo and Mono counties) that was proposed designated critical habitat for the Southwestern Willow Flycatcher. In July 2005, a MOU between USFWS and LADWP was drafted whereby the USFWS determined to exclude the Owens Management Unit as designated Southwestern Willow Flycatcher critical habitat. In this MOU, the LADWP agreed to implement the conservation strategy for the Southwestern Willow Flycatcher to reduce adverse effects related to livestock grazing, recreation, and fire management activities on LADWP lands.

5.6.5 Yellow-billed Cuckoo

The Yellow-billed Cuckoo *(Coccyzus americanus)* is listed as endangered in the state of California under the California Endangered Species Act (ESA), and is a candidate species under the federal ESA. It is listed as sensitive in Nevada, Washington, and Oregon, and as a "species of special concern" in Arizona. It has no listing status in New Mexico. The U.S. Forest Service classifies the Yellow-billed Cuckoo as “sensitive" in Region Three (Arizona and New Mexico). The cuckoo was listed as a candidate endangered species in 1986, but currently has no federal standing.[29] Efforts to provide federal protection for this species are ongoing. Candidate species are plants and animals for which the U.S. Fish and Wildlife Service (USFWS) has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a listing regulation is precluded by other higher priority listing activities.

The Yellow-billed Cuckoo formerly occupied habitats in the western United States and Canada, and northern Mexico in floodplain riparian forests below 1,500 feet.[30] It currently occupies large patches of riparian habitats, particularly woodlands with mature cottonwoods (*Populus fremontii*) and mid-successional willows (*Salix sp.*), and is usually found within 100 meters of slow or standing water.[31] They use the dense understory foliage of the willow for nest sites (usually on horizontal branches 3-5 meters above the ground) and use the cottonwood overstory for foraging.[32] They are known, to a lesser extent, to forage in box elder and white alder lined banks.[33] The cuckoo is not known to use non-native vegetation in the majority of its range; however, it does occupy a variety of marginal habitats at the edges of its range.[34]

Habitat size requirements for the western Yellow-billed Cuckoo include a total area in excess of 20 hectares, though some bird observations have been made in 10 hectare patches.[35] Foraging areas were found during one study to range from 11 to 28 hectares,

[28] USFWS 2002

[29] Center for Biological Diversity 1998
[30] Center for Biological Diversity 1998
[31] Gaines and Laymon 1984
[32] Laymon et al. 1997
[33] Laymon 1980
[34] Hunter et al. 1984
[35] Gaines and Laymon 1984

while home range sizes were from 20 hectares to over 30 hectares.[36]

The cuckoo arrives on its breeding grounds in the west from late May to early July.[37] Fall migration begins in August, and by October, cuckoos are no longer on their breeding grounds.[38] The migration route of the cuckoo is likely through western Mexico and along the west slope of Central America. They usually migrate at night in small groups or large flocks.

The California Natural Diversity Database (CNDDB) reported sightings of Yellow-billed Cuckoo at seven different sites in Inyo County since 1977, including Owens Valley Ranch, Hogback Creek, Willow Creek at China Ranch, Tinemaha Reservoir, Amargosa River, and northeast of China Ranch. According to Laymon (2004) cuckoos have been detected recently at Hogback Creek.

5.6.6 Swainson's Hawk (Buteo swainsoni)

The Swainson's Hawk is a neotropical migrant that travels over 5,000 miles from its breeding grounds in western North America south to the pampas of Argentina for the winter. A decline of 90 percent of Swainson's Hawk populations in California since the mid-1900s[39] prompted the state of California to list the hawk as threatened in 1983. It is a Federal Species of Concern, which indicates it is being considered for listing, but there is not enough information to support listing under the Endangered Species Act. The Swainson's Hawk is also protected by the Migratory Bird Treaty Act of 1918.

The breeding range of the Swainson's Hawk includes desert, shrubsteppe, grassland, and agricultural habitats in the western half of North America from interior Alaska and western Canada south into northern Mexico.[40]

Generally, Swainson's Hawks inhabit a wide variety of open habitats. The Swainson's Hawk forages in large, open, grass-dominated areas and relatively sparse shrublands, and has adapted well to foraging in agricultural lands (wheat, alfalfa). Nesting takes place in the semi-exposed upper canopy of riparian forests or in remnant riparian trees.[41] The two primary elements that provide suitable breeding habitat for this hawk are suitable nest trees and proximity to high-quality foraging habitat.

Upon arriving at their breeding grounds, male hawks construct nests about 11 to 21 feet above ground in trees of suitable size (taller than 10 feet with a d.b.h. [diameter at breast height] of 2 inches or more).[42] The female lays two to four eggs, and, along with the male, incubates the eggs for approximately 30 days. After fledging, the young remain with adults

Figure 5.7. Swainson's hawk

[36] Laymon 1980 & Laymon et al. 1990
[37] Laymon 2000
[38] Center for Biological Diversity 1998
[39] Bloom 1980
[40] England et al. 1995

for two to four weeks and then leave the parental territories and form groups where prey is abundant.

Historically, the population of Swainson's Hawks in California were considered to be a common to abundant breeding species in California.[43] Today, the largest populations of Swainson's Hawk in the state of California can be found in the Great Basin region, the Central Valley, and in the northern San Joaquin Valley. A scattered population of approximately 20 pairs of Swainson's Hawk occurs in the Owens Valley. The decline in population from historic levels can be attributed to a loss of high quality foraging habitat, loss of nesting habitat, a reduction of the prey population, and pesticide use in breeding and wintering grounds.[44]

5.6.7 Critical Habitat

Critical habitat has not been designated for the Owens pupfish but has been designated for the Owens tui chub at two sites. The first site occurs on 13 kilometers (eight miles) of Owens River and 15 meters (50 feet) of riparian vegetation on either side of the river encompassing a total of approximately 39 hectares (97 acres) in the Owens Gorge. The second site occurs at two spring provinces, and 15 meters (50 feet) of riparian vegetation on either side of spring brooks, encompassing approximately two hectares (five acres) at Hot Creek Fish Hatchery. Constituent elements of critical habitat include high quality cool water with adequate cover in the form of rocks, undercut banks, or aquatic vegetation, and a sufficient insect food base.

Critical habitat for avian and plant species in the project area is being determined and compiled during the course of the HCP process.

[41] Estep 1989
[42] Bednarz 1988 in Tesky 1994
[43] Sharp 1902 in CDFG 1993
[44] CDFG 1993

5.7 Effects

This section generally addresses the environmental effects of grazing, hydrological facilities/water diversions, recreation, fire, and exotic species in riparian ecosystems. The specific effects of management activities on covered species on city of Los Angeles-owned lands will be addressed in more detail in the HCP.

5.7.1 Effects

Habitat Enhancements

Habitat enhancement projects are usually intended to improve habitat conditions for a variety of species, and not necessarily just for listed species. The specific effects of enhancement projects on LADWP lands on listed species will be addressed in further detail in the HCP. Currently, grazing and recreation plans are being developed with the goal of improving riparian and upland habitats. Keeping LADWP's watershed in good health is compatible with meeting the needs of riparian species targeted in the HCP.

Water diversion, Extraction and Conveyance

The establishment and maintenance of riparian plant communities are a function of the interplay among surface water dynamics, groundwater, and river channel processes. The alteration of these processes has implications on riparian ecosystems and the wildlife that depend upon them.

Water diversions can affect the plant communities and structures that wildlife depend upon by altering the species composition. Changes in the hydrologic cycle as a result of flood control structures can affect the vegetation composition by altering the periodic peak flows that native riparian vegetation depends upon. The reduction in magnitude and frequency of these periodic high flows can change the vegetation composition and reduce species diversity. Other water management activities can favor the establishment of non native riparian species

such as tamarisk and Russian olive (see Exotic Species below).[45] Maintenance of gaging stations, access roads, etc., results in local reduction of riparian vegetation.
Groundwater pumping, when not properly managed, can affect plant water uptake by riparian plant species such as cottonwood and willow, and therefore affect the maintenance of these populations that depend on groundwater moisture sources.

Grazing

Livestock grazing, when not adequately managed, can impact riparian ecosystems by altering plant community structures, plant species composition, plant diversity, and the abundance of species, and altering stream channel morphology. The consumption of plant biomass by livestock, along with trampling, depletes riparian vegetation and reduces plant diversity, resulting in a reduction of animal habitat. The vertical stratification of plant communities, which provides food, shelter, and nesting habitat for different species, is also reduced.

For birds in particular, the principal impacts of livestock grazing are altered habitat structure and food availability. Grazing reduces the height and the ground cover of grasses, which serve as a refuge from predators and as a favorable thermal environment for roosting and nesting. Trampling can destroy nests and degrade nesting habitat in riparian areas; trampling of stream banks can also widen stream channels, which results in greater stream temperatures, which can negatively impact fish species. Grazing can also reduce or eliminate the recruitment of trees and shrubs, which impacts bird diversity and reproductive success.[46]

Parasitism

Nest parasitism by the Brown-headed Cowbird (*Molothrus ater*) has impacted populations of some bird species, including the Least Bell's Vireo, Yellow-billed Cuckoo and the Southwestern Willow Flycatcher. The cowbird follows livestock that flush the insects that the cowbird feeds upon. These cowbirds are brood parasites that lay eggs in other birds' nests. The host birds incubate and feed the cowbird nestlings often at the expense of their own young.

Gravel Extraction

Gravel pits and gravel mining may affect listed species by fragmenting habitat, and displacing populations. They usually occur in floodplains, which results in a net loss of riparian vegetation. A more detailed discussion of the effects of gravel extraction on listed species will be provided in the HCP.

Recreation

As noted in the *Southwestern Willow Flycatcher Conservation Strategy*, some of the impacts of recreation in riparian ecosystems include: trampling, clearing, soil compaction, bank erosion, exotic species establishment and spread, fragmented habitat, and increased incidence of fire.

Recreation in riparian ecosystems can directly impact birds through the trampling of nests and the disturbance of foraging areas. The presence of humans in nesting and foraging areas temporarily affects the behavior and movement of birds; birds usually avoid places where people are present.[47] Human presence, therefore, can directly and indirectly interfere with foraging, feeding, and nesting.

Native fish populations can be directly impacted by non-native fish species and recreation, or indirectly through the impacts on water quality from motorized uses on waterways, and sedimentation from bank erosion and soil compaction.

Fire Management

Fire is identified in the *Southwestern Willow Flycatcher Conservation Strategy* as one of three threats having the greatest potential to

[45] Busch and Scott
[46] Bock
[47] Bennett and Zuelke 1999

cause adverse effects to the Southwestern Willow Flycatcher on LADWP lands (pp.7-9). Generally, fires in riparian areas reduce vegetation cover and alter species composition; they can also promote the establishment of non-native species. Specifically, the reduction of native species such as cottonwood and willow negatively impacts the Southwestern Willow Flycatcher and other birds that use these plant species for foraging and nesting. Fires in riparian areas can also impact fish by reducing shade cover over streams, resulting in elevated stream temperatures. Increased surface erosion due to reduced ground cover can also affect fish by impacting water quality.

Road Construction and Maintenance

The extensive road network in the project area creates a significant impact on the resources of the Owens Valley. Non-paved roads are often exposed to wind and water erosion which can lead to flooding, erosion of banks, excessive dust, and the removal of vegetation. Such impacts have a negative effect on the quality and quantity of habitat, and thus a negative impact on listed species. The Owens Valley HCP should include measures to control the proliferation of roads and to mitigate for the impacts caused by existing roads.

Exotic Species

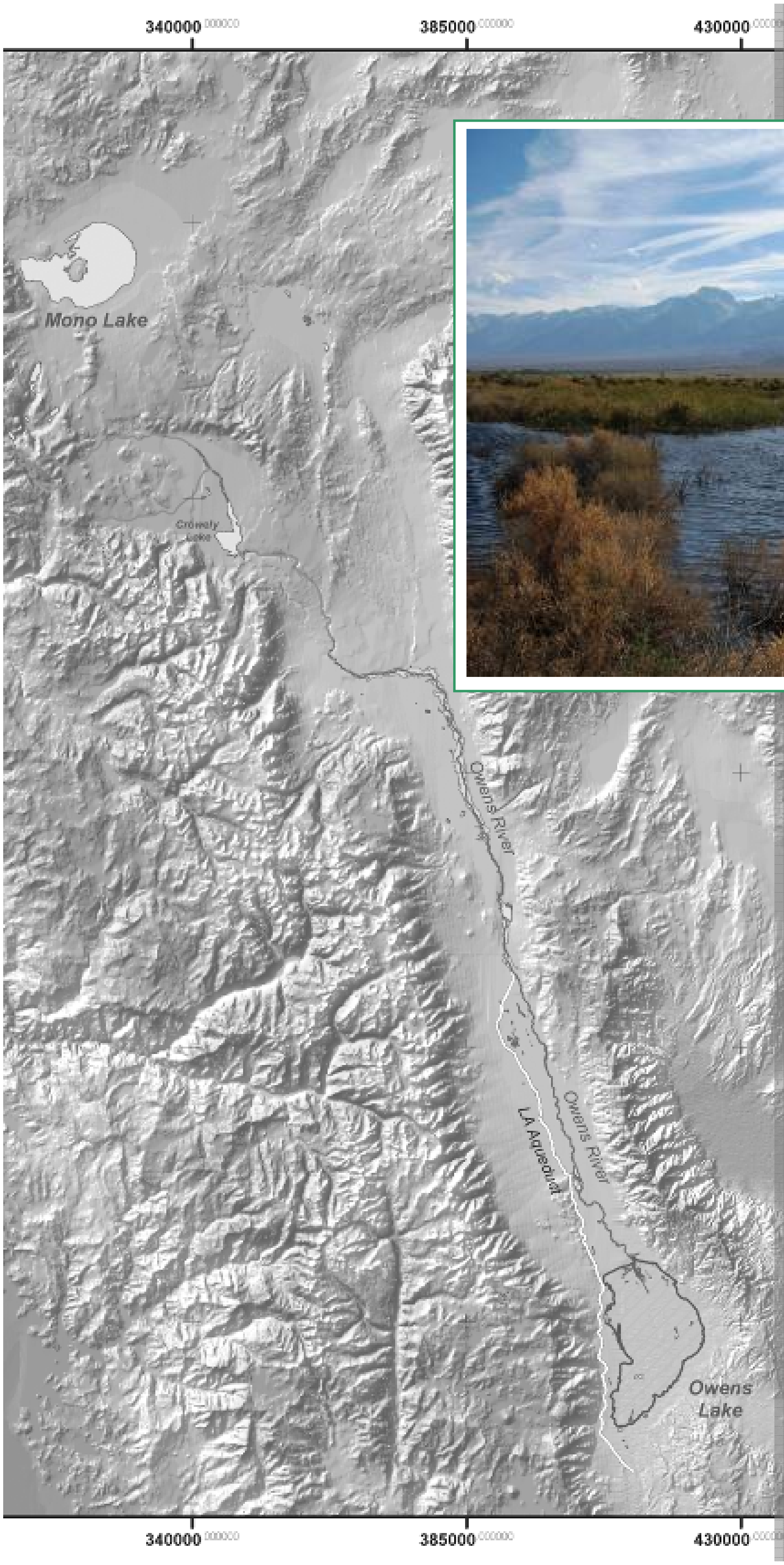
Infestations of saltcedar or tamarisk, perennial pepperweed, and Russian olive are widespread in the HCP project area. Saltcedar has invaded areas along waterways, altering wetland habitats. Its root system uses large amounts of ground water, often to the detriment of other species. The salt concentrations that accumulate in the soil from the plant's leaf litter prevent most other plants from growing under its canopy.

Perennial pepperweed grows in wet areas, ditches, croplands, and along roadways. Its spreading roots and numerous seeds make it difficult to control. Establishment and spread of these exotic species degrades the riparian and wetland habitats.

5.8 Monitoring and Adaptive Management

Adaptive management, an underlying principle of successful watershed management, demands that as restorative actions are implemented, that managers simultaneously monitor the effects closely, attend to how nature and its processes respond to the actions, and adjust management interventions as necessary to achieve restoration goals. Adaptive management strategies are required for HCPs that will impose a significant risk to the species due to significant data or information gaps, and operations or maintenance activities. A low-effect, habitat-based HCP will require a monitoring program and an adaptive management strategy other than that developed for the OVLMP.

There are two types of HCP monitoring: (1) compliance monitoring, which monitors the permittee's implementation of the requirements of the HCP; and (2) effects and effectiveness monitoring, which investigates the impacts of the authorized take and the operating conservation program implemented to verify progress toward biological goals. Monitoring plans for the OVLMP with minor changes will meet some of the monitoring requirements for the HCP. However, the final HCP covers all DWP in the Owens Valley (inclusive of Inyo and Mono Counties), whereas the OVLMP only covers those DWP lands in Inyo County. Therefore, the HCP will develop monitoring protocols and an adaptive management process specific to the HCP.



CHAPTER 6

Cultural Resource Management

CHAPTER 6

6.1 Introduction

This chapter summarizes the results of a Class III heritage resource survey and report for the riparian corridor of the Middle Owens River. The purpose of the heritage survey is to locate and record prehistoric, ethnographic, and historic resources in the Middle Owens River riparian corridor, and to evaluate these resources for mandated protection. Additional surveys may be necessary if project activities extend beyond the riparian corridor. The survey and subsequent report conform to the standards of the California Office of Historic Preservation and the California Environmental Quality Act (CEQA). Given the confidential nature of archaeological reporting, specific data have been omitted from this summary.

The heritage resource survey is confined to the riverine-riparian areas along the Middle Owens River, which is part of the OVLMP project area. The Middle Owens riparian corridor encompasses both banks of the Owens River, from Pleasant Valley Reservoir to the Los Angeles Aqueduct (Figures 1.2 and 2.1). This land is owned by the City of Los Angeles and administered by the LADWP.

OVLMP activities could affect the cultural resources situated along the river unless the location and significance of these sites is known and considered. Potential impacts include changes in the regulated flow pattern of the Owens River, removal of flow blockages, fenceline construction in riparian and adjacent areas, changes to livestock grazing practices, trail and road reclamation and restrictions, and the construction of paths and decking for wheelchair and recreation access. Any other proposed ground disturbing activities outside the riparian corridor should be inventoried for cultural resources prior to implementing project activities.

A systematic archaeological surface survey of the riparian corridor was conducted in March, April, and May of 2006 by McCombs Archaeology. A survey report *Class lll Heritage Resource Survey for the Riparian Corridor of the Middle Owens River Project* by Diane McCombs, was completed in 2006. The survey was conducted with a predominantly Native American crew representing Big Pine Paiute Tribe, Bishop Paiute Tribe, Fort Independence Tribe, and the Greenville Rancheria of Maidu Indians. The crew configuration and hiring was completed with assistance from Lee Chavez, Tribal Historic Preservation Officer (THPO) for the Bishop Paiute Tribe. Project Native American consultation was provided by Tribal representatives from four local Tribes and by the Native American Heritage Commission in Sacramento.

The heritage resource survey identified 45 heritage sites located partly or wholly in the Middle Owens River riparian corridor. Of these sites 12 are prehistoric, two are multi-

Figure 6.1. Petroglyphs near the Middle Owens River (Photo by Courtney Smith).

component (prehistoric and historic), and 31 are historic. All heritage sites have been preliminarily evaluated for state and federal listing. The prehistoric sites include areas where resources were procured seasonally. The historic sites reflect more recent local history such as agricultural expansion, the Carson & Colorado Railroad, and land purchasing by the City of Los Angeles for the Los Angeles Aqueduct. Recorded historic irrigation systems include portions of the Big Pine Canal, the northern segment of Bishop Creek Canal, A.O. Collins Canal, George Collins Canal, the McNally Ditch, Owens River Canal, Rawson Ditch, and Sanger Ditch. Sites associated with the expansion of the Los Angeles Aqueduct are Tinemaha Reservoir, 14 LADWP flowing wells, and two LADWP drain ditches.

A records search of both the riparian survey area and a wider 15,000 acre Middle Owens River area was conducted by the Eastern Information Center of the California Historical Resources Information System at the University of California, Riverside. The majority of the 15,000 acres has not been surveyed for heritage resources. Site records exist, however, for numerous heritage sites located within or very near the Middle Owens River area. The sites demonstrate that the Middle Owens River area has been intensively utilized over time. The Middle Owens River area also includes the Pawona Witsu Archaeological District, which is currently listed on the National Register of Historic Places and may require regulatory management during project implementation. Numerous unrecorded heritage resources were observed in the project vicinity. Under the current survey protocol, only those sites located within or immediately adjacent to the riparian corridor were recorded.

6.1.1 NRHP and CRHP

The National Register of Historic Places (NRHP), authorized under the 1966 National Historic Preservation Act, is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service. While National Register listings are mostly symbolic, they do provide some financial incentives to listed property owners.

The California Register of Historic Places (CRHP-also called the California Register) contains eligibility criteria for listing landmarks and archeological sites (see Section 6.10), points of interest, and includes resources listed in or formally determined eligible for listing in the NRHP, as well as some California State Landmarks and Points of Historical Interest. Properties that have been identified in a heritage resource survey may be eligible for listing in the California Register and are presumed to be significant resources for purposes of the CEQA unless evidence indicates otherwise (PRC Section 5024.1, 14 CCR § 4850).

6.2 Goals and Objectives

The MOU goal for cultural resource management for the Middle Owens riparian corridor (includes both banks of the Owens River, from Pleasant Valley Reservoir to the Los Angeles Aqueduct) includes:

1. *Implement sustainable land management practices for agriculture (grazing) and other resource uses*. The Cultural Resources Management Plan and other management plans implemented as part of the OVLMP will establish land uses that protect cultural and historical resources.

The objective that pertains to this MOU goal include:

1. *Establish guidelines to protect cultural resources.* There are many historical sites and cultural resource areas that have been identified throughout the Middle Owens River.

Any land management activities such as new roads, parking areas, and access points must take into account these sites and the potential impacts to them.

6.3 Native American Consultation

Prior to the field investigations the following Tribes in Inyo County were consulted:

1. February 8, 2006 in Benton; Joseph Saulque, Tribal Administrator for the U-te Ute Gwaitu Paiute Tribe.
2. February 8, 9, 13, and 14 in Bishop; Lee Chavez, Tribal Historic Preservation Officer for the Bishop Paiute Tribe.
3. February 9, 2006 in Big Pine; Irving Lent, Tribal Administrator for the Big Pine Paiute Tribe of Owens Valley. Bill Helmer, THPO, was unable to attend.
4. February 9, 2006 in Independence; Tribal Administrator Norman Wilder and Environmental Director Richard Stewart for the Fort Independence Indian Reservation.

During the consultation meetings participants reviewed maps of the Middle Owens River area, discussed project designs, identified qualified survey crew members to conduct the surveys, and shared Tribal knowledge and concerns about archaeological sites in the project area. The primary concern for the Tribes was the protection of Native American remains and resources within the project area.

The Native American Heritage Commission in Sacramento conducted a records search for the OVLMP of the Sacred Lands File in July, 2006. On-site Native American consultation was provided by the Paiute Tribal members employed as archaeological technicians on the survey crew.

6.4 Natural Setting

The distinctive setting of the project area has been described in a number of local publications, including Bateman et al. (1995) and Irwin (1991). The Middle Owens River is located in Owens Valley, a 90-mile long graben that sank as the adjacent Sierra Nevada and the Inyo-White Mountains rose. Bateman et al. (1995) describe Owens Valley as the Deepest Valley "for nowhere in the Americas is such a valley bounded on both sides by such towering peaks". Three distinct biogeographic regions abut in Owens Valley; the Great Basin, the Sierra Nevada, and the Mohave Desert. The valley's climate, flora, and fauna reflect the influence of all three regions, but the Sierra Nevada exerts the greatest influence, creating a barrier that extracts moisture from the clouds and blocks storms. The climate in Owens Valley is characterized by hot, dry summers and cold winters, with annual precipitation averaging less than 6 inches.

The Owens River flows southerly in numerous wide meanders through the Owens Valley. Irwin (1991) writes:

> *"The Owens River drains the entire eastern Sierra Nevada watershed south of the Mono Lake Basin. Like other rivers of the Great Basin, it flows into a desert sink rather than running out to sea. Called "Wakopee" by the Paiutes, the 120-mile river rises at the head of Long Valley northeast of Mammoth, meanders through Long and Owens valleys, and disappears in the vast playa of Owens Lake south of Lone Pine".*

The heritage survey took place within the narrow riparian corridor along the Owens River floodplain. For survey purposes, the

Figure 6.2. The Owens River near Aberdeen Station Road.

corridor was defined by fluvial landform features (terraces and active floodplain) and vegetative structure (willow, cottonwood, and sedges). Dense willow grows in large patches along the river in various locations, hindering ground visibility during survey.

6.5 Cultural Setting

6.5.1 Prehistoric

Archaeological study in the Owens Valley began with the early recording of rock art.[1] Halford (1999) and Far Western (2001) provide a summary of research in the Owens Valley area, along with a cultural chronology. The development of a regional cultural chronology with which archaeological data could be interpreted began during the 1940s to 1960s. The Cottonwood series and Rose Spring series projectile point typologies were identified in the Owens Valley during this period and continue in use today as approximate temporal indicators. Bettinger's research from the 1970s to 1990s addressed temporal relationships and introduced models about regional adaptations.

Archaeological work in the Owens Valley has intensified over the last 20 years due to environmental reporting requirements for the widening of U.S. Highway 395 by the California Department of Transportation (Caltrans). In conjunction with Far Western Anthropological Research Group, Pacific Legacy, Sacramento State University, and other archaeological firms, Caltrans has sponsored a great deal of advanced work in the valley, including public outreach material that is accessible by local Tribes and the general public. Combined with obsidian hydration analysis and X-Ray Fluorescence, this work has helped to clarify an archaeological record in the Owens Valley that dates back to the end of the Ice Age (the Hilgard glaciation), approximately 10,000 years ago. The most explicit research has been the dating and sourcing of obsidian artifacts, cores, and flakes. According to the documentary *The Obsidian Trail* (2002), Owens Valley is one of the most geologically active regions in North America, producing high quality obsidian extensively mined and widely traded by Paleo Indian and prehistoric flintknappers. There are 10 obsidian flows in the region, five of which were quarried. Owens Valley obsidian has been identified in diverse archaeological sites near Mexico and along the Pacific Coast, indicating extensive trade networks and mobility. The obsidian trade from the valley extended west into the Sierras, east to the Shoshone of the Great Basin, and south to the Mohave Desert, reaching a peak in activity around 1,000 years ago. Quarrying decreased significantly thereafter as land use practices changed.

The following cultural chronology for Owens Valley and the Southwestern Great Basin region is drawn from BLM Archaeologist F. Kirk Halford, in the Bishop Field Office (1999) and based on Bettinger and Taylor (1974). It is generally consistent with data provided by Forest Archaeologist Linda Reynolds of the Inyo National Forest and various private sector firms. Like most chronologies, it changes as more data is collected. Halford writes:

> *"A number of cultural chronologies have been proposed and outlined for the Region (Bettinger and Taylor 1974; Hester 1973; Lanning 1963; see also Elston 1986). For the most part the dates in each chronology are in agreement, as established from projectile point time markers, the main differentiation being in terminology".*

6.5.2 Mohave Period/Paleo Indian

This period ranged from 10,000 to 7,500 years Before Present (BP). Beginning with the Altithermal (the melting of the glaciers), this temporal period is characterized by small, highly mobile nomadic populations often associated with big game hunting. Few archaeological sites have been identified in this period, but may include a site (CA-INY-30) located along the Owens River south of Lone Pine. Obsidian analysis of the oldest period

[1] Mallery 1886

material indicates a source outside of the Owens Valley but within the Eastern Sierra. This period is also called the Early Holocene.

6.5.3 Little Lake Period

This period ranged from 7,500 to 3,500 years BP. With some exceptions, most sites from this period indicate brief occupation and continued mobility. The increased use of plant resources is indicated by the greater prevalence of milling equipment. Period markers include diverse split-stem projectile points. Site CA-INY-30 includes elements from this period. It is also called the Middle Holocene.

6.5.4 Newberry Period

This period ranged from 3,500 to 1,350 years BP and includes sites with developed residences in the lowlands. Numerous archaeological sites have been associated with this period and indicate an increase in obsidian quarrying, trans-Sierran trade, and greater use of the uplands for plant and animal resources.

6.5.5 Haiwee Period

This period ranged from 1,350 to 650 years BP. Haiwee sites have been identified throughout the Owens Valley with a pattern of increased occupation and intensified resource use. The Rose Spring series projectile point is a marker for this period as is increased social complexity and the presence of specialized structures.

6.5.6 Marana Period

This period ranged from 650 years BP to Contact, 1850. The last phase of the prehistoric period, the Marana Period is characterized by significant indicators such as pottery, mussel shell, and the bow and arrow. Trans-Sierran interaction is indicated by the long distance trade of marine shell ornaments, further indicating social complexity. The intensification of seed procurement (pinyon pine, rice grass, needlegrass, etc.) and the development of more elaborate and permanent house features further mark this well represented period in the Owens Valley.

6.6 Ethnographic Overview

The Middle Owens River is located within the territorial range of the Owens Valley Paiute.[2] The Paiute and Shoshone people have lived in the Eastern Sierra for at least the last 1,000 years. The lands of the Owens Valley Paiute, at the time of contact, extended south along the Owens River from below Mono Lake to just beyond Owens Lake, and east from the crest of the Sierra Nevada up the western slopes of the Inyo-White Mountains. Prior to contact, the population was estimated at approximately 1,000 people, making Owens Valley the most populated area in the Great Basin.[3]

The origin of the word Paiute is unknown. The Owens Valley Paiute and other Paiute people refer to themselves as Numu, the People. Although mutually intelligible, differences in linguistic dialect of the Mono language occurred within the Owens Valley. According to Steward (1933), dialects were present at Owens Lake and Lone Pine, Fish Springs, Independence, Big Pine, Deep Springs Valley, Bishop, Laws, and Round Valley. Julian Steward's ethnographic fieldwork in Owens Valley began in 1927 and was based on information provided by numerous Paiute and Shoshone people, including two men about 100 years old. For this reason, it is considered an important documentation of lifeways.

Steward (1933) writes:

> *"South of Mono Lake, Paiute are designated by terms descriptive of their habitats. Benton was utu utu witu, hot place. The following were districts of the Owens valley and neighboring valleys, each with communistic hunting and seed rights, political unity, and a number of villages: Round valley, kwina patu, "north place"; Bishop, pitana patu, "south place", extending from the volcanic tableland and Horton creek in the Sierra to a line running out into Owens valley from waucodayavi, the largest peak south of Rawson creek; utu utu witu (also applied to Benton), "hot place", from the warm springs, now*

[2] Steward 1933
[3] Far Western 2001

Keough's, south to Shannon creek; tovowahamatu, "natural mound place", centering at Big Pine, south to Big Pine creek in the mountains but with fishing and seed rights along Owens river nearly to Fish Springs; panatu, the Black Rock territory, south to Taboose creek; tunuhu witu, of uncertain limits. Other Paiute districts extended to the south shore of Owens lake, east and south of which were Shoshoni."

The Owens Valley Paiute were primarily hunters and gatherers who followed a seasonal round of resource procurement depending on the availability and location of plant and animal resources. Delacorte (1999) lists 50 plants of economic importance to the Owens Valley Paiute and Coso Shoshone, along with the months of seasonal availability. Drawing from Steward's work, Far Western (2001) writes:

"The annual round began in the early spring on the valley floor by collecting new roots, shoots, greens, and early ripening seeds. Those who wintered in the pinyon camps returned to the valley floor at this time, bringing with them whatever pine nuts they had left. Summer was spent in semipermanent villages located on the valley floor near the river, streams, or drainages. Subsistence activities included seed collecting, root gathering, and fishing. During this time small family groups left the village to collect specific resources. For several weeks during the fall, large aggregates of people participated in communal activities such as rabbit drives and festivals. Fall marked the beginning of pine nut collecting, which according to Steward (1933, 1938a) was the most important subsistence activity for the Owens Valley Paiute. If the pinyon crop was favorable, the people established winter encampments in the Inyo-White mountains near their caches; if not, they returned to the lowland village sites and subsisted on stored seeds".

Figure 6.3. Chalk Bluff Road, located in proximity to the riparian corridor

The Owens Valley Paiute practiced irrigation of several wild seed plots (tupus and nahavita) to increase their natural yield.[4] The practice included dam and ditch construction where natural conditions were optimal, including Bishop Creek, Pine Creek, Freeman Creek, and Baker Creek. This practice is considered unique among Great Basin and California populations. In reference to the Bishop district (pitana patu), Steward writes:

"The dam of boulders, brush, sticks, and mud was built by the irrigator, assisted by about twenty-five men. After water was turned into the ditch, the irrigator alone was responsible, watering the plot by small ditches and dams of mud, sod, and brush. The water, once started, needed little attention. A pole, pavodo, 4 inches diameter, by 8 feet long, was the irrigating tool".

Steward's 1933 manuscript provides detailed descriptions about the material and social culture of the Owens Valley Paiute. Hunting and fishing were individual or communal and occurred throughout the uplands and valley. Rabbits were hunted and their pelts were highly valued for use as capes and in the weaving of blankets, cords, and mats. Pottery was primarily made in Big Pine, but also Fish Springs and Lone Pine. It is found in the archaeological record as Owens Valley Brown Ware. Willow cut in winter was used for basketry. Stands of oak were uncommon but acorns were harvested on Division Creek, Oak Creek, at Fort Independence, and in the Fish Hatchery area.

[4] Steward 1933

Trade relations with other tribes were well established, with routes primarily traversing west into the Sierras. Although trade was commonly conducted by men, John Muir noted a Paiute woman traveling with a trading party in 1870.[5] The Owens Valley Paiute brought salt, pine nuts, seeds, obsidian, rabbitskin blankets, balls of tobacco, baskets, and buckskins to trade with the Yokuts and Plains Miwok. In return, they received shell money, glass beads, acorns, Manzanita berries, apasa, and baskets. According to Steward, "people crossed from both sides, making hurried trips."

Additional information about the Owens Valley Paiute and Shoshone Tribes can be found at the Owens Valley Paiute and Shoshone Cultural Center in Bishop.

6.7 Historic Overview

A history of the Owens Valley is provided in numerous sources including Bateman et al. (1995), Chalfant (1933), Irwin (1991), Nadeau (1997), and Sauder (1994). The creation of Indian reservations in Big Pine, Bishop, and Lone Pine is documented in a Ph.D. dissertation by Nancy Peterson Walker (1985). The life of Viola Martinez, an Owens Valley Paiute, is told by Bahr (2003). The Eastern Sierra Museum in Independence and the Laws Railroad Museum both house historic files and maps. It is a history similar to the northern Sierras, wherein the discovery of gold and silver triggered an influx of prospectors, followed by ranchers and farmers, which resulted in the displacement of Native Americans. What separates this history from other areas of the west is the development of the Los Angeles Aqueduct between 1905 and 1913 and subsequent large-scale land purchases by the City of the Los Angeles.

The history most relevant to the project area is that of the Owens Valley Paiute, agriculture and irrigation, the Carson and Colorado Railroad, and the expansion in land ownership by the Los Angeles Department of Water and Power.

[5] Steward 1933

6.7.1 Early History of the Owens Valley

Protected by the Sierra Nevada Mountains, the Owens Valley Paiute were not influenced by the Franciscan missions and Spanish ranchos of coastal California. According to Sauder (1994):

> *"The earliest known expedition into the Owens Valley was led by Joseph Reddeford Walker, who set out in 1833 from the Great Salt Lake region on a beaver trapping expedition to California. On his return journey in the spring of 1834, Walker searched for a path from the San Joaquin Valley through the Sierra Nevada in order to intercept the Humboldt River, the route used in his outward journey across the intermountain West. In late April, guided by local Indians, Walker's party moved up the south fork of the Kern River, crossed the Sierra over the pass ever since known by his name, and descended the east face of the range, reaching its base some distance south of then-unnamed Owens Lake."*

Owens Valley, along with much of the Far West, was incorporated into the public domain as part of the 1848 Mexican land succession. Accordingly, the first public land survey of Owens Valley was conducted in 1855 and 1856 by the surveyor A.W. Von Schmidt. This survey was the government's first step in securing control of the land, and produced a detailed account of resources in the area. Von Schmidt noted the irrigated taboose plots of the Paiute. A subsequent expedition and report was conducted in 1859 by Capt. J.W. Davidson, sent from Fort Tejon to the Owens Valley to investigate a false charge of stolen horses by the Owens Valley Paiute. Davidson's glowing report of the valley's resources was popularized and printed that same year in the Los Angeles Star newspaper, bringing public attention to the area.

The valley continued to be unoccupied by non-Indians until the 1860s. Gold and silver discoveries in Monoville (1859) and Aurora (1860) transformed Owens Valley into a thoroughfare to eastern Sierra boom towns.[6]

[6] Sauder 1994

The first cattle drive to the new mines was in 1861, following Walker Pass through Owens Valley. The establishment of ranches in the Owens Valley quickly followed, beginning in 1861 with the Samuel Bishop stock ranch, which had 500 to 600 head of cattle destined for the mines. During this same time, thousands of starving cattle were herded in for summer grazing in the Owens Valley due to the prolonged drought in western California.[7]

Cattle grazing severely impacted native plants used by the Owens Valley Paiute. Subsequent logging in the mountains for mine timbers impacted the pinon forests upon which they depended in winter. Some Paiute turned to cattle for food and the Indian Wars in Owens Valley escalated. In response, Fort Independence was established in 1862 as a military outpost. The strategy of garrison leader Colonel George S. Evans was to destroy native food sources even further to force submission by the Paiute.[8] He argued that it would be easier to starve the Paiute than to fight them. His scouts ranged throughout the valley eradicating winter supplies of grass seeds and fly larvae and preventing the Paiute from gathering additional supplies. Evans wrote: “Without this food gathered and laid up, they cannot possibly subsist through the winter.”[9]

This strategy resulted in the surrender in June 1863 of 400 Owens Valley Paiute at Fort Independence after the destruction of 300 bushels of pine nuts and taboose.[10] Shortly thereafter, almost 1,000 Paiute were forcibly moved to San Sebastian Reservation near Fort Tejon. Over time, most escaped and returned to their homeland.

In 1865, silver deposits were discovered at Cerro Gordo, located east of Owens Lake, bringing more permanent non-Indian residents to the valley. The following year, at the request of this growing population, the California Legislature approved the creation of Inyo County. The word Inyo is said to be the Paiute name for the Inyo-White Mountains and translates as “dwelling place of a great spirit”.[11]

6.7.2 *Agriculture and Irrigation*

According to census records from 1870 and 1880, early emigrants to the Owens Valley primarily came from Ohio, Illinois, Missouri, New York, Pennsylvania, Maine, Vermont, the British Isles, and Germany.[12] Most practiced a standard Midwestern three-crop rotation of corn, small grains, and hay, as well as livestock.

Census records from 1880 list the following livestock and production totals for Owens Valley:[13]

Corn:	31,111 bushels
Wheat:	28,833 bushels
Oats:	22,587 bushels
Barley:	31,897 bushels
Hay:	7,674 tons
Horses:	3,180
Milk Cows:	1,024
Range Cattle:	5,469
Sheep:	9,722
Swine:	2,308

Additional miscellaneous products listed in 1880 include 22,853 bushels of potatoes, $4,511 of orchard products, $4,757 of garden produce, 39,481 lbs of butter, 11,830 lbs of honey, 7,779 individual poultry, and 23,149 dozen eggs.

To maximize production, most farmers hired laborers, namely the Owens Valley Paiute. Paiute men performed most of the seasonal field labor while Paiute women were hired for winnowing and as domestic servants. Most Paiute lived in traditional shelters near farms or towns. The Indian Homestead Act of 1875 enabled some local Paiute to file on homesteads of their own.

Passage of the Desert Land Act in 1877 opened the way for use of the Owens River for

[7] Sauder 1994
[8] Sauder 1994
[9] Sauder 1994
[10] Walter 1985
[11] Chalfant 1933
[12] Sauder 1994
[13] Sauder 1994

agricultural irrigation.[14] Prior to this time, ranch and farm enterprises in the Owens Valley centered around Sierrean streams, with the Paiute irrigation ditches quickly acquired and expanded. The Desert Land Act, a Congressional extension of the Lassen County Desert Land Law, encouraged settlement of arid lands in the United States by allowing land entrants to acquire larger tracts of public lands (640 acres) to more effectively compensate for the expense of reclamation. The Act was passed to increase farm products to the mining states of the West. Although misused in land grabs, passage of the Desert Land Act resulted in the cooperative alliance of land entrants in Owens Valley for the financing and building of irrigation canals which drew water from the Owens River.

The McNally Ditch (constructed in 1877) and the Fish Slough Canal (a parallel ditch) were some of the first projects completed, irrigating arid lands northeast of Bishop in Laws. Portions of these two ditches are located in the MOR area, along with 5 others. Sauder (1994) writes:

> *"Although the Desert Land Act made no specific provision for reclamation except by individual effort, nothing prevented land entrants from joining together to build canals to irrigate their tracts. As a result, most canals in the Owens Valley were financed on a cooperative basis. Ditch companies were formed and incorporated, and farmers purchased shares of stock in them, with each share carrying the right to use a designated amount of water. The farmers themselves built the canals during the winter using teams of horses and primitive cast-iron scoops called Fresno scrapers."*

By 1901, eighteen main ditches and canals diverted water from the Owens River, creating an irrigation system 200 miles long. Most were located in the northern Owens Valley, where a more concentrated settlement pattern allowed for cooperative enterprises.

[14] Sauder 1994

6.7.3 The Carson & Colorado Railroad

Remains from a 300-mile long narrow gauge railroad can be seen along the east side of the Owens River in and near the project area. Known locally as the Slim Princess, the line operated in Owens Valley from 1883 to 1960. The Carson & Colorado Laws Station is listed on the National Register of Historic Places.

The 1928 completion of Tinemaha Reservoir by LADWP necessitated the construction of two bridges over the Owens River to carry the tracks to the west side of the river, around the reservoir, and back to the original grade on the east side. Both of these bridge locations were recorded during the 2006 survey.

The railroad line originated in Mound House, Nevada and ran to Keeler, California near Owens Lake, servicing the mining communities of Panamint, Darwin, and the Coso Mining District, all located on the east side of the valley. Initially scheduled to run 600 miles from the Carson River to the Colorado River, construction stopped with the decline in mining. The Jawbone Line to the Mohave was added in 1910 to haul equipment and supplies for the construction of the Los Angeles Aqueduct.

Early railroad shipments included borax from the mines to Mound House, corn from Bishop to Hawthorne, meat from Black Canyon to Candelaria, hay from Bishop and Hammill to Rhodes, and sheep from Benton to Belleville and Candelaria.[15] Prior to the railroad, products in Owens Valley were hauled south by Remi Nadeau's 20 mule team wagons. Several reports indicate that Indians rode free, in boxcars or on the outside roof. The line ran through the Walker River Indian Reservation in Nevada and tribal bargaining prior to construction included no-cost transport. When dismantled in 1960, the railroad line was the last narrow gauge common carrier west of the Rocky Mountains.

[15] Eastern Sierra Museum files

6.7.4 Los Angeles Department of Water and Power

Prior to 1905, the Los Angeles Department of Water and Power owned no land in the Owens Valley. Current land ownership reportedly exceeds 300,000 acres in Inyo and Mono counties.[16] .[17] LADWP is the nation's largest municipal utility company, and owns the entire land base of the OVLMP. Few would argue that the historical transfer of land and water from individual ownership to municipal management has been an easy one. Within 50 years of taking the land from the Owens Valley Paiute, ranchers and farmers were confronted with the beginnings of California's first water war.

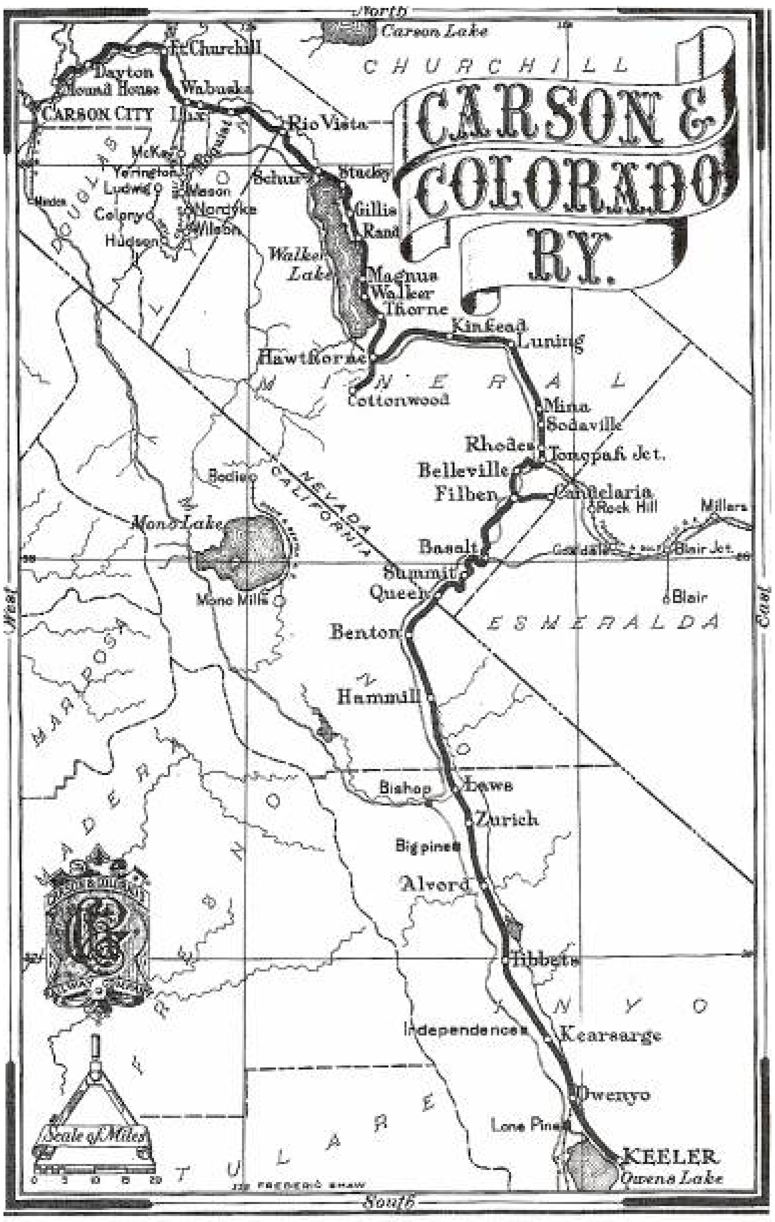


Figure 6.4. Carson and Colorado Railway Map. Circa 1883.

The completion of the Los Angeles Aqueduct in 1913 initially had a limited effect on farmers in northern Owens Valley. The aqueduct, which received diverted waters from the Owens River, was located in the southern valley, where overt and covert land purchasing by Los Angeles began in 1905. Expansion into northern Owens Valley by the city of Los Angeles during the early 1920s was due to a number of factors, including a burgeoning population growth in Los Angeles, a prolonged drought throughout the entire Southwest, the failure of a proposed Long Valley reservoir, water use in irrigation ditches, and potential injunctions against ground water pumping in the Independence area. In 1923, flow in the aqueduct was at half its normal level as the population of Los Angeles neared the one million mark.[18]

In 1922, the city of Los Angeles began purchasing lands in northern Owens Valley. By this time, the City owned continuous water-bearing lands from Owens Lake to three miles southeast of Bishop. In response, valley farmers began the formation of the Owens Valley Irrigation District, passed by referendum in the Bishop-Laws-Big Pine area. Declared a public corporation, the district encompassed 53,390 acres, the finalization of which would provide managerial control against encroachment by Los Angeles. The City countered by buying out the McNally Ditch property owners.

According to Nadeau (1997):

> *"Before the transaction could be completed, the Los Angeles Water Department, made desperate by drought, invaded the upper valley in spite of the*

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[16] Walter 1985

[17] Walter 1985

[18] Sauder 1994

> *irrigation district. In March 1923 the Los Angeles officials hired William Symons, president of McNally Ditch, to take options on all the ditch property on a commission basis… Constructed in 1877, McNally was the oldest large-sized canal on Owens River and hence carried an undeniable water right to its 100 second-feet of water. Serving most of the rich lands on the east side of the river in the Bishop area, it made up an essential part of the new irrigation district".*

The buy-out happened quickly with 80 percent of McNally under option within 24 hours. More than a million dollars worth of water was optioned at an average cost of $7,500 per second-foot.[19] According to Nadeau: "From the purchase of McNally Ditch dates the real beginning of the Owens Valley water war."

The complexities of ensuing actions on both sides are covered in numerous sources, including Chalfant (1933), Nadeau (1997), Sauder (1994), and others. The water war in the Owens Valley included armed conflict and civil unrest; similar events occurred in Arizona and the Rocky Mountain states over Colorado River water. By 1928, the city of Los Angeles had purchased 90 percent of water bearing parcels in the Owens Valley, effectively ending any potential compromise. By 1933, the amount increased to 95 percent of water bearing parcels and 85 percent of town property. The 1931 Ritch Maps, on file at the LADWP Bishop Office, show the date of purchase and price for former private land in the northern MOR area. The number of farms in Inyo County decreased from 521 in 1920 to 201 in 1935.[20]

6.7.5 The Development of Indian Reservations

Three small Indian reservations (Bishop Paiute, Big Pine, and Fort Independence Indian Reservations) are located in proximity to the MOR area. Two additional reservations, Benton and Lone Pine, are located to the north and south of the project area. Reservations were not established in Owens Valley until 1915. Fort Independence and Benton Reservation were both created in that year. Bishop, Big Pine, and Lone Pine were created by the Land Exchange Act of 1937 between the City of Los Angeles and the U.S. Department of Interior.[21] The agreement between these two entities involved the exchange of 2,914 acres of dispersed Indian holdings administered by the Department of Interior on behalf of the Paiute for 1,392 acres of adjoining 'higher quality' land near the towns of Bishop, Big Pine, and Lone Pine. The federal government subsequently constructed housing on these three reservations.

The process of a city government negotiating with the federal government for land and water on behalf of the Owens Valley Paiute was complicated. For additional information on treaty law and the federal government's political relationship with Tribes and families, see Walter (1985).

According to Walter, nineteen Indians sold their land to the city of Los Angeles during the 1910s and 1920s. By the early 1930s, a reported 94 percent of the Indian population in Owens Valley did not own or lease land.[22] With the reduction in farms following purchase by the city of Los Angeles, employment options were limited and ranch housing for laborers greatly reduced. Many Indian families lived along the Owens River in traditional housing, but were prevented from fully practicing hunting and gathering. Concern for water contamination, health, and welfare ultimately led the city of Los Angeles to negotiate a reservation system in Bishop, Big Pine, and Lone Pine.

The Tribes today continue to be a strong presence in the Owens Valley. According to the 2000 U.S. Census, 10 percent of the population (1,802 people) in Inyo County identified themselves as American Indian or Alaska Native.

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[19] Nadeau 1997
[20] Sauder 1994
[21] Bahr 2003 & Walter 1985
[22] Far Western 2001

6.8 Methods

6.8.1 Literature Search

Prior to fieldwork, a records search of the project area was conducted in February 2006 by the Eastern Information Center (California Historical Resources Information System) at the University of California, Riverside. At the request of Ecosystem Sciences, the records search included the riparian corridor and the wider 15,000 acre boundary which encompasses it, as part of the OVLMP.

The records search indicated that the majority of the wider Middle Owens River area has not been surveyed. Fifteen small heritage surveys were conducted in the Middle Owens River boundary and 73 heritage sites were recorded within or near the MOR area. The majority of these site records date from 1949 to 1974 and do not meet contemporary professional standards. Given this, the locations of sites, which were not field-checked, should be considered approximate. The records search strongly indicates that the project area is highly sensitive for historic and prehistoric resources.

Additional records searches were conducted at the Inyo County Assessor Office, Eastern Sierra Museum, Laws Railroad Museum, LADWP Bishop Office, BLM Bishop Office, and Inyo National Forest Bishop Office. Local literature was acquired at the Inyo County Library and at Spellbinder Books of Bishop.

Figure 6.5. Zurich (Alvord) Station remains near Big Pine.

6.8.2 Survey Coverage and Site Recording Strategy in 2006

An archaeological surface survey was conducted by McCombs Archaeology from March 6 to May 5, 2006. The survey crew consisted of three to five surveyors who worked together on long transects, first on one side of the river and then on the other. The area surveyed was 39 linear miles (72 river channel miles) of the Owens River riparian corridor (floodplain) from Pleasant Valley Reservoir to the Lower Intake for the Los Angeles Aqueduct. The floodplain was designated for survey by Ecosystem Sciences due to design changes in the Owens River flow pattern which would potentially be limited to the riparian corridor only.

The riparian corridor varied in width but was generally narrow (approximately 0-80 meters on each side of the Owens River). In some locations, there was no riparian corridor as the river channel was incised. The riparian corridor was determined by the presence of fluvial landform features (adjacent terraces, active floodplains) and vegetative structure (willow, sedge communities). This resulted in an adaptive strategy of varying survey transects according to the landform. Except where impenetrable willow was present, the survey coverage was complete (< 20 meter wide transects).

The survey transects did include some adjacent terraces. Archaeological sites that were located immediately adjacent to an actively eroding or potentially eroding terrace wall were recorded. Active or potential erosion was determined by the absence of vegetation at the water's edge and evidence of recent soil loss or movement. This determination was made in conjunction with local Native American crew members. Archaeological sites that extended to the terrace edge in an active or potential channel erosion area were determined at risk, and were recorded as part of the riparian area survey. Terrace sites which did not meet this definition were not recorded.

Due to dense vegetation, ground visibility in the riparian corridor was frequently poor but was considered adequate for site location.

Ground visibility on adjacent terraces was good to excellent.

All project heritage sites were recorded in accordance with the State Office of Historic Preservation (OHP) Instructions for Recording Historic Resources (1993). Heritage sites were recorded on OHP site forms (the DPR-523 series). A Trimble Pro-XR resource grade backpack Global Positioning System (GPS) unit was used to record all site locations and boundaries, which were then plotted by a Geographic Information System (GIS) onto site location maps. The unit has sub-meter accuracy. The Trimble unit was also used to generate site sketch maps. Site recording was conducted or supervised by the Principal Investigator.

Artifacts were not collected from the sites. At one site, local Paiute crew members chose to bury several projectile points in situ to protect them from illegal collecting.

6.8.3 Definitions of Archaeological Resource Types

The definitions of archaeological resource types used for the heritage survey are provided below and are consistent with BLM Bishop Office and regional private contractor site recording practices.

Prehistoric Sites were defined by the presence of at least one of the following:
-Fifteen or more lithic flakes within a 10 by 10 meter area.
-Midden (a mound or deposit containing shells, animal bones, and other refuse that indicates the site of human settlement).
-Presence of three artifact classes (projectile point, milling tools, biface, etc.).
-Any surface features (rock rings, BRMs, rock art, etc.).

Prehistoric Isolates were artifacts not associated with a site, other than unmodified flakes.

Historic Sites were defined as at least 50 years old and include one of the following:
-Water ditches
-Mines
-Logging chutes with structural components
-Standing, collapsed, or remnant structures
-Railroad grades, historic trails, and historic roads.
-Refuse dumps
-Dams and reservoirs
-Carved aspens
-Other, as appropriate

6.9 Report of Findings

During this heritage survey 45 archaeological sites located partly or wholly within or immediately adjacent to the survey area, were identified. Of these sites, 12 are prehistoric, two are multi-component (prehistoric and historic), and 31 are historic. The prehistoric sites reflect the pre-contact era in Owens Valley and include rock art, pottery, milling tools, extensive amounts of obsidian, and indications of seasonal resource procurement. The historic resources reflect local history beginning with agricultural development (seven irrigation ditches), the Carson & Colorado Railroad (two sites), and the Los Angeles Aqueduct (14 flowing wells, two LADWP drain ditches, and Tinemaha Reservoir).

The completed Class III report, which includes Office of Historic Preservation Site Records for the 45 sites, has been filed at the Eastern Information Center (the state regional clearing house at the University of California, Riverside). The Center subsequently files copies of the site records at the State Office of Historic Preservation in Sacramento. According to state and professional requirements, the report and site records are not available to the public.

6.9.1 Findings and Site Summaries

In order to protect these areas, descriptive summaries for prehistoric sites are kept to a minimum and location information is not released. The locations of the findings are not displayed on maps. LADWP, as landowner, is one of the custodians of the data, for management purposes.

Site summaries for the riparian corridor are as follows:

1. CA-INY-28 (multi-component):
A diverse resource that includes prehistoric petroglyphs and a 1930s/1940s LADWP drain ditch and weir to measure flow. The prehistoric component was initially recorded by H. Riddell in 1949. The petroglyphs include painted and pecked human forms and abstract designs. The site was re-recorded in 2006 according to contemporary professional standards.

2. CA-INY-123 (prehistoric):
This site was partially recorded and collected in 1951 by Dr. Douglas Dyer and Robert Farrell. Site records from the 1951 collection are not on file at the state level, which limits our understanding of this site based upon surface data. The site was re-recorded during the 2006 survey.

3. CA-INY-126 north (prehistoric):
As with CA-INY-123, the site was partially recorded and collected in 1951 by Dr. Douglas Dyer and R. Farrell. According to the 1951 site record, the collected material is in the possession of Dr. Dyer of Lone Pine. The site was re-recorded in 2006 according to remaining surface material.

4. CA-INY-126 west (prehistoric):
Same as above.

5. CA-INY-383 (prehistoric):
The site was initially recorded in 1955 by H. Riddell, with a greater number of formed tools noted at that time. It was re-recorded in 2006 by McCombs Archaeology. The site has been impacted by natural erosion, evidence of artifact collecting, and vehicular travel. Flaked stone is actively eroding into the river channel.

6. CA-INY-4682 (Big Pine Canal):
The canal diversion from the Owens River is located in the project riparian area. The site was recorded in 1993 by Foothill Resources, Ltd. and did not require updating beyond recording GPS points. The Big Pine Canal was completed in 1893 as a 15 mile long irrigation ditch for agricultural lands in the Big Pine area. It was purchased by LADWP in 1923 and extended into Tinemaha Reservoir for drainage into the Los Angeles Aqueduct. The canal is active and in use.

7. CA-INY-5058 north (Carson & Colorado Railroad):
The site contains historic railroad grade and scattered crossing remains from a former Carson and Colorado Railroad bridge over the Owens River. The crossing was constructed by Southern Pacific in 1927 for the re-routing of the railroad around Tinemaha Reservoir. The site includes dismantled narrow gauge railroad grade on the east and west approaches. The western approach has been converted to dirt road. The former wooden bridge reportedly was a simple trestle design, open deck, with no walkways. According to the Laws Railroad Museum, the bridge was intact in 1980. A picture of the former bridge is included in the site record. The 300-mile Carson & Colorado Railroad operated in Owens Valley between 1883 and 1960.

8. CA-INY-5058 south (Carson & Colorado Railroad):
The site is the remains of a former Carson and Colorado Railroad bridge over the Owens River. The crossing was constructed by Southern Pacific in 1927 for the re-routing of the railroad around Tinemaha Reservoir. The site includes dismantled narrow gauge railroad grade on the east and west approaches. The bridge remains consist of the intact partial structural base (pilings) of the crossing and include 4 standing rows of four poles each with attached bracings. The wooden bridge was a simple trestle design, open deck, with a reported span of 120 feet. It was removed in 2003 by the Owens Valley Railroad Company with material storage currently at the Laws Railroad Museum. Pictures of the former bridge are included in the site record.

9. CA-INY-6023 (Owens River Canal):
The canal diversion is adjacent to the project riparian area. The site was recorded in 2001 by Sonoma State University and did not require updating other than recording GPS points. The Owens River Canal was built in

1887-1888 as a 20-mile-long agricultural ditch for agricultural lands in the Bishop area. It was purchased by LADWP in 1924 and is currently abandoned.

10. P-14-8107 (Northern Segment of Bishop Creek Canal):
The canal diversion is located in the project riparian area. The site was recorded in 2004 by Foothill Resources, Ltd. and did not require updating other than recording GPS points. The Bishop Creek Canal was constructed in 1889 by the Bishop Creek Ditch Company for irrigation of agricultural lands north, east, and southeast of Bishop. According to the site record, the canal was purchased by LADWP in the late 1920s or early 1930s. It continues as an active and in-use system for the Los Angeles Aqueduct. According to Foothill Resources, the canal appears eligible for the National Register of Historic Places under a separate listing.

11. P-14-8740 (Tinemaha Reservoir):
Completed in 1928 by LADWP, the earthen fill non-power reservoir was constructed for flood control and water storage upstream from the Los Angeles Aqueduct. Modifications followed in 1932, 1948, and 1979. The dam is 32 feet high and 5,853 feet long with current reservoir capacity at 6,306 acre feet. The dam location is far from ideal, necessitating extensive transportation of rock and earth during construction. One report indicates Tinemaha Reservoir was constructed to protect the interests of chemical companies at Owens Lake, who were flooded out when the aqueduct capacity was overwhelmed by run-off during wet years.

12. P-14-8754 (McNally Ditch):
The McNally Ditch was constructed in 1877 for agricultural use in farm land in the Laws area. Various reports indicate the McNally Ditch is the oldest large-sized canal on the Owens River and therefore carried undeniable water rights. Its purchase by the City of Los Angeles in 1924 sparked the Owens Valley water wars. The ditch diverted water from the Owens River and carried it approximately eight miles northeast and then south to Laws. Its route is shown on the 1994 USGS map and includes two parallel ditches shown as the North McNally and the South McNally. Only the diversion at the Owens River, modernized in 1964, is located within the survey area. LADWP currently maintains and uses the McNally Ditch in part to carry and release water at nearby spreading grounds in order to raise ground water levels. The diversion structure at the Owens River consists of three steel headgates set in concrete that channel river water into the earthen canal. The canal then separates into Waterman No. 36 headgates for the Upper McNally and Lower McNally Canals, each 18-19 feet wide and six to eight feet in depth.

13. CA-INY-6842 (prehistoric):
A large prehistoric site recorded in 2006. The site boundary was defined by decreasing lithic density, with scattered lithic material continuing to the west and south of the boundary. Site material includes lithics, groundstone, and Owens Valley Brown Ware.

14. CA-INY-6843 (prehistoric):
A prehistoric site recorded in 2006. Flaked stone is actively eroding into the stream channel. Site material includes lithics and groundstone. Site integrity has been impacted by road construction, vehicular travel, and ongoing recreational use.

15. CA-INY-6844:
This site contains the remains of a historic structural platform of undetermined function. The site consists of three partially exposed reinforced cement slabs, one located at the river bank and two smaller ones located on the hillslope above. The bank platform extends 31 feet along the streambank with a concrete and rock base, partial wooden sill, and protruding rebar. The smaller platforms are less exposed with a width of two feet, serving as possible brace blocks. Site function may include a pre-reservoir cable way location for water flow measurements. The site boundary was GPSed and is 344 square meters in size.

16. CA-INY-6845 (prehistoric):
A large prehistoric site recorded in 2006. Site material includes lithics and groundstone. It has been impacted by levee and railroad grade/road construction.

17. CA-INY-6846 (prehistoric):
A small prehistoric site recorded in 2006.

18. CA-INY-6847:
The site consists of a handmade wooden bridge which spans a side channel of the Owens River. It is of simple construction and could have been used for foot and horse passage over the channel. The bridge is intact but partially submerged on the downstream side. It measures 24 feet long by 12 feet wide and is constructed of logs and planks with no abutments. No specific reference to the bridge has been located. The area is currently used for cattle grazing.

19. CA-INY-6848 (multi-component):
This site includes a prehistoric lithic scatter and an historic LADWP artesian flowing well, which was developed in 1929 and is currently maintained and in use (LADWP Well No. 123). The historic component consists of an exposed vertical well casing, a discarded well casing, and 257 feet of earthen drainage ditch, which terminates at a seep area adjacent to the Owens River. Well water flows by gravity and ditch east into the Owens River and then downstream into the Los Angeles Aqueduct. In 1929, the well had a reported depth of 564 feet.

20. CA-INY-6849 (LADWP Well No. 128):
The site is a LADWP artesian flowing well developed in 1929 and currently maintained and in use. Well water flows by gravity and ditch east into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical steel well casing, wooden metering box, and 118 feet of earthen drainage ditch, which terminates at a seep area adjacent to the Owens River. In 1930, the well had a reported depth of 597 feet.

21. CA-INY-6850 (LADWP Well No. 130):
The site is a LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch northeast into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical steel well casing, wooden metering box, an abandoned concrete ditch outlet at the Owens River, and 127 feet of earthen drainage ditch which terminates at the Owens River. In 1930, the well had a reported depth of 716 feet.

22. CA-INY-6851 (LADWP Well No. 127):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch northeast into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of a submerged well casing, wooden metering box, and 34 feet of earthen drainage ditch, which terminates at the Owens River. In 1930, the well had a reported depth of 591 feet.

23. CA-INY-6852 (LADWP Well No. 126):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch south into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical well casing, wooden metering box, and 853 feet of earthen drainage ditch, which terminates at the Owens River. In 1930, the well had a reported depth of 581 feet.

24. CA-INY-6853 (LADWP Well No. 125):
LADWP artesian flowing well developed in 1929-1930 and currently maintained and in use. Well water flows by gravity and ditch east into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of a submerged vertical well casing, cement metering box, and 22 feet of boulder-lined earthen drainage ditch, which terminates at the Owens River. In 1930, the well had a reported depth of 611 feet. The well pond is a popular swimming location.

25. CA-INY-6854 (LADWP Well No. 131):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch southeast into the Owens River and then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical well casing, cement metering box, and 659 feet of earthen drainage ditch, which terminates at the Owens River. A discarded wooden metering box and 54 feet of abandoned ditch

are located at the site. In 1930, the well had a reported depth of 616 feet.

26. CA-INY-6855 (LADWP Well No. 132):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch east and then south into the Owens River, then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical well casing, deteriorated wooden metering box, and 410 feet of earthen drainage ditch which terminates at the Owens River. In 1930, the well had a reported depth of 602 feet.

27. CA-INY-6856 (LADWP Well No. 133):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch southeast and then southwest into the Owens River, then downstream into the Los Angeles Aqueduct. Site material consists of an exposed vertical well casing, wooden metering box, and 390 feet of earthen drainage ditch, which terminates at the Owens River. In 1930, the well had a reported depth of 490 feet.

28. CA-INY-6857 (LADWP Well No. 134):
LADWP artesian flowing well developed in 1930 and currently maintained and in use. Well water flows by gravity and ditch east into the Owens River, then downstream into the Los Angeles Aqueduct. Site material consists of a submerged vertical well casing, cement metering box, and 144 feet of earthen drainage ditch, which terminates at the Owens River. In 1930, the well had a reported depth of 692 feet.

29. CA-INY-6858 (LADWP Well No. 136):
LADWP artesian flowing well developed in 1930, which is currently maintained and in use. Well water flows by gravity and ditch north into a seep area. Site material consists of a submerged vertical well casing, wooden metering box, and 29 feet of earthen drainage ditch, which terminates at the riparian area. In 1930, the well had a reported depth of 645 feet.

30. CA-INY-6859:
The site consists of structural remains from a former crossing of the Owens River. Site material includes dry laid rock in the east and west banks of the river and charred wooden posts in the western bank. An elevated road bed extends east to the western end of the crossing. The structural base of a second bridge was recorded in a breach of the road bed and includes cut and set poles. The site is fragmented and historical reference to the crossing has not been located.

31. CA-INY-6860 (Stewart Lane Bridge):
The site consists of remnant structural remains from a former wooden bridge over the Owens River in the town of Big Pine. According to local residents, the bridge was constructed around 1900 to access farm lands on the east side of the river. It continued in use as a public bridge maintained by the Inyo County Road Department into the 1970s. The single lane bridge was approximately 50 feet long. Located remains include concrete abutments on the east and west banks of the western channel width. According to one resident, the former bridge was constructed of hewed locus logs and rough-cut boards. It was removed by Inyo County in the 1970s when repair costs after a wash-out became prohibitive.

32. CA-INY-6861 (Warm Springs Bridge):
The site consists of the remains of two bridges located near the town of Bishop. Bridge 1 is the eastern and western concrete abutments from a former bridge over the Owens River. Bridge 1 has three maker marks by A.O. Adams in 1915. The bridge was replaced at an unknown date by the current county bridge. Bridge 2 is a largely intact 14 feet long wooden bridge constructed over a slough located east of the Owens River. The bridge is constructed of hand hewn planks and beams with concrete abutments.

33. CA-INY-6862:
The site is an abandoned LADWP drain ditch built in Owens Valley in 1932 to drain water from the Carson and Colorado Railroad tracks. The ditch drained west into the Owens River and was abandoned in 1960 with discontinuance of the railroad. The recorded portion of the ditch is 451 feet in length. The ditch structure continues east beyond the project survey area and is unrecorded. The earthen ditch is unlined and flat-bottomed. The ditch varies in width from 15-30 feet and the depth varies from six to ten feet. The ditch

headgate is constructed of milled lumber and steel, with an adjacent stilling well set in concrete.

34. CA-INY-6863 (Rawson Ditch Weir):
The site consists of an abandoned irrigation weir located within the North Fork of Bishop Creek, east of the town of Bishop. Historic maps and the 1994 USGS map illustrate the Rawson Ditch as extending north from the location of the weir. The Rawson Ditch was not located at or near the weir and may be filled in or concealed by vegetation. Remains from the weir include a deteriorating 35 feet long concrete structure built across the width of the creek channel. The structure includes sections for five gates, none of which are present. Weirs of this type were generally used to divert water into irrigation ditches.

35. CA-INY-6864 (prehistoric):
A prehistoric site recorded in 2006.

36. CA-INY-6865 (Sanger Ditch):
This site includes a historic rock diversion dam, an abandoned irrigation ditch, and steel headgate that diverted water east from the Owens River. Known as Sanger Canal or Sanger Ditch, the system was constructed prior to 1913 and extended an estimated eight miles to various agricultural lands likely owned by the Sanger family. The portion recorded is 1,271 linear feet of ditch from the diversion at the Owens River to the point where it has been filled in at the Owens Valley Radio Observatory. Other segments of the ditch have not been examined. Although written reference to the ditch is limited, it is shown on undated homestead maps, a 1913 land map at the Laws Railroad Museum, and a 1962 hydrographic map at the Inyo County Assessor Office. The recorded earthen ditch is unlined, flat-bottomed, 15-25 feet wide, and five to seven feet deep.

37. CA-INY-6866 (prehistoric):
A prehistoric site recorded in 2006. The site includes Owens Valley Brown Ware. Flaked stone is at risk of loss from bank erosion.

38. CA-INY-6867 (prehistoric):
A prehistoric site recorded in 2006. Site material extends to the terrace edge and is at risk of loss from bank erosion. The site includes Owens Valley Brown Ware.

39. CA-INY-6868 (prehistoric):
A prehistoric site recorded in 2006. Site material is at risk of loss from bank erosion.

40. CA-INY-6869 (Fish Slough Ditch):
The Fish Slough Ditch is a maintained LADWP drain ditch that was installed near Five Bridges prior to 1930. The ditch carries water south from Fish Slough to the Owens River for use in the Los Angeles Aqueduct. Fish Slough is a unique wetlands area located north of Bishop that includes several hundred acres of ponds and wetland habitat fed by natural springs. The full length of the Fish Slough Ditch is approximately one mile, of which 136 feet were recorded in the riparian area during survey. The recorded Fish Slough Ditch is an unlined earthen canal, 15 feet wide and six to eight feet deep, with a canal access road located on its north side. It empties directly into the Owens River without an outlet structure. A LADWP metering box (Fish Slough 3207) is present within the ditch structure north of the recorded segment.

41. CA-INY-6870 (LADWP Well No. 121):
The site is a LADWP artesian flowing well developed in 1929 and currently maintained and in use. Well water flows by gravity and ditch south into the Owens River and then downstream into the Los Angeles Aqueduct. Thirteen other flowing wells have been recorded in the vicinity. A 1929 LADWP Well Log is attached to the site record. Site material consists of an exposed vertical steel well casing and 145 feet of earthen drainage ditch which terminates at the Owens River. This site is part of overall ground water development in the Owens Valley by LADWP to increase water flow to the City of Los Angeles. In 1929, the well had a reported depth of 522 feet.

42. CA-INY-6871 (LADWP Well No. 122):
LADWP artesian flowing well developed in 1929 and currently maintained and in use. Site material consists of an exposed vertical steel well casing, wooden metering box, and 303 feet of earthen drainage ditch which terminates

at the Owens River. In 1929, the well had a reported depth of 631 feet.

43. CA-INY-6872 (LADWP Well No. 129): LADWP artesian flowing well developed in 1930 and currently maintained and in use. A reducer is present on the well head causing the water to fountain. Site material consists of an exposed vertical steel well casing, wooden metering box, and 918 feet of earthen drainage ditch that terminates at a seep area adjacent to the Owens River. In 1929, the well had a reported depth of 599 feet.

44. CA-INY-6873 (A.O. Collins Ditch):
This site consists of an abandoned irrigation ditch and two cement water control structures, which diverted water south from the Owens River near Laws. Known as the A.O. Collins Canal or A.O. Collins Ditch, the system was constructed prior to 1913 and extended approximately 8.5 miles. The recorded main ditch segment is 1.14 miles (6,024 linear feet) and includes the point of diversion at the Owens River. Two lateral ditches (totaling an additional 1,128 feet) extend west into the Owens River from the main structure. Unrecorded main ditch segments continue south of the survey area. Although written reference to the ditch is limited, it is shown as the A.O. Collins Ditch on a 1913 land map at the Laws Railroad Museum; as A.O. Collins Canal on the 1931 Ritch Maps; and as Collins Canal on the 1994 USGS quad map. A canal to the north was recorded as the George Collins Ditch. The recorded earthen ditch is concealed by dense riparian vegetation; it is unlined, flat-bottomed, 15-25 feet wide, and five to seven feet deep.

45. CA-INY-6874 (George Collins Canal):
The site consists of an abandoned irrigation ditch that diverted water south from the Owens River near Laws. The ditch is illustrated as the Geo Collins Canal on undated homestead maps and as the George Collins Canal on the 1931 Ritch maps, which mapped land ownership prior to and during purchase by the City of Los Angeles. The canal is illustrated on the Ritch maps as extending at least six miles south. The segment recorded in this record is one mile long (5,265 feet) and includes two concrete weirs. The northern weir is located in the current LADWP Laws Ditch. A similar canal/ditch to the south was recorded as the A.O. Collins Ditch and parallels the unrecorded George Collins ditch to the west. Both are part of the agricultural history of Owens Valley prior to land acquisition for the Los Angeles Aqueduct. The recorded earthen ditch is frequently concealed by dense riparian vegetation. It is unlined, flat-bottomed, 15-20 feet wide, and three to four feet deep. A portion of the ditch has been washed out by the current channel of the Owens River, a historic indicator of how much the river has shifted over time.

Isolated Material:

Isolate 1: A large, weathered, obsidian midsection found along the east bank of the Owens River. The obsidian has a greenish cast, indicating the Fish Springs quarry source.

Isolate 2: A large, grey-banded, chert projectile point base, corner-notched, found along the eastern river terrace of Owens River.

6.10 Evaluation of Cultural Resources

Activities associated with the OVLMP that may impact resources that are eligible or potentially eligible for listing must comply with the California Environmental Quality Act (CEQA), which commonly requires site evaluation for the California Register of Historic Places. The LADWP Bishop Office functions as the lead CEQA Agency.

In California, the national and state Registers now use essentially the same criteria. To be eligible for listing in either the NRHP or the CRHP, the resource must possess adequate physical integrity as defined by location, design, setting, materials, workmanship, feeling, and association, as well as meet at least one of the following criteria for significance:

Criteria A: Associated with events that have made a significant contribution to the broad patterns of our history; or

Criteria B: Associated with the lives of persons significant in our past; or

Criteria C: Embody the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possesses high artistic values, or that represents a significant and distinguishable entity whose components may lack individual distinction; or

Criteria D: Has yielded, or may be likely to yield, information important in prehistory or history (Prehistoric sites are commonly evaluated under Criteria D).

For the LORP, Far Western (2001) utilized the following:

> *"For a given prehistoric resource to have research potential, however, it must also possess certain structural characteristics. The most important of these is that it maintains physical integrity, i.e. that its deposits have not been compromised by modern (e.g. road building, plowing, looting) or natural (e.g. erosion, animal burrowing) activities and processes. A second important characteristic is the degree to which adequate temporal controls can be established. Sites are rarely significant if they cannot be adequately dated. Thirdly, a prehistoric site must generally possess a reasonably large and varied assemblage which could produce multiple classes of data useful in addressing outstanding research themes. Small site assemblages, comprising a few tools and flakes and lacking features and/or subsurface deposits, even if adequately dated, are rarely significant".*

For the LORP, Far Western noted that it is not always possible to reasonably evaluate sites on the basis of survey data alone, and in these cases, sites are termed unevaluated.
Based on the above criteria, sites in the project area are preliminarily evaluated for register listing as follows:

1. CA-INY-28 (multi-component): Potentially eligible for listing in the National Register of Historic Places (NRHP) and the California Register of Historic Places (CRHP).
2. CA-INY-123 (prehistoric): Potentially eligible for NRHP and CRHP listing.
3. CA-INY-126 north (prehistoric): Potentially eligible for NRHP and CRHP listing. This resource is part of a larger site.
4. CA-INY-126 west (prehistoric): Potentially eligible for NRHP and CRHP listing. This resource is part of a larger site.
5. CA-INY-383 (prehistoric): Potentially eligible for NRHP and CRHP listing.
6. CA-INY-4682 (Big Pine Canal): Unevaluated. Only the canal diversion of this 15 mile long structure was examined.
7. CA-INY-5058 north (Carson & Colorado Railroad): Ineligible due to a lack of physical integrity. The bridge structure has been removed.
8. CA-INY-5058 south (Carson & Colorado Railroad): Ineligible due to a lack of physical integrity. The majority of the bridge has been removed.
9. CA-INY-6023 (Owens River Canal): Unevaluated. Only a small portion of this 20 mile long structure is located within the survey area.
10. P-14-8107 (Northern Segment of Bishop Creek Canal: Found eligible for NRHP listing by Foothill Resources in 2004. CRHP listing is inferred.
11. P-14-8740 (Tinemaha Reservoir): Potentially eligible for NRHP and CRHP listing.
12. P-14-8754 (McNally Ditch): Potentially eligible for NRHP or CRHP listing.
13. CA-INY-6842 (prehistoric): Potentially eligible for NRHP and CRHP listing.
14. CA-INY-6843 (prehistoric): Not eligible for NRHP and CRHP listing.
15. CA-INY-6844 (structure platform): Not eligible for NRHP and CRHP due to a lack of physical integrity. The structure has been removed.
16. CA-INY-6845 (prehistoric): Unevaluated.
17. CA-INY-6846 (prehistoric): Not eligible for NRHP and CRHP listing.
18. CA-INY-6847 (plank bridge): Not eligible for NRHP and CRHP listing.

19. CA-INY-6848 (multi-component LADWP flowing well): Not eligible for either listing.
20. CA-INY-6849 (LADWP flowing well): Not eligible for either listing.
21. CA-INY-6850 (LADWP flowing well): Not eligible for either listing.
22. CA-INY-6851 (LADWP flowing well): Not eligible for either listing.
23. CA-INY-6852 (LADWP flowing well): Not eligible for either listing.
24. CA-INY-6853 (LADWP flowing well): Not eligible for either listing.
25. CA-INY-6854 (LADWP flowing well): Not eligible for either listing.
26. CA-INY-6855 (LADWP flowing well): Not eligible for either listing.
27. CA-INY-6856 (LADWP flowing well): Not eligible for either listing.
28. CA-INY-6857 (LADWP flowing well): Not eligible for either listing.
29. CA-INY-6858 (LADWP flowing well): Not eligible for either listing.
30. CA-INY-6859 (former unnamed bridge): Ineligible for NRHP and CRHP listing due to a lack of physical integrity. The structure is no longer present.
31. CA-INY-6860 (former Stewart Lane Bridge): Ineligible for NRHP and CRHP listing due to a lack of physical integrity. The bridge has been removed.
32. CA-INY-6861 (former Warm Springs Bridge): Ineligible for NRHP and CRHP listing due to a lack of physical integrity. The bridge has been removed.
33. CA-INY-6862 (LADWP drain ditch): Ineligible for NRHP and CRHP listing.
34. CA-INY-6863 (Rawson Ditch Weir): Unevaluated.
35. CA-INY-6864 (prehistoric): Unevaluated.
36. CA-INY-6865 (Sanger Ditch): Unevaluated. The majority of this eight-plus mile structure has not been examined.
37. CA-INY-6866 (prehistoric): Not eligible for NRHP or CRHP listing.
38. CA-INY-6867 (prehistoric): Unevaluated.
39. CA-INY-6868 (prehistoric): Not eligible for NRHP or CRHP listing.
40. CA-INY-6869 (Fish Slough Ditch): Unevaluated. Only a small portion of this structure is located within the riparian corridor.
41. CA-INY-6870 (LADWP flowing well): Not eligible for NRHP or CRHP listing.
42. CA-INY-6871 (LADWP flowing well): Not eligible for NRHP or CRHP listing.
43. CA-INY-6872 (LADWP flowing well): Not eligible for NRHP or CRHP listing.
44. CA-INY-6873 (A.O. Collins Ditch): Unevaluated. The majority of this 8.5 mile historic structure has not been examined.
45. CA-INY-6874 (George Collins Canal): Unevaluated. One mile of this six-plus mile historic structure has been examined.

6.11 Management Considerations

6.11.1 Resource Management

Of the 45 heritage sites identified in the project area, 26 are ineligible for listing in the NRHP and CRHP. Protective management of these sites is not recommended.

The 26 ineligible sites are:

CA-INY-5058 north	Former Carson & Colorado Railroad bridge
CA-INY-5058 south	Former Carson & Colorado Railroad bridge
CA-INY-6843	
CA-INY-6844	
CA-INY-6846	
CA-INY-6847	
CA-INY-6848	
CA-INY-6849	
CA-INY-6850	
CA-INY-6851	
CA-INY-6852	
CA-INY-6853	
CA-INY-6854	
CA-INY-6855	
CA-INY-6856	
CA-INY-6857	
CA-INY-6858	
CA-INY-6859	

CA-INY-6860
CA-INY-6861
CA-INY-6862
CA-INY-6866
CA-INY-6868
CA-INY-6870
CA-INY-6871
CA-INY-6872

The 26 ineligible sites include 21 historic resources, four prehistoric, and one multi-component. The historic/multi-component resources include all 14 active and maintained LADWP artesian flowing wells, one LADWP drain ditch, five removed bridges, one small plank bridge, and the remains of a structure platform. The prehistoric sites are small assemblages with limited diversity, one of which has been severely disturbed.

Of the 19 remaining project sites, nine are potentially NRHP and CRHP-eligible. These include six prehistoric and three historic resources. Mitigation of impacts or avoidance of impacts is recommended for these sites (see the CEQA Recommendations Section below).

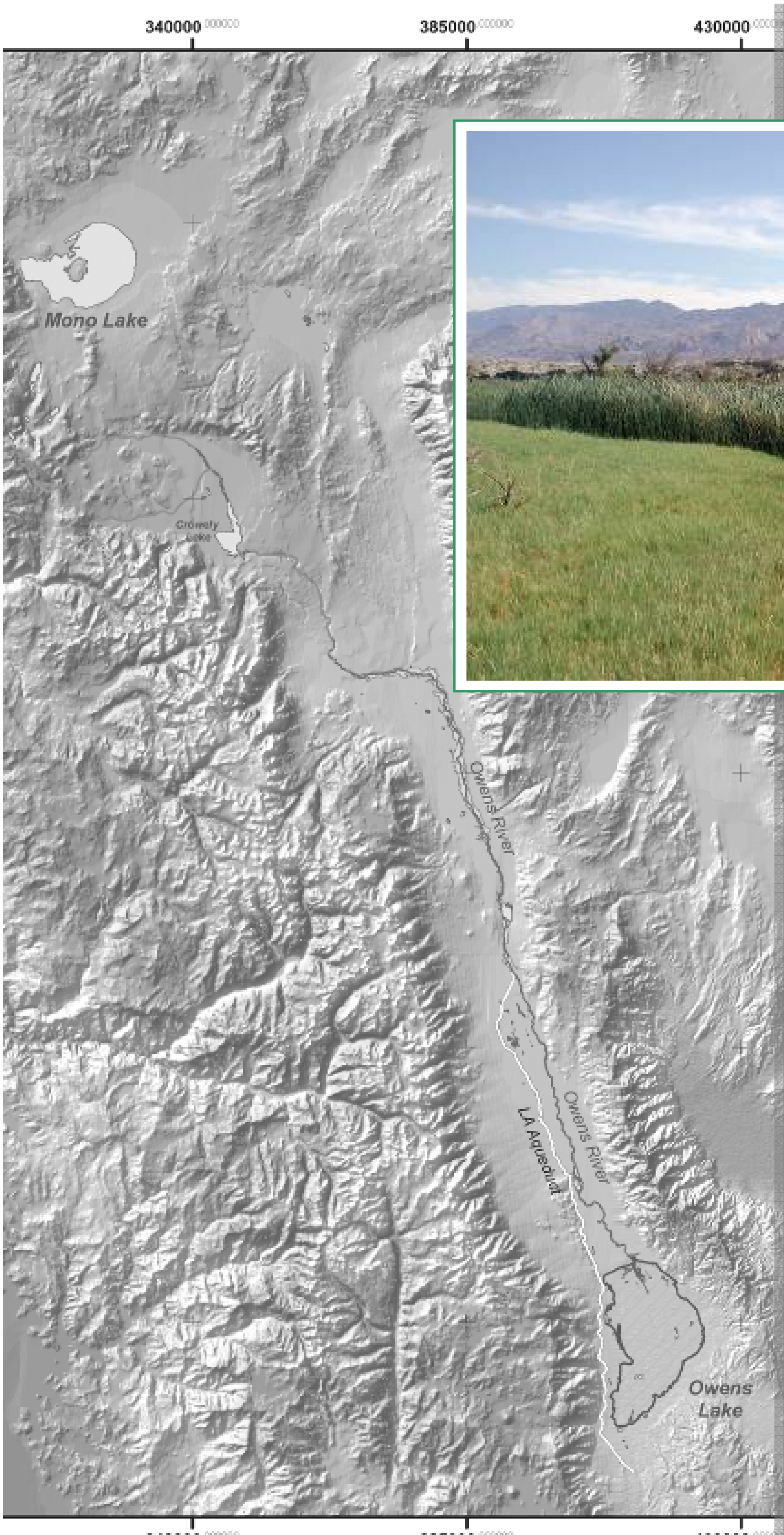
The 9 potentially eligible sites are:

CA-INY-28
CA-INY-123
CA-INY-126 north
CA-INY-126 west
CA-INY-383
CA-INY-6842
P-14-8107 Northern Segment of Bishop Creek Canal
P-14-8740 Tinemaha Reservoir
P-14-8754 McNally Ditch

Ten project sites could not be evaluated on the basis of survey data. These sites consist of seven historic and three prehistoric resources and include most of the historic irrigation ditches, which extend well beyond the survey area. Protective management of these sites is recommended.

The 10 unevaluated sites are:

CA-INY-4682/H Big Pine Canal
CA-INY-6023/H Owens River Canal
CA-INY-6845
CA-INY-6863 Rawson Ditch Weir
CA-INY-6864
CA-INY-6865 Sanger Ditch
CA-INY-6867
CA-INY-6869 Fish Slough Ditch
CA-INY-6873 A.O. Collins Canal
CA-INY-6874 George Collins Canal



CHAPTER 7

Fire Management

CHAPTER 7

7.1 Introduction

The purpose of a Fire Management Plan is to provide guidance and direction for wildland fire management and recommend strategies for fire suppression and prescribed fire. A wildland fire is any non-structure fire that occurs in the wildland. Types of wildland fire include wildfire, wildland fire use, and prescribed (controlled) fire. Wildfires are defined as an unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects and all other wildland fires where the objective is to put the fire out. Wildland fire use is the application of the appropriate management response to naturally ignited wildland fires to accomplish specific resource management objectives in predefined designated areas outlined in Fire Management Plans (wildland fire use for resource benefit is not an identified fire management option within the Owens Valley Fire Management Unit). Prescribed fire is any fire ignited by management actions to meet specific objectives.

Fire management takes into account a range of possible decisions and actions available to prevent, maintain, control or use fire in a given landscape. Fire is a major component of the ecosystem and can be used to achieve different resource benefits. Prescribed or controlled burning is used to achieve ecosystem benefits such as recycling nutrients tied up in old plant growth, controlling woody plants and herbaceous weeds, improving poor quality forage, increasing plant growth, reducing the risk of large wildfires, and improving certain wildlife habitat. To achieve these benefits, fire must be used under very specific conditions, and using very specific techniques. In order for fires to be allowed to burn for resource benefits on city of Los Angeles-owned lands, fire managers must provide the assurance that they have the capability to suppress those fires at any time they burn outside prescribed parameters.

Fire management on LADWP lands does not only include fire suppression, but promoting the use of fire as a land management tool, and restoring fire's role as a dynamic and necessary natural process. Fire suppression, or the act of putting out a wildland fire, is an important aspect of management on city of Los Angeles-owned lands. Terrain, weather, and the amount and types of fuels present affect the ability to suppress fire. LADWP fire suppression relies on an array of suppression resources. Each suppression effort involves a custom application of available resources in order to put the fire out in any given set of conditions.

7.2 Fire Management Goals and Objectives

Fire is collaboratively managed in the Owens Valley among various private entities and public agencies (Bureau of Land Management, U.S. Forest Service, National Park Service, State of California, Native American reservations, LADWP, and private landowners). The BLM Fire Management Plan (2004) provides wildland fire management guidance and recommends strategies for fire suppression, wildland fire use, prescribed fire, non-fire fuels treatment, emergency stabilization and rehabilitation, and community assistance/protection.

Figure 7.1. Fire is an important ecosystem component

The plan contains fire management units, which are geographic areas for which there are specific management response goals, objectives and constraints. The Owens Valley Fire Management Unit, which includes city of Los Angeles-owned lands, contains objectives and strategies for wildland fire, prescribed fire, non-fire fuels treatment, post-fire rehabilitation and restoration, and community protection (see appendices).

The MOU goals that pertain to fire management include:

1. *Improve biodiversity and ecosystem health (condition).* In addition to other land management activities, fire management prescriptions will also assist in protecting existing habitat and promoting ecosystem recovery after fires.
2. *Protect and enhance habitat for threatened and endangered species.* Fire management prescriptions will enhance existing habitat for T&E species.

The objectives that pertain to fire management include:

1. *Establish a fire response plan.* Vegetation vigor and diversity is dependent upon periodic disturbances such as fire. As such, fire is an integral part of an ecosystem. A fire management plan provides management direction for responding to fires and promoting ecosystem recovery in the OVLMP area.
2. *Initiate habitat conservation strategies to enhance and protect threatened and endangered species habitat.* The Habitat Conservation Plan, which will be implemented as part of this OVLMP process, will take into consideration fire management activities as a means of enhancing and protecting T&E species.

7.3 Fire Ecology

Fire management has shifted over the past decade as ecological research has shown fire to be an integral component to the function and biodiversity of many communities. The suppression of fire (which began in the early 1900's in the United States), in combination with other human-caused environmental changes, has resulted in unforeseen changes to ecosystem dynamics and species composition; altered natural fire regimes; increased fuel loads, and left areas more susceptible to intense and often, catastrophic wildfires. These conditions provide land managers with challenges with regard to how to restore fire regimes in ecosystems.

7.3.1 *Abiotic Responses to Fire*

Fire has important effects on the abiotic (non-living) components of an ecosystem, particularly the soil. Fire affects soil directly and also affects the plant communities using the soil.[1]

Temperature

By removing overhead vegetation, fire opens soil up to increased solar radiation and warming during the day. Alternately, the loss of vegetation also allows soils to become cooler, so soils cool down more quickly at night.

Moisture

Soil moisture does not change predictably with fire, and is a function of fire intensity and soil properties. Fewer leaves left to intercept rain allows more rain to reach the soil's surface and results in decreased transpiration (the process by which water travels through plants and evaporates through pores in the leaves) because the smaller leaves of post-fire plants allows the soil to retain more moisture. This overall positive effect on moisture can be counteracted when fires increase the ground's exposure to sunlight and evaporation, and/or when fire creates water-repellent soils. Water-repellent soils may form when fire heats organic matter on the ground into a waxy covering. This can lead to increased erosion.

Physical and Chemical Properties

Fire causes nutrient loss through a variety of mechanisms including oxidation, volatilization, and increased erosion and

[1] Hart et al. 2005

leeching by water. Temperatures must be very high, however, to cause a significant loss of nutrients, and these nutrients are often quickly replaced by dead organic matter left behind in the fire. Charcoal is able to counteract some nutrient and water loss because of its absorptive properties. Overall, soils become more basic (lower pH) following fires because of acid combustion. By driving novel chemical reactions at high temperatures, fire can even alter the texture and structure of soils by affecting the clay content and the ability of soil to form aggregates (clumps of soil that increase the ground's porosity to water).

7.3.2 Biotic Adaptations and Responses to Fire

Plants

Plants have developed many adaptations to fire. Because their stationary nature precludes fire avoidance, plants span the range from fire-intolerant species to fire-tolerant to fire-resistant species.[2] Fire-intolerant species tend to be highly flammable and are completely destroyed when exposed to fire. A few of these plants, however, are "obligate seeders" and have large, fire-activated seed banks that germinate, grow, and mature rapidly following a fire in order to reproduce and renew the seed bank before the next fire.[2] Fire-tolerant species are able to withstand certain fire intensities or severities and grow despite some damage. These plants are sometimes referred to as "resprouters." Some species of resprouters store extra energy in their roots for recovery and re-growth following a fire.[2] Many riparian species, like willow, exhibit such traits. Fire-resistant plants suffer little damage during a characteristic fire regime. Species that are fire-resistant include grasses and large trees whose flammable parts are high above surface fires.[2]

Animals and Microbes

Like plants, animals display a range of post-fire responses, but they differ from plants in that most of them must avoid the actual fire to survive. Though birds are vulnerable when nesting, they are generally able to escape fires. They often benefit from prey items fleeing from the fire and re-colonize burned areas quickly because of their high mobility. Mammals are also often capable of either fleeing the fire or seeking cover while it passes and then re-colonizing quickly. Amphibians and reptiles may avoid flames by burrowing into the ground or using the burrows of other animals. Amphibians in particular are able to take refuge in water or very wet mud.[2] Some arthropods may also take shelter during a fire, though the heat and smoke actually attracts some of them to their deaths.[3] Microbial organisms in the soil vary in their heat tolerance but are more likely to survive the deeper they are in the soil, the lower the fire intensity and residence time, and the drier the soil. A post-fire increase in nutrients may result in larger microbial communities.[4]

Fire behavior is different in every ecosystem and the organisms in those ecosystems have adapted accordingly. In all ecosystems, fire creates a mosaic of different habitat patches, with sites ranging from recently burned to not burned by fire for years, through a process known as succession. Succession is the progress of a site through continuous and directional phases of colonization and extinction of species after a disturbance, such as fire.[5] Ecologists usually characterize succession through vegetation. After a fire, the first species to colonize are those whose seeds are already present or those whose seeds disperse to the burned area rapidly. These are generally fast-growing herbaceous plants that need a lot of light and are poor competitors. As time passes, more slow-growing, shade-tolerant, and competitive woody species crowd out the herbaceous plants. These woody plants may be shrubs or trees.[5]

Different species of plants, animals, and microbes specialize in exploiting different

[2] Kramp et al. 1986

[3] DeBano et al. 1998

[4] Hart et al. 2005

[5] Begon et al. 1996

successional stages, and by creating these different types of patches, fire allows a greater number of species to exist within a landscape. Below are some characteristics of soils and the main types of fire-adapted ecosystems on city of Los Angeles-owned lands in the Owens Valley.

Shrublands

Shrub fires typically concentrate in the canopy and spread continuously if the shrubs are close enough together. Shrublands are typically dry and are prone to accumulations of highly volatile fuels, especially on hillsides. Burns follow the path of least moisture and greatest amount of dead fuel material. Surface and below-ground soil temperatures during a burn are generally higher than those of forest fires because heat is concentrated lower to the ground, though they can vary greatly.[6]

Fire suppression has greatly altered Great Basin shrub communities. The historic heterogeneous mosaic of uneven-aged stands has been replaced by large even-aged stands, which are more susceptible to large, catastrophic fires. Large fires in shrublands enable invasions of exotic grasses, which often further modify the fire regime to the detriment of native communities.[7]

Grasslands

Grasslands burn more readily than forest and shrub ecosystems, with fire moving through the stems and leaves of herbaceous plants and only lightly heating the underlying soil even in cases of high intensity. In most grassland ecosystems, fire is the primary mode of decomposition, making it crucial in nutrient cycling.[6]

Riparian and Wetland Areas

Fire regimes of riparian and wetland areas are less studied than upland areas, as their high moisture content often protects them from all but the most intense fires. However, these areas do have fire regimes, though often with longer and more variable fire return intervals than adjacent uplands. The longer return intervals often translate into more intense fires when they do occur, because fuels have built up and environmental conditions are often very conducive to large, intense fires.[8]

Riparian plant species are highly adapted to disturbance, and many have the capability to resprout readily following a fire. However, some invasive plants, such as *Tamarisk spp.* are well adapted to the soil environment following fire, and can quickly spread into recovering areas.[9] These areas also provide important refuges for birds and wildlife in the event of a fire, and often serve as effective barriers to many low and medium intensity fires and thus influence landscape patterns well beyond their immediate vicinity.[10]

7.3.3 Conditions on City of Los Angeles-Owned Lands

The normal fire season in the Owens Valley occurs from April 1st through November 31st. A majority of the fires that occurred from 1980 through 2002 were human-caused (60%), while 22% were natural (lightening), and 18% were unknown.[11] The conditions that influence fire behavior, fuels, and fire weather include the major plant community types (saltbush scrub, sagebrush steppe, alkali meadow, and riparian); the orographic influences of the Sierra Nevada and Inyo/White Mountains; and climatic conditions (windy in the spring, hot and dry summers with low to very low relative humidity, and numerous dry thunderstorms, which produce lightening and strong winds). Fire behavior in this area is considered "generally moderate", but can become extreme during thunderstorm events, or other periods of high wind. The primary values identified as "at risk" for the Owens Valley fire management unit that are pertinent to city of Los Angeles-owned lands include: forage for domestic livestock grazing, fences, recreational and visual qualities, and utility infrastructure.

[6] DeBano et al. 1998.

[7] Brooks and Pyke. 2001.

[8] Skinner and Chang. 1996.
[9] Brooks and Pike, 2000.
[10] Skinner and Chang, 1996.
[11] BLM Fire Management Plan, 2004

7.4 Fire Risk and Control Management Plan

Future grazing, recreation, and wildlife habitat management of LADWP lands could increase the volume of fuels and in turn increase the fire frequency potential. Therefore, more effort is needed to prevent and manage wildfire in the future.

The closest fire suppression resources are located in Round Valley and Independence at the California Department of Forestry (CDF) Fire Stations 58 and 59, respectively. The CDF has this area as a Designated Protection Area (DPA) which means the CDF will respond to fires first in this area. Generally if a fire is reported on State Responsibility Area (SRA) lands, all wildland agencies respond appropriately. If no CDF Fire Resources are in the area, Interagency Fire (BLM and Inyo National Forest) will staff the fire until CDF arrives and assumes control. If the fire is larger than a spot fire, local government resources or fire districts are requested to respond.

All wildfires in the Owens Valley are considered a priority. The CDF and LADWP offices have an agreement in place whereby a LADWP Resource Representative is consulted on all fires on city of Los Angeles-owned lands, and the Resource Representative is a part of the Joint Unified Command for the fire. The wildland fire agencies (CDF, BLM, Forest Service) and LADWP have an "Assistance by Hire" agreement in place to collaborate on suppressing fires. Coordination between LADWP and agency fire prevention and control personnel will be conducted for more effective fire management (see in the appendices the Owens Valley Fire Management Unit Description from the BLM Fire Management Plan).

No burning will be allowed on LADWP lands without written approval from LADWP. Lessees will not burn any part of their allotments without LADWP approval. All managed burning for the purposes of improving rangeland, wildlife habitat, and/or watershed conditions will be conducted under the direction of LADWP. LADWP will determine the grazing rest needed to allow rehabilitation of fire impacts, should they exist. No managed burning will be allowed in riparian habitats without proper study and evaluation.

Unintentional fires in riparian woodland areas will be given high priority for fire suppression. A resource officer will be called to participate in fire control decisions. The resource officer will direct the use of the "Suppression Responsibility actions" in Section 7.6 to all fire-line personnel when these guidelines can be followed safely.

7.5 Controlled Burn Management Plan and Protocols

This section describes the protocols for controlled burns. Limited controlled burning has been conducted to date to achieve habitat management goals and other resource benefits. LADWP or the lessees will propose areas for controlled burns. The following will be done to process each request for controlled burns:

- LADWP resource staff will evaluate the merits of a proposal to conduct a controlled burn and either authorize or not authorize the burn.
- If the burn is authorized, a burn plan will be developed to direct all resources on the burn. A burn plan will include goals, resource objectives, resource concerns, rehabilitation needs, and maps.
- An Incident Action Plan will also be developed and will include: objectives, fire prescriptions, a safety plan, medical plan, communications plan, division plan, Incident Command System (ICS) plan, fire plan, escaped fire analysis, travel plan, and maps.
- A smoke management plan will also be developed and adopted by the Great Basin Unified Air Pollution Control District (GBUAPCD).
- If the burn is proposed by the lessee, the lessee will work cooperatively with

LADWP and any of its federal and state cooperators to conduct the burn.

- If the burn is proposed by LADWP, the department will conduct the burn with or without federal and state cooperators.

7.6 Uncontrolled Burn Response

See Section 7.4.

7.7 Suppression Responsibility

Minimum Impact Suppression Tactics (MIST)

Firefighter and public safety is the highest priority. All actions will be anchored to the standard fire orders and watch-out situations. Safety will remain the responsibility of each person involved with the incident.

7.7.1 Initial/ Extended Attack

Following is a description of all personnel involved in making fire management decisions and their respective responsibilities.

Incident Commander — To understand and carry out an appropriate suppression response that most effectively meets the land management objectives of the area at the least cost and loss. Insure all forces used on the fire understand the plan for suppressing the fire in conjunction with MIST.

Keep in communication with responsible fire management resource advisor to insure understanding and support of tactics being used on the fire. Evaluate and provide feedback as to the tactical effectiveness during and after the fire incident.

7.7.2 Project Fire

Incident Commander—Establish and maintain a close dialogue with the resource advisor assigned to the fire team. Review actions on site and evaluate for compliance with the Environmental Affairs Officer direction and effectiveness at meeting fire management protection objectives.

Environmental Affairs Officer — To transmit the land management objectives of the fire area to the fire team and to define specific fire management protection objectives. Periodically review for compliance.

Resource Advisor — To insure the interpretation and implementation of oral or written Environmental Affairs Officer direction is adequately carried out. Provide specific direction and guidelines as needed. Participate at fire team planning sessions, review incident action plans and attend daily briefings to emphasize resource concerns and management expectations. Provide assistance in updating fire plans when necessary. Participate in incident management team debriefings and assist in the evaluation of team performance related to MIST.

7.7.3 Guidelines

Following is a list of considerations for each fire situation.

Hot-Line/Ground Fuels

- Allow fire to burn to natural barriers.
- Use cold-trail, wet line or combination when appropriate.
- If constructed fire-line is necessary, use only width and depth to check fire spread. Burn out in habitat areas and adjacent buffer zones when there is a natural fire-line feature or road nearby, to reduce the need for new fire-line construction.
- Use alternative mechanized equipment when appropriate such as excavators, rubber tired skidders, etc. rather than tracked vehicles. Use high pressure type sprayers on equipment prior to assigning to incident to help prevent spread of noxious weeds.
- Constantly re-check cold trailed fire-line.

Hot-Line/Aerial Fuels

- Limb vegetation adjacent to fire-line only as needed to prevent additional fire spread.

- During fire-line construction, cut shrubs or small trees only when necessary. Make all cuts flush with the ground.
- Minimize felling of trees and snags unless they threaten the fire-line or seriously endanger workers. In lieu of felling, identify hazard trees with a lookout or flagging.
- Scrape around tree bases near fire-line if it is likely they will ignite.

Mopup/Ground Fuels

- Minimize bucking of logs to extinguish fire or to check for hotspots; roll the logs instead if possible.
- Refrain from making bone yards: burned and partially burned fuels that were moved should be returned to a natural arrangement.
- Consider allowing large logs to burn out.
- Use gravity socks in stream sources and/or a combination of water blivits and fold-a-tanks to minimize impacts to streams.
- Consider using infrared detection devices along perimeter to reduce risk.
- Personnel should avoid using rehabilitated fire-lines as travel corridors whenever possible because of potential soil compaction and possible detrimental impacts to rehab work, i.e. water bars.

Mop-up/Aerial Fuels

- Remove or limb only those fuels, which if ignited, have potential to spread fire outside the fire-line.
- Before felling consider allowing ignited tree/snag to burn itself out. Ensure adequate safety measures are communicated if this option is chosen.
- Identify hazard trees with a lookout or flagging.
- If burning trees/snags pose a serious threat of spreading fire brands, extinguish fire with water or dirt whenever possible.

The burned area will be monitored to follow recovery success.

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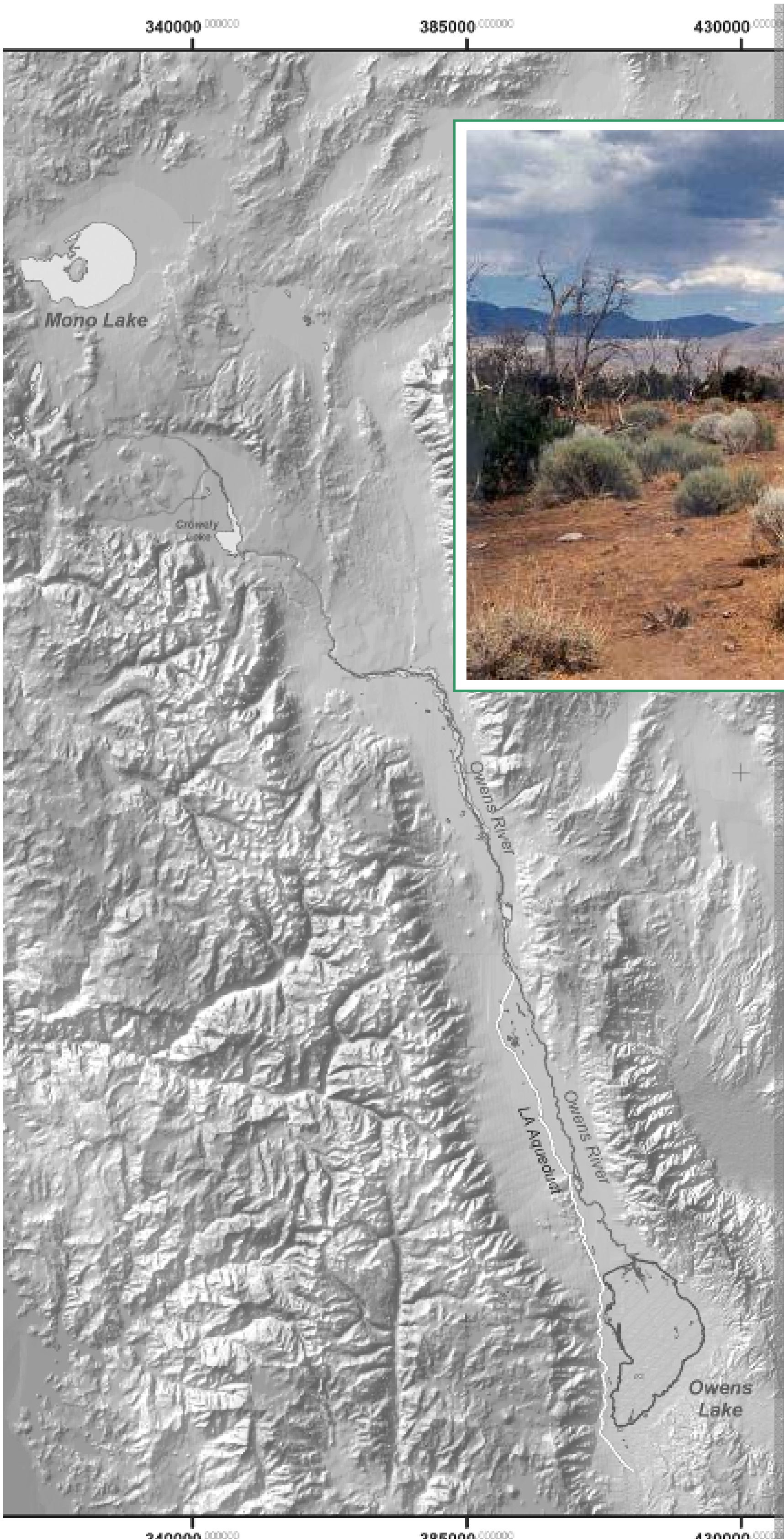


CHAPTER 8

Commercial Use Management

CHAPTER 8

8.1 General Commercial Use Policy

The LADWP Real Estate Section is charged and entrusted with the management of city-owned non-operating property under the control of the Aqueduct Division. Management relies upon it to give them sound advice about property management matters and to carry out the instructions and policies of management, within the guidelines of the City Charter.

Under the control and direction of the Board of Water and Power Commissioners (Board) and its Chief Administrative Officer, the Real Estate Section proposes, subject to approval of the Board of Water and Power Commissioners or management authorized by the Board, to grant and set the terms and conditions for any franchise, concession, permit, license, or lease concerning any property under its control that will further the Departmental purpose, to: “operate in connection with, or for the production and delivery of water and electric power, and for the promotion of the conservation of water and power resources”. It may grant a license or enter into a lease concerning property under its control for purposes other than Departmental purposes, if the Board or the delegated authority finds in writing that the property to be licensed or leased is not presently needed for Departmental purposes; and that the grant of the license or lease will not interfere with Departmental purposes.

Recommendations of approval of licenses, leases, etc. to the Board are formulated through property management policies established by Management within the guidelines of the Board and City Charter. Property management guidelines include, but are not limited to, consideration of benefits to the city of Los Angeles, the advantages and disadvantages of entering into an agreement, and public benefit associated with the action.

Commercial uses within the Owens Valley Management Area typically fall within four of the general areas listed above: Leases, License Agreements, Letters of Permission and Use Permits.

8.1.1 Commercial Use Policy Goals and Objectives

The MOU goals for the OVLMP that are pertinent to commercial use policy include:

1. Implement sustainable land management practices for agriculture (grazing) and other resource uses.

The objectives that are applicable to grazing management and meet the above stated goal as identified in the MOU include:

1. *Establish commercial use protocols.* LADWP emphasizes multiple resource uses on their lands such as livestock grazing, recreation, gravel extraction, business sites, parks, home leases, municipal dumps, and other agricultural activities such as bee-keeping, hobby ranching, orchards, and field crops. Commercial use management protocols for approving such activities include duration, extent, limitation, and review. Managing commercial uses ensures protection of habitat and avoids conflicts with other uses and management goals.

8.2 Leases, License Agreements, Letters of Permission and Use Permits

8.2.1 Business Leases

Business leases generally cover uses on city of Los Angeles property associated with commercial, recreational, and public purposes. These leases are generally located in the developed communities having no environmental impact to the area of occupancy other than the social, economical, and visual impacts associated with the designated use. Business leases are generally not permitted outside of existing communities where access to public utilities is not available. The exception to this is for uses associated with, and that promote significant public benefits. Such uses are evaluated on a case by case basis with consideration to the impacts to the City, the public benefits proposed, impacts to the resources of the area, and City obligations. Typical examples of such uses include fish hatcheries, borrow pits, campgrounds and airports.

8.2.2 Ranch Leases

Ranch leases cover property leased for agricultural and cattle grazing purposes. Ranch leases are ordinarily drawn for a five year period but may be for a shorter time. Lease proposals are submitted to the Board of Water and Power Commissioners for approval (usually renewals are submitted to the Board at the same time). Land management of ranch leases is discussed in Chapter 3, *Grazing Management*.

8.2.3 Letters of Permission

A Letter of Permission is issued to grant permissive use of, or on, City property that is associated with a specific event or activity limited in duration. Examples of this include organized events such as charitable runs, horse drives, studies, and use of City property for community events. Requests are evaluated on a case by case basis with consideration to the impacts to the City, the public benefit proposed (if any), impacts to the resources of the area, and City obligations.

8.2.4 Use Permits

Use permit rental agreements are issued to cover personal or private exclusive use of City property for a specific purpose that is not generally commercial or business related. Examples of such uses include private pastures, additional yard spaces, residential rental agreements, etc. Permitted uses are not associated with the “Department Purpose”. Before such agreements are entered into, an evaluation must find that the property to be permitted is not needed for the Departmental purpose, that granting the agreement will not interfere with the Departmental purpose, and that proposed use is consistent with the guidelines and policies of the City for the area.

8.2.5 Apiary Permits

Apiary permits are issued for the placement of bee boxes for harvesting honey on City property. For each permit, a written request must be submitted that includes a map(s) detailing the location(s) of the apiary site(s), the number of boxes to be placed, and the number of sites to be used (five sites maximum for each permit). Sites are not allowed to be located in areas actively used or inhabited by the public (camping, parking areas, walking paths, etc.), or that include LADWP operational structures. The evaluation of each request must consider that the use of City property will not interfere with the Department purpose, which use is consistent with Department guidelines, and use will not interfere with City obligations.

8.2.6 Burn Permits

When a ranch lessee or permittee requests to burn small piles of brush or debris, or larger expanses of an area on City-owned property, he/she must apply for a Burn Permit from the Department.
The completed permit provides information on the location of the proposed burn, the purpose, and the timing of the burn. The permit must be accompanied by either a Local Fire District Permit or a Burn Permit from the State of California, Department of Conservation, Division of Forestry.

The application and permit for Range Improvement Burns is used when a large expanse of area is to be burned (a maximum of 50 acres) at one time. However, range improvement burns are allowed only during March and April.

8.2.7 Film Permits

When issuing a permit for filming of any type on LADWP property, department staff determines what activity will be filmed and ensure that there are no impacts to property or ground cover. Staff also determines how many people, vehicles and animals are involved and the length of time filming will occur. If property is leased, permittees must also contact lessee for their consent.

Permission is only granted once assurances are received that no large-scale disruption of terrain or vegetation will occur. At the conclusion of the permitted activity, the property is inspected by the Real Estate Section to make sure the area is left in the condition it was found.

8.2.8 Wood Permits

Wood permits for cutting dead or downed trees may be obtained from the Department of Water and Power Real Estate Office in Bishop from May through October. Only in rare instances will permits be issued to cut live trees. A notable exception is for clearing ranch lands and occasionally for cutting small fence posts for ranching uses.

Permits are required prior to cutting or gathering firewood on city of Los Angeles lands. Applicants must determine the location of the wood to be gathered prior to applying for a permit. All permits issued for wood gathering or leased land must be approved and signed by the lessee before the permit will be validated by the Department. Permits are limited to the removal of three cords of wood per year, per family, and for personal use only. No permits are issued for commercial wood gathering. Permits to the public are not issued during the months of November through April because it is difficult to determine whether a tree is dead or merely dormant. However, special permits may be issued to ranch lessees during these months for the purpose of removing brush, trees, etc., which affect their operations. Such permits must be approved by the Watershed Resources Section prior to issuance.

CHAPTER 9

Monitoring and Adaptive Management

9.1 Introduction

CHAPTER 9

Monitoring and adaptive management are essential components of an effective management plan. The Middle Owens River project area will be monitored and adaptively managed. Adaptive management provides a process for continually improving management practices by learning from the outcomes of previously applied management practices. Management of the OVLMP is intended to be flexible so that strategies can be altered and revised through adaptive decisions and interventions and can be responsive to changes in the evolving ecosystem.

Having established adaptive management as the operative tool, the goal of the OVLMP is to assess and evaluate the effects of existing land and water-use practices and recommend flow management and land management improvements. Specifically, the OVLMP manages the condition of grasslands, desert scrub-lands, and riparian corridors as well as the river itself. Priorities for management, as specified by the MOU, include riparian areas, irrigated meadows, and sensitive species habitats. The outcome of the OVLMP is a multiple-use management approach that serves to balance the needs of a healthy ecosystem with optimal use of resources.

The OVLMP's resource components (uplands, riparian corridor, and Owens River) are the principal interactive and manageable elements of the ecosystem; they are interactive in that they exchange energy in response to stimuli. A management action that alters one component will reverberate and affect one or more other components. By describing these components as manageable, we assume that active intervention to achieve a desired goal will result in a measurable response.

The most important management tool for the OVLMP is land use. Land use management influences significantly the area's biotic and abiotic components and, ultimately, determines the functional state attained by the total ecosystem.

The data and information derived from monitoring ecological components provide the necessary information to allow managers to adapt goals and objectives to real-time circumstances and to unforeseen events. Details of monitoring activities are described below because monitoring is a distinct effort that supports management, but is not in and of itself management. The monitoring plan is comprehensive and includes monitoring of goals set in all of the Owens Valley Management Plans.

9.1.1 Adaptive Management

Adaptive management is widely recognized as an essential approach to natural resource management.[1] It is a common element in many large-scale restoration projects. As originally conceived, adaptive management can be defined as the systematic acquisition and application of reliable information to improve management over time. Adaptive management is a system in which monitoring measures progress toward goals, increases knowledge, and improves management and future plans.[2] Sit and Taylor (1998) define

[1] Holling 1978, Walters and Holling 1990, Irwin and Wigley 1993, Parma et al. 1998
[2] Busch and Trexler 2003

adaptive management as follows:

Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form – "active" adaptive management – employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed. The key characteristics of adaptive management include:

- *Acknowledgement of uncertainty about what policy or practice is "best" for each particular management issue.*
- *Thoughtful selection of policies or practices to be applied.*
- *Careful implementation of a plan of action designed to reveal critical knowledge,*
- *Monitoring of key response indicators.*
- *Analysis of the outcome in consideration of the original objectives.*
- *Incorporation of the results into future decisions.*

An essential idea of adaptive management is to recognize that management policies can be applied as experimental treatments.[3] A crucial implication of this is that monitoring activities must be integrated with management actions. Under adaptive management, monitoring and management plans are developed concurrently to form a single adaptive-management approach[4].

Adaptive management acknowledges that a complete understanding of ecosystem functions does not exist. However, it is designed to support action in the face of the uncertainty associated with limited knowledge and the complexities and stochastic behavior of large ecosystems.[5] Adaptive management aims to decrease this uncertainty over time by informing managers and scientists about ecosystems through management actions and associated monitoring efforts. Adaptive management aims to create policies that can help organizations, managers, and other stakeholders respond to, and even take advantage of, unanticipated events.[6] Instead of seeking precise predictions of future conditions, adaptive management recognizes the uncertainties associated with forecasting future outcomes, and calls for consideration of a range of possible future outcomes.[7]

Fundamental ecological principles show us that nature continuously and adaptively responds within biological systems. Recruitment and adult population patterns are usually mismatched, with recruitment levels often exceeding ultimate adult population levels, and plant communities developing through several seral stages. Current biological conditions at any point in time often do not predict or illustrate the unseen biological and social dynamics that create change in the system. Wise management is based upon knowledge and understanding of these dynamics, as well as current conditions, in order to anticipate the dynamics that will determine tomorrow's biological conditions.

To realistically manage the dynamics of an ecosystem means managers must adapt to changes over time that cannot be predicted or even adequately anticipated today. Adaptive management is the singular comprehensive approach for managing the OVLMP in order to reach the desired goals of a healthy and functional ecosystem. To achieve the goals of the OVLMP means using management tools over time in unique and flexible ways to adapt to changing conditions. It also means adopting new tools and approaches from scientific advances over time to build upon the understanding of ecosystem processes and the effects of management actions. Table 9.17 discusses some adaptive management options.

A team approach is needed for all phases of monitoring and adaptive management that includes field personnel and lead scientists. LADWP and the MOU Consultant will be responsible for conducting monitoring, analyzing the data and making recommendations. The first level will be joint

[3] Walters 1997
[4] Wilhere 2001
[5] Holling 1978, NRC 2004
[6] Holling 1978, Walters 1986
[7] Walters 1986

staff efforts to collect data under appropriate field supervision for adherence to the protocols and quality control of data. Staff will compile and tabulate the data and assist with the preparation and summary of monitoring data.

The Scientific Team will include scientists from the LADWP, and scientists and staff from the MOU Consultant's group. It will be the responsibility of LADWP and the MOU Consultant to analyze the data between years and baseline conditions and reference sites to: 1.) identify problems or conditions which are not meeting goals or expectations; 2.) determine if contingency monitoring is needed; 3.) determine the most appropriate adaptive management action(s); 4.) compile this information and present their conclusions and recommendations to the LADWP managers, and; 5.) oversee the implementation of adaptive management measures. The principle scientists may consult with the CDFG, other agencies or individual experts as needed. Recommendations and the summarized data will be forwarded to LADWP managers for inclusion in the Annual Report.

An effective system that reports results from OVLMP monitoring surveys will be implemented in order to provide for timely adaptive management considerations and responses. The monitoring will be conducted by LADWP and MOU Consultant staffs (according to the methods and schedules described under each monitoring method in this Chapter). The MOU requires that Inyo County and LADWP provide annual reports describing the environmental conditions in the Owens Valley, along with studies, projects and activities conducted under the Inyo-Los Angeles Agreement and the MOU. The LADWP will prepare the annual report and LADWP will include the summarized monitoring data collected, the results of analysis, along with recommendations regarding the need to modify project actions as recommended. Copies of the annual report (to be released annually) will be distributed to the other MOU parties (CDFG, California State Lands Commission, Sierra Club, Owens Valley Committee) and made available to the public. Any reports, studies, evaluations and analyses prepared pursuant to the MOU, along with supporting data, will be made available to the public.[12] As draft and final documents and data become available, one copy will be provided to each party; the public will be notified as final documents become available for review and comment.[8]

9.1.2 Monitoring

Monitoring efforts in the OVLMP will focus on flow, habitat, vegetation, and grazing. Since the Owens River functions as the northern extension of the Los Angeles Aqueduct within the boundaries of the OVLMP, flow monitoring is limited to reducing the deleterious effects of large flow ramping events. Large flow fluctuations over short periods of time are detrimental to fluvial landforms. Thus, the aim of flow monitoring within the OVLMP is to reduce the rate at which flows are ramped for LADWP operational needs.

Habitat and vegetation are directly responsive to changes in ecosystem management; therefore, they are descriptive and reliable indicators of change over time. Furthermore, management within the OVLMP is keyed to adaptive actions aimed at interventions at the habitat level, and not at the species population level.

It is financially and physically impossible to monitor the entire management area, therefore, monitoring will focus on priority areas identified in the MOU, namely riparian, irrigated pastures, and sensitive plant and animal habitats. The project area includes wetlands, transition zones, and upland areas, and changes in habitat will be quite variable from one area to another. In order to detect and quantify habitat changes, or possibly the lack thereof, and to make decisions on appropriate interventions, managers must recognize not only how the whole ecosystem is responding to flow and land management but also have reliable and quantifiable information.

[8] MOU 1997, Section III

Monitoring Component/ Sampling Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Flow Monitoring															
Ramping Rates	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Landscape Scale Sampling															
Vegetation Sampling		X			X		X		X		X				X
Habitat Characterization		X			X		X		X		X				X
Site Scale Sampling															
Vegetation Sampling			X			X		X		X		X		X	
Habitat Characterization			X			X		X		X		X		X	
Grazing Sampling															
Pasture Condition	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Utilization	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Range Trend			X			X				X					X
Recreation Projects	X	X					X					X			

Table 9.1 Monitoring Schedule – First 15 years of the OVLMP

OVLMP monitoring relies upon vegetation mapping from remote imagery and reconnaissance surveys at the landscape and site scales to observe major habitat changes and early detection of problem areas. Specific vegetation and habitat features for riparian areas, wetlands, fish and wildlife habitat are measured at the site scale that are spatially representative of key ecosystem types (i.e., riverine-riparian, wetland, and upland habitats throughout the OVLMP). An adequate number of sites are monitored so that data analyses identify biologically significant changes.

Landscape scale monitoring can confirm whether changes measured at the site-scale are indeed representative of the entire OVLMP; conversely, trends measured at the landscape scale are correlated with and substantiated by site-scale monitoring. Grazing will be monitored through pasture condition, utilization and range trend.

Managers will thereby have a good picture of how the ecosystem is responding through time, and where and what interventions would be most effective. Table 9.1 summarizes the monitoring components of the OVLMP and their frequency.

OVLMP monitoring will span 15 years (Table 9.1). The primary monitoring years will be 3, 6, 8, 10, 12 and 14 in which more intensive, site-scale monitoring will be performed. Secondary monitoring years at the landscape-scale include years 2, 5, 7, 9, 11, and 15. As such, habitat trends in the OVLMP are monitored 8 of the first 10 years.

9.1.3 Indicator Species

Indicator species for the OVLMP were adopted from the LORP due to the close proximity and similarity of habitat types found in the project areas. Table 9.3 shows the habitat indicator species and their general habitat preferences; more detailed habitat criteria for each species are described in the Middle Owens Habitat Assessment (see appendices). While monitoring does not focus on enumerating populations of indicator species, habitat is used to infer the suitability of the habitat for the indicator species.

In an effort to obtain accurate, cost-effective data, management indicator species are frequently used as the basis for environmental assessment and monitoring programs. However, habitat assessments and population monitoring that focuses on all species in a given area is neither time nor cost effective.

As a means to avoid these difficulties, Severinghaus (1981) and Verner (1984) proposed alternative approaches to monitoring using the guild indicator species concept.

A wildlife guild is a group of species that exploit the same class of environmental resources and respond to changes in their environment in similar ways.[9] The entire group of species is considered a guild unit, in contrast to a single member of the group, or guild indicator species. Guild units are grouped based on similarities in feeding and breeding strategies, habitat preferences, behavior, and species size.[10] Because all species in the guild are affected similarly by habitat change, one guild member, or indicator species, can be used to assess the impacts on other members. Using the needs of guild indicator species to guide OVLMP habitat assessments represents a compromise between a detailed approach that attempts to enumerate all local wildlife populations, and one that optimizes time and financial resources for the greatest ecological benefit. It should be noted, however, that the guild group approach is not a panacea and that as the value of a habitat component increases for an individual species of the guild unit following management actions, it may decline for other species in the guild.

For the birds, guild assignments are taken from the Breeding Bird Survey (BBS) 1993 annual summary.[11] This summary groups avian guilds by breeding habitat, migratory behavior, nest location and nest type. The breeding habitat guild grouping is chosen to best reflect the habitat value of the project area. Using this summary, 17 of the 19 avian indicator species are assigned to one of four breeding habitat guilds: grassland, successional scrub, wetland/open water, and woodland (Table 9.2). Two species, the Tree Swallow and Swainson's Hawk, were not included because these two species use multiple (breeding) habitat types throughout the continent.

Guild	Grassland	Wetland-Open Water	Successional-Scrub	Woodland
Species	Northern Harrier	Belted Kingfisher	Blue Grosbeak	Long-Eared Owl
	Swainson's Hawk	Great Blue Heron	Willow Flycatcher	Nuttal's Woodpecker
		Marsh Wren	Yellow-Breasted Chat	Red-Shouldered Hawk
		Sora	Yellow Warbler	Warbling Vireo
		Virginia Rail		Yellow-Breasted Chat
		Western Least Bittern		Tree Swallow
		Wood Duck		

Table 9.2. Breeding habitat guilds for avian indicator species.

9.1.4 Baseline Data

Baseline data were collected throughout the OVLMP management area from 2002 – 2006 using the methods described in this plan. The data was compiled, mapped, and/or tabulated and warehoused for future reference. No analyses have been performed on the baseline data; analyses will be conducted after the next set of monitoring data is collected. Most baseline data reports are included in the appendices of this plan.

Baseline data include basic site condition information gathered prior to the initiation of a change in management actions or a restoration project. Baseline data often pertain to water quantity and quality, vegetation community acreages, fisheries, avian and terrestrial animal populations and pertinent habitats, and geomorphic conditions. The term "baseline" simply refers to a point in time prior to implementation of the management action or onset of the restoration project[12] and should be viewed as current conditions. The Society for Ecological Restoration[13] states, "it is useful to obtain baseline measurements for a restoration project a year or more prior to initial project installation."

[9] Verner 1983
[10] Short and Burnham 1982, Neimi and Pfanmuller 1979, Severinghaus 1981, Crawford et al. 1981, Rice et al. 1984
[11] Peterjohn and Sauer 1993
[12] Busch and Trexler 2003
[13] Clewell et al. 2005

Table 9.3. OVLMP indicator species and their general habitat preferences.

Common Name	Scientific Name	Habitat Relationships[14]	Status[15]
Birds			
Great Blue Heron	*Ardea herodias*	Great Blue Herons are communal nesters/roosters in large trees, riparian, emergent, and shallow wetlands, wet and mesic meadows, high nest and roost fidelity.	W
Western Least Bittern	*Ixobrychus exlilis hesperis*	Western Least Bitterns nest in dense emergent (robust) vegetation (cattails and tules) in emergent wetlands and emergent riparian wetlands, they consume a variety of small fishes, mammals, crayfish, amphibians and many different aquatic and terrestrial invertebrates, the nest constructed of live and dead emergent vegetation near the water level.	C2, CSC
Swainson's Hawk	*Buteo swainsoni*	Swainson's Hawks nest in a wide variety of large trees usually in riparian areas, feeds in adjacent open meadows, fields and agricultural areas, susceptible to disturbance during nesting and potential nest abandonment	ST
Northern Harrier	*Circus cyaneus*	Northern Harriers nest and roost on or near the ground in herbaceous and dense shrubby vegetation, many times nest are located along the edge between two vegetation types, harriers are commonly associated with mesic, wet, and mash vegetation were they hunt from low gliding flights over the vegetation, susceptible to heavy grazing that does not preserve the understory. Nests and nesting habitat area susceptible to land uses such as heavy grazing that does not preserve the understory and/or may physically disrupt the nest.	CSC
Red-shouldered Hawk	*Buteo lineatus*	Red-shouldered Hawks build stick nests in riparian areas with very dense foliage, might refurbish old nest of other raptors, including long-eared owls, usually hunts from perches along edge herbaceous/shrub/tree edge, Red-shouldered Hawks are recent immigrants to the Owens Valley.	
Virginia Rail	*Rallus limicola*	Virginia Rails nest and feed in dense emergent, riparian, and herbaceous wetlands; grazing practices that reduce herbaceous wetland vegetation to less than 30 - 40 cm can be very detrimental especially to nesting birds.	
Sora	*Porzana carolina*	Soras nest in dense emergent wetlands and emergent riparian wetlands, grazing practices that reduce herbaceous wetland vegetation to less than 30 - 40 cm can be very detrimental especially to nesting birds.	
Marsh Wren	*Cistothorus palustris*	Marsh Wrens nest in dense emergent wetlands and emergent riparian wetlands, feeds in aquatic/emergent wetlands.	
Wood Duck	*Aix sponsa*	Wood Ducks are secondary cavity nesters in riparian trees (snags) >50 cm dbh, prefers areas with a mixture of riparian, riverine, and emergent wetlands, feeds on all parts of aquatic plants and some grasses, forbs, and mast, suitable nesting cavities are probably very limiting in the Owens Valley.	
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Western Yellow-billed Cuckoos nest in native deciduous trees (cottonwood, willow, etc.), thrive in healthy dynamic riparian communities, inverse relation to riparian fragmentation, width and size of patches are important, require relatively large blocks of habitat (optimal nesting conditions are sites that are greater than 200 acres in extent and wider then 200 m).	SE
Long-eared Owl	*Asio otus*	Long-eared Owls nest and roost in riparian areas in a variety trees and shrubs, dense vegetation and willow thickets are commonly	CSC

[14] The Status of Rare, Threatened, and Endangered Animals and Plants of California. California Department of Fish and Game, 2000.
[15] Ibid.

		used, this species is known to use old raven, magpie and hawk nests are occasionally used, usually hunts in semi-open wetlands and meadows. Nests and nesting habitat area susceptible to land uses such as heavy grazing that does not preserve the understory and/or may physically disrupt the nest.	
Willow Flycatcher	*Empidonax traillii*	Willow Flycatchers nest preferences varies by subspecies and geographic location, generally prefers dense patches and early successional and/or shrubby riparian vegetation, species composition important, native deciduous species such as cottonwood, willow, alder are preferred although the majority of nests in Arizona are in salt cedar, nests susceptible to physical damage by livestock. Three subspecies in CA, two of these probably occur in Owens Valley: *E.t. extimus,* Southwestern Willow Flycatcher is federally listed as Endangered, and *E. t. brewsteri*, Little Willow Flycatcher is a state listed CSC.	SE, CSC
Yellow Warbler	*Dendroica petechia brewsteri*	Yellow Warblers nesting preferences vary by subspecies but they usually nest in deciduous riparian plant species, such as willows and cottonwoods. Grazing can reduce nesting habitat quality, Usually occurs in early successional riparian areas with vertical stratification, and partially open canopy.	CSC
Yellow-breasted Chat	*Icteria virens*	Chats nest in low thick shrubby vegetation in forested and shrub dominated riparian areas; they glean insects and spiders from foliage of shrubs and trees.	CSC
Blue Grosbeak	*Guiraca caerulea*	Blue Grosbeaks nest in early successional riparian communities with healthy herbaceous and shrubby understory, nests located in vertical forbs, herbaceous annuals and submature willows and cottonwood, prefers riparian edges, fragmentation and patch size are apparently unrelated to species success.	
Warbling Vireo	*Vireo gilvus*	Vireos nests in large riparian deciduous trees (cottonwood, willow, alders, etc.) with partially open canopy.	
Belted Kingfisher	*Ceryle alcyon*	Kingfishers usually excavate nest holes in steep earthen banks of friable soil within 1 mile of aquatic foraging habitat. Feeds on fish, amphibians, crayfish, and some aquatic insects. Forages in shallow, clear, slow moving water. Peak breeding activity occurs in May and June.	
Nutall's Woodpecker	*Picoides nuttallii*	Nuttall's Woodpeckers are primary cavity nester in snags > 20 cm dbh located in deciduous riparian habitat, forages in deciduous areas gleans form twigs, branches, foliage, and trunks for adult and larval insects, like most primary cavity nesters these birds play and important role excavating cavities for a host of secondary cavity nesters.	
Tree Swallow	*Tachycineta bicolor*	Tree Swallows are secondary cavity nesters in trees (snags) > 25 cm dbh that are usually located in riparian areas, mostly feeds on insects hawked during long flights.	

Code	Conservation Status
FE	Listed as Endangered by the U.S. Fish and Wildlife Service
FT	Listed as Threatened by the U.S. Fish and Wildlife Service
FSS	Listed as a Sensitive Species by the U.S. Fish and Wildlife Service
C2	A Category 2 Candidate for listing by the U.S. Fish and Wildlife Service under the former Category 2 Classification System
SE	Listed as Endangered by the State of California
ST	Listed as Threatened by the State of California
CSC	Listed as a Species of Special Concern by California Department of Fish and Game
W	A watch species- A species that is biologically rare, restricted in distribution, declining throughout their range, or at a critical stage in their life cycle when residing in California

Baseline information is then used to provide a comparison for assessing the impact of restoration, as baseline data measurements are repeated throughout the life of the project as part of the monitoring program. Unanticipated extremes in data can indicate problems that might require mid-course correction, or adaptive management. Additionally, upon project completion the baseline dataset is assessed to help evaluate the effectiveness of restoration.[16]

Baseline data are collected for three reasons:

(1) Inventory and document existing site conditions and biota
(2) Quantify the degree of degradation or damage
(3) Enable managers to evaluate changes in pre- and post- management action site conditions and make adaptive management decisions.

Over the course of time vegetation communities and habitats will change as management actions are implemented. To analyze how much and in what way vegetation and habitat are changing, it is imperative to inventory existing site conditions and flora and fauna in a baseline data collection effort. The structure of all component communities should be described in sufficient detail to allow a realistic prediction of the effectiveness of subsequent management actions.[17]

Type of Report	Frequency	Person(s) Responsible for Report Preparation	Report Recipients
Annual Report (Summary of data collected for all monitoring tasks, results of analysis, and recommendations regarding the need to modify project actions)	Annually	Lead project manager (LADWP)	▪ LADWP and ICWD ▪ MOU Parties ▪ Interested members of the public (project website)

Table 9.4. Reporting requirements for the OVLMP

Baseline data are critical for evaluating a project and making decisions to ensure its success. Altering management actions and making management decisions during the course of a restoration project to ensure its success is part of adaptive management. Adaptive management is highly recommended, if not essential, because what happens in one phase of project work can alter what was planned for the next phase.[18] The rationale for initiating adaptive management should be well documented by monitoring data or other observations and is usually based on a contrast, or lack of contrast, from baseline conditions.[19]

Baseline data collection for the OVLMP consisted of vegetation mapping, soil descriptions, landform mapping, and habitat evaluations. Future monitoring will be compared against these baseline data to determine if changes are consistent with OVLMP goals and objectives. If objectives are not being met or unanticipated conditions appear that hinder progress towards these objectives, adaptive management measures will be considered and implemented.

9.1.5 Reporting

An effective system that reports OVLMP monitoring results will be implemented in order to provide for timely adaptive management responses. Monitoring will be conducted by project consultants or LADWP technical staff according to the methods and schedules described herein and determinations as to whether an adaptive management response is warranted will be made by LADWP staff.

LADWP will direct the preparation of the annual report that summarizes the data collected, presents the results of analyses, and provide recommendations regarding the need to modify project actions. Any reports, studies, evaluations and analyses prepared for the OVLMP, along with supporting data, will be made available to the public and the MOU parties.

[16] Clewell et al. 2005
[17] Clewell et al. 2005

[18] Clewell et al. 2005
[19] Clewell et al. 2005

Other reporting requirements include the publishing of flow data for the public. The OVLMP reporting requirements are summarized in Table 9.4.

9.1.6 Data Management

Due to the high volume of data generated for the OVLMP, a standardized process for managing and storing data is necessary. Generally, all original data collected for the OVLMP monitoring program (field forms, field notebooks, photographs, etc.) will be stored at LADWP offices in Bishop for a minimum of 15 years. Scanned field forms, photographs, and all other electronic data will be stored on a server dedicated to the OVLMP, which will be located at LADWP offices in Bishop. All electronic data will be retained for the life of the project. The project server (HP Proliant ML570G2 with 1GB RAM, Windows Server 2003) will have two backup systems, consisting of mirrored hard drives (four 72GB and two 36GB hard drives) and an SDLT internal tape drive (for use with 160 GB backup tapes). Data will be backed up weekly, and the backup tapes will be stored in a fire-proof vault located in the Bishop office. A large-format printer (HP Designjet 800) will be connected to the server for data output. In addition to data collected after project implementation, relevant existing data and background information (e.g., OVLMP technical memoranda) will be also be stored on the project server.

9.2 OVLMP Management and Geography

The OVLMP management area consists of Los Angeles-owned, non-urban lands within the portion of the Owens River watershed located in Inyo County not included in the LORP planning area.[20] The management area has been broken down into two components, the riverine-riparian area and uplands. The riverine-riparian area consists of the floodplain of the Owens River and its tributaries. The MOU (1998) identifies the riverine-riparian area as a priority area for the OVLMP. The uplands consist of lands outside the riparian areas of the Owens River and its tributaries.

9.2.1 Riverine-Riparian Area

The riverine-riparian area of the OVLMP encompasses the 102-km riparian corridor along the Middle Owens River from Pleasant Valley Reservoir to the aqueduct intake (Figure 1.2). The lateral boundaries of the riparian area generally correspond with transitions from stream terraces, landforms that are capable of supporting wetland/riparian habitat, transition to higher terraces with upland habitat. Grazing and recreation are primary land uses in riparian areas. The riparian area was identified in a 2000 mapping effort[21] and is approximately 14,735 acres. The major tributaries to the Middle Owens flow from the Sierra Mountains on the west and include Bishop Creek, Horton Creek, Big Pine Creek, Birch Creek, Taboose Creek, and Tinemaha Creek. Other tributaries, including those from the White Mountains to the east, provide ephemeral flows generally during the wet season.

9.2.2 Land Use and Uplands

Areas outside the floodplain of the Owens River and its tributaries are considered uplands. Uplands occur throughout the Owens Valley and are located on higher elevation areas than the riverine-riparian management area. Upland areas consist of mesic to xeric vegetation with grazing as the primary land use. Fifty grazing leases occur within the OVLMP management area. The driest lands of the leases are the uplands east and just west of the river on higher elevation terraces.

9.3 Riverine-Riparian Methods

Land and water-use modifications will seek to maximize the efficient use of the resource while conserving the ecological function of the

[20] MOU 1998

[21] WHA 2003

Middle Owens watershed. The following guidelines apply to a variety of ecological components that will provide project scientists with data needed to assess the ecological integrity of LADWP lands.

The stability of the channel and surrounding riparian landforms is improved by later-successional plant communities. Such stability will serve to improve and maintain water quality and wildlife habitat. The landforms and corresponding vegetation types and the response of these components to water and land management alterations will be assessed by the monitoring protocols.

The riparian ecotone is an important component of any terrestrial ecosystem, acting as a corridor for energy and nutrients, as well as home to a variety of plants and animals. Each of these organisms also has a role important to the overall functioning of the ecosystem, therefore their presence and vigor must be preserved. Included in this protocol are methods to assess the riparian habitat conditions for endangered and non-endangered plants and animals; data acquisition will be accomplished by both on-site and remotely sensed methods.

Analysis at Two Scales

Baseline monitoring was conducted at two scales: landscape scale and site scale. Other riverine restoration projects have employed a similar hierarchal scale strategy[22]. Landscape scale analysis involved broad sampling of the entire project area, including the uplands and reaches 7 (Tinemaha Reservoir) and 8 (Tinemaha to the intake). Site scale analysis involved intense sampling of representative study sites along the Owens River encompassing the riparian zone upstream of Tinemaha Reservoir. These riparian zones are of disproportional importance to the biota of the project area, and therefore site scale analysis is concentrated within these areas. The landscape scale information will be useful to characterize the entire project area with a coarse grained level of detail. This allows for a more comprehensive view of the project area, including areas such as uplands and reservoirs. The data collected through the site scale analysis will provide managers with detailed information able to detect small changes in ecosystem condition. Landscape level analysis will be slow to detect ecosystem change, therefore management decisions will likely be primarily driven by the response seen at the site level.

Landscape Scale Methodology and Protocols

The landscape scale methodology and protocols were designed to characterize vegetation, land type, water regime, and habitat quality for the entire Middle Owens

	Reach 1			**Reach 2**			**Reach 3**			**Reach 4**			**Reach 5**			**Reach 6**			**Reach 7**	**Reach 8**
Data Collected	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 18		
Landscape Scale Sampling																				
Vegetation Sampling	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Habitat Characterization	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Site Scale Sampling																				
Vegetation Sampling	x			x				x		x			x				x			
Habitat Characterization	x			x				x		x			x				x			

Table 9.5 Middle Owens River Project Vegetation Sampling Data Collected by Reach.

River project area. Efforts were coordinated so that all aspects of monitoring are integrated into a comprehensive GIS database.

Site Scale Methods and Protocols

The purpose of the site scale monitoring methods and protocols is to provide mangers with fine grained data capable of detecting change over time. The vegetation and habitat components of the site scale monitoring will be integrated in a coordinated effort. As stated above, the best opportunities for improved ecosystem management occur above the tailwaters of Tinemaha Reservoir. Therefore, six 500 meter sites were selected above the tailwaters (reaches 1-6).

Site Selection and Stratification Criteria

Within each of the reaches above Tinemaha Reservoir (Reaches 1-6) three sampling sites were selected. Sites were selected randomly within some constraining stratification criteria, which were used in order to minimize overlap and insufficient, confusing or inconsequential data. The stratification consists of, in descending order:

(1) Accessibility. The river should be accessible by road or footpath. The intention here was to minimize time and effort required to get to a site. The number of reaches and sites selected will insure a valuable and well-proportioned cross section of the river ecosystem without selecting sites that are prohibitive to gather the field data.

(2) Avoid overlapping meanders. The Middle Owens River is a meandering river throughout most of its flow between the two reservoirs. Some of the meanders have very tight radii. Typically in a tight meander situation the river backs up to itself and eventually will create an oxbow. The meander can form a sinuous line of opposing meanders backing up to one another with a shallow landform separating them. The landform becomes a narrow peninsula consisting of stream bank and floodplain. This type of condition is not advantageous to cross channel transect measurements. One or more of the cross channel transects will traverse into the river channel beyond the first landform thereby repeating, confusing and nullifying much of the data. The progress across the landform classification is attenuated by the next meander eliminating higher upland landforms that define the river channel. In selecting sites the meander conditions described above will be avoided for reasons of clarity in data and analysis of results.

(3) Avoid heavily impacted areas. Identifying opportunities to improve flow management in the Middle Owens River is the key objective. We will, therefore, focus on identifying flow levels that maintain ecological function; i.e., flow levels that synchronize with existing landforms necessary for riparian habitat. Recreation and grazing can change landform and bank conditions at the critical zone of the riparian area. Sites where the bank is sloughed, broken or trampled by impacts outside of stream flow conditions can be misleading when collecting elevation data. Thus, sites exhibiting severe degradation from grazing or recreational use were avoided. These impacts will be assessed through grazing plans and recreational management.

The data collected at each scale and site is displayed in Table 9.5.

9.3.1 Flow Monitoring

As discussed in Chapter 2, the Middle Owens River serves many important functions in the management of Owens Valley water. It has a flow regime determined largely by water needs throughout the valley and in the Los Angeles Basin, as well as power needs. Middle Owens River flows are measured at three gaging stations: at the Pleasant Valley release, below Big Pine Canal, and at Tinemaha release. These stations record flow data, which is posted on the LADWP website. There will be no formal monitoring program for flow releases, but records may be checked to indicate whether flows have been ramped up and down at appropriate rates (25 cfs/day) to prevent adverse impacts on the riverine-riparian system (e.g. bank sloughing).

[22] Stillwell Sciences 2001.

Adaptive Management for Flow Monitoring

As mentioned above, water flowing in the Owens River between Pleasant Valley Reservoir and the Aqueduct intake serves many purposes: irrigation, stock water, enhancement and mitigation, and most importantly water for Los Angeles. Since the Owens River is a "working river" it is not feasible to create a flow regime for the river within the boundaries of the OVLMP. LADWP must manage the river to provide water to the City during times of need and thus manages the river based on human rather than ecological needs. LADWP ramps up flows when city of Los Angeles water demands increase and ramps down flows when water demands decrease.

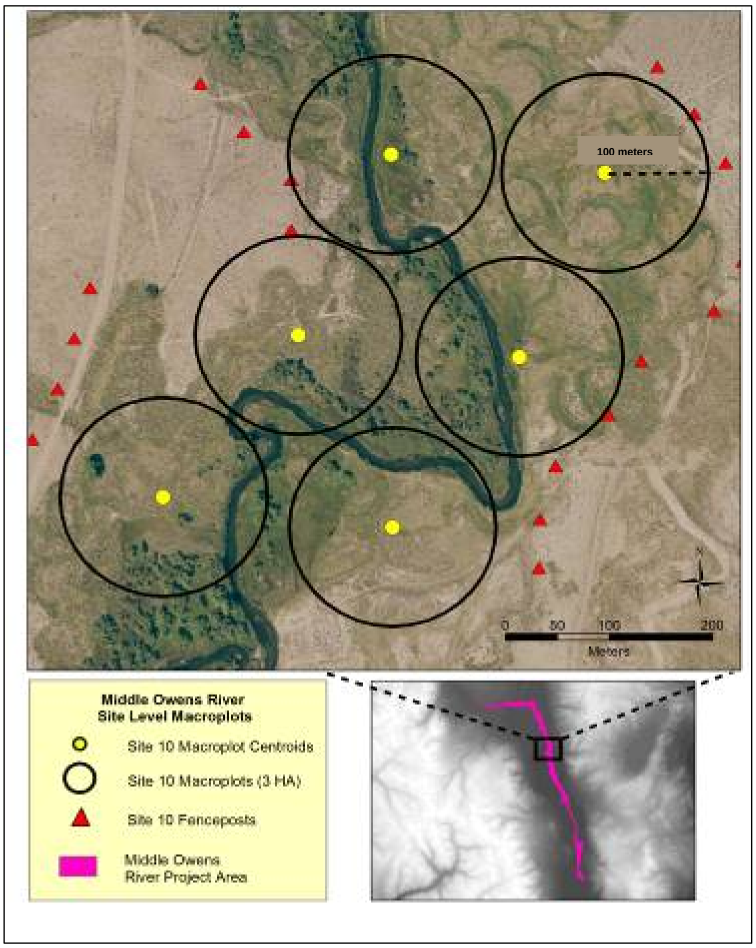


Figure 9.1. Middle Owens River Habitat Assessment

Site level macroplots at Site 10, Reach 4 of the Middle Owens River, eastern California, USA.

Flow management in the Owens River must therefore be aimed at minimizing degradation, rather than defining a flow regime that is beneficial to fluvial processes. The only adaptive management option for the river within the boundary of the OVLMP, given these constraints, is adjusting the ramping rates.

The up or down ramping of Owens River flows must not exceed 25 cfs per day. Ramping rates will be monitored by LADWP staff according to their daily operational needs. LADWP posts flow data online so it is easy to monitor daily changes in flow.[23]

Changes in ramping rates will also be noticeable in the habitat and vegetation monitoring data. Large flow fluctuations over short periods of time induce cut banks and a loss of riparian vegetation adjacent to the river channel. If the habitat and vegetation monitoring data indicate that a net loss of riparian vegetation occurred during the monitoring interval that can be directly attributed to ramping rates, then ramping rates, timing and duration will need to be reevaluated.

9.3.2 Habitat Monitoring

9.3.2.1 Landscape Scale Habitat Characterization and Analysis

Monitoring Purpose

The purpose of the landscape level habitat analysis was to develop a broad scale analysis of habitat characteristics and indicator species presence for the entire Middle Owens River area. The landcover maps (Whitehorse Associates-WHA) along with wildlife habitat data derived from macroplots are used to inform the Middle Owens River wildlife habitat assessments at the landscape level.

Nineteen bird species were selected as habitat indicator species to evaluate the habitat quality of the Middle Owens riverine-riparian

[23] http://www.ladwp.com/ladwp/aqueduct/showAqueductMap.ladwp?contentId=LADWP_AQUERTD_SCID

ecosystem (Table 9.2, also see discussion above under Section 9.1.3 Indicator Species).

Baseline Data Collected
See Section 9.3.

Methods

Protocol
GIS Site Selection and Habitat Analysis
Macroplots of approximately 3 hectares (~8 acres) were selected using two methods and evaluated for large scale habitat attributes. The first method used GIS to randomly generate 60 points throughout the Middle Owens River study area that are a minimum of 200 m apart and a minimum of 100 m from the Middle Owens River riverine-riparian area boundary. These points were buffered by 100 m to develop the 3 ha macroplot areas within which landscape level habitat attributes are measured. The vegetation composition within these macroplots was analyzed using the WHA landcover map (Section 9.3.3). If there was more than one macroplot with the same vegetation composition, duplicates were eliminated from analysis so that selected macroplots were representative of all possible vegetation types within the study area, without over-representing any particular vegetation community. Macroplots that fell within inaccessible areas such as water were also eliminated. This process reduced the number of macroplots to approximately 50 throughout the Middle Owens River area. These plots are referred to as “random macroplots.”

In the second method, macroplots were developed to encompass the entire area of each site as designated by Ecosystem Sciences. This allowed for a more thorough sampling of landscape level habitat characteristics at sites where fine scale vegetation information was collected at subplots. Macroplots were laid within the fence posts demarking the boundaries of each site within the six river reaches (Figure 9.1). The typical site is approximately 600 x 400 m wide, an area which encompasses six 3 ha macroplots, yielding 36 “site macroplots” for the entire Middle Owens River area.

	Layer	Class Code	Description of Class
Vigor and Condition Class	Herbaceous Layer	1	Grasses robust; numerous blades; tall seed stalks; few dead plants; uneven aged; firm sod grass
		2	Some open places with grass in poor condition; slight pedestalling; some tufted grass loose; sparse seeding
		3	Sod thinning; few seed stalks; obvious pedestalling; many grasses loose, some dead
		4	Weak grasses, sickly in color; widespread pedestalling; grasses "shocked"; many invasives; extensive bare ground
	Shrub Layer	1	Vigorous shrubs, well branched upward, irregular shape
		2	Shrub slightly hedged only
		3	Shrub shows apparent browse or hedgeline
		4	Shrub has distinct browse or hedgeline
	Tree Layer	0	No or very light use of trees evident
		1	Light use (some high-lining evident but very light)
		2	Moderate use (high-lining obvious; distinct line)
		3	Extensive use (high-lining)

Table 9.6. Qualitative habitat condition categories
Used to evaluate vegetation layers at Middle Owens River Project site subplots.

Habitat Attribute Measurements
In order to compare ground based information with remotely sensed GIS maps developed by WHA, the data were qualitatively evaluated for vegetation community composition at each macroplot. Each WHA community that fell within the macroplot was evaluated for its habitat value. Attributes evaluated included percent cover and bare ground, dominant herbaceous, shrub and tree species, and overall vegetation composition for the entire macroplot area. WHA community classifications were cross-walked to the California Wildlife Habitat Relationship System (CWHR).[24] This allows wildlife habitat acreages to be calculated for the entire Middle Owens River area. The WHA landcover map was used to calculate the following fragmentation metrics: mean patch size, mean patch number, edge density, mean nearest neighbor, and mean isolation index.

[24] CA Dept. of Fish & Game 2003

Habitat Characteristic	Class Code	Description of Class
New Recruitment	0	No new recruitment
	1	One small area with recruitment, □ 5% of the plot
	2	One larger or several smaller recruitment areas □ 5 to □ 10%
	3	One large or many small recruitment areas □ 10%
Vegetation Use	0	No use
	1	Use (vegetation is used but timeframe is unknown)
	2	Recent use (vegetation was used recently; within the last several months terminal portions of the plant were clipped; little or no re-growth; all use on this year's seedlings is considered recent
	3	Previous use (vegetation was used during the previous season and there was re-growth, new sprouting, and hedging)
	4	Previous and recent use (conditions 2 and 3 exist)
Erosion	1	No evidence of erosion present
	2	Slight pedestalling of plants
	3	Moderate pedestalling; slight erosion rills; small gullies, if present, are widely spaced with no more than one or two visible from a single observation point
	4	Extreme pedestalling; erosion rills; gullies present, with more than two features visible from a single observation point
	5	Extensive and numerous erosion gullies (numerous or large, extensive features)

Table 9.7. Habitat characteristics and qualitative condition

Categories used to describe habitat at Middle Owens River Project site subplot

Frequency

Landscape scale habitat sampling is conducted in monitoring years 2, 5, 7, 9, 11, and 15.

9.3.2.2 Site Scale Habitat Characterization and Analysis

Monitoring Purpose

Indicator species' habitat monitoring is designed to document changes in habitat conditions in the OVLMP project area. Indicator species represent a subset of the entire array of species that could possibly reside in the project area. Changes in the quantity and quality (suitability) of habitat for a particular species or guild indicates that the system is changing compared to baseline conditions. Changes in habitat for indicator species will be analyzed using the California Wildlife Habitat Relationship (CWHR) system.

The CWHR System is the most extensive compilation of wildlife habitat information in California today. The CWHR is a community level matrix model that predicts wildlife habitat relationships for 692 regularly occurring terrestrial vertebrates in California. Habitat suitability predictions are based on geographic range, relationships to 59 habitat types (27 tree, 12 shrub, 6 herbaceous, 4 aquatic, 8 agricultural, 1 developed and 1 non-vegetated) averaging 12 stages each, and use of 124 special habitat elements (CWHR 2007). CWHR wildlife experts have assigned wildlife suitability values for each habitat type that species occupy. Within the Middle Owens, suitability values will be derived for indicator species and guilds (species similar in their habitat needs and response to habitat changes) (Tables 9.2 and 9.3).

Each species CWHR model has expert-applied suitability ratings for three life-requisites: breeding, cover and feeding. For each species, every habitat stage is rated as high, medium, low or unsuitable for each of the three life requirements. Each special habitat element is also assessed as essential, secondarily essential, preferred or not rated for the species (CDFG 2000).

The CWHR system rests on a set of general assumptions. In addition, there are a number of specific assumptions which model raters must adhere to when assigning suitability values to habitats and importance levels to elements for any given species. General and specific system assumptions are listed below (CDFG 2000):

1. Wildlife species occurrence and abundance are strongly influenced by habitat conditions.
2. Wildlife habitat can be described by a set of environmental characteristics.
3. Relative suitability values (i.e., high, moderate, low, unsuitable) of habitats and the relative importance of special habitat elements may be determined for each species.
4. Habitat suitability value is uniform for a species throughout its range in California for the specified habitat.

The CWHR with the software application BioView enables managers to build habitat suitability (HSI) models for each indicator species and guild, thus evaluating the quality of habitats in the project area for each species or guild. Additionally, the CWHR with BioView application HSI value output can be added to a GIS layer, allowing managers to quantify the acreage of suitable habitat for each species or guild.

Baseline Data Collected
Baseline conditions of indicator species' habitat quantity and quality (suitability) will be analyzed prior to monitoring; all available data sources will be used to assign height and canopy cover stages to the vegetation GIS polygons (Vegetation Mapping Section 9.3.3).

For available data sources see the Middle Owens River Habitat Assessment Report in the appendices.

Protocol
Qualitative Habitat Characteristics

1. Vigor and Condition Class
Qualitative categories were used to describe the dominant condition in the 10 m vicinity surrounding each subplot based on the following vigor and condition class categories. One class per layer from the list presented in Table 9.6 was used to describe the condition of that layer. Additionally, technicians recorded the dominant vegetation species per layer.

2. New Recruitment (woody vegetation)
Dominant condition in the 10 m vicinity of the subplot was evaluated based on the categories described in Table 9.7.

3. Sprouting Recruitment (trees)
Up to 4 trees within a 10 m radius of the subplot center point were selected for sprouting recruitment evaluation. For each of the trees, the total number of grazed and non-grazed sprouts were counted and incorporated into the following ratio:

Sprouting Ratio =
$$\frac{\text{Total number of sprouts (0 to 2 m from ground)}}{\text{Total number of sprouts grazed}}$$

4. Vegetation Use (woody vegetation)
Qualitative assessment of vegetation use was performed in the vicinity of the subplot. Amount or type of use was indicated by the categories described in Table 9.7.

5. Erosion Class
Dominant erosion condition in the vicinity of the plot was noted according to the categories described in Table 9.7.

Quantitative Habitat Characteristics

1. Foliage Density
Foliage density is a measure of vertical and horizontal structure in forested and shrub-scrub and herbaceous vegetation communities. The "pole method" utilizes a density pole to find vegetation volume[25] and foliage obstruction. The pole method is a variation of MacArthur and Horn's (1969) vertical line-intercept technique. The pole is 3 m long, divided into 0.1 m black and white band increments with red lines to represent each 1 m increment. Two poles can be connected to form a 6 m pole to make observations up to 8 m. Measurements above 8 m were estimated visually.[26]

Additionally, the pole was used to reach tree heights to 8 m. Foliage density measurements were taken at the center point of each subplot. Both of these measurements required two field technicians: one to hold the density pole and one to read and record data.

Presence/Absence of Live Foliage (*Vegetation Volume*)
Hit or miss data was recorded for each of the 0.1 m increments marked on the density pole. The technician holding the pole stood at the center point of the subplot. The observer envisioned a 1 dm cylinder surrounding the density pole and stood at a distance (approximately 3 m) that provided a good vantage point to determine hits or misses on the density pole within the cylinder area. Any 1 dm increment that had vegetation occurring within it was termed a "hit" and given a value of 1; any increment with no vegetation was

[25] Mills et al. 1991
[26] Maguire 2002

recorded as "miss", and given a 0 value. This data was later pooled into three vegetation layers (herbaceous, shrubs and trees). The information obtained with the pole method allowed for later calculations of total vegetation volume (TVV) and foliage height diversity (FHD).[27]

Percent Obstruction of Live Foliage (*Foliage Obstruction*)
Foliage obstruction was determined by recording the percent visual obstruction (0-100%) of the pole by foliage in each of the 0.2 m increments on the pole. One technician held the pole at the center point of the subplot while the observer stood approximately 5 m from the pole to determine percent obstruction. To fully understand the vegetation complexity of the subplot, this measurement was taken four times in the four cardinal directions (N, S, E, W) relative to the technician holding the pole.[28]

2. Tree Canopy Cover (Live Crown Density)
When a tree occurred within a subplot, tree canopy cover estimates were made using a spherical densiometer, commonly used by foresters and forestry technicians.[29] The densiometer consists of a mounted concave mirror etched with grid lines whose intersections are considered hit points. There are a total of 24 squares formed on the mirror by the gridlines. The number of squares that have live foliage reflected in them were totaled. To account for the variability in canopy cover of the tree, four readings were taken and averaged to derive the final percent canopy cover measurement. The observer stood with her back to the tree and took measurements in four cardinal directions. Up to four trees within a 10 m radius of the subplot center point were sampled.

3. Other Tree Condition Indicators
In addition to foliage density and tree canopy cover, five other tree condition indicators were measured and recorded. The following measurements were taken at the same points as tree canopy cover.

Live Crown Diameter (m)
Live crown diameter is the average of the tree crown diameter at its widest point and at its narrowest point. The diameter of the narrowest spread was measured at a 90º angle to the diameter at the widest point.[30]

Number of Trunks
The number of trunks per tree was tallied by direct count. The number of trunks on a multi-trunked tree such as *Salix laevigata* (red willow) helps to illustrate canopy cover and age.

Diameter at Breast Height (cm)
Diameter at breast height was measured (cm) for all single-trunked trees that lay within a 10 m radius of a subplot. A DBH tape was used to measure the diameter of the tree trunk at 1.3 meters above the ground.

Live Crown Ratio (m)
Live crown ratio compares the tallest point of the dead canopy to the tallest point of the live canopy. Tree heights were measured using the density pole.

Crown Die-Back
Crown die-back is the estimate of the percentage of the tree that is dead to the nearest 5%, compared with the percentage of the tree that is living. These two percentages must total 100%.

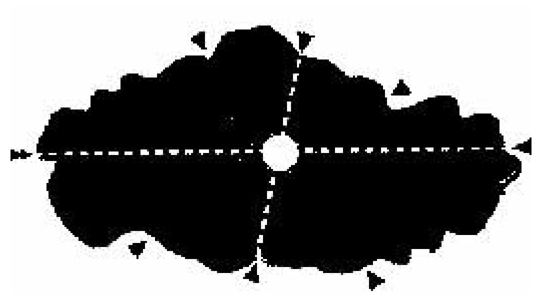


Figure 9.2. Average Tree Crown Diameter (American Forestry Association)

4. Emergent Vegetation Measurements
Percent cover, plant height and water depth in each subplot where emergent vegetation exists

[27] MacArthur and Horn 1969, Maguire 2002, Mills et al. 1991
[28] ES 2004; GANDA 2003
[29] Lemmon 1957
[30] Bechtold 2002; NPS 2005

within a 2.5-m radius circle of the center point was measured. Emergent vegetation can be live or residual. Residual emergent vegetation is any dead plant matter that remains from the previous growing season of aquatic emergent vegetation. Any dead upland herbs, shrubs or trees were not included in this category. If there were no emergent vegetation present in a subplot area, "N.A." (rather than "0") was denoted.

Percent Cover (%)
Percent cover was determined within a 2.5 m radius circle centered on the subplot centerpoint. Cover measurements for both live and residual emergent vegetation were determined by visual estimates within this area and recorded as a cover class. The cover classes were grouped according to the following scale: <1%, 1-5%, 5-25%, 25-50%, 50-75% and 75-100%. This procedure was conducted two times, once for live emergent vegetation and a second time for residual emergent vegetation when present.

Height of Maximum Plant Growth (m)
Height of maximum plant growth is a measure of plant height at four equally spaced locations within a 2.5 m radius circle of the subplot center point. Locations should be representative of the average heights of the vegetation in the radius area. This procedure was conducted twice: once for the average height of live emergent vegetation, and a second time for the average height of residual emergent vegetation.

Water Depth Near Shoreline (m)
The average water depth of four points near shoreline was recorded when shoreline was included in a 2.5 m radius from the center point of the subplot. If the subplot fell in a wetland, four locations of representative depth surrounding the subplot were measured; otherwise "N.A." was noted.

5. Riparian Tree Inventory
An inventory of riparian trees was conducted within a 10 m radius circle of the center point of the subplot. Measurements included tree counts, seedling counts, seedling tree damage, and number of seedling regeneration measurements.

Tree Count
The tree count included a direct count of trees per species, assignment of an age class determination (seedling – dead), and the percent of the tree that was dead (0-100%).

Seedling Count
The seedling count is a direct count of the number of seedlings per species and the number of seedlings per size class (0m - >3m) per species.

Seedling Tree Damage
Seedling tree damage is damage done to trees by browsing animals and by beaver dam construction. The amount of damage was tallied by direct count of the number of seedlings browsed and the number damaged by beaver.

Seedling Regeneration Information
The seedling regeneration information provided a description of the site where regeneration was noted. The data recorded included distance of seedlings from channel (m), physiographic setting (shoreline, low, mid- or high terrace), percent cover of competing vegetation (>10% – 100%), and direct count of invasive species.

In an effort to integrate past work done by Ecosystem Sciences, the methodologies used to describe habitat were similar to those used in the past by Ecosystem Sciences and Garcia & Associates to define habitat quality and quantity for species of concern in the Owens Valley (e.g., Yellow-billed Cuckoo). Specific methodologies for each of these procedures also incorporated ideas published by the California Native Plant Society[31], the USDA Forest Service (2001), and Elzinga et al. (1998).

Vegetation measurements obtained by the pole method [32] and MacArthur and Horn's (1969) vertical line-intercept technique can be used to determine total vegetation volume (TVV) and foliage height diversity (FHD). The formula for total vegetation volume is TVV = h/10p where h = the total number of hits summed over all the vegetation layers, and p = the

[31] Sawyer & Keeler-Wolf 1995
[32] Mills et al. 1991

number of points at which vegetation volume was measured[33]. Foliage height diversity was used to measure the relationship between bird species diversity (BSD) and vegetation structure diversity. To calculate FHD, each vegetation layer (herbaceous, shrub and tree) is correlated to a specific meter area of the pole. The specific meter area varies depending whether the methods of Mills et al. (1991) or MacArthur and MacArthur (1961) are employed.

The latter methodology focuses on three layers that birds respond to, whereas Mills et al. (1991) use up to 8 layers, which may provide a more accurate vegetation profile. Recent research[34] shows no significant difference in FHD when either method is employed. Therefore, for the purposes of this study, the three layer method of MacArthur and MacArthur (1961) will be utilized. The number of hits in the specified meter area are then used in the Shannon-Weiner Diversity Index, $H' = \Sigma p_i \ln p_i$, where p_i = the proportion of total number of hits in the i^{th} layer to the total number of hits. The vegetation structure diversity derived with this equation is correlated with bird species diversity (BSD) data to determine which layers provide the most suitable habitat for a diverse number of bird species. The analyses utilized all data to construct accurate models of the vegetation structure for each subplot community.

Photo-documentation of the area was the first task at each subplot. Having photographs to refer to allows a rapid assessment of sites and relative habitat values, and provides a visual example of the changes that occur within sites over time. At least four photos were taken at each subplot, consisting of two subplot specific photos and two or more landscape photos. The subplot photos were taken 10 m from the center point while facing the subplot making note of the direction (N, S, E, or W) the photo is facing. Photo-documentation of the landscape attempts to capture the diversity and the characteristic features of the area. Two or more landscape photos were potentially taken from any location in the subplot area. Additionally, photographs were taken of any unknown plant species to aid in identification of the species.

All photographs for subplots or landscapes were taken on consistent camera settings to allow for the best comparison of future photos. Every photo was assigned a field number and cataloged in a photo log which recorded the date, field number, site and subplot number, direction, and description of the photo. The field number for a photo is the number of the photo and the date and time displayed on the LCD on the camera. At the end of each field day digital photographs were downloaded to the computer and sorted by subplot waypoint number (subplot and landscape) or placed in an unknown plant species file.

Analysis Methods

As mentioned above, habitat quantity and quality (suitability) in the OVLMA for each indicator species and guild will be evaluated using the CWHR system with the BioView application. CWHR habitats will be evaluated to derive habitat suitability values (e.g., high, moderate, low) for each indicator species and guild. Habitats will be described using field data that describes specific habitat elements (vegetation type, structural elements, cover classes and special elements) outlined by the CWHR. Most important to the CWHR with BioView application is the CWHR habitat type and that habitat type's size (height and age) and cover stages. Stages are defined for virtually all habitats and are a combination of size and cover class for tree-dominated habitats, age and cover class for shrub habitats, height and cover class for herb habitats and depth and substrate for aquatic habitats (Tables 9.9– 9.11). For more information see the Middle Owens River Habitat Assessment Report in the appendices.

<u>*Protocol*</u>

The 4 step process described below outlines the protocol required to prepare data for use in CWHR's BioView and how to run BioView to produce suitability values for indicator species and guilds.

Step 1. Crosswalk WHA's mapping to the CWHR (Table 9.8).

[33] Maguire 2002, Mills et al. 1991
[34] Maguire 2002

Whitehorse Associates (WHA) mapped the Middle Owens River Riparian Vegetation based on 2000 aerial photos. WHA's vegetation types are described in Whitehorse Associates 2004c (this report is included in the appendices). WHA's map units (polygons) denote areas of distinctive landtype, soil, hydrologic and vegetative character, that enable technicians to easily crosswalk WHA's vegetation types to CWHR habitat types. Thus, each WHA vegetation type will be cross walked to one of eight CWHR habitat types. The CWHR system uses the following five classification schemes to inform the development of their habitat types: Sawyer & Keeler-Wolf (1995), the USDA Forest Service CalVeg (2001), Holland (1986), Cheatham and Haller (1975) and UNESCO (1996). These five classification systems were also used to crosswalk the WHA vegetation types into CWHR habitat types. Of all the classification schemes, the Holland classification was the most useful because both WHA and CWHR use Holland's classification scheme to describe their respective vegetation types. Therefore, the Holland classification system was used as an intermediary between WHA vegetation and CWHR habitat types (Table 9.8) (Oxbow Environmental 2006). The result of this step is a new GIS shapefile that describes the spatial location and acreage of CWHR habitat types within the Middle Owens River Project area. Future vegetation mapping may not be performed by WHA. Therefore, future vegetation mapping must be able to be cross walked to CWHR habitat types.

Step 2. Assign appropriate size and cover stage classes to WHA's polygons.

Each CWHR habitat type is divided into sub-categories based on vegetation layers which are representative of unique attributes to which wildlife are thought to respond (CWHR 2005). They include tree dominated, shrub dominated, herbaceous dominated, aquatic and developed habitat categories. Each sub-category has corresponding structural components, such as height and canopy cover that are grouped into standardized size and stage classes (Tables 9.9 – 9.11). Size and stage classes refer to vegetation age and vigor conditions. By standardizing size and stage classes, comparisons in suitability values may be made between different habitat types (Oxbow Environmental 2006).

The CWHR habitat types Barren, Pasture and Urban do not have defined size and stage classes (Table 9.12). CWHR defines size and stage classes as structural components based on native vegetation composition and non-managed habitat (Oxbow Environmental 2006). Barren is classified as having a minimal amount of vegetation (≤ 2%) and is therefore not applicable to this classification scheme. Pasture and Urban habitat types are considered to be devoid of native vegetation (Urban) or non-managed habitat (Pasture) (Oxbow Environmental 2006), and are therefore not structurally defined by their vegetation.

Size and cover stage classes will be added to WHA polygons by adding fields to the WHA attribute table and populating those fields with the appropriate CWHR classes. The CWHR program requires data to be in classes (Tables 9.9 – 9.11); therefore quantitative field data must be converted to CWHR classes before being applied to the WHA polygons. Converting raw field data to classes is beneficial as it reduces the problems caused by using multiple data sources collected by many individuals. Most likely monitoring data will not cover every single polygon in WHA's OVLMP mapping. To alleviate this problem, technicians must make estimates based on aerial/satellite imagery and compare to existing data to add stage classes to the GIS CWHR habitat layer created in Step 1.

Several monitoring data can be used to add CWHR size and stage class data to the CWHR habitat GIS layer (e.g., Irrigated Pasture Scoring, Utilization Monitoring and Range Trend). The result of Step 2 is a GIS layer containing polygons depicting CWHR habitat types with stage class data. Technicians will need to export the database file (*.dbf) of the GIS layer from ArcView and import it into BioView to perform the suitability modeling.

CWHR Habitat Type	Holland Vegetation Type	WHA Vegetation Type
Alkali Desert Scrub	Rabbitbrush scrub meadow	Rabbitbrush-NV saltbrush scrub/meadow
Desert Riparian	Modoc-GB cottonwood/willow riparian forests	Riparian Forest (cottonwood)
	Modoc-GB cottonwood/willow riparian forests	Riparian forest (willow)
	Riparian scrub	Riparian forest shrub (rose)
	Riparian scrub	Riparian shrub (willow)
Perennial Grassland	Alkali meadow	Alkali meadow
Freshwater Emergent Marsh	Transmontane alkali marsh	Marsh
	N/A	Reedgrass
	Rush/sedge meadow	Wet alkaline meadow
Riverine	Permanent lakes and reservoir	Water

Table 9.8. Sample Crosswalk CWHR to Holland to WHA

Step 3. Run CWHR Version 8.1 with BioView using database file exported from Step 2.

CWHR Version 8.1 with BioView derives suitability values for indicator species based on habitat type and stage class data. The database file exported from Step 2 must contain four fields; ID which is a unique identifier, CWHR habitat type and size and stage class. The database file exported from ArcView in Step 2 must be imported into BioView. After importing the database file suitability values can be defined for each indicator species selected by the technician. Suitability values can be derived in two formats: Standard Habitat Suitability Values and Habitat Suitability Values Using Fuzzy Logic. The major difference between Standard Habitat Suitability Values and Fuzzy Logic is Fuzzy Logic uses quantitative measurements while Standard Habitat Suitability Values relies on stage class data.

CWHR rates suitability of habitat within three potential use categories: breeding, feeding and cover. Unlike previous versions of the CWHR program, CWHR Version 8.1 with BioView assigns a value to a given habitat type when one or two of the use types are suitable. Those habitat types with no suitability value for any of the three use categories are assigned a 0. When one or two of the use categories are suitable, a value of 1 is assigned. This distinguishes habitats that have no suitability from those that may have provided some value, although minimal. Habitat types with undefined size and stage classes (i.e. Barren, Pasture and Urban) are assigned a value of “1” for size class and “0” for stage class. This is necessary for BioView to be able to process these habitat types and calculate suitability values for each habitat type and indicator species.

It is recommended that technicians adhere to the standards and guidelines outlined in CDFG 2000 and the methods for the CWHR system described in CDFG 2005.

The result of Step 3 is one database file (*.dbf) per indicator species. The database file is compatible with ArcView and will be joined to the CWHR Habitat GIS layer created in Step 2.

Step 4. Join indicator species database file, created in Step 3, to the CWHR Habitat GIS layer created in Step 2. BioView is compatible with ArcView by joining the exported database file from Step 3 to the CWHR Habitat GIS layer created in Step 2.

One GIS layer per indicator species will be created, thus it is possible that 19 (number of indicator species) individual shapefiles will be created. Each indicator species database file exported from BioView will be imported into ArcView and joined to the CWHR Habitat GIS layer created in Step 2. Once joined, the shapefile will need to be saved and named per indicator species. Each polygon’s area (acres) will need to be added to each individual shapefile to determine the quantity of suitable habitat per species in the OVLMA.

It is recommended that technicians use the XTOOLS program to calculate the area of each polygon in each indicator species shapefile. The output from this step enables managers to examine year to year changes in the quantity and quality of habitat for indicator species in the OVLMP project area. Significant changes in an indicator species’ habitat quality or quantity may warrant adaptive management action.

Sites
There are no actual individual sites for the indicator species' habitat monitoring.

Data Management
Project managers are responsible for ensuring that each of the steps described above are carried out correctly. Resultant data from BioView and ArcView applications will be saved per monitoring year.

Data Analysis and Reporting

Statistical Applications
Statistical applications performed for this monitoring task occur in BioView and ArcView and are outlined in the protocols section above.

Future Field Work
It should be noted that HSI models, like the CWHR, are a useful way to reduce large complex data sets to one understandable metric, but they can be flawed. The models are developed from correlations between habitat attributes and species abundance. In many cases the model assumptions are inappropriate for site-specific reasons.[35] For this reason, subsequent habitat suitability data collection efforts in the OVLMP should be CWHR specific and focus on standardizing the methods to best fit the CWHR model.

CDFG provides a field sampling protocol, which is well-established for determining stages in all vegetated habitats (CDFG 2007). Future monitoring should include taking digital photographs of sampling locations when appropriate. Special habitat elements are also defined and include live and decadent vegetation elements such as snags, physical elements such as banks and burrows, aquatic elements, vegetative and animal diet elements and human-made elements (CDFG 2007).

[35] United States Fisheries and Wildlife Service 1982

Standards for Height Classes			Standards for Canopy Closure		
CWHR Code	Size Class	Plant Height	CWHR Code	Closure Class	Ground Cover (Canopy Closure)
1	Seedling Tree / Shrub	<2'	S	Sparse Cover	2-9%
2	Small Tree / Shrub	2-10'	P	Open Cover	10-39%
3	Medium Tree / Shrub	10-20'	M	Moderate Cover	40-59%
4	Large Tree	>20'	D	Dense Cover	60-100%

Table 9.9. Size (height) and stage (canopy closure) classes
for the CWHR tree dominated habitat subdivision. Standards listed are relevant to the Desert Riparian habitat type

Standards for Height Classes			Standards for Canopy Closure		
CWHR Code	Size Class	Crown Decadence	CWHR Code	Closure Class	Ground Cover (Canopy Closure)
1	Seedling Shrub	Seedlings or Sprouts <3 Years	S	Sparse Cover	2-9%
2	Young Shrub	None	P	Open Cover	10-39%
3	Mature Shrub	1-25%	M	Moderate Cover	40-59%
4	Decadent Shrub	>25%	D	Dense Cover	60-100%

Table 9.10 Size (age) and stage (canopy closure) classes
for the CWHR shrub dominated habitat subdivision. Standards are relevant to Alkali Desert Scrub habitat.

Standards for Height Classes			Standards for Canopy Closure		
CWHR Code	Size Class	Plant Height at Maturity	CWHR Code	Closure Class	Ground Cover (Canopy Closure)
1	Short Herb	<12"	S	Sparse Cover	2-9%
2	Tall Herb	>12"	P	Open Cover	10-39%
			M	Moderate Cover	40-59%
			D	Dense Cover	60-100%

Table 9.11 Size (height) and stage (canopy closure) classes
for the CWHR herbaceous dominated habitat subdivision. Standards are relevant to Fresh Emergent Wetland and Perennial Grassland herbaceous

CWHR Habitat Type	Size Class	Stage Class
Barren	None Defined	None Defined
Pasture	None Defined	None Defined
Urban	None Defined	None Defined

9.12 CWHR habitat types with no defined size and stage classes

Reporting
Reporting will occur in each monitoring year following data collection and analysis. Staffs will prepare a report documenting the quality and quantity of habitat for each indicator species and guild.

Frequency
Site scale habitat monitoring will occur in monitoring years 3, 6, 8, 10, 12, and 14.

Adaptive Management for Habitat Monitoring

If habitat measurements do not show that habitat values are being maintained or enhanced, adaptive management actions will be implemented. CWHR habitat acreages for indicator species guilds should be maintained or enhanced over time. Habitat values, as well a CWHR habitat acreages, need to be analyzed and assessed from an appropriate perspective. Managers must have the flexibility to properly examine and interpret results. For example, if land use management results in a localized shift from a shrub dominated community to an herbaceous wetland community type, avian indicator species within the scrubland guild may experience a decline in CWHR habitat acreages. In such a case no intervention might be the best action. However, if CWHR habitat acreages are declining for several species, it could be due to poor grazing management, an exotic species invasion, or new recreational impacts. If management actions need to be taken, flow history can be reviewed and ramping rates modified, fencing installed, grazing management altered, or a series of other actions (see Table 9.17).

9.3.3 Vegetation Assessments

Vegetation assessments for the OVLMP include landscape vegetation mapping and site scale vegetation monitoring.

9.3.3.1 Landscape Vegetation Mapping

Monitoring Purpose

The purpose of the Landscape Vegetation Mapping is to provide managers with a landscape scale measurement of the riverine-riparian vegetation. This assessment will be able to accurately (though not necessarily precisely) monitor the entire project area.

Baseline Data Collected

Baseline vegetation monitoring data consist of mapping, field review and description, accuracy assessment and the correlation of map legends. Because of the nature of vegetation assessment technology, baseline data are described below along with the methods used. Protocols for each step are based upon those defined by Whitehorse Associates in the Middle Owens River Riparian Vegetation Inventory, 2000 Conditions[36] and are described below (the full baseline mapping report is included in the appendices).

Methods

In recent years mapping methods have changed dramatically with the advent of mapping software like ESRI's ArcGIS and the widespread use of remote sensing technology (satellite imagery and digital orthophotography). These two advances in mapping technology have not only reduced the amount of time it takes to map an area, but have also increased the accuracy of maps. The advances in mapping techniques will continue in the future and thus all mapping techniques must be considered for future monitoring in the OVLMP area.

The mapping methods used to collect baseline data are presented here. Since mapping

[36] WHA 2004c

techniques and methods are subject to change in the future based on emerging technologies, future monitoring will likely involve using different or modified methods.

Protocol

Baseline mapping was conducted using high-resolution (2 foot pixels) digital orthophotos dated September 2000. These orthophotos were plotted at 1:4,000 (1 inch = 333 feet) scale on glossy photo-paper at 600 dpi using an HP Designjet 3500 Color Plotter. Areas with distinctive landform/soil, hydrologic, and vegetative character were delineated based on the author's previous experience mapping riparian/wetland features in the Owens Valley[37] and other areas of the Western United States. Distinctive areas were delineated using an ultra-fine point Sharpie marker on the 1:4,000 scale plots backlit on a light table. Delineations were digitized on a large-format digitizer with a magnifier puck set to record continuous points (0.5 mm point spacing). Mapping was compiled and plotted on the same 1:4,000 scale images, which were reviewed in the field. Subsequent map editing was conducted using "heads-up" digitizing at scales up to 1:1,000. Field reconnaissance to validate mapping occurred in fall 2002 and spring 2003.

Map units denote areas of distinctive land type/soil, hydrologic and vegetative character. Land types were distinguished by form and position relative to hydrologic gradients. Hydrologic character was distinguished by color indicative of dominant understory vegetation, viewed in the context of landforms and specified in terms of water regimes. Water regimes were defined based on the frequency and duration of flooding and/or depth to seasonal water table. Vegetation character was defined in terms of physiognomic class and plant species composition. Stream reaches with distinctive valley-form, stream channel morphology and hydrologic character were also identified. Concepts for map units and stream reaches were refined through subsequent field reconnaissance and descriptions.

Field reviews were conducted in fall 2002 and spring 2003. The field reviews in 2002 served to refine mapping throughout the Middle Owens riparian area. The field reviews in 2003 focused on 11 study areas, each including 1 mile of the Owens River. Maps of study areas plotted at 1:2,000 scale served as a basis for further refining mapping and for selecting sites where vegetation, soil and hydrologic attributes were described. These descriptions, coupled with other field observations, are the basis for qualitative descriptions of landtypes, water regimes and vegetation types. Map concepts developed in study areas were extrapolated to reaches (or parts of reaches).

Representative map delineations were traversed to compile a list of plant species. A canopy cover class (T=<1%; P=<5%; 1=5-15%; 2=15-25%; 3=25-35%; etc.) was assigned to each plant species based on ocular estimates. Wetland status for each species was determined from a list prepared for California by the Fish and Wildlife Service. Hydrophytic vegetation was deemed present if the status of more than half of the dominant[38] species was facultative (FAC), facultative wetland (FACW), or obligate (OBL) hydrophytes.

Soil was described at each site that was not flooded. The layer designation, moist Munsell color, texture, degree of wetness (dry, moist, wet, saturated), and the abundance, contrast and color of mottles were recorded for soil horizons to a depth of 3 feet, or to the alluvial ground water level if less than 3 feet. Hydric soil indicators (e.g. aquic moisture regime, reducing conditions, and glayed color) were also noted. Hydrologic parameters (e.g., depth of flooding, depth to free water, depth to saturation) and wetland hydrology indicators were also recorded. Vegetative, soil and hydrologic criteria listed in the Wetland Delineation Manual[39] were used to determine the wetland status of each site.

Additional vegetation descriptions were compiled from two sources:

[37] WHA 1997

[38] To determine which species are dominant, species in each life form (tree, shrub, herbaceous) are ranked by percent canopy cover (highest to lowest); species that make up the first 50% of the total cover for the life form, or that comprise 20% or greater of the total cover for the life form are dominant.

[39] U.S. Army Corps of Engineers 1987

1.) Inyo County Water Department has been monitoring the vegetation of 24 Greenbook parcels in the Middle Owens riparian area since 1991. Vegetation composition was measured annually along approximately a dozen random 50 meter transects in each of the Greenbook parcels. A digital map of transects was generated from starting points and bearing provided by ICWD for 707 transects monitored in 2000, 2001, and 2002. Mapping of 2000 conditions, conducted at 1:2,000 to 1:6,000 scales, is more detailed than the Greenbook mapping, conducted at 1:24,000 scale, which serves as a basis for the ICWD monitoring. ICWD transects were intersected with vegetation, landtype and water regime mapping from the 2000 orthophotos. Transects that were not wholly within a map unit were discarded, resulting in 370 usable transects. Information was used to supplement field vegetation type descriptions for some vegetation type.

2.) Resource Concepts, Inc.[40] measured vegetation composition in four Greenbook parcels in the Middle Owens riparian area that were designated irrigated agriculture (Type E) in 1987. Vegetation composition was measured along about a dozen random 50 meter transects in each parcel. A digital map of 39 transects was generated from starting points and bearings compiled by RCI. Transects were intersected with vegetation, landtype and water regime mapping. Transects that were not wholly within a map unit were discarded, resulting in 31 usable transects. Information was used to supplement field vegetation type descriptions.

A dozen cross-section schematics were developed, 11 of which correspond with the 11 study areas. An additional cross-section was developed in the confined tuff canyon between below Pleasant Valley Dam. Horizontal measures of the distance of map parcels were compiled from the GIS mapping. Relative elevations were interpreted from 10 meter digital elevation models (DEMs), aerial photo interpretation, and field observations. Cross-section schematics were compiled using Adobe Illustrator.

[40] RCI 1999

An average wetland status score was computed for each WHA description site, ICWD polygon and Resource Concepts, Inc. (RCI) polygon (RCI 1999). A numeric rank (Table 9.13) was assigned to each plant species based on the wetland status for California listed in the wetland plant list. The average wetland status score was calculated based on the rank of all species in the site or polygon, weighted by percent composition. An average wetland status class was assigned to each site and polygon based on the average wetland status score.

Table 9.13. Wetland Status Rank

Wetland Status	Rank
Obligate (OBL)	4
Facultative wetland (FACW)	3
Facultative (FAC)	2
Facultative upland (FACU)	1
Not indicator (NI)	0

For the accuracy assessment, three common types of mapping error were identified:

1) Delineation error – putting the boundary of a parcel in one place when it should be in another.
2) Label error – labeling a feature #1 when it should be #2.
3) Inclusions – areas of contrasting types that are too subtle, small or complex to delineate.

The scale of mapping and the specificity of the map unit largely determine the magnitude of delineation error. For broadly defined categories (e.g., vegetation complexes) mapped at small spatial scales (i.e., 1:40,000), the magnitude of potential error is relatively large (100s to 1000s of feet). For more specific categories (e.g., landforms and vegetation types) mapped at large scales (e.g., 1:6,000), the magnitude of potential error is small (< 20 feet). At 1:6,000 scale the narrowest parcels that can be delineated is about 50 feet; at 1:3,000 scale 25 feet; at 1:1,000 scale less than 10 feet. The 2000 digital orthophotos can be viewed at scales up to about 1:1,000 with good resolution. The goal was an average delineation error, relative to the 2000 digital orthophotos, less than 5 meters.

Label error (e.g., labeling a parcel "marsh", when it was actually "wet meadow") is influenced by the specificity at which map units are defined and the medium from which they are drawn. Distinguishing very specific classes of vegetation that appear similar on aerial photos (e.g., communities dominated by *Salix gooddingii* versus *Salix laevigata*) would result in a high degree of label error. Label error can be controlled by appropriate design of distinguishable map units. The frequency of label errors is also influenced by the resolution of the map base (e.g., aerial photos) and the experience of the interpreter. The goal was less than 5% overall label errors.

Inclusions of contrasting types are common in all map units. Inclusions may include gradual transitions between similar vegetation types and/or small areas of contrasting vegetation scattered in the parcel. The goal was less than 15 percent inclusion of any contrasting type and less than 30 percent inclusion of similar types.

A product of the study was a map with consecutively numbered parcels, each labeled with vegetation type, landtype and water regime. Parcels were randomly selected for a field accuracy assessment using the following sequence:

1. Parcels were sorted by size (area); parcels less than 1 acre were eliminated from further consideration.
2. Parcels were sorted by vegetation type and sequenced by parcel number (#).
3. A random number generator was used to select 20 parcels of each vegetation type based on the sequence for that type.
4. The 20 selected parcels of each vegetation type were evaluated for accessibility. Parcels that were difficult to access were eliminated from further consideration.
5. A random number generator was again used to select 10 of the accessible parcels of each major vegetation type and 3 parcels of each minor vegetation type for the field accuracy assessment.
6. The outlines of selected parcels were plotted on an aerial photo background and labeled with the parcel number (#) for use in the field. The UTM coordinates were also listed to facilitate use of a GPS to confirm the location of the parcels in the field.

Field assessments were conducted in spring 2003. The dominant landform, water regime and vegetation type were identified for each parcel. The accuracy of map boundaries and inclusions of contrasting types were also noted during field assessments.

In the office, field determinations of landform, water regime and vegetation type were compared with map attributes. The percent label error was tabulated for each vegetation type. The overall label error was estimated as the average error for all vegetation types, weighted by the total number of parcels of each type. An overall error rate for wetland versus upland was also estimated. The target overall rate was less than 5 percent. An example of the final mapping for the area around study site 1 is displayed in Figure 9.4.

Plant species cover and frequency for combinations of vegetation type, landtype and water regime served as a basis for correlating map legends and served as a basis for testing classifications of vegetation associations and/or more general vegetation series.

WHA and selected ICWD (1998-2000), Garcia and Associates (GANDA) and RCI vegetation data were assembled into a common format. Selected transects were those that occurred entirely within a single WHA parcel. Where multiple ICWD and RCI transects were present within a single WHA parcel, cover values were averaged for the parcel prior to pooling. The pooled vegetation data served as a basis for discriminate analysis to test the vegetation classifications.

Discriminate analysis was conducted using a reduced data set of selected plant species. Selection entailed the following sequential steps:

1. Similar species that are diagnostic of the same type (i.e. occur in similar

habitats) were combined into a broader species class
   a. SALIX = SALGOO + SALLAE + SALIX [TREE]);
   b. SCIRPUS-TYPHA = SCIACU + SCIAME + SCIMAR + TYPLAT + TYPDOM + TYPHA;
   c. JUNCUS = JUNBAL + JUNCUS + JUNMEX;
   d. ELOCH = ELEMAC + ELEOCH + ELEPAL+ ELPAR + ELEROS;
2. The percent composition of plant species was calculated for understory (grass-like + forb) and overstory (shrub + tree) layers for each of the 307 parcels.
3. Species that comprised < 10 percent composition in all 307 parcels were not considered.
4. Species with ≤ 5 percent cover in all 307 parcels were not considered.

The selection reduced the number of species used for ordination analysis from 189 to 58.

Sites
Encompass the entire riverine-riparian area in the landscape scale vegetation mapping.

Frequency
Conduct landscape scale vegetation mapping in years 2, 5, 7, 9, 11 and 15.

Data Management
Store the digital imagery obtained in its original media format (CD-ROM or DVD) (which will not be modified) and on the project server located at LADWP's Bishop office (for use in analysis). Store the landform classification maps derived from the imagery as ESRI shapefiles on the project server.

Data Analysis and Reporting

Statistical Applications
In addition to the analyses described in the methods section above, generate summary statistics for each monitoring year. Present descriptive statistics like acres of vegetation type, landtype and water regime for the reach, lease and management area scales. Calculate the difference in acres of each vegetation type and water regime. Measure patch diversity per reach using the Shannon-Weiner diversity index (H') (Shannon index) to monitor biodiversity in the LORP area. The Shannon index is calculated as:

$$H' = -\sum_{i=1}^{s}(p_i)(\ln p_i)$$

Where S = # of acres per reach, p_i = the proportion of S consisting of the i^{th} community.

GIS Applications
See above.

Reporting
Monitoring results will be prepared annually, where applicable, and included in annual monitoring reports.

9.3.3.2 Site Scale Vegetation Assessment and Landform Elevation Mapping

Monitoring Purpose

Site scale (scale of site ~ 1:0000, sites mapped at 1:2000 scale, refined at 1:500 scale) vegetation assessment methods and protocols are composed of vegetation transects, subplots, landform and vegetation community type mapping. The site scale vegetation assessment and landform elevation mapping are designed to inform managers about riparian conditions at a larger scale (finer resolution) than the existing Greenbook and White Horse Associates (2004) community type mapping efforts, which were performed at the landscape scale. The landscape scale vegetation monitoring operates on a coarse scale, informing managers about broad changes in the entire riverine-riparian landscape. The site-scale vegetation methods will be able to detect more subtle changes in vegetation in response to management actions. This data will enable managers to analyze changes in community composition and structure, patch dynamics, wetland indicator status, reach and community type diversity and several other measures. The objective of landform and elevation modeling is to establish the baseline geomorphic landforms and height above water surface elevation as they relate to riparian vegetation to determine future changes in riparian vegetation and geomorphology. The vegetation transect data, subplot data, landform and elevation data and community type mapping occur at selected sites upstream of Tinemaha Reservoir (reaches 1-6) (Figure 2.2). One site for each of the 6 reaches was selected for site scale vegetation sampling (1,4,8,10,13,17). The data were designed to detect change within areas that managers have the ability to effectively manage through flow and land management. Managers have a greater ability to change management within these areas than within the uplands and reaches 7 and 8.

Baseline Data Collected

Vegetation Transect Data

- Vegetation patch species composition and structure - dominant species ranked within 6 structural levels,
- Length of vegetation patch
- Collected at transects in each of the six reaches.

Subplot Data

- Canopy cover for each species in 2 m x 2 m plots
- Ground cover in 2 m x 2 m plots

Landform and Elevation Data

- Elevations (above water surface) and lateral distances of landforms, as well as water surface elevations at the river channel
- Riparian vegetation type along transects

Vegetation Mapping Data

- Aerial extent of vegetation communities
- Map units are ≥ 4 m^2 (2 m x 2 m) mapped at 2 km study plots
- Number, age/size class, condition and landform for native riparian hardwood species

Methods

Protocol

Transect Sampling

The purpose of the vegetation transect data is to work in conjunction with mapping and other sampling efforts to describe the riparian vegetation communities of the OVLMP project area. Therefore, transects were sampled at the same site locations as the site scale mapping and sub plots. Study sites are aligned with the river channel. Because of the meandering nature of the Middle Owens River, it was logistically practical and more scientifically meaningful to have all transects within each plot parallel to one another. Sites are 500 m in length, and transects occur every 50 m within each site (11 transects over 500 m). Each transect extends away from both sides of the wetted area of the channel through the riparian zone toward the upland zone. Transects extend laterally (perpendicular) from the center axis of the site to the edge of the riparian vegetation and encompassing the entire historic floodplain (as judged by examination of aerial photography). Fence posts were installed at what appeared to be the edge of the riparian vegetation (or the top of the terrace), to mark the outer end of each transect. Each fencepost was labeled according to site and transect. GPS locations of each fence post were recorded. Figure 9.3 shows an example of the transect layout at site 1.

Along each transect, the area covered by unique plant communities was determined via a modified line-intercept method.[41] Dominant species were ranked by percent cover within each community patch (sample unit) in each of the 6 vegetation layers (upper canopy, lower canopy, high shrub, low shrub, high grass/herb, low grass/herb). The three species with the highest estimated canopy cover in each layer were recorded as dominant, 1st sub-dominant, and 2nd sub-dominant. A minimum of 5% canopy cover (within the community patch) was required in order for a species to be eligible for inclusion. Species are recorded by their 4-letter acronyms. Dominant and sub-dominant species within the same layer were recorded in order of dominance and separated within each layer by dashes (-). Structural layers were separated by slashes (/). The length of the transect segment that traveled through the patch was measured using a sonar range finder or measuring tape. Fencepost locations, maps, compass, and GPS units were used to facilitate navigation. Digital photographs of sampling locations were taken, when appropriate.

[41] Winward 2000

Figure 9.3. Aerial image of site 1
Transects traversing the riparian zone (shown as red lines) and fence posts (shown as green dots).

Subplot Sampling
The purpose of this protocol is to describe in more detail the vegetation community polygons created through the mapping protocol by intensively sampling small plots within the polygons. Within each site, 40 vegetation polygons were randomly selected using GIS software. Within these selected polygons ESRI's ArcView computed the center of mass point. The centermost point was used to avoid edge effects in small patches. To accurately characterize the larger polygon shapes, four random points were added to those larger than 0.5 acres. At all of these points, subplots (2 m X 2 m) were sampled using the protocol described below.

UTM coordinates of subplot locations were loaded onto field GPS units and maps of subplot locations were provided. Field technicians navigated to the appropriate subplot location using the GPS unit and map. If, for some reason, the field technicians were unable to navigate to the prescribed point in the selected community polygon, they selected a reasonable new location close as possible to the center of the polygon and recorded the UTM coordinates with the GPS unit and on the map.

Subplot sampling is conducted using a series of 2 m x 2 m subplots to provide more detailed information about vegetation communities. After transect data are collected, five communities are randomly selected from the sampled patches using accepted methods (e.g., random number generation). Establish a subplot at each of these randomly selected communities. Locate subplots adjacent to the transect line (sharing one 2m side) in the center of a community. Subplots share their downstream edge with the transect on which they are located.

Within each subplot, record canopy cover for each species. Canopy cover is a percentage of the 2 m x 2 m area covered by each species when viewed from above. To understand this estimate, it is best to imagine a 2m x 2m column extending from the quadrat upwards through the canopy. Because several structural layers may exist, the cover percentages may collectively total more than 100%. For example, a willow may have 90% canopy cover in a plot, with a rush having 70% canopy cover in that same plot. To be considered for inclusion in canopy cover estimates, herbaceous plants must be rooted within the subplot, while trees and shrubs need not be rooted within the plot. Record species using their 4-letter acronyms and a percent cover estimate (to the nearest whole percentage). Determine ground cover for each subplot. Unlike canopy cover estimates, ground cover estimates always total 100%. Divide ground cover into litter, rock, bare ground, downed wood, vegetation, cow manure and other (specify). Take digital photographs of sampling locations when appropriate.

Landform and Elevation Methods
Assess the physical condition of the river channel and adjacent landforms using transects that dissect the river corridor at predetermined locations (locations and site selection are described above). Measure landforms, which include the Owens River channel, streambank, cutbank, floodplain, bench and terraces at cross channel transects within each of the plots (see Figure 2.2 for plot locations and Table

9.13 for a description of landforms). Measure landform elevations (above the channel bed or water surface) and distances along each transect. Each cross channel transect illustrates the height of the landform above the water surface elevation (WSE), except for those plots located in the dry reaches of the river below the intake. Attain the height above WSE and length along the transect of each riparian landform (see Figures 2.15, 2.16 and 2.17) using a laser transit that records horizontal distance, vertical height and bearing in degrees.

Site Scale Mapping
Site scale mapping methods roughly follow those developed for Rush Creek in the Mono basin by Kauffman et al.[42] In the field, all vegetation plant communities (patches) 4 m^2 in size are identified and the boundaries of all stands are mapped on a Mylar sheet placed over a digital aerial photograph (scale:1:2,000) at all 6 of the Middle Owens 500m riverine-riparian study sites. Use multiple aerial photographs to map each site. For each mapped patch ($\geq$4 m^2) determine and label on the map the dominant species in the tallest layer (overstory) and the understory (if possible). In order to quantify the native riparian tree demography, record age/size class data for all native riparian trees within each riparian hardwood patch. Estimate the diameter at breast height (dbh) and record as one of the eight size classes and four plant status categories listed in Table 9.16. Select the geomorphic surface that the riparian hardwood patch is rooted in from the list in Table 9.15 and recorded.

In the lab, scan and fit together into a mosaic the field maps drawn on Mylar sheets using Adobe Photoshop and import them into ESRI's ArcView. Overlay the scanned field maps over the digital aerial photographs and properly align them. Use this layer in ArcView as a guide from which digitize shape files for all communities mapped. Generate associated attribute tables for each shape. The site maps may be crosswalked to any vegetation classification system that is desired. An example of the site-scale mapping for site 1 is provided in Figure 9.4 in a side-by-side comparison with the landscape scale mapping with the same vegetation classification system.

[42] Kauffman et al. 2000

Landform	Description
Channel	Area inundated by water with depth of at least five centimeters.
Streambank	Area of incline between flowing water and crest of active channel or edge of floodplain.
Floodplain	Area of relatively flat land adjacent to streambank, historically inundated by flowing or non-flowing water during periods of high (out of channel) discharge.
Bench	Level or sloped area between floodplain and terrace.
Terrace	Area of elevated terrain outside of riparian area representing the dissected remnants of an abandoned floodplain, Stream bed or valley floor produced during a former stage of deposition.
Cutbank	Area of incline between flowing water and terrace when no other landforms are present.

Table 9.14. Definition of landform terms used in OVLMP.

Abbreviation	Landform	Definition
CB	channel bed	The active channel bed; area frequently inundated with water
SB	stream bank	An inclined area connecting an active channel with a floodplain.
DB	depositional bar	An area of alluvium deposited by hydrologic flow.
FP	floodplain	A relatively flat area periodically inundated by flow events.
BN	bench	An inclined area connecting two landforms.
OM	old meander	A low lying area that is a remnant of a past channel meander.
TR	terrace	A flat area too far above the channel to be frequently inundated. Many formed by ancient fluvial processes.
HL	hill slope	A steeply inclined upland area that confines the channel or the riparian zone.

Table 9.15. Geomorphic Landforms and Definitions.

<u>Sites</u>
Study Design and Site Selection
Site scale vegetation monitoring consists of vegetation transect and subplot sampling, landform and elevation modeling and vegetation community mapping efforts. These fine scale sampling techniques occur at 2 m X 2 m subplots in each of the OVLMP river reaches (see Section 2.4 and Figure 2.2). The study plots were selected to be representative of each reach, encompassing the range of vegetative, geomorphic and environmental conditions, as well as grazing management approaches. The data were designed to detect change within areas that managers have the

ability to effectively manage through flow and land management.

Class	Description	
1	seedlings <0.5 m tall	
2	established small shrubs 0.5-1.3 m tall	
3	tall shrubs >1.3 m tall and 0-2.5 cm dbh	
4	young trees 2.5-10 cm dbh	
5	trees 10-20 cm dbh	
		<u>Plant status</u>
6	> 20 cm dbh	a. vigorous
		b. in decline 25-50% of crown dead
		c. in decline >50% of crown dead
		d. Snag – tree is dead
7	> 30 cm dbh	a. vigorous
		b. in decline 25-50% of crown dead
		c. in decline >50% of crown dead
		d. Snag – tree is dead
8	> 40 cm dbh	a. vigorous
		b. in decline 25-50% of crown dead
		c. in decline >50% of crown dead
		d. Snag – tree is dead

Table 9.16. Age/size class classifications for riparian woody

<u>*Frequency*</u>
Site scale vegetation assessments will be performed in years 3, 6, 8, 10, 12, and 14.

Data Analysis and Reporting

<u>*Statistical Applications*</u>
Error check the raw transect data entered into an Excel spreadsheet. The Excel transect data spreadsheet consists of species ranked by dominance within each of six structural levels for each patch sampled.

<u>*Data Management*</u>
Technical staff will enter transect and subplot data into Microsoft Excel. Enter the landform elevation data into AutoCAD. Enter mapping data into ArcView GIS, create shape files and populate attribute tables. Record the name of the staff entering the data on the original field form. The technical staff entering the data will be responsible for reviewing and correcting any data transcription errors.

Transform the raw transect data spreadsheet into a matrix of values recognizable by PC-ORD (or another appropriate statistical software program). Import the matrix into the software program for analysis. The matrix consisted of ranked species scores for each community patch measured. Assign a ranked score to each species in each transect patch sampled as follows: dominant species=3, 1st subdominant= 2, 2nd subdominant =1. Assign these ranked scores at each of the 6 structural levels. All non-dominant species receive zeros, which will result in a high number of zeros in the data set. To find groups with the strongest species associations (community types) use hierarchical agglomerative cluster analysis. The basic idea behind this method is to find the two entities (rows or transect patches) that are the closest to each other in species-space, merge them and then find the next two closest entities, merge them and so on until there is eventually one group. The cluster analysis will group the patch data into community types, which can then be cross-walked to any classification system desired, including those used by White Horse Associates, the Green Book or Holland (Calveg).

Enter vegetation subplot data into an excel spreadsheet and then error check. Summarize these data to provide more detail on the vegetation communities delineated through the transect data analysis.

Enter landform and elevation survey base data into an AutoCAD drawing file format. CAD drawings are cross sectional illustrations of each transect and include elevation above sea level for each transect landform and WSE with elevation data to form a three dimensional diagram of each complete plot. Display measurements of heights and distances in meters. Each fencepost location serves as a permanent benchmark from which future changes can be monitored. Riparian vegetation and landform and height above WSE associations can aid in the understanding of ecological processes and provide prescriptions for future adaptive management strategies. The data obtained using the above described methods serve as a baseline from which future measurements can be taken. Each cross channel transect was established with fenceposts that serve as benchmarks. The entire transect does not need to be resurveyed during future monitoring efforts. This will allow future change detection to be relatively uncomplicated and straightforward. Enter new elevation data into the existing AutoCAD digital models, update water surface elevation, water spreading and vegetation.

GIS Applications
Import each elevation point along the transects where landform attributes (height and distance locations) were recorded into a GIS (e.g. ESRI ArcView). Convert these points into a shapefile and overlay on the plot vegetation plan maps.

Reporting
Staff will submit a report following data collection and analysis in each monitoring year.

Adaptive Management for Vegetation Monitoring

If vegetation monitoring data do not show that vegetation resources are being maintained or enhanced, adaptive management actions will be taken. Managers must have the flexibility to properly examine and interpret results. If vegetation transects reveal an increase in cut banks and bank sloughing, flow data may be examined to determine if proper ramping rates were used. Adjustments to these rates may be possible. Site-scale vegetation monitoring may reveal an increase in exotic species; managers may determine that an eradication effort, in conjunction with grazing management modifications, should be employed. Vegetation monitoring may detect new recreational impacts, as new roads and parking areas will be detected by mapping efforts. If management actions need to be taken, flow history can be reviewed and ramping rates modified, fencing installed, grazing management altered, or a series of other actions, summarized in Table 9.17 could be employed.

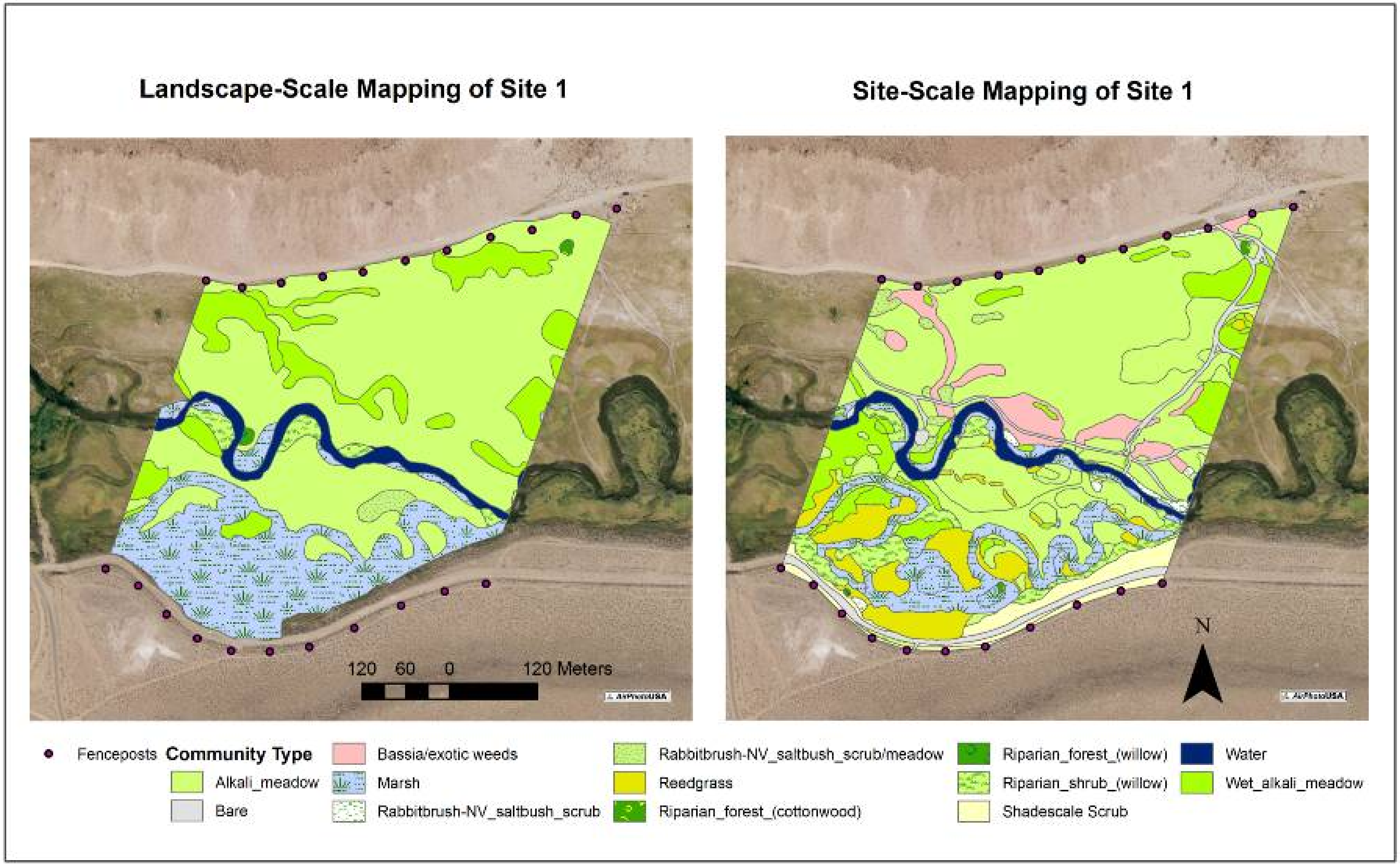


Figure 9.4 Site-scale and landscape-scale mapping at site 1.

The site-scale vegetation communities have been assigned the same classification system as the landscape-scale mapping for comparison purposes. Site-scale mapping differentiates bare areas like roadways, invasive plant populations, and differences in vegetation types that appear similar on the orthophoto used for landscape scale mapping. Often with remote sensing (Landscape-scale mapping) differences in vegetation density are interpreted as a community change when they are simply a change in live foliar cover (see northwest quadrant of site 1 maps). However, landscape scale mapping covers the entire project area, and provides reliable results for the scale at which it is mapped.

9.4 Land Management Monitoring

Chapter 3 of this plan describes the grazing management plans for the 50 leases in Inyo County, which were developed to address livestock management issues and provide guidelines for better watershed management. The plans focus on enhancing native habitat diversity while allowing for sustainable grazing. The plans address riparian areas, irrigated pastures, and areas with sensitive species or habitats.

This section details the three types of monitoring that will take place that are directly related to the management of livestock grazing: irrigated pasture condition scoring, utilization and range trend. Irrigated pasture condition scoring is a tool used by managers to systematically track the condition of irrigated pastures. Utilization monitoring tracks the amount of biomass removed from non-irrigated fields. Range trend tracks the long-term effects of grazing and livestock management prescriptions on the grazing resource. Range trend and/or irrigated pasture condition will be monitored on all leases. Range trend and pasture condition scores will help guide future grazing management decisions. Range condition monitoring on non-irrigated upland habitats will be conducted at permanent transect locations.

9.4.1 Irrigated Pasture Condition Scoring

Monitoring Purpose

Irrigated pastures are classified as any portion of the lease where the lessee receives an irrigation duty and is charged an additional fee for this irrigation. LADWP and the lessees will jointly determine irrigated pasture condition using the Natural Resource Conservation Service (NRCS) Pasture Condition Scoring system[43] (see appendices). The NRCS Pasture Condition Scoring system systematically evaluates pasture health and the effectiveness of management in terms of optimizing plant and livestock productivity while minimizing detrimental effects to soil or water resources. The rating system also helps identify management options needed to improve condition and productivity.

Baseline Data Collected

Baseline irrigated pasture condition scoring data were collected on all leases in order to provide lessees feedback about current (pre-project) conditions. Knowledge of pre-project pasture condition may ease the transition to compliance with standards. This baseline period also allowed LADWP staff to refine data collection methodologies and develop the tools needed to effectively and efficiently monitor long-term pasture condition trends. The methods described below represent the current and planned monitoring methods.

Methods

Protocol
Field crews walk random transects throughout the entire irrigated pasture, or through the entire area of a pasture that is irrigated. Generally, the boundary of a pasture is walked first, and then the interior of the pasture is crisscrossed. This allows the raters to evaluate the entire pasture and all factors that contribute to the pasture condition score, including the condition and location of irrigation structures, and the condition and distribution of the livestock. Topics that are scored include (see sample data sheets in appendices):

- Percent desirable plants
- Plant cover
- Plant residue
- Plant diversity
- Plant vigor
    - Soil fertility
    - Severity of use
    - Site adaptation of desired species
    - Climatic stresses
    - Soil pH
    - Insect and disease pressure
- Livestock concentration areas
    - Uniformity of use
- Erosion
    - Sheet and rill
    - Streambank, shoreline and gully
    - Wind

[43] Cosgrove, et al. 2001

- Percent legume
- Soil compaction

When the evaluation team has completed their walking assessment, each indicator is scored, the scores are totaled and an overall score is assigned for the pasture. Not all 10 indicators may be appropriate for use in every pasture. In this case, using less than 10 indicators will reduce the possible score, but the percent rating will still be comparable. Take digital photographs of pasture condition when appropriate.

Sites
Each irrigated pasture or that portion of a field that is irrigated is evaluated in its entirety.

Frequency
Annually monitor pastures below the minimum 80% score. Pastures between 80 and 90% are monitored bi-annually. Pastures scoring over 90% are evaluated every 5 years.

Data Analysis and Reporting

Data Management
Data for each pasture that is evaluated is compiled in the Irrigated Pasture Condition Database. The field crew leader is responsible for collecting all completed field forms and delivering them to LADWP offices in Bishop in person. All original field forms will receive a document control number and will be filed and retained for a minimum of 15 years at LADWP offices in Bishop. In addition to retaining hard copies, all field forms will be scanned and filed electronically (e.g., PDF) at LADWP offices.

For quality assurance purposes, at least one person familiar with identification of local flora species and vegetation types and with use of the sampling methods will be included in each field crew. Training will be conducted in the field by the task leader before the first sampling activity and as needed (e.g., when a new examiner is added).

Statistical Applications
Pasture condition scoring involves the visual evaluation of 10 indicators, each having five environmental conditions.[44] Each indicator is rated separately and the scores are combined to get an overall score for the pasture. The overall score can then be divided by the total possible score to give a percent rating (overall score ÷ total possible score × 100 = percent rating).

GIS Applications
There are no applicable GIS requirements for irrigated pasture condition scoring.

Reporting
Monitoring results will be prepared annually, where applicable, and included in annual monitoring reports.

Data Integrity and Quality Assurance

Quality assurance activities for the irrigated pasture monitoring task consist of the following:

- Before leaving each sample site, a field crew member other than the person who collected the data, will review the data to ensure that they are complete, legible, accurate, and in standard format. Errors will be corrected with a line drawn through them and the correct term or value written above. Data that are considered suspect will be flagged. Flagged data will be described in a comments section.
- Technical staff will enter the data into spreadsheets such as MS Excel. The name of the staff entering the data will be recorded on the original field form. The technical staff entering the data will be responsible for reviewing and correcting any data transcription errors.
- Lead project manager will review all flagged data and make the ultimate decision to exclude any data from use in further analyses.

Adaptive Management for Irrigated Pasture Condition

Irrigated areas within the lease that score 80% or greater will be considered in good to excellent vegetative condition. These areas

[44] Cosgrove et al., 2001

will not be subject to any changes in grazing management. Irrigated pastures scoring less than 80% will receive needed changes in management prescriptions.

Adaptive management measures may include, but are not limited to, changes in forage utilization, water management, fertilizer application, seeding, livestock numbers, season, or duration of use. Necessary changes will be determined by LADWP in consultation with the lessees. These standards only apply to those portions of pastures or fields classified as irrigated on lease maps. If rare plants occur on irrigated pastures or fields, forage utilization criteria and duration and timing of grazing may be modified, as needed, to protect these species.

Where poor pasture conditions exist, individual ranch lessees will be consulted to determine what factors are contributing to those conditions, and what can be done to ensure future pasture management is consistent with OVLMP goals.

9.4.2 Utilization

Monitoring Purpose

The grazing management plans described in Chapter 3 identify grazing utilization standards for upland and riparian areas. Utilization is defined as the percentage of the current year herbage production consumed or destroyed by herbivores.[45] Grazing utilization standards identify the maximum amount of biomass that can be removed by grazing animals during specified grazing periods.

This section describes the methods used for determining grazing utilization in upland and riparian areas on LADWP leases. Land managers can use this data to document the percent of biomass removed by grazing animals and determine whether or not grazing utilization standards are being exceeded. Utilization data collected on a seasonal basis will determine compliance with grazing utilization standards, while long-term utilization data will aid in the interpretation of range trend data and help guide future grazing management decisions.

Baseline Data Collected

Baseline utilization data were collected on all leases in order to provide lessees feedback as to current (pre-project) levels of utilization. Knowledge of pre-project utilization levels may ease the transition to compliance with utilization standards. This baseline period also allowed LADWP staff to refine data collection methodologies and develop the tools needed to effectively and efficiently monitor utilization on a long-term basis. The methodologies described below represent the current and planned monitoring methods with all the refinements incorporated.

The grazing season is defined as the temporal period when livestock first enter a pasture until they are removed from that pasture. The majority of the fields on LADWP leases are currently grazed continuously from fall to late spring. Baseline utilization data collection was initiated in 2007. Mid-season utilization monitoring was conducted well before livestock were removed from a field (generally February/March), and again at or near the end of the grazing season (May/June).

Monitoring sites associated with a range trend transect were selected to represent the use in the vicinity of that transect. Monitoring sites not associated with a trend transect were selected at random from an aerial photo. This additional sampling was conducted to provide improved coverage in large fields or when use appeared to be unevenly distributed in a field.

Methods

Utilization will be monitored using the height-weight method[46], which is based on the allometric relationship between the height of a plant and the distribution of biomass within the plant. This method results in an estimate of the amount of biomass removed from an area based on knowledge of what the average height of ungrazed plants of a particular species is, and a determination of the average

[45] Holecheck et al. 2004

[46] BLM 1996

height of the grazed plants of that same species. Determining the percent of biomass removed based on the average height of grazed plants requires the use of a height-weight relationship curve and a best-fit regression equation.

LADWP developed height-weight relationship curves for native forage species in the Owens Valley using locally-collected plants. A description of the methodology used to develop height-weight relationship curves can be found in the "Herbaceous Removal Methods" section of Utilization Studies and Residual Measurements.[47]

Utilization monitoring will focus on the use of graminoids (grass and grass-like species), which are the main forage base for livestock on DWP lands. The species monitored in each area will depend on the occurrence or abundance of each species along each transect. The forage species typically encountered on DWP lands include alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distichlis spicata*), and creeping wild rye (*Leymus triticoides*).

Protocol

Grazing utilization data are collected by walking along transects, stopping every 6-8 steps and recording the height of plants that are closest to the toe of your shoe. Take digital photographs of sampling locations when appropriate. The distance between measurements (in terms of number of steps) is selected by the observer, based on the size of the field and the spacing of the plants. Information about transect, field or livestock use of the field is noted on the utilization datasheet.

The following directions are provided for field crews and lessees conducting utilization monitoring. In order to measure plant heights, follow the following six steps:

1) At each measuring point and for each forage species, select the plant closest to the toe of your shoe for sampling. Plants unavailable to grazing animals (i.e., plants growing in the center of a shrub or beyond the reach of an animal) should not be sampled.
2) Only sample plants within a one-meter radius half-circle, forward of the frontal plane of your body. Collect height data on all forage species at each measuring point. If there are no forage species to sample a particular stopping point, continue another 6-8 steps to the next sample area.
3) For rhizomatous/sod-forming species, select a two-inch diameter bundle of the grass to measure when individual plants cannot be identified. For bunch grasses, sample a two-inch diameter bundle.
4) Determine whether or not the plant has been grazed.
5) If the plant has not been grazed, measure the tallest part of the plant. If an inflorescence is present, measure to the tip of the inflorescence. If no inflorescence is present, or if the flowering parts are below the height of the tallest leaves, take the measurement after pulling the leaves up along the vertical axis of the plant (so that you are essentially measuring length of the leaves).
6) If the plant has been grazed, determine whether the plant has been evenly- or unevenly grazed (are all grazed parts the same height or not). If the plant has been evenly grazed, measure the height of the grazed plant. If the plant has been unequally-grazed, you must determine the average height of the remaining biomass taking into consideration the distribution of biomass within grass plants (i.e., in most species, the bulk of the biomass is distributed near the base of the plant).

The average height of ungrazed plants by species is needed in order to calculate utilization using height-weight curves. In most cases, ungrazed plant height data will be obtained after the peak of the growing season and before the start of the grazing season. Initially, ungrazed heights will be collected at the majority of permanent utilization transect locations. In an effort to reduce redundant sampling, data will be analyzed for differences in mean ungrazed heights among fields and utilization transects. If the analysis reveals no

[47] BLM 1996

difference in the mean ungrazed height of a species between two transects and among years, data will be pooled for analysis.

Field crews and lessees should execute the following eight steps to determine average ungrazed heights of forage species:

1) Ungrazed heights for forage species will be collected after the peak of the growing season and before the start of the grazing season (between late July and October).
2) Navigate to the utilization transect location using a handheld GPS and/or maps.
3) Following the general trajectory of transect, start walking the transect. It is not necessary to use a sampling tape.
4) Stop every 6-8 steps and locate the plant of each key species closest to the toe of your shoe. If a plant has been grazed by any animal, trampled, run over, or does not have a fully-developed or intact inflorescence, choose the next closest plant of the same species to measure.
5) If 80% or more of the plants (by species) in an area are culm-producing, then measure only plants that produced a culm.
6) If 80% or more of the plants (by species) in an area are not culm-producing, then measure only plants that are culm-less. If the majority of plants are culmless, and a culmless curve should be used, this should be noted on the datasheet.
7) Individual plants subject to significantly different localized growing conditions should not be selected for measurement (e.g., "leggy" plants growing in the middle of a shrub, highly shaded plants).
8) Collect a minimum of 20 samples of ungrazed plants of each key species at each transect location.

Sites
Utilization monitoring will be conducted in both upland and riparian areas, with an emphasis on grass-dominated communities such as alkali meadow, wet meadow, and shrub-meadow habitats. Priority will be placed on monitoring utilization in the vicinity of range trend transects, the majority of which are located in the Owens River floodplain. At a minimum, one utilization transect will be assessed at each range trend transect location. This will assist in the interpretation of range trend in the context of utilization history. Utilization monitoring will also be conducted in other grass-dominated sites or other areas of resource concern. The total number of transects per field or lease will ultimately depend upon data needs and staffing levels.

Permanent utilization transects will be established at all range trend transect locations. Additional permanent utilization transect sites will be selected through a random site selection process using ArcView. These transects will have a permanent starting location and a specified direction of travel, but may vary in length depending upon the spacing of plants, and therefore the distance of travel needed to obtain an adequate sample size. As was the case during baseline monitoring, a stratified-random approach will be used to select areas for monitoring utilization whereby vegetation will be stratified by community type and random sites will be selected within grass-dominated communities.

Frequency
Utilization monitoring is conducted annually over the life of the project. The grazing season is defined as the time period when livestock first enter a pasture until they are removed from the pasture. The majority of the fields in the leases are currently grazed continuously from fall to late spring.

Data Analysis and Reporting

Data Management
The datasheet forms provide check boxes for each step that must be taken to complete the data compilation process. Check boxes should be checked, initialed and dated after each step is completed. The steps involved in data compilation are:

1) Data sheet review: Datasheets will be reviewed by one of the field crew members and the project manager for completeness prior to data entry.
2) Photo download: Any photos taken during monitoring will be downloaded and renamed.
3) Naming of reference photos: Photos will be renamed according to a standard

naming format and the name assigned to the photo will be recorded on the datasheet. A spreadsheet will also be developed to track the availability of reference photos.

4) Data entry: Data will be entered into the Grazing Utilization MS Access database
5) Data entry verification: Data will be checked for data entry errors.

The grazing utilization database will allow data to be examined in a number of different ways. Use of individual species on an individual transect will be the finest level of analysis. These data can then be scaled to examine average use along each transect, use within individual fields and overall use on a lease.

The locations of each utilization transect will be transferred to aerial photos in order to provide visual representation of sampling activities. Grazing utilization data may be useful in modeling the impacts and effects of grazing combined with other various land management activities through time; however, this potential aspect of the project has not been explored to date. Monitoring results will be prepared annually where applicable and included in the annual monitoring reports.

The field crew leader will be responsible for collecting all completed field forms and delivering them to LADWP offices in Bishop in person. All original field forms will receive a document control number and will be filed and retained for a minimum of 15 years at LADWP offices in Bishop. In addition to retention of hard copies, all field forms will be scanned and retained in an electronic format (e.g., PDF) on a hard drive at LADWP offices.

For quality assurance purposes, at least one person familiar with identification of local flora species and vegetation types and with use of the sampling methods will be included in each field crew. Training will be conducted in the field by the task leader before the first sampling activity and as needed (e.g., when a new examiner is added).

Statistical Applications

Utilization for each species along each transect is calculated using species-specific height-weight algorithms. These algorithms calculate the percent of biomass removed as a function of the percent of height that has been removed. The reference height used to determine the percent of height that has been removed from the current year growth will be the average ungrazed height values obtained prior to grazing each season. The percent of biomass removed will be calculated for each sample. Ungrazed samples are assigned a percent use of zero regardless of the height of the plant.

In an effort to reduce redundant sampling, data will be analyzed for differences in mean ungrazed heights among fields and utilization transects. If the analysis reveals no difference in the mean ungrazed height of a species between two transects and among years, data will be pooled for analysis.

Performance curves[48] were used to determine the sample size required to obtain a reliable estimate of the average ungrazed plant heights. Performance curves plot sample number versus the cumulative mean of all samples. Sample size is sufficient when the calculated mean ceases to fluctuate, despite variations in individual samples. The performance curves of approximately 40 samples were examined to determine an adequate sample size for determining mean ungrazed heights. The majority of the curves leveled off between 7-10 samples, however for some locations, 13-15 samples were required. Thus a minimum sample size of 20 was established, which is consistent with recommendations in BLM 1996.[49]

The grazing utilization database will allow data to be examined in a number of different ways. Use of individual species on an individual transect will be the most discrete level of analysis. These data can then be scaled to examine average use along a transect, use within individual fields and overall use on a lease.

GIS Applications

[48] Brower et al 1989
[49] U.S. BLM 1996b

The locations of each utilization transect will be transferred to aerial photos in order to provide visual representation of sampling activities. Grazing utilization data may be useful in modeling the impacts and effects of grazing combined with other various land management activities through time.

Reporting

Monitoring results will be prepared annually, where applicable, and included in annual monitoring reports.

Data Integrity and Quality Assurance

Quality assurance activities for the utilization monitoring task will consist of the following:

- Before leaving each sampling site, field forms will be reviewed by a field crew member other than the person recording the data to ensure that they are complete, legible, accurate, and in standard format. Errors will be corrected with a line drawn through them and the correct term or value written above. Data considered as suspect will be qualified using a flag variable. The field crew will enter explanations for all flagged data in a comments section.
- Technical staff will enter the data into spreadsheets such as MS Excel. The name of the staff entering the data will be recorded on the original field form. The technical staff entering the data will be responsible for reviewing for and correcting any data transcription errors.
- Lead project manager will review all flagged suspect data and make the ultimate decision of excluding any data from use in further analysis.

Adaptive Management for Utilization

The maximum allowable utilization in upland and riparian areas has been identified and described in Chapter 3 of this document. Utilization standards are not a management goal, but a management tool. For example, the current utilization standard of 40% use of herbaceous vegetation in riparian areas does not mean the goal is to have livestock remove 40% of the biomass, but net utilization must not exceed 40%. Maximum annual average herbaceous livestock grazing utilization allowed in upland areas is 65% if grazing occurs only during the plant dormancy period. Maximum average herbaceous forage utilization allowed in upland areas is 50% if livestock grazing occurs during the active plant growing period; however, if no livestock grazing occurs during the active plant growing period (that period when plants are “active” in putting on green growth) or the field is completely non-used for a minimum of 60 continuous days during the latter part of this “active stage” to allow seed set, allowable forage utilization can be increased from 50 to 65%.

Grazing management changes, if they are necessary, may include but are not limited to changes in livestock numbers, changing the duration of use of a particular area or field, and changes to timing of use or class of livestock. If necessary, additional fencing may improve the distribution of livestock.

If issues of overuse occur, individual ranch lessees will be consulted to determine why the overuse occurred and what can be done to ensure future use is consistent with allowable use. If overuse continues, it may result in a reduction in the maximum allowable use in order to achieve management goals.

9.4.3 Range Trend

Monitoring Purpose

Range trend monitoring uses quantitative sampling techniques to assess the trend in key indices of range condition and health. The range trend monitoring program provides the data necessary to evaluate the response of range condition and trend with respect to grazing management practices. The range trend monitoring program was developed in conjunction with, and as a result of development of the OVLMP. The data provided by this monitoring program will help determine whether grazing management activities are supporting management goals.

Prior to 2002, there were few restrictions on grazing management practices in the leased areas of City-owned lands. Grazing management activities were left primarily up to the discretion of the lessees, with guidelines and restrictions for rare plant and post-fire management areas. The implementation of the land management plans will apply uniformity to management actions, as well as implement resource conservation techniques. The grazing plans are designed to maximize production and utility of the grazing resource while also restoring and preserving ecological values.

Baseline Data Collected

Permanent range trend monitoring transects were established in 2005. Baseline data collection was initiated by LADWP staff in 2007. Data collected on all transects included: the nested frequency value for all species; cover estimates for ground substrates and all non-woody species; line intercept for shrub species; shrub age classification; visual obstruction readings; and digital photographs of the transect and ground substrate conditions. Minor changes were made to the sampling protocol after the initial year of monitoring. These changes were made to improve the statistical power of the sampling program. The methods presented here represent the current methodologies with all changes incorporated.

Methods

The range trend monitoring program consists of six components: nested frequency sampling, cover estimates for vegetation and surface substrates, line intercept sampling for shrub cover, shrub age classification, vertical obstruction readings, and photo documentation. Example datasheets for all 4 protocols are provided in appendices.

<u>Protocol</u>
The following methods describe how baseline data were collected and provide a guide for future monitoring efforts. Protocols may be modified in the future.

Nested Frequency Sampling
Conduct nested frequency sampling using the methods described in the Interagency Technical Reference *Sampling Vegetation Attributes*.[50] Nested frequency sampling provides an index to the abundance of each plant species. This method is highly repeatable and appropriate for use in grass, forb, or shrub communities. Nested frequency values are less responsive to annual weather variations than some other types of vegetation indices.

Nested frequency sampling was done on the right side of each transect, as viewed from the beginning of the transect (Figure 9.5). Three different quadrat frame sizes (0.25 m^2, 0.5 m^2 and 1.0 m^2) were manufactured for use during sampling. Each quadrat frame was further divided into five subquadrats, such that five different-sized quadrats are "nested" in the frame (Figure 9.6). The subquadrats are assigned a number from 1-5, with the smallest subquadrat assigned number 1. The nested frequency value recorded for each plant species ranges from 1-5 depending on the smallest sub-quadrat in which the plant was rooted.

The specific quadrat frame size used for each transect is a function of the vegetative community being sampled and thus the spacing of plants. In more xeric sites where plants are well-spaced, the 1.0 m^2 frame was used, while a smaller-sized frame was used in more grass-dominated sites where the inter-plant spacing is less. Ideally, nested frequency values for key species should fall between 20% and 80% in order to be able to detect trends over time. Because it is difficult to have one plot size that will be appropriate for all species (i.e., produce frequency values between 20 and 80%), the use of a nested frequency frame allows the sampling of plots of 5 different sizes simultaneously. This allows for the selection of an appropriately-sized plot for long-term monitoring. The same frame size will be used each year that sampling is conducted.

Nested frequency sampling is done every 3 meters for a total of 34 samples per transect. The first sample is at 0 meters and the last sample at 99 meters. The frame is placed flat on the ground with the bottom edge of the frame perpendicular to the tape, and

[50] Bureau of Land Management's National Applied Resource Sciences Center 1996

subquadrat 1 next to the tape at the sampling location (Figure 9.7).

Cover estimates for vegetation and surface substrates

Estimates of foliar cover are made for all species (except shrubs) in each nested frequency quadrat frame. As a means of reference, subquadrat 1 ≈ 1.5% of the total area of the frame, 2 ≈ 6% of the area, 3 = 25% of the area, and 4 = 50% of the area. Total cover values may exceed 100% due to overlapping species' canopies.

Estimates of actual cover are also made for bare ground, litter, rock, dung, and cryptogamic crust in each nested frequency quadrat frame. Rock is defined as any substrate > 2 mm in any one dimension; litter is accumulated dead or detached vegetative material; dung is any identifiable animal feces; and cryptogamic crust is defined as any biological soil crust. Total substrate cover may be less than 100% to account for shrub basal cover, but should not exceed 100%.

Line Intercept Sampling for Shrub Cover

The live cover of each shrub species is determined using the line intercept method. Line intercept is measured along the 100-meter sampling tape. The observer stands directly over the tape and records the intercept of live cover to the nearest 5 cm. Gaps in the canopy of more than 5cm are not counted as live cover. Similarly, dead areas of a shrub are not recorded as live cover.

Shrub age classification

Shrub age classification provides information about the age classes of the shrubs and the dynamics of the shrub population. In combination with cover values and nested frequency sampling data, shrub age classification information is used to interpret trend. For example, if cover of a particular shrub species is decreasing over time, the age classification data will indicate if the decrease is due to the death of individual shrubs and whether there is recruitment of younger age classes.

Shrub age classification sampling is conducted in a one-meter belt transect along the left side of the nested transect (as viewed from the beginning of the transect, Figure 9.5). For ease of sampling, the continuous one-meter belt has been divided into 10, 10-meter x 1-meter plots. All shrubs rooted within one meter of the transect tape are classified as belonging to one of five age classes: seedling (a young shrub not firmly established and with limited branching); juvenile (more established plant with more complex branching but not sexually mature); mature (complex branching and the shape expected for a mature plant of that species; sexually mature, i.e., would flower in a "good" year); decadent (a shrub of any age composed of 50% or more dead biomass by volume); or dead (>50% dead biomass by volume).

Visual Obstruction

Visual obstruction measurements provide an index of vertical structure of the vegetation with the use of a Robel pole. Visual obstruction measurements are taken on the left side of the transect, one meter from the sampling tape. (Figure 9.5). When taking measurements, one person holds the Robel pole at the sample point, while the observer (person reading the visual obstruction) stands 4 meters away from the pole and directly in line with the pole.[51] When reading the visual obstruction, the observer must have his/her eye level at a height of one-meter above ground. Visual obstruction is measured by recording the highest point on the pole that is at least partially obstructed by vegetation. Visual obstruction is recorded for four vegetation classes: shrubs, current years growth of graminoids, residual graminoids (previous year growth of perennial grasses and grass-likes), and other herbaceous (e.g., broadleaved annuals). Readings are taken on opposite sides of the pole at each observation point, resulting in two samples per point. Robel pole measurements are taken every five meters (25 stations) for a total of 50 samples per transect.

Photo Documentation

To document overall vegetation conditions, take general view photos at each sampling transect, and take close-up photos to document general soil and ground substrate condition. The purpose of the photos is to provide a

[51] BLM 1996

visual reference of conditions encountered in the field. Take general view photos from both ends of each transect. Label a dry erase board with transect information including sampling date, transect ID, Ranch Lease number, and the subject (e.g., 100 m → 0 m). Clip the dry erase board to the top of the fence post and take the photo to insure that the transect information is discernable and the entire transect is visible (Figure 9.8). Take close-up photos with the nested frequency frame in place; include the dry erase board with all transect information in the frame of the photo, but out of the sampling frame. Take close-up photos at 0 m, 51 m, and 99 m (Figure 9.7).

Sites

Range trend monitoring sites were selected through a stratified-random process (LADWP maintains a database of these transect locations). The principal vegetation communities selected for monitoring included all Type C Green Book vegetation communities.[52] Type C communities are grass-dominated and include alkali meadow, alkali seep, rabbitbrush meadow, and Nevada saltbush-meadow communities. These communities were selected for monitoring because they provide a forage base for livestock and are expected to be areas of livestock use on an annual basis.

The majority of transects are located in riparian areas along the Owens River corridor. Some of the transects along the river are in habitats that are not currently grass-dominated, but are expected to support plant communities similar to other transect locations along the river following project implementation.

The starting point and orientation of each 100 meter transect was randomly selected within the LADWP GIS system using ArcView GIS 8.1 and digital aerial photos from 2000. A field crew was provided the UTM coordinates for each randomly-selected transect; they were also given the randomly selected compass direction for orientation of each transect. In some cases, slight adjustments were made in the field to the randomly-generated starting point or direction in order to avoid a road, ditch, or other drastic changes in vegetation composition.

The starting and ending locations for each transect were marked with a white-tipped green fence post. The fence posts were placed three meters fore and aft of the actual start and end point of each transect, respectively, in the event that livestock concentration around the post resulted in excessive vegetation disturbance. Each post was marked with an aluminum tag identifying the project ("TREND"), and a unique transect identifier which includes the lease name and transect number and whether or not the post marked the beginning (0 meter) or end (100 meter) of the transect (e.g., "TREND THIBAUT_4 BEG").

Frequency

Range trend will be monitored during the years 3, 6, 10, and 15. Baseline monitoring was initiated in 2007. Monitoring will be more frequent during the initial post-implementation period, and then occur on a less frequent basis. This will allow for a more responsive adaptive management approach during the initial phases of the project.

Data Management

The field crew leader is responsible for collecting all completed field forms and delivering them to LADWP offices in Bishop in person. All original field forms receive a document control number and will be filed and retained for a minimum of 15 years at LADWP offices in Bishop. Field forms will also be scanned and retained in an electronic format (e.g., PDF) at LADWP offices.

Data Analysis

Technical staff enter the data into spreadsheets such as Microsoft Excel. The name of the staff entering the data is recorded on the original field form. The staff are responsible for reviewing and correcting any data transcription errors. The project leader will do a final proofing of data entry prior to analysis. Data compilation will proceed as follows:

1) Nested Frequency: The frequency values for each nested plot in the frequency frame will be tallied and the percent frequency of each species in each will be determined by dividing the

[52] Green Book 1990

number of occurrences in each subquadrat by the number of samples.

2) Cover estimates: For each transect, the average cover of each species will be calculated.
3) Line intercept: For each transect, the percent cover for each species will be determined by totaling the intercept measurements and converting the value to percent cover for the transect.
4) Shrub age classification: For each transect and each species, the total number of shrubs in each age class will be totaled.

Statistical Applications
Statistical tests appropriate to data type will be applied to all components of the monitoring program. Data will be analyzed by each individual monitoring component as well as from a multivariate approach. Trend will be evaluated in terms of changes to cover and frequency of forage species, invasive or other undesirable species, cover of bare ground, shrub cover and the dynamics of the shrub community. Soil type, utilization history, site constraints and comparisons to grazing exclosure sites will all be taken into consideration during the evaluation of trend.

GIS Applications
The beginning and end of each range trend transect has been identified and transferred to aerial photos in order to provide visual representation of sampling activities. Range trend data may be useful in modeling the impacts and effects of various land management activities through time, however this potential aspect of the project has not been explored to date.

Reporting
Monitoring results will be prepared annually, where applicable, and included in annual monitoring reports.

Data Integrity and Quality Assurance

For quality assurance purposes, at least one field person with a background in botany and familiarity with identification of local flora species and vegetation types, and use of the sampling methods, will be included in each field crew. The remaining crew members will receive training on the sampling procedures, including plant identification, use of nested frequency frames, cover estimation, use of Robel poles, age classification of shrubs, and photo documentation methods. Training will be conducted in the field by the task leader before the first sampling activity and as needed (e.g., when a new examiner is added).

Quality assurance activities for the range trend monitoring task consists of the following:

- Before leaving each sampling site, field forms will be reviewed by a field crew member other than the person recording the data to ensure that they are complete, legible, accurate, and in standard format. Errors will be corrected with a line drawn through them and the correct term or value written above. Data considered as suspect will be qualified using a flag variable. The field crew will enter explanations for all flagged data in a comments section.
- Technical staff will enter the data into spreadsheets such as MS Excel. The name of the staff entering the data will be recorded on the original field form. The technical staff entering the data will be responsible for reviewing for and correcting any data transcription errors.
- Lead project manager will review all flagged suspect data and make the ultimate decision of excluding any data from use in further analysis.

Adaptive Management for Range Trend

A number of factors will contribute to trend at each site including grazing history, land management history, past and current disturbance, water management activities, presence of invasive species, etc. The pending statistical analysis of the entire baseline dataset, combined with future trend data gathered in grazing exclosures, and other relevant data will aid in the establishment of thresholds and triggers, and an improved understanding of the ecological dynamics of project area in response to changes in land management activities.

Grazing management changes may include, but are not limited to, changes in livestock numbers, changes in the duration of use of a particular area or field, changes to timing of use, or class of livestock. If necessary, additional fencing may improve the distribution of livestock.

If range trend data indicate a downward trend at a site, or a failure to move in the direction of identified management goals, a multidisciplinary team will evaluate all available data and determine the appropriate land management change.

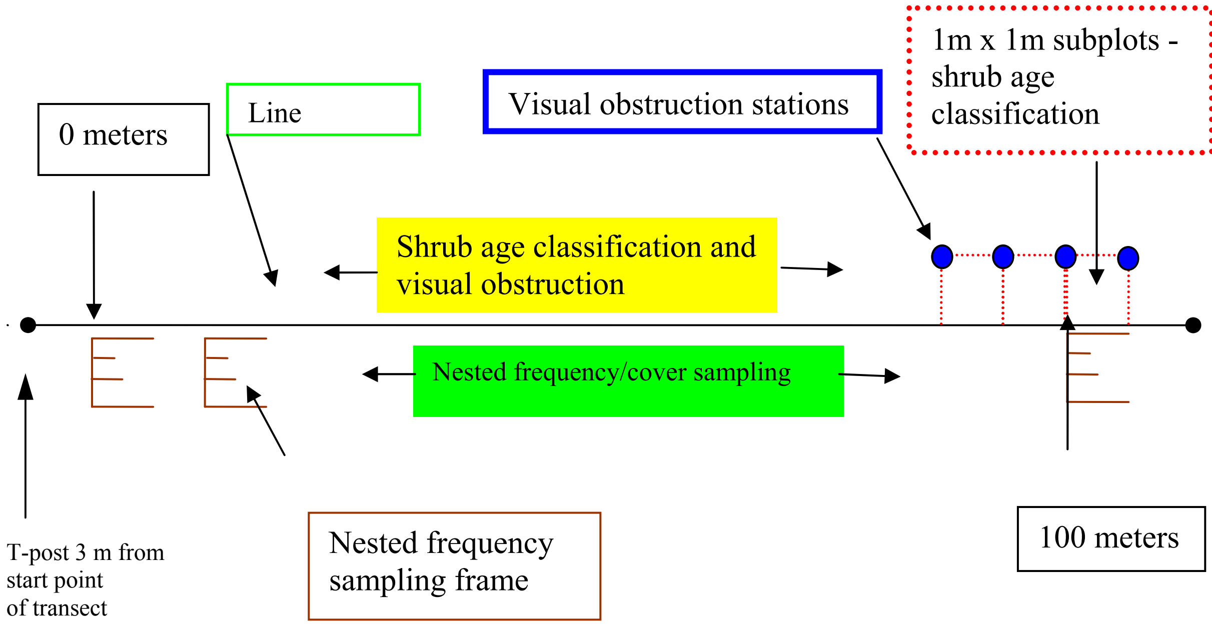


Figure 9.5. Layout of range trend vegetation monitoring components.

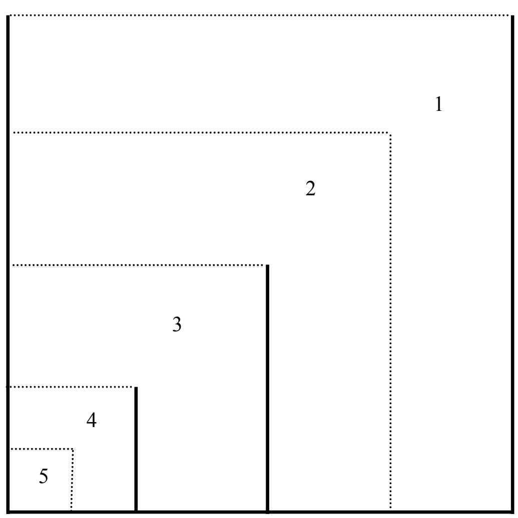


Figure 9.6 Plant species nested frequency sampling frame with sub-quadrat designations.

Figure 9.7 Example of a close-up view photo showing placement of the nested frequency frame.

Figure 9.8. Example of a general view photo of a range trend monitoring site.

Table 9.17. Adaptive Management Measures			
MEASURE	**DESCRIPTION**	**PURPOSE**	**MONITORING TRIGGER**
Modification of ramping rates	Adjust the ramping rates	Reduce bank sloughing and changes in channel configuration	Evidence of sloughing in river banks.
Modification of schedules for maintenance and mechanical intervention activities	Adjust timing of when maintenance activities or mechanical intervention activities	Minimize interference with bird nesting or migration, plant seeding, etc.	Maintenance and/or mechanical intervention activities are interfering with bird nesting, or migration, plant seeding, etc. Interference will be avoided by scheduling maintenance during non- critical periods.
Conducting exotic plant control activities	Increase any ongoing activities to control saltcedar and/or other exotic plant species	Limit invasion of exotic plant species	Growth of exotic plant species is hindering achievement of habitat management objectives. A determination that exotic plant control activities is hindering the achievement of habitat management objectives will be based upon monitoring data that show exotic plants are growing in concentrations that prevents or inhibits the growth of native species.
Modification of fencing, or addition of new fencing, for riparian and upland pastures	Add additional fencing and/or move existing fencing	Better manage livestock grazing	Livestock grazing is hindering achievement of habitat management objectives. A determination that livestock grazing is hindering the achievement of habitat management objectives will be based upon monitoring data that show recruitment or growth or riverine-riparian vegetation in riparian pastures is prevented or inhibited to the extent that more stringent management is needed.
Modification of utilization rates and timing within riparian and upland pastures	Alter utilization rates employed to manage livestock grazing and/or alter timing of livestock grazing	Better achieve habitat management objectives by improvement riparian vegetation recruitment and growth	Livestock grazing is hindering achievement of habitat management objectives. A determination that livestock grazing is hindering the achievement of habitat management objectives will be based upon monitoring data that show recruitment or growth or riverine-riparian vegetation in riparian pastures is prevented or inhibited to the extent that more stringent management is needed.
Installation of grazing exclosures	Add new grazing exclosures	Better protect areas of sensitive, threatened or endangered species, and/or promote site specific recovery	Livestock grazing may adversely affect sensitive, threatened or endangered plants. A determination that livestock grazing could adversely affect sensitive, threatened or endangered plants will be based upon monitoring data that show a potential for loss of T&E plant species.
Modification of livestock management following wildfire	Temporarily eliminate livestock grazing, reduce utilization rates and/or change timing of grazing.	Promote recovery of habitat following a wildfire.	Wildfire affects a portion of the project area.
Modification of recreational and human use management	Increase efforts to regulate recreational activities and other human use of the project area	Regulate human activities within the project area as necessary to achieve project management objectives	Human activities are hindering the achievement of project management objectives. A determination that human activity is hindering the achievement of project management objectives will be based upon monitoring data that show trampling of recruiting vegetation on streambanks or cutting of new roads or trails from ATV use.


340000
385000
430000
Mono Lake
Crowley Lake
Owens River
Owens River
LA Aqueduct
Owens Lake
340000
385000
430000

Appendices

A.1 References

APPENDICES
A

Agreement. 1989. Agreement Between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long Term Groundwater Management Plan for the Owens Valley and Inyo County. Los Angeles Department of Water and Power, Bishop, CA.

Bahr, Diana Meyers. 2003. Viola Martinez. University of Oklahoma Press, Norman.

Barnes, H.H. Jr., 1967. Roughness characteristics of natural channels. U.S. Geol. Survey Water supply Paper 1849.

Bateman, Paul and Mary DeDecker, Greg James, Jo and Tom Heindel, Harold Klieforth, Phil Pister, Richard E. MacMillen, Jeff Putman, and Genny Smith. 1995. Deepest Valley. Genny Smith Books, Mammoth Lakes, Ca.

Bechtold, W.A., M.E. Mielke and S.J. Zarnoch. 2002. Comparison of Field Methods and Models to Estimate Mean Crown Diameter. Northern Journal of Applied Forestry. 19(4):177-182.

Begon, M., J.L. Harper and C.R. Townsend. 1996. Ecology: individuals, populations, and communities, Third Edition. Blackwell Science Ltd., Cambridge, Massachusetts, USA.

Bennett, Karen A. and Eric F. Zuelke. 1999. The Effects of Recreation on Birds: A Literature Review. Available at: http://www.dnrec.state.de.us/fw/Bird%20Disturbance%20Literature%20Review%20-%20Final%20Report.pdf. Accessed 7/13/05.

Bettinger, R.L. and R.E. Taylor. 1974. Suggested Revisions in Archaeological Sequences of the Great Basin and Interior Southern California. Nevada Archaeological Survey Research Paper 5:1-26.

Bloom, P.H. 1980. The status of the Swainson's hawk in California, 1979. U.S. Dept. Interior, Bureau of Land Management, Sacramento. Project W-54-R-12, Job 11-8. Final Report, 42pp.

Bureau of Land Management (BLM). 1996. Sampling Vegetation Attributes in Rangeland Analysis and Planning Guide. The Agreement, 1989. Agreement Between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long-Term Groundwater Management Plan for the Owens Valley and Inyo County.

Bureau of Land Management (BLM). 1996. *Utilization studies and residual measurements* - Interagency Technical Reference. U.S. Department of Interior, Bureau of Land Management Technical Reference 1730-4.

Bureau of Land Management (BLM) Bishop Field Office. 2004. Bureau of Land Management Transportation and GPS Survey. Interagency Road Network Data of Inyo National Forest, Bureau of Land Management, and Los Angeles Department of Water and Power Property in Inyo County. Bishop, California.

Bock, Carl E. No date. Birds and Bovines: Effects of Livestock Grazing on Birds in the West. Available at http://www.publiclandsranching.org/htmlres/wr_birds_bovines.htm. Accessed 7/12/05.

Brooks, M.L., and D.A. Pyke. 2001. Invasive plants and fire in the deserts of North America. Pages 1-14 in K.E.M Galley and T.P. Wilson (eds.) Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Misc. Publication No. 11, Tall Timbers Research Station, Tallahassee, FL

Brower, J., J. Zar, and C. von Ende. 1989. Field and Laboratory Methods for General Ecology. Wm. C. Brown Publishers.

Bureau of Land Management (BLM). 2004. Fire Management Plan. Bishop Field Office, Bishop, California.

Busch, David E., and J.C. Trexler. 2003. Monitoring ecosystems: interdisciplinary approaches for evaluating Ecoregional initiatives. Island Press, Washington D.C.

Busch, David E., and Michael L. Scott. No date. Western Riparian Ecosystems. National Park Service, Homestead, Florida. Available at: http://biology.usgs.gov/s+t/noframe/m6140.htm#22070. Accessed 7/14/05.

California Department of Fish and Game (CDFG). 1993. 5 - Year Status Review: SWAINSON'S HAWK *(Buteo swainsoni)*. California Department of Fish and Game Wildlife Management Division-Nongame Bird and Mammal Program. Reported to California Fish and Game Commission. Available at: http://www.dfg.ca.gov/hcpb/info/bm_research/bm_pdfrpts/93_16.pdf. Accessed 6/6/07.

CDFG. 2000a. The Status of Rare, Threatened, and Endangered Animals and Plants of California, Owens Pupfish. Available at: http://www.dfg.ca.gov/hcpb/cgi-bin/read_one.asp?specy=fish&idNum=45. Accessed 7/11/05.

CDFG. 2000b. The Status of Rare, Threatened, and Endangered Animals and Plants of California, Owens Tui Chub. California Department of Fish and Game, 2000. Available at: http://www.dfg.ca.gov/hcpb/cgi-bin/read_one.asp?specy=fish&idNum=101. Accessed 7/11/05.

CDFG. 2003. California Wildlife: Conservation Challenges (Comprehensive Wildlife Conservation Strategy). Wildlife Species Matrix from the associated web publication. pp. 53. http://www.dfg.ca.gov/habitats/wdp.

California Natural Diversity Database (CNDDB). 2006. Biogeographic Data Branch, California Department of Fish and Game. Version 3.0.5. Commercial Version – Dated September 1, 2006.

California Office of Historic Preservation. 1990. Archaeological Resource Management Report (ARMR): Recommended Contents and Format. State of California, Department of Parks and Recreation, Office of Historic Preservation, Sacramento.

California Office of Historic Preservation. 1993. Instructions For Recording Historical Resources. State of California, Department of Parks and Recreation, Office of Historic Preservation, Sacramento.

California Trout. 2000. The Golden Trout Wilderness: An angler's view of grazing from the ground up. Unpublished Report, Camp Nelson, CA.

California Wildlife Habitats Relationships Program (CWHR). 1997. Version 5.3 Database and Users Manual. California Department of Fish and Game, Wildlife Management Branch, Sacramento CA.

Center for Biological Diversity. 1998. Petition to list the yellow-billed cuckoo *Coccyzus americanus* as a Federally Endangered Species. Center for Biological Diversity Endangered Species Report No. 36, February 2, 1998. Available at: http://www.biologicaldiversity.org /swcbd/species/cuckoo/petition.html. Accessed 9/5/06.

Chalfant, W.A. 1933. The Story of Inyo. Community Printing and Publishing, Bishop, Ca.

City of Los Angeles vs. County of Inyo. 1991. Agreement Between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long Term Groundwater Management Plan for Owens Valley and Inyo County. Case No. 12908. Stipulation and Order for Judgment.

Clary, Warren P. and Bert F. Webster. 1989. Managing grazing areas in the Intermountain Region. General Technical Report INT-263. USDA Forest Service, Rocky Mountain Research Station. Ogden UT.

Clewell, A., Rieger, J., and J. Munro. 2005. Guidelines for developing and managing ecological restoration projects, 2 Edition. Society for Ecological Restoration International, www.ser.org and Tucson.

Crawford, H.S., R.G. Hooper and R.W. Titterington. 1981. Songbird Population Response to Silvicultural Practices in Central Appalachian Hardwoods. Journal of Wildlife Management. 45:680-692.

Cosgrove, D., D Undersander, and J Cropper. 1991. Guide to Pasture Condition Scoring. USDA NRCS Grazing Lands Technology Institute.

Cosgrove, D., D. Undersander, and J. Cropper. 2001. Guide to Pasture Condition Scoring. USDA-NRCS Grazing Lands Technology Institute.

Cummins, K.W. l972. What is a River? River Ecology and Man. Academic Press, Inc. New York.

Dambacher, J.M., K.K. Jones and H.W. Li. 2001. The distribution and abundance of Great Basin redband trout: an application of variable probability sampling in a 1999 status review. Oregon Department of Fish and Wildlife, Information reports 2001-08, Portland.

Danskin, W.R. 1998. Evaluation of the hydrologic system and selected water-management alternatives in the Owens Valley, California. USGS water supply paper 2370-H.

DeBano, L.F., D.G. Neary, P.F. Folliot. 1998. Fire's Effects on Ecosystems. John Wiley & Sons, Inc., New York, New York, USA.

Delacorte, M.G. 1999. The Changing Role of Riverine Environments in the Prehistory of the Central-Western Great Basin: Data Recovery Excavations at Six Prehistoric Sites in Owens Valley, California. Report submitted to Caltrans District 9, Bishop. On file BLM Bishop Office.

Draft Coachella Multiple Species HCP and NCCP. 2004. Available at: http://www.cvmshcp.org/sp_23.htm. Accessed 7/11/05.

Draft Environmental Impact Report. 2002. Lower Owens River Project, Inyo County, California.

Eastern Sierra Weed Management Area Noxious Weed [ESWMA] Identification Handbook: A County, State and Federal Partnership. 1999.

Ecosystem Sciences. 1997. Results of User Group Interviews, Task IIIA. Lower Owens River Project Technical Memorandum #6. Ecosystem Sciences, Boise, Idaho. Prepared for LADWP and ICWD.

Ecosystem Sciences. 1999. Wetland Management Plan: Blackrock Waterfowl Management Area Implementation (April 1999). Technical Memorandum No. 18. Ecosystem Sciences, Boise, ID.

Ecosystem Sciences. 2000. Owens Gorge Permanent Flow Recommendations (Owens River Gorge Rewatering Project). Prepared for the Las Angeles Department of Water and Power.

Ecosystem Sciences. 2000a. Lower Owens River Projects; Seeps and Springs Inventory Phase 1. Boise, ID.

Ecosystem Sciences. 2000b. California Yellow-billed Cuckoo Habitat Evaluation and Enhancement Plans for Hogback and Baker Creeks. June 2000. Technical Memo #21. Lower Owens River Project. DWP Northern Regional Office, Bishop, CA.

Ecosystem Sciences. 2001. Fisheries in the Lower Owens River; revised version issued April 2001. Technical Memorandum No. 14. Ecosystem Sciences, Boise, ID.

Ecosystem Sciences. 2002. Lower Owens River Project Ecosystem Management Plan. Prepared for Los Angeles Department of Water and Power and Inyo County Water Department.

Ecosystem Sciences. 2004. Lower Owens River Project Monitoring Methodologies: Baseline. Prepared for Los Angeles Department of Water and Power and Inyo County Water Department. Unpublished Report.

Egglishaw, H. 1984. The distribution of invertebrates in stream flow on substrata of fast-flowing streams. J. of Animal Ecol. 38:19-33

Elmore, Wayne. 1997. National Riparian Service Team report on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest, Bishop, CA.

England, A. S., J. A. Estep, and W. R. Holt. 1995. Nest-site selection and reproductive performance of urban nesting Swainson's Hawks in the Central Valley of California. *Journal of Raptor Research* 29(3): 186–197.

Environmental Impact Report (EIR). 1991. Prepared by the City of Los Angeles Department of Water and Power and the County of Inyo. Water from the Owens Valley to Supply the Second Los Angeles Aqueduct, 1970 to 1990, 1990 Onward, Pursuant to a Long-Term Groundwater Management Plan. State Clearinghouse #89080705.

Estep, J. A. 1989. Biology, movements, and habitat relationships of the Swainson's Hawk in the Central Valley of California. California Department of Fish and Game, Wildlife Management Division. Sacramento, CA.

Far Western Anthropological Research Group, Inc. 2001. A Class III Cultural Resources Inventory For The Lower Owens River Project, Inyo County, California. Prepared for URS Greiner Woodward Clyde.

Gaines, D., and Laymon, S.A. 1984. Decline, status and preservation of the Yellow-billed Cuckoo in California. Western Birds 15:49- 80.

Garcia and Associates (GANDA). 2003. Lower Owens River Project (LORP) Report on Baseline Data. Prepared for Ecosystem Sciences and Los Angeles Department of Water and Power. Unpublished Report.

Gebhardt, K. 1994. Owens River Modeling.

Gordon, N.D, McMahon, T.A., and B.L. Finlayson. 1992. Stream Hydrology: An Introduction for Ecologists. John Wiley & Sons. West Sussex, England.

Green Book. 1990. Green book for the long-term groundwater management plan for the Owens Valley and Inyo County. Prepared by Inyo County and the City of Los Angeles.

Hafele, R. 1978. Effects of Controlled Flow Reductions on the Insect Community of an Oregon Coastal Stream. Masters Thesis. Oregon State Uni. Corvallis.

Halford, F. Kirk. 1999. Mitigation Banking Proposal for the Independence Land Exchange Cultural Resources Project: CA-017-97-24. On file BLM Bishop Office.

Hart, S. C., T. H. DeLuca, G. S. Newman, M. D. MacKenzie, and S. I. Boyle. 2005. Post-fire vegetative dynamics as drivers of microbial community structure and function in forest soils. Forest Ecology and Management 220: 166-184.

Heath, S.K., G. Ballard, and C. McCreedy. 2001. Eastern Sierra Riparian Songbird Conservation: 1998-2000 Final Report and Mono Basin 2000 Progress Report. PRBO Contribution #1002. Available at: http://www.prbo.org/cms/docs/terre/98_00_Report.pdf. Accessed 11/28/06.

Hill, M.T., and W.S. Platts. 1998. Ecosystem Restoration: A Case Study in the Owens River Gorge, California. *Fisheries* 23(11): 18-27.

Holecheck, J. L., R. D. Pieper, and C. H. Herbel. 2004. Range Management – Principles and Practices. Fifth edition. Pearson-Prentice Hill. New Jersey.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpublished report. State of California. The Resources Agency, Department of Fish and Game, Natural Heritage Division, Sacramento, CA.

Holling, C. S., ed. 1978. Adaptive environmental assessment and management. John Wiley and Sons, Hoboken, NJ.

Hughes, J. M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*). *In* The Birds of North America, No. 418 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hunter, W.C., Ohmart R.D., and Anderson, B.W. 1984. Use of exotic saltcedar (*Tamarix chinensis*) by birds in arid riparian systems. The Condor 90: 113-123.

Inyo County Water Department (ICWD) and Los Angeles Department of Water and Power (LADWP). 1990. Green Book for Long-Term Groundwater Management Plan for the Owens Valley and Inyo County. Los Angeles Department of Water and Power, Bishop, CA. 176 pages.

Inyo National Forest (INF) and Bureau of Land Management (BLM) Bishop Resource Area. 1996. Interagency Vehicle Access Strategy. Interagency publication. Bishop, California.

Irwin, L. L., and T. B. Wigley. 1993. Toward and experimental basis for protecting forest wildlife. Ecological Applications 3:213-217.

Irwin, Sue. 1991. California's Eastern Sierra. Cachuma Press, Los Olivos, Ca. Published in Cooperation with the Eastern Sierra Interpretive Association.

Kauffman, J.B., D.A. Cummings, C. Heider, D. Lytjen, and N. Otting. 2000. Riparian Vegetation responses to re-watering and cessation of grazing, Mono Basin, California. *In* Proceedings of the American Water Resources Association international conference on riparian ecology and management in multi-land use watersheds. pp. 251-256.

Kramp, B.A., D.R. Patton, and W.W. Brady. 1986. Run wild: wildlife/habitat relationships. U.S. Forest Service, Southwestern Region.

Kus, B. 2002. Least Bell's Vireo (*Vireo bellii pusillus*). *In* The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. Available at: http://www.prbo.org/calpif/htmldocs/riparian_v-2.html. Accessed 7/14/05.

Kus, B.E. and M.J. Whitfield. 2005. Parasitism, productivity, and population growth: response of Least Bell's Vireos (*Vireo bellii extimus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) to cowbird (Molothrus spp.) control. *Ornithological Monographs* 57:16-27.)

Laymon, S. A. 2004. Existing conditions and their effects on yellow-billed cuckoos. Prepared for Ecosystem Sciences. April 2004.

Los Angeles Department of Water and Power (LADWP). 1966. Report on water supply management in Inyo and Mono Counties. Prepared by R.V. Phillips et al.

LADWP. No date. The story of the Los Angeles Aqueduct. Available at: http://www.ladwp.com/ladwp/cms/ladwp001006.jsp. Accessed 2/14/07.

LADWP. 1981. Some observations on vegetation growth and vigor in the Owens Valley, California. Prepared by Dave E. Babb for the Los Angeles Department of Water and Power.

LADWP, the County of Inyo, the California Department of Fish and Game (CDFG), the California State Lands Commission (SLC), the Sierra Club, the Owens Valley Committee. 1997. Memorandum of Understanding between the City of Los Angeles Department of Water and Power, the County of Inyo, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, the Owens Valley Committee. Los Angeles Department of Water and Power, Bishop, California.

LADWP. 2005. Conservation strategy for the Southwestern Willow Flycatcher on City of Los Angeles Department of Water and Power Lands in the Owens Management Unit. *Prepared by* Los Angeles Department of Water and Power Watershed Resources Staff.

LADWP. 2007. LADWP Homepage. Available at: http://www.ladwp.com/ladwp/homepage.jsp. Accessed 2/16/2007.

LADWP, U.S. Environmental Protection Agency (USEPA), and Inyo County Water Department (ICWD). 2004. Lower Owens River Project Final Environmental Impact Report and Environmental Impact Statement. Bishop, California.

Laymon, S.A. 1980. Feeding and nesting behavior of the Yellow-billed Cuckoo in the Sacramento Valley Wildlife Management Branch Administration Rep 80-2. California Department of Fish and Game, Sacramento.

Laymon, S.A. 2000. Supporting information for the listing of the yellow-billed cuckoo. Report submitted to the USFWS, Sacramento Fish and Wildlife Office, April 17, 2000. Available at: http://www.biologicaldiversity.org/s wcbd/species/cuckoo/layman.pdf . Accessed 9/5/06.

Laymon, S.A. and M.D. Halterman. 1990. Distribution and habitat requirements of the Yellow-billed Cuckoo in California in 1990. Draft report to The Nature Conservancy.

Laymon, S.A. and P.L. Williams. 1994. Riparian and wetland breeding bird surveys, Inyo County, CA, with emphasis on the Yellow-billed Cuckoo and the Snowy Plover. Admin. Rept. California Dept. of Fish and Game, contract #FG-2319.

Laymon, S. A. and P. L. Williams. 1999. Yellow-billed Cuckoo in the Owens Valley. In: Tech Memo #21, Appendix 1. Ecosystem Sciences, Boise, ID.

Laymon, S.A., and P.L. Williams, M.D. Halterman. 1997. Breeding status of the yellow-billed cuckoo in the South Fork Kern River Valley, Kern County, California: summary report 1985-1996. Report to U.S.D.A. Forest Service Sequoia National Forest Service, Cannell Meadow Ranger District, Grant #92-5-13.

Laymon, S. A. 2004. Existing conditions and their effects on yellow-billed cuckoos. Prepared for Ecosystem Sciences. April 2004.

Lemmon, P.E. 1957. A New Instrument for Measuring Forest Overstory Density. Journal of Forestry. 55(9):667-668.

MacArthur, R.H. and H.S. Horn. 1969. Foliage profile by vertical measurements. Ecology 50:802-804.

Maguire, Timothy J. 2002. The role of environmental factors and vegetation development on avian diversity following re-watering in the Owens River Gorge, Eastern California. Thesis; Portland State University. pp. 28-32.

Mallery, G. 1886. Pictographs of the North American Indians: a Preliminary Paper. Bureau of American Ethnology, Annual Report 4:3-256.

McCombs Archaeology. 2006. Class III Heritage Resources Survey for the Riparian Corridor of the Middle Owens River Project. McCombs Archaeology, Taylorsville, Ca.

McCreedy, C.L., and S.K. Heath. 2004. Atypical Willow Flycatcher nesting sites in a recovering riparian corridor at Mono Lake, CA. *Western Birds* 35: 197-209.

Memorandum of Understanding (MOU), 1997. MOU Between the City of Los Angeles Department of Water and Power, the County of Inyo, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, the Owens Valley Committee, and Carla Scheidlinger. Bishop, CA.

Miller, R.R. 1973. Two new fished, Gila bicolor snyderi and Catostomus fumeiventris, from the Owens River Basin, California. Occasional Papers of the University of Michigan Museum of Zoology 667:1-19.

Mills, G.S., J.B. Dunning, and J.M. Bates. 1991. The relationship between bird density and vegetation volume. *Wilson Bulletin* 103:468-479.

Minshall, G. and P. Winger. 1968. The effects of a reduction in stream flow on invertebrate drift. Ecol. 49:580-582
Nadeau, Remi. 1997. The Water Seekers. Crest Publishers, Santa Barbara, Ca.

National Park Service, U.S. Department of the Interior. 2005. Inventory and Monitoring Program. Summary of Indicators Sampled by the FIA Phase 3 Protocols. http://science.nature.nps.gov/im/monitor/protocols/fhmindic.htm

Niemi, G.J., and L. Pfannmuller. 1979. Avian Communities: Approaches to Describing Their Habitat Associations. Pages 154-179 *In* Proceeding of the Workshop on Management of North Central and Northeastern Forest for Nongame Birds (R. M. DeGraaf and K. E. Evans, Eds.). U. S. Forest Service. General Technical Report NC-51. St. Paul, Minnesota.

NRC. 2004. Adaptive management for Water Resources Project planning. National Academy Press, Washington, D.C.

Oxbow Environmental. 2006. Middle Owens River Habitat Assessment for the Owens Valley Land Management Plan. Prepared for Ecosystem Sciences and the LADWP, July 21, 2006.

Parma, A. M., and the NCEAS Working Group on Population Management. 1998. What can adaptive management do for our fish, forests, food, and biodiversity? *Integrative Biology* 1:16-26.

Peterjohn, B. G., and J. R. Sauer. 1993. North American breeding bird survey annual summary 1990-1991. Bird Populations 1:1-24, 52-67.

Rice, J., Anderson, B.W. and R.D. Omhart. 1984. Comparison of the importance of different habitat Attributes to avian community organization. *Journal of Wildlife Management* 48:895-991.

Root, R.B. 1967. The Niche Exploitation Pattern of the Blue-Gray Gnatcatcher. *Ecological Monographs*. 37(4): 317-350.

Rosgen, Dave. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs CO.

Sada, D. W. 1989. Status and distribution of speckled dace (Rhinichthys osculus) in the Owens River system, Inyo and Mono Counties, California. Unpublished report to California Department of Fish and Game, Rancho Cordova. 33 pp.

Sauder, Robert A. 1994. The Lost Frontier. University of Arizona Press, Tucson and London.

Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society. Sacramento, CA.

Severinghaus, W.D. 1981. Guild Theory as a Mechanism for Assessing Environmental Impact. *Environmental Management*. 5:187-190.

Short, H.L. and K.P. Burnham. 1982. Technique for Structuring Wildlife Guilds to Evaluate Impacts on Wildlife Communities. U.S. Fish and Wildlife Service. Spec. Sci. Rep. Wildl. No. 244. Washington, D.C.

Sit, V. and B. Taylor (editors). 1998. Statistical methods for adaptive management studies. Res.Br., B.C. Min. For., Res. Br., Victoria, BC, Land Management. Handb. No. 42.

Skinner, C.N. and C. Chang. 1996. Fire regimes, past and present. Pages 1041-1069 in Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources, 1996.

Society for Ecological Restoration (SER) and the International Science & Policy Working Group. 2004. The SER International Primer on Ecological Restoration. Society for Ecological Restoration International, www.ser.org & Tucson.

Stalnaker, C. and J. Arnette. 1976. Methodologies for determination of stream resource flow requirements: an assessment. USFWS-Office of Biological Services. Utah State University, Logan.

Stankey, G.H., D.N. Cole, R.C. Lucas, M.E. Petersen, S.S. Frissell, and R.F. Washburne. 1985. The Limits of Acceptable Change (LAC) System for Wilderness Planning. USDA Forest Service General Technical Report INT-176.

Steward, Julian H. 1933. Ethnography of the Owens Valley Paiute. University of California Publications in American Archaeology and Ethnology Volume 33, No. 3, pp. 233-350.

Stillwater Sciences. 2001. Merced river restoration baseline studies: Volume II: Geomorphic and riparian vegetation investigations report. Final report, April 18, 2001.

Testy, Julie L. 1994. *Buteo swainsoni*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at: http://www.fs.fed.us/database/feis/. Accessed 6/4/07.

The Obsidian Trail (video documentary). 2002. A production of Caltrans in association with Cinnabar Video and Far Western Anthropological Research Group, Inc.

United States Army Corps of Engineers (ACOE). 1987. Corps of Engineers Wetland Delineation Manual. Wetlands Research Program Technical Report Y-87-1.

ACOE. 1987. Wetland delineation manual. Waterways Experiment Station, Vicksburg, Mississippi.

ACOE. February 1991. HEC-2 water surface profiles user’s manual. Version 4.6 of HEC-2.

United States Department of Agriculture (USDA) Forest Service. 1995. Allotment Management Plan. Inyo National Forest, Bishop, CA.

USDA Forest Service. 1996. Term grazing permit Mulkey Allotment, Inyo National Forest. Bishop, CA.

USDA Forest Service. 1997. National Riparian Service Team report on stream conditions and livestock management on stream conditions and livestock management in the Golden Trout Wilderness, Inyo National Forest. Inyo National Forest, Bishop, CA

USDA Forest Service. 2002. Mulkey Allotment annual operating instructions. Inyo National Forest. Bishop, CA.

United States Fish and Wildlife Service (USFWS). 1997. Amargosa Vole (*Microtus californicus scirpensis*) Recovery Plan. Portland, OR. pp. 43.

USFWS. 1998. Draft Recovery Plan for the Least Bell's Vireo. Portland, OR. 139 pp.

USFWS. 1998. Owens Basin Wetland and Aquatic Recovery Plan, Inyo and Mono Counties, California (Owens pupfish, Owens tui chub, Fish Slough milk-vetch, and Selected Species of Concern). Region 1 Fish and Wildlife Service, Portland, OR.

USFWS. 2002. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico. I-ix + 210pp. Appendices A-O.

USFWS. 2008. USFWS Endangered Species Program Website. Habitat Conservation Planning. Available at: http://www.fws.gov/endangered/hcp/NOSURPR.HTM. Accessed 3/19/08.

United States Forest Service (USFS) Rocky Mountain Research Station. 1999. RMRS Research Themes: Integrated Adaptive Management. Available: http://www.fs.fed.us/rm/main/themes/integrate.html. Last Update: November 9, 1999.

USFS. 2004. RPA Assessment Glossary. Available: http://www.fs.fed.us/pl/rpa/95rpa/glossary.htm. Last update: October 14, 2004.

United States Geological Survey (USGS). Surface-water field techniques. Available at: http://wwwrcamnl.wr.usgs.gov/sws/fieldmethods/Indirects/nvalues/index.htm. Accessed 2/14/07.

Verner, J. 1983. Three-way commuting pattern of Brown-headed cowbirds in the western Sierra Nevada. Abstracts of the Annual Meeting of Cooper Ornithological Society 53:30.

Verner J. 1984. The Guild Concept Applied to Management of Bird Populations. *Environmental Management* 8:1-14.

Von Werlhof, Jay C. 1965. Rock Art of Owens Valley, California. Reports of the University of California Archaeological Survey No. 65. University of California Archaeological Research Facility Department of Anthropology, Berkeley.

Wall, G. and C. Wright. 1977. The Environmental Impact of Outdoor Recreation. Publication Series No. 11. Ontario, Canada: University of Waterloo, Department of Geography.

Walter, Nancy Peterson. 1985. The Exchange of Lands in the Owens Valley of California Between the City of Los Angeles and the United States which created the Indian Reservations at Big Pine, Bishop, and Lone Pine. On file BLM Bishop Office.

Walters, C. J., and C. S. Holling. 1990. Large-scale management experiments and learning by doing. Ecology 71:2060-2068.

Walters, C.J. 1986. Adaptive management of renewable resources. Macmillan, New York.

Western Riverside County MSHCP. 2003. Available at: http://wildlife.ucr.edu/full.asp?sp_num=83. Accessed 7/11/05.

White Horse Associates (WHA). November 2002a. Delta habitat area, vegetation inventory, 2000 conditions. Digital report to Ecosystems Sciences, Los Angeles Department of Water and Power and Inyo County.

WHA. November 2002b. Lower Owens River riparian vegetation inventory, 2000 conditions. Digital report to Ecosystems Sciences, Los Angeles Department of Water and Power and Inyo County.

WHA. November 2003. Blackrock Waterfowl Management Area vegetation inventory, 2000 conditions. Digital report to Ecosystems Sciences, Los Angeles Department of Water and Power, and Inyo County.

WHA. 2004. Middle Owens River Project Riparian Area Inventory 2000 CONDITIONS Prepared for: Ecosystems Sciences, LADWP and Inyo County.

Wilhere, G.F. 2001. Adaptive management in habitat conservation plans. *Conservation Biology* 16:1, 20-29.

Winward, A.H. 2000. Monitoring the vegetation resources in riparian areas. United States Department of Agriculture. General Technical Report RMRS-GTR-47, Rocky Mountain Research Station, Ogden, UT.

White, R.G., et. al. 1981. Effects of Reduced Stream Discharge on Fish and Aquatic Macroinvertebrate Populations. Idaho Water and Energy Resources Res. Instit. University of Idaho, Moscow

A.2 GIS Metadata

The GIS shapefiles, Grids and Images used in the creation of the OVLMP GIS database are presented below (Table A.3 GIS data). The GIS data were collected from various sources, most notably the Los Angeles Department of Water and Power (LADWP), California Spatial Information Library (CASIL), Bureau of Land Management (BLM) White Horse Associates (WHA), Oxbow Environmental (Oxbow) and Ecosystem Sciences (ES).

Table A.3 Pertinent GIS data

Feature Name	Projection	Shapefile Description	Type	Origin
ALL_MACROPLTS	NAD27 Z11	Oxbow Macro plots	Polygon	Oxbow
ALL_MACROPTS	NAD27 Z11	Oxbow Macro plots points	Points	Oxbow
Aqueduct	NAD27 Z11	Los Angeles Aqueduct	Polyline	CASIL
BLM_roads	NAD27 Z11	BLM Road Layer	Polyline	BLM
BWMA	NAD27 Z11	Blackrock Waterfowl Management Area	Polygon	WHA
BWMA_roads	NAD27 Z11	Roads of the Blackrock Waterfowl Area	Polyline	LADWP
Cal_counties	NAD27 Z11	California Counties	Polygon	CASIL
Cal_waterbodies	NAD27 Z11	California waterbodies for Inyo County	Polygon	CASIL
california	NAD27 Z11	California State Boundary	Polygon	CASIL
Canals	NAD27 Z11	Canals of Inyo County	Polyline	CASIL
esn_gap_veg	NAD27 Z11	Gap vegetation for Owens Valley	Polygon	CASIL
Highway	NAD27 Z11	Highways of the Owens Valley	Polyline	CASIL
Highways	NAD27 Z11	Major roads of Mono/Inyo County	Polyline	CASIL
Hogback_boundary	NAD27 Z11	Boundary of Lease RLI 429 (Hogback parcel)	Polygon	LADWP
inyo_county	NAD27 Z11	Inyo County Polygon	Polygon	CASIL
ladwp_property_5_2_06	NAD27 Z11	Los Angeles Owens Land in Mono/Inyo	Polygon	LADWP
Lake	NAD27 Z11	Lakes and reservoirs of the Owens Valley	Polygon	CASIL
Lease Boundary (RLI #)	NAD27 Z11	Master Lease Boundary from LADWP	Polygon	LADWP
LORP_Mapping(2000)	NAD27 Z11	Veg. Communities of the LORP	Polygon	WHA
LORP_Planning_Area	NAD27 Z11	Boundary of the LORP	Polygon	ES
LORP_RIV	NAD27 Z11	Owens River within the LORP	Polyline	CASIL
MO_canals	NAD27 Z11	Some Middle Owens Canals	Polyline	ES
MO_Roads	NAD27 Z11	Roads of the Middle Owens	Polyline	ES
MORP.tif	NAD27 Z11	2000 aerial image of entire MORP	GEOtif	ES
MORP_forest	NAD27 Z11	Forest habitat survey GPS locales	Point	ES
MORP_project_area	NAD27 Z11	Boundary of the Middle Owens Area	Polygon	WHA
MORP_project_area	NAD27 Z11	Project Area Boundary	Polygon	WHA
MORP_quad_index	NAD27 Z11	24k Quads of the Middle Owens	Polygon	CASIL
MORP_REACHES	NAD27 Z11	Reach designations of the Middle Owens	Polygon	WHA
MORP_reaches	NAD27 Z11	Project Area broken into reaches	Polygon	WHA
MORP_thalwags	NAD27 Z11	Transect lines from initial MORP work	Polyline	ES
MORP_wetland	NAD27 Z11	Wetland habitat survey GPS locales	Point	ES
observe_wave	NAD27 Z11	Kayak surf wave in Middle Owens	Polyline	ES
OLD_MORP_sites	NAD27 Z11	GPS points of the initial MORP Baseline	Point	ES
Owens River	NAD27 Z11	Owens River shapefile	Polyline	CASIL
Owens_streams	NAD27 Z11	Creeks and Rivers of Inyo County	Polyline	CASIL
R1S1.tif	NAD27 Z11	2000 aerial image of R1S1	GEOtif	ES
R1S1_chan_gps	NAD27 Z11	GPS points for Channel X-sections S1	Point	ES
R1S1_HEC_FLOWS	NAD27 Z11	Modeled 145,300,600cfs flows - HEC-2	Polygon	ES
R1S1_merge_pts	NAD27 Z11	All points for S1 (Trim&GEOX)	Point	ES
R1S1_outline	NAD27 Z11	Transect lines for site 1 reach 1	Polyline	ES
R1S1_pts	NAD27 Z11	Transect endpoints (GPS) site 1 reach 1	Point	ES
R1S1_SP	NAD27 Z11	Sub plots for site 1	Point	ES
R1S1_SP_POLY	NAD27 Z11	Random polygons for site 1	Polygon	ES
R1S1_upland	NAD27 Z11	Upland pts for S1 (Trimble - Oct&Nov)	Point	ES

R1S1_VEG	NAD27 Z11	Vegetation polygons for site 1	Polygon	ES
R1S1_ws	NAD27 Z11	Water Surface for S1 (Trimble)	Point	ES
R2S4.tif	NAD27 Z11	2000 aerial image of R2S4	GEOtif	ES
R2S4_CONTOUR	NAD27 Z11	Contours created after chan survey	Polyline	ES
R2S4_CONTOUR_3D	NAD27 Z11	Contours created after chan survey (3D)	Polyline	ES
R2S4_HEC_FLOWS	NAD27 Z11	Modeled 145,300,600cfs flows - HEC-2	Polygon	ES
R2S4_outline	NAD27 Z11	Transect lines for site 4 reach 2	Polyline	ES
R2S4_POLY	NAD27 Z11	Polygon of site 4 area	Polygon	ES
R2S4_pts	NAD27 Z11	Transect endpts (GPS) for site 4 reach 2	Point	ES
R2S4_RIVER_POINTS	NAD27 Z11	10/06 channel survey points	Point	ES
r2s4_river_poly	NAD27 Z11	River channel polygon for HEC-2	Polygon	ES
R2S4_SP	NAD27 Z11	Sub Plots for site 4	Point	ES
R2S4_SP_POLYS	NAD27 Z11	Random veg polygons for site 4	Polygon	ES
R2S4_Veg	NAD27 Z11	Vegetation of Site 4	Polygon	ES
R3S8.tif	NAD27 Z11	2000 aerial image of R3S8	GEOtif	ES
R3S8_chan_gps	NAD27 Z11	GPS points for Channel X-sections S8	Point	ES
R3S8_DTM	NAD27 Z11	Terrain Model of Site 8	GRID	INTER
R3S8_merge_pts	NAD27 Z11	All points for S8 (Trim&GEOX)	Point	ES
R3S8_outline	NAD27 Z11	Transect lines for site 8 reach 3	Polyline	ES
R3S8_POLY	NAD27 Z11	Polygon of site 8	Polygon	ES
R3S8_pts	NAD27 Z11	Transect endpoints (GPS) site 8 reach 3	Point	ES
R3S8_SP	NAD27 Z11	Sub Plots for site 8	Point	ES
R3S8_SP_POLYS	NAD27 Z11	Random veg polygons for site 8	Polygon	ES
R3S8_upland	NAD27 Z11	Upland pts for S8 (Trimble)	Point	ES
R3S8_upland_GEOX	NAD27 Z11	Upland pts for S8 (GEOX)	Point	ES
R3S8_veg	NAD27 Z11	Vegetation of Site 8	Polygon	ES
R3S8_WS	NAD27 Z11	Water Surface pts for S8 (Trimble)	Point	ES
R4S10.tif	NAD27 Z11	2000 aerial image of R4S10	GEOtif	ES
R4S10_chan_gps	NAD27 Z11	GPS points for Channel X-sections S10	Point	ES
R4S10_outline	NAD27 Z11	Transect line for site10 reach 4	Polyline	ES
R4S10_pts	NAD27 Z11	Transect endpts (GPS) of site 10 reach 4	Point	ES
R4S10_SP	NAD27 Z11	Sub Plots for Site 10	Point	ES
R4S10_SP_add	NAD27 Z11	Additional (20) Sub Plots for Site 10	Point	ES
R4S10_SP_poly	NAD27 Z11	Random Veg polygons for Site 10	Polygon	ES
R4S10_upland	NAD27 Z11	Upland pts for S10 (Trimble)	Point	ES
R4S10_veg	NAD27 Z11	Vegetation of Site 10	Polygon	ES
R5S13.tif	NAD27 Z11	2000 aerial image of R5S13	GEOtif	ES
R5S13_chan_gps	NAD27 Z11	GPS points for Channel X-sections S13	Point	ES
R5S13_merge_pts	NAD27 Z11	All points for S13 (Trim&GEOX)	Point	ES
R5S13_outline	NAD27 Z11	Transect lines for site 13 reach 5	Polyline	ES
R5S13_pts	NAD27 Z11	Transect endpts (GPS) of site 13 reach 5	Point	ES
R5S13_SP	NAD27 Z11	Sub Plots for Site 13	Point	ES
R5S13_SP_POLY	NAD27 Z11	Random Veg polygons for Site 13	Polygon	ES
R5S13_up_GEOX	NAD27 Z11	Upland pts for S13 (GEOX)	Point	ES
R5S13_Upland	NAD27 Z11	Upland pts for S13 (Trimble)	Point	ES
R5S13_veg	NAD27 Z11	Vegetation of Site 13	Polygon	ES
R5S13_WS	NAD27 Z11	Water Surface pts for S13 (Trimble)	Point	ES
R6S17.tif	NAD27 Z11	2000 aerial image of R6S17	GEOtif	ES
R6S17_CONTOUR	NAD27 Z11	0.5 meter Contours of Site 17	Polyline	ES
R6S17_CONTOUR_3D	NAD27 Z11	3d contours used to convert to dxf	Polyline	ES
R6S17_HEC_FLOWS	NAD27 Z11	Modeled 145,300,600cfs flows - HEC-2	Polygon	ES
R6S17_outline	NAD27 Z11	Transect lines for site 17 reach 6	Polyline	ES
R6S17_POLY	NAD27 Z11	Site 17 polygon	Polygon	ES
R6S17_pts	NAD27 Z11	Transect endpts (GPS) for site 17 reach 6	Point	ES
R6S17_riv_poly	NAD27 Z11	River channel polygon for HEC-2	Polygon	ES
R6S17_RIVER_POINTS	NAD27 Z11	10/06 channel survey points	Point	ES
R6S17_SP	NAD27 Z11	Sub Plots for Site 17	Point	ES
R6S17_SP_Polys	NAD27 Z11	Random Veg polygons for Site 17	Polygon	ES

R6S17_Veg	NAD27 Z11	Vegetation of Site 17	Polygon	ES
Random_macro_plts	NAD27 Z11	Oxbow landscape level macro plots	Polygon	Oxbow
Random_macro_pts	NAD27 Z11	Oxbow landscape level macro plots pts	Point	Oxbow
Roads	NAD27 Z11	Dirt Roads of Inyo County	Polyline	CASIL
Roads	NAD27 Z11	Roads of Inyo/Mono County	Polyline	CASIL
Streams	NAD27 Z11	Hydro layer streams, canals, aqueduct	Polyline	CASIL
upper_owens	NAD27 Z11	Upper Owens Watershed (Long Valley)	Polygon	CASIL
watersheds	NAD27 Z11	Owens River Watersheds	Polygon	CASIL

Projection Information – Spatial Metadata

All data and shapefiles are projected in the following projection system:

Horizontal coordinate system

Projected coordinate system name: **NAD_1927_UTM_Zone_11N**

Geographic coordinate system name: **GCS_North_American_1927**

Details

Map Projection Name: Transverse Mercator
Scale Factor at Central Meridian: **9996.000000**
Longitude of Central Meridian: **-117.000000**
Latitude of Projection Origin: **0.000000**
False Easting: **500000.000000**
False Northing: **0.000000**

Planar Coordinate Information

Planar Distance Units: **meters**
Coordinate Encoding Method: **coordinate pair**

Coordinate Representation
Abscissa Resolution: **0.000022**
Ordinate Resolution: **0.000022**

Geodetic Model

Horizontal Datum Name: North American Datum of 1927

Ellipsoid Name: Clarke 1866

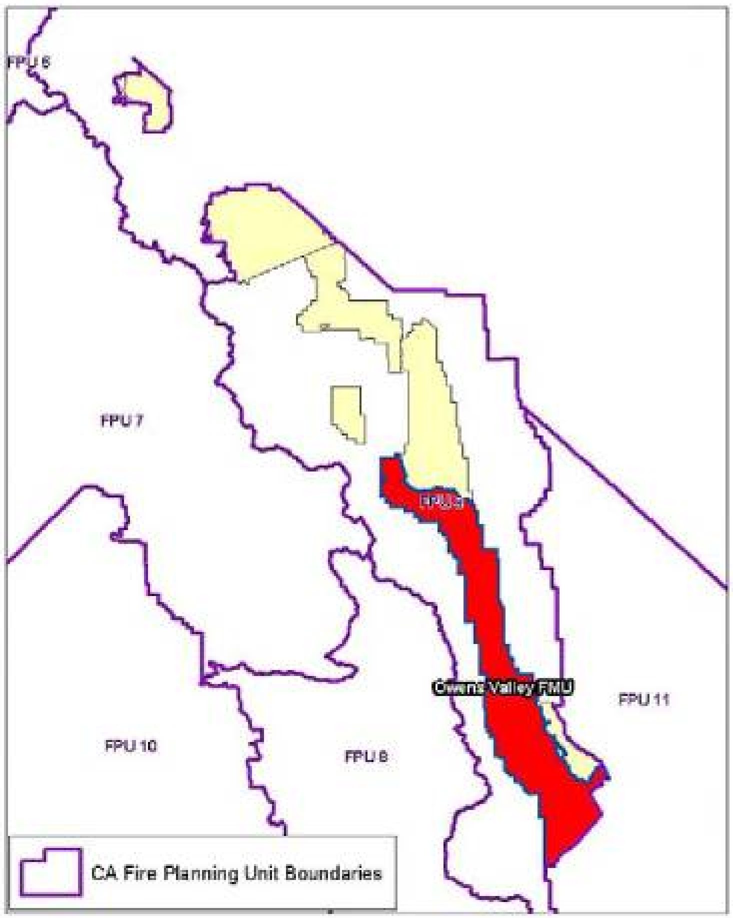
Semi-major Axis: 6378206.4000

Denominator of Flattening Ratio: 294.978698

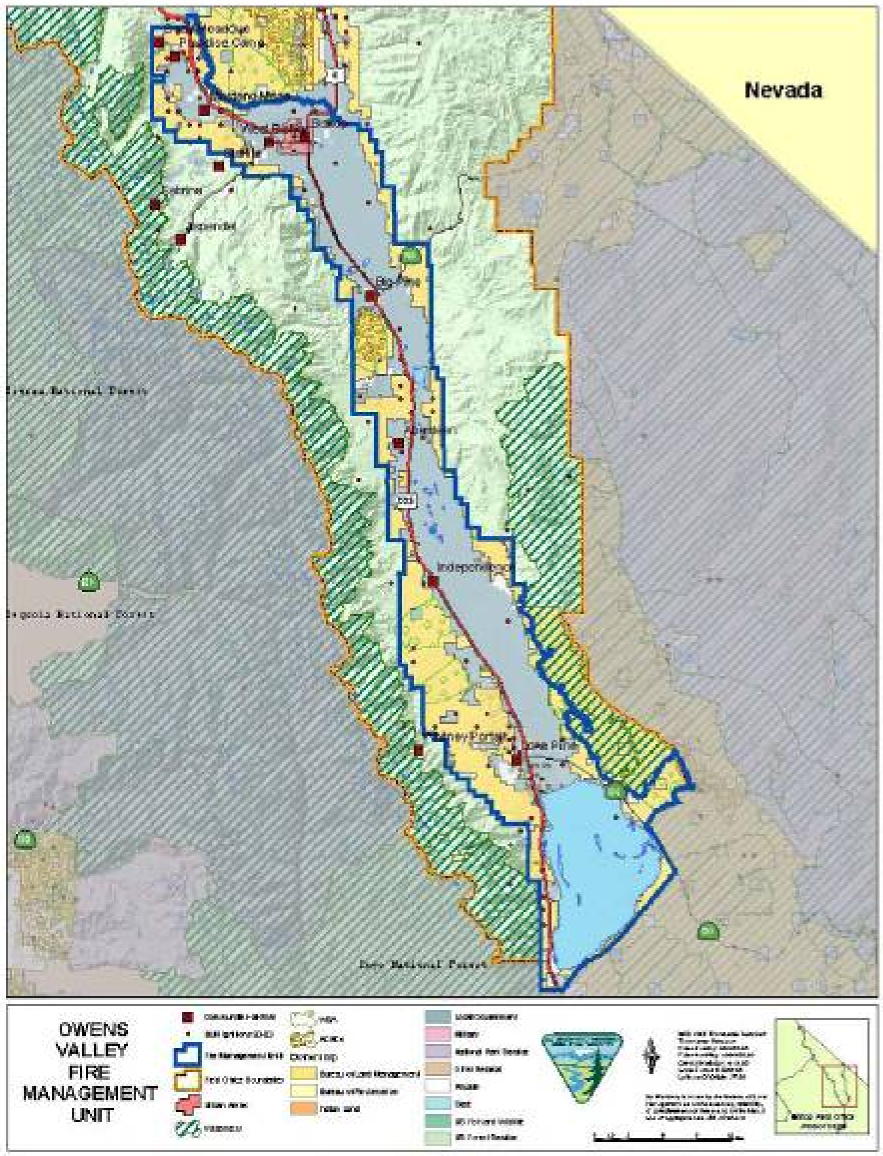
A.3 BLM Fire Management Plan

(2004)- Owens Valley Fire Management Unit

Owens Valley FMU



CA-170-06


Nevada
Bishop
Big Pine
Independence
Lone Pine
OWENS
VALLEY
FIRE
MANAGEMENT
UNIT

FMU I.D. No.: CA-170-06 Owens Valley

FMU Type: WUI

FMU Location Information:

- **Geographic boundaries:** This 506,859-acre FMU includes the lower alluvial fans surrounding the Owens Valley in Inyo County. This FMU contains the communities of Bishop, Big Pine, Independence, and Lone Pine. This FMU includes the Crater Mountain ACEC and five WSA's (Cerro Gordo, Southern Inyo, Independence Creek, Crater Mountain, and Symmes Creek)

FMU Area Acre Total:

Ownership by Acres and Percent		
CA-170-06	Owens Valley	
Ownership	**Acres**	**Percent**
Bureau of Land Management	190,695	38
Other Federal/State/Private/etc.	316,165	62
Total Acres	506,859	

FMU Characteristics:

This FMU consists of volcanic flows, upland slopes, and valleys with generally well defined access routes. Elevations range from 2,500 ft. to 5,000 ft. Major plant community types in this FMU include pinyon pine woodlands, saltbush scrub, shadscale scrub, sagebrush steppe, alkali meadow and riparian. Use in this FMU includes grazing and dispersed recreation.

Soils are comprised primarily of granitic and volcanic parent material that are well drained and slightly to moderately susceptible to erosion. There are numerous perennial drainages that bisect the FMU. The drainages are narrow and soils are generally rocky in texture.

Fire Occurrence and History:

Fire History Ignitions by Size Class		CA-170-06
Size Class (Acres)	**Number of Ignitions**	**Number of Acres**
A (0.0 - 0.2)	108	7.0
B (0.3 - 9.9)	32	50.7
C (10 - 99.9)	9	437
D (100 - 299.9)	5	743
E (300 - 999.9)	4	2,546
F (1000 - 4999.9)	2	4,540
G (5000+)	3	21,750
Total	163	30,074

In the period from 1980 thru 2002, 163 wildland fires occurred wholly or partially within this FMU, burning a total of 30,074 acres (includes acres burned outside the FMU boundary). Fire cause was 22% natural (lightning), 60% human-caused and 18% unknown.

Normal fire season is April 1st thru November 31st.

Fire Regime and Condition Class:

- Pinyon - juniper woodlands are 3/2 and 3/3
- Shrub steppe is 3/2 and 3/3
- Desert scrub is 3/1

Fuel Models, Fire Behavior, Fire Weather & Climate Related Impacts:

Major plant community types in this FMU include pinyon pine woodlands, saltbush scrub, shadscale scrub, sagebrush steppe, alkali meadow and riparian.

Desert scrub, shrub steppe, and pinyon – juniper woodlands dominate this FMU. There is also an alkali flat component at the southern end of this FMU. Fuel Model 6 applies to nearly all of this area.

Orographic influences of the Sierra Nevada and White Mountains/Inyo Mountains significantly affect this FMU. Spring can be extremely windy, and many large, damaging, wind-driven fires have occurred in this FMU during the spring months. Summers are typically hot and dry, with low to very low relative humidity, and live fuel moisture typically drops to 30 – 40% by late summer and early fall. Thunderstorms are common and frequently these storms produce little or no rain. Multiple ignitions caused by dry lightning are common during these periods. Additionally, these thunderstorms are usually accompanied by strong, erratic winds.

Fire behavior is generally moderate, but in the vicinity of thunderstorms or other periods of high wind, fire behavior readily becomes extreme. Daytime winds are normally upslope and up canyon, with late afternoon shifts to down slope, down canyon. Very strong winds associated with cold fronts moving through the area are not uncommon on the east side of the Sierra Nevada, particularly in the spring and fall.

Values at Risk:

- **Primary values (resource values and private property) to be protected:**
  - Mule deer winter range
  - Owens Valley vole habitat
  - Rare plants
  - Oak trees
  - Ash trees
  - Joshua trees
  - Riparian habitat
  - Loss of native plant species to conversion to cheat grass
  - Known and unknown cultural sites
  - Cerro Gordo site
  - Manzanar National Monument

- Keeler Dunes
- Soda Plant National Register District at Keeler
- Carson and Colorado historic railroad grade
- Forage for domestic livestock grazing
- Fences
- Recreational and visual qualities
- Alabama Hills Special Recreation Management Area (SRMA)
- Campgrounds
- Crater Mountain ACEC
- Cerro Gordo WSA
- Southern Inyo WSA
- Independence Creek WSA
- Crater Mountain WSA
- Symmes Creek WSA
- Private property and structures
- Power line right-of-ways.

Human Environment/Communities at Risk:

Communities in the Owens Valley FMU are primarily comprised of permanent residents who live and work within the FMU or nearby commuting area. This FMU includes Bishop, the largest community in the eastern Sierra region. Numerous other smaller communities also exist. The communities in this FMU are fairly stable, featuring many families and retirees. Seasonal influxes of tourists are substantial. Many homeowners recognize the need for and benefits from defensible space and community fuels reduction work. Most residents can be reached through the various media outlets based in Bishop. Traditional home defense brochures, press releases and flyers work well in this FMU. Posted flyers at local gathering places, such as post offices, general stores, or other businesses, serve as an excellent method for information distribution. The small town atmosphere helps spread information by word-of-mouth and e-mail. More challenging is reaching the tourists who come from outside the area to recreate on public lands. The audience consists mainly of permanent residents and tourists.

Communities at risk include: Several fire safe councils are already operating in these Owens Valley communities.

- Aberdeen
- Alabama Hills
- Big Pine
- Birch Creek
- Bishop
- Cartago
- Chipmunk Canyon
- Fort Independence
- Forty Acres
- Granite View
- Independence
- Keeler
- Keough's Hot Springs

- Lone Pine
- Mustang Mesa
- Oak Creek.
- Olancha
- Paradise
- Rocking K
- Round Valley
- Rovana
- Seven Pines
- Swall Meadows
- Wilkerson

OBJECTIVES AND STRATEGIES

Fire Management Objective Priority Statement:

"The protection of human life is the single, overriding priority. Setting priorities to protect human communities and community infrastructure, other property and improvements, and natural and cultural resources will be based on the values to be protected, human health and safety, and the costs of protection. (Federal Wildland Fire Management Policy, 1995/Updated 2001)"

Wildland Fire Burned Acre Constraints/Targets:

- FMU target Individual Wildland Fire Size: **1 acres**
- FMU Target Wildland Fire Acres Burned Per Decade: **3,814 acres (2%)**
- **Suppression/Protection Priorities:**
  - Protect human life and property.
  - Provide for increased firefighter safety.
  - 100% protection of "Values at Risk" or "Communities at Risk" from wildland fire.
  - Fires on BLM land remain on BLM land – no crossover to private or other agency land.
  - The intensity of fire suppression effort is limited to the most economical response consistent with human and resource values at risk.
  - When appropriate utilize contain/confine strategies instead of control strategy.
  - Utilize existing natural and human made barriers (i.e. roads, trails, rock outcroppings, riparian areas) when feasible during wildland fire suppression.
- **Suppression Constraints:**
  - Bulldozers and other heavy equipment can only be used in old growth timber stands, prominent viewsheds, riparian areas, aspen groves, cultural sites,

ACEC's, and mule deer winter ranges with authorization from the Field Office Manager, and only to protect human life, private property, structures, visitor safety, or other, sensitive or valuable resources

- **Special Fire Mgt. Considerations/Areas:**
    - Wildland urban interface
    - Protection and enhancement of sensitive plant and animal species, including mule deer winter range

Wildland Fire Suppression Strategies:

- At all Fire Intensity Levels (FIL), **90%** of all unplanned ignitions are kept under **1 acre** in size

- If the 2% **(3,814 acres) decadal threshold for acres burned by wildland fire** is met, a review of objectives and strategies will be initiated to develop new criteria for suppression of wildland fires and prescribed fire and non-fire fuels treatments

- Use Appropriate Management Response (AMR) to meet suppression objectives listed above, based on current conditions and fire location

- Except where human life and private property are threatened, wildland fire managers will request and work closely with, a Resource Advisor for all wildland fires exceeding or expected to exceed initial attack suppression efforts

- In non-emergency situations, request an archeologist be present prior to any heavy equipment activity. In emergency circumstances, where heavy equipment must be employed, conduct post-fire archeological evaluations to assess and document equipment damage to resources.

- In cases where wildland fire threatens listed cultural resource properties, employ all available suppression and resource protection measures to avoid loss to the property. Contact the Bishop Field Office Manager and archeologist as soon as the threat to listed properties is recognized. Request an archeologist be dispatched to the incident as soon as practicable. Use care to avoid unintended damage to the listed property as a result of the suppression and protection efforts.

Wildland Fire Use Objectives and Strategies:

Wildland fire use for resource benefit is not an identified fire management option within this FMU.

Prescribed Fire Objectives and Strategies:

Prescribed Fire Objectives:

- No more than 3% of BLM lands (**5,721 acres not including maintenance treatments of WUI fuel breaks**) is treated via prescribed fire and/or non-fire means over the 10-year period
- Treatment emphasis will be in the WUI and for the protection and enhancement of sensitive plant and animal species, including mule deer winter range
- Treatment in desert scrub is minimal, outside of WUI
- Prescribed fire emissions remain within those allowed by state and local air quality regulators

Prescribed Fire Strategies:

- Treat up to 3% of BLM lands (**5,721 acres not including maintenance treatments of WUI fuel breaks**) via prescribed fire and/or non-fire means over the 10-year period
- Treatment emphasis is in the WUI, pinyon – juniper, and shrub steppe vegetation types
- An interdisciplinary approach is used to determine the best site-specific prescribed fire treatments to accomplish fuels reduction and other resource goals and objectives
- Conduct appropriate pre-treatment surveys (archeological, botanical, etc…) to ensure no unintended loss of other resource values
- Fire and fuels management specialists will work closely with in local air quality regulators to ensure prescribed fire emissions stay within permitted levels
- Use of herbicides as a vegetation treatment option will be carefully examined, for potential impacts to water sources, wildlife habitat, and cultural/traditional uses
- Consult with all affected Native American communities prior to any vegetation treatment of pinyon pine
- Conduct post-treatment surveys for increases in non-native plant species. If non-native species cover exceeds 5% in treated areas, implement appropriate eradication measures, as determined by an interdisciplinary effort.

Non-Fire Fuels Treatment Objectives and Strategies:

Non-Fire Fuels Treatment Objectives:

- No more than 3% of BLM lands (**5,721 acres not including maintenance treatments of WUI fuel breaks**) is treated via non-fire and/or prescribed fire treatments over the 10-year period
- Treatment emphasis will be in the WUI and for the protection and enhancement of sensitive plant and animal species, including mule deer winter range
- Treatment in desert scrub is minimal, outside of WUI

Non-Fire Fuels Treatment Strategies:

- Treat up to 3% of BLM lands (**5,721 acres not including maintenance treatments of WUI fuel breaks**) via non-fire and/or prescribed fire treatments over the 10-year period
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- Conduct post-treatment surveys for increases in non-native plant species. If non-native species cover exceeds 5% in treated areas, implement appropriate eradication measures, as determined by an interdisciplinary effort.

Post Fire Rehab & Restoration Objectives and Strategies:

Post Fire Rehab & Restoration Objectives:

- Rehabilitate burned areas to mitigate the adverse effects of wildland fire on soil and vegetation in a cost-effective manner and to minimize the possibility of wildland fire recurrence or invasion of weeds.
- Post-Fire Rehabilitation and/or Restoration will emphasize the re-establishment and perpetuation of habitat diversity and the reduction of annual grass establishment and proliferation.

- Ensure that equipment and stabilization material, e.g., straw etc… are weed-free.

Post Fire Rehab & Restoration Strategies:

- Post fire rehabilitation will be considered on a case-by-case basis depending on the location of the fire and resources to be protected.

- Site specific projects will be considered to meet the objectives as identified in the LUP.

- Where rehabilitation and/or restoration are deemed necessary or desirable, successfully achieve slope stabilization, re-establishment of appropriate, site-specific native plant species, or other rehabilitation/restoration work in a timely manner.
  - If appropriate, develop and submit ESR plan to CA BLM State Office.
    - State Director approval is currently required for all ESR work under $100,000 (WO IM 2004-184).
    - WO approval is currently required for all ESR work over $100, 000 (WO IM 2004-184).

- Fire Suppression Rehabilitation plan to be prepared by environmental specialist and carried out.

- Post-suppression mitigation shall include reestablishing drainage, removing trash, rehabilitation of firebreaks and other ground disturbances and obliteration of vehicle tracks sufficient to discourage future casual use and erosion.

- Fire damages resulting from wildland fires takes two forms: suppression damages and resource damages. Suppression action damages may be the result of suppression operations; resource damages are a result of the fire itself as it related to the damage to the natural resource.
  - Suppression damage restoration or rehabilitation involves short term actions usually (0-6 months) to stabilize a burned area and mitigate suppression damage. This includes replacing region equipment, infrastructure, buildings or facilities damaged or destroyed by suppression action.
    - Immediate rehabilitation actions to prevent further land degradation or resource loss.
  - Resource damage restoration or rehabilitation involves long term or post incident actions:
    - Post-incident rehabilitation actions must be specified in a rehabilitation plan.
    - Post-Fire Rehabilitation and/or Restoration needs should be considered for each fire and plans prepared for those fires requiring complex rehabilitation and restoration efforts.

- **Emergency Stabilization Strategies:**
  - Stabilize and prevent unacceptable degradation to natural and cultural resources
  - Minimize threats to life and property resulting from the effects of a fire

- Ensure that equipment and stabilization material, e.g., straw etc… are weed-free.

Post Fire Rehab & Restoration Strategies:

- Post fire rehabilitation will be considered on a case-by-case basis depending on the location of the fire and resources to be protected.

- Site specific projects will be considered to meet the objectives as identified in the LUP.

- Where rehabilitation and/or restoration are deemed necessary or desirable, successfully achieve slope stabilization, re-establishment of appropriate, site-specific native plant species, or other rehabilitation/restoration work in a timely manner.
  - If appropriate, develop and submit ESR plan to CA BLM State Office.
    - State Director approval is currently required for all ESR work under $100,000 (WO IM 2004-184).
    - WO approval is currently required for all ESR work over $100, 000 (WO IM 2004-184).

- Fire Suppression Rehabilitation plan to be prepared by environmental specialist and carried out.

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    - Immediate rehabilitation actions to prevent further land degradation or resource loss.
  - Resource damage restoration or rehabilitation involves long term or post incident actions:
    - Post-incident rehabilitation actions must be specified in a rehabilitation plan.
    - Post-Fire Rehabilitation and/or Restoration needs should be considered for each fire and plans prepared for those fires requiring complex rehabilitation and restoration efforts.

- **Emergency Stabilization Strategies:**
  - Stabilize and prevent unacceptable degradation to natural and cultural resources
  - Minimize threats to life and property resulting from the effects of a fire

    - Repair/replace/construct physical improvements necessary to prevent degradation of land or resources
    - Actions must be taken within one year following containment of a wildland fire

- **Rehabilitation Strategies:**
    - Specifies treatments required to implement post-fire rehabilitation policies
    - Repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions
    - Repair minor facilities damaged by fire
    - Actions must be taken within three years of containment of a wildland fire
    - Consult with staff archaeologist, botanist, wildlife biologist, and other staff specialists to evaluate fire and suppression operations effects and determine if additional restoration is necessary.

- **Rehabilitation:**
    - "NEPA Documentation Needed for Fire Management Activities; Categorical Exclusions" Federal Register, June 5, 2003. "Activities carried out under the rehabilitation category will take place only after a wildfire. These activities cannot use herbicides or pesticides, nor include the construction of new permanent roads or other infra-structure, and they must be completed within three years following a wildland fire. Activities carried out under the rehabilitation categorical exclusion will not exceed **4,200 acres.**"

- Use agency resource specialists to provide guidance during fire rehabilitation efforts.

- All fire restoration efforts will be carried out in a manner that least impairs wilderness values (MIST).

- Inspect equipment and stabilization material, e.g., straw etc. to ensure weed-free status.

- Hand tools will be used for rehabilitation activities whenever feasible.

- All firelines will be rehabilitated to natural conditions.

- Long term rehabilitation could involve the use of an ESR team on larger fires.

- Long term rehab may include repairs to structures (like fences, signs, windmills and such), construction of temporary fences to exclude people and livestock from burned areas and signing.

Community Protection/Community Assistance Objectives and Strategies:

Community Protection/Community Assistance Objectives:

- Increase public awareness, participation, and cooperation pertaining to the mitigation of fire threats in the WUI

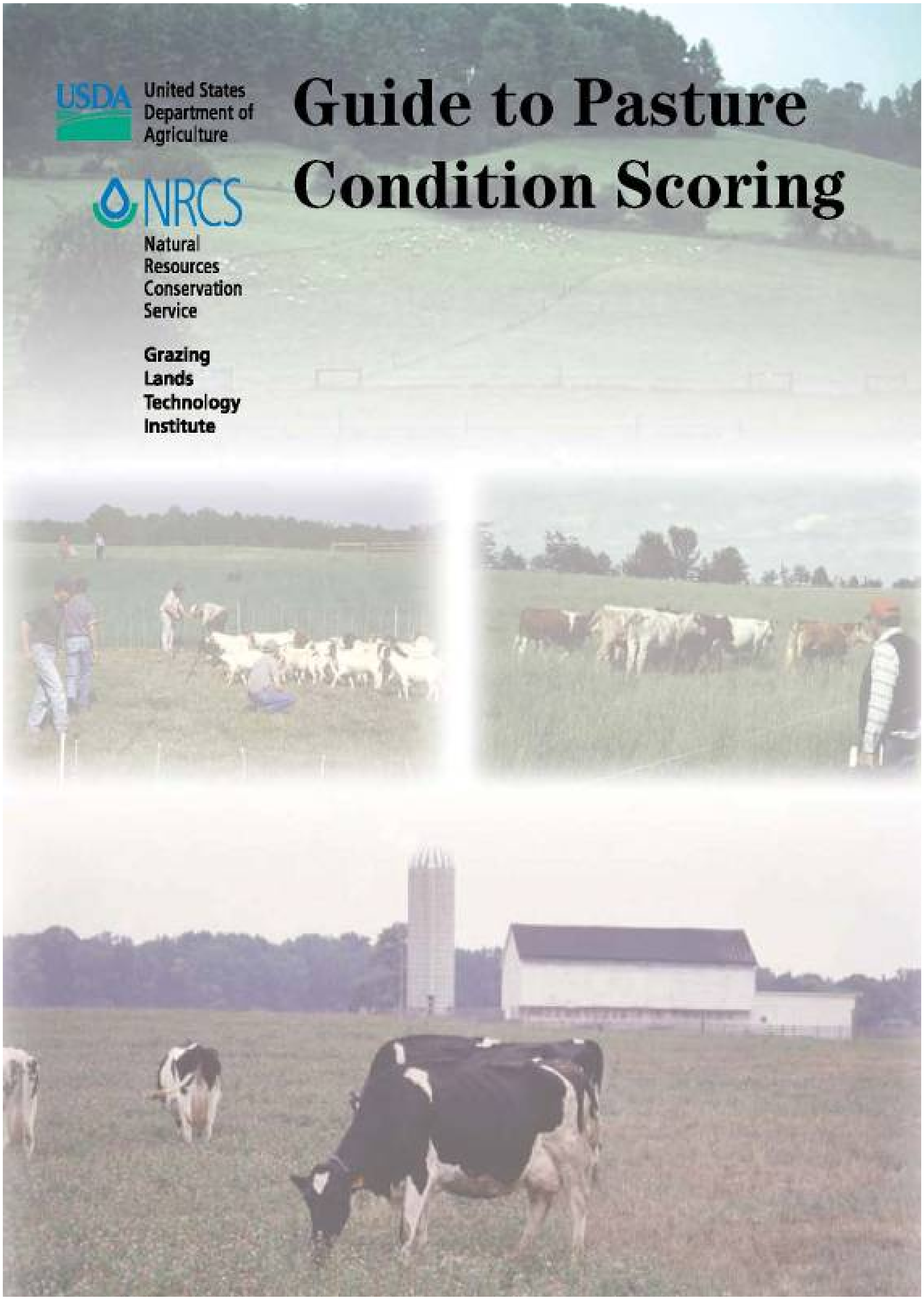
- Educate area population on the basic principles of fire ecology and fire's role in the environment
- Build public support for fuels reduction efforts in and around WUI
- Collaborate with local fire departments and other entities and individuals regarding federal grants available to communities at-risk
- Develop and implement collaborative mitigation and prevention strategies with communities at risk
- Reduce the risk of human caused wildland fires, with special emphasis on recreationalist-caused fires
- Improve rural and volunteer fire department readiness and fire fighting capacity

Community Protection/Community Assistance Strategy:

- Pursue formation of fire safe councils in all communities at risk.
- Work collaboratively with communities and other partners to develop a Community Wildfire Protection Plan (CWPP) and will update or amend the FMP as necessary to incorporate mitigation/prevention recommendations and priorities developed by the community or outlined in the CWPP.
- Work with US Forest Service prevention staff through an interagency agreement to make sure campsites and high use areas are patrolled and signs are maintained.
- Provide yearly fire prevention outreach materials to agencies offering campfire permits and general camping information to the public.
- Provide fire restriction and emergency closure information to the public.
- Present fire mitigation and prevention information to local K-12 schools at least once a year over the 5 year period and then re-evaluate the program to determine its effectiveness.
- Present fire ecology information to local youth groups to help enhance the understanding and support the BLM management activities.
- Coordinate information relating to funding and training opportunities to rural fire departments in order to enhance their fire fighting capacity.
- Provide informational brochures and materials to communities and homeowners on reducing fire risks. Provide Defensible Space fire education materials at events.

- Use local media outlets to encourage defensible space and to mitigate current fire causes.
- Produce mini campaigns each year to address the priority fire cause which may include some of the following: billboards, flyers, Fire Safe Council ads, and radio PSA's.
- Participate in residential assessments and provide education to the homeowners.
- Conduct presentations to local homeowner groups explaining "Defensible Space" and/or fire prevention risks and mitigation.

A.4 Pasture Condition Scoring Document



Introduction

A well-managed pasture is one whose productivity (plant and animal) is optimized while it does no harm to soil, water, and air quality. Pasture condition scoring is a systematic way to check how well a pasture is managed. If the pasture is located on the proper site and well managed, it will have a good to excellent overall pasture condition score. By rating key indicators and causative factors common to all pastures, pasture condition can be evaluated and the primary reasons for a low condition score identified. A condition that can lead to one or more pasture resource concerns such as poor plant growth, weedy species invasion, poor animal performance, visible soil loss, increased runoff, and impaired water quality.

Pasture condition scoring, to be most useful, should occur several times a year during key critical management periods throughout the grazing season. Scoring should be performed:

- At the start before placing livestock on pasture
- At peak forage supply periods
- At low forage supply periods
- As plant stress appears
- Near the end to help decide when to remove livestock

In addition, pastures used for year-round grazing benefit from pasture condition scoring:

- Going into the winter season
- Late in winter
- During thaws or wet periods

Pasture condition scoring can be useful in deciding when to move livestock or planning other management actions. It sorts out which improvements are most likely to improve pasture condition or livestock performance.

Pasture condition scoring involves the visual evaluation of 10 indicators, listed and described below, which rate pasture condition. In the *Pasture Condition Score Sheet*, each indicator or factor has five conditions described for it, ranging from lowest (1) to highest (5). This objectively ranks the extent of any problem(s) and helps sort out the likely cause(s). Evaluate each indicator separately. They may be combined into an overall score for the pasture unit or left as an individual score and compared with the other nine indicators. Indicators receiving the lowest scores can be targeted for corrective action as warranted. The plant vigor indicator can be analyzed further by rating six factors that cause plant vigor to be what it is. As one or more erosion indicators may exist on a site, they are split into four types: sheet and rill, gully, streambank or shoreline, and wind.

Indicator Descriptions

Percent desirable plants

This indicator determines if the pasture has the kind of plants that the livestock on it will graze readily. A desirable species is readily consumed, persistent, and provides high tonnage and quality for a significant part of the growing season. Undesirable species, such as woody invaders, noxious weeds, and toxic plants, are those that typically are not eaten (rejected) by most livestock or cause undesirable side effects when eaten, and that crowd out more desirable species.

A few forages for a time are undesirables during a specific growth stage when they produce toxins. Intermediate species are those which, while eaten, provide low tonnage or lose quality fast, and often have a short-lived grazing use period. Some examples are dandelions, wild plantains, and annual grasses, such as crabgrass. Estimate visually the proportion of desirable species present in the entire sward by weight, and score accordingly.

(Guide to Pasture Condition Scoring, May 2001)

Plant cover

The percentage of the soil surface covered by plants is important for pasture production and soil and water protection. A dense stand (high stem count) ensures, when properly grazed, high animal intake and high sunlight interception for best forage growth. Bare, open spots allow for weed encroachment, increased water runoff during intense rains, and soil erosion. Visually estimate the total cover of all desirable and intermediate species. Assign a value based on either green leaf canopy or live vegetative basal area cover percentage. Use the most familiar method that provides a consistent, reliable estimate of plant cover for the pasture being rated.

Canopy cover works best on sod-forming pastures. It can be determined at any time on continuously grazed pastures provided stubble heights greater than 1 inch are present. On rotational pastures, estimate canopy cover of a paddock the day prior to livestock entry. This will represent the best possible condition. If it rates fair or lower at this growth stage, management changes are definitely in order.

Basal area works best on bunch grass pastures. It is hard to use on pastures where sod-forming grasses and broadleaf plants dominate. Estimate by eye or use either the step-point or the point-intercept methods. Basal area is measured by both methods by counting pin hits on live stems and plant crowns at ground level (within 1 inch above). Where it is most useful, basal area is more constant than canopy cover and thus is more reliable.

Plant residue

Plant residue, in various states of decay, provides additional surface cover and organic matter to the soil. However, too much standing dead material in the grass stand reduces the feed value of the forage consumed and animal intake, and inhibits new plant shoot growth. Excessive amounts of standing dead material may cause the forage to be rejected by the grazing animal. Less than 25 percent of the standing forage mass should be dead or dying leaves and stems. Buildup of thatch (mat of undecomposed residue) at the soil surface indicates retarded residue decay. Thatch promotes fungal diseases and retards or prevents shoot and seedling emergence. This results in forage stand decline.

Plant diversity

Plant diversity is the number of different forage plants that are well represented (20% or more of plant cover) in a pasture. Low species diversity causes season-long pastures, or a set of pastures grazed as a unit, to be less reliable suppliers of forage to livestock during the grazing season. Forage production varies more widely through the grazing season because of changing weather and light conditions and insect and disease pressure. Pastures that have high species diversity tend to be older, moderately grazed permanent pastures. Here planted and volunteer forages have adjusted to the management and the prevailing environmental stresses. No single forage species is so dominant as to crowd out others.

Having more than one functional plant group growing either in a pasture or in different, complementary pastures is highly important. This maintains the most consistent forage supply during the grazing season. Functional groups of forages are plant groupings that have similar growth habits and management needs. The four basic functional groups for improved pastures are cool-season grasses, warm-season grasses, legumes, and other grazable broadleaf plants (e.g., *Brassicas* and forage chicory). These basic functional groups can be split into more specific groups, such as upright versus prostrate and sod-formers versus bunch grasses. However, this extra detail is unwarranted in improved pasture condition evaluations.

Plants from different functional groups are most compatible when they can compete successfully together as managed. Mixed species pastures with at least two functional groups and three to four well-

Standing dead residue of mature plants reduce forage quality and cause livestock to selectively graze around them.

(Guide to Pasture Condition Scoring, May 2001)

represented forage species are generally the most productive. Higher diversity (over six species) does not assure higher productivity. It may actually spur animals to avoid some species and graze others hard, as species differences in palatability and maturity are more likely. Potential forage is wasted. Less desirable species gain in area by outcompeting overgrazed desirable species. However, trying to prevent this selectivity by reducing forage on-offer and forcing animals to eat everything, reduces intake and gains. This also decreases productivity.

When plant diversity scores low, several courses of action are possible. The appropriate response depends on the region in which the pasture is located, its intended use period, and the species growing in it. Applying other treatment measures may be easier or more appropriate than trying to grow several plant species together within a single pasture. These measures include:

- Applying nitrogen fertilizer to a pasture with few or no legumes present
- Establishing a different forage functional group in a separate pasture
- Oversowing an annual forage crop into a perennial forage pasture going into dormancy

Always rate plant diversity even if you may ultimately not wish to change it in that pasture. Monocultures can be quite productive on seasonal and irrigated pastures. They can provide abundant production at times precisely when other pastures on the operating unit are unproductive. However, when plant diversity is rated low on an individual field, some alternative course of action must be in place or developed. Some, such as feeding hay or applying N fertilizer, are expensive alternatives.

Plant vigor

Desirable species should be healthy and growing at their potential for the season when rated. If not, they will be replaced by weeds and low quality forage plants. If plant growth conditions really suffer, bare soil will begin to appear. Some things to consider when rating plant vigor are color, size of plants, rate of regrowth following harvest, and productivity. Determine overall vigor of desirable and intermediate species, and record. If score is less than four, utilize the causative factors below to help determine what may be causing the lack of vigor. If scoring a pasture for the first time, review soil test results or get soil tests done for it regardless of plant vigor rating to determine the pasture's level of fertility and pH. It also pays to rate the other causative factors as well first time out; this provides initial facts vital to managing the pasture from here, on.

Soil fertility

Adequate, but not excessive, fertility is critical for good plant vigor. Test soil or plant tissue to determine nutrient status. Excessive amounts of nutrients, particularly N, P, and K, can also cause animal health and/or water quality problems. Rank, often lodged, dark green to blue-green forages are a warning sign of excessive soil fertility. Maintain adequate nutrient balance to not exceed maximum economic yield of desirable forage species. In some areas of the United States, excess salts and sodium are often present in the soil at levels that reduce plant vigor. Test those soils for electrical conductivity and exchangeable sodium. Reduce their levels, or plant forage species tolerant of the levels found.

When urine and dung patches are noticeably greener than the rest of the pasture, nutrients are limiting production.

Severity of use

Grazing management is critical in maintaining productive pastures. Close, frequent grazing (mown lawn appearance) often causes loss of vigor reducing yields and ground cover. Low stocking rates promote selective grazing that causes excessive residue buildup (presence of mature seed stalks and dead leaves). This standing residue blocks sunlight, reduces overall forage quality, and favors the spread of less palatable and/or taller, grazing intolerant forages. Assign a value based on the proportion of the pasture grazed closest and the height at which it is grazed. Compare that height to minimum stubble heights recommended for maintaining desired forages.

(Guide to Pasture Condition Scoring, May 2001)

Site adaptation of desired species
Climate and soil type play a major role in the vigor of a given species. Consider these items when evaluating adaptability:

- cold hardiness
- tolerance to aridness
- summer heat and humidity levels
- frost heave or soil cracking
- soil wetness
- flooding or ponding
- soil acidity or alkalinity
- toxic elements
- salinity
- sodicity
- low or high nutrient levels

Two other factors to consider are the desired species tolerance to existing grazing pressure and soil and water management. Plants that hold their growing point close to the ground can be grazed close provided they are allowed some time between grazing events to push out new leaf area. Others that elevate the growing point into the grazing zone need grazing events timed to release new shoot growth. The presence and balance of desired species are compared with those species present now and their balance. This verifies how well adapted the desired species were to the site, grazing pressure, and management.

Climatic stresses
Extremely wet, dry, hot, or cold weather may threaten plant vigor even when climatically adapted forage species are present. When rating the pasture, consider recent weather events and their role in the present health of a forage stand. Extremely cold and wet weather can cause temporary nitrogen deficiency symptoms (yellowish leaves). A hard winter may weaken the stand. A drought can cause the stand to go dormant. Check for frost or freeze damage to foliage.

Soil pH
Soil pH influences plant vigor primarily through its effect on nutrient availability. It also influences the amount of nitrogen-fixing nodules formed on legume roots. Determine the pH in the surface 3 to 4 inches through a soil test or reliable field methods. Adjust pH to provide optimum yield of desirable forage species.

Note: Reduced yields may continue if the pH in the subsoil is too low or high. Contact a soil fertility or forage management specialist for further management options.

Insect and disease pressure
Look for signs of leaf, stem, and root damage caused by insects and disease. Assess their impact on forage quality, quantity, and stand life. Some are chronic, occurring yearly, but with little consequence to the forage stand life. Others take the forage species under attack out of the stand. Corrective actions to take are numerous and specific to the insect or disease involved. Consult with a local, respected forage expert when unsure of proper course of action.

Livestock concentration areas

Concentration areas are places in pastures where livestock return frequently and linger to be near water, feed, mineral or salt, or shelter, or to be in shade. Typically, well-worn pathways lead to these preferred areas. Depending on the degree of usage, these areas are usually bare and receive extra animal waste. Depending on where they are on the landscape and flow paths, they can direct sediment, nutrients, and bacteria to nearby waterbodies.

Heavy use areas, such as around this feed bunk, often wash during heavy rains. Note missing hay residue at the bare spots in foreground.

These areas can direct contaminated runoff to surface waters unless there is an intervening grass buffer between them and open channels. Note reed canarygrass riparian area buffer below feed bunk.

(Guide to Pasture Condition Scoring, May 2001)

Uniformity of use

Spot grazing often occurs where forage growth exceeds livestock intake at least seasonally. Once established, it stays in place unless pattern is destroyed seasonally.

Check uniformity of use by observing animal grazing patterns. Uniform grazing results in all desirable and intermediate species being grazed to a similar height. Spotty or patterned grazing appears uneven throughout a pasture with some plants or parts of paddocks grazed heavily and others lightly. Individual forage species are being selected for or against by the livestock based on their palatability and nutritional value. Selectivity is also affected by forage species stage of maturity differences, amount of forage offered to livestock, and their length of stay in the paddock. Zone grazing occurs when one end of the pasture is heavily grazed and the other end is ungrazed or lightly grazed. It occurs on long and narrow pastures and ones that run lengthwise up and down steep slopes. Other pastures that have shady areas, windbreaks, or hay feeding, creep feeding, and watering sites whose location and duration of use at that location skew foraging to one end of a pasture are often zone grazed as well. Physical barriers, such as streams, cliffs, and obstructing fencelines, can confine livestock to one area of a pasture causing zone grazing. When rating this factor keep in mind that while overgrazing may result in a uniform height (mown lawn appearance), it is to a height lower than that needed to maintain all desirable forage species.

Areas that are grazed close contrasted with areas largely avoided. Several causes exist. The one shown is a deep, entrenched stream barrier and entry choice to pasture.

Erosion

Sheet and rill

This erosion is soil loss caused by rain drop impact, drip splash from rainwater dropping off plant leaves and stems onto bare soil, and a thin sheet of runoff water flowing across the soil surface. Sheet and rill erosion increases as ground cover decreases. Evidence of sheet erosion in a pasture appears as small debris dams of plant residue that build up at obstructions or span between obstructions. Some soil aggregates or worm castings may also be washed into these debris dams. Rills are small, incised channels in the soil that run parallel to each other downslope. They join whenever the ground surface warps and deflects the direction of their flow. When rills appear, serious soil loss is occurring. This erosion type also includes most irrigation-induced erosion.

Streambank, shoreline, and gully

This erosion occurs in large, open drainage channels or around shorelines. When in pastures, these channels or shorelines can have heightened erosion problems and losses of vegetative cover that typically grows on them. These heightened damages result from grazing animal traffic in or on them. Open channels may be intermittent or perennial flowing streams or dry washes. The factors that affect the extent of disturbance livestock cause to gullies, streambanks, shorelines, and their associated vegetation are:

- Livestock traffic patterns
- Frequency of use
- Attractiveness of these channels or banks as sunning, dusting, travel lanes, watering, grazing, or rubbing areas
- Channel shape (depth, width, presence and frequency of meanders, and bank stability)
- Flow characteristics (frequency, depth, sediment carried, swiftness, and turbulence)

Wind

Erosion occurs when heavier, windblown soil particles abrade exposed soil and cause dust to become airborne. Deposition of the heavier soil particles occurs downwind of obstructions, such as fencelines, buildings, and vegetation. Often vegetative debris is windrowed against obstructions.

(Guide to Pasture Condition Scoring, May 2001)

Percent legume

Legumes are important sources of nitrogen for pastures and improve the forage quality of a pasture mix when they comprise at least 20 percent of total air-dry weight of forage. Deep-rooted legumes also provide grazing during hot, dry periods in mid-summer. Visually estimate the percentage of legume present in the total forage mass. Rate this indicator even if site or grass species preclude successful legume establishment and reliable survival to have an effective legume component to fix nitrogen. Most pastures are nitrogen-limited since much of the nitrogen excreted by animals eludes plant uptake. Pastures with few or no legumes present need alternative means of supplying nitrogen for optimum forage production. When bloating legume content is greater than 60 percent of total forage dry weight; bloat incidence in livestock is likely without preventative steps.

Avoid grazing pastures too close that causes spreading, bloat-inducing legumes to become dominant (over 60 percent of stand by weight).

Cool-season grass pastures should have 30 percent legume by weight.

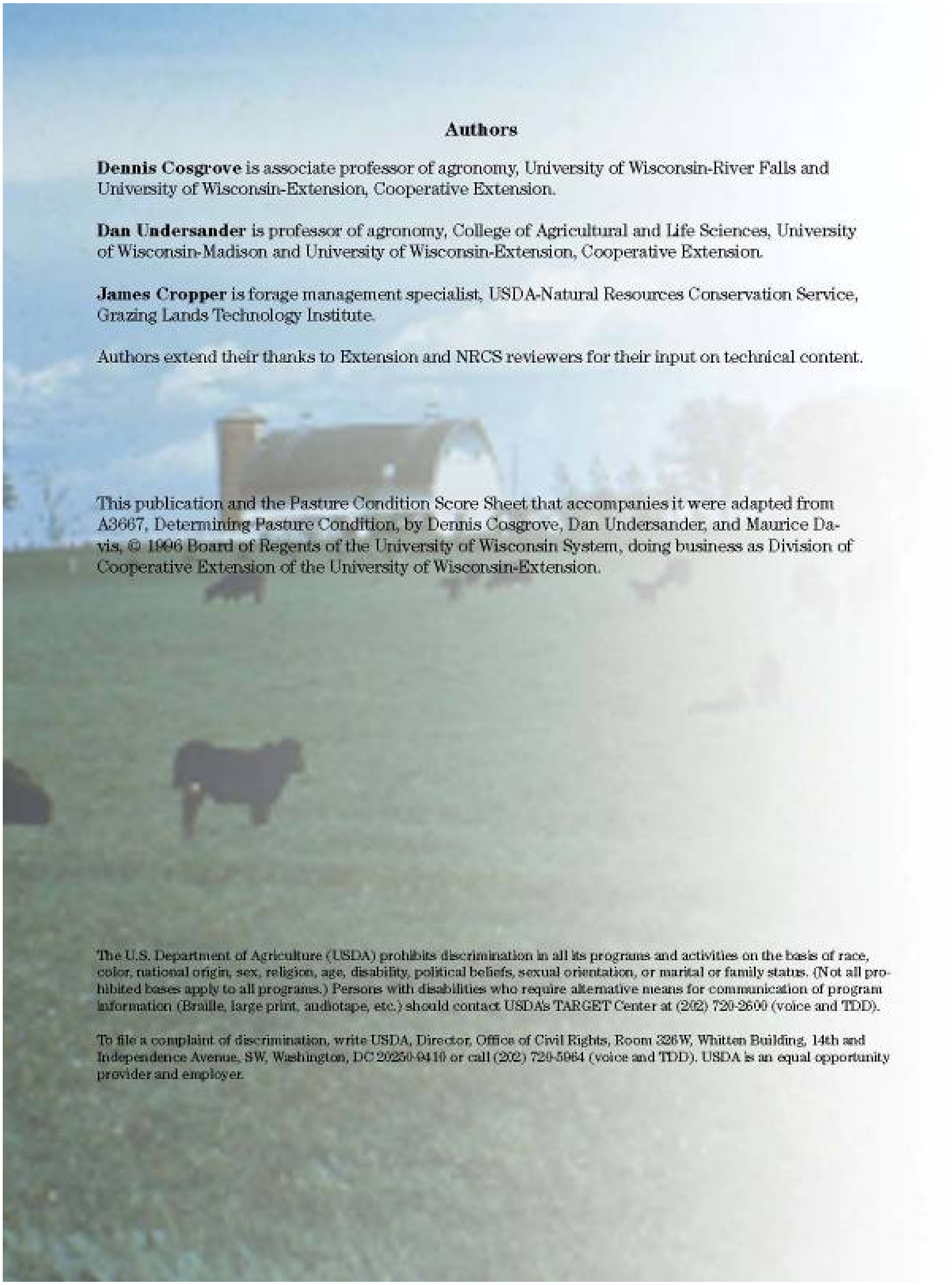
Warm-season grass pastures, like this rotationally grazed bermudagrass-white clover, should have 20 percent legume for good livestock performance and nitrogen self-sufficiency.

Soil compaction

Soil compaction impacts water infiltration rates and runoff. Lack of infiltration decreases water available in the soil for plant growth. Instead, water runs off, increasing channel erosion downstream, and conveys contaminants, such as nutrients, from the site, reducing water quality. Soil compaction is best determined by measuring the bulk density (weight per volume of soil) at 1-inch increments to plow depth. However, compaction can be detected in the field using a soil probe, metal rod, or knife. As these tools are pushed into the soil, compacted soil layers interrupt their ease of penetration. Compare in-field resistance to penetration with resistance found at a grazed fenceline where the livestock cannot stand or walk on the soil surface. The more noticeable the difference in resistance between the two areas is, the worse the compaction is in the pasture.

Wet soils are easily compressed and deformed by livestock hooves.

(Guide to Pasture Condition Scoring, May 2001)



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Authors extend their thanks to Extension and NRCS reviewers for their input on technical content.

USDA NRCS
Natural Resources Conservation Service

Grazing Lands Technology Institute

May 2001

Pasture Condition Score Sheet

Purposes

- Evaluate current pasture productivity and the stability of its plant community, soil, and water resources.
- Identify what treatment needs, if any, are required to improve a pasture's productivity and protect soil, water, and air quality.

Suggested uses

This score sheet may be used to rate different pastures in a single growing season or the same pasture over a period of years. Rating a pasture yearly can track trends, either improvement or decline, in its condition. Some indicators change slowly in response to stresses caused by management or climate. Also, some indicators may change as each season progresses. An indicator or causative factor may rank high at one time and low another. Uniformity of use, plant residue, percent legume, severity of use, weather, and insect or disease pressure can vary widely on the same pasture depending on when they are scored during the year and the degree of management the pasture receives. Therefore, it is often wise to score a pasture at different, key times during the year before deciding to make changes in management. Indicate on the form the date the scoring occurred.

Procedure

Step 1—Rate each pasture one by one that is occupied all at the same time by a herd or flock and separated from other pasture areas by portable or fixed fencing. Paddocks in rotational pastures may be rated separately or as a combined unit. It depends on how alike they are. If any indicator looks markedly different from paddock to paddock, it may pay to rate each one separately.

Step 2—Score all 10 indicators regardless of your feelings of their relative worth. To learn or recall how each indicator reflects on how well a pasture is being managed, see *Guide to Pasture Condition Scoring*.

Step 3—Using the attached score sheet and indicator criteria, read the scoring criteria for each of the 10 pasture condition indicators one at a time and rate before moving onto the next. Use the 1 to 5 scale provided. Estimate by eye or measure as precisely as you feel is needed to rate the indicator reliably.

Step 4—When scoring plant vigor, enter a score based on the general criteria given on page 2 using the most limiting trait listed. Use this number to determine the overall pasture score. If the plant vigor score is less than 4, refer to the plant vigor causative factors' criteria on page 6 to identify the plant stress(es) causing reduced vigor. Rate each causative factor independently on the score sheet provided on page 5. Do not average to adjust the original vigor score.

Step 5—When scoring erosion, rate sheet and rill erosion every time. Rate other types of erosion only if present. When present, indicate which one(s) by identifying the erosion type with a unique symbol next to its score. Divide the box as needed to score them separately. Erosion is rated by averaging the individual scores. A need remains to prioritize which erosion problem is controlled first and how.

Step 6—Total the score for each pasture and compare to the following chart. Also, focus on any low scoring individual indicators or causative factors.

Pasture condition score: Overall	Individual	Management change suggested
45–50	5	No changes in management needed at this time.
35–45	4	Minor changes would enhance, do most beneficial first.
25–35	3	Improvements benefit productivity and/or environment.
15–25	2	Needs immediate management changes, high return likely.
10–15	1	Major effort required in time, management, and expense.

Step 7—When an individual indicator's score falls below a 5, determine its worth to your operation. Then, decide whether to correct the cause or causes for the low rating. If you choose to correct, apply the most suitable management options for your area and operation.

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Pasture Condition Score Sheet

Indicator	Score 1	Score 2	Score 3	Score 4	Score 5
Percent desirable plants	Desirable species < 20% of stand. Annual weeds and/ or woody species dominant.	Desirable species 20–40% of stand. Mostly weedy annuals and/or woody species present and expanding. Shade a factor.	40–60% desirable forage species. Undesirable broadleaf weeds and annual weedy grasses invading. Some woodies.	60–80% of plant community are desirable species. Remainder mostly intermediates and a few undesirables present.	Desirable species exceed 80% of plant community. Scattered intermediates.
Plant cover (Live stems and green leaf cover of all desirable and intermediate species.)	Canopy: < 50% Basal area: < 15% Photosynthetic area very low. Very little plant cover to slow or stop runoff.	Canopy: 50–70% Basal area: 15–25% Photosynthetic area low. Vegetal retardance to runoff low.	Canopy: 70–90% Basal area: 25–35% Most forages grazed close, little leaf area to intercept sunlight. Moderate vegetal retardance.	Canopy: 90–95% Basal area: 35–50% Spot grazed low and high so some loss of photosynthetic potential. Vegetal retardance still high.	Canopy: 95–100% Basal area: >50% Forages maintained in leafy condition for best photosynthetic activity. Very thick stand, slow or no runoff flows.
Plant diversity	One dominant (> 75% of DM wt.) forage species. Or, over 5 forage species (all <20%) from one dominant functional group, not evenly grazed - poorly distributed.	Two to five forage species from one dominant functional (>75% of DM wt.) group. At least one avoided by livestock permitting presence of mature seed stalks. Species in patches.	Three forage species (each ≥ 20% of DM wt.) from one functional group. None avoided. Or, one forage species each from two functional groups, both supply 25–50% of DM wt.	Three to four forage species (each ≥ 20% of DM wt.) with at least one being a legume. Well intermixed, compatible growth habit, and comparable palatability.	Four to five forage species representing three functional groups (each ≥ 20% of DM wt.) with at least one being a legume. Intermixed well, compatible growth habit, and comparable palatability.
Plant residue (Rate ground cover and standing dead forage separately and average score.)	**Ground cover:** No identifiable residue present on soil surface. Or, heavy thatch evident (> 1 inch). **Standing dead forage:** >25% of air dry weight.	**Ground cover:** 1–10% covered with dead leaves or stems. Or, thatch 0.5 inch to 1 inch thick. **Standing dead forage:** 15–25% of air dry weight.	**Ground cover:** 10–20% covered with dead residue. Or, slight thatch buildup but < 0.5 inch. **Standing dead forage:** 5–15% of air dry weight.	**Ground cover:** 20–30% covered with dead residue. No thatch present. **Standing dead forage:** some, but < 5% of air dry weight.	**Ground cover:** 30–70% covered with dead residue, but no thatch buildup. **Standing dead forage:** none available to grazing animal.
Plant vigor *If plant vigor rating is less than 4, determine cause by rating 6 possible causes listed on page 5.*	No recovery after grazing or pale yellow or brown, or permanent wilting, or plant loss due to insects or disease, exercise lot only. Or, lodged, dark green overly lush forage. Often avoided by grazers.	Recovery after grazing takes 2 or more weeks longer than normal, or yellowish green leaves, or major insect or disease yield loss, or plants wilted most of day. Productivity very low.	Recovery after grazing takes 1 week longer than normal, or urine/ dung patches dark green in contrast to rest of plants, or minor insect or disease loss or mid-day plant wilting. Yields regularly below site potential.	Recovery after grazing takes 1 to 2 days longer than normal, or light green plants among greener urine and dung patches, or minor insect or disease damage. No plant wilting. Yields near site potential.	Rapid recovery after grazing. Healthy green color. No signs of insect or disease damage. No leaf wilting. Yields at site potential for the species adapted to the site's soil and climate.
Percent legume (Cool season stands. See foonote 3 of score sheet for warm season)	< 10% by wt. Or, greater than 60% of bloating legumes.	10–19% legumes. Or, losing grass, 40–60% spreading legume.	20–29% legumes.	30–39% legumes.	40–60% legumes. No grass loss; grass may be increasing.
Uniformity of use	Little-grazed patches cover over 50% of the pasture. Mosaic pattern throughout or identifiable areas of pasture avoided.	Little-grazed patches cover 25–50% of the pasture either in a mosaic pattern or obvious portion is not frequented.	Little-grazed patches cover 10–25% of the pasture either in a mosaic pattern or obvious portion is not frequented.	Little-grazed patches minor spots where isolated forage species is rejected. Urine and dung patches avoided.	Rejected areas only at urine and dung patches. No forage species rejection.

Pasture Condition Score Sheet

Indicator	Score 1	2	3	4	5
Livestock concentration areas	Cover >10% of the pasture; or all convey contaminated runoff directly into water channels.	Livestock conc. areas and trails cover 5–10% of pasture; most close to water channels and drain into them unbuffered.	Isolated livestock conc. areas and trails <5% of area; one close to water channel and drains into it unbuffered.	Some livestock trails and one or two small concentration areas. Buffer areas between them and water channels.	No presence of livestock concentration areas or heavy use areas sited or treated to minimize contaminated runoff.
Soil compaction	Infiltration capacity and surface runoff severely affected by heavy compaction. Excessive livestock traffic killing plants over wide areas. Very hard to push probe into soil without damaging the probe.	Infiltration capacity lowered and surface runoff increased due to large areas of bare ground and dense compaction layer at surface. Livestock trails common throughout. Off-trail hoof prints common. Hard to push probe past compacted layers.	Infiltration capacity lowered and surface runoff increased due to plant cover loss and soil compaction by livestock hooves. Soil resistant to soil probe entry at one or more depths within plow depth.	Infiltration capacity lowered and surface runoff increased due to reduced vegetal cover/retardance. Probe enters soil easily except at rocks. Scattered signs of livestock trails and hoof prints, confined to lanes or small, wet areas.	Infiltration capacity and surface runoff are equal to that expected for an ungrazed meadow; not affected by livestock traffic.
Erosion					
Sheet and rill	Sheet and rill erosion is active throughout pasture; rills 3–8 inches deep at close intervals and/or grazing terracettes are close-spaced with some slope slippage.	Most sheet and rill erosion confined to steepest terrain of unit; well defined rills 0.5–3 inches deep at close intervals and/or grazing terracettes present.	Most sheet and rill erosion confined to heavy use areas, especially in loafing areas and water sites; rills 0.5–3 inches deep. Debris fans at down-slope edge.	No current formation of rills; some evidence of past rill formation, but are grassed. Scattered debris dams of litter present occasionally.	No evidence of current or past formation of sheet flow or rills.
Rate additional erosion categories below only if present					
Wind	Blowouts or dunes forming or present.	Soil swept from the established pasture being rated causing plant death by burial or abrasion.	Soil swept from adjacent fields or pasture during seedbed prep. and seedling growth to cause pasture plant death by burial or abrasion.	Some vegetative debris windrowed. Some dust deposition from offsite source. Minor wind damage to foliage.	No visible signs of windblown soil or trash. No wind related leaf damage.
Streambank or shoreline	Banks mostly bare and sloughing. No native streambank or shoreline vegetation remaining.	Banks are heavily grazed and trampled all over. Many are actively eroding laterally. Little native streambank or shoreline vegetation. Bank sloughing common.	Banks are close grazed, but few are unstable. Some native streambank or shoreline vegetation remaining. Livestock enter only at specific points, but use heavy. Remote alternative water site present.	Banks are grazed but stable. Mix of pasture plants and native water's edge species. Muddy livestock stream crossing(s) or pond entrance(s) not used heavily. Alternative water sites present.	Banks ungrazed or grazed infrequently. Abundant streambank or shore loving vegetation. Gravelly or constructed stable livestock stream crossing(s) or watering ramp(s). Or, alternative water sources present and close-by.
Gully	Mass movement of soil, rock, plants, and other debris; occurrence of landslides, debris avalanches, slumps and earthflow, creep and debris torrents. Found in mountainous or very hilly terrain.	Gully(s) advancing upslope cutting longer channel(s). Revegetation difficult without using constructed structures & livestock exclusion; continuous gully(s) with many finger-like extensions into the hillside.	Gully(s) present with scattered active erosion, vegetation missing at heavy use slopes and/or on bed below overfalls. New eroding channels present and new overfalls appearing along sides and bed of main channel.	One or more existing stable gullies present, vegetation covers gully bottom and slopes well; no visual signs of active cutting at gully head or sides. Some soil moved in channel bottom.	No gullies; natural drainageways are stable grassed channels. Spring or seep fed bare channels are small and stable, often covered with overhanging vegetation.

Plant Vigor Causative Factors

Factor	Score 1	2	3	4	5
Soil fertility (P & K status) 1/	Very low P & K, or very high P & K.	Low P and K; or low P, very high K; low K, very high P; opt. P, very high K; very high P, opt. K.	Low P, optimum K; or low P, high K; or optimum P, low K; high P, low K; or high P, high K.	Optimum P, high K; or high P, optimum K.	Optimum P and K
(Nitrogen status) 2/	N deficient or excessive.		N marginal or high.		Adequate N.
Upper 4-inch root zone pH 3/	< 4.5 or > 9.0	4.5-5.0 or, 8.5-9.0	5.1-5.5 or, 7.9-8.4	5.6-6.0 or, 7.4-7.8	6.0 to 7.3
Severity of use	All desirable species grazed out. Or no grazing, resulting in thatch and/or standing dead accumulation and woody invasion.	All edible plants grazed to lowest level feasible by the livestock type (mown lawn look). Or, undergrazed - mostly stemmy overgrowth and much dead leaf .	Spot grazing common. Equal amount of close-grazed and little-grazed areas. Close grazed areas are grazed as low as livestock can graze (mown lawn look.)	Some spot grazing, avoided areas primarily at dung and urine spots. Closer grazed areas are not grazed below proper height needed for plant vigor.	Forage species grazed within height ranges that promote dense sward and near maximum production.
Site adaptation of desired species	Properly planted and established (desired) species are no longer present.	Properly planted and established (desired) species are nearly gone. Volunteer unwanted species dominate.	One or more properly planted and established, or recruited desired species are missing. Unwanted species invading.	Properly planted and established, or recruited desired species still represented, but not in the desired proportions.	Properly planted and established, or recruited desired species are present in the desired proportions.
Climatic stresses	Brownout from drought. Or, frost heaved plants, most with severed roots and dying. Or, major loss due to submergence or ice sheets.	Wilted plants, little recovery during night. Or, some frost heaved plants, recovery slow. Some spotty stand loss due to submergence or ice sheets.	Wilting during heat of the day. Or, weak plants from winter damage or short-term submergence. Or, freezing damage to foliage.	Dry conditions, but no wilting. Or, above or below normal temperatures slowing growth. Or, slight leaf yellowing due to cold, wet conditions.	No climatic stress.
Insect and/or disease pressure	Severe insect attack, mortality high. Or, disease caused mortality high.	Insect or disease outbreak at economic threshold, treat now.	Insect or disease outbreak near economic threshold, continue watch and weigh options for treatment.	Some insect and/or disease present, but little impact on forage quality or quantity.	No visible damage.

1/ Names used to describe P & K levels not consistent nationwide; Very high referred to as excessive, and optimum as moderate or medium. Determined by approved soil testing procedures and comparing soil test results for exchangeable P and K with this table.

2/ Determined using chlorophyll meter or plant tissue test and comparing those results with this table.

3/ pH ratings may need to be regionalized to account for soil chemistry differences that influence range of acceptability as soils become more highly weathered or excess salts, exchangeable aluminum, or sodium begin to interfere with forage production. Establish exchangeable aluminum, electrical conductivity, and sodium absorption ratio criteria where their levels in the soil interfere with forage production.

Pasture Condition Score Sheet

Farm or ranch site: ______________________________ Date ______________

	Pasture Unit Description									
Indicators										
Percent desirable plants1/ Percent plant cover by weight that is desirable forage: 1 2 3 4 5 <20 20-40 40-60 60-80 >80										
Plant cover1/ 2/ Percent live, leafy canopy cover of desirables and intermediates is: 1 2 3 4 5 <50 50-70 70-90 90-95 95-100 Percent live basal area cover of desirables and intermediates is: <15 15-25 25-35 35-50 >50										
Plant diversity1/ The diversity of well-represented forage species is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Plant residue1/ Ground cover, standing dead forage, or thatch is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Plant vigor (Read criteria and select appropriate number) Degree of stress of plant community is: 1 2 3 4 5 (If less than 4, see Causative factors table. Rate those factors)										
Percent legume1/ 3/ Percentage of legume present as total air dry weight: 1: <10, or >60 bloating legume; 2: 10-19, or 40-60 spreading legume; 3: 20-29; 4: 30-39; 5: 40-60 no grass loss										
Uniformity of use Degree of spot grazing is: 1: >50% ungrazed; 2: 25-50% ungrazed; 3: 10-25% ungrazed; 4: Minor species rejection; 5: Urine and dung spots ungrazed										
Livestock concentration areas Presence of livestock conc. areas and proximity to surface water: 1 2 3 4 5 (Read criteria and select appropriate number)										
Soil compaction Degree of soil compaction is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Erosion (Always rate sheet and rill; others only if present) Sheet and rill, and gully, streambank, shoreline, or wind erosion is: 1: Very severe; 2: Severe; 3: Moderate; 4: Slight; 5: No visible										
Pasture condition score										

1/ Pastureland inventory worksheet helpful.
2/ Choose one proper, practical cover type estimation procedure to rate plant cover. The two procedures are not directly comparable.
3/ For warm season grass (C4)-legume stands, use the following criteria: 5, 30-40%; 4, 20-29%; 3, 10-19%; 2, 5-9%, and 1 <4%.

Pasture Condition Score Sheet

	Pasture Unit Description									
Causative Factors Affecting Plant Vigor										
Soil fertility (P & K status)* Phosphorus and potassium status of the soil are: 1 2 3 4 5 (Read criteria and select appropriate number)										
Soil fertility (N status)* Nitrogen status of the grasses is: 1 3 5 (Read criteria and select appropriate number)										
Soil pH* pH status of the soil for the upper 4-inch root zone best fits: 1: ≤4.5, or > 9.0; 2: 4.5-5.0, or 8.5-9.0; 3: 5.1-5.5, or 7.9-8.4; 4: 5.6-6.0, or 7.4-7.8; 5: 6.0-7.3										
Severity of use Degree of forage removal is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Site adaptation of desired species Presence of planted or desired forage species is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Climatic stresses Degree of plant stress due to recent weather events is: 1 2 3 4 5 (Read criteria and select appropriate number)										
Insects and disease pressure Degree of plant stress due to insect or disease pressure is: 1 2 3 4 5 (Read criteria and select appropriate number)										

* Rate electrical conductivity and sodium adsorption ratios in regions where appropriate. Where excess salts, exchangeable sodium, or exchangeable aluminum hinder plant growth they are the controlling factor rather than soil pH conditions. Use appropriate criteria for them as found in the National Range and Pasture Handbook under Evaluating and rating pastures, Pasture Condition Scoring. See pH criteria below for highly weathered soils.

Soil pH Criteria for Major Landuse Resource Areas with Oxisols and Ultisols
pH status of the soil for the upper 4" rooting zone best fits:

1	2	3	4	5
< 4.0, or > 9.0	4.0-4.5 or, 7.0-9.0	4.5-5.0 or, 6.5-7.0	5.1-5.5 or, 6.2-6.5	5.6-6.2

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A.5 Comments and Response to Comments

Comments Received and Response to Comments on First Draft OVLMP February, 2007.

OVLMP- Response to California Department of Fish and Game's Comments

Note: In the response to comments, all references to the OVLMP address the February 23, 2007 draft. Responses by the Los Angeles Department of Water and Power (LADWP) are noted as "DWP Response", while responses by Ecosystem Sciences are referred to as "ES Response".

The development of the OVLMP is a collaborative effort between the Los Angeles Department of Water and Power and Ecosystem Sciences. Personnel from both entities that are most familiar with the subject area or various components of the OVLMP each take the lead for that subject area and are supported as necessary by other staff members from either entity. ES and LADWP are both familiar and comfortable with all aspects of the OVLMP. However, ES and LADWP have been responsible as lead entity and primary author for different aspects of the OVLMP. The response to these comments is done by either ES or LADWP or both depending on the lead entity for that section or chapter.

Generally, LADWP is the lead author for Chapter 3 Grazing Management, Chapter 4 Recreation Management, Chapter 7 Fire Management, Chapter 8 Commercial Use Management, and Chapter 10 Special Management Areas. Ecosystem Sciences is the lead author for Chapter 2 River Management, Chapter 5 Habitat Conservation Planning, Chapter 6 Cultural Resources Management, and the Appendices. Both LADWP and ES worked collaboratively, with stakeholder and MOU party input, to develop the overall composition and organization of the OVLMP and Chapter 1 Introduction and Plan organization, and Chapter 9 Monitoring (LADWP authored the Land Use Monitoring while ES authored the Riverine Riparian Monitoring and Methods).

General Comments by CDFG

Comment #1: "The OVMP, as currently written, fails to meet some important requirements of the MOU, especially with regard to the basic process of plan development described in the MOU. The MOU calls for the early coordination of MOU Parties to address plan organization and prioritization prior to plan development. The concern is that by not involving the MOU Parties at an early stage, the document may ultimately fail to address collective priorities, and may also be very difficult to implement and track. The current draft of the OVMP should be revised to conform to MOU requirements. This may be accomplished by identification and prioritization of plan development for problem areas, planning area and project identification, and preparing an implementation plan and schedule".

The MOU requires that the parties "…review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. The MOU implies a spatial framework (i.e., areas where problems exist, areas identified, and planning areas) for development of the management plans. The draft OVMP does not explicitly identify problem areas or planning areas as required, and the MOU parties have not been consulted prior to the preparation of this draft."

"…Attempting to cover all of DWP's holdings in the Management Area in the present draft of the OVMP tends to dilute the priority issues that should be addressed immediately. Obtaining Department and other MOU Party concurrence on what prioritization and Planning Area identification should be completed as soon as possible in order to ensure MOU compliance".

"…The first step should be the preparation of maps, photographs, and summary descriptions of problem areas for review by the MOU Parties. Descriptions of each problem area should focus on a review of the existing resource issues, including water management, grazing, recreation, and other land uses. At the same time, these descriptions should be succinct and utilize the detailed discussions of existing conditions in the current draft of the OVMP. The written description should focus on 1) the location and acreage of problem areas; 2) the types and severity of the problems; 3) the proposed priority ranking of each area for plan development; and 4)a brief summary of possible management measures that would reduce the level of ongoing impact and address the biodiversity, ecosystem health, and listed species focus required by the MOU. In some cases, it may not be possible to address all land use problems through management and at the same time provide for water delivery and other sustainable uses of DWP's holdings, and these considerations should be addressed and considered in the development of the priority list."

"…the MOU directs DWP to prepare "management plans", again emphasizing that the required plans are intended to be developed for specific areas, with certain types of habitats as described in the MOU having priority for plan development. This approach would also consider the special needs of each planning area, with zones of higher or lower management intensity based on the unique resource issues within each planning area. Rather than taking the spatial approach described in the MOU, the draft OVMP is organized by "resource areas"…making the current plan difficult to interpret and implement. The various types of management activities are treated more or less separately in different chapters, without assembling the pieces at a manageable scale. It is impossible to understand the location of priority/problem areas or to determine the priority of management plan development and implementation between and within these areas. It is therefore not clear how to prioritize management efforts in order to address the needs of problem areas and promote biodiversity and listed species needs within each planning area as required by the MOU".

"Some portions or chapters of the OVMP, such as the recreation management, do make an effort to more closely follow the MOU. The recreation management section proposes twelve projects designed to address recreational impacts and provides rationale for the prioritization of these projects. It is difficult, however to integrate this information with the fifty individual grazing plans and other resource areas described in the different chapters. Chapter 3 (Grazing Management) does not provide a summary of problem areas or list priority projects, but treats each grazing lease as a separate unit, with a discussion of current conditions. Other management measures are discussed in separate chapters, and much of the monitoring methods are discussed in their own chapter. This makes it difficult to make logical connections from broad-scale, landscape level goals for habitats and species to site-specific management measures."

DWP Response: Section III.B of the MOU states: *"Within the Management Area, DWP, in consultation with the Parties and others, will identify and prioritize for plan development, those areas where problems exist from the effects of livestock grazing and other land uses. The Parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. The first level of priority will be given to riparian areas, irrigated meadows and sensitive plant or animal habitats. The plans will use the work done and underway in the Long Valley and Upper Owens River areas as a model where appropriate. Opportunity for Party, agency and public review of the proposed plans will be provided. The process will comply with applicable provisions of CEQA"* (MOU page 27).

Early in the development of Grazing Management Plans, Ecosystem Sciences, the MOU consultants, met with the MOU Parties regarding priority areas for planning efforts on the seven grazing leases that lie within the boundaries of the Lower Owens River Project (LORP). The results of the meeting reinforced that the areas to receive prioritization were riparian areas, irrigated meadows, and sensitive plant and animal habitats. The results of these initial efforts were documented in Chapter 9, Land Management Plan of the Final Environmental Impact Report for the Lower Owens River Project (June 23, 2004).

In addition, input was requested from the MOU Parties in May 2004 with regard to recreation issues. ICWD provided the only comments in response to the request. Ecosystem Sciences and LADWP also hosted a series of recreation focus group meetings in February of 2005. These focus group meetings were held with local representatives from area recreation interests, including the OHV, hunting, fishing, rock climbing, and birding communities. Both of these efforts to obtain information were performed prior to the development of the draft OVMP.

Comment #2: "We are also very concerned that the grazing management plans "were developed in consultation with lessees" prior to the opportunity for the MOU Parties to provide input on project prioritization. …the grazing plans should have been negotiated with lessees much later in the process, after considering planning area configuration and problem area prioritization. It may or may not be most appropriate to treat individual leases as "planning areas", but these types of decisions should have been addressed through an open process with the MOU Parties much earlier in the process".

DWP Response: See response to Comment #1.

Comment #3: "In the development of management priorities for the planning areas, landscape-level goals and objectives across all DWP lands in Inyo County should be applicable at multiple scales, with consistency all the way down to individual grazing leases. Planning areas should be defined in the OVMP, and may be assembled in consideration of both landscape and site-specific scales, including natural community assemblages, land use practices, or known problems in need of being addressed. Important decisions will need to be made by DWP and the MOU parties regarding the size and the configuration of planning areas. We suggest that this process should consider grouping areas to the greatest extent possible by both habitat types, while providing flexibility to incorporate unique measures into each of the 50 grazing leases. It may also be useful to consider grouping planning areas by land use focus, with some planning areas more suited to have more emphasis on management for specific habitat values, while other areas suited for less intensive habitat management. Once the location and prioritization of planning areas has been agreed upon by the MOU Parties, management plans may be developed."

The development of the management plans should follow the direction provided by the MOU, and should be designed to have specific actions to be undertaken by DWP to promote biodiversity and address other MOU considerations. An effective management plan should include measurable objectives, clearly defined management areas, DWP commitments and responsibilities for completion of management actions; an implementation schedule for proposed projects, and monitoring and reporting designed to answer current and future management questions….The OVMP can be revised to be more user-friendly and easier to implement by reorganizing portions of the document describing management actions into a single chapter summarizing plan implementation. This chapter should describe management actions at multiple scales (e.g., River Management (broad-scale), Recreation Management (both broad-scale and site specific), and specific grazing prescriptions for management of listed plants within a grazing lease (site-specific). This section should include succinct descriptions of the actions to be taken within each Planning Area along with implementation schedules (required by the MOU), and reference to the schedules and methods for effectiveness monitoring designed to evaluate the success of the OVMP in meeting its stated biological objectives consistent with the MOU.

"…we recommend that all reports are shared with the MOU Parties and the public to promote transparency and open communication. Since project implementation, monitoring, and reporting will ultimately be the measures by which both the MOU Parties and DWP assess the effectiveness of this program, considerable effort should be focused on clearly describing DWP's proposed land management goals and objectives, management activities, monitoring, and how monitoring will answer management questions to improve future management effectiveness."

DWP Response: Comment noted. Future revisions of the draft OVLMP will clarify the status of proposed projects. A description of accountability, enforcement, and notification will be provided in the document, along with procedures for revising the document, should that be necessary. See response to Comments #1 and #20.

Chapter 1, Introduction

Comment #4: **Section 1.5, Pg. 1-6, MOU Goals and Objectives.** The five OVMP goals discussed in this section do not appear to be directly tied to the OVMP discussion in the MOU. For example, "*Continue to supply water to the City of Los Angeles*" is not a goal of the MOU with regard to the OVMP. The MOU does not use the word "goal" at all when describing the OVMP, and therefore the OVMP should not imply that this is the case. This section should describe the requirements of the MOU (see CDFG comment letter), and may then elaborate on appropriate goals and objectives for the OVMP in order to comply with MOU direction. Likewise, the "MOU objectives" tied to the "MOU goals" and management strategies should be revised accordingly. Once OVMP goals and objectives are chosen, a clear relationship between management actions and the goals/objectives should be demonstrated throughout the document.

ES Response: The five OVLMP goals described in this section were derived from the following MOU language under Section III(B), Owens Valley Management Plans: *"While providing for the primary purpose for which Los Angeles owns the lands, including the protection of water resources utilized by the citizens of Los Angeles, the plans will also provide for the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities) will promote biodiversity and a healthy ecosystem, and will consider the enhancement of Threatened and Endangered Species habitats."*

For example, Goal #1, Continue to supply water to the city of Los Angeles, was derived from the sentence *"While providing for the primary purpose for which Los Angeles owns the lands, including the protection of water resources utilized by the citizens of Los Angeles…".*

Goal #2, Implement sustainable land management practices for agriculture (grazing) and other resource uses, and Goal #3, Continue to provide recreational opportunities on all LADWP-owned lands, were derived from the sentence *"…the plans will also provide for the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities)…"*

Goal #4, Improve biodiversity and ecosystem health was derived from *"…will promote biodiversity and a healthy ecosystem…"*, and Goal #5, Protect and enhance habitat for T&E species came from *"…and will consider the enhancement of Threatened and Endangered Species habitats"*. The objectives are not outlined in the MOU but were identified during the planning process as necessary for achieving the MOU goals.

Chapter 2, River Management Plan

Comment #5: Section 2.1.1, Pg. 2-1, Riverine-Riparian Goals and Objectives. This section includes no goals or objectives. This section should include goals and measurable objectives for maintaining and enhancing aquatic habitat and associated riparian habitats.

ES Response: The "tools for actively managing water and land resources" listed in this section are actually objectives that are described in Chapter 1. This will be clarified.

Comment #6: Section 2.12, Pg. 2-35, Conclusion. Is this conclusion "*better riparian vegetation with more bank stability*", "*increased vegetation overhang on streambanks…will improve fish habitat*" and "*future flow management (same as now) will provide environmental and habitat improvement in a number of ways*" supported anywhere in the text? Is future monitoring proposed to document this claim? Section 9.3.1 states that flow management in the Owens River is "*aimed at minimizing degradation, rather than defining a flow regime that is beneficial to fluvial processes*", which may contradict the above statement.

ES Response: The reference Hill and Platts (1998) *Ecosystem Restoration: A Case Study in the Owens River Gorge, California* will be added to the text to support those conclusions. Future monitoring to determine whether the MOU goals are being met is described in Chapter 9, Monitoring and Adaptive Management. Note that the flow management projects continue to be operated as part of the water delivery system for the city of Los Angeles. For this reason, the flow regime cannot be altered, and instead ramping rates and grazing management will be used to improve bank stability and increase riparian vegetation.

Chapter 3, Grazing Management

Comment #7: Section 3.1, Pg. 3-1, Purpose and Process. The OVMP does not make clear whether these grazing management plans have been developed specifically for the OVMP, or if this discussion reflects current grazing management practices. The MOU calls for involvement by the MOU parties and others in the development of the OVMP, and it should therefore be stated that all of the grazing management plans, as currently written, are subject to change upon completion of the OVMP.

According to the MOU, the management plans must "consider multiple resource values, and will provide for management based upon holistic management principles". The draft OVMP seems to omit any discussion of Holistic Management. Holistic Management is an integrated system for management of agricultural lands largely developed to improve ecosystem health in arid climates. The MOU directs DWP to utilize this approach to resource management, and the OVMP should therefore discuss Holistic Management in the context of agricultural practices on DWP lands. Ultimately, grazing plans should be evaluated in coordination with the MOU Parties to ensure that they will meet this MOU requirement. This section should make clear whether the proposed grazing management plans have or will be developed in accordance with this system. If a decision was made to not utilize Holistic Management, rationale should be provided.

It would be useful to develop a table describing proposed BMP's, the types of situations in which they would be utilized, and the positive improvements expected from such measures. The basic utilization standards are a start, but this section needs additional measurable objectives to guide grazing management toward promoting biodiversity and special-status species needs. Exotic plant species and prescriptions to minimize their impacts should be discussed at the beginning of this section. This would help support grazing management goals and BMP's that would be useful for management of sensitive species.

DWP Response: The MOU provides that the LADWP generate a Land Management Plan for Los Angeles-owned, non-urban lands in the Owens River Watershed in Inyo County (excluding the LORP planning area). Section III B of the MOU states: *"Within the Management Area, DWP, in consultation with the Parties and others, will identify and prioritize for plan development, those areas where problems exist from the effects of livestock grazing and other land uses. The Parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. The first level of priority will be given to riparian areas, irrigated meadows and sensitive plant or animal habitats. The plans will use the work done and underway in the Long Valley and Upper Owens River areas as a model where appropriate. Opportunity for Party, agency and public review of the proposed plans will be provided. The process will comply with applicable provisions of CEQA"* (MOU page 27).

Early in the development of Grazing Management Plans, Ecosystem Sciences, the MOU consultants, met with the MOU Parties regarding priority areas for planning efforts on the seven grazing leases that lie within the boundaries of the Lower Owens River Project (LORP). The results of the meeting reinforced that the areas to receive prioritization were riparian areas, irrigated meadows, and sensitive plant and animal habitats. The results of these initial efforts were documented in Chapter 9, Land Management Plan of the Final Environmental Impact Report for the Lower Owens River Project (June 23, 2004).

The template that was developed for grazing management on the seven LORP leases after MOU Party consultation was utilized in the development of grazing management plans for the other forty five grazing leases in Inyo County outside the LORP area. At that time we had developed a list of leases and priorities. These were discussed at an MOU meeting that was about several issues related to the LORP and other projects. A discussion of grazing plans was just one of the topics. However, from that meeting we began developing plans for the 45 grazing leases. As in the LORP, we have consulted with each rancher to identify plans that will allow sustainable agriculture while meeting the goals of the MOU. Our priorities, since that initial meeting, have been on leases where sensitive resources are present and are at risk, T&E species habitat and overall range conditions.

The Department would like to stress that all natural riparian areas are regarded as vitally and equally important from both a watershed and habitat standpoint, and are viewed as interconnected elements to the Owens River Watershed. Therefore, all riparian areas within the Management Area have been a critical focus of the Owens Valley Land Management Plan for the land uses addressed. We also realize that addressing these natural river and creek habitats is essential to compliance with the 1997 MOU and the Inyo/LA Water Agreement. In that context, the riparian areas along Rock Creek, Pine Creek, Horton Creek, McGee Creek, Bishop Creek, Rawson Creek, Freeman Creek, Baker Creek, Big Pine Creek, Tinehama Creek, Taboose Creek, Goodale Creek, Division Creek, Sawmill Creek, Thibaut Creek, Oak Creek, Independence Creek Symmes Creek, Shepherd Creek, Bairs Creek, George Creek, Hogback Creek, Lone Pine Creek, Tuttle Creek, Diaz Creek, Owens River, were evaluated and where appropriate, special management changes will be made. As a rule, if no issues were found in the riparian areas, the new riparian grazing prescription, as described for the LORP riparian areas in the LORP EIR will be implemented.

Additionally, all known seeps and springs on the leases were visited prior to plan development. If the assessment indicated that current management was negatively impacting the springs, management changes to protect the spring or seep were recommended.

Springs that were assessed include;
BLK 133, DG 31, DG 72, DG 81, DG 83, DG 93, DG 123, DG 175, DG 181, DGNOGR, DWP 1, DWP 2, DWP 4, DWP 5, DWP 6, DWP 7, DWP 8, DWP 9, DWP 11, DWP 12, DWP 13, DWP 16, DWP 17, DWP 20, DWP 21, DWP 22, DWP 26, DWP 28, DWP 29, DWP 30, DWP 31, DWP 35, DWP 36, U42, U43, U44, IND 102, IND 182, IPT 3, IPT 11, DWP 32, U 18, U 24, U 25, U 26, U 27, U 28, U 29, U 31, U 49, U 52,U 59, U 60, U 62.

Seeps that were assessed include:
BIS 111, DG 64, DG 82, DG 170, DG 176, DG 177, DRGVAS, DUTCH JOHN MEADOW, DWP 3, DWP 10, DWP 18, DWP 23, DWP 24, DWP 27, DWP 33, IND 56, IND 168, IND 215, LKIRK, IPT 5, NUTWIN, PHUBBARD, U 10, U 19, U 20, U 21, U 22, U 23, U 30, U 32, U 33, U 34, U 35, U 36, U 37, U 38, U 39, U 40, U 41, U 45, U 46, U 47, U 48 UWASH FAULT

Further, during the development of the grazing management portion of the OVLMP, all meadows (irrigated and non-irrigated) are being considered of equal value. No City lands leased for grazing in Inyo County have been excluded from consideration in the Grazing Management Plans.

The 1997 MOU states that LADWP will manage livestock grazing consistent with the other goals of the Lower Owens River Project (LORP). During the preliminary development of the grazing management plans for areas within the LORP project area, LADWP gathered information from the ranch lessees and combined it with technical expertise in grazing management to develop applicable management strategies for the LORP area. Management and monitoring methodologies derived from this process is being applied to non-LORP lands within Inyo County. Non-LORP meadows/pastures are currently monitored through utilization standards, irrigated pasture condition scoring and/or range trend monitoring, as described in the LORP Environmental Impact Report for LORP area leases. This monitoring is used to understand current use patterns, and provides a useful tool to guide proper management in the future. Future management of these meadows/pastures will consider and prioritize riparian areas, seeps and springs, the integrity of the meadows, and sensitive plant and animal habitats, while still sustaining this important and historical use of City lands.

Comment #8: Sections 3.3 and 3.4, Pg. 3-1, Standards and Criteria, and Pg. 3-3, Monitoring. The text should describe how the standards and criteria were developed and the rationale for their use. A brief summary of monitoring results should be provided or referenced in order to support the use of these standards. For example, the document should state whether or not 65 percent utilization in uplands will "provide productive wildlife and fish habitat, maintain desired healthy rangeland conditions, and maintain or increase rangeland condition trend". What are the riparian management objectives? Evidence should be provided whether the proposed 40 percent riparian utilization standard is expected to meet riparian habitat objectives. Adaptive management would imply an empirical approach (randomization, controls, adequate sample sizes, etc.) used to develop and monitor the adequacy of the proposed utilization rates as well as other future grazing management decisions.

The OVMP should make the reader aware of the regulatory and planning framework influencing management actions before discussing how they would be implemented. For example, the *Conservation Strategy for the Southwestern Willow Flycatcher* is first mentioned in passing in the text discussing a grazing lease, with no citation or lead-in discussion about its relevance to the OVMP (this subject reappears in Chapter 5, much later in the document. Other planning documents for species on DWP lands have been prepared and should be incorporated into the OVMP, in particular, the *Owens Basin Wetland and Aquatic Species Recovery Plan for Inyo and Mono Counties*, prepared by the U.S. Fish and Wildlife Service.

DWP Response: Currently, LADWP leases within the OVLMP area do not have formal protocols for quantitative monitoring and evaluation of rangeland conditions and grazing strategies. The proposed actions describe modified grazing practices on LADWP leases within the OVLMP area and establish quantitative monitoring of rangeland conditions; see Chapter 9, Monitoring.

Under OVLMP, lease-specific utilization rates will be established and monitored in both riparian and upland areas to guide grazing strategies. Utilization rate is defined as the proportion of current year's forage production that is consumed and/or destroyed by grazing animals, including livestock, wildlife (e.g., elk), and insects. Utilization rates will be measured by establishing utilization cages and comparing the amount of vegetation biomass outside (grazed) and inside (not grazed) the cages. Additionally, utilization rates will be used to monitor and manage the use of vegetation, prevent forage overuse, and maintain the ecosystem health of rangelands. As part of the OVLMP adaptive management approach, the initial allowable maximum riparian and upland utilization rates and grazing periods described below may be increased or decreased on a case-by-case basis depending on the changes in rangeland conditions as indicated by monitoring of rangeland trend.

In general, implementation of the proposed grazing management actions (i.e., creation of riparian pastures) and modification of utilization rates in both riparian and upland pastures will reduce current grazing impacts to existing biological resources. Beneficial impacts include increased plant production and cover in riparian areas, which would provide more food for small mammals and birds, and cover for ground- and understory-nesting birds. Cattle will graze riparian areas for a shorter period of time, resulting in less frequent disturbance to ground- and understory-nesting birds.

ES Response: With regard to the regulatory framework, the OVLMP states on pg. 1-1 that the "resource management priorities are derived from the 1997 Memorandum of Understanding…". The LADWP is not a signatory to the *Owens Basin Wetland and Aquatic Species Recovery Plan for Inyo and Mono Counties.* Management actions will be consistent with the *Conservation Strategy for the Southwestern Willow Flycatcher*. A description of the Conservation Strategy will be added to Chapter 1. Chapter 1 also describes, in brief, the Habitat Conservation Plan for the Owens Valley which includes the Southwestern Willow Flycatcher as one of the species covered.

Comment #9: Section 3.5, Pg. 3-3, Grazing Lease Management Plans. We appreciate the attention to detail in the narrative accounts of the 50 grazing leases, and the work that went into problem identification. We recommend supplementing Table 5.1 (Pg. 3-17-should read Table 3.1) with additional columns to facilitate quick identification of the environmental conditions and constraints within each lease. For example, a column could identify which leases support wetlands, riparian habitats, irrigated pastures or uplands, by using letter codes, another column could identify the presence of other constraints (listed species, etc.) that may influence site management. In some cases, the presence of certain sensitive or listed species may be unknown, in which case inventories of biological resources should be conducted. Other columns could list whether or not a lease is currently in need of remedial measures to address overuse, and another could direct the reader to the appropriate OVMP section number describing each lease.

It will be important to include all pastures, ditches, and other areas referenced in the text on the gazing lease maps. In particular, an overlay of each lease with known sensitive resources such as sensitive or listed species would be very useful. We request site visits to representative grazing leases to view both current conditions and future management measures. We suggest examination of several examples from a range of excellent to poor condition, in order to better understand the range of existing conditions, and remedial measures for areas in poor condition. It may also be useful to discuss and examine sites in improved condition as a result of recent improved grazing practices. Finally, we would appreciate the opportunity to participate in test-runs of the various monitoring techniques discussed in Chapter 9.

Overall, this section is missing a discussion regarding the overall goals and objectives that are described in the OVMP introduction. For example, according to OVMP Objective 5, the grazing management plans should "protect water quality, enhance range conditions, promote biodiversity, and increase the sustainability of grazing by improving the overall forage base", so each planning area or individual lease should include a discussion of whether these OVMP objectives are being met. Ultimately, the proposed grazing management measures should be discussed in light of the MOU focus for biodiversity, ecosystem health, sustainability, and listed species habitat.

DWP Response: LADWP is currently developing a Grazing Monitoring Program, Lease Monitoring Plan, and Annual Lease Monitoring Report. These reports will detail the information requested. Due to time constraints on the development of the OVLMP the development of these plans has been delayed, but is ongoing. Regarding the mapping efforts, LADWP will not identify known threatened or endangered species locations or known sensitive areas on maps that are available to the public. If representatives of the CDFG desire tours of any ranch LADWP ranch leases, they should feel free to contact any of the LADWP lessees and arrange for a visit so that they may discuss current and future management of the lease. All monitoring efforts described in the OVLMP are beyond the test-run stage and are currently being implemented. Monitoring is seasonal with the bulk of the monitoring occurring between March and September. Representatives from the CDFG should feel free to contact LADWP staff to arrange a time to participate in these ongoing monitoring efforts.

Chapter 4, Recreation Management

Comment #10: To fully comply with the MOU, provide transparency, and foster a closer working relationship, we recommend that reporting is conducted for all projects, whether or not alterations in management activities are required. Full reporting of all projects may be reduced in the future, depending on the success of the OVMP.

DWP Response: Comment noted. Reporting will be conducted by LADWP Watershed Resources Staff if feasible based on current staff availability and their other work commitments. Priority for formal reporting will be given to the larger projects that were outlined in the draft plan.

Comment #11: Section 4.1.2., Pg. 4-2, Plan Development. We request a table with all information received (including dates) from the MOU Parties regarding recreational issues.

DWP Response: The table below notes all correspondence from the MOU parties regarding recreational issues on City lands prior to the release of the draft plan. Inyo County Water Department was the only Party to respond.

Information Received from all MOU Parties Regarding Recreational Issues				
Date	**MOU Party**	**Recreation Issue and/or Problem Area**	**Recommended Level of Priority**	**Other Information**
7/1/2004	Inyo County Water Department	none	none	This letter was in response to LADWP's initial inquiry (5/27/04) for the Parties' concerns regarding recreational issues. It did not provide any information about specific problem areas or recreational concerns on City of Los Angeles lands. This letter addressed procedural questions about soliciting comments.
9/16/2004	Inyo County Water Department	none	none	This letter was sent to LADWP requesting additional time to submit comments on recreation following an already extended comment period.
9/24/2004	Inyo County Water Department	"The management plans should include measures to control the proliferation of roads, tracks, trails, parking areas, etc. and to mitigate for these impacts, including dust generation."	none	The County submitted additional general comments in this letter about the Owens Valley Management Plan that were not recreation specific.

Comment #12: Section 4.3.2., Pg. 4-6, Recreation Management Tools for LADWP Property. This section should provide commitments about whether the Recreation Management Tools will actually be used. If specific locations or projects have not been developed at this point, the document should propose a process for determining where such improvements (such as kiosks) will be located.

The DWP should implement a phone hotline number to allow the public to report problems quickly. This would provide more "eyes and ears" to allow for a more rapid response to urgent issues. The DWP recreation website http:wsoweb.ladwp.com/Aqueduct/recreation/recreation index.htm does not currently list a phone number to call in order to report resource damage.

We are interested in whether DWP has fully investigated the possibility of utilizing regular patrols of its property by peace officers. Section 830.31 of the California Penal Code allows the authority of California Peace Officers to extend to any place in the state for the purpose of performing their primary duty or when making an arrest. It may be possible for DWP to contract with another enforcement agency, such as the County of Inyo, to provide regular patrols and other enforcement services to prevent or minimize resource damage. Peace officers have been hired under contract by state and local agencies elsewhere in the state for this purpose. Issuance of a citation can also be a valuable deterrent to individuals contemplating damaging resources.

DWP Response: LADWP requires some flexibility to treat each recreation issue on a case by case basis and apply the relevant management tools discussed in Section 4.3.2. Managing recreation in the Eastern Sierra is a moving target. Improvements will be pursued if or when a natural resource or LADWP operation becomes compromised due to a recreational use. These situations will be assessed by LADWP Watershed Resources Staff and treated accordingly.

Public reporting of recreation violations/problems should be directed to the Inyo County Sheriff, Fish and Game Warden, or federal law enforcement based on the type of violation (as specified in Figure 4.2). The public may also contact the LADWP Bishop Office at (760) 872-1104 to report problems.

LADWP currently relies on the Inyo County Sheriff's Office for law enforcement. LADWP pays approximately $17 million annually in property taxes to Inyo and Mono Counties for the betterment of Eastern Sierra communities. In addition, LADWP provides funds to the County of Inyo for recreational purposes, as required under Section XIV (B) of the Long Term Water Agreement (*Park Rehabilitation, Development, and Maintenance*). Under this section, LADWP has already contributed over $2 million for the rehabilitation and development of recreational facilities, operation and maintenance of facilities and recreational programs in Inyo County, and for a recreational use and management plan for the Owens River from Pleasant Valley Reservoir to the Owens River Delta.

While the idea of additional patrols is well intended, LADWP has already provided the county entities with substantial funds that could be used for this purpose. Perhaps Inyo County should direct some of these finances to additional patrols of City property and the employment of peace officers.

Comment #13: Section 4.4, Pg. 4-8, Proposed Projects for Areas of Specific Concern. This Section has been prepared with the requirements of the MOU in mind, but would benefit by including maps of specific areas with proposed projects, and more detail about specific measures should be included.

DWP Response: Comment noted.

ES Response: Three maps and one aerial photo are provided in this section to show the proposed project areas at appropriate scales. We feel the descriptions under each of the 12 projects proposed provide an adequate level of detail and background information.

Comment #14: Section 4.4.5., Pg.4-19, Projects Applicable to the Entire Management Area. It is expected that a portion of the recreational impacts associated with roads occur as a result of lack of knowledge about routes and where they lead, especially where multiple routes exist. Route closures may be ineffective without providing some guidance to the public on how to access historic use areas. Providing route maps to the public or map kiosks in key areas may be one way to reduce cross-county travel impacts by recreationists who may simply be lost.

DWP Response: Comment noted.

Comment #15: Section 4.5.1., Pg.4-20, Adaptive Management, and Figure 4.17., Pg. 4-21, Management Options in Handling Recreation Issues on LADWP Property. How would adaptive management be used in the context of recreation? The statement "LADWP will consider and use adaptive management…when necessary" does not give much indication about how the recreation management measures will be evaluated, or when an adaptive management approach is deemed necessary. As the impacts of vehicular trespass are quite easy to evaluate without using an empirical approach, it may be more appropriate for DWP to commit to a specified number of patrol hours, and to address adverse situations as they occur, in addition to the measures proposed in Section 4.4.

Figure 4.17 is a useful start, but how will any actions taken be tracked in order to measure their effectiveness? How many times will LADWP continue an ineffective measure before taking a more direct action such as physically installing a barrier? Figure 4.17 should avoid restating measures that are already in place, such as "Post recreation policies on LADWP website" or other weak measures.

DWP Response: LADWP will apply adaptive management measures to recreation when Watershed Resources staff considers a recreational use to be significantly impacting a natural resource, compromising LADWP's operations, or the projects proposed in the OVMP have proved ineffective. LADWP Watershed Resources Staff, Hydrographers, and Aqueduct and Reservoir Keepers are regularly in the field conducting various projects and monitoring efforts as part of their daily tasks. These tasks/commitments put LADWP staff throughout the valley on a regular basis, at which time they can check on and/or assess these projects. At this time, LADWP is unable to commit to a specified number of patrol hours based on current staffing levels and their associated workloads.

Actions taken will be tracked through field monitoring as stated in section 4.4. If a measure is clearly ineffective (e.g., signage does not prevent degradation of resource, vehicles drive around barriers, etc.), LADWP will explore other relevant options in table 4.17 to rectify the problem. The main idea is to allow recreational use of City lands to occur, while efficiently and effectively managing the resources in the Valley.

Chapter 5, Habitat Conservation Planning

Comment #16: Figure 5.4, Pg. 5-7, Least Bell's Vireo in Mono Basin. It may be useful to provide a bit of explanation with the photograph based on the LBV species distribution discussed in Section 5.6.3.

ES Response: Section 5.6.3 states that there are currently no known Bell's Vireo territories in the Owens Valley. According to the photographer's website, the photo of the Least Bell's Vireo was taken circa 1981 in Mono Basin. This will be noted under the photo.

Comment #17: Section 5.7.1, Pg. 5-12, Direct and Indirect Effects, Recreation. The personal communication from S. Laymon (statement reads: "…yellow-billed cuckoo appear to be more tolerant of recreational activities even in close proximity to nests) should be better described. Is the comparison being made with the other covered avian species, or is this a comparison to riparian birds in general? Is there any data available to support this argument?

ES Response: Information in the literature was not located- this sentence will be deleted to avoid confusing or misleading readers.

Chapter 9, Monitoring and Adaptive Management

Comment #18: Section 9.3.1., Pg. 9-11, Flow Monitoring. Monitoring of flows to insure compliance with the recommended ramping rate (25 cfs/day) is a start, but an Adaptive Management approach would also explore whether this rate is leading to any stream morphology improvements, or if additional measures may be needed to avoid continued degradation of the river. We understand and acknowledge that the Owens River is a working river subject to great demands based on water delivery needs, but maintenance and enhancement, where possible, of riverine and riparian habitats should also be a high priority.

ES Response: As mentioned in the plan on page 9-12, the only adaptive management option for the river within the boundaries of the OVLMP is ramping rates. Ramping rates will be monitored by LADWP staff. In addition to flow monitoring, changes in ramping rates will also be noticeable in the habitat and vegetation monitoring data. The timing and duration of ramping rates will be adjusted if flow fluctuations are having undesirable effects on habitat or vegetation (i.e. creation of cutbanks and/or loss of riparian vegetation adjacent to the river).

<u>Comment #19:</u> Section 9.4.1., Pg. 9-24, Land Use and Uplands Monitoring, Irrigated Pasture Condition Scoring. We recommend that annual reports contain not only pasture condition, but also list management changes designed to address poor pasture condition, or rare plant management measures. Reports should also describe the effectiveness of past management changes, and state whether these measures will be continued into the future, or if some other method might be utilized.

<u>DWP Response:</u> Comment noted.

<u>Comment #20:</u> Section 9.4.2., Pg. 9-25, Utilization. The OVMP should explain why it is important to monitor utilization in the vicinity of the Range Trend Transects, and how the resulting data may be linked and interpreted. The OVMP should also better explain how the total number of utilization transects per field or lease will be determined-statistical power or other needs? The OVMP should also describe why the focus is on grasses, particularly the grass species listed in the text, which are often associated with mesic or wet conditions. What species might be monitored in dry uplands or woody riparian areas with few grasses?

The text mentions the fact that combined effects of grazing have not been evaluated with other land management activities through time. This should be a focus of exploring if monitoring can capture and provide management direction for multiple stressors.

As mentioned later in this Chapter, the utilization standards should be considered a management tool rather than a management goal. Based on monitoring results, it is probable that these standards may be revised on a site-specific basis in the future. The OVMP should make this clear.

<u>DWP Response:</u> Also see response to Comment #8. The following is a response to comments regarding utilization. LADWP agrees that utilization should never be a goal, only a management tool. Utilization data will provide use of key forage species by transect and pasture. Not only will documenting utilization provide a "track record" as to whether the utilization guidelines are being adhered to or not, but will also indicate forage species preference and document level of use over time. The level of use (i.e. percent utilization) by species and transect will be used to help interpret trend relative to livestock use. Site-specific data on use will be tied to site-specific trend data so that relationships between utilization and trend can used to help guide future management decisions.

As mentioned in the OVLMP, the combined effects of grazing have not been evaluated with other land management activities, and the CDFG suggests further exploration of this idea to determine monitoring can detect the effect of multiple stressors. LADWP has been working with Dr. Terry McLendon for several years on the development of the Ecological Dynamics Simulation Model (EDYS) for use in Owens Valley. The EDYS model provides predictive capability of ecological response of systems to multiple stressors. It is hoped that the EDYS model will be a valuable tool to help guide management decisions in the future.

Regarding site selection and methodologies, the key area and key species concept was applied taking into consideration previous commitments and agreements. The key area concept is widely used in range management. Key areas were selected because of their location and use by livestock and because they should be reflective of management. The MOU specifies that the first level of priority in development of management plans be given to riparian areas, irrigated meadows and sensitive plant or animal habitat. The department has done this by establishing range monitoring transects primarily in the riparian corridor and meadow areas which are also potential habitats for several of the sensitive plant and animal species in the valley. Within the riparian corridor, sites were selected based on whether they were expected to be used by livestock or not. Areas devoid of key forage species (grasses and grasslikes) would not provide a good indication of use by livestock, and thus were not selected. The forage base in the riparian corridor is dominated by graminoids or grass and grass-like species (such as sedges). Determining utilization of grass and grass-like species can be reliable, fairly accurate, and cost-effective. In contrast, determining utilization of shrubs tends to be time-consuming and does not produce very reliable data.

The Department feels that it is more cost-effective to use their resources to measure utilization of graminoids which will provide more reliable and defensible data than to attempt to measure use of shrubs. Because grass-dominated sites often occur with woody riparian areas within the same pasture, measurement of utilization of grasses is preferred to measuring utilization of riparian shrub or trees. Under proper management (i.e. adherence to utilization guidelines), use of riparian woody vegetation should be minimal and measurement of use on grasses will provide more defensible data than attempting to measure use of woody riparian vegetation. With regard to what species might be monitored in dry upland areas with few grasses, areas such as this are not likely to receive much use except in years when there is sufficient moisture to support the growth of annuals. As is the case with shrubs, there is no efficient way to determine use on annuals. LADWP plans on implementing a program of rangeland assessment using “Indicators of Rangeland Health” which will help to prioritize monitoring of upland sites to areas where resource problems exist.

Comment #21: Section 9.4.3., Pg. 9-29, Range Trend. What are the objectives for the Range Trend Sampling? The text states that the monitoring is designed to assess the trend of key indices of range condition and health. The text should provide information about the baseline conditions/indices, and list measurable objectives for future desired condition during future monitoring events (1,3,5,10, and 15 years). The statistical analysis of the baseline trend information should be performed as soon as possible. At least a preliminary indication of management thresholds and triggers for action should be provided in the OVMP, rather than deferring this to a later date.

Why are LORP lease transects discussed, and the non-LORP lease transects only mentioned in the text?

DWP Response: The objective of range trend monitoring is to track variables that can be related to range condition and health such as the cover and frequency of perennial grasses, shrubs, nonnative bare ground and litter. These values will be compared to 1984-1987 Baseline Vegetation Mapping studies in order to determine if conditions under baseline are being maintained or enhanced in terms of the cover of perennial vegetation and plant community status. Enhancement would be increases in the cover of perennial vegetation provided that the community does not change from one classification to a lower classification, as defined by the Green Book. LADWP is not deferring analysis of trend data to a later date. Compilation and analysis of range trend data has been a continual priority of staff.

Chapter 10, Special Management Areas

Comment #22: General: Interaction with Dust Control Projects on DWP Lands at Owens Lake. The OVMP should state whether any DWP-owned lands outside the LORP on the bed or shore of Owens Dry Lake are subject to special management requirements subject to PM10 requirements for emissive areas. Special management considerations for DWP lands on the bed or shoreline of Owens Lake may require more discussion in the OVMP.

DWP Response: Comment noted. Owens Lake is outside the project area for the OVLMP.

OVLMP- Response to Inyo County Water Department's Comments

Note: In the response to comments, all references to the OVLMP address the February 23, 2007 draft. Responses by the Los Angeles Department of Water and Power (LADWP) are noted as "DWP Response", while responses by Ecosystem Sciences are referred to as "ES Response".

The development of the OVLMP is a collaborative effort between the Los Angeles Department of Water and Power and Ecosystem Sciences. Personnel from both entities that are most familiar with the subject area or various components of the OVLMP each take the lead for that subject area and are supported as necessary by other staff members from either entity. ES and LADWP are both familiar and comfortable with all aspects of the OVLMP. However, ES and LADWP have been responsible as lead entity and primary author for different aspects of the OVLMP. The response to these comments is done by either ES or LADWP or both depending on the lead entity for that section or chapter.

Generally, LADWP is the lead author for Chapter 3 Grazing Management, Chapter 4 Recreation Management, Chapter 7 Fire Management, Chapter 8 Commercial Use Management, and Chapter 10 Special Management Areas. Ecosystem Sciences is the lead author for Chapter 2 River Management, Chapter 5 Habitat Conservation Planning, Chapter 6 Cultural Resources Management, and the Appendices. Both LADWP and ES worked collaboratively, with stakeholder and MOU party input, to develop the overall composition and organization of the OVLMP and Chapter 1 Introduction and Plan organization, and Chapter 9 Monitoring (LADWP authored the Land Use Monitoring while ES authored the Riverine Riparian Monitoring and Methods).

General Comments by ICWD

<u>Consistency with the Long-Term Water Agreement, MOU, and 1991 EIR</u>

1. The OVMP does not supersede any provision of the Water Agreement, including provisions for vegetation management (whether Type A, B, C, D, E or "other" vegetation), surface water management, monitoring, or the implementation of E/M projects. The requirement to prepare the land management plans is a part of the MOU. Concerning the relationship between the MOU and the Water Agreement, Section I. C of the MOU expressly provides as follows:

   > *The overall goal of the Agreement is to manage water resources within Inyo County to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated, while providing a reliable supply of water for delivery to Los Angeles and for use in Inyo County.* <u>*Except as it modifies the scope of the Lower Owens River Project as described in the Inyo County/Los Angeles Long Term Water Agreement approved in October 1991 ("Inyo-Los Angeles Agreement"), nothing in this MOU affects any other provision of that agreement.*</u> *(Underlining added for emphasis.)*

   Therefore, provisions of the MOU, such as the OVMP, cannot supercede the Water Agreement.

   Further, the 1991 EIR describing LADWP's project to supply its second aqueduct and the implementation of the Water Agreement describes the mitigation that will be implemented to reduce or avoid the environmental impacts of the project. In the absence of actions from the governing boards of LADWP and the County the OVMP cannot change the description of the project contained in the EIR or the mitigation measures described in the EIR.

   For example, the plan does not address whether described management practices are consistent with the 1991 EIR, the 1997 MOU, and the Long-Term Water Agreement (LTWA). Provisions in these documents as they pertain to elements in the Land Management Plan should be described and addressed. Some of the pertinent issues are contained in comments under chapter headings. For example, the plan uses different vegetation community designations and polygons than the LTWA. It is not clear whether the plan's remapping of baseline vegetation data conflicts with the LTWA designations or whether analysis of management actions will be compared against the LTWA maps or the inventory conducted in 2000 by WHA. The City and the County should carefully review the mapping effort contained in the plan for consistency with the LTWA prior to adoption of this management plan.

DWP Response: The MOU provides that the LADWP generate a Land Management Plan for Los Angeles-owned, non-urban lands in the Owens River Watershed in Inyo County (excluding the Lower Owens River Project [LORP] planning area). As you stated in your letter of June 21, 2007, the OVLMP does not supersede the Inyo/LA Long-Term Water Agreement, the 1991 EIR, the 1997 MOU, or the 2003 LORP EIR. Staff from LADWP and Ecosystem Sciences, who developed the OVLMP, are confident that none of the management actions or mapping efforts contained within the plan are inconsistent or in conflict with any provision contained within the guiding documents.

2. The Water Department recommends the OVMP describe whether the management actions are consistent with the three documents and fully disclose areas where discrepancies may exist. Any inconsistency between the OVMP and the referenced documents would likely be considered a significant adverse impact by CEQA. CEQA guideline Section 15125 (d) requires that an EIR address any inconsistencies between a proposed project and applicable general and regional plans.

DWP Response: Comment noted. Staff from LADWP and Ecosystem Sciences are confident that none of the management actions contained within the plan are inconsistent or in conflict with any provision contained within the guiding documents. In addition, possible inconsistencies between the OVLMP and the referenced documents do not necessarily imply a significant adverse impact under CEQA.

3. The plan's vegetation community designations and polygons are not always consistent with the Water Agreement. The OVMP may apply different names to plant communities but the approach should be consistent with the Water Agreement. The City and the County should carefully review the mapping effort contained in the plan for consistency with the LTWA prior to adoption of this management plan.

DWP Response: Vegetation mapping conducted for the OVLMP is not being used for any purpose other than the land management activities described within the plan. Ecosystem Sciences has provided the Inyo County Water Department all of the mapping that is conducted during the development of the OVLMP and will provide a cross walk between the nomenclature utilized in its mapping efforts to that utilized in the Greenbook if requested to do so.

4. The LTWA also provided "other vegetation" not identified in the 1984-87 inventory would be mapped and monitored. This includes "certain vegetation of significant environmental value." The monitoring and management procedures for the areas of other vegetation are described in the Green Book and are separate from Type E and Type D procedures. These areas still need to be identified by the City and the County before implementation of the management actions cause change to these areas.

DWP Response: In order to complete the OVLMP and the associated Habitat Conservation Plan (HCP), Ecosystem Sciences completed mapping efforts of the Owens River from Pleasant Valley Reservoir to the Owens River Delta and its tributaries. These efforts were not intended to be mapping for "other vegetation".

5. The directions for plan development provided in the MOU were not followed. The MOU provides:

> *… DWP, in consultation with the Parties and others, will identify and prioritize for plan development, those areas where problems exist … The parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. ..*

The identification and prioritization of problematic areas did not occur in consultation with the Water Department. In addition, the Water Department did not have the opportunity to review and comment on a written description of the areas identified and the reasons for their prioritization, **before** plan development as provided in the MOU. The plan is presented as a nearly finished document without having a consultation aspect of receiving feedback prior to plan development.

<u>DWP Response:</u> Section III.B of the MOU states: *"Within the Management Area, DWP, in consultation with the Parties and others, will identify and prioritize for plan development, those areas where problems exist from the effects of livestock grazing and other land uses. The Parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development. The first level of priority will be given to riparian areas, irrigated meadows and sensitive plant or animal habitats. The plans will use the work done and underway in the Long Valley and Upper Owens River areas as a model where appropriate. Opportunity for Party, agency and public review of the proposed plans will be provided. The process will comply with applicable provisions of CEQA"* (MOU page 27).

Early in the development of Grazing Management Plans, Ecosystem Sciences, the MOU consultants, met with the MOU Parties regarding priority areas for planning efforts on the seven grazing leases that lie within the boundaries of the Lower Owens River Project (LORP). The results of the meeting reinforced that the areas to receive prioritization were riparian areas, irrigated meadows, and sensitive plant and animal habitats. The results of these initial efforts were documented in Chapter 9, Land Management Plan of the Final Environmental Impact Report for the Lower Owens River Project (June 23, 2004).

In addition, input was requested from the MOU Parties in May 2004 with regard to recreation issues. ICWD provided the only comments in response to the request. Ecosystem Sciences and LADWP also hosted a series of recreation focus group meetings in February of 2005. These focus group meetings were held with local representatives from area recreation interests, including the OHV, hunting, fishing, rock climbing, and birding communities. Both of these efforts to obtain information were performed prior to the development of the draft OVLMP.

6. The plan describes the need to manage water use. For example,

   > *The fundamental role of resource management is to assess and evaluate the effects of existing land and water-use practices, and recommend flow management and land management improvements. The outcome is a multiple-use management approach that serves to balance the needs of a healthy ecosystem with optimal use of resources. The OVMP must, therefore, be robust, flexible and meet the test of time as a management tool to meet MOU goals. (Text from the Executive Summary.)*

   > *The Owens Valley Management Plan (OVMP) provides management direction for resources on all City of Los Angeles owned lands in Inyo County, California, excluding the Lower Owens River Project (LORP) area. Resource management issues include water supply, habitat, recreation and land use. The OVMP provides a framework for implementing management prescriptions through time, monitoring the resources, and adaptively managing changes land and water conditions.*

   The OVLMP must be consistent with the surface water provisions of the controlling documents. It is unclear if part or all of the components of LADWP's proposed projects, the Water Conservation Incentive Program (March 2004) or the Sprinkler Irrigation Water Conservation Incentive Program (September 2005), are referenced through this management plan. The Water Agreement contains provisions to protect vegetation associated with irrigated leases, to maintain water supplies to leases, and maintain wildlife and recreational uses on irrigated lands. In addition, changes to surface water management practices must be described, including, but not limited to, stockwater reductions and alteration to ditches and canals. The County submitted extensive comments on the proposal including the County's concerns over the plan's potential impacts on Type D, Type E and other vegetation. Those comments are attached.

<u>DWP Response:</u> Neither the Water Conservation Incentive Program or the Sprinkler Irrigation Water Conservation Incentive Program were considered in the development of the OVLMP.

<u>Plan Structure</u>

7. The plan needs to clearly describe whether management practices contained in this plan have already been implemented, are currently being implemented, will be implemented in the future, or may be implemented (e.g. recommendations). The Water Department suggests future revisions describe the status of the management actions and specify the conditions that would necessitate implementation of the adaptive management actions.

<u>DWP Response:</u> Comment noted. Future revisions of the draft OVLMP will clarify the status of proposed projects.

8. Accountability and enforcement of the management plan is not described. Is LADWP committed to implement the plan as presented? If so, who would be responsible for assuring the plan is implemented as described? Further, if management actions change, how will the relevant sections of the plan be revised? Will the MOU parties be notified of changes in management practices and schedules?

DWP Response: LADWP is obligated under the 1997 MOU to implement the Owens Valley Land Management Plan as expeditiously as possible following its acceptance by the Board of Water and Power Commissioners.

Ecosystem Sciences has authored a Monitoring and Adaptive Management section of the OVLMP to address issues and subsequent changes in management. Adaptive management will be applied on a case by case basis if/when the need occurs. The MOU Parties will be notified of applicable changes in an annual report.

9. The first chapter combines goals and objectives into strategies. Subsequent chapters are then divided by management resource areas (river, grazing, recreation, etc). The strategies, goals, and objectives described and developed in Chapter 1 are not consistently carried forward into the management resource areas although on page 1-6 the plan states, "These goals will be tracked through the different chapters of the OVMP." Each chapter describing a management resource area should contain the goals and objectives, monitoring and data analysis methods, adaptive management measures, and reporting procedures. This would present the information as a unit, simplifying understanding of all the components.

ES Response: Comment noted. The next issue of the OVLMP will address this comment and make a greater effort to integrate within each chapter and throughout the document.

Chapter 1 Introduction

Section 1.5 MOU Goals and Objectives

10. The description of MOU Goals and Objectives should better define the terminology being used. For example, what processes would be functioning such that land management practices would be deemed "sustainable?" Defining terms provides clarity, helps determine whether management practices are effective, whether adaptive management measures need to be implemented, or whether the adaptive management measure is addressing the problem.

ES Response: Comment noted. Some terms will be defined and will be added to the OVLMP. "Sustainable uses" is defined in the 1997 MOU.

11. The MOU did not set goals nor did it state the plan would turn the stated provisions for the plan into goals. If the plan provisions from the MOU are set as goals, then the MOU language should be followed consistently and the MOU parties should agree on the plan goals. For example, the wording for goal #3 in the plan should contain the word sustainable. The MOU reads, "Continue to provide *sustainable* recreational opportunities." Goal #4 in the plan uses "improve" biodiversity and ecosystem health instead of "*promote.*"

ES Response: The five goals described in this section were derived from the following MOU language under Section III(B), Owens Valley Management Plans: *"While providing for the primary purpose for which Los Angeles owns the lands, including the protection of water resources utilized by the citizens of Los Angeles, the plans will also provide for the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities) will promote biodiversity and a healthy ecosystem, and will consider the enhancement of Threatened and Endangered Species habitats."*

For example, Goal #1, Continue to supply water to the city of Los Angeles, was derived from the sentence *"While providing for the primary purpose for which Los Angeles owns the lands, including the protection of water resources utilized by the citizens of Los Angeles…".*
Goal #2, Implement sustainable land management practices for agriculture (grazing) and other resource uses, and Goal #3, Continue to provide recreational opportunities on all LADWP-owned lands, were derived from the sentence

"…the plans will also provide for the continuation of sustainable uses (including recreation, livestock grazing, agriculture, and other activities)…"
Goal #4, Improve biodiversity and ecosystem health was derived from *"…will promote biodiversity and a healthy ecosystem…"*, and Goal #5, Protect and enhance habitat for T&E species came from *"…and will consider the enhancement of Threatened and Endangered Species habitats"*.

12. The plan states the volume of exported water to Los Angeles is regulated by other agreements. A summary of the Agreements and their conditions or requirements should be provided to better understand the constraints of the river system.

DWP Response: LADWP, along with the Inyo County Water Department, recognizes that the Long Term Water Agreement regulates water exports.

Section 1.6 Management Strategies

13. The plan appears to confuse objectives with tasks. Objectives are goals. Because the plan is for a large area and comprehensive in scope, the plan could use objectives as sub-goals to meet the larger overarching goals.

ES Response: Objectives are described in Section 1.5.1 as a means of achieving OVLMP goals. Objectives are not goals. In many situations people use words goals and objectives as interchangeable. Yet, in the context of goal setting, the difference between goals and objectives has an important practical meaning. There is confusion between a "goal" and an "objective." Although the terms are sometimes used interchangeably, there are differences between the two.

Goals are general directions, somewhat nebulous, that are not specific enough to be measured. **Objectives**, on the other hand, are specific and often measurable. They are concise. They are specific.

Goals are broad; objectives are narrow.
Goals are general intentions; objectives are precise.
Goals are abstract; objectives are concrete.

14. The plan states the MOU consists of five goals and ten objectives. The MOU does not list five goals nor does it contain the ten items listed as objectives.

ES Response: See responses to Comments #11 and #13 above.

Section 1.7 CEQA Process

15. This section notes that LADWP will prepare CEQA documents to address the OVMP. The next draft of the OVMP should include an analysis that describes how the management plan is consistent with the Water Agreement, MOU and 1991 EIR. As stated in Comment #2, changes to, or inconsistencies with, existing agreements would likely be considered a significant impact under CEQA.

DWP Response: Comment noted. See responses to Comments #2 and #12.

Chapter 2 River Management Plan

16. It is not clear why the plan limits management concerns to the Owens River. River management should include all tributaries to the Owens River. For example, is the incised state of the Owens River causing erosion to tributary streams and canals? If so, are areas of groundwater dependent vegetation being affected? Can management efforts be directed to curtail or contain stream bank erosion and dewatering of associated vegetation?

ES Response: Management of tributaries and other land and water resources are described in Chapter 3 in the grazing management plans, and will be considered in the Habitat Conservation Plan which is described in Chapter 5.

17. The Technical Group should review and approve portions of the plan and appendices that comprise Type D vegetation, riparian and marshland. This review should focus on the adequacy of the mapping, e.g., the classification system, management measures and goals, and its consistency with the Water Agreement. The Inyo/Los Angeles Standing Committee approved a cooperative study for the Technical Group to pursue a request for proposals to inventory, classify, and map riparian and marshland vegetation in the Owens Valley. Thus, any mapping, monitoring, and management of Type D vegetation must be approved by the Technical Group before being incorporated into a land management plan. (See General comment #3.) Thus, the Water Department reserves comment on the adequacy of the riparian inventory and its application to the plan.

DWP Response: See response to Comment #3.

18. The OVMP should identify the river reaches where perennial pepperweed was observed and recommend actions to address this problem. Numerous potential problems associated with the occurrence and increase of perennial pepperweed along waterways should be addressed. For example, the thick rhizomes of perennial pepperweed increase bank erosion. Problems with exotic weeds are not discussed in this chapter or in Chapter 9, although it is contained in the Adaptive Management Table 9.8. Therefore, it is not clear how this plan would implement control along the Owens River and tributaries.

DWP Response: Inyo County Weed Management receives money from LADWP and is responsible for weed management on City of Los Angeles lands.

19. A pre-LORP Hydraulic Gradient in Nearby Wells map is attached as an example of what might be done to examine groundwater-surface water interaction in the OVMP (attached). The gradients on the map were developed using the following databases: USGS Owens River elevations, the groundwater elevations from near river test holes, and a GIS map of the river and vicinity including shallow test holes. Analysis consisted of dividing the difference in elevations from the river and test hole water elevations by the map distance between the river and test hole. It is important to note that this is an approximation. The USGS elevation data uses estimates and reflects the time of mapping of the 7.5 minute USGS Quad from which the data were taken.

DWP Response: This is beyond the scope of the OVLMP. Groundwater-surface water interactions are not being managed in any way, shape, or form as part of this planning process.

20. Consider replacing the word or words used to refer to river flow amount with the words "river discharge" on pages 2-1, 2-6 and any other locations. In addition, all references to HEC-2 should be consistent, not HEC2 as on page 2-6.

ES Response: Comment noted.

Section 2.1.1 Riverine-Riparian Goals and Objectives

21. This section does not contain any goals. Chapter 1 listed several goals to be achieved by allowing for annual out-of channel flows, by prescribing ramping rates to minimize rapid water level changes, by maintaining existing average in-channel flows, or by applying a combination of these management tools. Goals included the ability to continue to supply water to the city of Los Angeles, continue to provide recreational opportunities on all LADWP-owned lands, improve biodiversity and ecosystem health, protect and enhance habitat for threatened and endangered species, and to implement sustainable land management practices for agriculture (grazing) and other resource uses.

ES Response: Comment noted. This will be clarified in the OVLMP.

Section 2.2 Environmental Setting

22. The location of the White Mountains and Sierra Mountains is switched in the text.

ES Response: Comment noted. This has been corrected.

23. In the Owens River channel below Pleasant Valley Reservoir, consider describing the down cutting, the northward migration of the river, and the bed armoring. Reference: *Erosion and sediment transport in the Owens River near Bishop, California*, by Rhea P. Williams, USGS Water-Resources Investigations Report, 75-49.

ES Response: This reference is from 1975. The river channel has changed substantially since then.

Section 2.3.2

24. It appears that ESI will unilaterally determine and map Type D and Other Vegetation.

    Middle Owens River, Riparian Vegetation Inventory, 2000 Conditions Prepared by Whitehorse Associates, this document maps the character of the riverine/riparian area at the landscape scale with a high degree of definition. Existing information pertinent to vegetation resources in the area was reviewed and assembled. Mapping was conducted from high-resolution digital orthophotos. Mapping denotes areas of distinctive soil, hydrologic and vegetative character. Field descriptions of soil, hydrologic and vegetative attributes were conducted. Vegetative, soil and hydrologic criteria were used to determine the wetland status of map units. The distribution of land types, water regimes, and vegetation types were mapped and described as valley form, channel/floodplain morphology, and hydrologic variables.

    The Middle Owens River riparian area was divided into 6,562 parcels, each consisting of a dominant land type, water regime and vegetation type. Five major landtypes were identified based on soil, morphology and position relative to environmental gradients. Water regimes for the MORP riparian area were determined by the frequency and duration of flooding, and/or depth to saturated conditions. Vegetation types were identified based on community physiognomy and species composition. The overall accuracy of the final mapping approached 95 percent. (Page 2-4, emphasis added)

    Mapping the vegetation types is part of the joint management of the resources in the Owens Valley, and the Water Department should be involved in a mapping effort. The Water Department recommends the mapping effort occur in conjunction with us.

DWP Response: See response to Comment #3.

Section 2.4.1 Reach 1: Pleasant Valley Reservoir to Five Bridges: Wild Trout Reach

25. The plan describes Reach 1 as having “recreational impacts.” Please provide a more informative description of the impact, e.g. denuding areas, soil compaction, littering, wood collection, or a combination of these activities.

DWP Response: The recreational impacts that occur in this reach are described in greater detail in the Recreation Management Section of the document (Section 4.4.1, Owens River: Pleasant Valley Reservoir to Highway 6).

26. Consider removing the reference to the “confluence” of Five Bridges in the first paragraph and replacing it with “the crossing of Five Bridges Road.”

ES Response: Comment noted. This change has been made.

27. Consider describing Horton Creek as an entrenched, armored channel that has readjusted to the lowering of the main Owens River Channel below Pleasant Valley Reservoir.

ES Response: Comment noted, but such a statement requires data to substantiate it.

28. The plan should describe the effects of Pleasant Valley Reservoir referenced in Comment #23.

ES Response: Comment noted, see response to Comments #23 and #25.

29. The plan should describe channel work done in the reach from Pleasant Valley Reservoir to Five Bridges, e.g. the fish spawning channel and alterations on the bridge.

ES Response: Comment noted.

Section 2.4.5 Reach 5: Big Pine Canal Diversion to Zurich

30. The second paragraph for Reach 5 incorrectly states, "The lack of riparian vegetation in this reach indicates a water table."

ES Response: Comment noted, the sentence will be changed to read "The lack of riparian vegetation in this reach indicates a low water table".

Section 2.9.3 Historic River Flow Management

31. The plan describes the beginning of flow from the Mono Basin to the Owens River as occurring "*after World War II.*" Please be more specific.

ES Response: Comment noted. The Mono Basin Project was completed in 1940.

Figure 2.13 and Figure 2.9

32. McNally Canals are incorrectly labeled and the small lake east of Fish Springs does not exist. In addition, labels on water conveyance features are not consistent in relationship to flow and sewer ponds are identified as lakes.

ES Response: Comment noted. Corrections will be made to these figures.

Section 2.10.4 HEC-2 Modeling Discussion

33. The plan describes a HEC-2 analysis was conducted to assess the channel morphology changes; however, HEC-2 does not provide information on changes in or out of the channel. Conclusions on channel morphology changes are the result of projecting interpretations of the HEC-2 results.

ES Response: Comment noted.

34. The plan should consider adding the reference, Roughness characteristics of natural channels, by Harry H. Barnes Jr., USGS WS Paper 1849, 1967. In addition, an "n" not N is used for Manning's n.

ES Response: Comment noted. The Manning's N was changed to n.

Section 2.10.5 Flow Ramping Rates

35. The management plan's goal is to minimize bank sloughing by setting ramping rates. To some extent, bank sloughing is a natural dynamic river process that results in healthy riparian habitat. How might restricting this process affect development and maintenance of a riparian corridor? In addition, cut banks are described as a problem only in Reaches 5 and 8. Changing elevations in Tinemaha Reservoir is identified as the likely cause of erosion in Reach 8 but no cause is attributed for Reach 5. Please describe management measures that could be implemented to reduce erosion rates in Reach 5.

ES Response: Headcutting also occurs in reaches from Tinemaha water surface elevation fluctuations. The degree of bank sloughing is extreme and does not reflect natural processes.

36. The plan explains bank sloughing occurs when high flows are quickly reduced causing saturated banks to collapse into the river. Thus, LADWP "imposed a ramping rate change of 25 cfs per day." When was this management measure implemented? Is there supporting documentation for the 25 cfs plan?

ES Response: The rate was implemented in 2007, and early indications are that bank sloughing is less severe than in previous years.

37. The plan states, "Allowing flows to ramp up and down slowly (i.e. over four days instead of one day) will alleviate many of the problems caused by past flow management." The plan only explains why quickly decreasing flows is problematic; therefore, it is not clear why increasing flows must also be ramped up slowly. Please explain.

ES Response: A gradual approach to ramping flows up or down more adequately mimics a natural system. Quickly ramping up flows can disturb aquatic organisms through dislodgement, stress fish through water temperature and water quality changes, and result in greater sediment transport.

38. The management plan should consider whether a drying front created by decreasing flows at 25 cfs/day meets the soil moisture requirements for native riparian seedlings.

ES Response: Comment noted.

Section 2.11 Future River Flow Management

39. The plan describes, in years with 200 cfs seasonal habitat flows:

    LADWP must balance flow in the Owens River to provide for the 200 cfs LORP flow while maintaining adequate flow in the aqueduct to ensure Los Angeles is receiving their allotted water. This will entail releasing higher flows from Tinemaha Reservoir. Future flow management in the OVMP must be forward thinking and must balance the water needs of the City of Los Angeles, local lessees, and the myriad of mitigation and restoration projects that LADWP has underway in the Eastern Sierra.

    Are the authors considering additional problems that are likely to result in the Middle Owens River as result of the habitat flows to the LORP? If so, what are the potential problems? Are there management measures that should be considered and implemented prior to the 200 cfs release to the LORP? Will the issue of future management changes to the Owens River be presented to the MOU groups once the 200 cfs flows to the LORP are implemented?

ES Response: The intent was to ensure that flow planning remain cognizant of downstream requirements.

40. The plan states, *"The yearly high flow events (flows exceeding 600 cfs) will scour stream banks and bars within the river channel and promote riparian and wetland plant development in the low floodplain areas adjacent to the river through inundation."* Is the yearly high flow event a management measure? How frequently is it projected to occur?

ES Response: River management in the Middle Owens River includes ramping rates and pulse flows. The pulse flows are generally released on average to above average water years. Ramping rates and pulse flows are management tools used to meet the following goals: "Continue to supply water to the city of Los Angeles, improve biodiversity and ecosystem health, and protect and enhance habitat for threatened and endangered species".

41. In several locations, the chapter describes the MORP as receiving *"a high spring or pulse flow most years and on average this flow exceeds 600 cfs."* A 600 cfs flow is used for the HEC-2 model because "for nine of the 180 months between 1991 and 2005, flows averaged over 600 cfs in the Owens River" (page 2-30). However, it is not clear that a 600 cfs spring flow occurs. Figure 2.19 indicates the majority of high flows occur in late summer/early autumn. In fact, only one of the >600 cfs flows depicted in the graph occurred in the spring, the other flows occurred after July. Will flows occurring later in the year achieve management objectives?

ES Response: Yes, flows occurring later in the year will achieve management objectives.

Chapter 3 Grazing Management

42. The OVMP needs to describe locations where decreases in surface water have been made since 1990 or will be made by implementation of the OVMP. As mentioned under General Comments (#6), the OVMP must be consistent with the LTWA, MOU and 1991 EIR. Between the period of 1970 and 1990, the 1991 EIR describe LADWP's management of irrigated lands as having,

> *… a firm allocation of five acre-feet of water per acre. Irrigated leased lands solely dependent on diversions from a creek for irrigation water would receive the full allotment only when sufficient water was available from the natural flow in the creek. Other irrigated leased land would receive pumped groundwater, where available, to stabilize water supply during drought years.*

The LTWA further provided,

> *A program providing for reasonable reductions in irrigation water supply for Los Angeles-owned lands in the Owens Valley and for enhancement/mitigation projects may be implemented if such a program is approved by the Inyo County Board of Supervisors and the Department, acting through the Standing Committee.*

Therefore, the OVMP may not implement measures decreasing water allotments without approval from the governing boards. CEQA procedures must be followed if the land is a mitigation measure in the 1991 EIR.

DWP Response: There have been no reductions in surface water allocations made since 1990, nor will any be made with the implementation of the OVLMP. Also see response to Comment #6.

43. It is not clear if water usage is consistent with the 1981-82 baseline period, or reflects modifications to the lease allocations. A couple of years ago, LADWP proposed reductions in surface water irrigation as part of an agricultural water conservation plan. The County submitted extensive comments on the proposal including the County's concerns over the plan's potential impacts on Type D, Type E and other vegetation. LADWP did not implement the plan. Subsequently, LADWP released a modified proposal that would allow reductions in the amount of water supplied on only sprinkler-irrigated areas of Los Angeles-owner lands. Once again, the County submitted extensive comments to LADWP on its proposal. LADWP has not implemented that plan. Those comments are attached.

DWP Response: See response to Comment #6.

44. The 1991 EIR also described LADWP's management of canals and ditches between 1970 and 1990,

> *Flows in certain canals and ditches supplying irrigated Los Angeles-owned lands were increased as part of the project, with no significant impact on water resources.*

The OVMP needs to disclose actions that involve changes to LADWP's management of canals and ditches in order to comply with the LTWA and 1991 EIR, if such changes occurred.

DWP Response: No changes in surface water management practices were described or contemplated in the development of the OVLMP.

45. Locations of decreased irrigation supply should be described to ensure recreation and wildlife uses have not been or will not be negatively impacted. The LTWA described for Type E,

Another primary goal is to avoid significant decreases in recreational uses and wildlife habitats that in the past have been dependent on water supplied by the Department.

DWP Response: See response to Comment #44.

46. The plan should describe how management and monitoring activities would use the Type E inventory data collected as a provision in the 1997 MOU. Although the Appendices mentioned the RCI transects were used, it did not describe how they were used to supplement vegetation type descriptions. The MOU provided:

> *Type E Vegetation: Within 30 months of the discharge of the writ, using aerial photographs, transect data, and other relevant information, baseline conditions for vegetation identified as "Type E" in the Inyo-Los Angeles Agreement will be adopted by the Standing Committee. These baseline conditions will be used in the management of this vegetation under that agreement, in the preparation of the LORP Plan, and in the preparation of any other management plans that address the area.*

DWP Response: No management actions are contemplated that would change the Type E inventory data.

47. The OVMP should locate and describe areas where vegetation may be negatively impacted by loss of irrigation tailwater. For example, on page 3-19, the plan includes a partial description of lease management changes that reduced irrigation tailwater. The LTWA includes provisions for vegetation dependent on irrigation tailwater. In addition, there is no analysis of whether groundwater recharge or adjacent vegetation parcels were negatively affected as a result of the management changes described.

> *Irrigation "tail-water" enters the Swamp Field from the adjacent Reinhackle and Brockman leases. Since Reinhackle lease management was transferred, tail-water entering the Swamp Field has declined by 50 percent. During winter months, the Swamp field now dries up.*

DWP Response: No management actions are contemplated that would change the LTWA.

48. The 1991 EIR was approved with a mitigation measure requiring:

> *irrigated lands in Owens Valley (including in Olancha-Cartago area) in existence during the 1981-82 runoff year or that have been irrigated since then, will continue to be irrigated in the future…*

The OVMP makes a distinction between surface irrigated lands and subirrigated lands. Since both are classified and managed as Type E in the LTWA, the OVMP should provide maps of the Type E lands and distinguishing the surface and subirrigated lands for review by the City and the County.

DWP Response: Any reference to subirrigated lands will be removed from the document.

49. Management in the plan categorizes vegetation as either upland or riparian for grazing management. This is an over-simplification of the vegetation and associated habitats. The LTWA provides protection of vegetation categories as mapped in 1984-87. Further, the LTWA provided for mapping and monitoring of Other Vegetation as described in the General Comments section.

DWP Response: No management actions are contemplated that would alter the LTWA.

50. Chapter 3 identifies additional goals that were not included in Chapter 1. These are to improve water quality and water use efficiency, maintain compatibility with water gathering activities, support continuation of a cost-effective aqueduct operation, minimize resource conflicts that may threaten LADWP's water supply while benefiting fish, wildlife, and other natural resources, and improve degraded rangelands, and maintain healthy rangelands.

ES Response: These goals you refer to are Best Management Practices (BMPs). Clarification will be added to the OVLMP.

51. The plan should provide a description of the plant communities included in the upland and riparian designations. For example, is Mojave mixed woody scrub and alkali meadow both considered upland? (Pg. 3-2).

ES Response: Yes, both are considered upland plant communities. The Middle Owens River Project Riparian Vegetation Inventory 2000 Conditions, which is included in the appendices of the OVLMP, provides descriptions of vegetation communities in the riverine-riparian project area.

52. The description for riparian pasture management states that the survival of riparian trees and shrubs will be enhanced for the first three years. It is not clear how the plan will achieve this. The plant communities contained in the riparian management schemes should be described for clarity. (Pg. 3-2)

DWP Response: Please review the Clary and Webster (1989) paper cited in the document, *Managing grazing areas in the Intermountain Region*.

53. The plan provides for the application of upland vegetation utilization rates for areas of significant upland vegetation occurring in riparian pastures. Please provide a quantifiable range of acres rather than applying the term "significant." (Pg. 3-2)

ES Response: Comment noted. Grazing management plans quantify riparian pastures.

54. How does the NRCS rating system and range trend monitoring insure the provisions of the Water Agreement are met? What is the frequency of monitoring if a lease has a high score? How will the season of monitoring be determined? (Pg. 3-2)

DWP Response: Monitoring insures that the goals of the OVLMP are met. The frequency of monitoring is described in the plan. Monitoring is conducted during the growing season, an appropriate length of time after irrigation has begun.

Chapter 4 Recreation Management

55. The OVMP should include a map showing the area affected by the recreation management plan. Page 4-2, section 4.1.1, describes that the LORP planning area is not included under this chapter and provides an incorrect reference, Figure 1.2 from the 1997 MOU.

ES Response: The Figure 1.2 that you reference refers to the map on pg. 1-3, LADWP Owned Lands in Inyo County and LORP Planning Area. It is not referencing a map in the 1997 MOU- the 1997 MOU citation is included as a reference for establishing the Recreation Management Plan project area. The reference to Figure 1.2 has been amended to read “see Figure 1.2, Chapter 1 of the OVLMP.

56. Specific problem sites slated for management are identified, mostly at intersections of the river and major roadways. While these areas have obvious impacts to soil and vegetation measures from recreation, there are several other areas adjacent to the river needing similar measures to halt and reverse degradation. The final plan should include these sites, as well.

DWP Response: Your comment references “several other areas adjacent to the river needing similar measures to halt and reverse degradation”. Further, you state that the final plan should include these sites, but you do not provide information on what locations you are referencing.

Section 4.1.2 Plan Development

57. The MOU provides “The Parties will have the opportunity to review and comment on a written description of the areas identified, and the reasons for their prioritization, before plan development.” (Bold text added for emphasis.) On May 27 2004, LADWP requested MOU parties to provide a list of ranked recreational concerns to be considered for the plan. The Water Department does not believe this request nor the presentation in the plan fulfills the quoted provision in the MOU. Although, the plan states LADWP “prioritized issues and areas of concern with regard to recreation on LADWP property;” there is no description of the issues or any discussion of how the issues and locations were prioritized. Therefore, the Water Department does not agree with the conclusion “All procedures in plan development … were in compliance with the 1997 MOU …” See Comment # 5.

DWP Response: LADWP’s May 27, 2004 letter to the MOU parties soliciting comments on recreation issues was an opportunity for the parties to contribute to the product and assist in producing a comprehensive, usable tool for the management of LADWP lands. The parties have also had the additional opportunity to review the draft OVLMP, which lists specific recreational projects that are proposed under the plan.

The MOU provides that priority should be given to riparian areas, irrigated meadows, and sensitive plant and animal habitats. The plans should also use the work completed in Long Valley and the Upper Owens River if applicable, as well as multiple resource values and holistic management principles. Section 4.2.1 of the OVLMP discusses this direction from the MOU. Section 4.4 addresses how specific recreation projects will be implemented in a phased approach, allowing LADWP to address the most critical needs first (as identified in the MOU and/or other jurisdictional agencies). Under this direction, it is logical to prioritize work along the Middle Owens River Corridor for riparian values, as well as to meet goals in the *Conservation Strategy for the Southwestern Willow Flycatcher.* This section further states “finally, areas with less urgency from a natural resources and/or public safety standpoint will be addressed, including much of the area’s uplands.” See response to Comment #5.

Section 4.2.2 General Management Principles

58. The OVMP provides a list of management guidelines that were considered “to reflect critical needs within the management area.” Under “LADWP Organization Commitments,” meeting commitments in the 1997 MOU is listed but provisions of the Long-Term Water Agreement and 1991 EIR should also be included.

DWP Response: Comment noted.

Section 4.3.1 LADWP Recreation Policies

59. The Owens River, canals, and artesian wells are utilized as water sources for fighting wildfires. This requires the ability to place large apparatus within a few feet of the source, frequently using trails or parking areas

slated to receive barriers to restrict vehicle access. Immobile barriers like boulders instead of fences (which can be breached relatively quickly) would hinder fire-fighting efforts by requiring longer transit time to refill engines. The final plan should coordinate with local and federal fire agencies to designate filling sites that would remain accessible.

DWP Response: Comment noted.

60. The plan includes the creation of sanitation facilities if recreational usage becomes too high in an area, and waste/sanitation becomes a problem. How are these criteria determined? For example, no facilities are currently provided at Klondike Lake.

DWP Response: Sanitation facilities will be explored if waste becomes a substantial detriment to water quality or other resources. Evaluation of these impacts will be on a site specific basis by LADWP Watershed Resources Staff. LADWP will continue to minimize the construction of formal facilities for recreational purposes if possible, consistent with the semi-primitive approach outlined in Section 4.2.3.

Section 4.4 Proposed Projects for Areas of Specific Concern

61. The plan does not describe how the projects were identified and prioritized.

DWP Response: Section 4.1.2, Plan Development, describes the development and prioritization of projects. The projects were identified through review of LADWP staff comments, comments received from the MOU parties, and information gained through public focus group meetings. Projects were prioritized based on language in the MOU and other jurisdictional agencies. Also see response to Comments #5 and #57.

62. The projects described in the recreation chapter appear to rely on environmental self-organization following implementation of measures to limit disturbance. Aggressive intervention like mechanical bank stabilization/restoration to decrease erosion and revegetation are not included in the identified projects, although active measures are described under section 4.4.5 Projects Applicable to the Entire Management Area. Soil compaction in certain areas will almost certainly delay natural revegetation and restrict diversity of species despite removal of the disturbance. The final plan should anticipate the need for active methods in the more severely disturbed sites and include a determination of which sites need active intervention to establish the trajectory towards the desired vegetation/habitat. For other sites, the final plan should describe how it would be determined when it is necessary to implement different restoration methods to attain the desired habitat or condition.

DWP Response: Active management measures are discussed in Section 4.4.5 in the context of reclaiming unnecessary roads in the valley. (LADWP has no interest in using a heavy handed approach to bank stabilization/stream restoration). These roads will be evaluated on a site specific basis by LADWP Watershed Resources Staff and recommendations for improvement will be made appropriately. As this section states, "in some cases, ripping and seeding reclaimed road surfaces is recommended in order to achieve particular goals; in other cases, simply blocking access to a road is more appropriate." Such active measures may be used in cases where soil compaction inhibits recovery of vegetation.

63. The plan describes impacts created by vehicles driving up to the riverbanks. Some of these drivers are elderly or have restricted mobility. Thus, the final plan should consider the potential impact to the elderly or disabled that may have difficulty accessing the river for recreation when fencing and other barriers to allow only foot traffic are constructed.

DWP Response: There are several locations in the proposed projects that will allow for handicap access; hence, part of the reason LADWP is using boulders in many areas rather than fencing.

64. In the final plan, the descriptions of the specific project areas should contain additional details, in particular the size of the specific project area, extent of new fencing/vehicle barriers, type and location of educational information (kiosks or signage), and location and size of parking areas adjacent to barriers.

DWP Response: Specific projects will be described as they are developed over time.

Section 4.4.1 Owens River: Pleasant Valley Reservoir to Highway 6

65. The plan again needs to describe what criteria will be used to determine whether resources are being degraded or "significantly impacted". These definitions can then be used to determine the need to adjust management actions or judge whether implemented management measures are successful.

ES Response: The degree of degradation depends upon the activity, intensity, and resource impacted. A set of criteria cannot cover all potentials, thus professional judgment will be the determinate.

Project 3. East Line Street and the Owens River

66. The project does not address the OHV use on the dunes. Denuding the dunes is an example of an unsustainable recreational activity. Destruction of the vegetation cover on the dunes has caused erosion and dust problems. In addition, the denuded areas are unsightly and may be difficult to revegetate because of the instability caused by the OHV traffic.

DWP Response: Comment noted. The final OVLMP will address OHV use in this location.

Project 12. Klondike Lake

67. The plan states "LADWP will continue to coordinate with Inyo County to explore options for waste management at Klondike Lake and may install trash and toilet facilities (operation and maintenance would be the responsibility of Inyo County.)" The Water Department and Inyo County Department of Parks and Recreation are not aware of any communications regarding development of waste facilities for Klondike Lake. The Water Department is aware of requests from Audubon for a protected area in the northern part of the lake. The recreation impacts at this project site need to be more fully addressed.

DWP Response: The Klondike Lake portion of this plan references the Park Rehabilitation, Development, and Maintenance section of the Long Term Water Agreement. This section states that LADWP is to provide funds for Inyo County to develop new recreational facilities and programs and fund annual operation and maintenance of existing and new facilities located on LADWP lands. The words "continue to" will be omitted from "LADWP will continue to coordinate with Inyo County to explore options for waste management at Klondike Lake…"

Section 4.5 Adaptive Management

68. The presence of this section in a chapter should be consistent throughout the plan. If subsequent versions of the OVMP contain an adaptive management section in each chapter, there is no need to repeat an explanation of adaptive management.

DWP Response: Comment noted. We will avoid repeating explanations unless necessary.

69. Figure 4.17 explains LADWP "may" use the tools shown. If the plan isn't describing the intended actions, then the purpose of the plan is unclear. In addition, details of thresholds that would cause a management action to be implemented should be included in the plan.

DWP Response: The caption under Figure 4.17 explains "the series of boxes on the left represent general situations (resource damage or other recreation problems/issue) that may arise on LADWP lands. The series of boxes on the right represent the management tools that may be applied, singly or collectively, to rectify the situation and improve recreation management on Department lands." Again, most of these recreation issues will be evaluated on a site specific basis by LADWP Watershed Resources Staff to determine the applicable measures.

Chapter 5 Habitat Conservation Planning

70. According to the cover letter accompanying this draft plan, this chapter is incomplete. Therefore, the Water Department reserves the opportunity to comment further as the chapter is completed; however, the following comments are provided:

71. This chapter has two titles: Habitat Conservation Planning (chapter title page) and Habitat Conservation Plan (heading on subsequent chapter pages). Thus, the authors' intentions for the contents of this chapter are not clear. Will it be based on the Habitat Conservation Plans (HCP) for the five listed animal species or will it be broadened to include other sensitive species? In addition, will the management plan consider and implement recommendations contained in the Owens Basin Multi Species Recovery Plan. If not, where does this leave management of a broad range of rare and sensitive species (including plants)?

ES Response: Chapter 5 is correctly titled "Habitat Conservation Planning". The title in the header section will be changed to read "Habitat Conservation Planning" to avoid confusion. The introductory paragraph of Chapter 5 describes that when the HCP is completed, it will be incorporated into the OVLMP as an appendix- until then, the HCP will be incorporated by reference and summarized in Chapter 5.

The HCP will be habitat-based rather than species-based, which means that the HCP will address a specific habitat, in this case, riverine-riparian and the target species will be used to manage that habitat. The Swainson's Hawk and Owens Valley vole are evaluated and described in the HCP. The HCP incorporates the Owen's Basin Wetland and Aquatic Species Recovery Plan (1998) to describe specific actions and sites that have the greatest potential for recovery and delisting of species. The HCP will also relate to other existing recovery plans and species conservation efforts already drafted for areas that overlap the project area boundaries, including the: Draft Recovery Plan for the Least Bell's Vireo (1998) and the Recovery Plan for the Southwestern Willow Flycatcher (2002).

72. Unlike previous chapters, this chapter contains an exotic species and a Monitoring and Adaptive Management section.

ES Response: Comment noted. The Monitoring and Adaptive Management will be addressed in Chapter 9 of the revised OVLMP.

Section 5.2 HCP Goals and Objectives

73. The description of the project scope mentions five target species. It is not clear why OVMP did not include all state and federally listed species, not just those considered riparian-obligate. Further the Swainson's Hawk (state listed) and Owens Valley Vole require riparian habitat and were not included in the OVMP.

ES Response: The HCP covers federally listed species (with the exception of the cuckoo, which is state-listed endangered) that are riparian habitat obligates. Because it is a habitat-based HCP, the project area will be focused on riparian systems (rivers, tributaries, and wetlands) on LADWP property within Inyo and Mono counties. See response to Comment #71.

Section 5.3.1 Activities Covered by the HCP

74. Under recreation, 'off-road' vehicle should be changed to 'off-highway' vehicle.

ES Response: Comment noted. The change has been made.

Section 5.6.3 Least Bell's Vireo

75. The plan should include a citation for the description of the Least Bell's Vireo breeding distribution. Additional information of the Bell's Vireo should include: observations in the Owens Valley in recent years (December 2002) and an increase in population in Riverside County is attributed to an extensive Brown-headed Cowbird eradication project.

ES Response: The species accounts in Chapter 5 are only brief summaries. Detailed accounts of covered species will be provided in the HCP. For clarification, the following citations will be added to the description of the breeding distribution in Chapter 5: Kus 2002 and USFWS 1998. The following text will also be added:

"Vireo distribution is expanding eastward in San Diego County and northward into Riverside and Ventura counties. Sightings indicate the vireo may be reestablishing in the central and northern portions of their historical breeding range (Kus 2002 and USFWS 1998). Cowbird eradication programs have resulted in significant increases in vireo populations in southern California in the Camp Pendleton, San Luis Rey River, and San Diego River areas (Kus and Whitfield 2005 and USFWS 1998). Overall, the California population in 2007 was 10 times larger than it was at the time of its listing as Endangered. Cowbird control is an effective short-term crisis management tool and should be replaced, when appropriate, by restoration and maintenance of natural processes on which species depend" (Kus and Whitfield 2005).

According to the California Natural Diversity Database (CNDDB 2006) there have been no documented sightings of Least Bell's Vireos in the Owens Valley in recent times. Please provide more information on the December 2002 citation indicating recent observations of Least Bell's Vireo in the Owens Valley. In August 2005, there were sightings of Least Bell's Vireo in the Central Valley, which was reported by the U.S. Fish and Wildlife.

Section 5.6.4 Southwest Willow Flycatcher

76. Southwest should be changed to Southwestern in the section title. The species description should include the known distribution of the Willow Flycatcher in Owens Valley (e.g. Round Valley to Collins Rd). The Owens River Habitat Assessment (Oxbow Environmental in Appendices) described the known distribution, based on nesting observations, as expanding downriver.

ES Response: "Southwest" will be changed to "Southwestern". The following information is taken from the species account for the HCP and will be added to Chapter 5:

"A relatively large breeding population of southwestern willow flycatchers exists on LADWP-owned lands along the Owens River and adjacent tributaries in northern Inyo County (LADWP 2005). Additional isolated territories have been documented along Lone Pine Creek (1999); the Owens River north of Tinemaha (1999 and 2006) and south of Collins Road, near Bishop (2006); from Long Valley Dam to about 1.5 miles south of Line Street in Bishop; and along the Owens River from Pleasant Valley to south of Poleta Road east of Bishop (2001). Southwestern willow flycatchers have also recently recolonized areas of Rush Creek in Mono County (Heath et al. 2001 and McCreedy and Heath 2004)."

Section 5.6.5 Yellow-Billed Cuckoo

77. The section should include the known distribution of Yellow-billed Cuckoo in the Owens Valley.

ES Response: A more detailed account of the Yellow-billed Cuckoo will be provided in the HCP. The following description of cuckoo distribution in the Owens Valley will be added to the OVLMP:

"The California Natural Diversity Database (CNDDB) reported sightings of Yellow-billed Cuckoo at seven different sites in Inyo County since 1977, including Owens Valley Ranch, Hogback Creek, Willow Creek at China Ranch, Tinemaha Reservoir, Amargosa River, and northeast of China Ranch. According to Laymon (2004) cuckoos have been detected recently at Hogback Creek".

Chapter 6 Cultural Resources Management

78. The direction of management action is not clear. The chapter concludes with recommendations to implement protective management for 19 heritage sites. Has LADWP not determined whether these sites would be protected? Will the MOU parties be notified when the management actions are decided?

ES Response: In this section, it states that "protective management (avoidance) of these sites is recommended". Any future project, be it recreation, grazing, or cultural resources, will rely upon the database and recommendations for protection. MOU parties will be notified as necessary. Section 6.2, MOU Goals and Objectives, was added to this Chapter to clarify the direction of management.

Section 6.11.2 CEQA Recommendations

79. The purpose of this section should be explained. It contains additional recommendations for management inside and outside of the MORP area. In addition, there are additional management recommendations that should be included with the overall management for cultural resources.

ES Response: A section has been added to explain the role of NRHP and CRHP and the CEQA recommendations section has been expanded to better describe CEQA requirements.

80. Additional explanation for this statement would also be helpful,

    If MORP is a CEQA-only project, the role of SHPO is commentary only.

    Is there work on the river that is being considered for a separate CEQA document? Further, the plan suggests that comments from SHPO should be solicited to clarify whether there may be:

    …potential impact to heritage sites from design changes in the river flow pattern, particularly for prehistoric sites on adjacent eroding terraces.

    Has this been done?

ES Response: Any future project that may have an environmental impact will require CEQA review, which would also include SHPO review. See the revised Chapter 6.

Chapter 7 Fire Management

81. This chapter is largely incomplete, however, the following comments are provided.
82. The chapter should provide the land management goals pertaining to fire as described in Chapter 1. For example, the purpose of fire management is to protect and enhance habitat for threatened and endangered species, implement sustainable land management practices for agriculture and other resource uses, continue providing recreational opportunities on all LADWP-owned lands, and improve biodiversity and ecosystem health.

DWP Response: Comment noted, see the final plan. The applicable goals and objectives will be added from Chapter 1.

83. The plan will remove grazing from burn areas resulting from unintentional fires for at least two years. However, it is questionable whether this policy would be applied to every burn. Therefore, the plan should include a description of how the decision will be made whether this measure would be implemented, the purpose and means of implementing the measure, and how determination will be made to return grazing to the burned areas.

DWP Response: Comment noted, see the final plan.

84. Further, the final plan should require preparation of fire recovery plans for all fires (controlled or wild) on LADWP lands. The plans should be incident- and site-specific and should describe measures that will be used to rehabilitate the burn area. The plans should describe measures that will be used to rehabilitate the burn area. The plans should characterize the area burned and describe revisions to grazing management, soil erosion control, soil compaction amelioration, active revegetation methods, weed control and follow-up monitoring. This procedure would replace a-priori prescriptions such as the automatic exclusion of grazing for two years currently included in the draft plan.

DWP Response: Comment noted, see the final plan.

85. The final plan should define minimum impact suppression tactics and describe how training will be provided to responding agencies to ensure expectations are understood.

DWP Response: Comment noted, see the final plan.

Section 7.2 Fire Ecology

86. Footnote 1 should note Hunter, M.L. is the editor not the author. The title contains an error, it should read, Maintaining Biodiversity *in* Forest Ecosystems, italics added to show error. In addition, this citation is not included in the reference section of the plan.

ES Response: The footnote was amended and added to the reference section of the plan.

87. The Water Department withholds further comment until the chapter is completed.

Chapter 8 General Commercial Use Policy

88. This chapter is largely incomplete, however, the following comment is provided.

89. This chapter should describe how the management actions to be implemented would address the goals stated in Chapter 1. These goals are to continue to provide recreational opportunities on all LADWP-owned lands, protect and enhance habitat for threatened and endangered species, and implement sustainable land management practices for agriculture (grazing) and other resource uses.

DWP Response: Comment noted. The applicable goals and objectives will be added from Chapter 1.

Chapter 9 Monitoring and Adaptive Management

90. It is not clear why only some chapters included discussion of adaptive management measures. The organization of the plan could be helped by including the monitoring and adaptive management in the pertinent chapters. The separation of information makes it difficult to assess inconsistencies with the management goals and measures.

ES Response: This will be clarified in the final OVLMP.

91. The OVMP must be consistent with the LTWA, MOU and 1991 EIR. This chapter should specifically address the plan's consistency (or potential inconsistency) with these documents for the management proposed and how consistency will be maintained as adaptive management is implemented. For example, the plan should clearly describe whether the vegetation goals in the plan are consistent with the LTWA maps. Because

baseline vegetation data was collected for this plan, the management goals may be inconsistent with the LTWA vegetation goals. Further, implementation of adaptive management may modify management described in this plan; however, management may not be modified to the extent that it becomes inconsistent with the Water Agreement, 1991 EIR or with the goals and objectives of the MOU.

DWP Response: See response to Comment #1.

92. The OVMP includes vegetation maps in which tiny vegetation polygons have been delineated: Is this practical from a management standpoint?

ES Response: This is not practical from a management standpoint but small polygons are combined to create vegetation types.

93. The review conducted by Drs Patten and Twiss on the LORP monitoring and adaptive management plan are relevant to this plan. For example,

> *[The plan] leaves out the important process of creation of a conceptual model or plans of the system with inputs, processes and outcomes that helps establish rationale for restoration processes. A conceptual model also guides evaluation of monitoring results…[A]n Adaptive Management Plan should … be guided by an actual set of diagramed conceptual models, stating the conditions that would trigger evaluations leading to course confirmation or course correction.*

ES Response: Comment noted, however, we disagree with using hypothetical models.

94. The plan should describe who would be responsible for determining whether monitoring results will trigger adaptive management. Further, it should describe how determinations would be made on which measure(s) to implement.

ES Response: Accountability, enforcement, and notification procedures will be clarified in the next version of the OVLMP.

Section 9.2.2 Land Use and Uplands

95. The plan describes areas outside the floodplain of the Owens River or its tributaries are managed as uplands. This simplification ignores areas of vegetation dependent on high groundwater, canals and ditches, springs, and flowing wells.

DWP Response: See response to Comment #1.

96. Pages 9-9 and 9-25 includes the following statements: *"Land and water-use modifications will seek to maximize the efficient use of the resource…"* and *"Management changes may include, but are not limited to, …water management."* Water supplied to irrigated lands is governed by the LTWA and mitigation measures adopted in the 1991 EIR. Decreases in irrigation must be approved by governing boards from LADWP and the County. The plan needs to recognize these protections and describe how they are incorporated into the plan.

DWP Response: See response to Comment #1.

Table 9.8, Riverine-Riparian System Adaptive Management Measures

97. Are the measures listed in this table restricted to river management issues? Several of the measures should be considered for the entire plan area. On pages 9-12 and 9-22, the plan describes potential changes to river ramping. This measure is not included in the table. In addition, it also includes measures for addressing problems not discussed in the plan such as, tule removal and modification of the river channel. Modification of

the river channel would require additional agency review, obtaining the appropriate permits, and possible CEQA notification.

ES Response: Several of these measures are applicable to riverine-riparian and upland areas. The change in ramping rates was added to Table 9.8 and the modification of the river channel measure was eliminated from the table as it is not applicable.

Chapter 10 Special Management Areas

98. The plan describes *"unique areas of concern with specific management goals and objectives"* are included in this chapter. However, in addition to the MOU projects, other areas of special consideration could be included in this chapter, e.g. areas of other vegetation (as defined in the Green Book), springs, riparian vegetation, flowing wells, and other areas of high groundwater not mapped during the 1984-87 LADWP vegetation inventory.

DWP Response: Comment noted.

99. If the adopted plans for the MOU projects, the 1,600 acre-feet projects and the Yellow-billed Cuckoo habitat enhancement plans, specify the land management practices for the project areas, the specified management practices should be included in the OVMP. To the extent that the adopted plan for the projects do not describe the land management applicable to the area included in the plan, the OVMP will then have to prescribe management for the area that is consistent with the intent of the mitigation plan for the area. If no plans are adopted for one or both of these MOU projects, then the OVMP will have to prescribe the management for these areas.

ES Response: The details of these plans are still being worked out. When these plans are completed, they will be incorporated into the OVLMP.

A.6 Baseline Studies

List of studies:

Middle Owens River Study Design, Ecosystem Sciences

Middle Owens River Inventory 2000, Whitehorse Associates

Middle Owens River Habitat Assessment, Oxbow Environmental