Lower Owens River Project

2008
Final Annual Monitoring ~~Draft~~ Report

Prepared by: Los Angeles Department of Water and Power,
Inyo County Water Department,
and
Ecosystem Sciences, Inc.

Revised Cover Page

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1.0 Lower Owens River Project Monitoring Report Introduction

The Lower Owens River Project (LORP) is a large-scale habitat restoration project in Inyo County, California being implemented through a joint effort by the Los Angeles Department of Water and Power (LADWP) and Inyo County (County). The LORP was identified in a *1991 Environmental Impact Report* (EIR) as mitigation for impacts related to groundwater pumping by LADWP from 1970 to 1990. The description of the project was augmented in a *1997 Memorandum of Understanding* (MOU), signed by LADWP, County, California Department of Fish and Game (CDFG), California State Lands Commission (SLC), Sierra Club, and the Owens Valley Committee. The MOU specifies the goal of the LORP, timeframe for development and implementation, and specific actions. It also provides certain minimum requirements for the LORP related to flows, locations of facilities, and habitat and species to be addressed.

The overall goal of the LORP, as stated in the MOU, is as follows:

> "The goal of the LORP is the establishment of a healthy, functioning Lower Owens River riverine-riparian ecosystem, and the establishment of healthy, functioning ecosystems in the other physical features of the LORP, for the benefit of biodiversity and Threatened and Endangered Species, while providing for the continuation of sustainable uses including recreation, livestock grazing, agriculture and other activities."

LORP implementation included release of water from the Los Angeles Aqueduct to the Lower Owens River, flooding of approximately 500 acres in the Blackrock Waterfowl Management Area, maintenance of several Off-River Lakes and Ponds, modifications to land management practices, and construction of new facilities including a pump station to capture a portion of the water released to the river.

The LORP was evaluated under CEQA resulting in the completion of an Environmental Impact Report (EIR) in 2004.

1.1. Monitoring and Reporting Responsibility

Section 2.10.4 of the Final LORP EIR states that the County and LADWP will prepare an annual report that includes data, analysis, and recommendations. Monitoring of the LORP will be conducted annually by the Inyo County Water Department (ICWD), LADWP and the MOU consultant, Ecosystem Sciences, Inc. (ESI) according to the methods and schedules described under each monitoring method as described in Section 4 of the *Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, Inc., 2008).

Specific reporting procedures are also described under each monitoring method. The MOU requires that the County and LADWP provide annual reports describing the environmental conditions of the LORP. LADWP and the County are to prepare an annual report and include the summarized monitoring data collected, the results of analysis, and recommendations regarding the need to modify project actions as recommended by the MOU consultant, ESI. This LORP Annual Monitoring Report describes monitoring data, analysis, and recommendations for the LORP. The development of the LORP Annual Monitoring Report is a collaborative effort between the ICWD, LADWP and the MOU Consultant. Personnel from these entities participated in different sections of the report writing, data collection and analysis.

The 2007 Stipulation & Order also requires the release to the public and representatives of the Parties identified in the MOU a draft of the annual report. The 2007 Stipulation & Order states in Section L:

> "LADWP and the County will release to the public and to the representatives of the Parties identified in the MOU a draft of the annual report described in Section 2.10.4 of the Final LORP EIR. The County and LADWP shall conduct a public meeting on the information contained in the draft report. The draft report will be released at least 15 calendar days in advance of the meeting. The public and the Parties will have the opportunity to offer comments on the draft report at the meeting and to submit written comments within a 15 calendar day period following the meeting. Following consideration of the comments submitted the Technical Group will conduct the meeting described in Section 2.10.4 of the Final LORP EIR."

Generally, LADWP is the lead author for a majority of the document and is responsible for overall layout, and content management. Specifically, LADWP wrote: Chapter 1.0, Introduction; Chapter 5.0, Rapid Assessment Report; Chapter 6.0, Hydrologic Monitoring; Chapter 7.0, Land Use Monitoring; and Chapter 8.0, Weed Control. ESI is the lead author for: Chapter 3.0, Seasonal Habitat Flow Flooded Extent; Chapter 4.0, Assessment of River Flow Gains and Losses; and Chapter 10.0, Adaptive Management Recommendations. ICWD is the lead author for: Chapter 2.0 Water Quality Monitoring and Chapter 9.0, Salt Cedar Treatment.

As described in the *Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, Inc., 2008) copies of the annual monitoring report will be distributed to the other MOU parties (CDFG, SLC, Sierra Club, and the Owens Valley Committee) and made available to the public.

This document represents the reporting requirements for the LORP Annual Monitoring Report for 2008.

1.2. 2008 Monitoring

The first year of monitoring for the LORP was 2008 and the monitoring that was conducted included:

- Base Flow and Seasonal Habitat Flow Water Quality (February 2008)
- Seasonal Habitat Flow Flooded Extent (February 2008)
- Assessment of River Flow Gains and Losses (September 2008)
- Rapid Assessment Survey (August 2008)
- Hydrologic Monitoring (throughout 2008)
- Fencing (throughout 2008)
- Utilization Monitoring (February and June 2008)
- Weed Monitoring and Treatment (growing Season 2008)
- Salt Cedar Treatment (throughout 2008)

2.0 Water Quality Monitoring Data Collected During Base Flow Establishment (2006-2008) and the First Habitat Flow in 2008

Prepared by:
Randy Jackson
Senior County Hydrologist
October 29, 2008

2.1. Introduction

The Lower Owens River Final Environmental Impact Report (EIR) (LADWP-Los Angeles Department of Water and Power, 2004) outlines a two-phase rewatering schedule for establishing 40 cubic foot per second (cfs) base-flows in the Lower Owens River channel. In addition, the EIR describes seasonal habitat flows of up to 200 cfs. The principal water quality concern related to rewatering of the Lower Owens River was re-suspension of bottom sediments in the currently wetted reach from Mazourka Canyon Road to the Pump Station. Anaerobic organic bottom sediments, when mobilized by flows having sufficient velocity, consume dissolved oxygen in the water column and release hydrogen sulfide and ammonia. These water quality conditions can result in fish kills and objectionable odors.

A water quality monitoring plan was prepared to fulfill the Final EIR requirement for water quality monitoring (Jackson, 2006) and was incorporated into the *Lower Owens River Project Monitoring, Adaptive Management and Reporting Plan* (Ecosystem Sciences, Inc., 2008). That water quality monitoring plan was designed to collect the data necessary to determine if fish refuge creation was warranted at three sites in Phase 1 and 2 of establishing the 40 cfs baseflow. General water quality river conditions were to be monitored for up to 6 months after the 40 cfs baseflow had been established. Additional data was collected to describe general river water quality conditions during the habitat flow release for up to two weeks in duration and for up to two weeks after the seasonal habitat flows are released. The seasonal habitat flow water quality monitoring is scheduled for the first three seasonal habitat flows. The first seasonal habitat flows were released in February 2008.

Monitoring extended past the originally planned six-month period of Phase 2. Water quality data collected under the monitoring plan was to be incorporated into the annual report to be presented to the Technical Group (LADWP, LORP Final EIR, 2004, Pages 2-3 and 2-4). This is the water quality data section of that report. Data presented here was collected starting on November 6, 2006 and extended through May 14, 2008.

Water Quality Table 1 presents the water quality and fish condition thresholds originally presented in the monitoring plan (Jackson, 2006). It was found from collection of the water quality monitoring data that the threshold for dissolved oxygen in Water Quality Table 1 was set much too conservatively based on the absence of fish stress at low concentrations of dissolved oxygen. The monitoring plan allowed for the implementation of field variances to the water quality thresholds in Water Quality Table 1. The dissolved oxygen threshold was changed to 1.0 mg/L.

Constituent or Observation	**Threshold**
Dissolved oxygen	1.5 mg/L and downward trend in data (Changed to 1.0 mg/L and a downward trend in data)
Hydrogen sulfide	0.030 mg/L
Ammonia	Acute Criterion (one-hour average concentration) for Non-Salmonids (pH dependent)
Fish conditions	The condition of fish visible at each station will be observed for evidence of stress such as excessive jumping, lying motionless near the surface, rapid gill movement, and poor coloring or body appearance. The threshold will be observance of one or more of these behaviors in several fish.

Water Quality Table 1. Water Quality and Fish Condition Thresholds
Source: LADWP, LORP Final EIR, 2004.

2.2. Mazourka Canyon Road-Base Flows

Water quality data were collected manually at Mazourka Canyon Road (Water Quality Figure 1). Those data are presented graphically in Appendix A. Water Quality Table 2 presents summary descriptive statistics for a selected interval of those data. No water quality thresholds were exceeded. No fish stress was observed. Independence spillgate operated throughout the period of sampling.

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity	Temperature C	Ammonia	Hydrogen Sulfide	Tannins and Lignins
Maximum	11.59	22.70	8.01	0.561	24.30	0.00	0.00	4.20
Minimum	1.11	1.30	7.01	0.336	0.24	0.00	0.00	0.00
Mean	5.75	6.83	7.45	0.390	12.49	0.00	0.00	1.09
S.D.	3.23	4.02	0.23	0.036	7.67	0.00	0.00	1.00

Data Collected November 6, 2006 to November 27, 2007-Electrical Conductivity ms/cm, Ammonia mg/L N, Hydrogen Sulfide-mg/L, Tannins and Liginins -mg/L Tannic Acid

Water Quality Table 2. Mazourka Canyon Road Water Quality

Data Summary Statistics-Manual Data

2.3. Manzanar-Reward Road-Base Flows

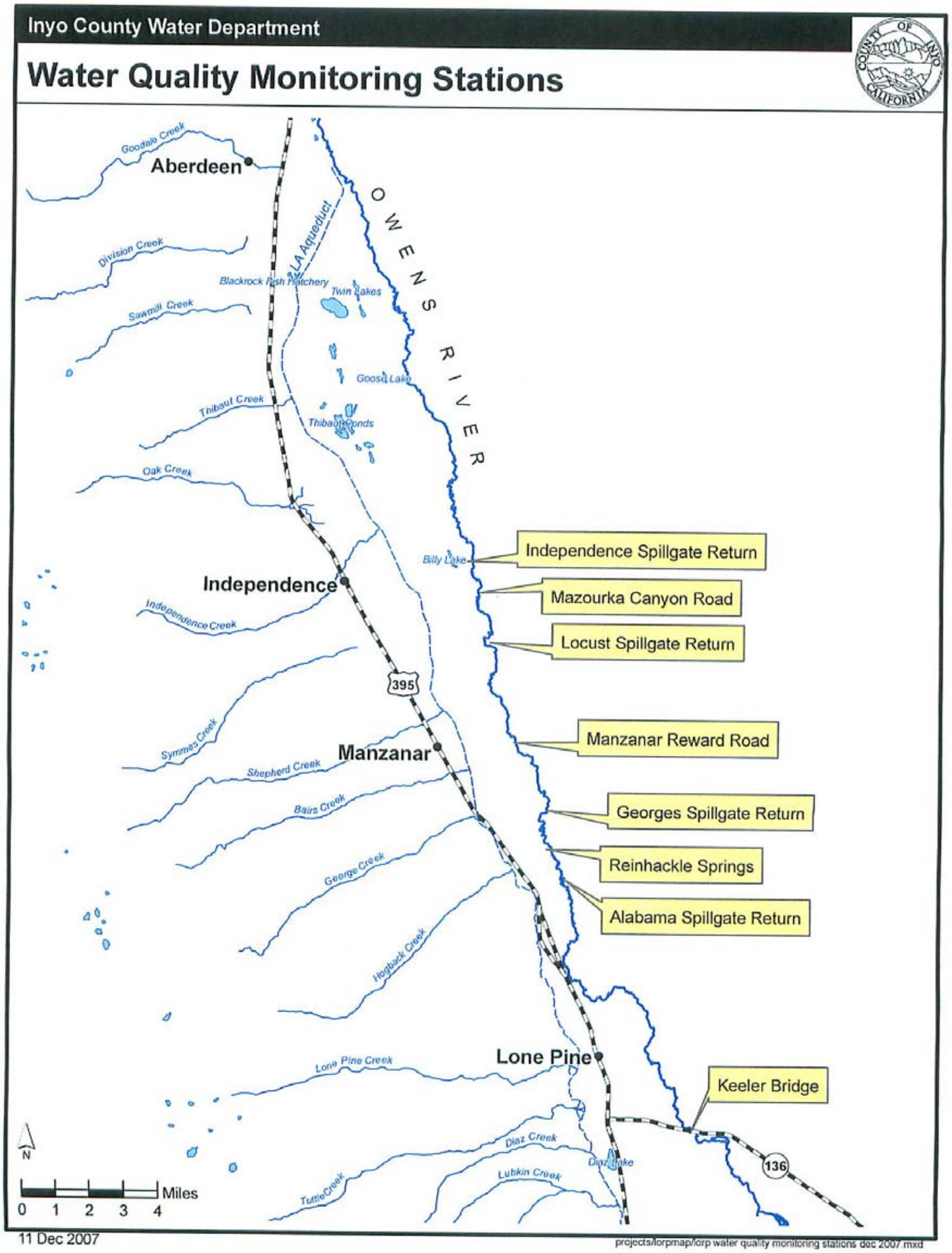
Water quality data were collected manually and by continuous recorder at Manzanar-Reward Road (Water Quality Figure 1). The continuous recorder was set to read every two hours. Manual data are presented graphically in Appendix A and continuous recorder data are presented graphically in Appendix B. Water Quality Tables 3 and 4 present summary descriptive statistics for a selected interval of those data. Water quality thresholds were exceeded for dissolved oxygen on June 15, 2007 for the manual data and for the continuous data for various short periods from April 8, 2007 to August 27, 2007. During much of this time daytime dissolved oxygen levels exceeded 1.0 mg/L. On June 17-18, 2007 dissolved oxygen levels remained below 1.0 mg/L. No fish stress was observed at any time. Locust spillgate was operated from May 16, 2007 through September 4, 2007.

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity	Temperature C	Ammonia	Hydrogen Sulfide	Tannins and Lignins
Maximum	11.18	25.10	8.29	0.503	23.90	0.00	0.00	6.20
Minimum	0.90	0.10	6.80	0.371	0.05	0.00	0.00	0.20
Mean	4.39	5.31	7.24	0.416	12.91	0.00	0.00	1.23
S.D.	2.93	3.90	0.32	0.028	7.79	0.00	0.00	1.07

Data Collected November 6, 2006 to November 27, 2007-Data units same as Table 2.

Water Quality Table 3. Manzanar-Reward Road Water Quality

Data Summary Statistics-Manual Data.



Water Quality Figure 1. Monitoring Stations

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity ms/cm	Temperature C	Ammonia NH4 Total mg/L	D.O. % Saturation
Maximum	9.84	117.20	7.49	0.639	26.17	1.55	85.70
Minimum	0.27	0.00	6.16	0.377	0.00	0.46	3.60
Mean	3.68	0.08	6.96	0.448	13.96	0.99	37.63
S.D.	2.57	2.25	0.32	0.048	7.13	0.23	22.48

Data Collected January 6, 2007 to November 27, 2007.

Water Quality Table 4. Manzanar-Reward Road Water Quality

Data Summary Statistics-Continuous Recorder Data.

2.4. Reinhackle Spring Station-Base Flows

Water quality data were collected manually at the Reinhackle Spring Station along the Lower Owens River (Water Quality Figure 1). Those data are presented graphically in Appendix A. Water Quality Table 5 presents summary descriptive statistics for a selected interval of those data. Dissolved oxygen thresholds were exceeded on the following dates: May 2; 21; 30, 2007 and June 6; 15; 20, 2007 and July 12, 2007. No fish stress was observed at any time. Alabama Spillgate operated from June 26, 2007 through October 18, 2007. Alabama Spillgate releases were not thought to form an effective fish refuge because the water flowed southward from the spillgate for a long distance in a diffuse unchannelized shallow flow to the Lower Owens River channel.

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity	Temperature C	Ammonia	Hydrogen Sulfide	Tannins and Lignins
Maximum	10.55	21.00	8.25	0.612	23.38	0.00	0.00	5.20
Minimum	0.35	0.60	6.78	0.424	0.12	0.00	0.00	0.40
Mean	4.31	5.83	7.33	0.489	12.02	0.00	0.00	1.76
S.D.	3.42	4.01	0.28	0.050	7.17	0.00	0.01	1.14

Data Collected November 6, 2006 to November 27, 2007-Data units same as Table 2.

Water Quality Table 5. Reinhackle Spring Station Water Quality

Data Summary Statistics-Manual Data.

2.5. Keeler Bridge-Base Flows

Water quality data were collected manually and by continuous recorder at Keeler Bridge (Water Quality Figure 1). The continuous recorder was set to read every two hours. Manual data are presented graphically in Appendix A and continuous recorder data are presented graphically in Appendix B. Water Quality Table 6 and 7 present summary descriptive statistics for a selected interval of those data. Water quality thresholds were not applicable to Keeler Bridge. Dissolved oxygen concentrations dropped below 1.0 mg/L for various lengths of time in May, June and July 2007. No fish stress was observed at any time.

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity	Temperature C	Ammonia	Hydrogen Sulfide	Tannins and Lignins
Maximum	8.79	11.90	8.35	0.823	24.42	0.00	0.00	5.40
Minimum	0.95	2.90	7.00	0.570	4.48	0.00	0.00	1.00
Mean	3.81	5.87	7.50	0.658	15.80	0.00	0.00	2.51
S.D.	2.42	1.83	0.33	0.064	5.78	0.00	0.00	1.35

Data Collected November 6, 2006 to November 27, 2007-Data Units Same as Table 2.

Water Quality Table 6. Keeler Bridge Water Quality

Data Summary Statistics-Manual Data.

Statistic	D.O. mg/L	Turbidity NTU	Ph	Electrical Conductivity ms/cm	Temperature C
Maximum	12.87	156.80	7.78	1.274	26.05
Minimum	0.20	0.00	7.05	0.548	0.00
Mean	5.22	0.31	7.51	0.727	12.71
S.D.	3.59	3.28	0.11	0.156	7.72

Data Collected November 14, 2006 to November 27, 2007

Water Quality Table 7. Keeler Bridge Water Quality
Data Summary Statistics-Continuous Recorder Data.

2.6. Summary and Conclusion-Base Flows

Three of the monitoring stations (Manzanar-Reward Road, Reinhackle Spring Station and Keeler Bridge) experienced dissolved oxygen levels below the 1.0 mg/L concentration during warm weather periods after the 40 cfs baseflows had been established. Other water quality parameters measured were not a problem. Fish stress was not observed at any of these stations at any time. It is likely that after habitat flow release during warm weather periods, similar concentrations of dissolved oxygen will be experienced.

2.7. Mazourka Canyon Road-Habitat Flows

Water quality data were collected manually at Mazourka Canyon Road during habitat flow releases. Those data are presented graphically in Appendix A. No water quality thresholds were exceeded during habitat flows at this location. No fish stress was observed during habitat flows at this location. Slightly elevated levels of tannins and lignins, turbidity and electrical conductivity were noticed as habitat flows passed this water quality station. Maximum average daily flow was 174 cubic feet per second (cfs) during habitat flow releases (See hydrograph in Appendix C).

2.8. Manzanar-Reward Road-Habitat Flows

Water quality data were collected manually and by continuous recorder at Manzanar-Reward Road during habitat flow releases. The continuous recorder was set to read every two hours. Manual data are presented graphically in Appendix A and continuous recorder data are presented graphically in Appendix B. Water quality thresholds were not exceeded at any time during habitat flows at this location. No fish stress was observed at any time during habitat flows at this location. Slightly elevated levels of tannins and lignins, turbidity and electrical conductivity were noticed as habitat flows passed this water quality station. Slightly decreased levels of pH were noticed. A moderate drop in dissolved oxygen (approximately 2.5 mg/L) was also noticed as habitat flows passed this water quality station. Maximum average daily flow was 164 cfs during habitat flow releases (See hydrograph in Appendix C).

2.9. Reinhackle Spring Station-Habitat Flows

Water quality data were collected manually at the Reinhackle Spring Station along the Lower Owens River during habitat flow releases. Those data are presented graphically in Appendix A. Water quality thresholds were not exceeded at any time during habitat flows at this location. No fish stress was observed at any time during habitat flows. Slightly elevated levels of tannins and lignins, turbidity and electrical conductivity were noticed as habitat flows passed this water quality station. Slightly decreased levels of pH were noticed. A moderate drop in dissolved oxygen (approximately 4 mg/L) was also noticed as habitat flows passed this water quality station. Maximum average daily flow was 171 cfs during habitat flow releases (See hydrograph in Appendix C).

2.10. Keeler Bridge-Habitat Flows

Water quality data were collected manually and by continuous recorder at Keeler Bridge during habitat flow releases. The continuous recorder was set to read every two hours. Manual data were presented graphically in Appendix A and continuous recorder data are presented graphically in Appendix B. Water quality thresholds were not exceeded at any time during habitat flows. No fish stress was observed at any time during habitat flows. Slightly elevated levels of electrical conductivity, turbidity and tannins and lignins were noticed as habitat flows passed this water quality station. A very slight decrease in pH was noticed. A considerable drop in dissolved oxygen (approximately 6 mg/L) was also noticed as habitat flows passed this water quality station. Maximum average daily flow was 223 cfs during habitat flow releases (See hydrograph in Appendix C).

2.11. Summary and Conclusions-Habitat Flows

Three of the monitoring stations (Manzanar-Reward Road, Reinhackle Spring Station and Keeler Bridge) experienced drops in dissolved oxygen levels as the habitat flows passed these stations. Some of the stations experienced slight elevations of other water quality parameters as well as some slight declines in others. Fish stress was not observed at any of the four water quality stations at any time during habitat flows. Release of the first habitat flows during cold weather, when ambient dissolved oxygen concentrations in the water were high, prevented dissolved oxygen levels from dropping to levels of concern. It is possible, based on what was observed during the first habitat flow release, that when habitat flows are released in warmer weather with higher ambient water temperatures after early April Owens Valley runoff forecasts, that dissolved oxygen levels could decline to levels of concern (at or below 1.0 mg/L) as the peak of habitat flows pass the lower three monitoring stations (Manzanar-Reward Road, Reinhackle Station and Keeler Bridge) in the Lower Owens River.

2.12. References for Section 2.0

Ecosystem Sciences, 2008, *Lower Owens River Project Monitoring, Adaptive Management and Reporting Plan*

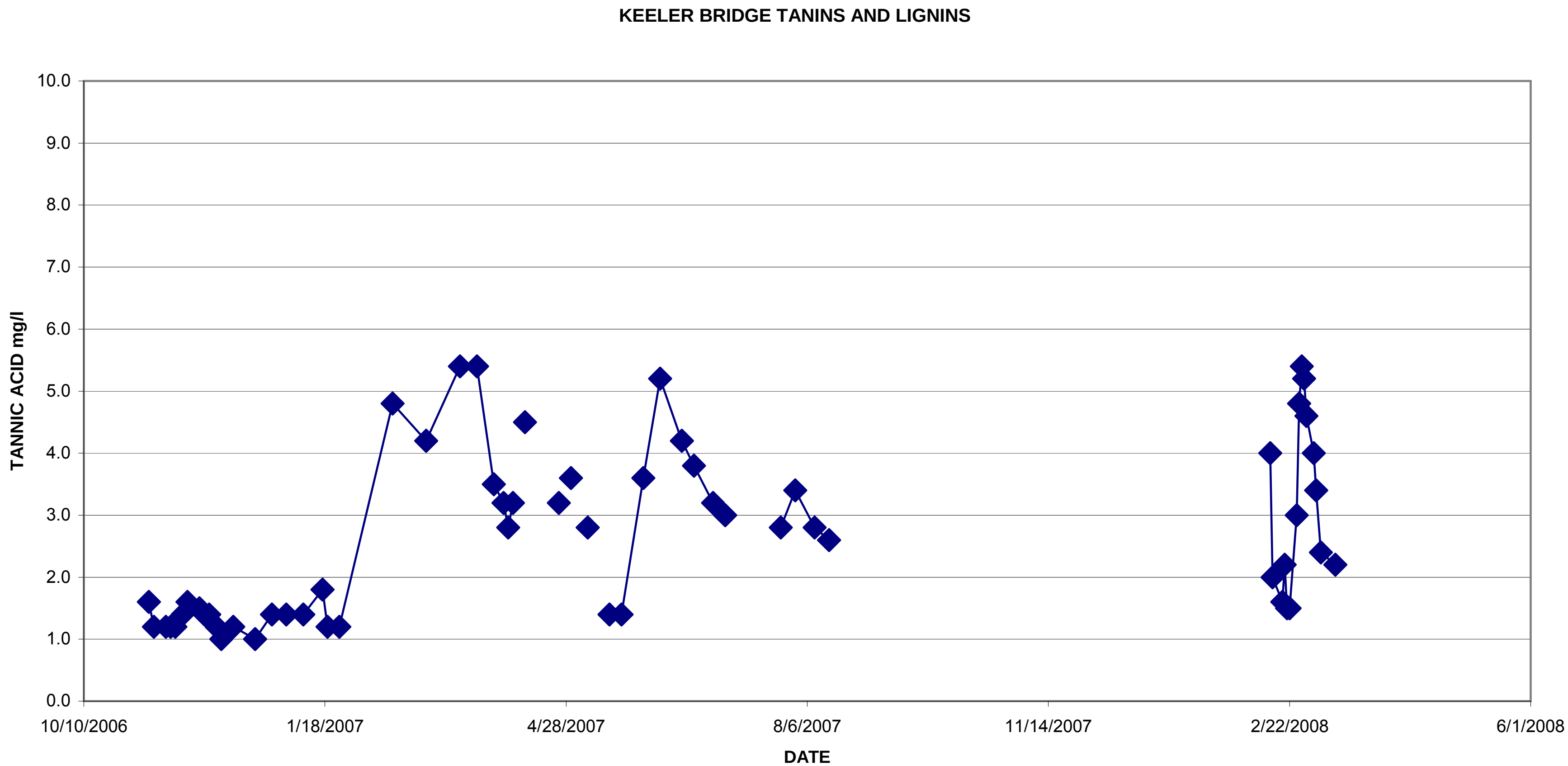
Jackson, R., 2006, *Lower Owens River Project Water Quality Monitoring Plan to Fulfill the Final EIR Requirements*

Los Angeles Department of Water and Power, 2004, *Final Environmental Impact Report for the Lower Owens River Project*, Inyo County, California.

2.13. Appendix A: Manual Water Quality Data, Graphs for Section 2.0

Note: Gaps in the data on the graphs have several causes:

1. When no data was taken
2. When the data was eliminated due to quality assurance-quality control issues



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2.0
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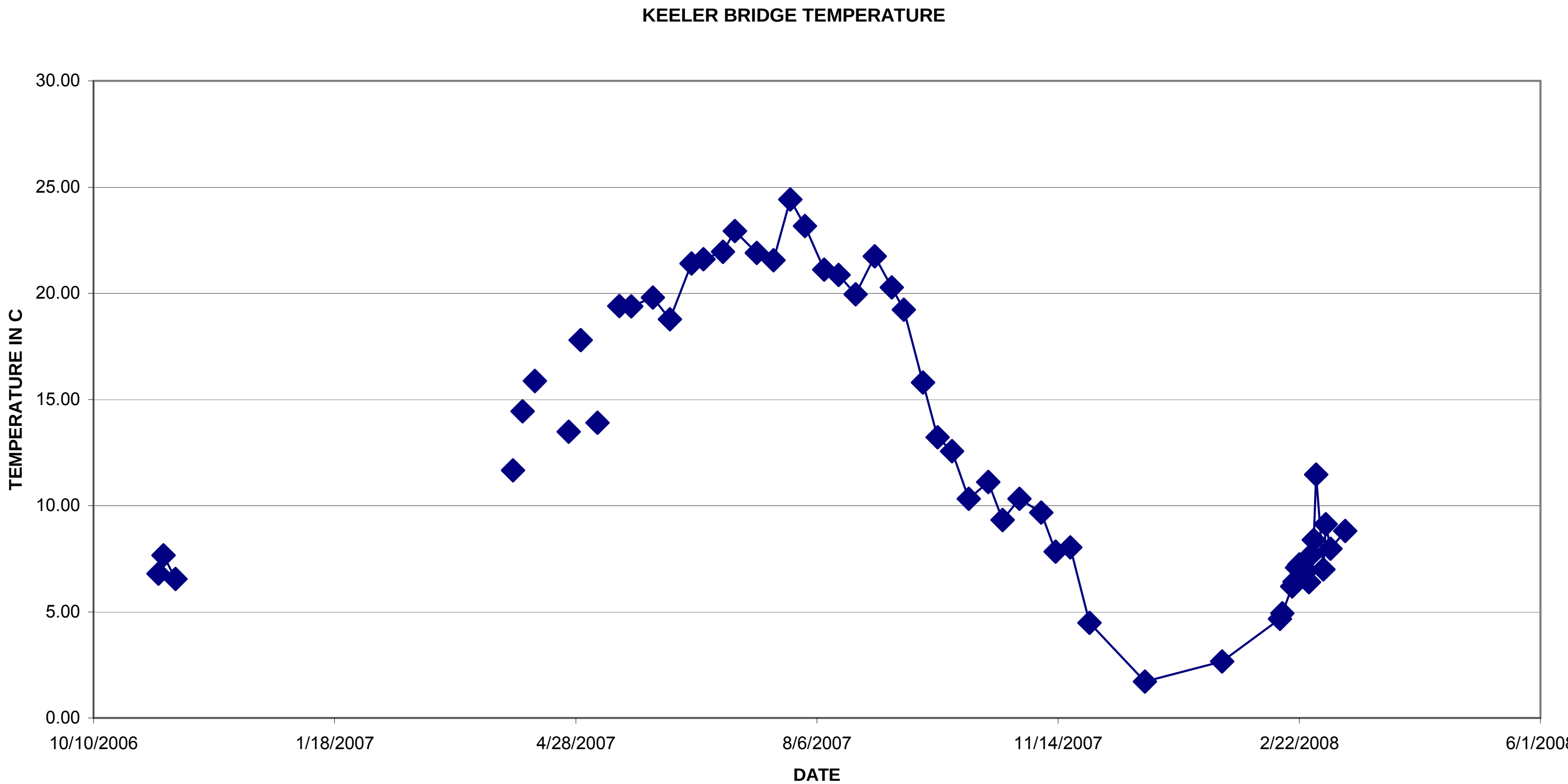
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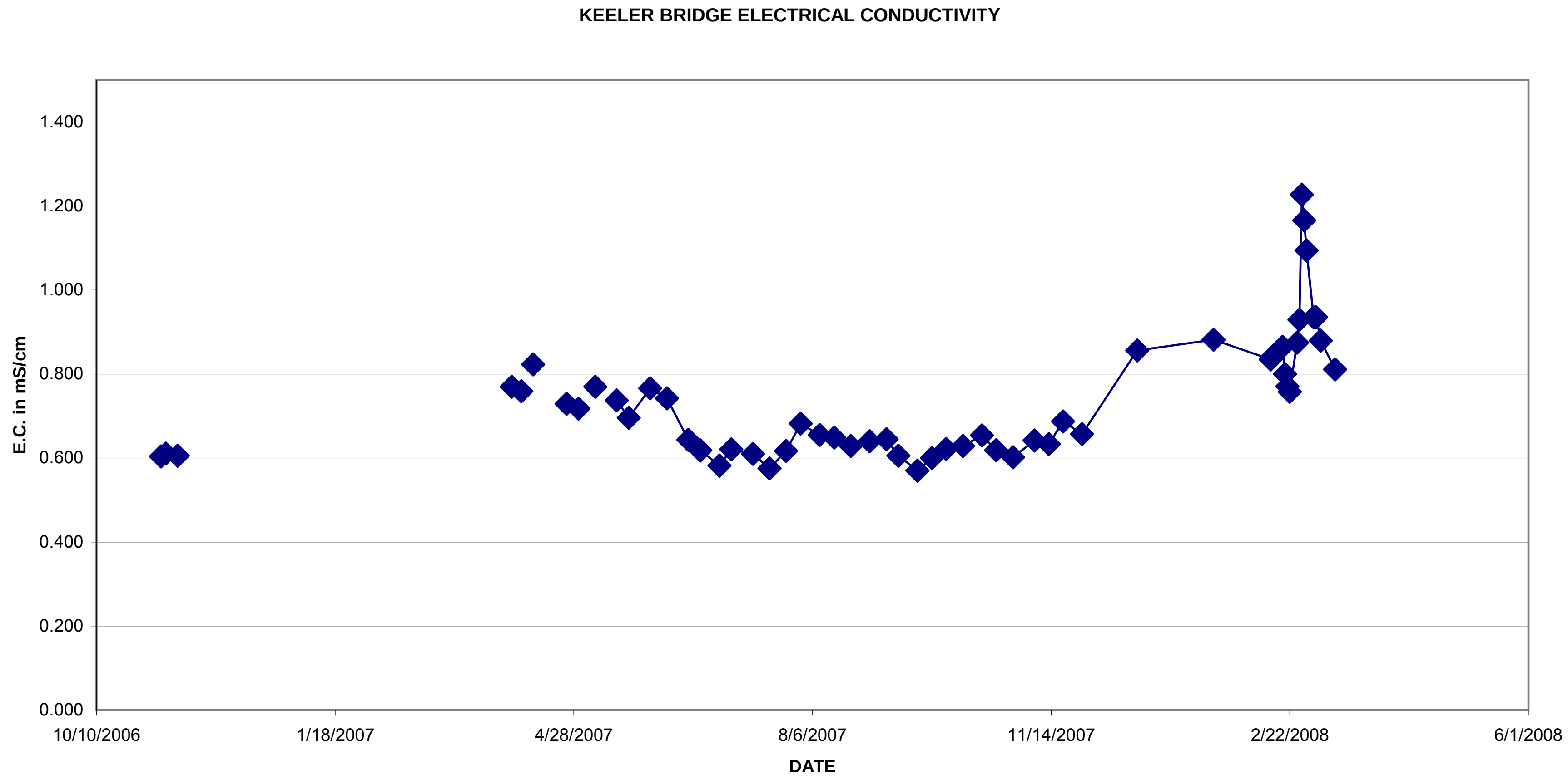
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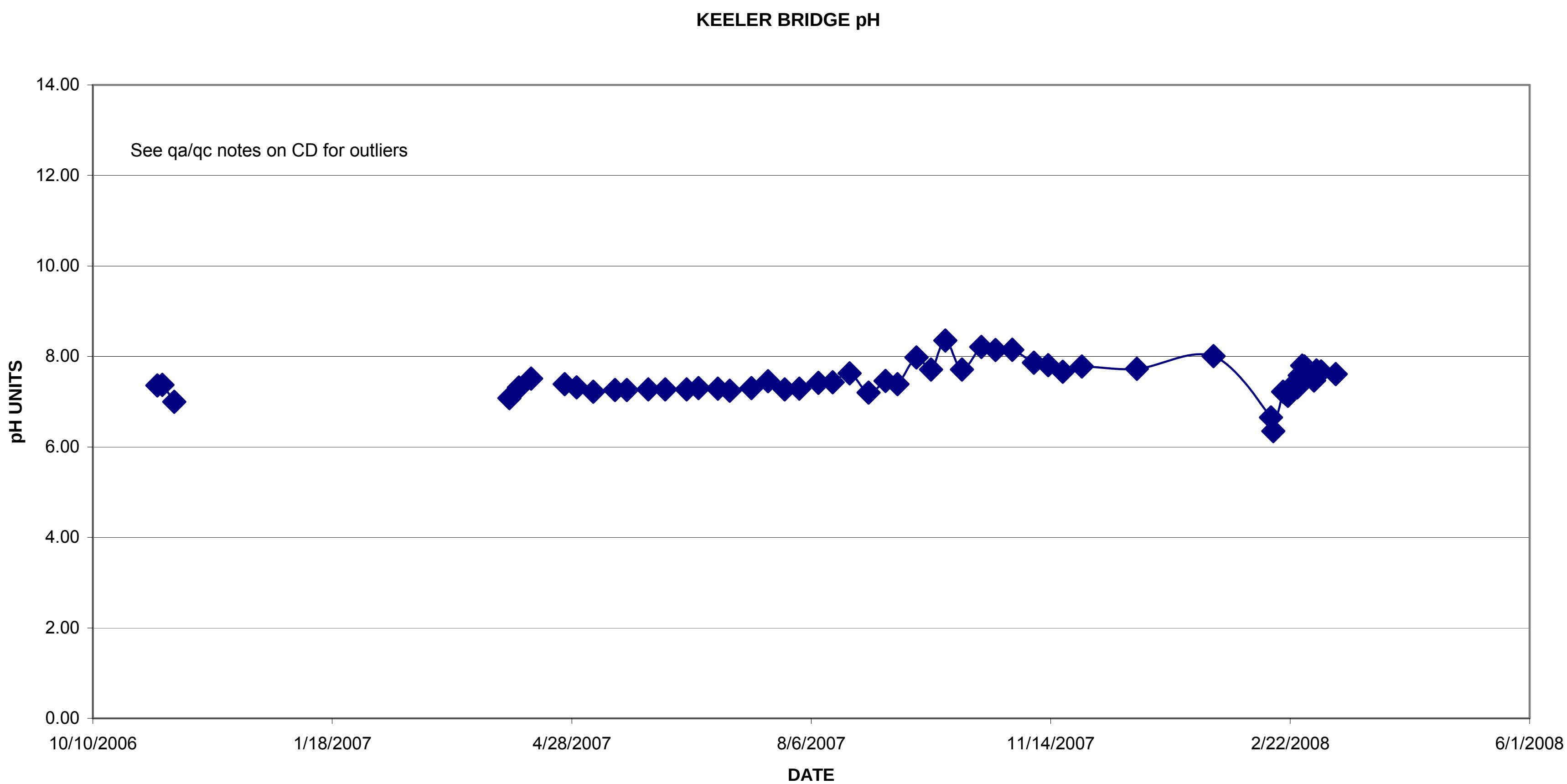
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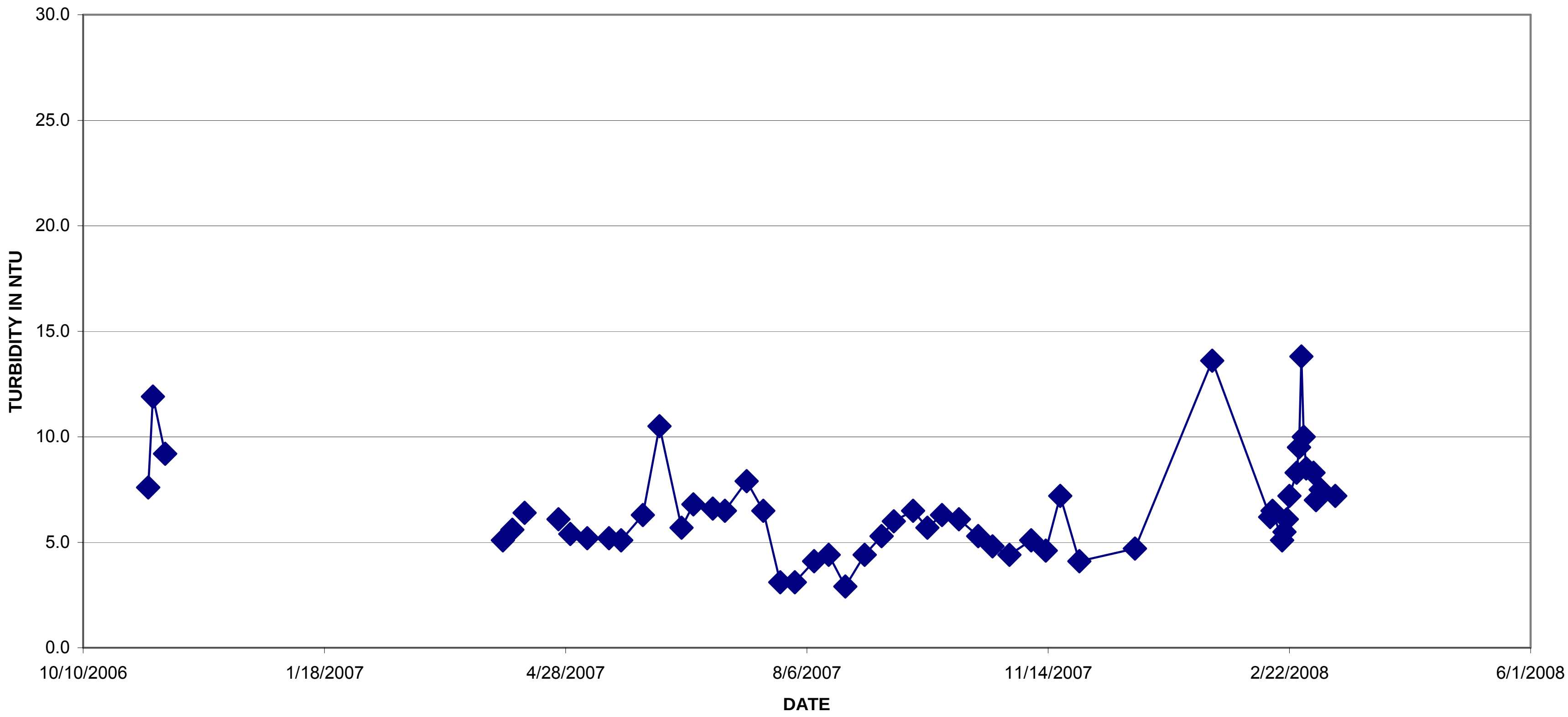

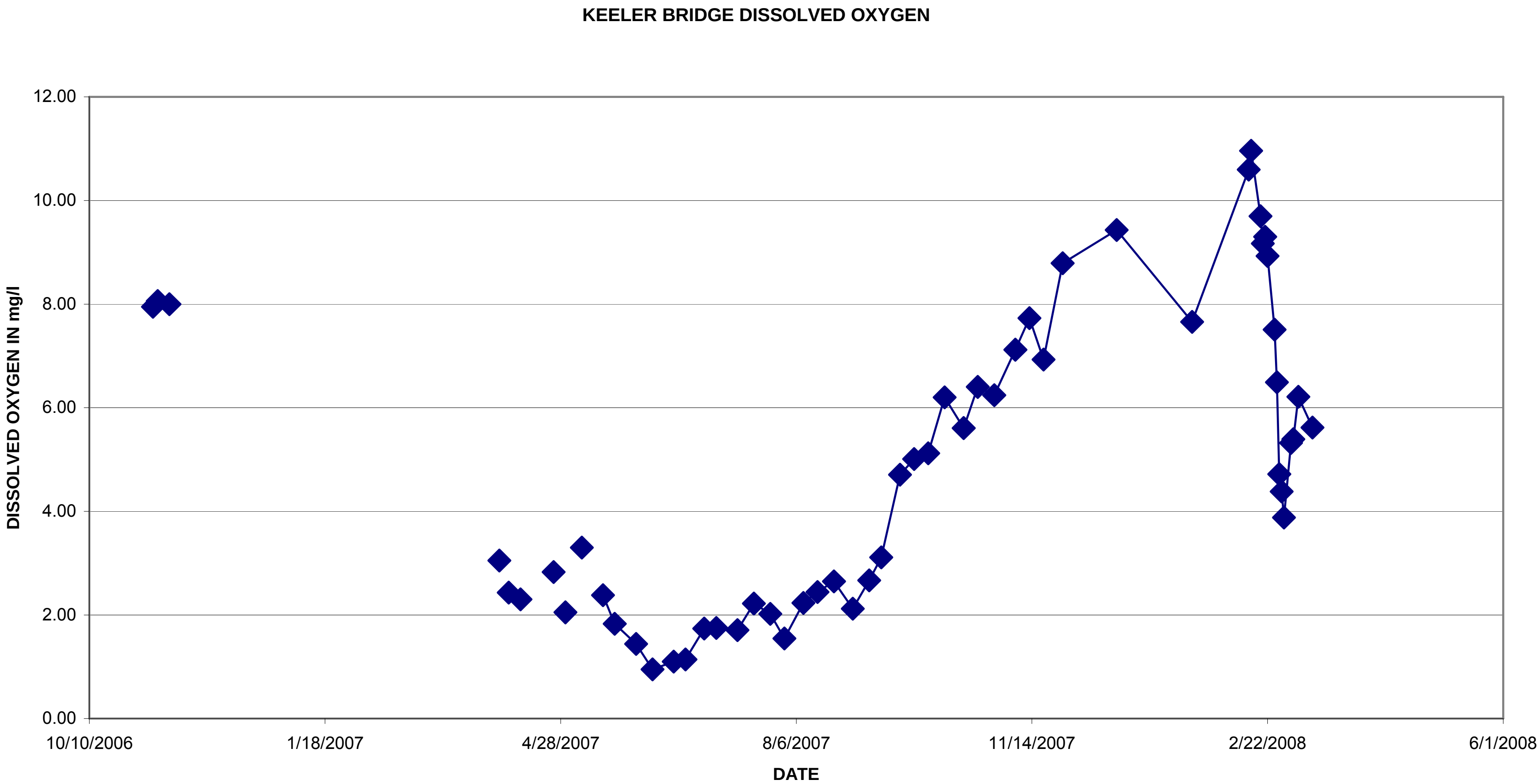
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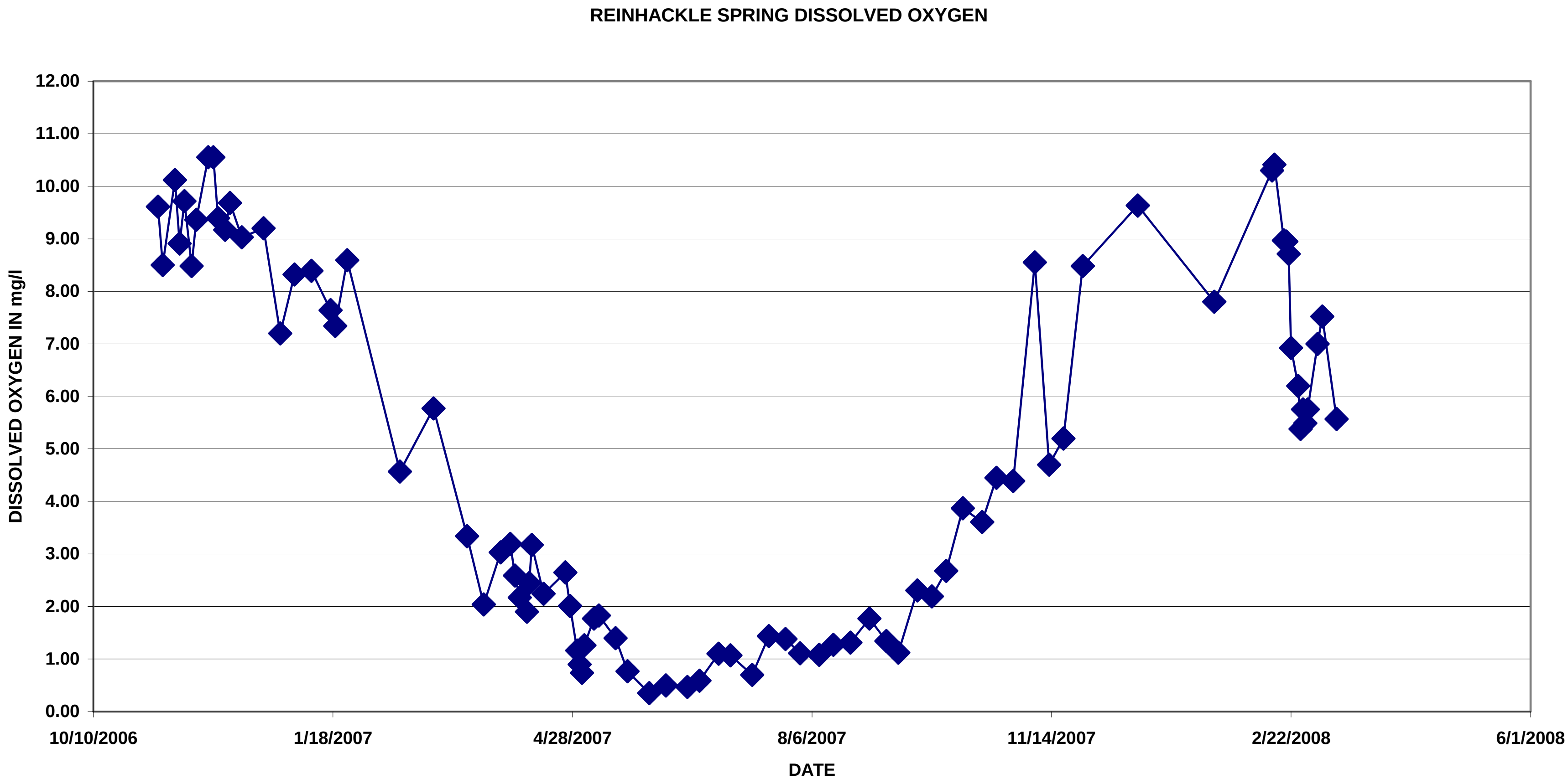
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3.00
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DISSOLVED OXYGEN IN mg/l
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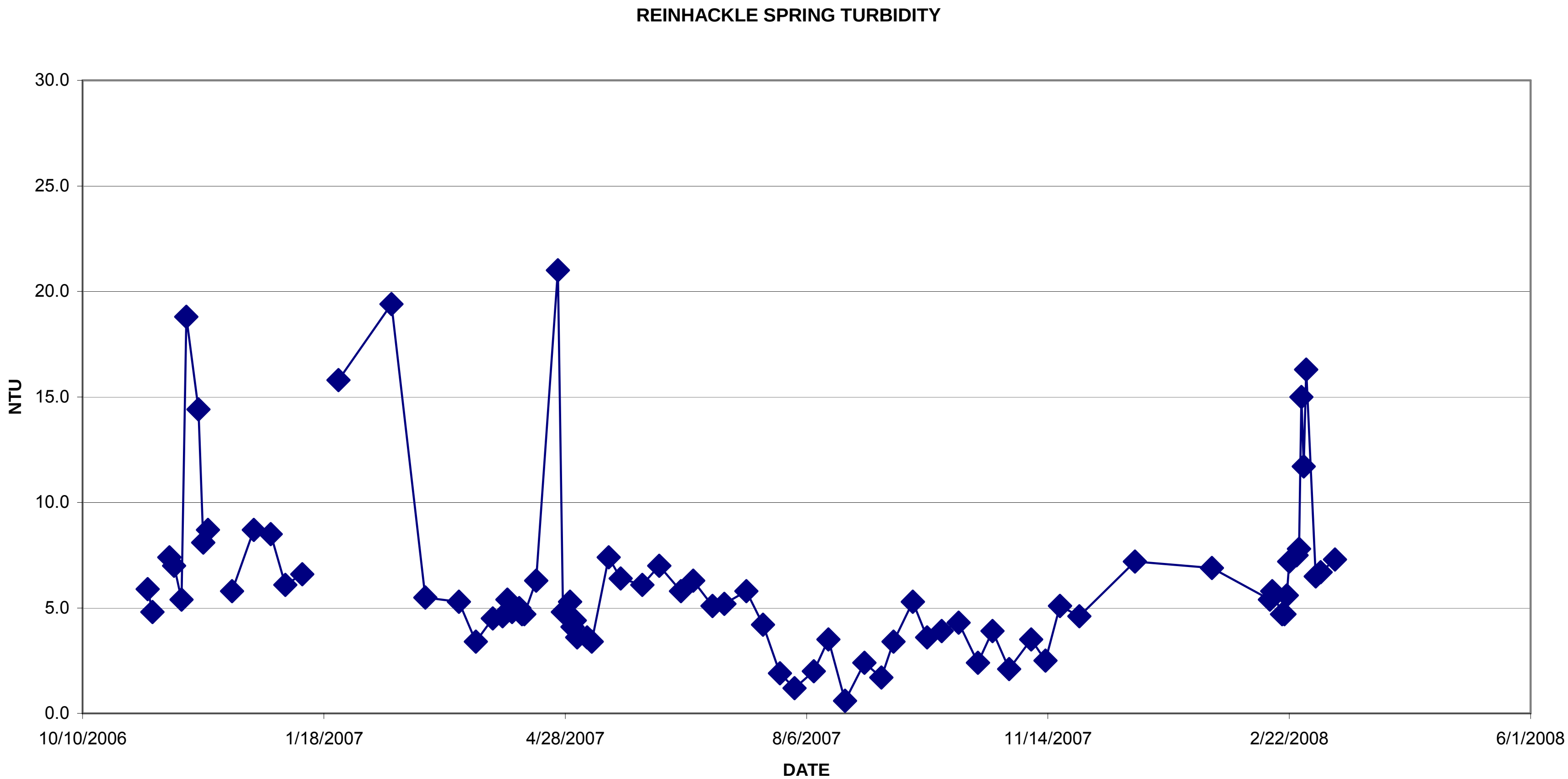
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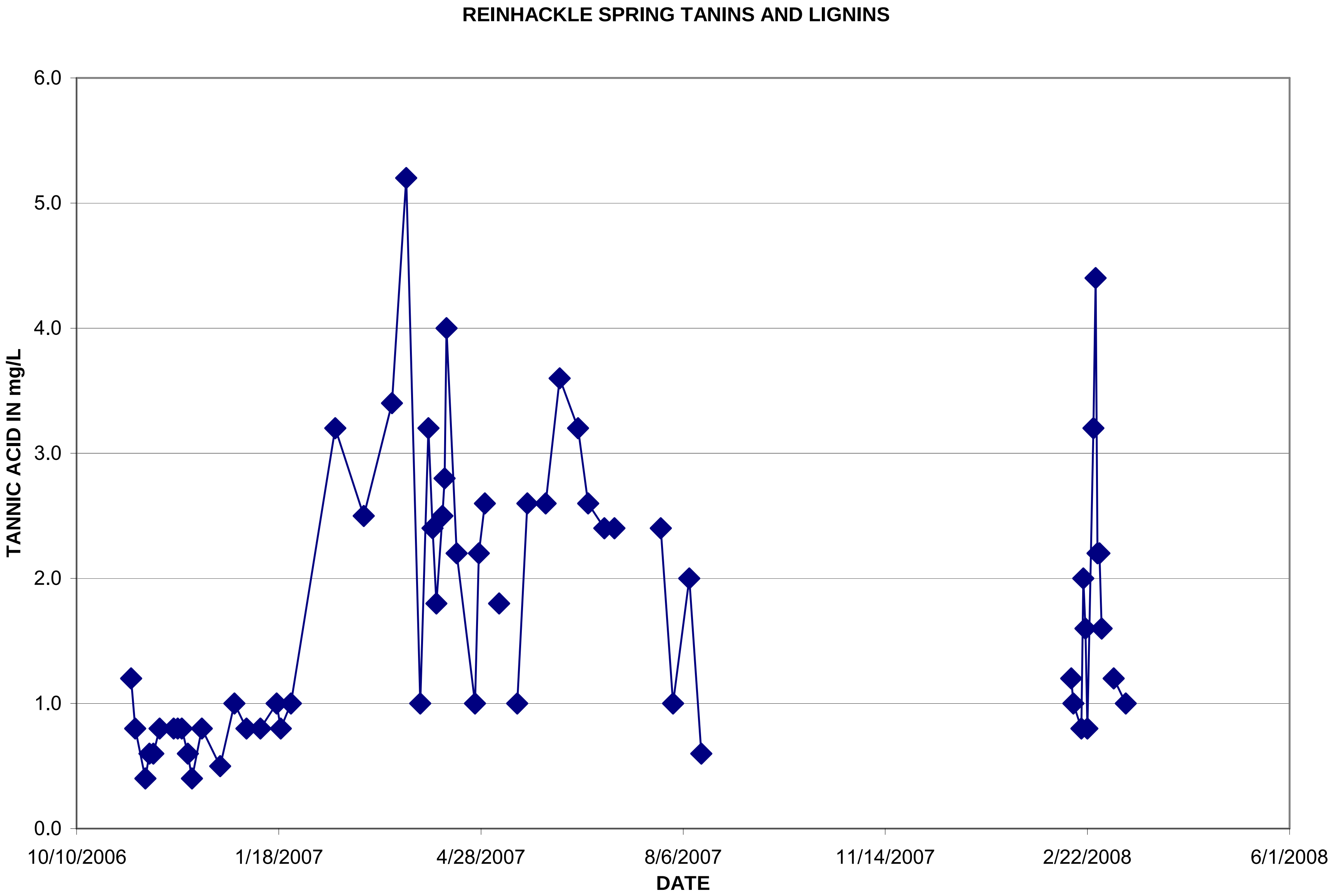
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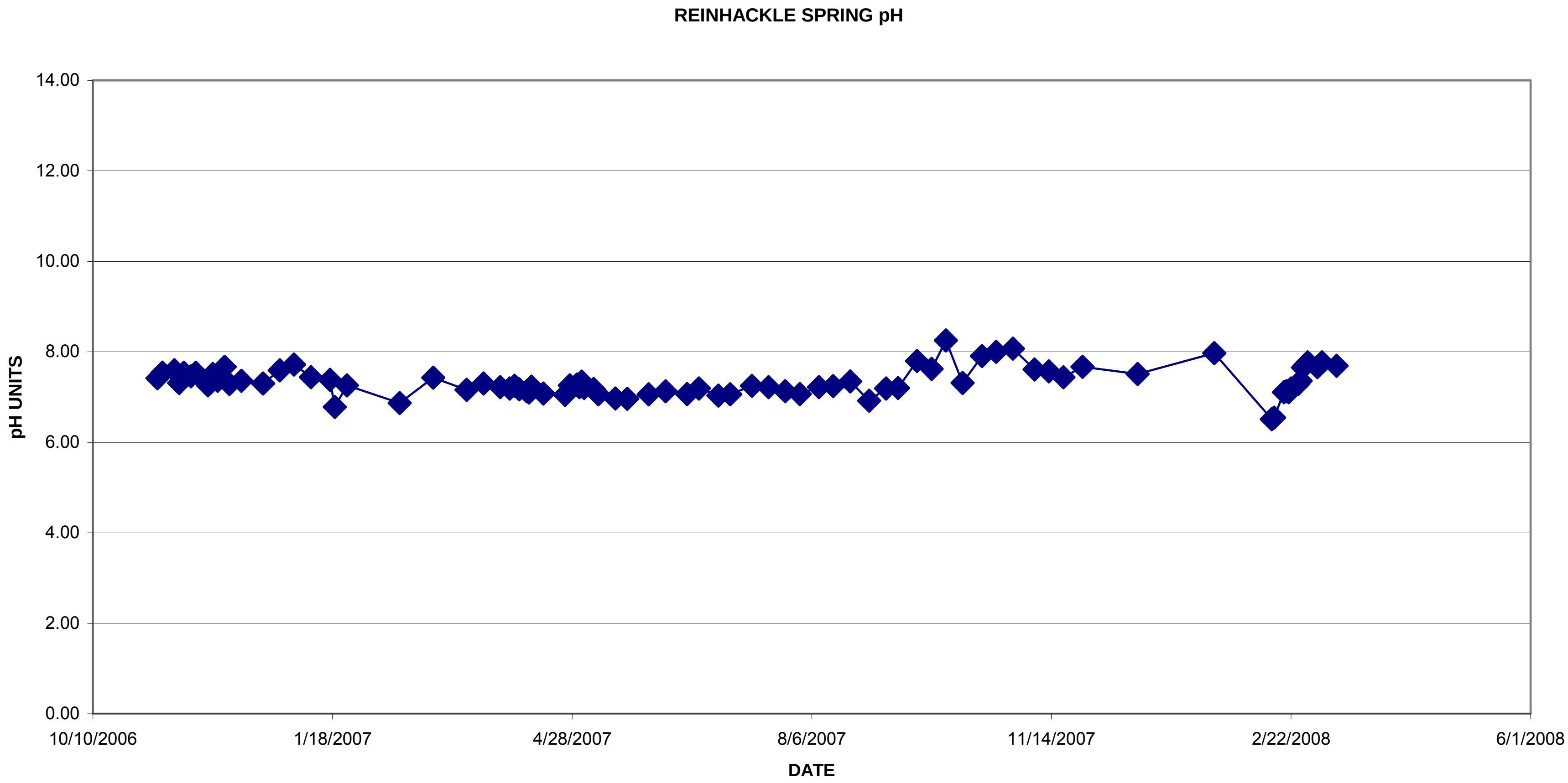
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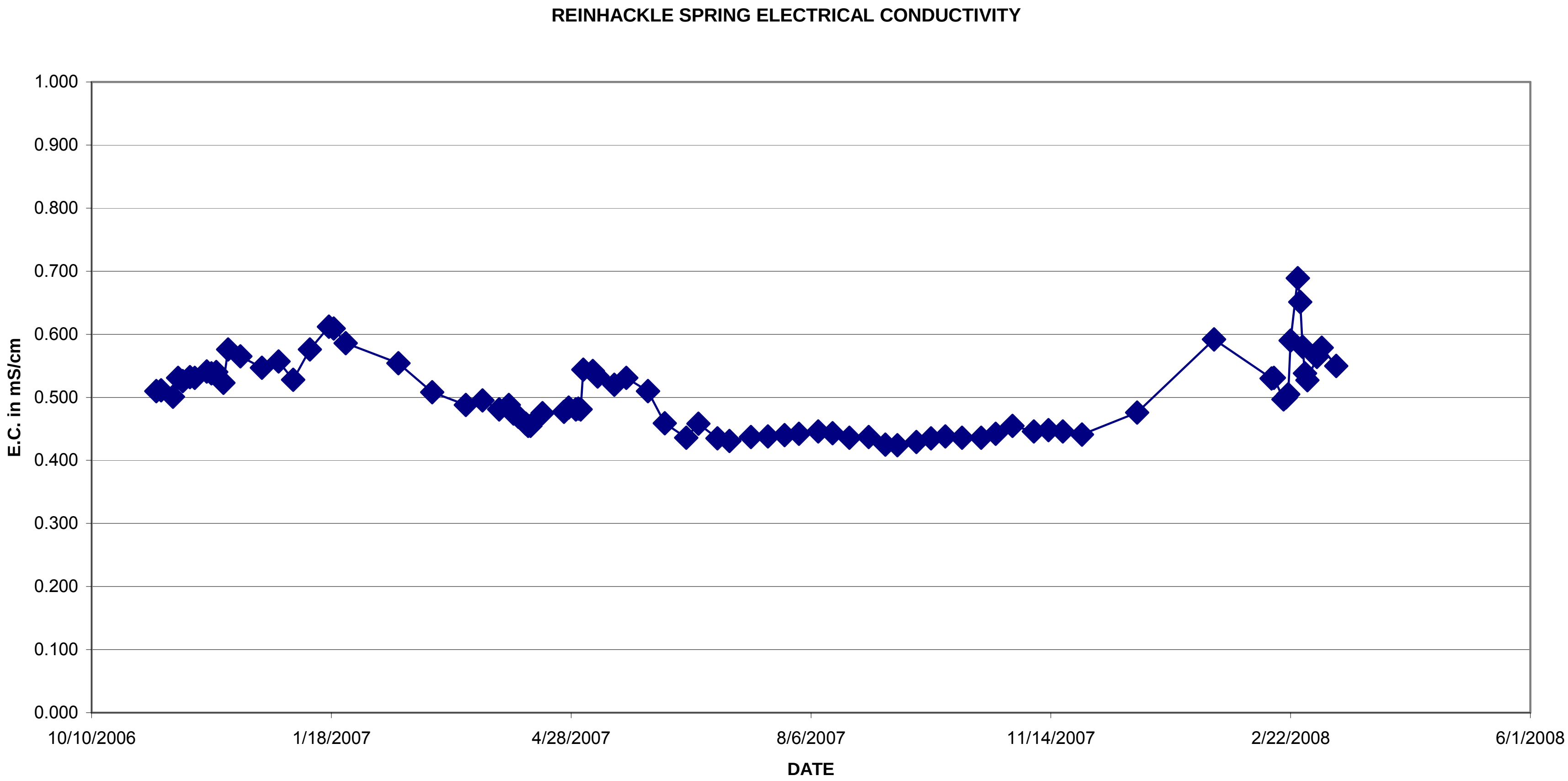
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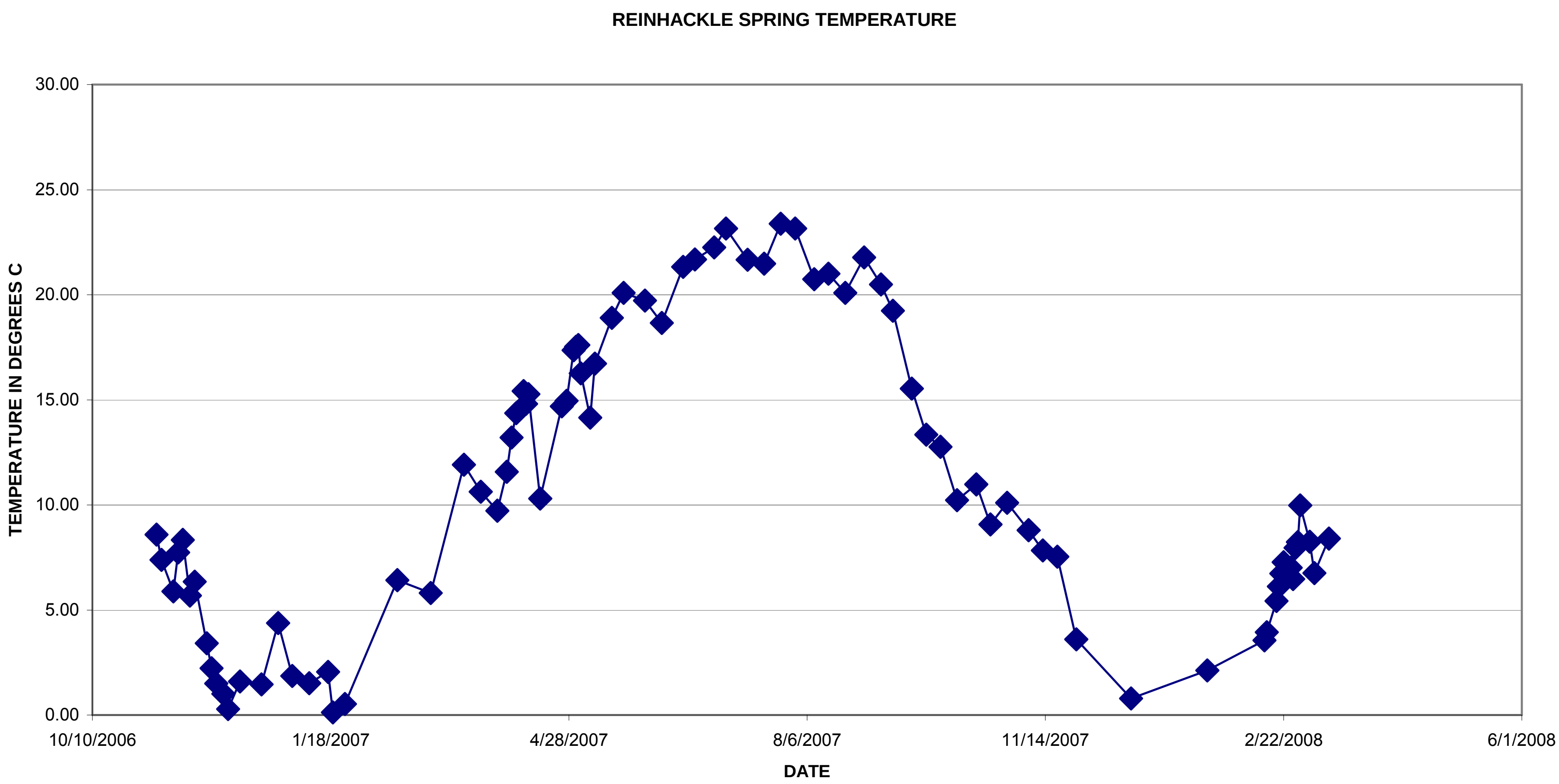
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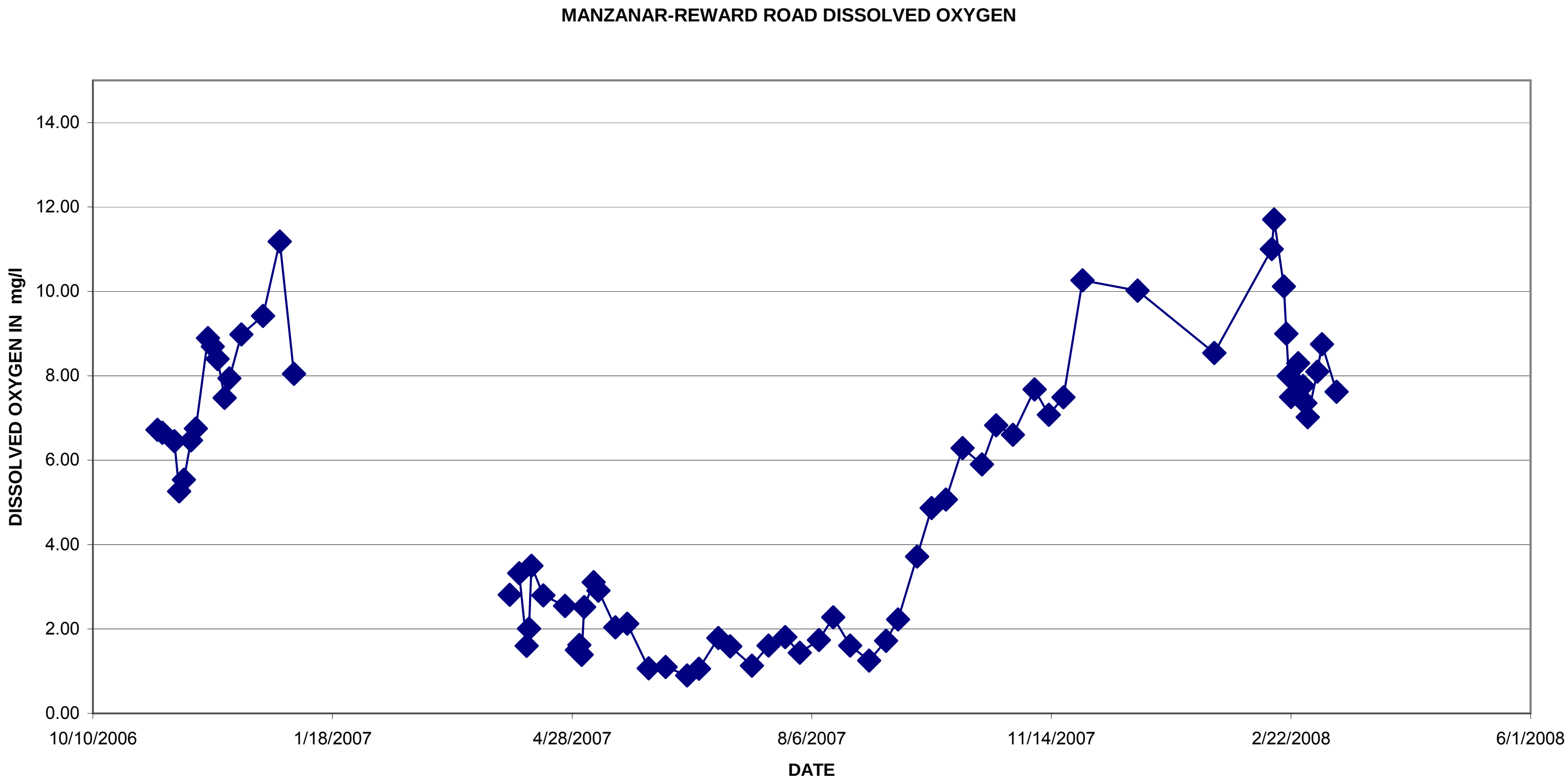
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DISSOLVED OXYGEN IN mg/l
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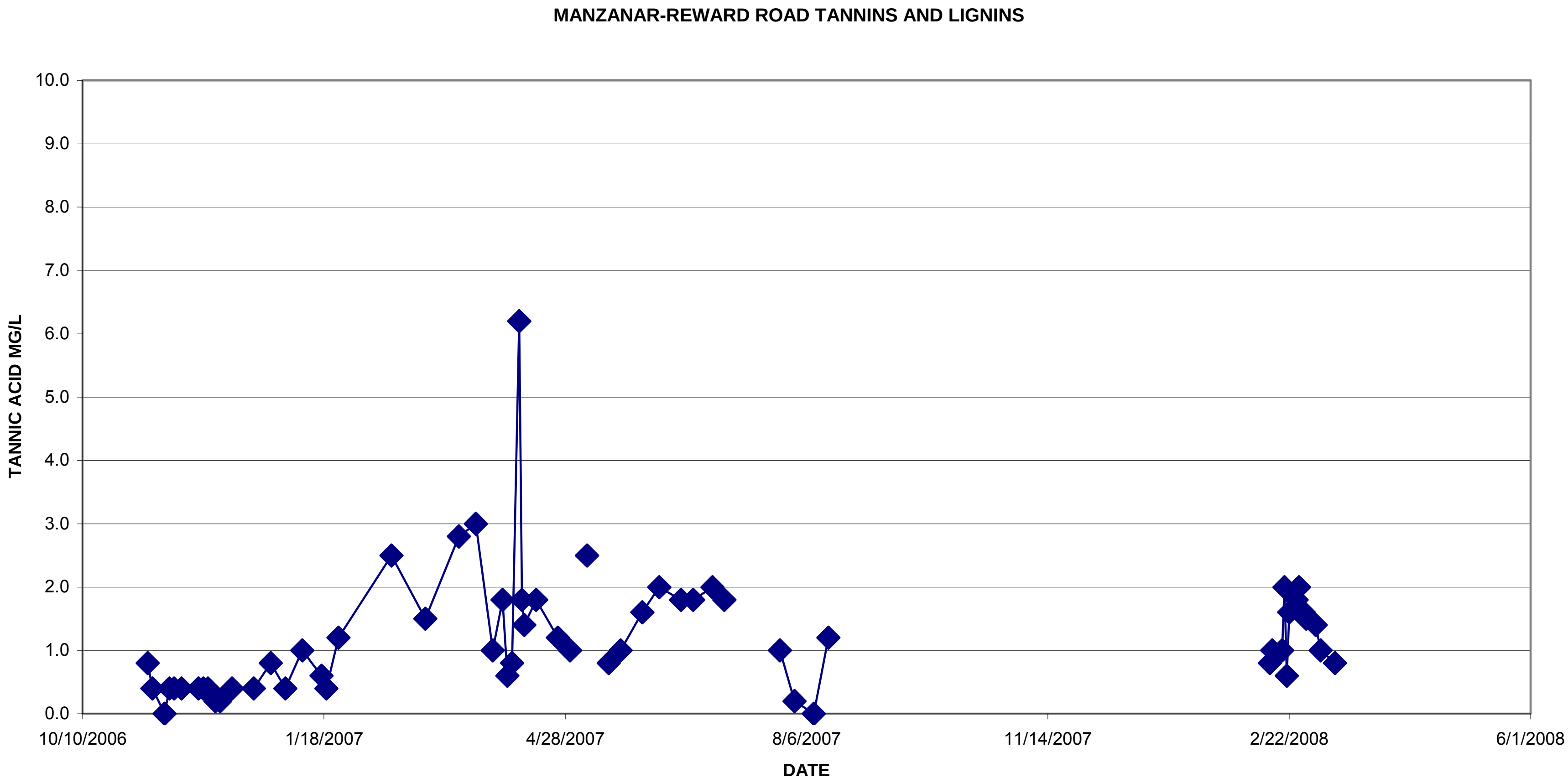
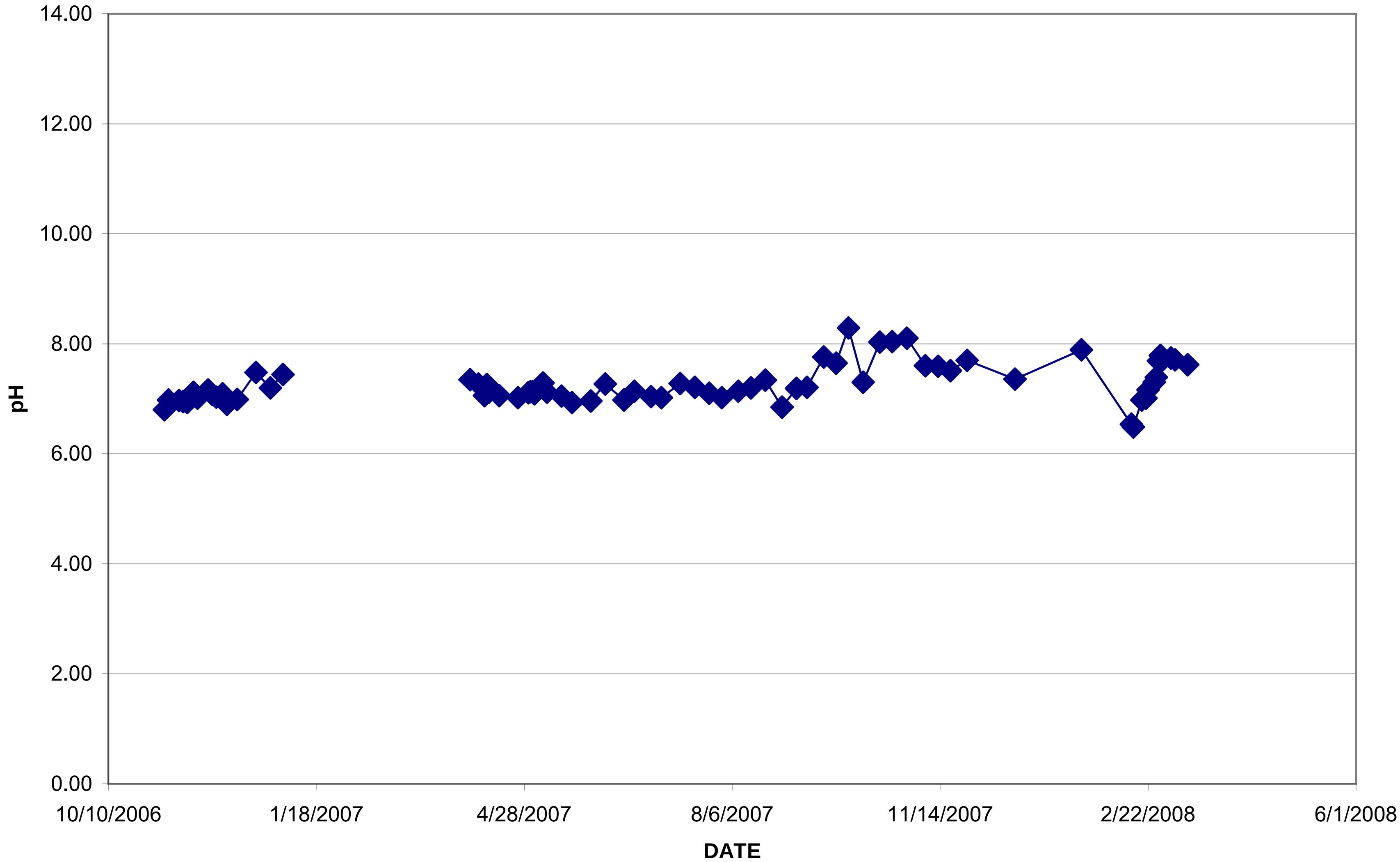
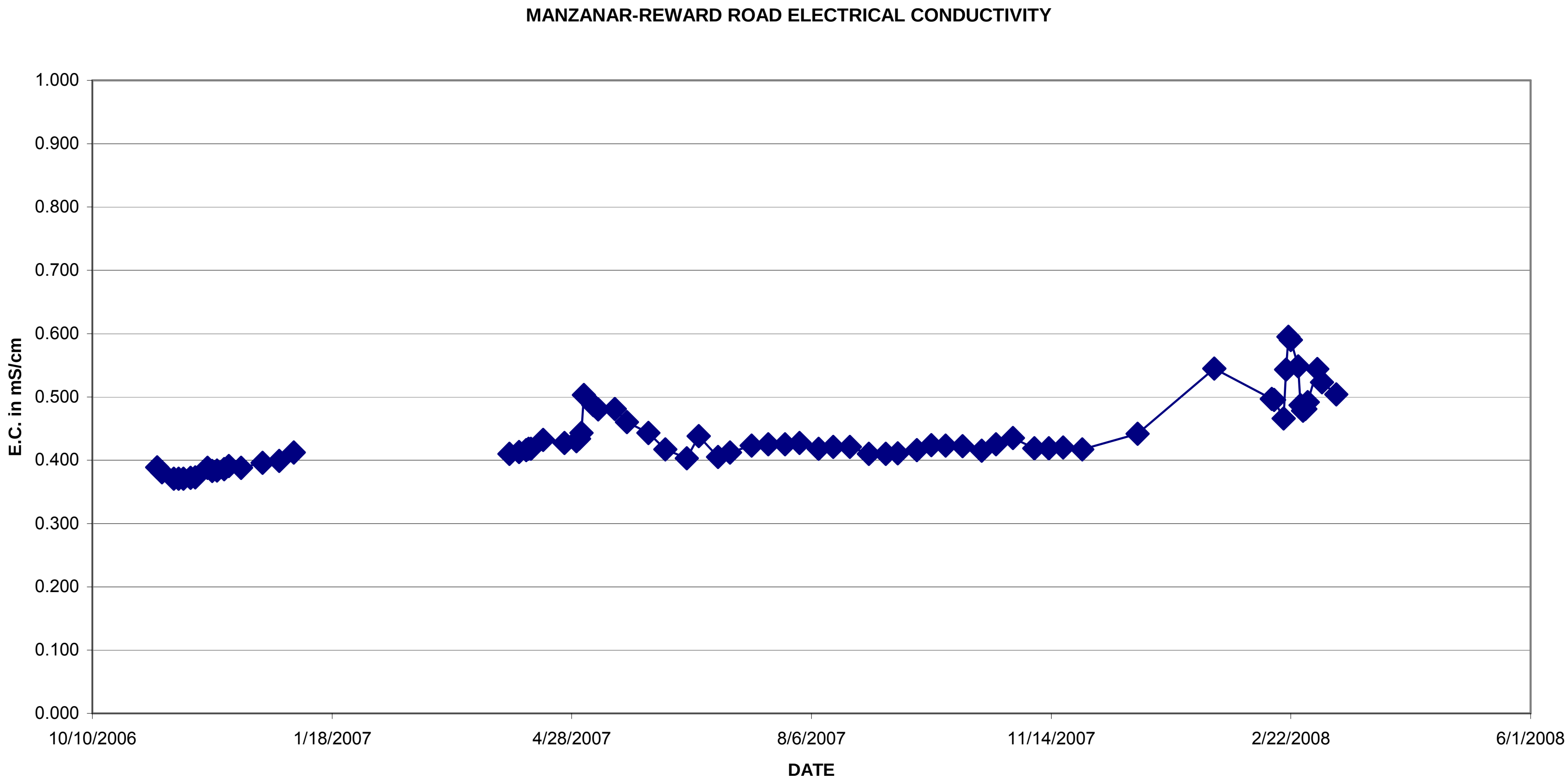
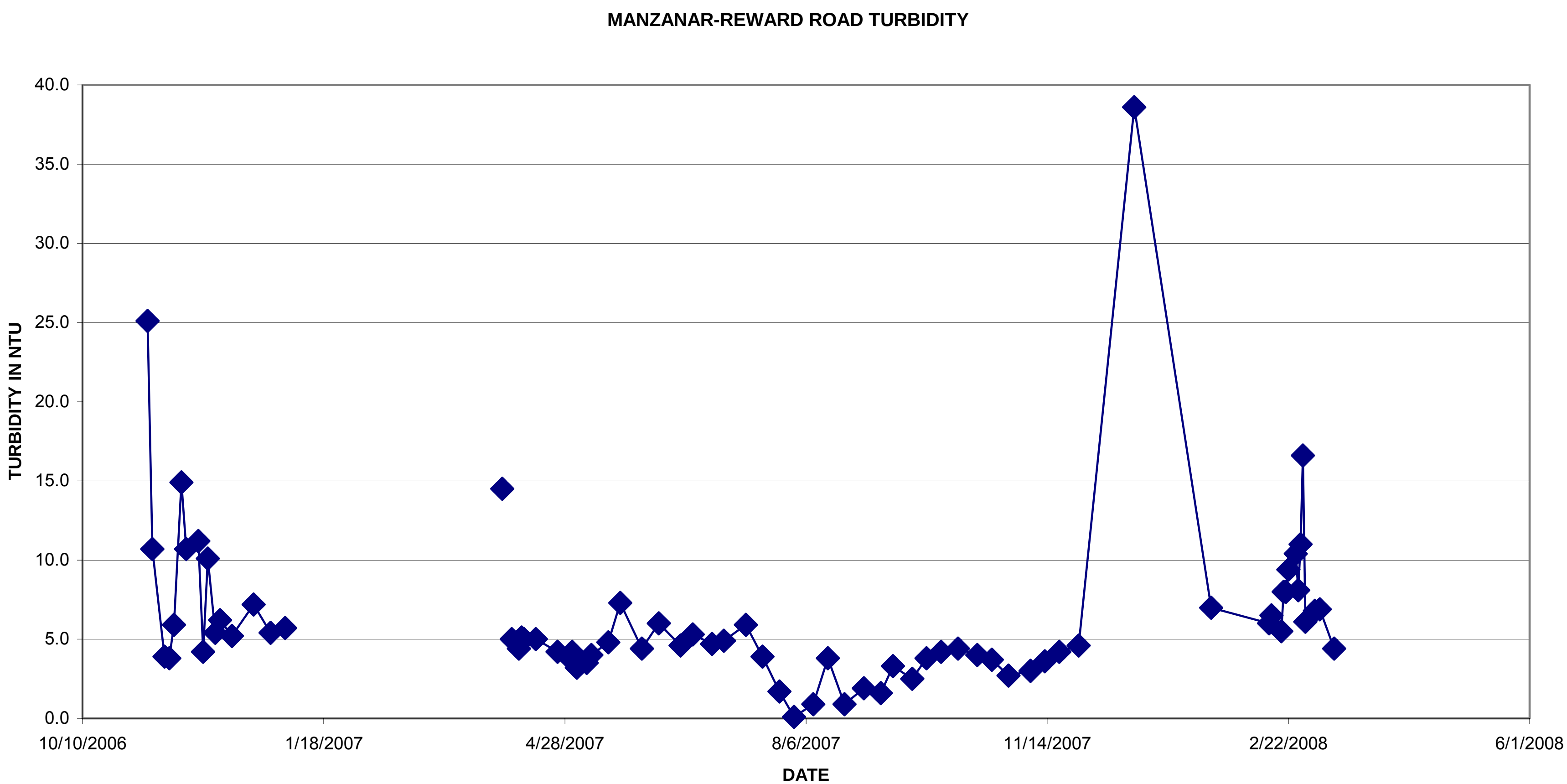
6/1/2008
DATE


MANZANAR-REWARD ROAD TANNINS AND LIGNINS
TANNIC ACID MG/L
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE

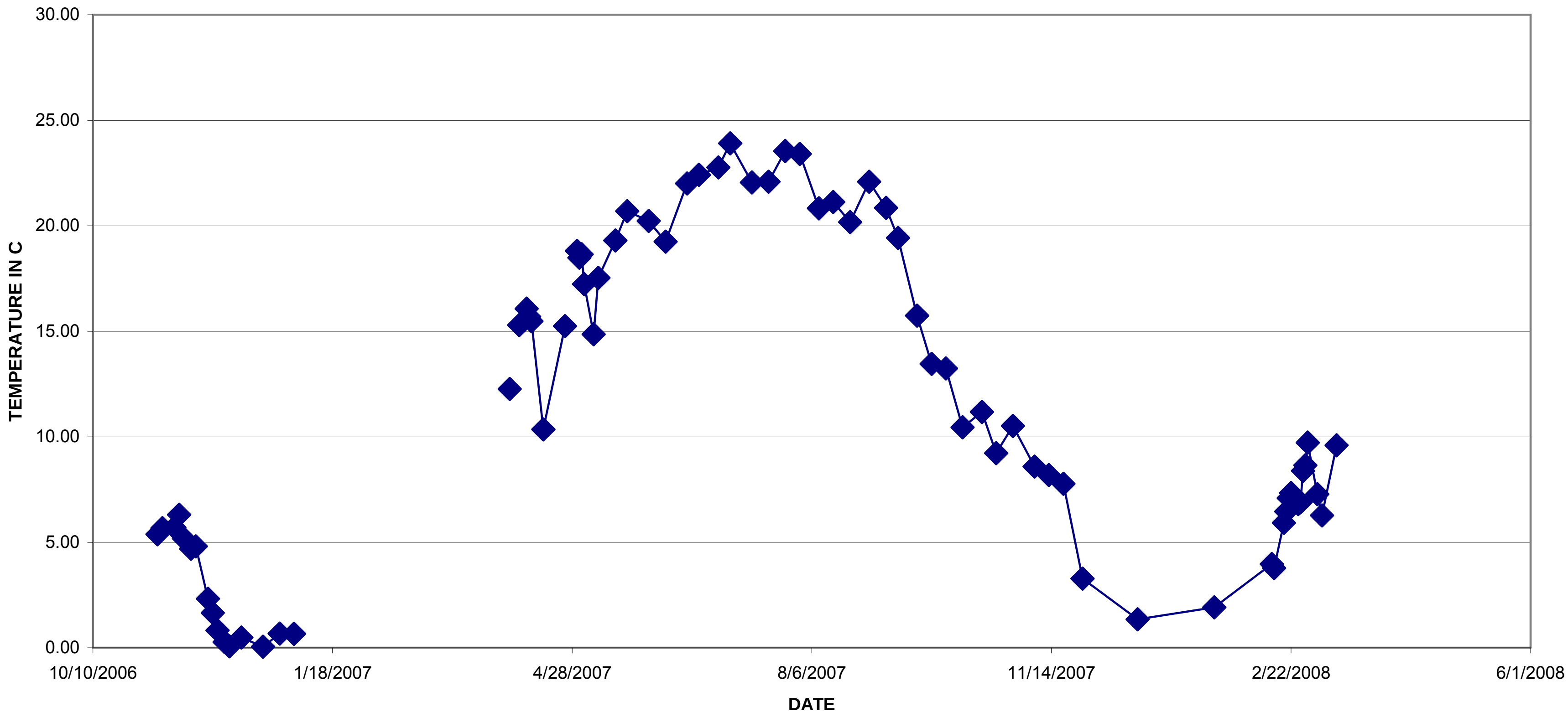
MANZANAR-REWARD ROAD pH

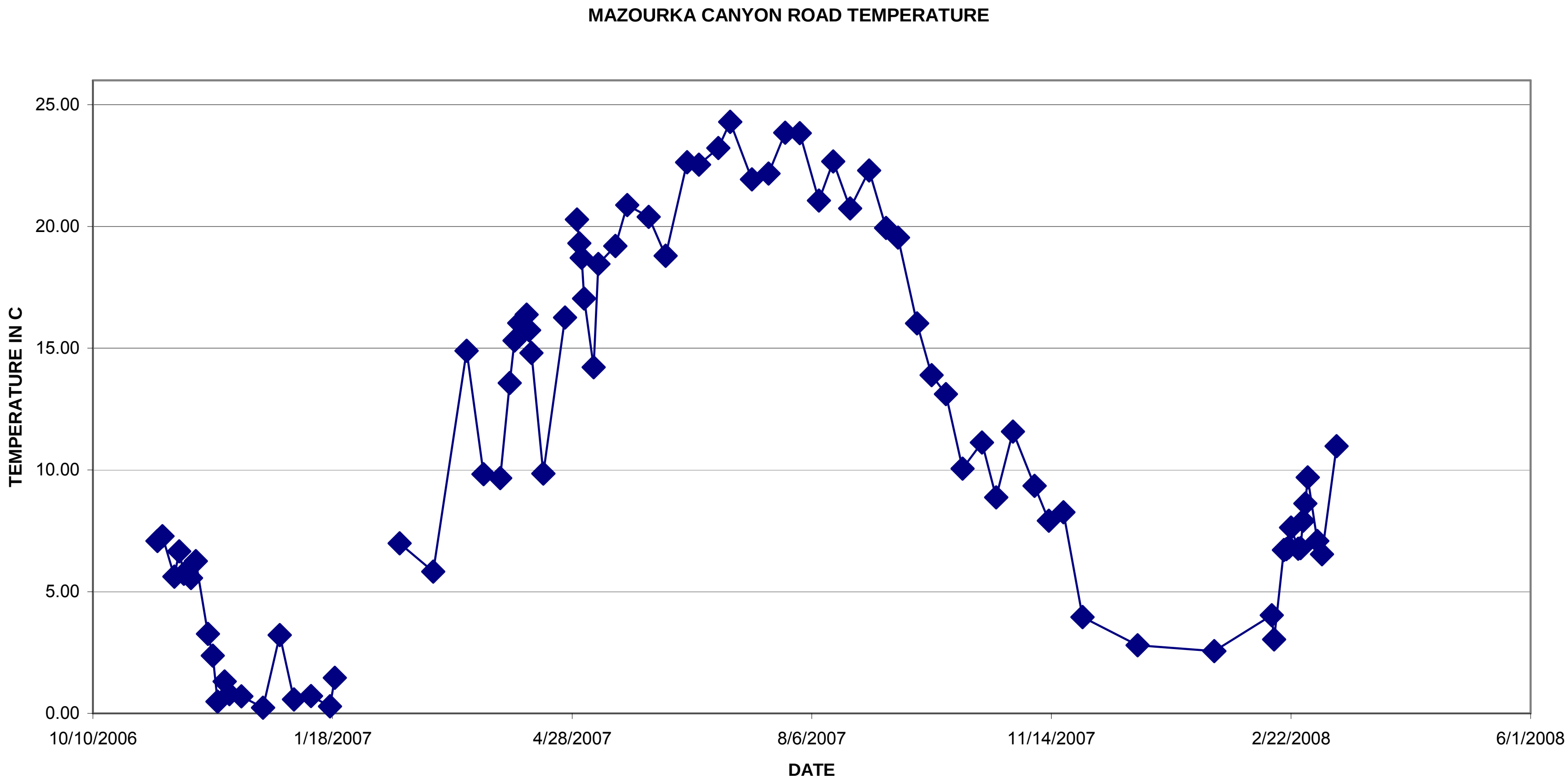


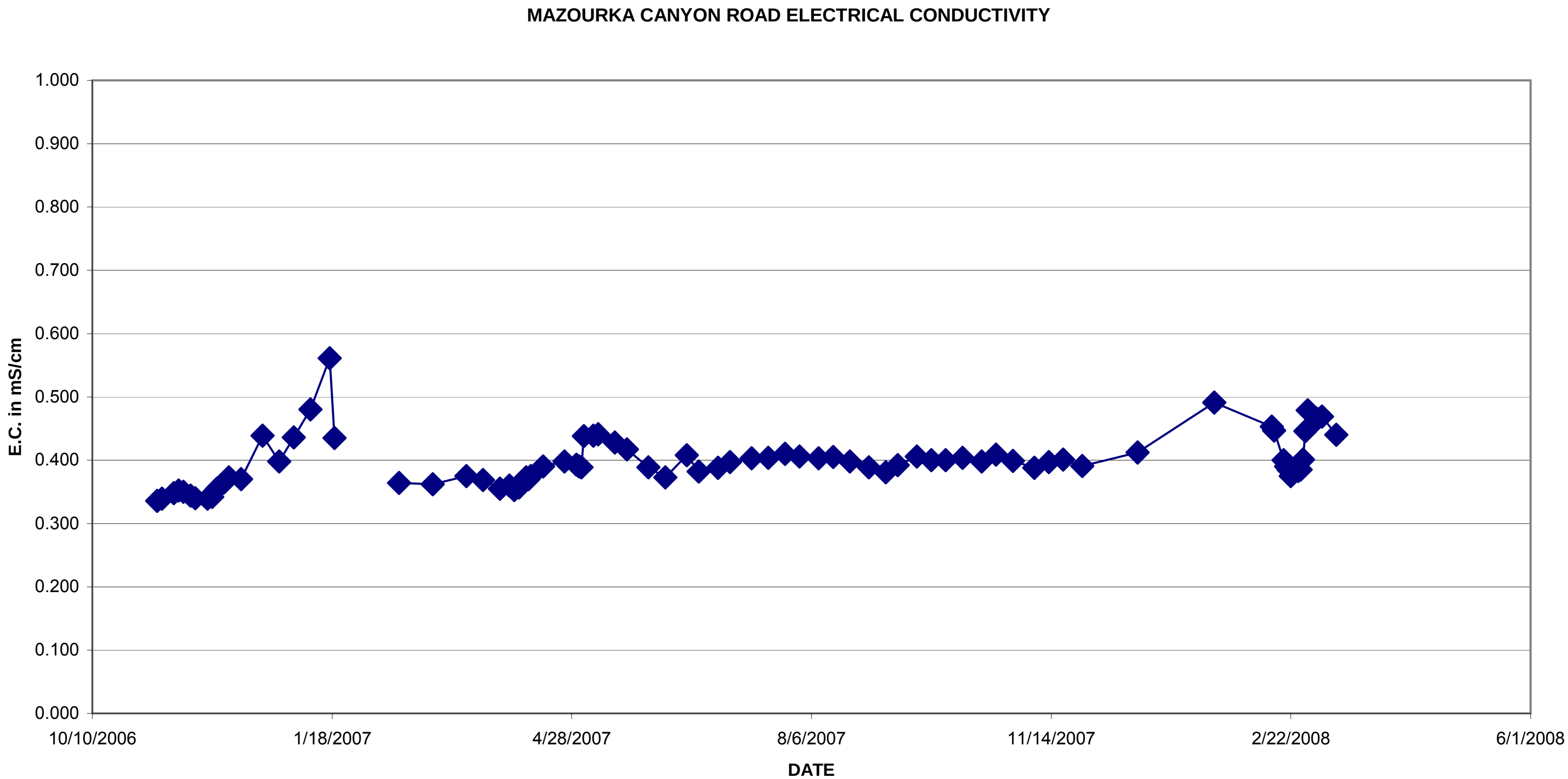

MANZANAR-REWARD ROAD ELECTRICAL CONDUCTIVITY
E.C. in mS/cm
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE


MANZANAR-REWARD ROAD TURBIDITY
TURBIDITY IN NTU
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE

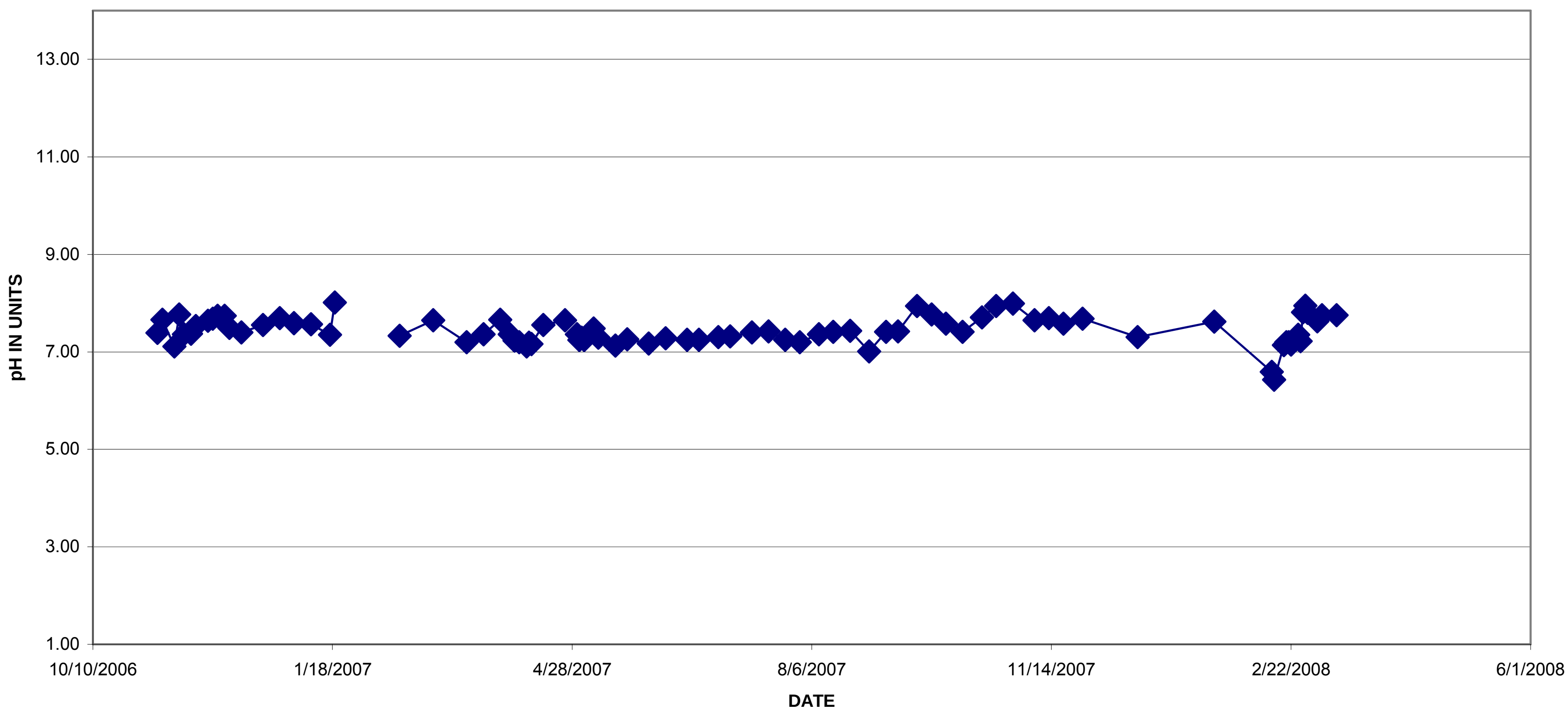
MANZANAR-REWARD ROAD TEMPERATURE

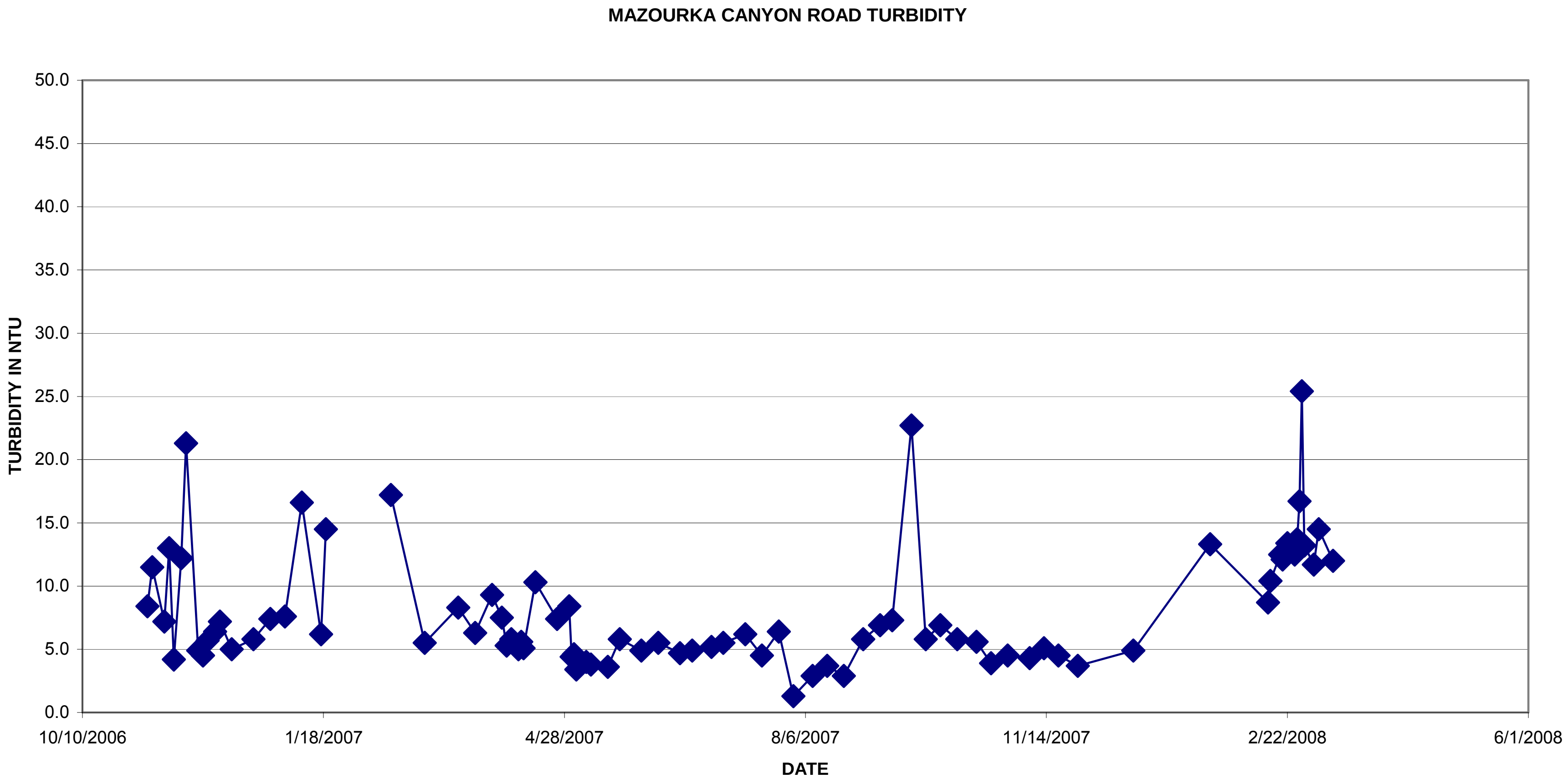



MAZOURKA CANYON ROAD TEMPERATURE
TEMPERATURE IN C
25.00
20.00
15.00
10.00
5.00
0.00
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE

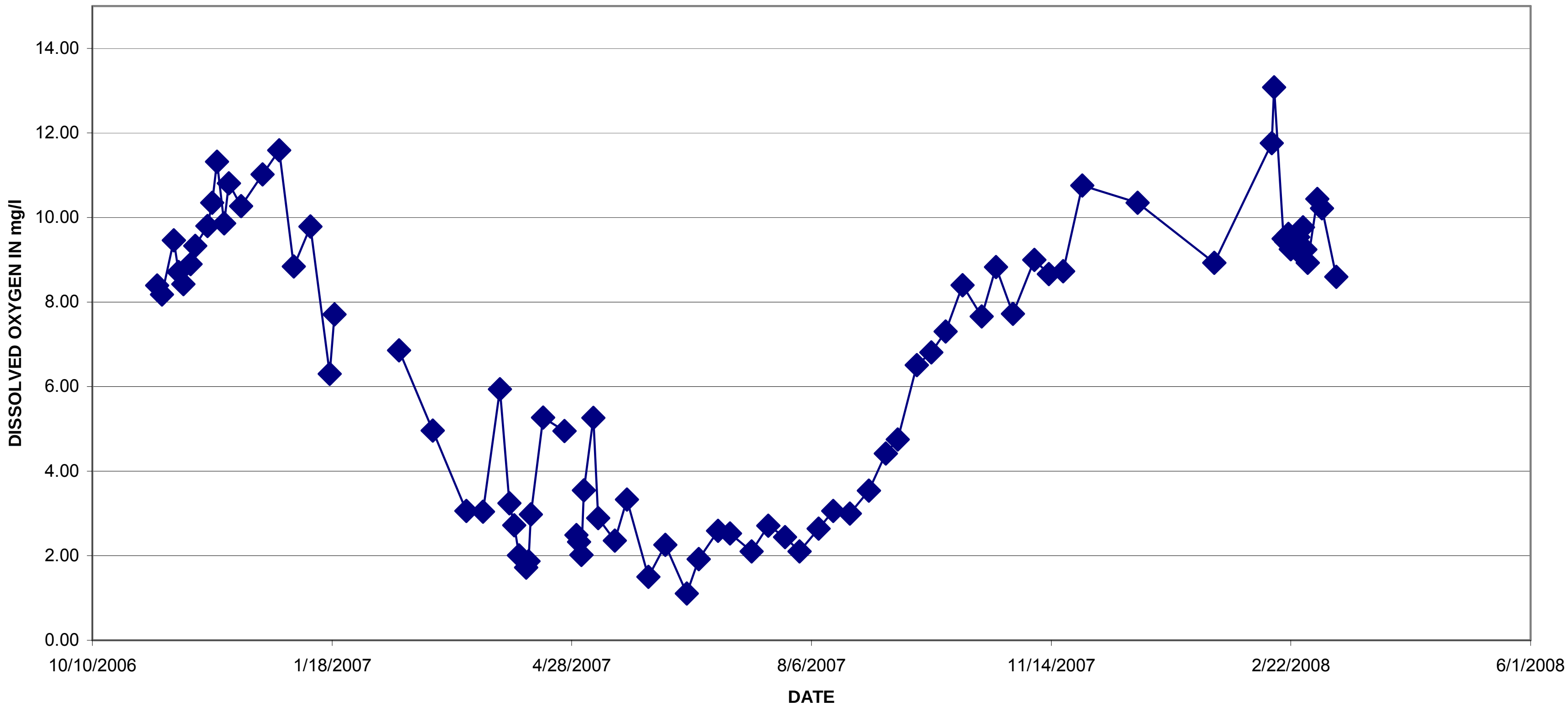

MAZOURKA CANYON ROAD ELECTRICAL CONDUCTIVITY
E.C. in mS/cm
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE

MAZOURKA CANYON ROAD pH

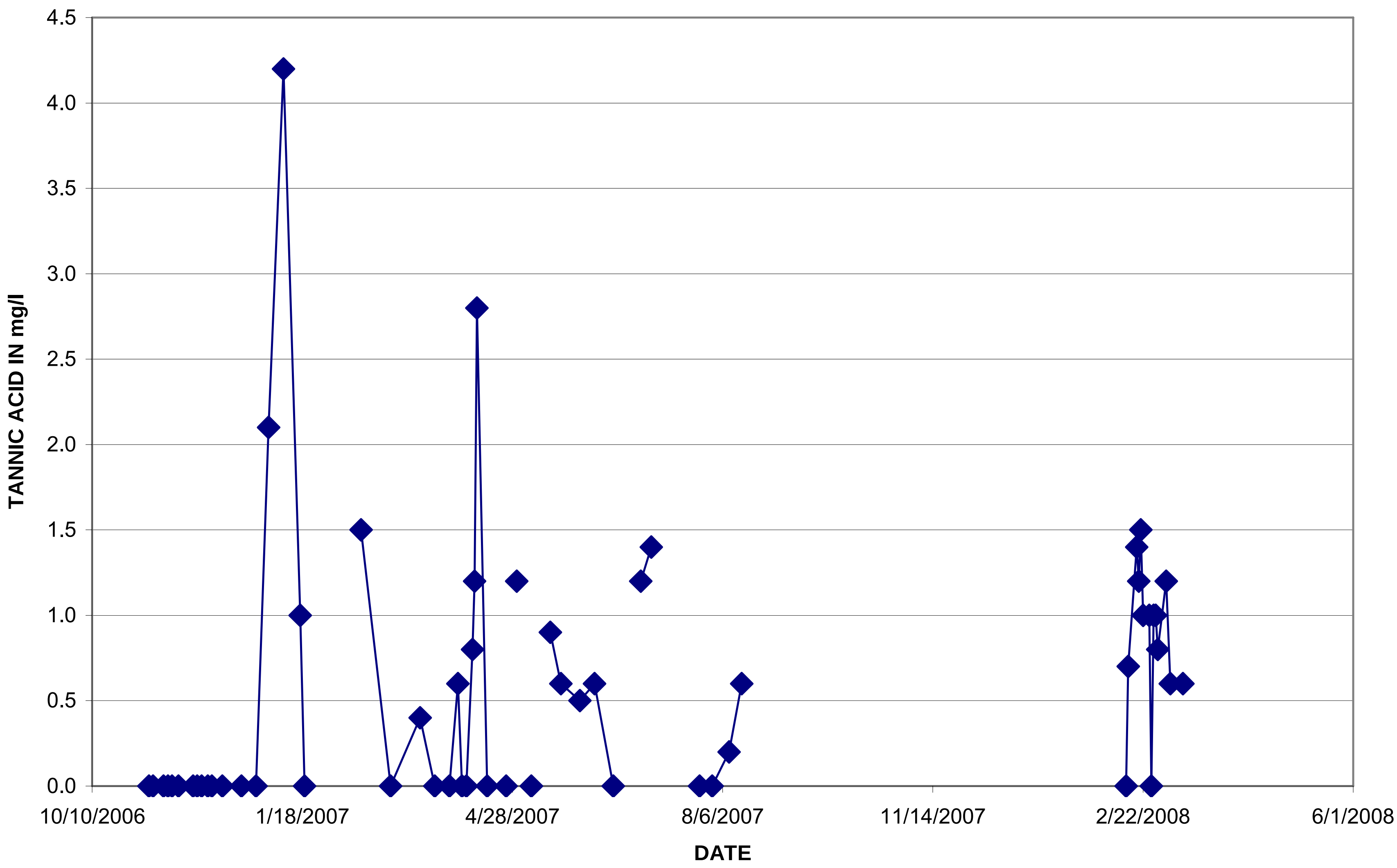



MAZOURKA CANYON ROAD TURBIDITY
TURBIDITY IN NTU
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
6/1/2008
DATE

MAZOURKA CANYON ROAD DISSOLVED OXYGEN



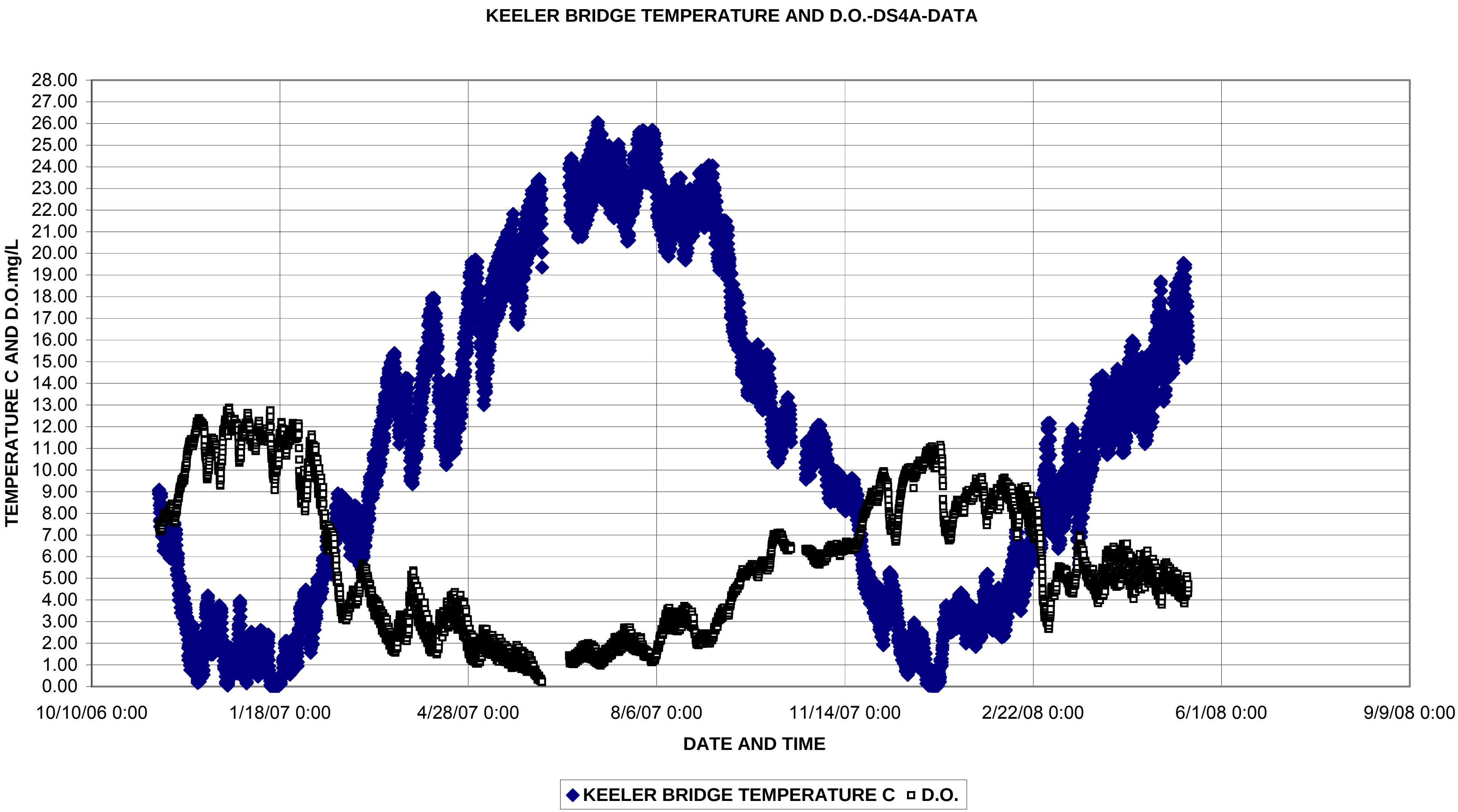
MAZOURKA CANYON ROAD TANINS AND LIGNINS

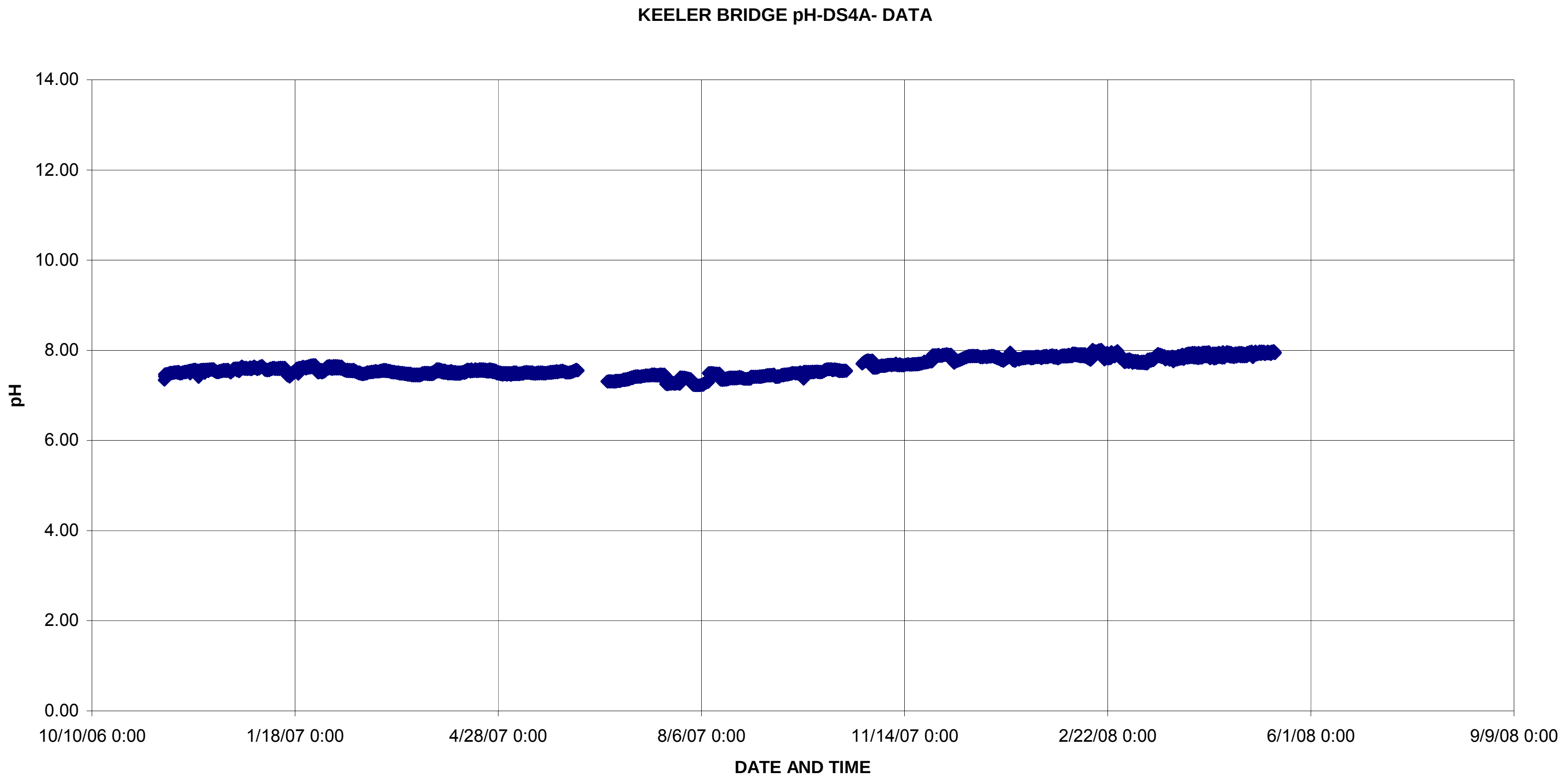


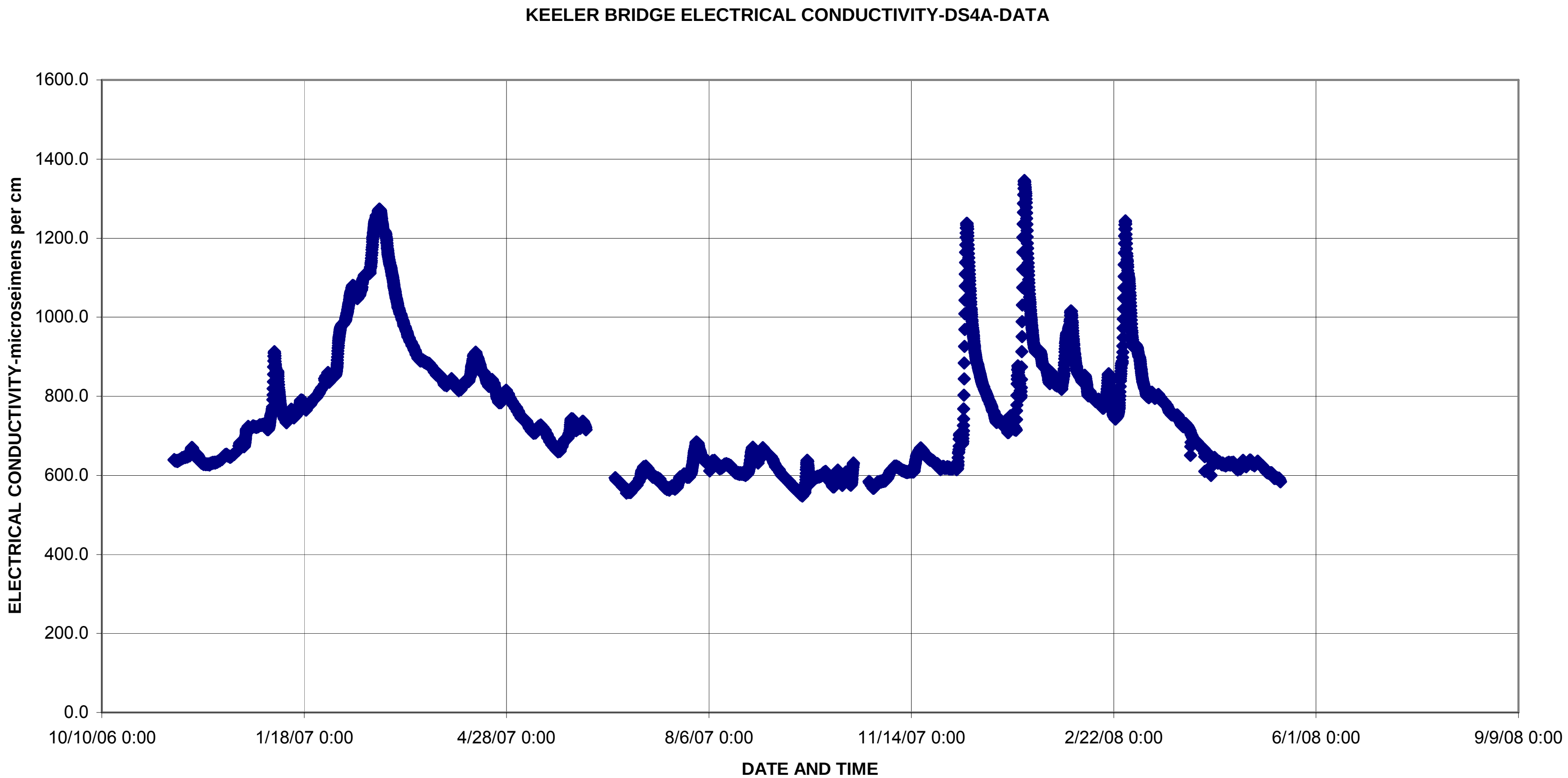
2.14. Appendix B: Continuous Recorder Water Quality Data, Graphs For Section 2.0

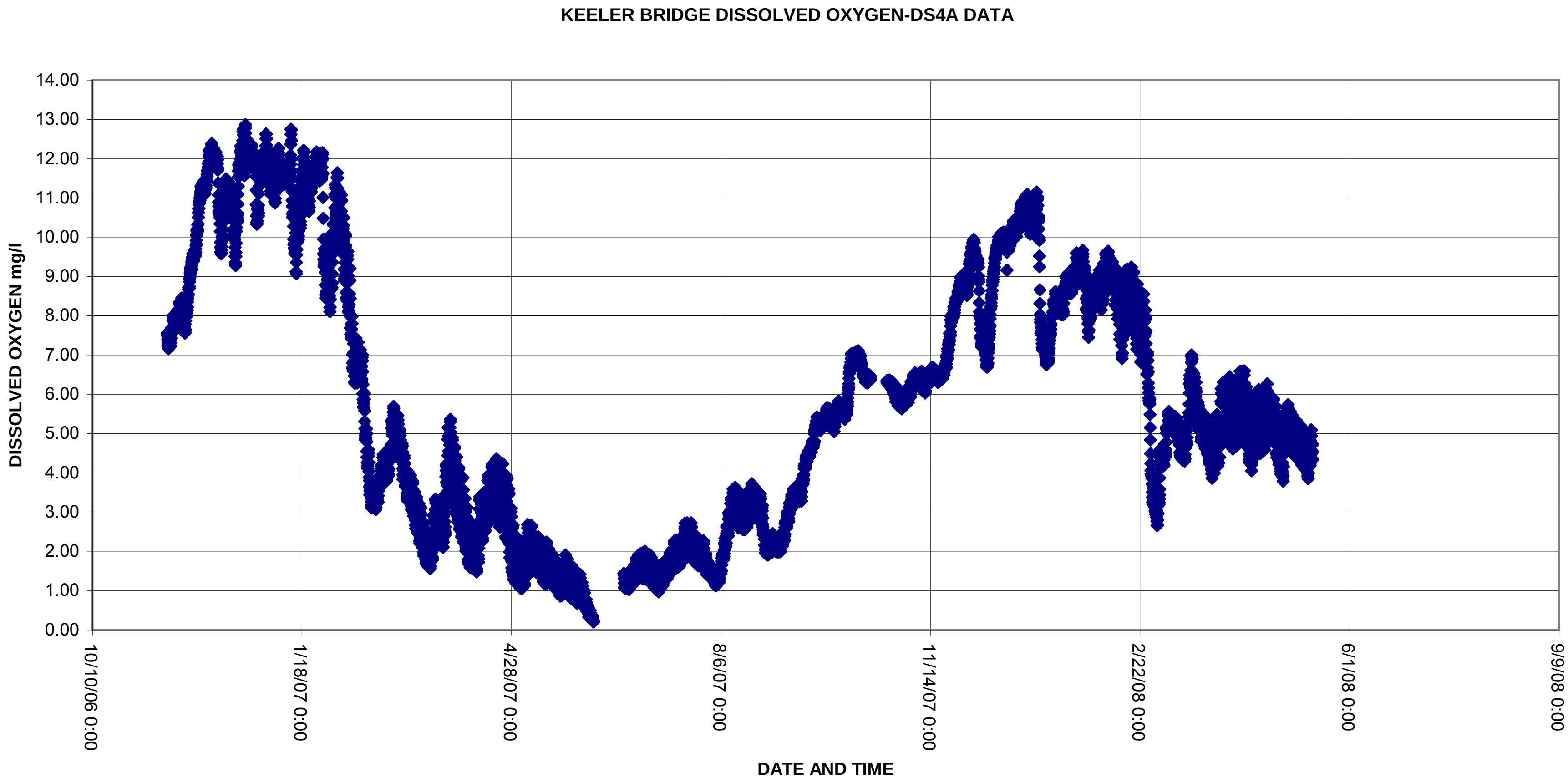
Note: Gaps in the data on the graphs have several causes:

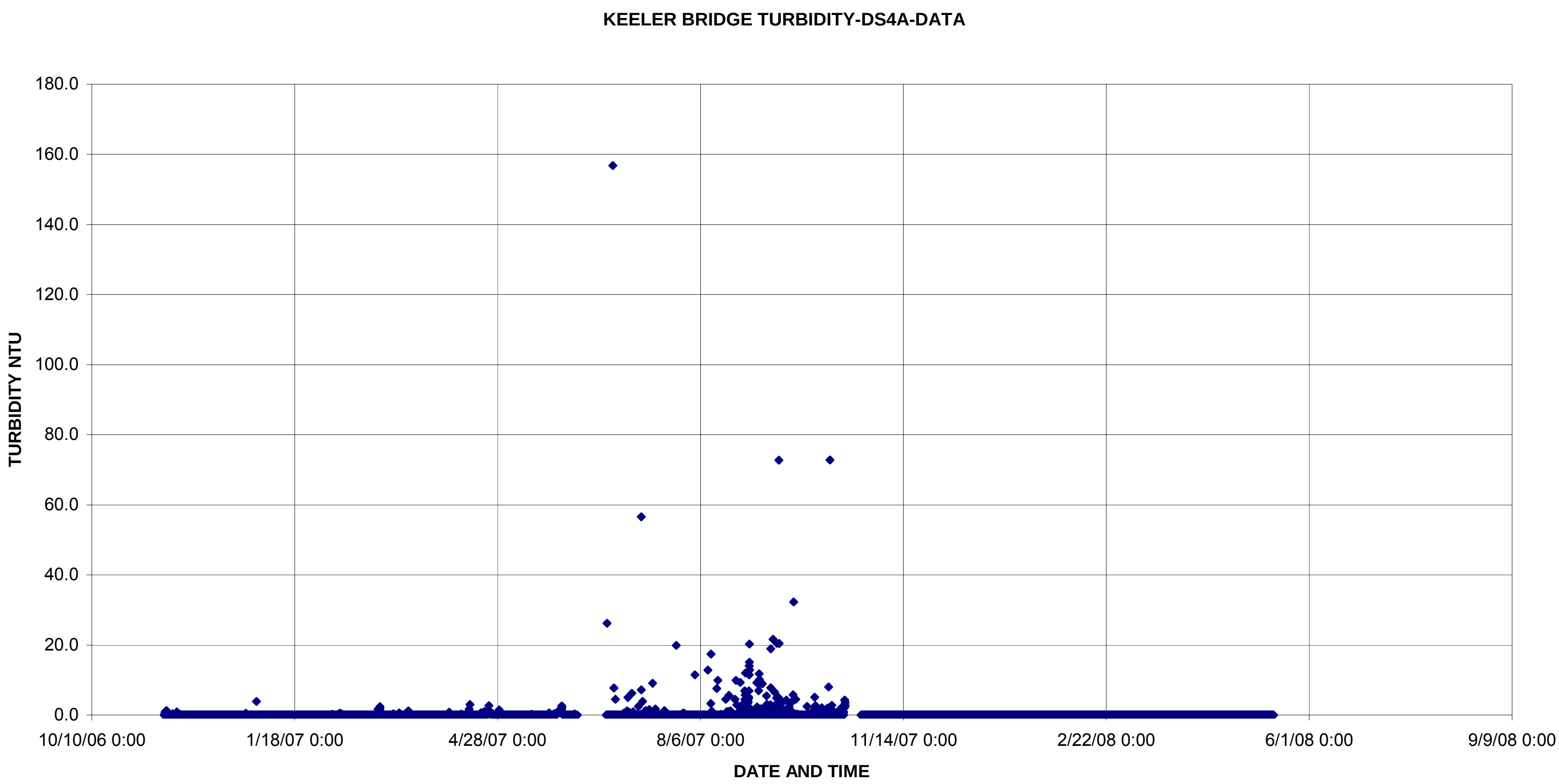
1. When no data was taken-the instrument was removed for maintenance and calibration
2. When the data was eliminated due to quality assurance-quality control issues
3. A probe on the instrument failed

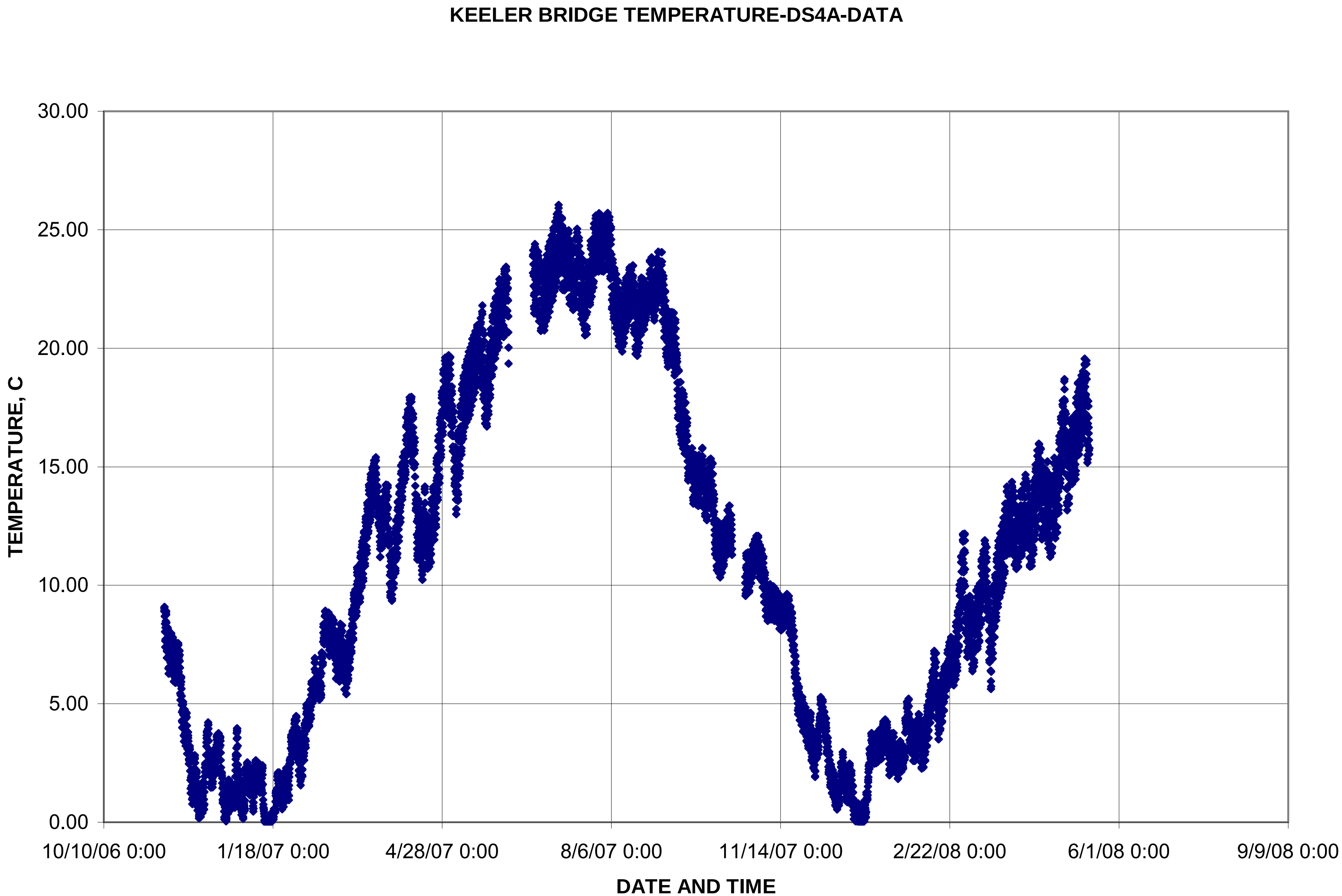

KEELER BRIDGE TEMPERATURE AND D.O.-DS4A-DATA
28.00
27.00
26.00
25.00
24.00
23.00
22.00
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
TEMPERATURE C AND D.O.mg/L
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME
KEELER BRIDGE TEMPERATURE C
D.O.

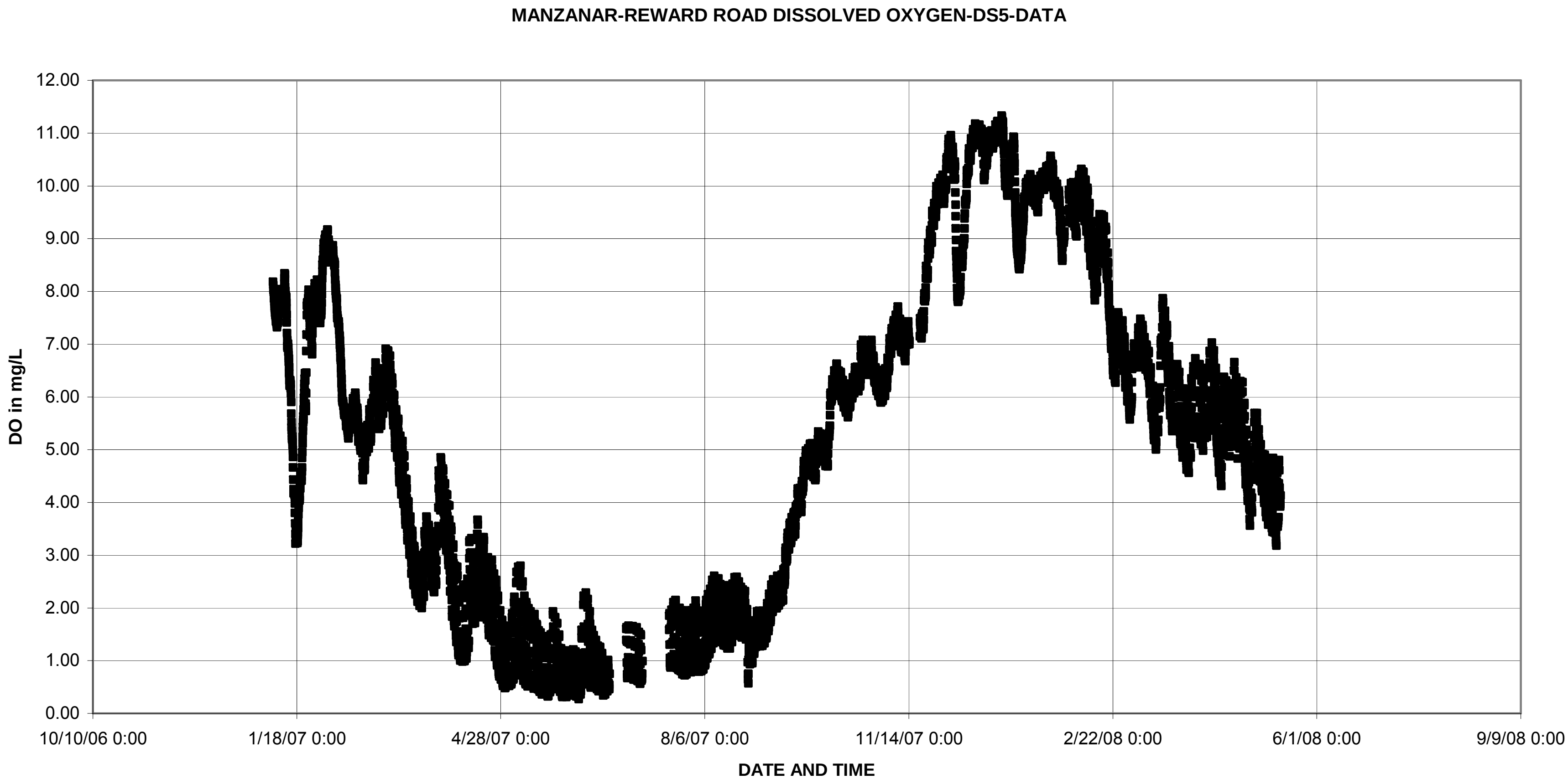

KEELER BRIDGE pH-DS4A- DATA
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
pH
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

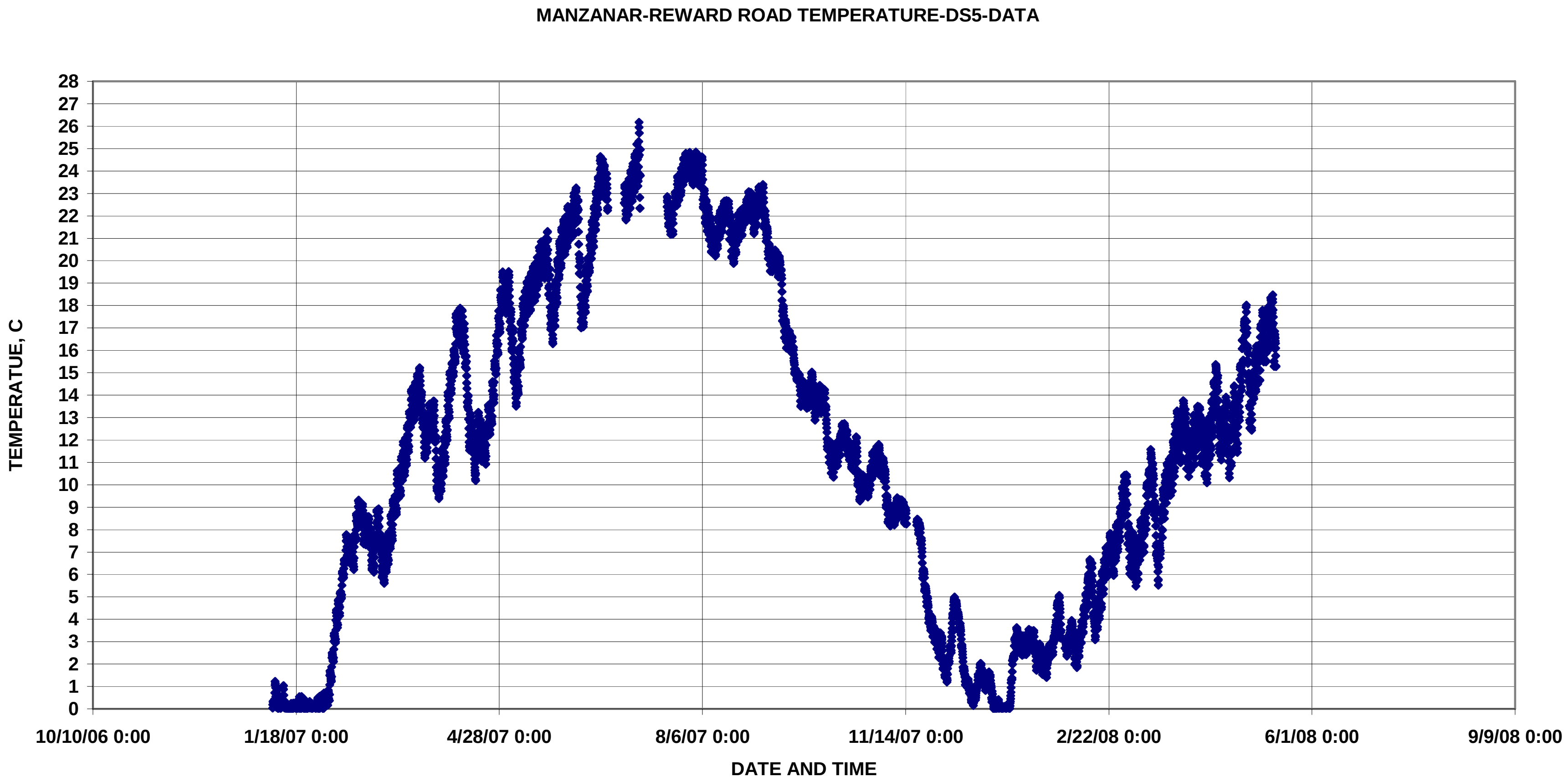

KEELER BRIDGE ELECTRICAL CONDUCTIVITY-DS4A-DATA
ELECTRICAL CONDUCTIVITY-microseimens per cm
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

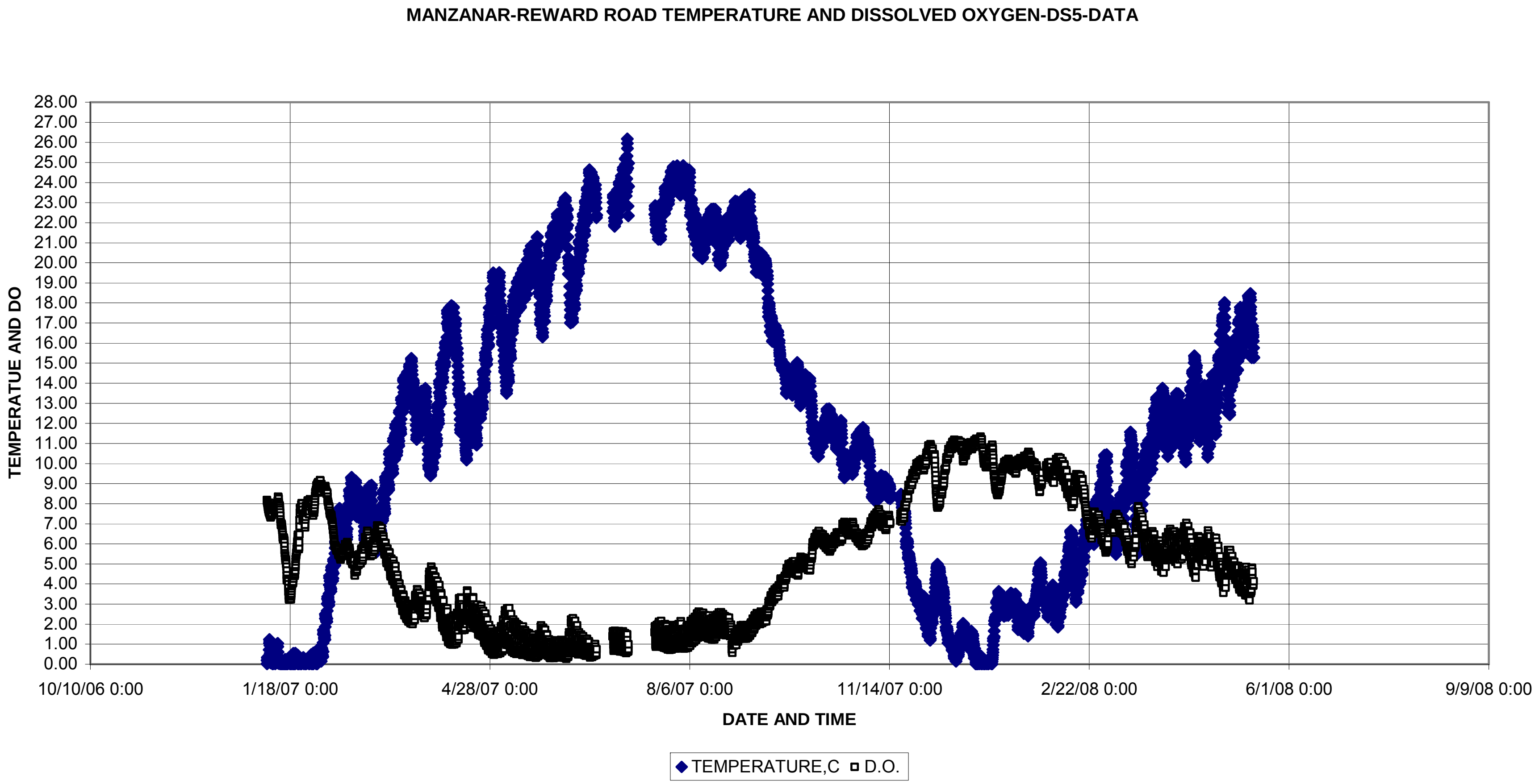

KEELER BRIDGE DISSOLVED OXYGEN-DS4A DATA
DISSOLVED OXYGEN mg/l
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

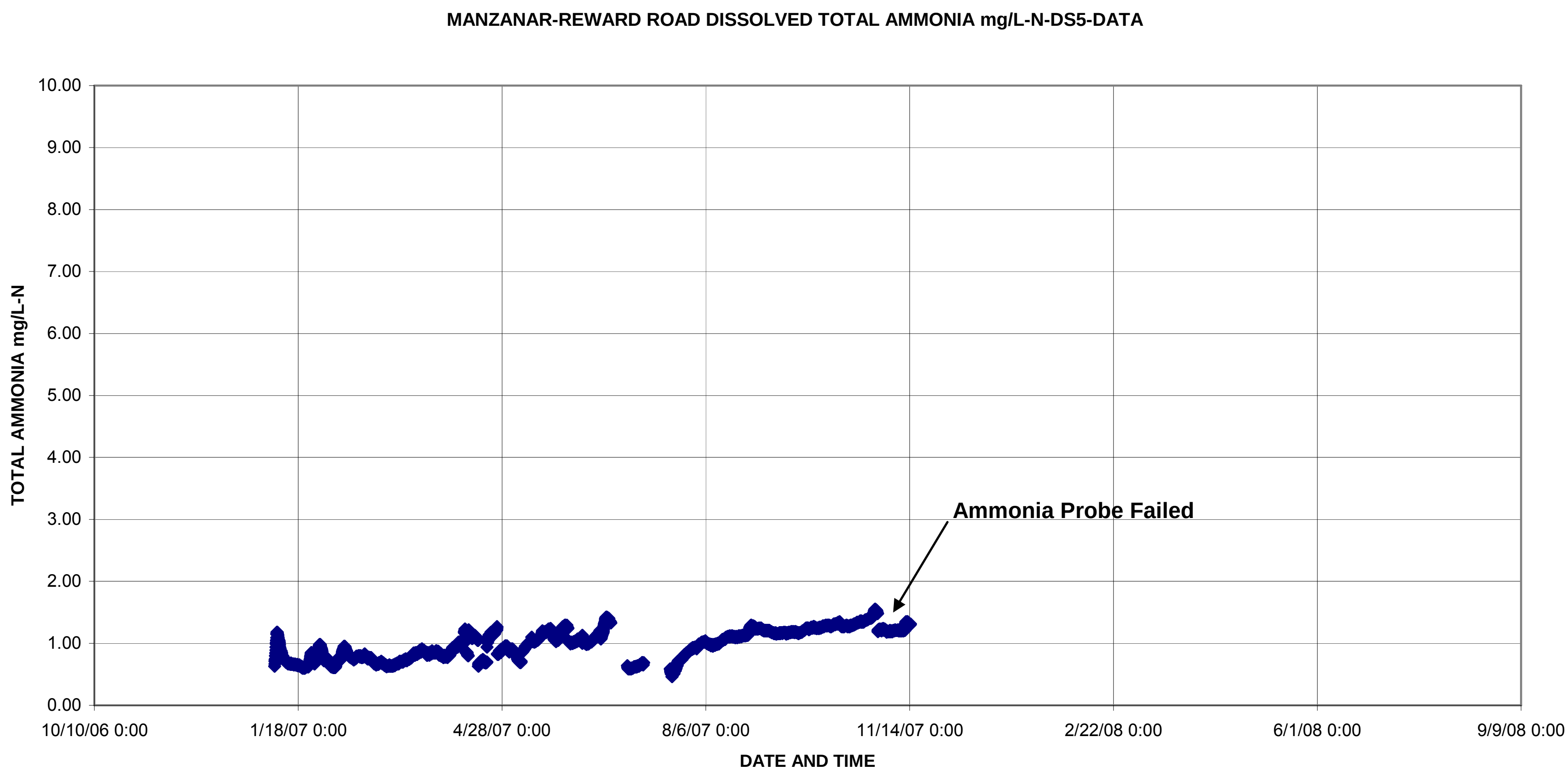

KEELER BRIDGE TURBIDITY-DS4A-DATA
TURBIDITY NTU
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME


KEELER BRIDGE TEMPERATURE-DS4A-DATA
30.00
25.00
20.00
15.00
10.00
5.00
0.00
TEMPERATURE, C
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

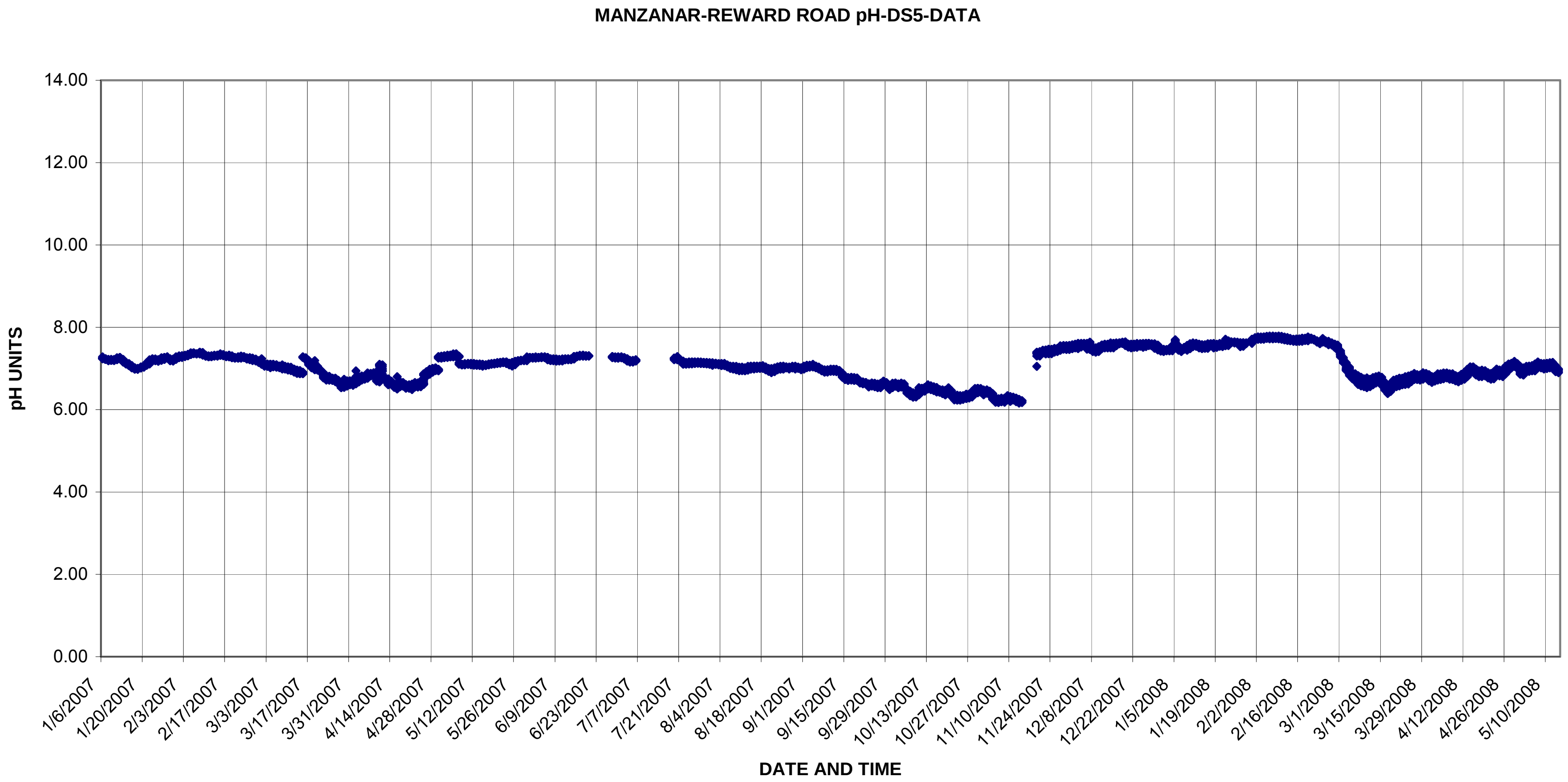

MANZANAR-REWARD ROAD DISSOLVED OXYGEN-DS5-DATA
DO in mg/L
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

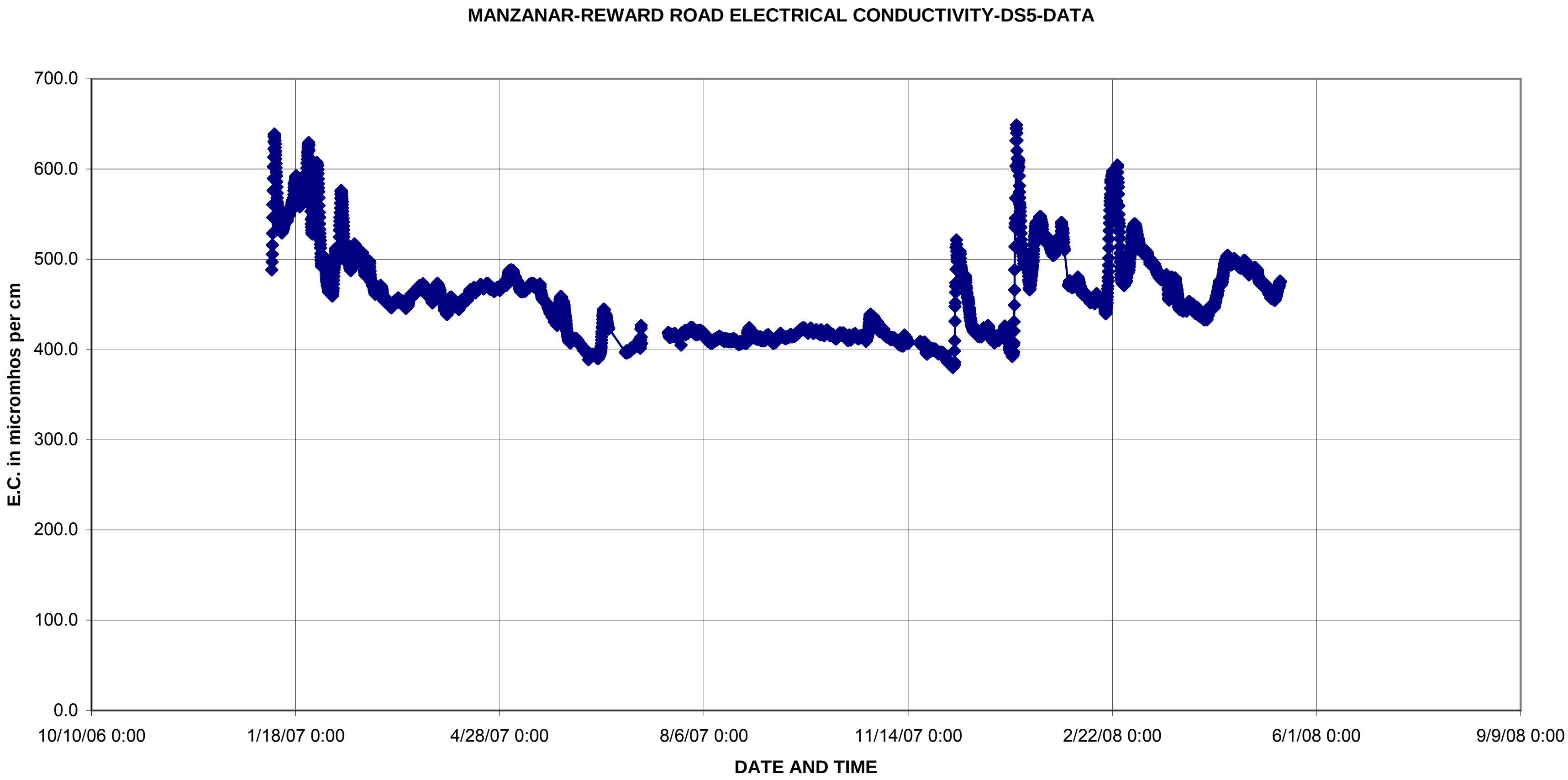

MANZANAR-REWARD ROAD TEMPERATURE-DS5-DATA
TEMPERATUE, C
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

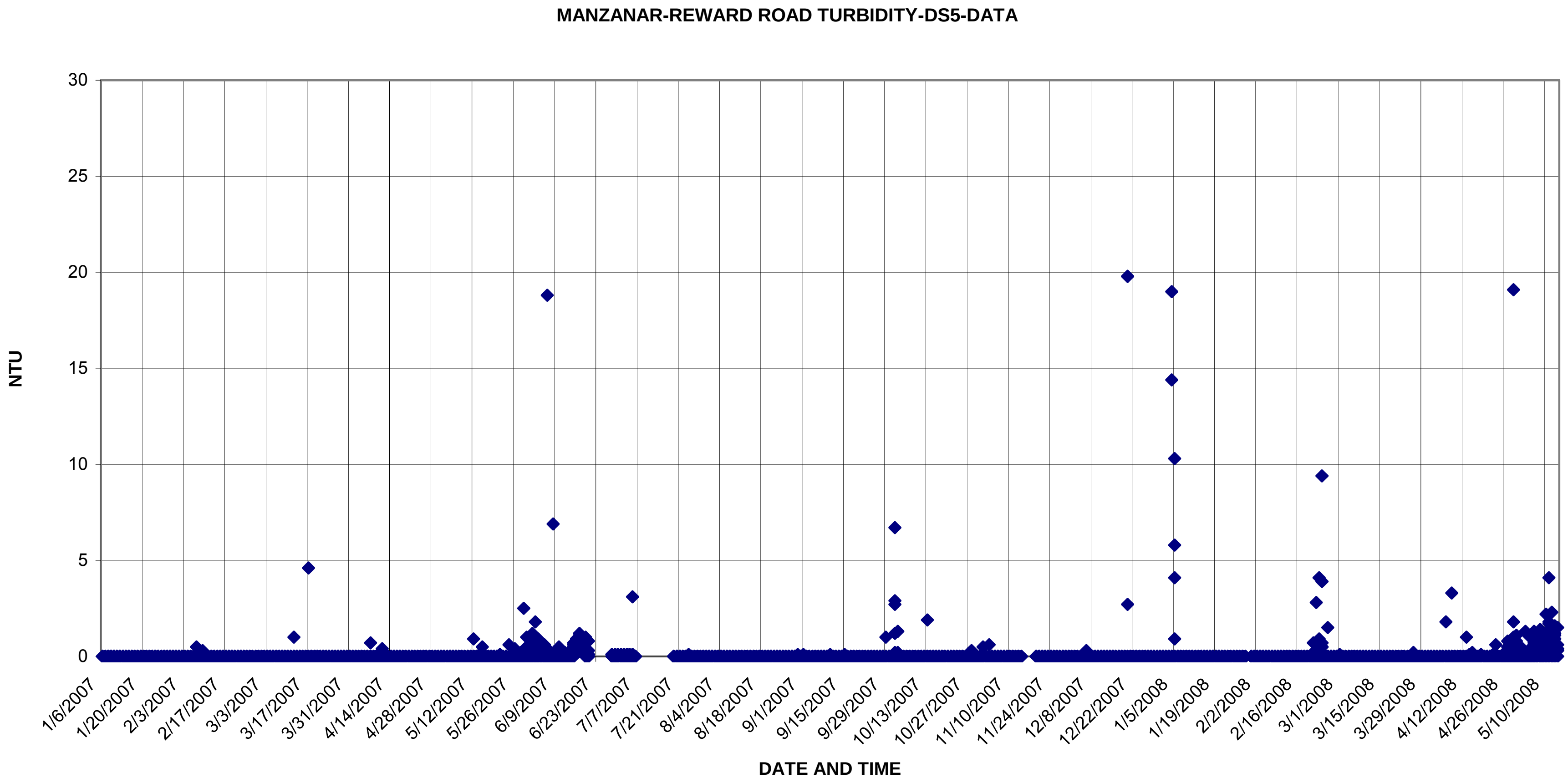

MANZANAR-REWARD ROAD TEMPERATURE AND DISSOLVED OXYGEN-DS5-DATA
TEMPERATUE AND DO
28.00
27.00
26.00
25.00
24.00
23.00
22.00
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME
TEMPERATURE,C
D.O.



MANZANAR-REWARD ROAD DISSOLVED TOTAL AMMONIA mg/L-N-DS5-DATA
TOTAL AMMONIA mg/L-N
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME
Ammonia Probe Failed

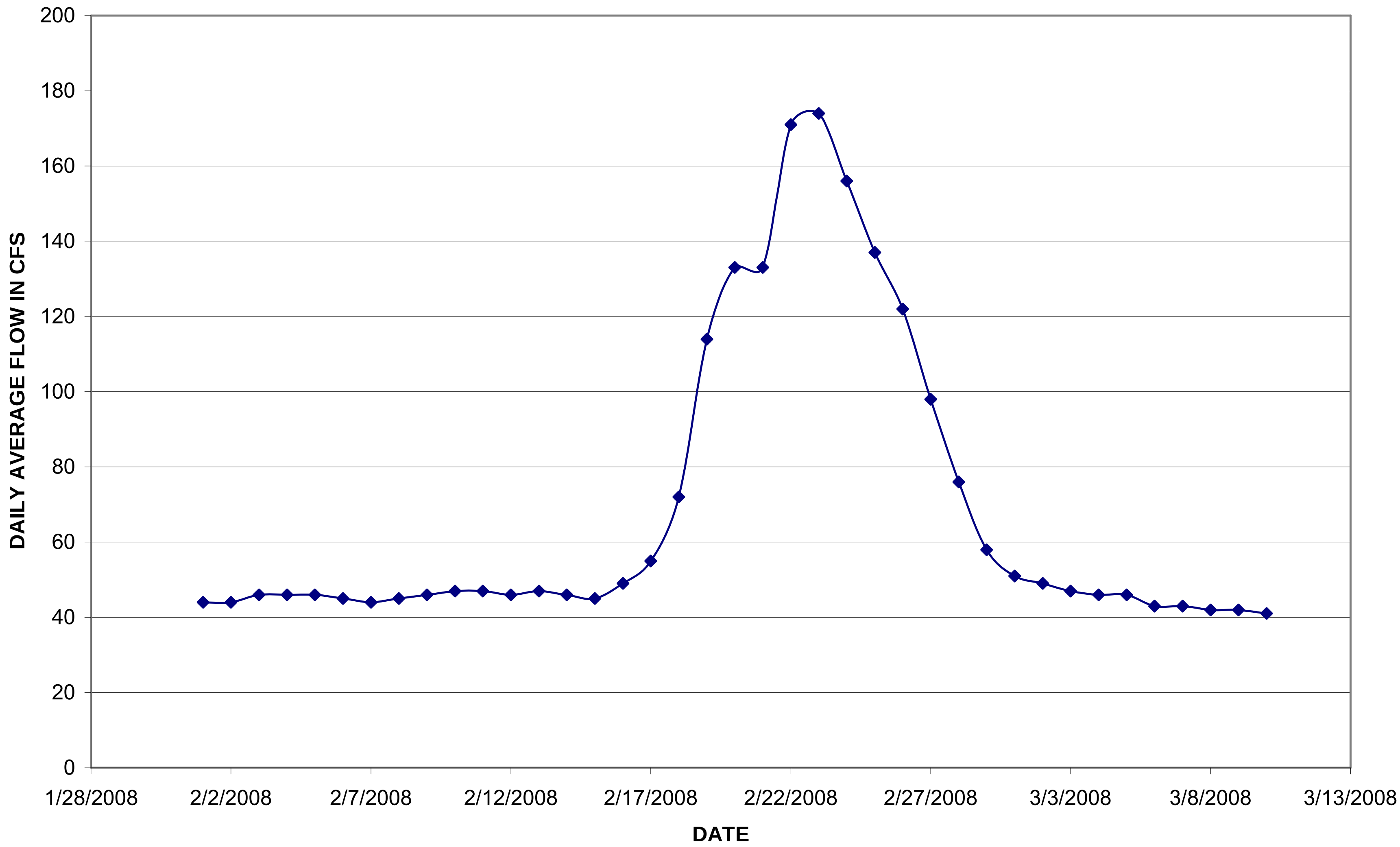

MANZANAR-REWARD ROAD pH-DS5-DATA
pH UNITS
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1/6/2007
1/20/2007
2/3/2007
2/17/2007
3/3/2007
3/17/2007
3/31/2007
4/14/2007
4/28/2007
5/12/2007
5/26/2007
6/9/2007
6/23/2007
7/7/2007
7/21/2007
8/4/2007
8/18/2007
9/1/2007
9/15/2007
9/29/2007
10/13/2007
10/27/2007
11/10/2007
11/24/2007
12/8/2007
12/22/2007
1/5/2008
1/19/2008
2/2/2008
2/16/2008
3/1/2008
3/15/2008
3/29/2008
4/12/2008
4/26/2008
5/10/2008
DATE AND TIME


MANZANAR-REWARD ROAD ELECTRICAL CONDUCTIVITY-DS5-DATA
E.C. in micromhos per cm
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
10/10/06 0:00
1/18/07 0:00
4/28/07 0:00
8/6/07 0:00
11/14/07 0:00
2/22/08 0:00
6/1/08 0:00
9/9/08 0:00
DATE AND TIME

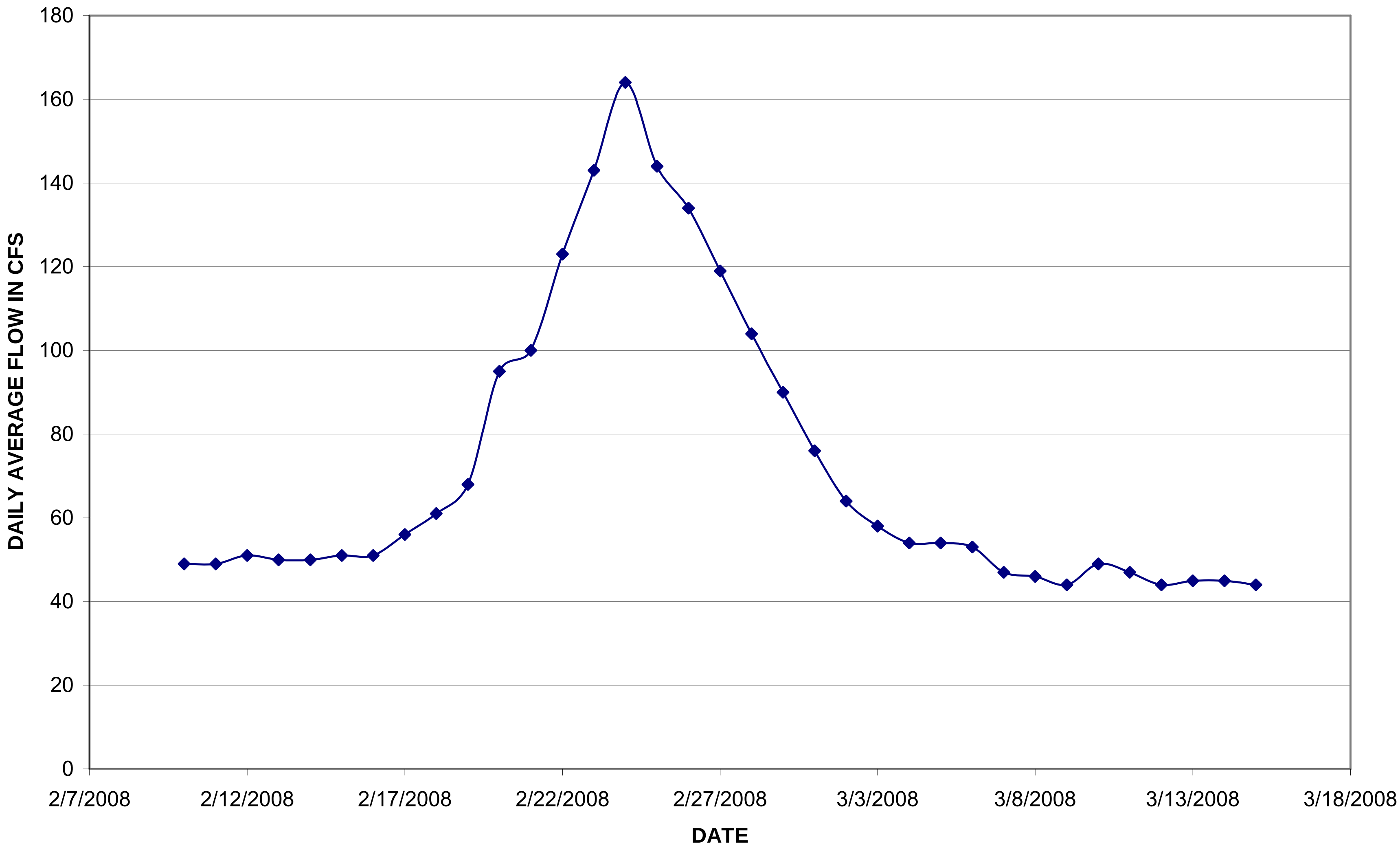

MANZANAR-REWARD ROAD TURBIDITY-DS5-DATA
NTU
30
25
20
15
10
5
0
1/6/2007
1/20/2007
2/3/2007
2/17/2007
3/3/2007
3/17/2007
3/31/2007
4/14/2007
4/28/2007
5/12/2007
5/26/2007
6/9/2007
6/23/2007
7/7/2007
7/21/2007
8/4/2007
8/18/2007
9/1/2007
9/15/2007
9/29/2007
10/13/2007
10/27/2007
11/10/2007
11/24/2007
12/8/2007
12/22/2007
1/5/2008
1/19/2008
2/2/2008
2/16/2008
3/1/2008
3/15/2008
3/29/2008
4/12/2008
4/26/2008
5/10/2008
DATE AND TIME

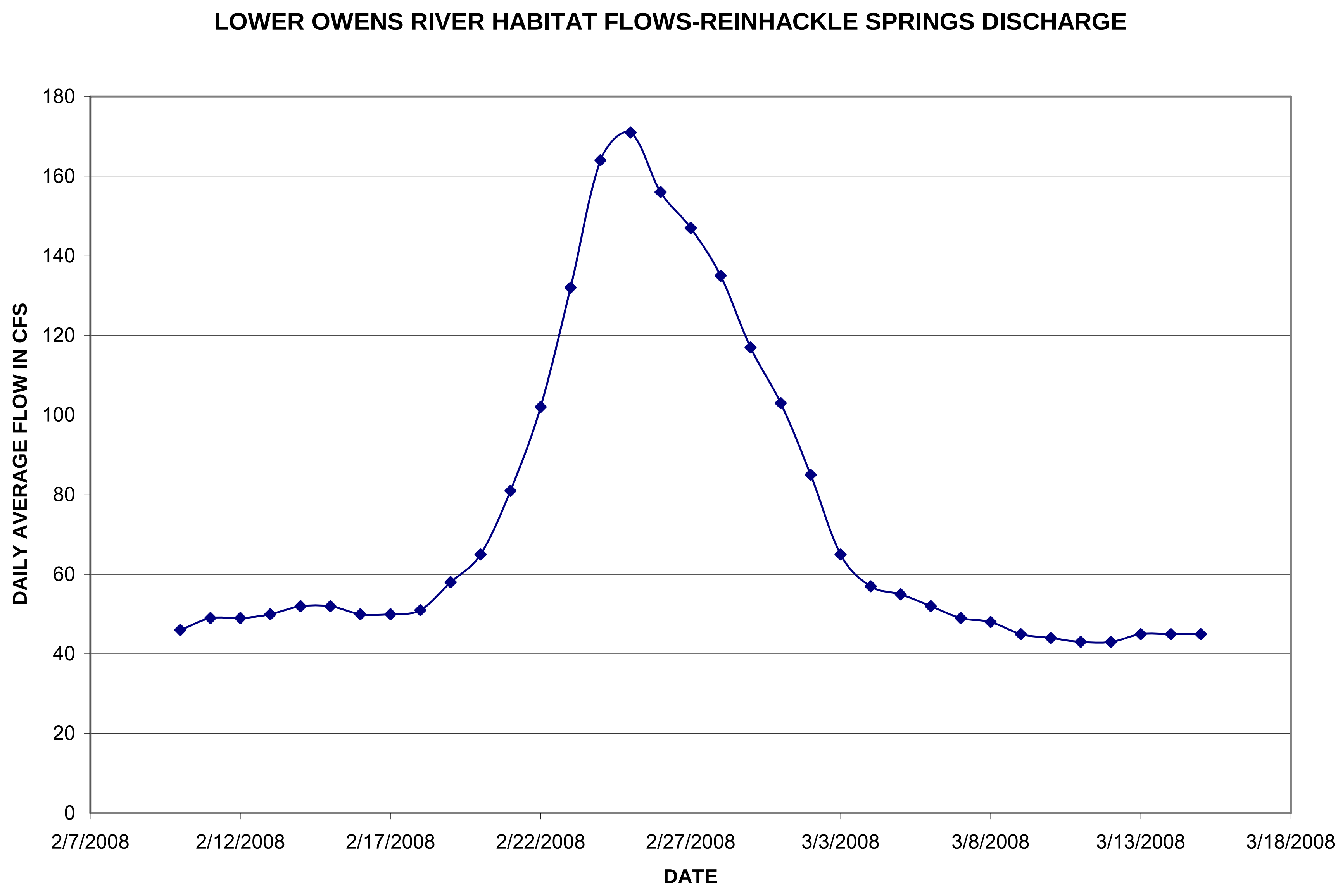
2.15. Appendix C: Habitat Flow Hydrographs at Water Quality Monitoring Stations For Section 2.0

LOWER OWENS RIVER HABITAT FLOWS-MAZOURKA CANYON ROAD DISCHARGE

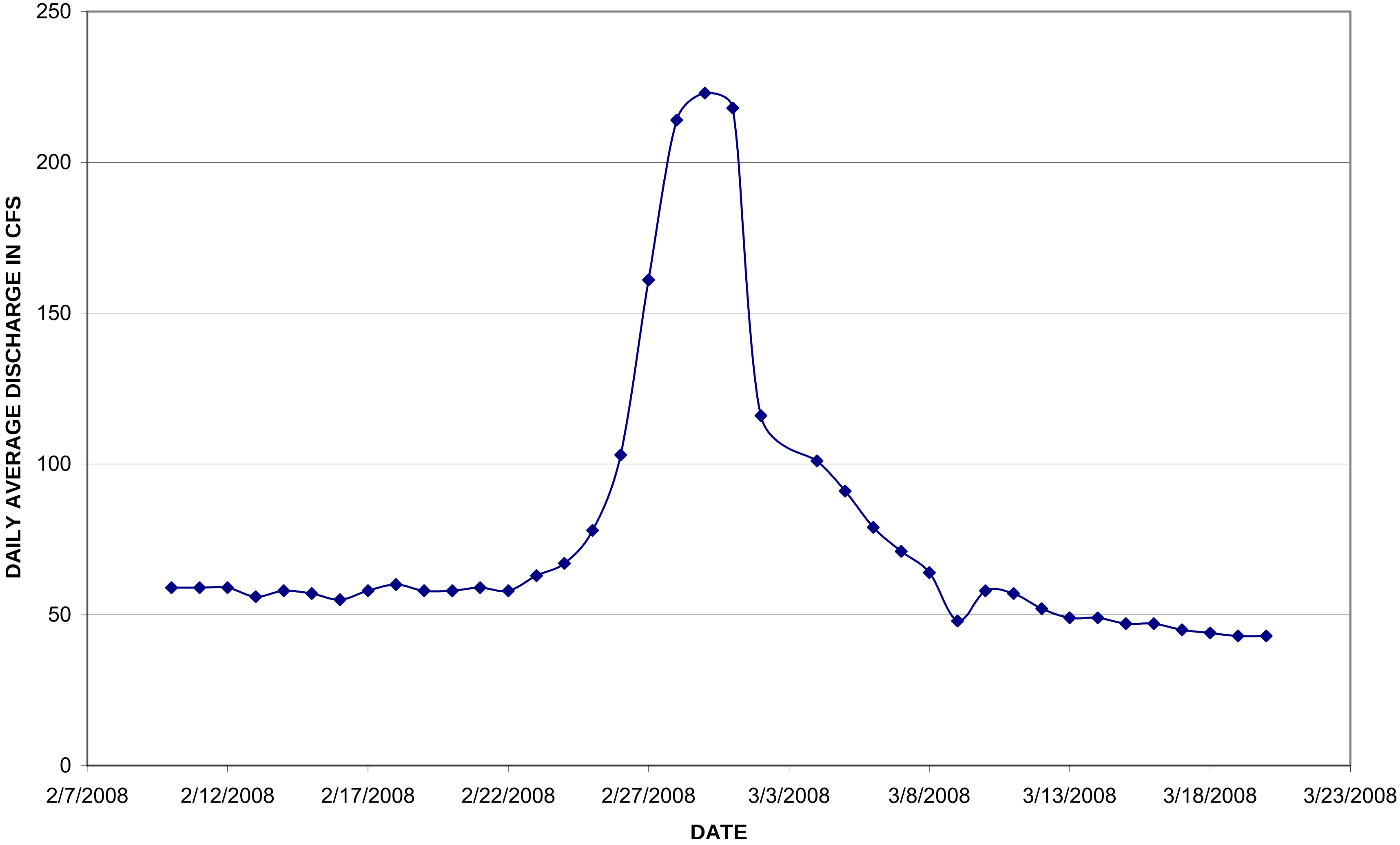


LOWER OWENS RIVER HABITAT FLOWS-MANZANAR-REWARD ROAD DISCHARGE




LOWER OWENS RIVER HABITAT FLOWS-REINHACKLE SPRINGS DISCHARGE
DAILY AVERAGE FLOW IN CFS
0
20
40
60
80
100
120
140
160
180
2/7/2008
2/12/2008
2/17/2008
2/22/2008
2/27/2008
3/3/2008
3/8/2008
3/13/2008
3/18/2008
DATE

LOWER OWENS RIVER HABITAT FLOWS-KEELER BRIDGE DISCHARGE



3.0 Seasonal Habitat Flow 2008 Report

Prepared by:
Ecosystem Sciences, Inc.
June 15, 2008

Supporting Data Provided by:
Los Angeles Department of Water and Power
and Inyo County Water Department

The seasonal habitat flow event, observation and data collection was a collaborative effort conducted by the Los Angeles Department of Water and Power (LADWP), Inyo County Water Department (ICWD), and Ecosystem Sciences, Inc. (ESI). LADWP managed the flow releases and flow monitoring and contributed the section on *Flow Hydrographic Analysis*. ICWD conducted the required water quality monitoring and provided the tabulated data. ESI performed all other data collection, analysis, and mapping and produced this report.

3.1. Executive Summary

The purpose of the seasonal habitat flow, as required in the Memorandum of Understanding (MOU), is to create a dynamic equilibrium for riparian habitat, fishery, water storage, water quality, animal migration and biodiversity, which result in resilient productive ecological systems. The maximum flows to be delivered to the Lower Owens River, as part of the LORP, are out-of-channel flows intended to emulate natural runoff periods (spring time freshets from rapid snowmelt). Out-of-channel flows (termed riparian or seasonal habitat flows) are essential to the life of the river because they create flooding on important landforms (floodplains) that result in habitat diversity and the creation and maintenance of riparian habitat.

The 2008 seasonal habitat flow had specific objectives of the flow release not pertinent to all MOU objectives. This first flow event initiated during winter conditions was intended to protect water quality and aquatic biota, evaluate the effects on LADWP and Inyo County infrastructure, test monitoring instruments and techniques, develop analytical tools, and provide more definitive information about flood extent and hydrologically varying reaches of the river.

High flows (210 cfs from the Intake) were successfully released and conveyed from the Los Angeles Aqueduct Intake (Intake) to the Delta. There were no significant blockages or flooding of infrastructure. The peak flow reached the Pumpback Station 8 ½ days after its release from the Intake. Supplemental flows were released from the Alabama Spillgates to augment the Intake release as mandated by the Lahontan Regional Water Quality Control Board (LRWQCB). The effects of these releases from the Alabama Spillgates on water quality are unclear, however, water quality declined as flow magnitude increased. Throughout the flow event water quality parameters remained within acceptable ranges for fish and other aquatic biota.

Observation and mapping of the high flow event in the LORP were conducted using helicopter aerial photography and ground level surveys to document the extent of flooding. Total acres inundated under base flow conditions (measured between 41 and 60 cfs) were 1,234. Total acres inundated under 200 cfs flows were 1,937, an increase of approximately 700 acres over base flow conditions for the Lower Owens River from the Intake to the Pumpback Station. The total flooded extent acreage from the high flows exceeded the modeling predictions by 1,127 acres. Although flooding varied dramatically between river reach types, 88% of floodplains and 25% of low terraces in the entire Lower Owens River area were inundated at a flow of 200 cfs. These landforms are suitable for woody riparian vegetation to establish, particularly willow and cottonwood. These results and acreages of flooded extent are based on an extrapolation of measured conditions and are detailed in this report.

It must be recognized that the results of this flow event are unique for several reasons: this is the first time since the early 1980s that flows of this magnitude were released to the Lower Owens River channel; the flows were released in the winter as opposed to the spring or summer; and flows were augmented at the Alabama Spillgates. It is not possible, therefore; to predict with precision what effect future seasonal habitat flows will have on wetted area, landform inundation, gains and losses, travel time, or water quality in reaches below the Alabama Spillgates. Recommendations to alter future seasonal habitat flows or to recommend any adaptive management actions for the LORP should not be based solely on observations during the 2008 habitat flow.

3.2. Introduction

A seasonal habitat flow was initiated in the Lower Owens River from the Intake to the Pumpback Station (Seasonal Habitat Flow Figure 2) in February 2008 to meet goals stipulated in the 1997 Memorandum of Understanding (MOU) and objectives of the LRWQCB permit. The habitat flows were initiated for the first time as part of the LORP. Flows were gradually ramped up from a base flow of 47 cfs to 210 cfs from the Intake into the river channel beginning February 13. High flows reached a peak of 227 cfs on March 1 at the Pumpback Station (with augmentation from the Alabama Spillgates). Flows were ramped down and base flow conditions were reached on March 9. Instream river flows and water quality parameters were measured during the seasonal habitat flow event, along with flooded extent, water surface elevations and widths, photo and video monitoring to determine whether objectives for the initial seasonal habitat flows were achieved.

This chapter describes the results of the LORP 2008 Initial Seasonal Habitat Flow. The report describes the flow event, data collected, data analysis and results. The chapter is organized as follows:

- Purpose of Seasonal Habitat Flows
- Initial Seasonal Habitat Flow Objectives
- Water Quality Permit Requirements
- Background and Related Information
- LORP Geography
- Hydrometeorology
- o Precipitation
- o Temperature
- Hydrologic Infrastructure
- Flows
- o Flow Event Chart Illustrations
- o Flow Hydrographic Analysis
- Photo Point Monitoring
- Video Point Monitoring
- Water Quality Methods and Results
- Field Data Collection and Methods for Flooded Extent
- Baseflow and Flooded Extent Mapping Methods
- o Site Scale – Plot Analysis
- o Reach and River Wide Analysis
- Results and Discussion
- o Baseflow and Flooded Extent Mapping
- Site Scale – Plot Results
- Reach and River Wide Results
- Extrapolated vs. Predicted
- Conclusion
- Recommendations for Future Seasonal Habitat Flows
- Appendices

Seasonal Habitat Flow Figure 1. Seasonal Habitat Flooding in the Lower Owens River.
In this reach of the river near the Alabama Hill's and upstream of Lone Pine landforms are inundated from terrace to terrace across the floodplain at 200 cfs.

3.3. Purpose of Seasonal Habitat Flow

The goal of the LORP, as stated in the MOU:

> "is the establishment of a healthy, functioning Lower Owens River riverine-riparian ecosystem, and the establishment of healthy, functioning ecosystems in the other physical features of the LORP, for the benefit of biodiversity and Threatened and Endangered Species, while providing for the continuation of sustainable uses including recreation, livestock grazing, agriculture and other activities".

The MOU requires that flow and land management be used in conjunction to "create and maintain, to the extent feasible, diverse natural habitats consistent with the needs of the 'habitat indicator species' ".

The purpose of the seasonal habitat flow, as described in the MOU, is to create a dynamic equilibrium for riparian habitat, the fishery, water storage, water quality, animal migration and biodiversity, which results in resilient productive ecological systems. The MOU outlines flow regimes for seasonal habitat flows. For average to above average runoff years, the flow regime includes releasing 200 cfs into the Lower Owens River. For below average runoff years, the flow regime includes a reduction from 200 cfs to as low as 40 cfs in general proportion to the forecasted runoff in the watershed.[1]

Seasonal habitat flows are "to be of sufficient frequency, duration and amount and will be implemented in order to: (1) minimize the quantity of muck and other river bottom material that is

[1] MOU 1997, Section II, pg. 12

transported out of the riverine-riparian system, but will cause this material to be redistributed on floodplains and terraces within the riverine-riparian system and the Owens River Delta for the benefit of the vegetation; (2) fulfill the wetting, seeding and germination needs of riparian vegetation, particularly willow and cottonwood; (3) recharge the groundwater in the streambanks and the floodplain for the benefit of wetlands and the biotic community; (4) control tules and cattails to the extent possible; (5) enhance the fishery; (6) maintain water quality standards and actions; and (7) enhance the river channel."[7]

The MOU specifies that the amount of seasonal annual habitat flow be set by the Standing Committee, "subject to any applicable court orders concerning the discharge of water onto the bed of Owens Lake and in consultation with CDFG, and be based on the Lower Owens River Riverine-Riparian Ecosystem element of the LORP Plan, which will recommend the amount, duration and timing of flows necessary to achieve the goals for the system under varying hydrologic scenarios."[2]

3.4. Initial Seasonal Habitat Flow Objectives

In addition to addressing the goals and obligations of the MOU and water quality permits, the primary objectives for the 2008 seasonal habitat flow included:

- Successful release and conveyance of water from the Intake to the Delta
- Observe and test blockages and flooding potential at critical points
- Estimate flooded extent
- Compare inundated landforms to assist in predicting riparian/wetland vegetation areas
- Identify effects of flooding in the Delta
- Measure water quality parameters
- Test effectiveness of river flow measuring stations
- Improve knowledge of travel time and channel losses or gains
- Qualitatively record the flow event through photo and video monitoring

3.5. Water Quality Permit Requirements

The LRWQCB issued the 2005 Permit No. R6V-2005-0020, which contains certain requirements for the first three seasonal habitat flow releases. The 2008 release was required to be done under winter conditions to minimize adverse water quality impacts. The LRWQCB also required LADWP to monitor the flow during the 2008 release upriver from the Alabama Spillgate at the Reinhackle Spring gaging station, and the release rate from Alabama Spillgate, to demonstrate that requirements to provide and maintain minimum combined flow rates of 200 cfs for at least 96 hours are achieved in the river below Alabama Spillgate.

LRWQCB's intent was to release enough water at the Alabama Spillgate to augment the flow measured at Reinhackle Springs for a one-time "flush" of the river below the Alabama Spillgate to the Pumpback Station. In subsequent seasonal habitat flow years augmentation from the Alabama Spillgate is not required.

3.6. LORP Geography

The LORP is located in the southern portion of the Owens Valley in eastern California. The LORP area begins at the Intake and follows the course of the Owens River south terminating at Owens Lake (Seasonal Habitat Flow Figure 3). The LORP planning area encompasses 77,657 acres of riverine, riparian, wetland and upland habitats.

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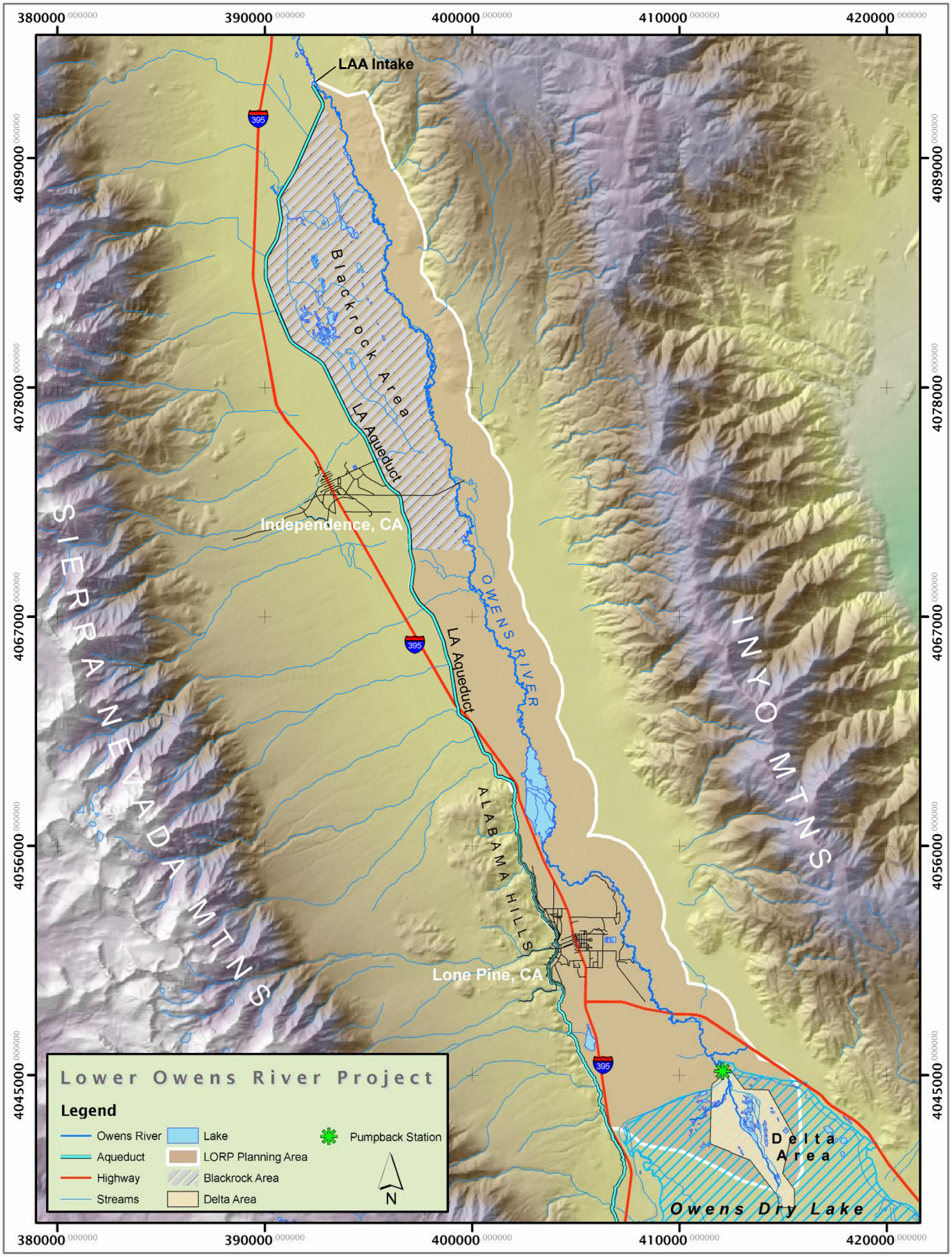
[2] MOU 1997, Section II, pg. 12

The LORP Riverine-Riparian Area follows the Owens River from the Intake in the north to the Delta Habitat Area on the Owens Lake bed to the south. The LORP riparian area is 6,437 acres and includes 53.3 miles of the Owens River channel (Seasonal Habitat Flow Figure 3). The east and west boundaries of the LORP Riverine-Riparian Area generally correspond to transitions of stream terraces along the Owens River, where wetland/riparian habitat is present to higher terraces with upland habitat.

Seasonal Habitat Flow Figure 2. Oblique Aerial Photo of Seasonal Habitat Flooding in the LORP.

Pictured is a flooded reach of the river at approximately 175 cfs. The green-blue line in the photo represents the confined river channel and wetted edge under baseflow conditions. This reach of the river was significantly inundated with flooding during the high flows.



Seasonal Habitat Flow Figure 3. LORP Planning Area

3.7. Hydrometeorology

3.7.1. Meteorological Background

It is important to recognize the meteorological contribution to surface water flows in the Lower Owens River. Without going into extensive analysis, this section presents the data pertinent to understanding the context of the winter 2008 seasonal habitat flows.

In January, winter precipitation caused flooding on terrace and floodplain surfaces in and adjacent to the Lower Owens River. Several river access roads were closed in January because of ponding (Seasonal Habitat Flow Figure 4).

3.7.2. Precipitation

Precipitation patterns in the Owens Valley are influenced primarily by the rain-shadow effect of the Sierra Nevada. Consequently, most of the precipitation falls on the Sierra Nevada Mountains to the west of the valley, which receives more than 30 inches/year on average at the crest. The Inyo and White Mountains to the east, receive on average about 10 inches/year, while the valley floor gets less than 6 in/yr. Precipitation in the valley varies locally, and varies from year to year and by season. Most of the precipitation falls as snow in the Sierra Nevada between October and April and provides the annual valley runoff. Runoff below the aqueduct contributes to channel flows in the Lower Owens River. Much of the precipitation received in the Owens Valley percolates into the near-surface unsaturated zone and is transpired by native vegetation.[3]

Seasonal Habitat Flow Figure 4. Ponding on Primary Access Road to Keeler Weir Near Lone Pine, CA.
Note the alternative route in the foreground created by vehicles trying to access the river.

Long-term mean annual precipitation at the weather station at Independence for the 99-year period from 1886 to 1985 was 5.10 inches.[4] Seasonal Habitat Flow Table 1 contains mean annual precipitation data for select stations in and around the LORP area for the period of record 1963 to 1984. Seasonal Habitat Flow Table 2 shows annual precipitation from 1985 to 2008. During the time period 1985 to 2008 (to date), mean annual precipitation was 5.04 inches, and ranged

[3] Danskin, W.R. 1998. Hydrology and Soil-Water-Plant Relations in Owens Valley, California. United States Geological Survey, Water Supply Paper 2370. Available at: http://ca.water.usgs.gov/archive/reports/wsp2370/

[4] Belvins 1986 in Danskin 1998

from .85 inches in 1990 to 10.38 inches in 1996.[5] For 2008, total precipitation measured at Independence is 3.82 inches; most of this occurred in January (3.65 inches), and none was recorded in March and April. The amount of precipitation in January 2008 exceeded the average January precipitation (1.2 inches) recorded from 1985 to 2008. California in general received significant amounts of precipitation in January and early February 2008; however, since precipitation was significantly below average for 2007 (2.99 inches at Independence), dry hydrologic conditions still prevail.

It is important to recognize that the winter habitat flow of 2008 was initiated right after January, which experienced above average precipitation and when groundwater levels were generally higher than in the summer time. The wetted extent of flooding could therefore have been affected by extraordinary January 2008 precipitation.

Station Name	Mean annual precipitation (in/yr)
Bishop	5.67
Lone Pine	4.06
LA Aqueduct at intake	6.49
Independence	5.98
LA Aqueduct at Alabama Gates	4.24

Seasonal Habitat Flow Table 1. Mean Annual Precipitation Values for Select Stations
In and Around the LORP Area from 1963-1984 (Danskin 1998).

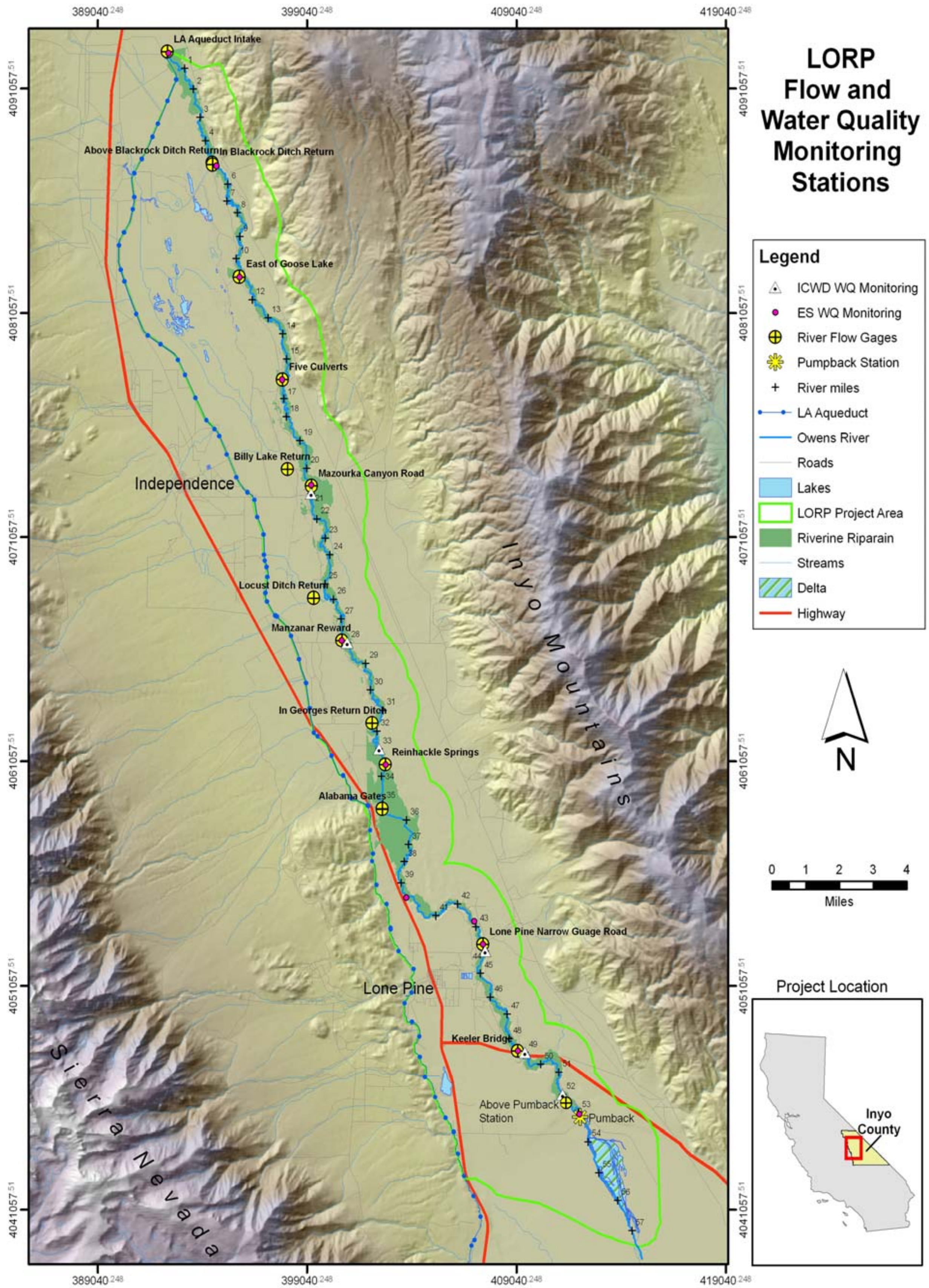
Year	Annual precipitation* (in)
1985	4.23
1986	8.66
1987	2.78
1988	3.56
1989	1.58
1990	.85
1991	6.17
1992	4.52
1993	6.36
1994	2.26
1995	10.03
1996	10.38
1997	6.44
1998	8.82
1999	1.93
2000	1.63
2001	4.22
2002	6.51
2003	4.18
2004	5.97
2005	8.37
2006	4.82
2007	2.99
2008	3.82 (to date)

Seasonal Habitat Flow Table 2. Annual Precipitation in the LORP Area From 1985 to Present.
* Precipitation data from the California Data Exchange Center, California Department of Water Resources.

[5] Precipitation data obtained from the U.S. Weather Bureau station at Independence (California Data Exchange Center, California Department of Water Resources, available at http://cdec.water.ca.gov/cgi-progs/reports/EXECSUM).

3.8. Hydrologic Infrastructure

Automated flow monitoring in the Lower Owens River occurs at ten locations from the gated release at the Intake to the Pumpback Station upstream of the Delta. Flow is also monitored in six spillgate ditch tributaries. Seasonal Habitat Flow Table 3 lists the flow monitoring stations. Seasonal Habitat Flow Figure 5 displays the locations of the flow measuring stations. Additional detailed information and descriptions of base flow monitoring, and flow measuring stations can be found in Section 4.2.1 of the *LORP Monitoring, Reporting and Adaptive Management Plan (2008)*.



Seasonal Habitat Flow Figure 5. LORP River Flow Gaging and Water Quality Monitoring

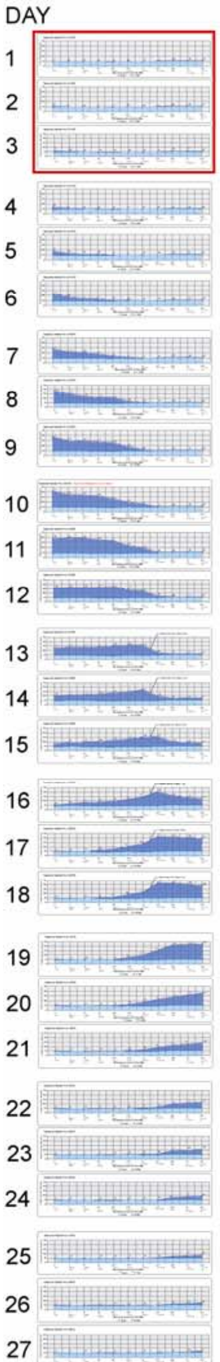
Station Name	Altitude (m)
LAA Intake	**1164**
Above Blackrock Ditch Return	1159
Blackrock Ditch Return	**1159**
East of Goose Lake	**1153**
Goose Lake Return	1154
Two Culverts	**1147**
Billy Lake Return	1144
Mazourka Canyon Road	**1140**
Locust Ditch Return	1143
Manzanar Reward Road	**1128**
Georges Return Ditch	1124
Reinhackle Springs	**1119**
Alabama Gates	1117
Lone Pine Narrow Gage Road	**1106**
Keeler Weir	**1099**
Above Pumpback Station	**NA**
Pumpback Station	**1098**
Release to Delta	NA

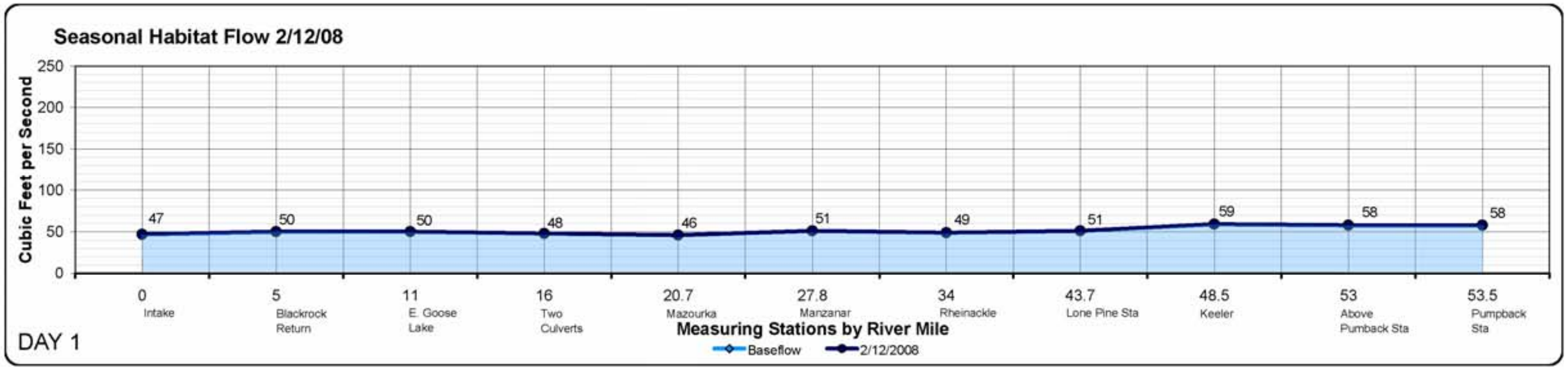
Seasonal Habitat Flow Table 3. Flow Measuring Stations and Altitude Values in the LORP
and its Tributaries In-River Stations are Indicated by Boldface Type.

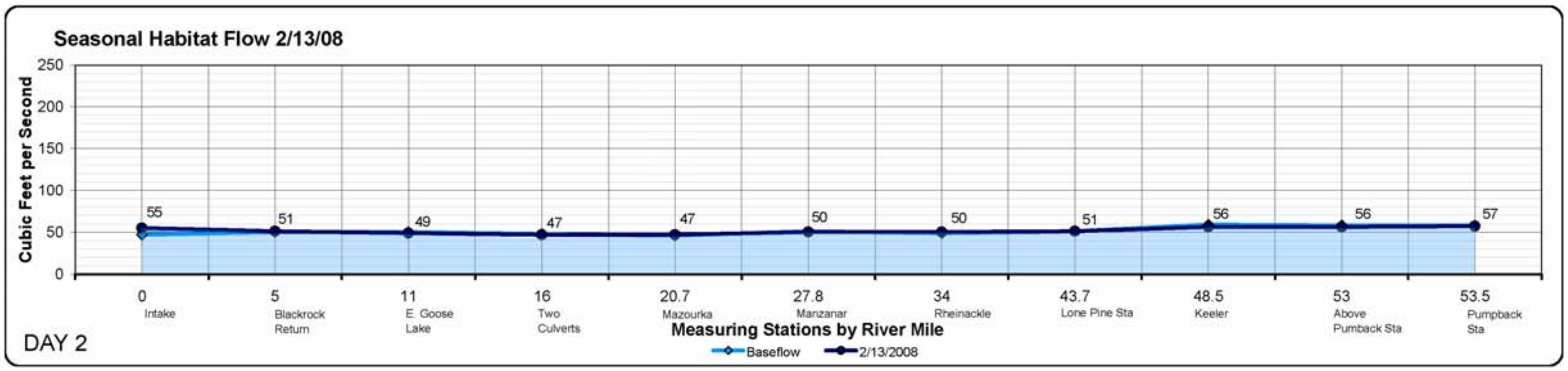
3.9. Flows

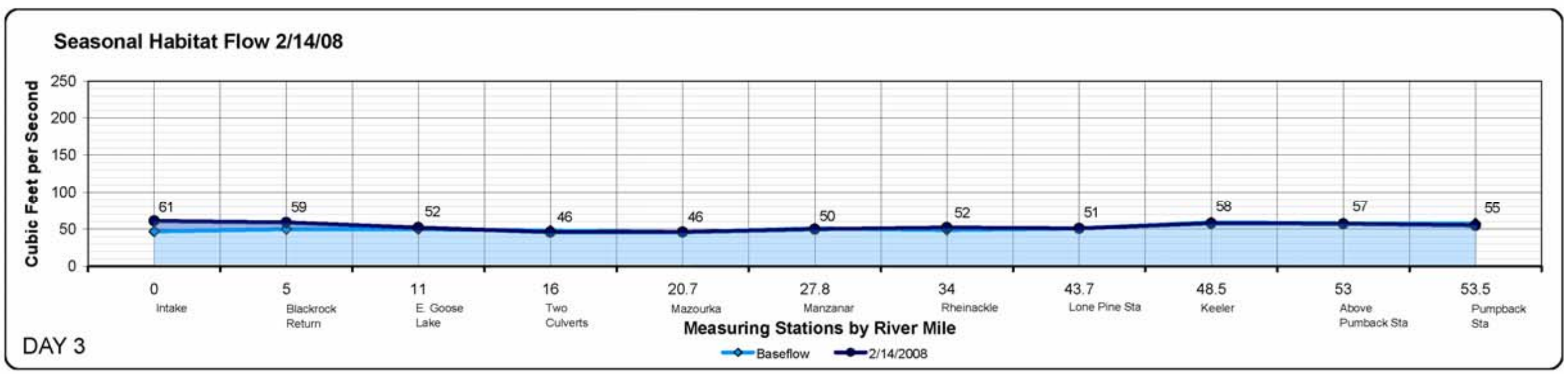
Flows in the Lower Owens River and its tributaries, including return ditches, are monitored by LADWP's automatic and manual metering equipment. Flows are reported by the LADWP website 2-3 days after the date. Flow data are presented in Appendix D. Water releases at the Intake were increased 6-25 cfs per day beginning on February 13. The entire flow event lasted for approximately 26 days at any given point on the river. The maximum flow released from the Intake, 210 cfs, was reached on February 22. The leading edge of the increased flows reached Keeler Weir on February 23. The maximum flows recorded in the Owens River during the seasonal habitat flow, and in recent history, were recorded February 29 and March 1; 223 cfs near Lone Pine, and 227 cfs at the Pumpback Station. Flows returned to normal base flow conditions at all stations by March 9, 2008.

The following illustrations (Seasonal Habitat Flow Figures 6-14) display the river flow by measuring station and river mile for each day that the flow release occurred. The illustrations display 27 days of river flow data from February 12 through March 9, 2008 (base flow to high-flow and return to base flow). The flow illustrations show base flow as light blue and the seasonal habitat high flow releases as darker blue over the base flow. River flow data for these illustrations is based on the summarized data table in Appendix D.

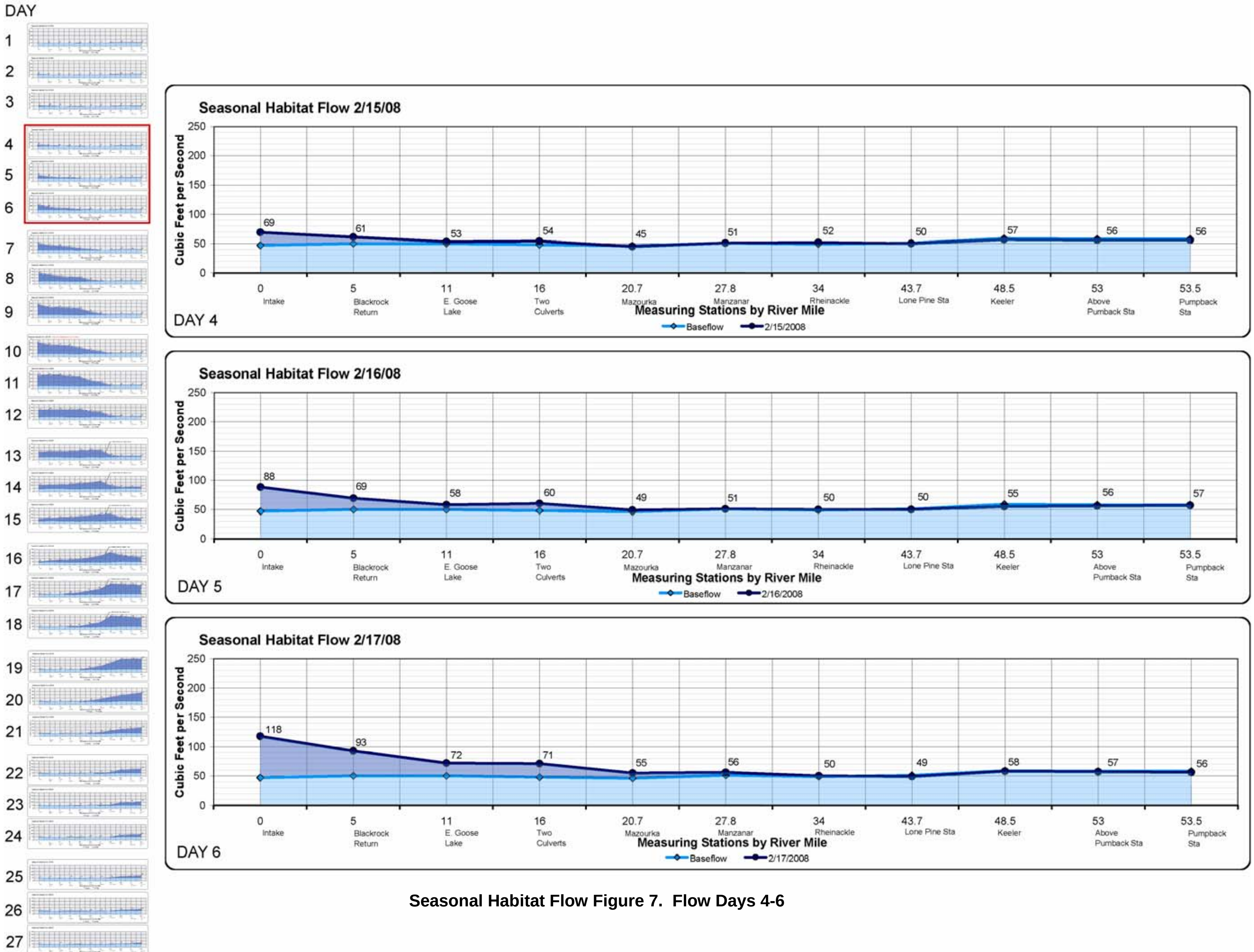




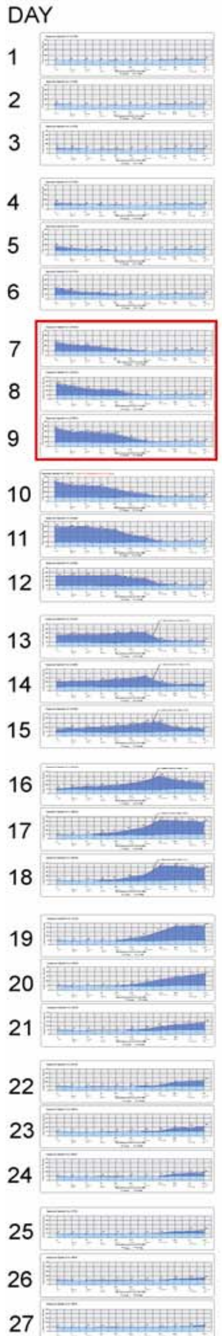


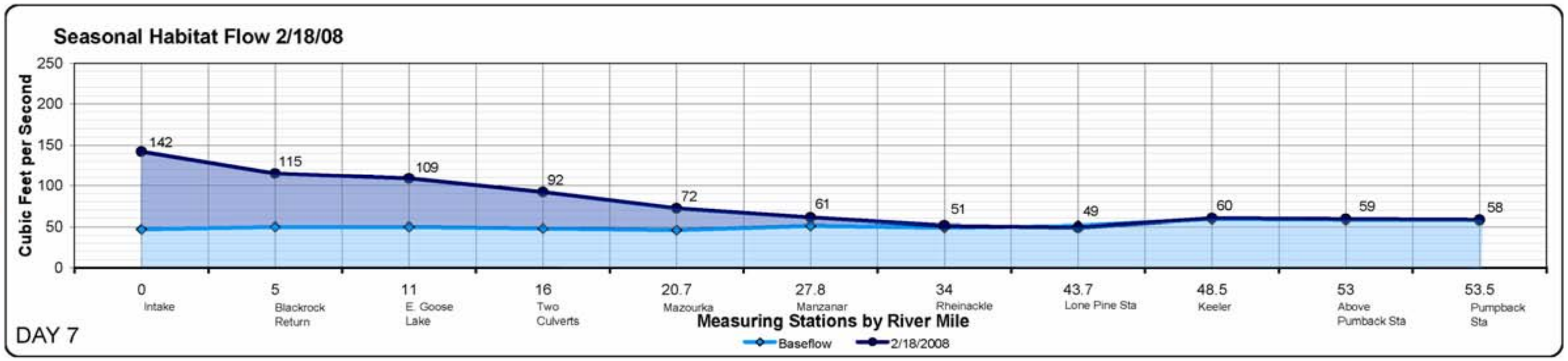


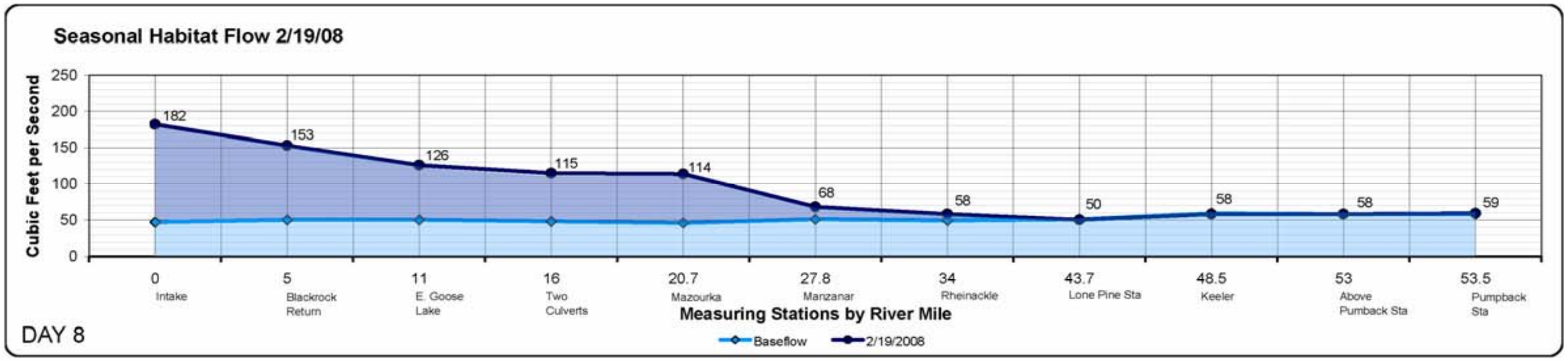
Seasonal Habitat Flow Figure 6. Flow Days 1-3

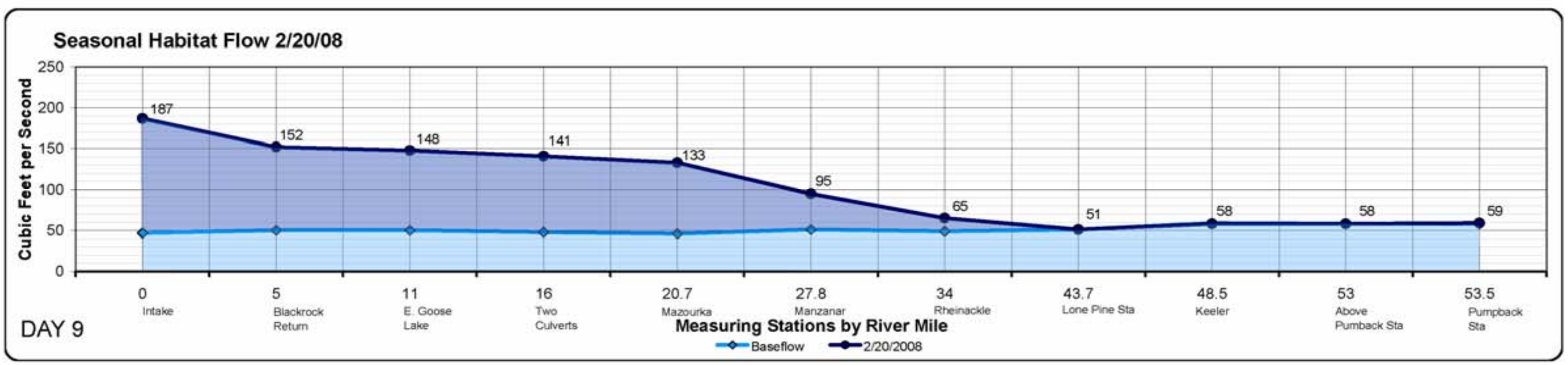


Seasonal Habitat Flow Figure 7. Flow Days 4-6

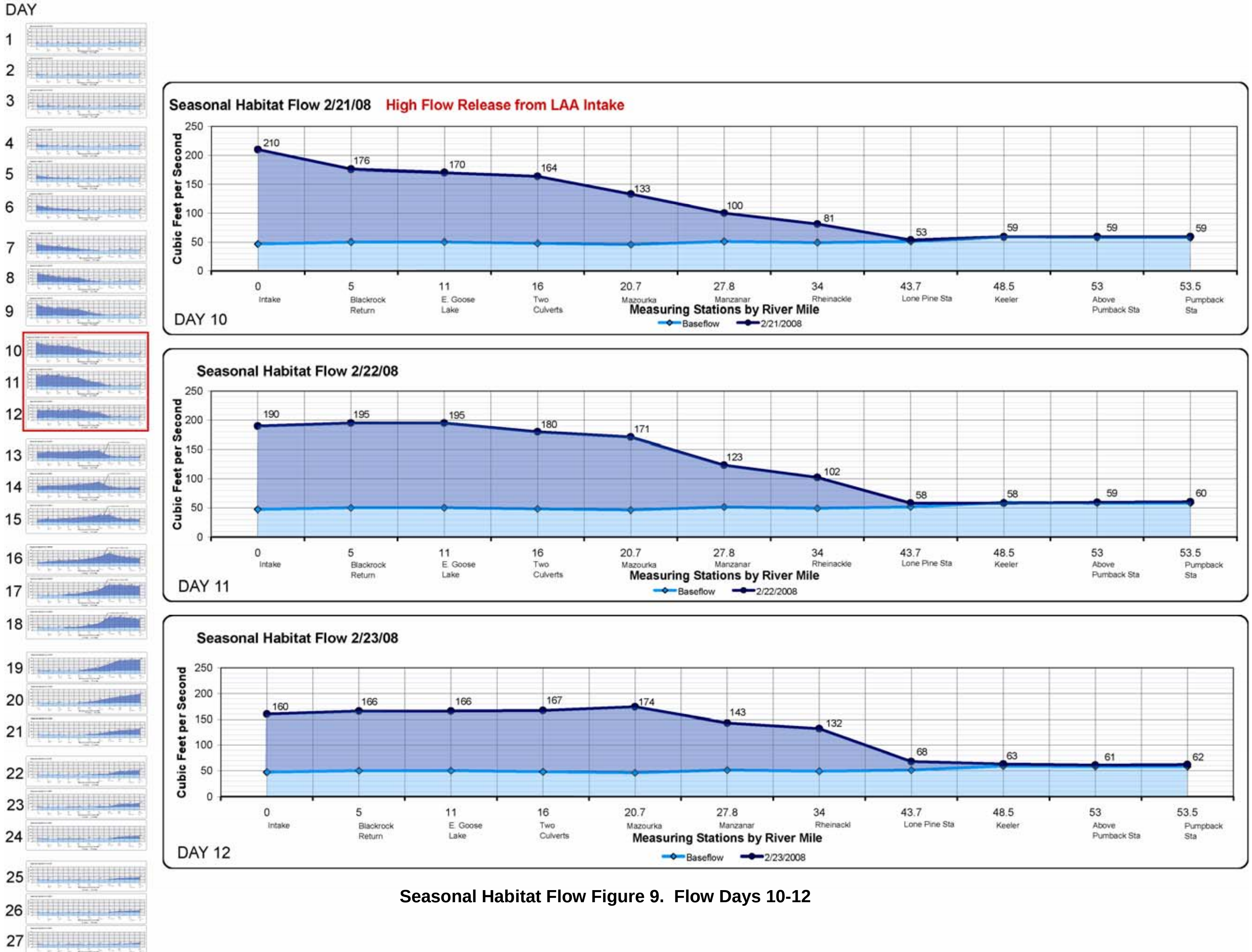




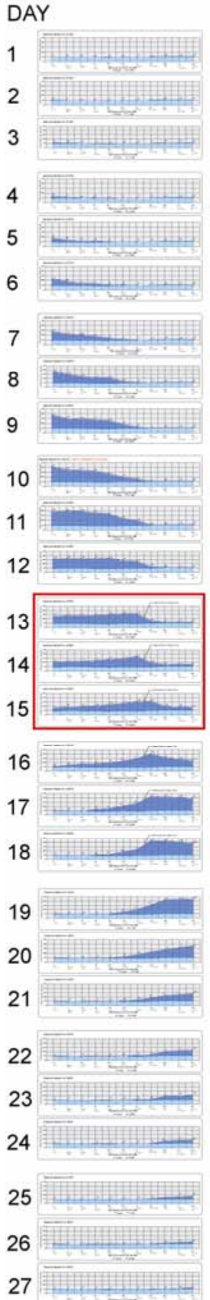


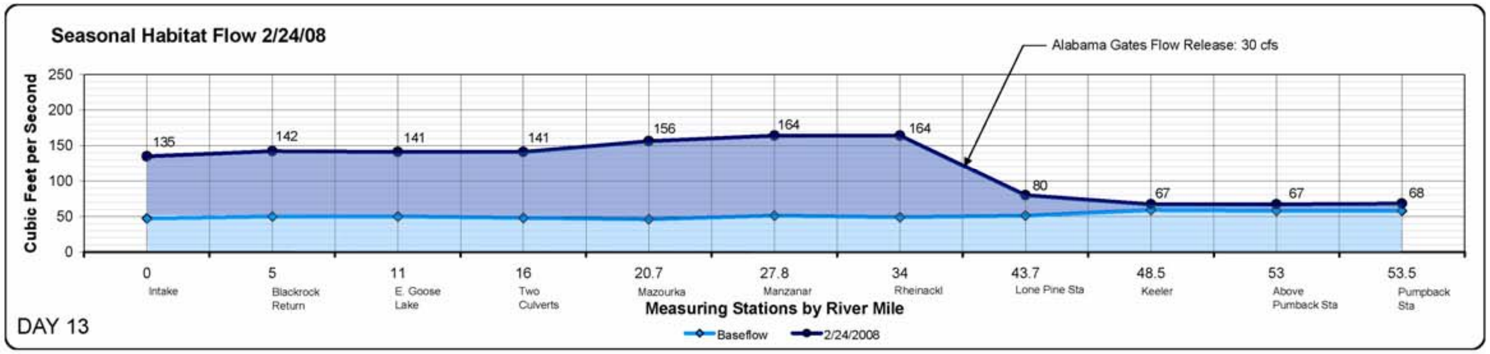


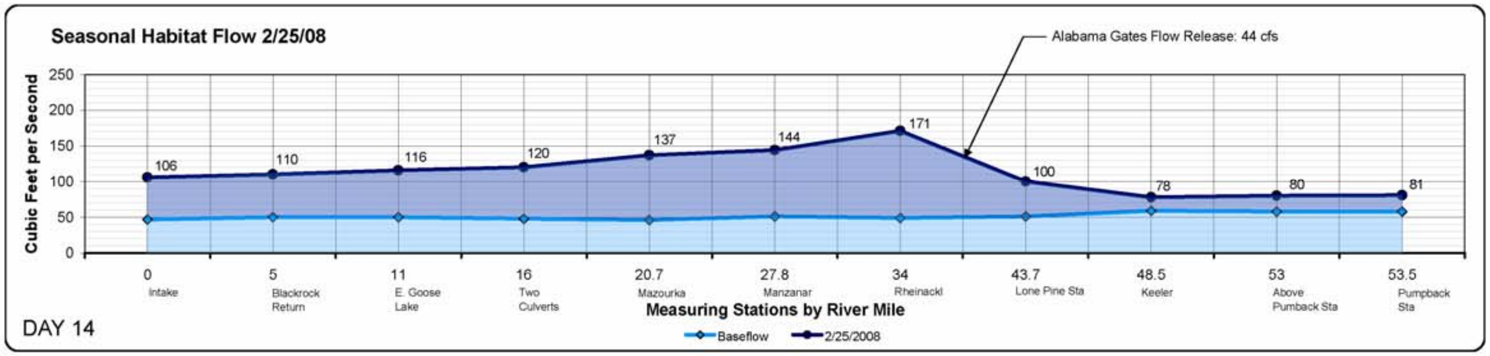
Seasonal Habitat Flow Figure 8. Flow Days 7-9

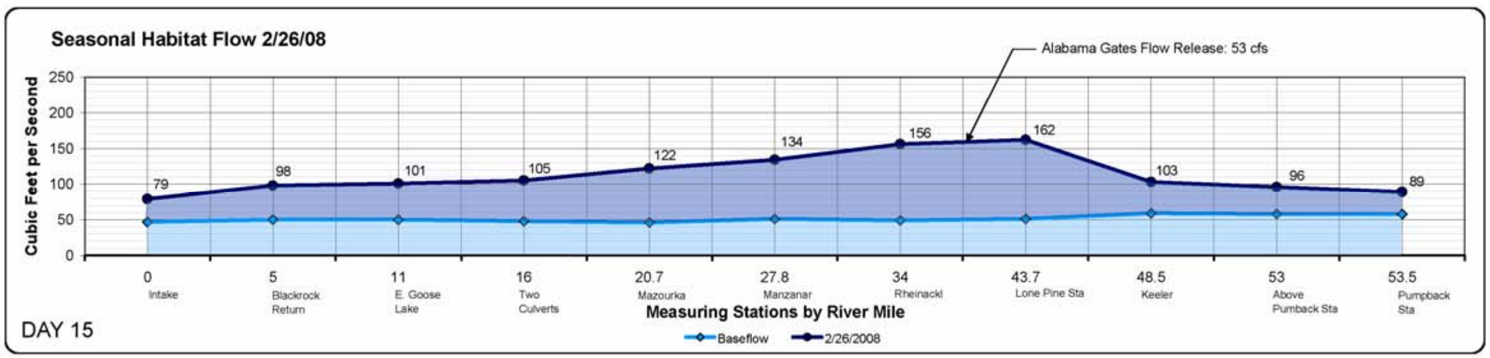


Seasonal Habitat Flow Figure 9. Flow Days 10-12

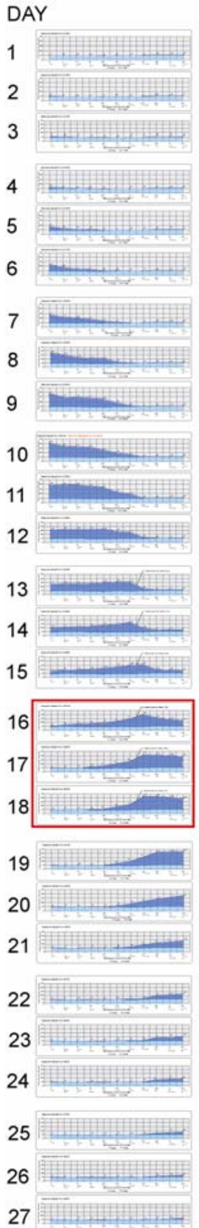


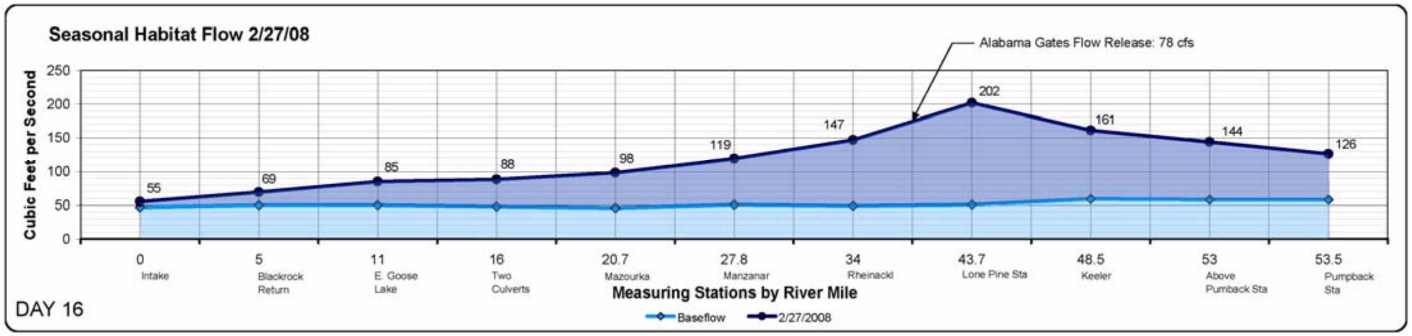


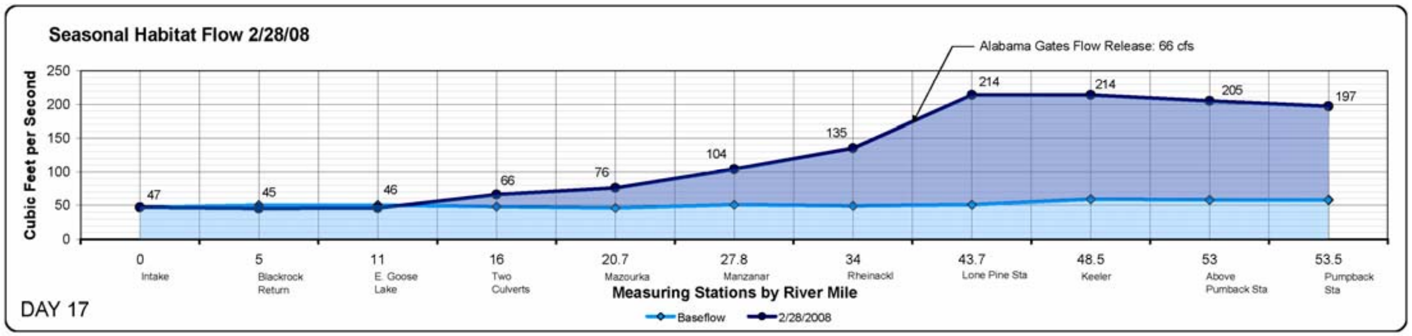


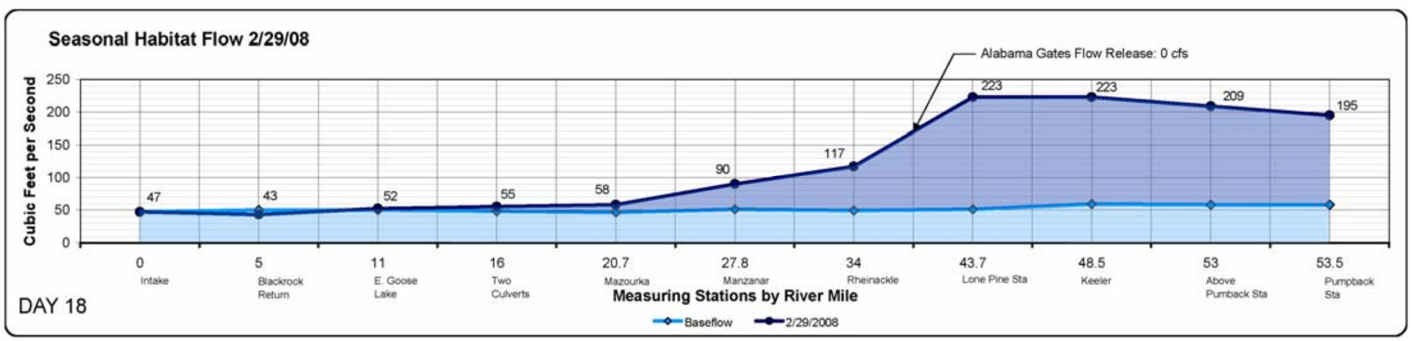


Seasonal Habitat Flow Figure 10. Flow Days 13-15

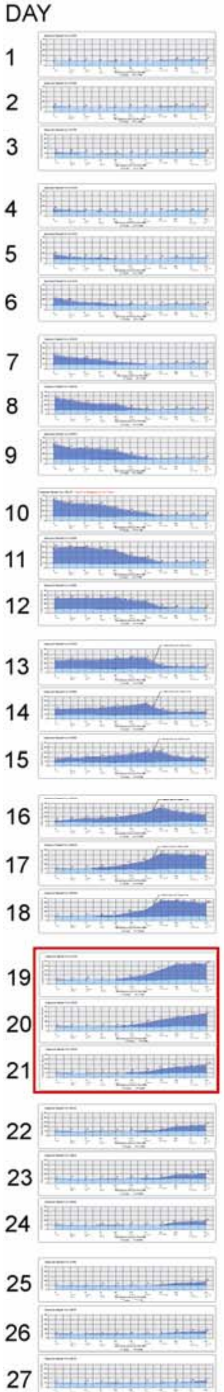


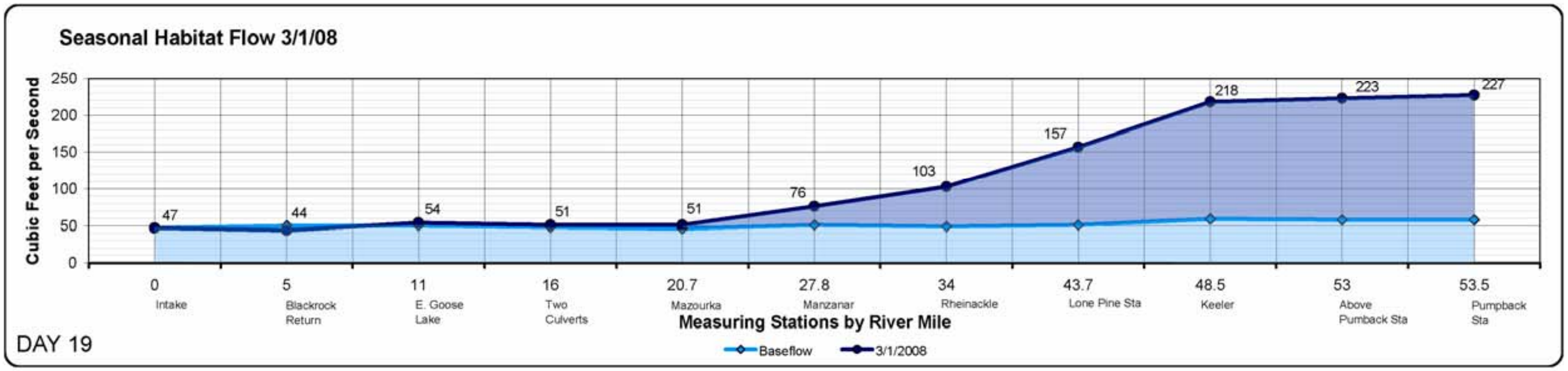


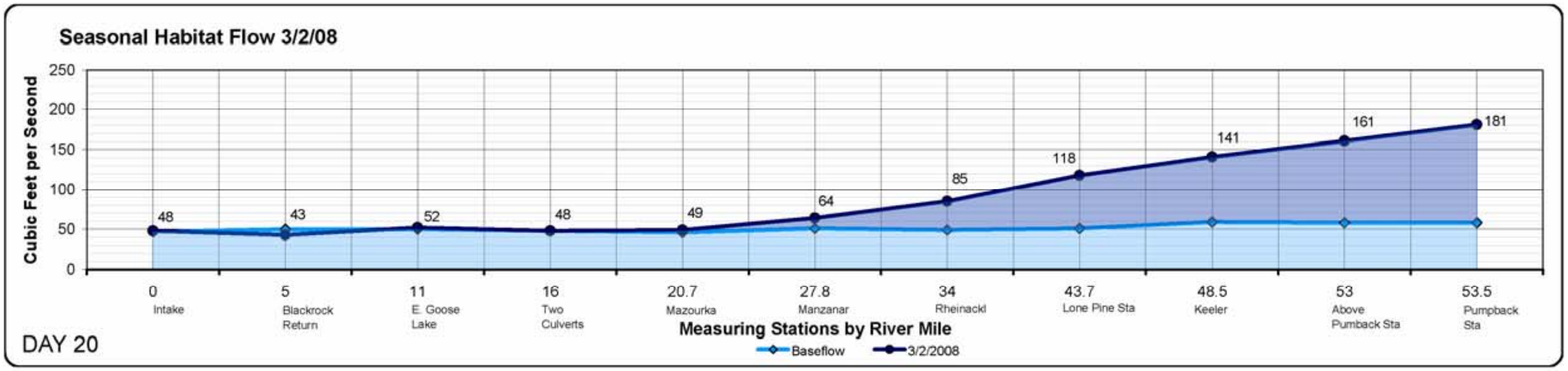


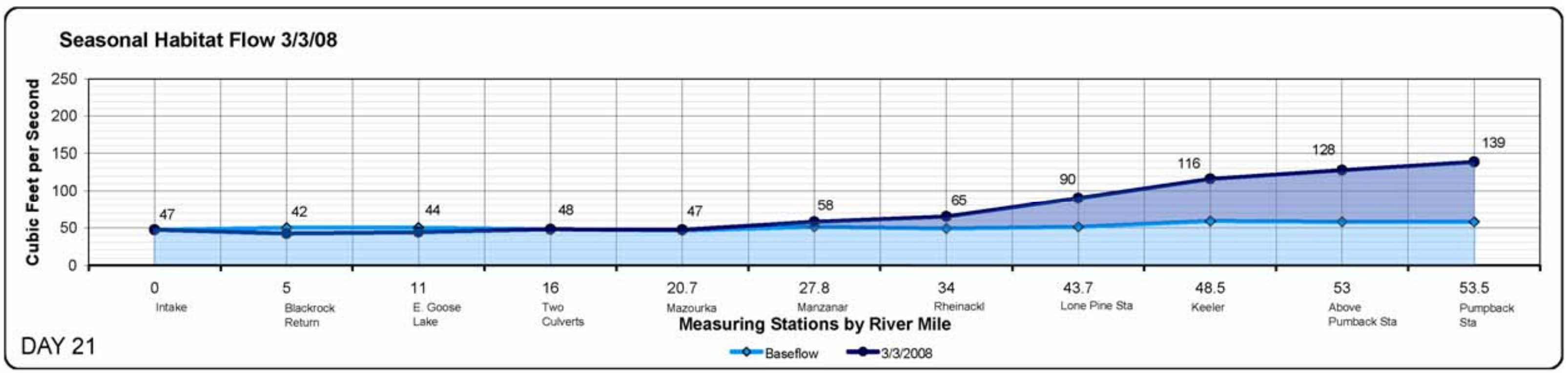


Seasonal Habitat Flow Figure 11. Flows Days 16-18.



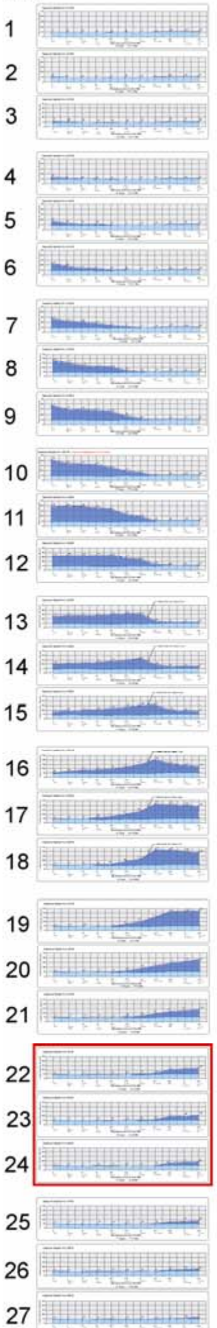


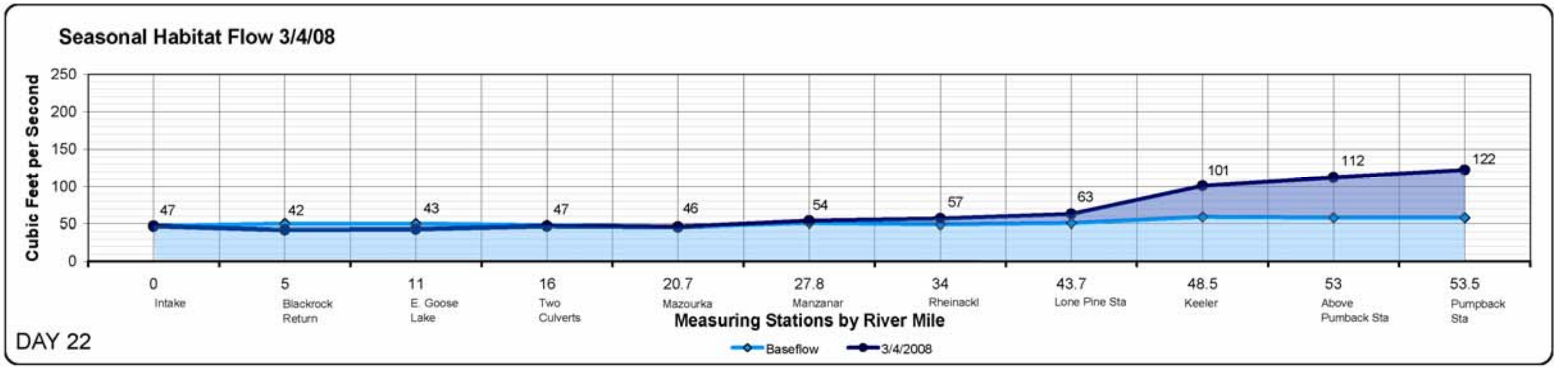


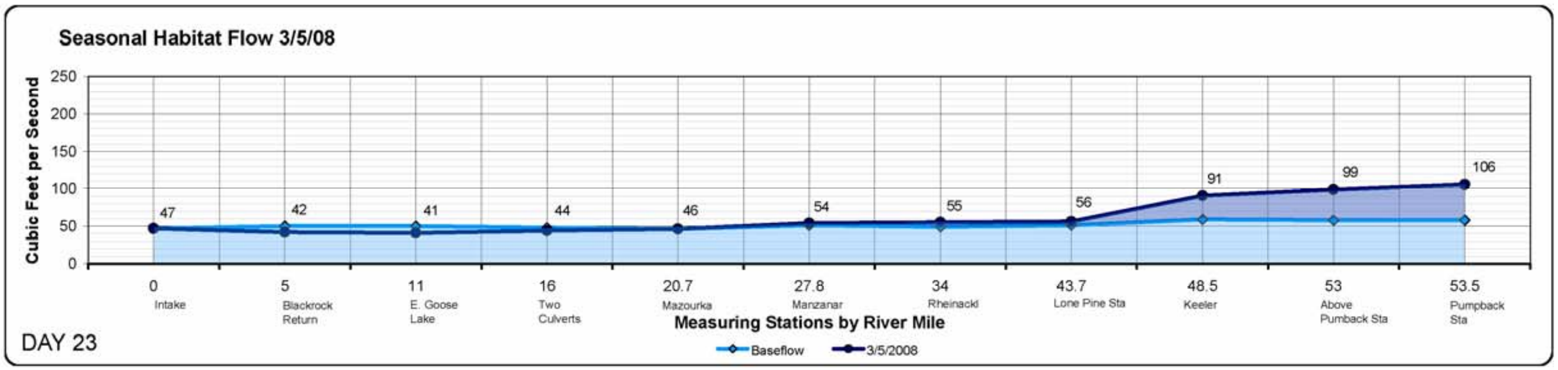


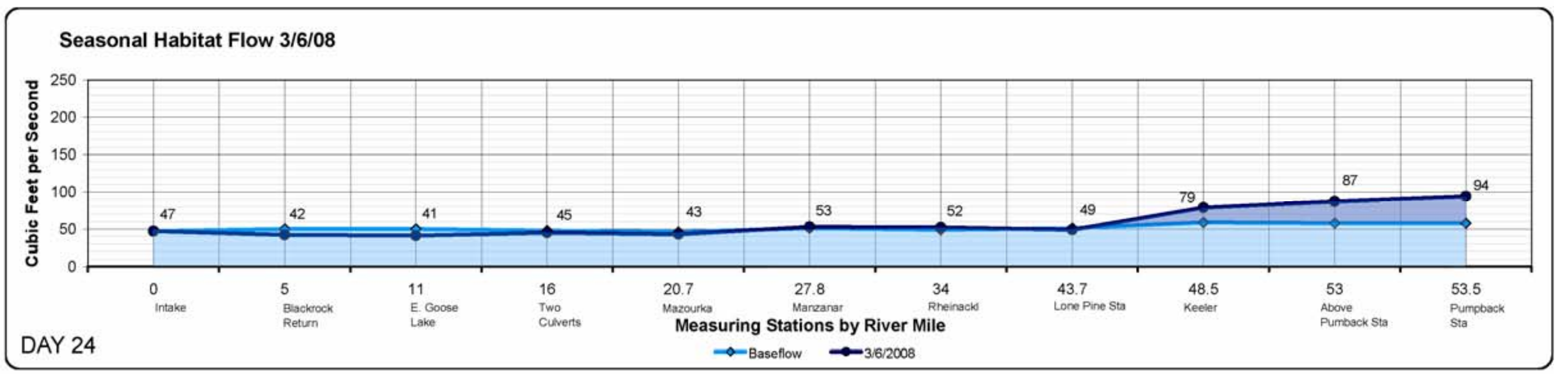
Seasonal Habitat Flow Figure 12. Flow Days 19-21.

DAY

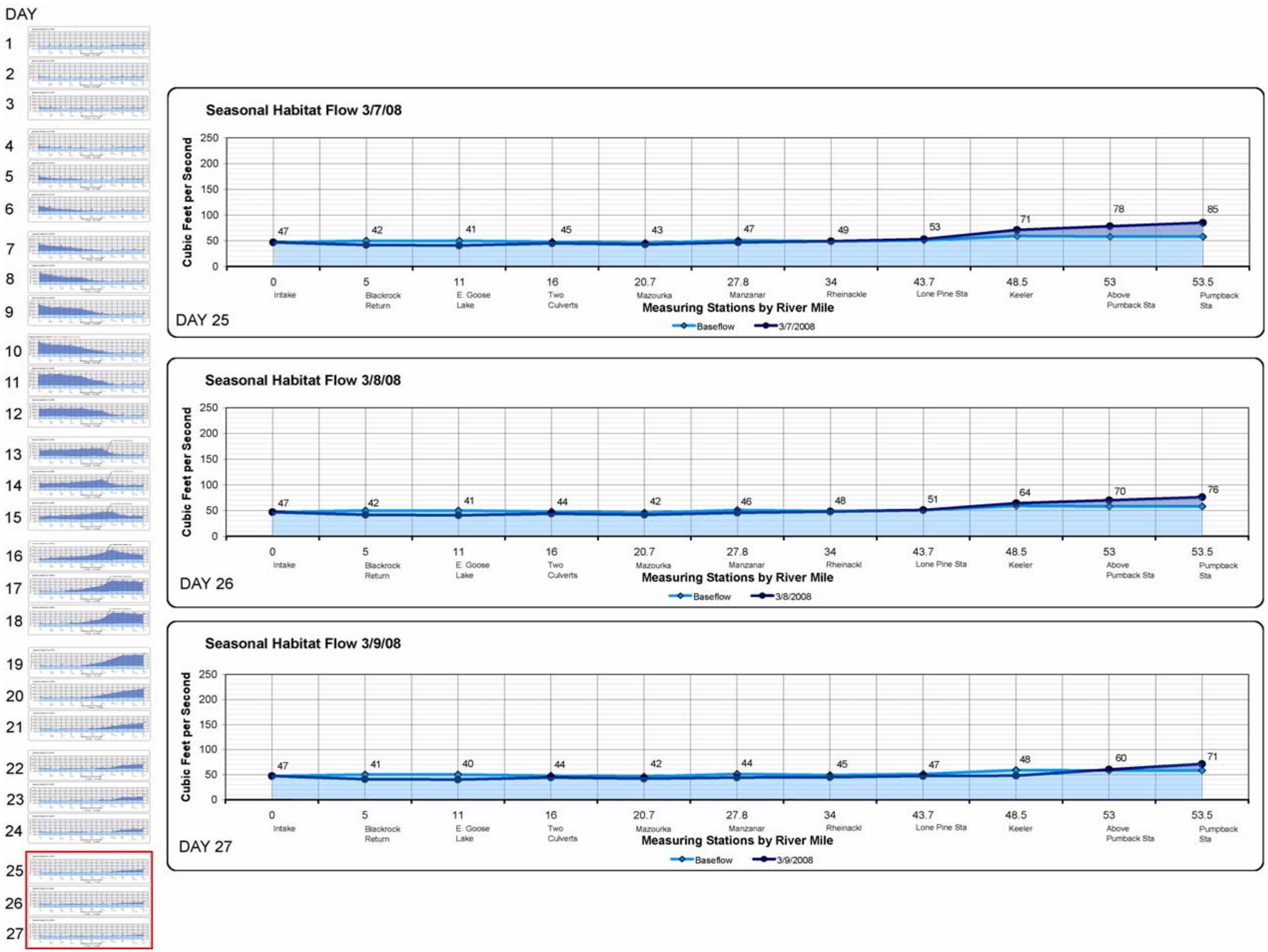








Seasonal Habitat Flow Figure 13. Flow Days 22-24



Seasonal Habitat Flow Figure 14. Flows Days 25-27.

3.10. Flow Hydrographic Analysis

This section was prepared by LADWP Hydrologists and edited by ESI

3.10.1. LORP Inflows

Just before the high flow release, the LORP inflows were 47 cfs at the Intake with an additional 7 to 8 cfs added down river at various augmentation points. The seasonal habitat flows themselves were ~~scheduled to be~~ released at the Intake as follows:

Date	Time	Flow change:
Wednesday February 13th	11:30am	47cfs to 60cfs
Friday February 15th	8:00 am	60 cfs to 70 cfs
Saturday February 16th	8:00 am	70 cfs to 100 cfs
Sunday February 17th	8:00 am	100 cfs to 130 cfs
Monday February 18th	8:00 am	130 cfs to 150 cfs
Tuesday February 19th	8:00 am	150 cfs to 175 cfs
Wednesday February 20	8:00 am	175 cfs to 190 cfs
Thursday February 21st	8:00 am	190 cfs to 200 cfs
Friday February 22nd	10:00 am	200 cfs to 175 cfs
Saturday February 23rd	8:00 am	175 cfs to 150 cfs
Sunday February 24th	8:00 am	150 cfs to 125 cfs
Monday February 25th	8:00 am	125 cfs to 100 cfs
Tuesday February 26th	8:00 am	100 cfs to 70 cfs
Wednesday February 27th	8:00 am	70 cfs to 47 cfs

*see Appendix D for measured river flows.

Additional flows were also added from Alabama Gates and were released as follows:

Date	Time	Flow change:
Sunday February 24th	10:00am	0 cfs to 50 cfs
Monday February 25th	11:00am	50 cfs to 40 cfs
Tuesday February 26th	10:00am	40 cfs to 50 cfs
Tuesday February 26th	4:30pm	50 cfs to 70 cfs
Wednesday February 27th	2:00pm	70 cfs to 90 cfs
Thursday February 28th	11:00am	90 cfs to 70 cfs
Thursday February 28th	3:00pm	70 cfs to 50 cfs
Thursday February 28th	7:00pm	50 cfs to 30 cfs
Thursday February 28th	11:00pm	30 cfs to 0 cfs

*see Appendix D for measured river flows.

3.10.2. Methods of Measurement

The Lower Owens River presents a difficult situation when it comes to measuring water flows. The river channel has a flat slope and slow flow velocities, making it difficult to use standard measuring devices with any accuracy. Flumes and weirs would not have enough channel slope fall to prevent backwater, so the Department used a meter that uses ultra-sonic technology. The meters installed along the Lower Owens River are located on the channel bottom and project a beam up through the water, measuring both depth and velocity. When combined with the surveyed cross-section of the channel, the meter calculates the measured flow.

<u>Ultra-Sonic Meter Issues on the LORP</u>

The ultra-sonic meters (from Son-Tec) are very accurate, but come with another set of problems associated with the conditions of the LORP and the flushing flows:

1) In order to calibrate these meters, manual current meter shots must be input into the meter at various flows so the programming can generate a flow curve that can account for the velocity and depth conditions and calculate the correct flows. However, the Lower Owens River had been operated at very consistent flows since initiation of base flows and all of the meters along the Lower Owens River measuring stations were only

calibrated for flows ranging from 35 cfs to 60 cfs. Outside of this range, the meters could have large margins of error without proper calibration.

2) The Lower Owens River channel has large deposits of sediment that are constantly moving downstream. The moving sediments often cause the velocity profiles at the flow measuring stations to also shift, thus causing inaccuracies in the flow measurement data.

Solution to Providing Accurate Flow Data

Generally, when flows measured using the ultra-sonic meters are inaccurate due to the shifting of velocity profiles or out-of-calibration reads a simple manual current metering of the flows can bring the accuracy back to normal water measurement standards. During the flushing flows, the Department scheduled crews to manually current meter any station along the Lower Owens River experiencing flows above 60 cfs and increasing daily. This established a 'shift' that could be applied to provide an accurate flow measurement at the station. As the flows at each station came down, the same shift was applied as on the upwards flow curve that was established by the manual current metering.

Flow Measurements Problem Areas

The ultra-sonic meters, combined with the manual current metering provided accurate flow measurements at almost all of the stations. Areas that experienced measurement problems during the flushing flow event include:

1) **Issue:** At around 10 p.m. on February 21 the meter at 'Above Blackrock Return' along the LOR began reporting inaccurate flows. Investigation by LADWP crews the next morning revealed sediment had built up high enough to top over the meter and block the measuring beam. The sediment was cleaned out and a manual current metering was performed to make sure the meter was reading accurately. However, the meter was not reading accurately between 10 p.m. and 11 a.m. the next day.

Future Fix: Under the conditions of the Lower Owens River, this problem will likely reappear during future flushing flow events. LADWP crews will monitor the sediment during the manual current metering and remove the sediment when excessive build ups occur.

2) **Issue:** The reported flows at Keeler Bridge topped out at around 150 cfs, but manual current metering showed flows of just over 220 cfs. Further investigation revealed that the upper portion of the cross-section where the water flowed over the walls was not recorded by the meter, so any flows passing over the walls were not being accounted for by the meter. The flows were manually current metered daily and compared with the flows at the Lone Pine Narrow Gage Road Station just upstream in order to provide accurate estimates at the Keeler Bridge Station.

Future Fix: The cross-section over the walls will be included in the meter programming at the station and the flows should be measured accurately by the meter during future flushing flow events.

3) **Issue:** Water flowing by the Pumpback Station was held up by the vegetation in the Delta to the point where the flows backed up and submerged the weir and the Langemann Gate, which measures flows going into the Delta. The submergence happened when flows were above 160 cfs in the river channel. In order to achieve accurate flows, a manual current meter read was taken daily just upstream of the Pumpback Station.

Future Fix: Unless substantial vegetation clearing is performed in the channel going to the Delta (unlikely due to environmental issues), this problem will occur during future flushing flow events when flows are at or above 160 cfs at the Pumpback Station. LADWP crews will continue to manually current meter just upstream of the Pumpback Station in order to obtain accurate flows whenever this occurs.

Flow Peaks and Travel Times

The time for the peak 200 cfs flow to move down the LORP was 8 ½ days from the Intake to the Pumpback Station. Based on previous studies, the velocities averaged around 1 ft/sec during the flushing flows. Below is a schedule of the peaks and travel times taken at the Lower Owens River measuring stations:

Station	Begin Peak	Peak Flow (cfs)	Peak Dur. (hrs)	Travel Time (hrs)	Travel Time from Intake	Distance (miles)
Intake	2/21 at 11am	220	24	--	--	--
Blackrock	2/22 at 4am	217	11	17	17 hours	5
E/O Goose	2/22 at 10am	213	9	6	23 hours	6
Two Culverts	2/22 at 9pm	194	7	11	1 day, 10 hours	8
Mazourka	2/23 at 7am	177	9	10	1 day, 20 hours	5
Manzanar	2/24 at 10am	165	8	27	2 days, 23 hours	7
Reinhackle	2/25 at 1am	173	25	13	3 days, 12 hours	6
LP at NG Rd	2/28 at 6pm	247	12	84*	7 days (approx.)	11
Keeler Bridge	2/29 at 3am	225	21	9	7 1/2 days (approx.)	5
Above Pumpback Station	3/1 at 1am**	225**	24**	22**	8 1/2 days (approx.)	5
Alabama Gates	2/27 11am	90	21	--		
* The travel time to Lone Pine Narrow Gage is approx. due to inflows from Alabama Gates confusing the peak flow timing.						
** The pumpback station peak and timing is estimated due to backwater from the delta						
submerging the weir at the pump station. Flows at the pumpback station were taken once a						
day with a current metering device.						

Seasonal Habitat Flow Table 4.
Flow Peaks and Travel Time Schedule.

The travel times for the lower portion of the Lower Owens River below Alabama Gates and the Islands had to be approximated due to the inflows from Alabama Gates making analysis of when the true peak passing through Reinhackle Springs actually reached the Lone Pine Narrow Gage Station.

3.11. Photo and Video Monitoring

3.11.1. Photo Points Monitoring

Photo Point monitoring qualitatively records the changing nature of the Lower Owens River throughout the duration of the seasonal habitat flow. Photo Points were established at each flow monitoring station within the LORP area (Seasonal Habitat Flow Figure 5; ES WQ Monitoring Stations points). Generally, photos were taken from a fixed position facing upstream, downstream and across the river channel. Multiple pictures from each location qualitatively records water surface elevation changes per day associated with the seasonal habitat flow. Photo points also record the effect of the seasonal habitat flow on LADWP/Inyo County infrastructure (the LAA Intake, Culverts, and the Pumpback Station). Additionally, pictures of interest were taken of areas near each flow monitoring station. For example, several flow monitoring stations have staff gages and pictures of these gages were taken at various water flows.

Photos were taken using a digital camera. Photo location, date of photo, time of photo, direction facing, and a description of the photo was recorded on photo record. Each monitoring day upon returning from the field photos were downloaded to a computer and named. Photo point monitoring of the seasonal habitat flow occurred from February 15 to March 1, 2008.

3.11.2. Qualitative Comparisons

Generally, water surface elevation increased with flow; inundating out-of-channel landforms and flooding previously dry vegetation. The following figures qualitatively depict changes in the Owens River and its adjacent landforms due to increased flow. Appendix B contains all photo point locations pictures and qualitative comparisons.

Below Blackrock Return Ditch at 50 cfs.

Below Blackrock Return Ditch at 50 cfs with 200 cfs flow overlay (blue layer). Note that emergent vegetation and Instream islands are fully inundated by flow.

Below Blackrock Return Ditch at 200 cfs.

Facing Downstream – 50 cfs 2/19/2008	Facing Downstream – 202 cfs 2/27/2008

Seasonal Habitat Flow Figure 15. Qualitative Comparison of Lone Pine Narrow Gauge Road Photo Point.

River Near Lone Pine – 47 cfs 2/17/2007	River Near Lone Pine – 200 cfs 3/1/2008

Seasonal Habitat Flow Figure 16. Qualitative Comparison of River Floodplain Inundation/Flooded Extent Near Lone Pine. The left photo shows the river at base flow, right photo shows the river and inundated floodplain at high flow.

River floodplain inundated at high flow – 200 cfs 3/1/2008

Seasonal Habitat Flow Figure 17. Picture is a Flooded Reach of the River at Approximately 200 cfs.

The green-blue line in the photo represents the confined river channel and wetted edge under base flow conditions. This reach of the river was significantly inundated with flooding during the high flows.

3.11.3. Video Monitoring

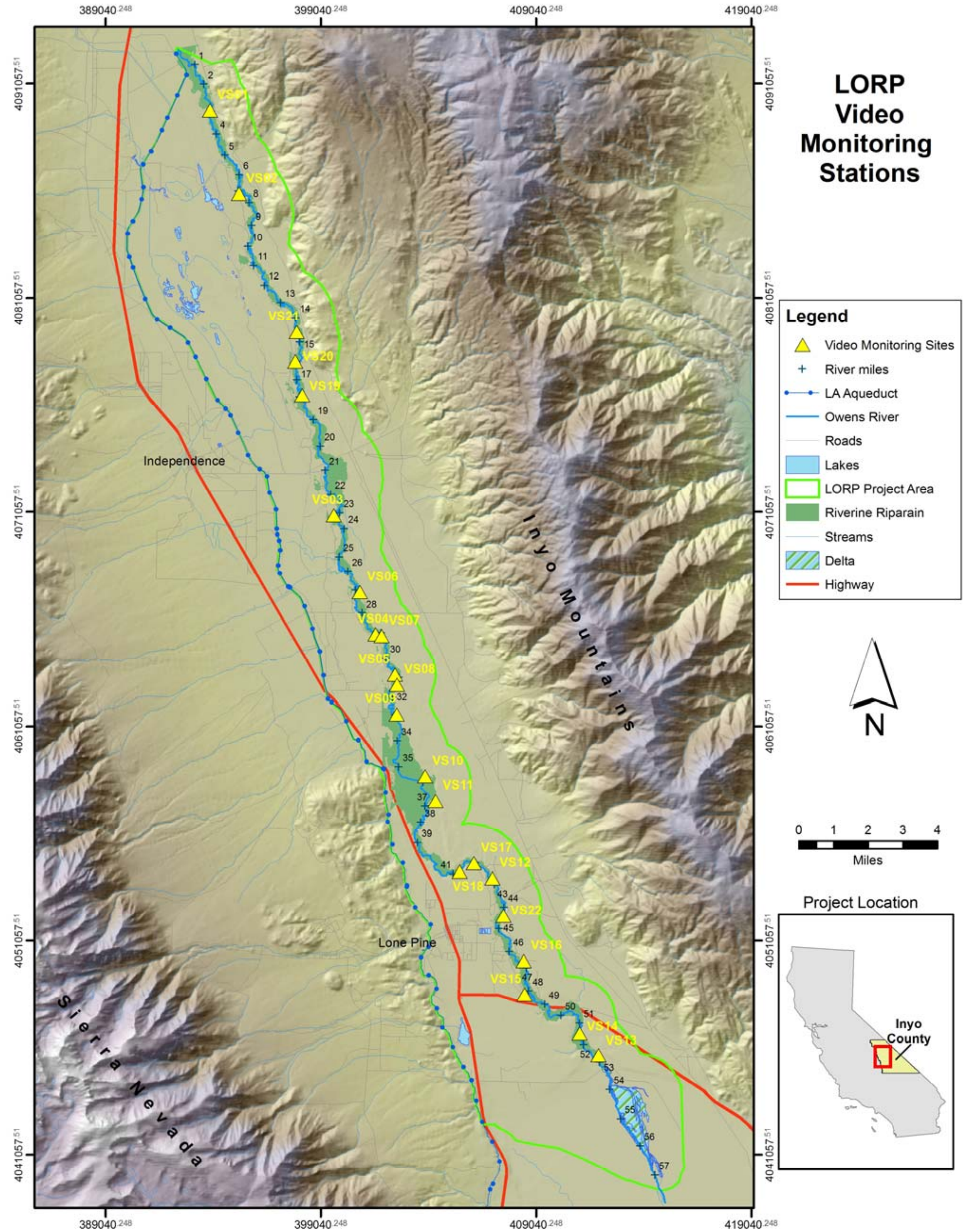
Video monitoring provides a visual and qualitative benchmark from which change can be evaluated. Monitoring is performed twice per year, once in the winter and once in the summer, and for special occasions such as seasonal habitat flow events. Twenty-one baseline monitoring sites were established in 2006: "VS01" – "VS21;" these original sites are highest priority for each semi-annual monitoring effort. More sites are added as needed. Video site locations are displayed in Seasonal Habitat Flow Figure 18. Video footage of the seasonal habitat flow is not included in this report.

The video monitoring effort is qualitative and designed to be flexible in order to adapt to future circumstances, but the following protocols are in place to standardize the process to a reasonable degree.

Protocol:

1. Perform sampling twice per year: once in the winter when leaves are not present on deciduous trees and once in the summer during the vegetation growing season.
2. Locate video site location with GPS and assess site for visual cues and obstructions.
3. Prepare video cue board: "*date*; LORP Video Monitoring, Site No.: VS-*XX.*"
4. Stand at exact video site location and focus camcorder on cue board and start recording; direct camcorder up-valley and proceed to turn 180 or 360 as necessary while capturing LORP riparian area with a wide angle for approximately one minute; return to up-valley and then turn and zoom as necessary to capture riparian area and views of interest for 1-2 minutes; total video sample for each site should be 2-3 minutes.
5. Complete checklist and note pertinent information in comment area, as necessary.
6. At end of sampling process, mark title of MiniDV cassette and process as necessary to DVD acceptable file.

Thirty-four minutes of video were recorded at 14 sites in late March, ~~during~~ ***following*** the LORP 2008 Initial Seasonal Habitat Flow. Since the flow event and the monitoring occurred prior to spring leaf-out, flooding is easily identifiable in each video segment; this may be the only flooding event of the project that occurs when leaves are not obstructing the viewfield. The product of the video monitoring will serve as a qualitative measurement to which future monitoring efforts will be compared and contrasted.



Seasonal Habitat Flow Figure 18. LORP Video Monitoring Sites.

3.12. Water Quality

3.12.1. Background

Water quality monitoring was performed by ICWD and ESI. Methods and a summary of results for both entities' efforts are presented here, and the data tables are provided in Appendix A.

3.12.2. Environmental & Regulatory Setting

The *LORP Monitoring, Adaptive Management and Reporting Plan* describes water quality monitoring protocols and pertinent issues in detail (pp. 3-47 to 3-49, and 4-11 to 4-14).

3.12.3. Water Quality Methods

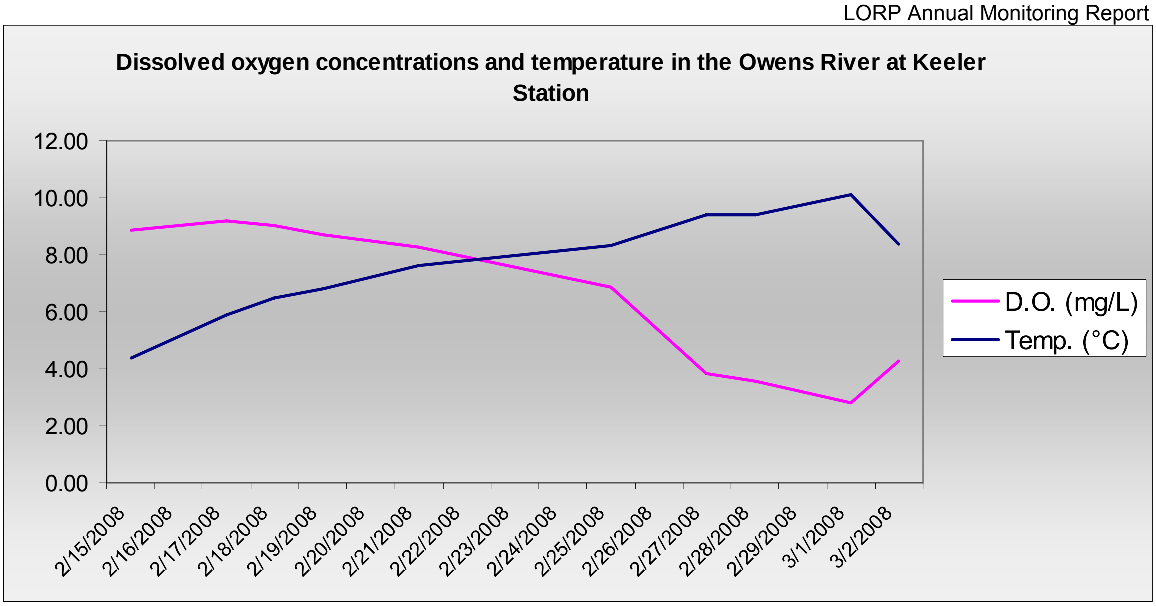
River water quality was measured by ESI at twelve locations listed in Seasonal Habitat Flow Table 4, and illustrated in Seasonal Habitat Flow Figure 5. Water quality measurements were taken with a multi-parameter *YSI meter* by ESI scientist wading into the main current of the river. Water quality parameters recorded included odor, color, visibility, dissolved oxygen (DO), temperature, conductivity, specific conductivity, and salinity. Sites were sampled once a day, eight to eleven times during the seasonal habitat flow (depending on the site). The purpose of ESI water quality monitoring was to keep project managers informed of current conditions.

River water quality was measured by ICWD at Mazourka Canyon Road, Manzanar Reward Road, Reinhackle Spring, and Keeler Bridge. Staff used a *HydroLab Quanta* and a *Hach Test Kit* to analyze river water quality. Water quality parameters evaluated and recorded by ICWD included dissolved oxygen, turbidity, pH, electrical conductivity, temperature, ammonia, hydrogen sulfide, and tannins and lignins. Water quality sampling was performed 14 to 15 times at each site during the seasonal habitat flow; sampling occurred once each day. The purpose of ICWD water quality monitoring was to fulfill MOU requirements.

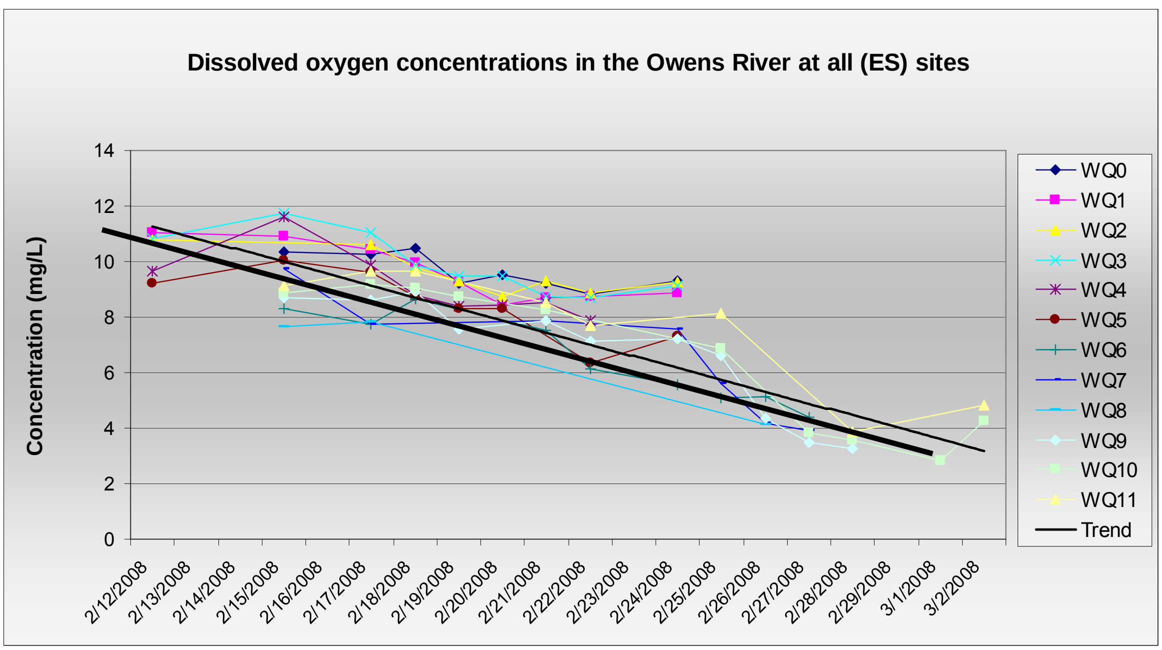
3.12.4. Water Quality Results

Results of the ESI and ICWD water quality testing are presented in Appendix A. As flow increased, there were changes to most of the measured water quality variables, most notably temperature and DO. Odor remained constant at "none", except for an occurrence of high ammonia and hydrogen sulfide at Lone Pine Narrow Gauge Road and Keeler Weir on February 28, 2008. Color generally changed from green or tea to brown as the flows increased. The ICWD turbidity readings showed an increase in turbidity in response to higher flows, peaking between February 27 and February 29, 2008. Visibility varied at the different water quality measuring stations. The pH levels went from acidic at the ICWD measuring stations to more basic over the February 14 to March 2, 2008 monitoring period. The conductivity increased as the flows increased, reaching a level of 1,034 μs/cm on February 28, 2008 at the Pumpback Station. Salinity stayed constant at most of the upstream measuring stations and showed slight increases at downstream stations as the flows increased.

The most important water quality issue during the seasonal habitat flows was dissolved oxygen. It is believed that low DO levels contributed to the fish kills in the Lower Owens River during the 1993 flow studies. Temperature is inversely related to dissolved oxygen, which is why the first seasonal habitat flow was scheduled for winter when cooler temperatures allow water to hold more oxygen. Seasonal Habitat Flow Figure 19 illustrates the relationship between temperature and dissolved oxygen at Keeler Weir. Seasonal Habitat Flow Figure 20 shows DO levels at all stations on all sampled dates. Dissolved oxygen concentrations were higher upstream then downstream. Temperatures were lower upstream, and steadily increased downstream to Keeler Weir. Generally, the lowest DO values at each site coincided with the peak flow at each site. For the sites that were monitored over a longer time period, DO concentrations increased as the flooding receded and almost returned to pre-flood values. The lowest DO concentration was 2.82 mg/L at Keeler Weir on March 1, 2008 when the flow was recorded at 218 cfs.



Seasonal Habitat Flow Figure 19. Dissolved Oxygen Concentrations and Water Temperature in the Lower Owens River at Keeler Station.



Seasonal Habitat Flow Figure 20. Dissolved Oxygen Concentrations in the Lower Owens River at ES Sites.

Name	Code	Altitude (m)	River mile (below Intake)
LAA Intake	WQ0	1164	0
Blackrock below Blackrock Ditch Return	WQ1	1159	5
East of Goose Lake Gage	WQ2	1153	11
Two Culverts	WQ3	1147	16
Mazourka Canyon Road	WQ4	1140	20.7
Manzanar Reward Road	WQ5	1128	27.8
Reinhackle Gage	WQ6	1119	34
Below Alabama Gates	WQ7	1111	39.5
Lone Pine Ponds at Trestle	WQ8	1107	42.8
Lone Pine Narrow Gauge Road	WQ9	1106	43.7
Keeler Weir	WQ10	1099	43.7
Pumback Station	WQ11	1098	53

Seasonal Habitat Flow Table 5. Water Quality and Flooded Extent Observations Points.
Location information provided along with code (used in Appendices tables).

3.13. Field Data Collection Methods

During the high flow event, three previously established study sites were visited and measurements taken to evaluate the flooded extent in relation to past mapping efforts. Part or all of the three study sites were surveyed directly during the flow event. An effort was made to survey and stake sites when they were close to the peak flows. Often it was difficult to determine the precise day that peak flows would move through a site.

Field maps depicting the study site with study plot transects and fence posts were generated and brought to the field along with stakes, flagging, and a GPS (loaded with plot information, including river shape, transects and fencepost). Personnel walked along the river's flooded edge, mapping the flooded extent on their field maps as they walked between transects. Stakes were placed and GPS points taken where the transects intersected the flooded extent. This often involved staking side channels and oxbow lakes.

The water surface elevation and wetted width of the river channel was measured at baseflow and high flow using transects that dissect the river corridor at each plot (locations and site selection are described below). WSE and wetted width was measured at 21 cross channel transects within plots 2, 4 and portions of 5 (see Seasonal Habitat Flow Figure 22 for plot locations). Each cross channel transect illustrates the height of the landform above the water surface elevation (WSE). Attained the height above WSE and length along the transect of the wetted width using a laser transit that records horizontal distance, vertical height and bearing in degrees. Refer to Section 4.2.7.2 *Site Scale Vegetation Assessment and Landform Elevation Mapping* of the LORP Monitoring and Adaptive Management Plan (2008). Seasonal Habitat Flow Figures 28-31 show representative river reach cross sections at both Plots 2 and 4 and illustrate conditions at baseflow and high flow.

Field maps and GPS points were used to digitize an estimate of flooded extent at each site using *ESRI's Arcview 9.2*. These shapefiles informed the mapping effort described in the mapping methods below.

3.14. Base Flow and Flooded Extent Mapping Methods

Aerial digital imagery taken from multiple helicopter flyovers of the LORP study area were used to map the base flow and the flooded extent before and during the seasonal habitat flows. Digital still images and ground surveys were also used to ground-truth the flooded extent data derived from the aerial digital imagery. These data were used to derive the amount of area flooded (expressed in acres), the types of landforms flooded, and the cover types flooded at different intervals during the seasonal habitat flow event. These methods are described below.

3.14.1. Site Scale - Plot Mapping Analysis Methods

Mapping was conducted to document the extent of flooding during the seasonal habitat flows. Aerial digital video was taken at base flow (year-round flow of equal to or greater than 40 cfs) prior to initiation of the seasonal habitat flow, and during the ramping of the flows. LADWP personnel used a georeferenced FLIR Systems stabilized digital video camera mounted on the LADWP helicopter, which allowed for easy location of video frames in geographic space. The helicopter flights generally progressed from south to north beginning with Owens Lake and following the Lower Owens River channel north to the Los Angeles Aqueduct Intake. LADWP personnel narrated the aerial video as they flew over landmarks such as roads and stream confluences. The helicopter's altitude, bearing and angle of view varied depending on weather conditions and width of the floodplain.

Seven helicopter flights were conducted over 17 days from February 19 to March 5 (Seasonal Habitat Flow Table 6). On February 7, prior to initiation of habitat flows, a helicopter flight recorded the base flow conditions. Video from days that represent the lowest flows and highest flows (see highlighted flows on Seasonal Habitat Flow Table 5) were used to map the seasonal habitat flow event. The aerial video imagery was used to digitize flooded extent in ArcView 9.2. Base flow and seasonal habitat flow flooded extent were digitized on screen, side-by-side with the digital video imagery running on Corel Win DVD 9. ArcView shapefiles created during the digitizing process were named by plot, date of imagery acquisition and flow at the closest monitoring station. Mapping was conducted at five plots 2 km in length and varying in width from 300 to 500 m. Section 4.2.7.2 of the *LORP Monitoring, Adaptive Management and Reporting Plan* describes the five plots used in the overall monitoring of the LORP in greater detail. Plots are located in 3 of the 4 reach types (dry incised floodplain, wet incised floodplain, graded wet floodplain, and aggraded wet floodplain) of the Lower Owens River (Seasonal Habitat Flow Table 10).[6]

During several of the helicopter flights, staff captured high quality digital still frames that aided in the mapping process. Still frame digital images of plots were taken using a Canon Powershot digital camera. These photos were used during the digitizing process as they often had better resolution than the digital video (example Seasonal Habitat Flow Figure 21).

As part of the ground surveys, GPS points of the wetted extent were taken on both sides of the river channel at 3 of the 5 plots (Plots 2, 4, and 5) along transects placed 100 m apart (see Section 4.2.7.2 of the *LORP Monitoring, Adaptive Management and Reporting Plan*). In some cases there were multiple wetted edges along each transect due to oxbows and other landform features (see field methods description and Seasonal Habitat Flow Figures 28-31). These GPS points were used in the digitizing process to ensure that wetted extent margins were mapped correctly. The on-the-ground GPS data allowed accurate identification of off-channel inundated areas that were most likely filling with water via groundwater.

River Flow Meas. Station / Date (2008)	Intake	Blackrock Return	East of Goose Lake	Two Culverts	Manzanar	Mazourka	Reihnackle	Lone Pine Narrow Rd	Keeler Bridge	~~Above~~ Pumpback Station	*Above* Pumpback Station
Feb. 7	48	41	47	48	44	48	48	51	60	47	58
Feb. 19	182	153	126	115	114	68	58	50*	58	47	59
Feb. 20	187	152	148	141	133	95	65	51	58	48	59
Feb. 22	190	195	195	180	171	123	102	58	58	48	60
Feb. 25	106	110	116	120	137	144	171	100	78	47	81
Feb. 27	55	69	85	88	98	119	147	202	161	44	126
Mar. 3	47	42	44	48	47	58	65	90	116	48	139
Mar. 5	47	42	41	44	46	54	55	56	91	47	106

Seasonal Habitat Flow Table 6. River Flow (CFS) per Helicopter Flights.

*Feb. 19th data was used to map plot 4 due to problems with the Feb. 7 video.

[6] WHA 2004(b)

Data from the video imagery, digital photos, and ground surveys were compiled to create a total of 10 shapefiles during the digitizing process; one shapefile per plot for base flow and one shapefile per plot for the high flow. Seasonal Habitat Flow Table 6 highlights the date and monitoring stations used to identify the flow per helicopter flight and map the flooded extent along the Lower Owens River channel (See Seasonal Habitat Flow Figures 23-27).

Flooded area per plot

Flooded area is used to determine the amount of area (expressed in acres) flooded during the seasonal habitat flows. Flooded area per plot for the base flow (see February 7 reading in Seasonal Habitat Flow Table 6) and the high flows (highlighted on Seasonal Habitat Flow Table 6) was determined by running *XTOOLS calculate area* tool for each GIS shapefile derived from the wetted extent data. *XTOOLS calculate area* tool adds a column (or columns depending on how many area measurements the user desires) to each GIS shapefile's attribute table. Every feature (polygon) within a shapefile has its area derived. Each feature's area per shapefile was summed to derive the overall flooded area per flow (Seasonal Habitat Flow Table 7).

Landform types flooded per plot

White Horse Associates mapped the landforms of the Lower Owens River in 2004 (WHA 2004b). Key landforms that were identified in the plots include floodplain, low terrace, high terrace, and undifferentiated upland (Seasonal Habitat Flow Table 8). The *ArcGIS Analysis Tool Intersect* was used to clip the landform type shapefile to each flooded extent shapefile (base flow and high flow associated with seasonal habitat flow). The landform and the wetted extent shapefiles were used to determine the landform types that were inundated during the seasonal habitat flows. Inundated landform type acreages were summed to determine the total acreage per landform type flooded during different flows (Seasonal Habitat Flow Table 8). The percent landform type flooded per plot was derived by dividing inundated landform type by the total acres of that landform type per plot (Seasonal Habitat Flow Table 8).

Cover types flooded per plot

Ecosystem Sciences mapped the cover types of each plot in 2002 (Risso 2007). A description of the cover types is provided in Appendix C. Similar to the landform types flooded per plot, the *ArcGIS Analysis Tool Intersect* was used to clip each plot's cover type shapefile to each flooded extent shapefile (base flow and high flow associated with seasonal habitat flow). This resulted in new shapefiles that integrate cover type and flooded extent attribute data for each plot. Inundated vegetation type acreages at different flow levels (for base flow levels and high flow levels) are presented in Seasonal Habitat Flow Table 9. Total acreages for each cover type inundated per flow (base flow and high flow) are also summarized in Seasonal Habitat Flow Table 9.

3.14.2. Reach and River-Wide Analysis Methods

Results derived from the site scale analysis, described above, were used to extrapolate inundated conditions by reach type, and then to the entire Lower Owens River. The extrapolation of flooded area per landform for each reach type (dry incised floodplain, wet incised floodplain, graded wet floodplain, and aggraded wet floodplain) was conducted for base flow and seasonal habitat flows (200 cfs) (Tables 10 and 11). Lower Owens River reaches were designated and described by White Horse Associates (WHA 2004b). The six Lower Owens River reaches were assigned reach types; as the table demonstrates, one reach type can be used to describe multiple reaches (i.e. Reaches 1, 3, and 5 are all wet incised floodplain reach types). Extrapolation of flooded area per landform occurred in 3 of the 4 Lower Owens River reach types (dry incised floodplain, wet incised floodplain, and graded wet floodplain--see

Seasonal Habitat Flow Table 10) (WHA 2004b). Assumptions were made for Reach 4, which is the forth reach type (aggraded wet floodplain), and consists of the Islands; the assumption was that 100% of the Islands reach floodplain type was inundated during the high flows, while only 50% of the Islands floodplains were inundated at base flows. See Seasonal Habitat Flow Figure 21 for a comparison of the islands reach at two different flows.

Base flow flooded area for each reach type landform

Flooded area per reach type for Lower Owens River base flow was extrapolated by using a plot's (or multiple plots') percent landform type inundated as a multiplier (Seasonal Habitat Flow Table 8). For example, the wet incised floodplain reach type (Reaches 1, 3 and 5) contained Plot 3 (Seasonal Habitat Flow Figure 22). Thus, to determine this reach types' acres inundated for each landform, the percent inundated per landform at the plot level (in this case, Plot 3) was used as a multiplier (see multiplier column in Seasonal Habitat Flow Table 10); this number was multiplied with the acres per landform for each reach type to calculate total acres inundated per landform per reach type. In reach types where multiple plots occurred, such as dry incised floodplain and graded wet floodplain, the average of those plots percent landform type inundated were used as multipliers to extrapolate to the reach type (Seasonal Habitat Flow Table 10).

Seasonal habitat flow (200 cfs) flooded area for each reach type landform

Acres inundated per landform for each reach type were extrapolated for 200 cfs flows (Seasonal Habitat Flow Table 11). Extrapolation was required because most of the helicopter flights did not capture the plots at or above 200 cfs. The following discussion explains the process of extrapolating to the 200 cfs flow.

The percentage of each reach type landform flooded at 200 cfs was extrapolated from the percent increase in inundation associated with the change in flow between the observed base flow and the high flows for each plot (Seasonal Habitat Flows Tables 7 and 8). To make this extrapolation, the percent change in flooded acres per cfs per landform between observed high flow and base flow for each plot was computed:

$$\%LF_H – \%LF_B / Q_H – Q_B = \%\Delta\ LF/cfs$$

Seasonal Habitat Flow Figure 21. Increased Flooded Area in Islands (Reach 4--Aggraded Wet Floodplain Type)
48 cfs v. 171cfs (measured at Reinhackle measuring station).

Where $\%LF_H$ = percent of a given plot's acreage of a landform type (floodplain, low terrace, high terrace, or undifferentiated upland) inundated by the observed high flow, $\%LF_B$ = percent of a given plot's acreage of a landform inundated by the base flow, Q_H = discharge in cfs at high flow, Q_B= discharge in cfs at base flow. Seasonal Habitat Flow Table 12 shows the results of these extrapolated calculations, and provides total acres inundated by landform for each of the reach types and the total acres inundated for the entire Lower Owens River.

The percent change in flooded acreage per cfs for a given landform for a reach type was then multiplied by the difference between the high flow and 200 cfs to determine the estimated percent increase in flooded acres:

$$(200 - Q_H)^* \%\Delta\ LF/cfs = \%\Delta\ LF$$

This product ($\%\Delta$ LF) was then added to the percent of the landform type flooded by the observed high flow ($\%LF_H$) to estimate the flooded acreage for each landform in that reach type at 200 cfs:

$$\%\Delta\ LF + \%LF_H = \%LF_{200}$$

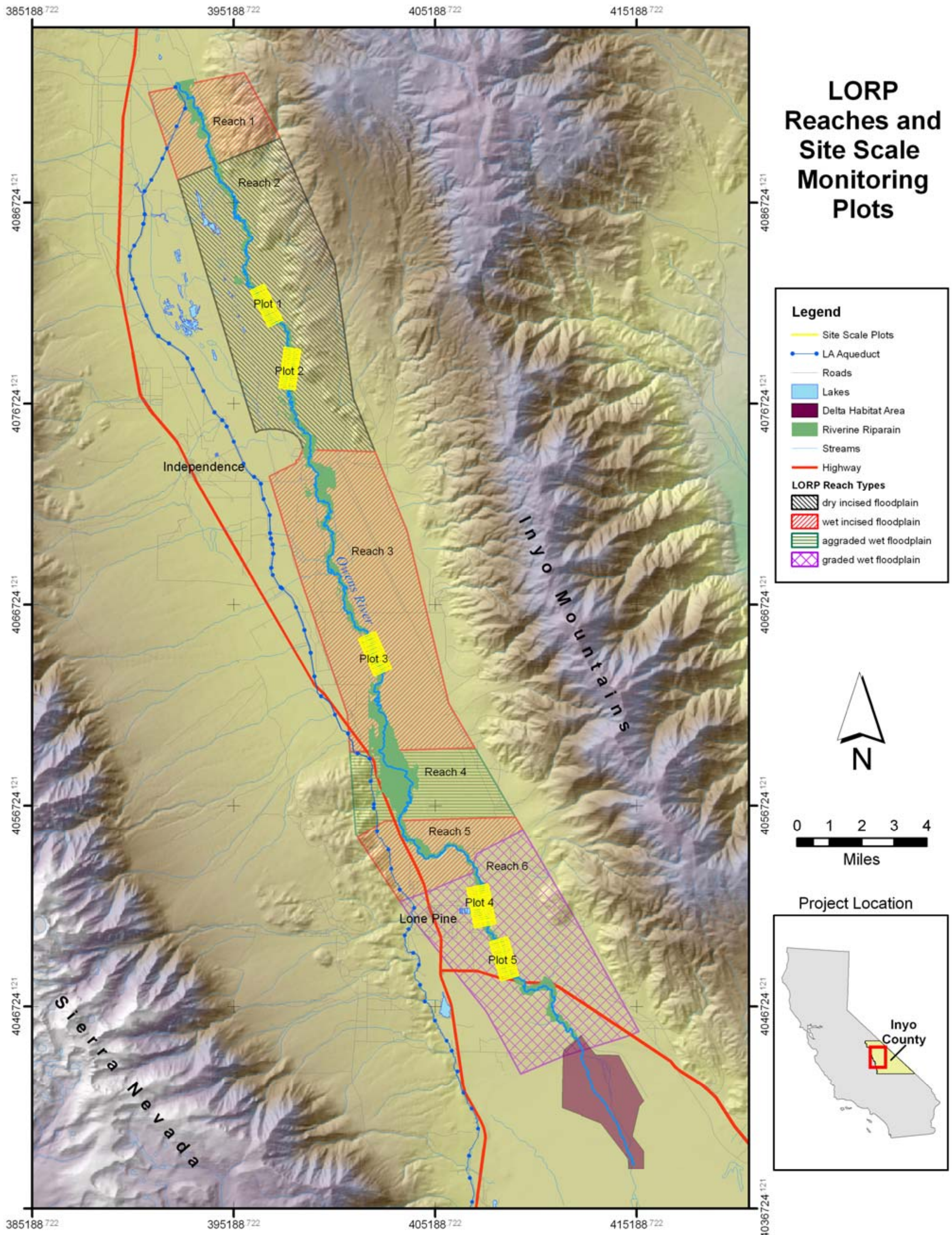
These computations were then made for all landforms in each reach type. The results are displayed in Seasonal Habitat Flow Table 12. The total acreage for all landforms per reach type was summed to derive the total area inundated by the high flow. The total potential area inundated at a flow of 200 cfs for the entire Lower Owens River was derived by summing the acres inundated per reach.

For the entire Lower Owens River the difference in inundated area per flow was derived by subtracting the base flow inundated acres from the high flow inundated acres (Seasonal Habitat Flow Table 13). Additionally, Seasonal Habitat Flow Table 13 demonstrates the percent of each landform type inundated as a result of the seasonal habitat flow.

Predicted vs. Extrapolated

WHA's (2004a) LORP delineation, prediction, and assessment of wetland/riparian resources contained a predicted conditions section. In this section WHA explains that based on the results of the 1993 HEC-2 analysis (Ecosystem Sciences 1993 Lower Owens River Flow Calibration Study) buffer widths by reach type for the Lower Owens River were derived. The buffer widths correspond to the expected width per reach type of the Lower Owens River at 200 cfs. WHA's buffer widths are presented in Seasonal Habitat Flow Table 14. Ecosystem Sciences used the ArcGIS Analysis Tool Clip to clip the Lower Owens River shapefile per reach. Then using the ArcGIS Analysis Proximity Tool each reach's section of the Lower Owens River was buffered based on WHA's (2004a) predicted width at 200 cfs. The resulting shapefiles depicted the predicted width of the Lower Owens River per reach at 200 cfs. These new shapefiles were intersected (using the ArcGIS Analysis Tool Intersect) with WHA's landform type shapefile to determine the predicted landform type's inundated at a 200 cfs flow in the Lower Owens River. The results of this analysis are presented in Seasonal Habitat Flow Table 15.

To examine the difference between predicted conditions and extrapolated conditions, the predicted inundated acres per landform type per reach was subtracted from the extrapolated inundated acres per landform type per reach (Seasonal Habitat Flow Table 15). This analysis demonstrates the difference between observed conditions (extrapolated) and predicted conditions based on the HEC-2 analysis performed in 1993.



Seasonal Habitat Flow Figure 22. LORP Reaches and Site Scale Monitoring Plots.

3.14.3. Base Flow and Flooded Extent Mapping

Results of the analyses described in the Methods section are presented at two different scales: the site or plot scale and the river reach/river-wide scale. The site scale section describes the results of the site scale mapping, which included aerial digital imagery mapping collected by LADWP's helicopter, aerial digital still images, and ground surveys. The variable such as percent landform type flooded per plot was derived from analysis of the site scale mapping, and was used to extrapolate to the river reach level and then to the entire Lower Owens River. The final section uses the results from the reach analysis to compare the predicted flooded extent (determined by White Horse Associates 2004a) with the extrapolated (based on observed conditions) flooded extent.

Generally, results are presented by plot and flow. Flow results per plot were recorded at base flow and high flows. Base flow results depict a point-in-time measurement, for example, the flooding extent at base flow recorded on February 7, 2008 (Seasonal Habitat Flow Table 6). The flooded extent results at base flow conditions are not extrapolated to the court ordered minimum 40 cfs, but rather represent the flooded extent based on the flow measured at the applicable monitoring station on February 7, 2008.

Extrapolation to a consistent base flow did not occur because base flows are not consistent throughout the entire river, as the Lower Owens has losing and gaining reaches. Measured flow on February 7, 2008 ranged from 41 cfs to 60 cfs for all monitoring stations (Seasonal Habitat Flow Table 6). These baseflow conditions (both surface and sub-surface) were likely influenced by the above average winter precipitation (i.e. 3.65 in. in January 2008 compared to an average of 1.2 in. from 1985 to 2008). Seasonal habitat flow conditions will be conducted in a different hydrological setting; precipitation will have less influence while Sierra snowmelt will have more influence on surface and groundwater conditions. The above average precipitation coupled with the off-season timing of the flushing flow in relation to the seasonal habitat flow make drawing conclusions about future habitat flow conditions difficult. The variables derived from the base flow analysis (e.g. % landform inundated/plot) were used to extrapolate to the reach and then to the entire river.

The high flow results depict the flooding extent per plot per flow on the days of the helicopter flights. These results also demonstrate a point-in-time measurement; the highest flow measured per helicopter flight day (Seasonal Habitat Flow Table 6). High flows ranged from 161 cfs to 202 cfs for the plot analysis. In contrast to the base flow reach analysis-river wide results, the high flow reach analysis-river wide results were extrapolated to a flow of 200 cfs. Extrapolating to one consistent flow for the reach analysis-river wide results enabled comparison to WHA 2004b predictions. Predictions were based on a fixed width buffer of the river channel per reach (WHA 2004b).

3.14.4. Site Scale - Plot Analysis

Flooded area per plot varied considerably for base flows and high flows associated with the seasonal habitat flow. Seasonal Habitat Flow Table 7 shows the percent flooded area per plot at base flow and high flow levels. Plot 1 had the lowest percent of its area flooded under both flows (3.4% at 47 cfs and 8.3% at 195 cfs), while Plot 4 experienced the highest percent of its area flooded under both flow scenarios (42.9% at 50 cfs, and 61.9% at 202 cfs) (Seasonal Habitat Flow Table 7). Generally, flooded area increased incrementally with flow, but not at the same rate over all plots (Seasonal Habitat Flow Figures 29-33). For example, Plot 1 experienced a flooded area increase of only 4.9% with a flow change of 148 cfs, while a flow increase of 101 cfs resulted in a 14.3% increase in flooded area in Plot 5 (Seasonal Habitat Flow Table 7).

Plot	Flight Date	Flow (cfs)	Station	Site (Acres)	Flooded (Acres)	% Flooded
1	02/07/2008	47	East of Goose Lake	165.6	5.7	3.4%
1	02/22/2008	195	East of Goose Lake	165.6	13.7	8.3%
2	02/07/2008	48	2 Culverts	161.7	15.3	9.5%
2	02/22/2008	180	2 Culverts	161.7	35.4	21.9%
3	02/07/2008	48	Reinhackle	167.5	43.2	25.8%
3	02/25/2008	171	Reinhackle	167.5	57.4	34.3%
4	02/19/2008	50	Lone Pine Narrow Gage Rd	197.9	84.9	42.9%
4	02/27/2008	202	Lone Pine Narrow Gage Rd	197.9	122.5	61.9%
5	02/07/2008	60	Keeler Bridge	251.7	61.7	24.5%
5	02/27/2008	161	Keeler Bridge	251.7	97.6	38.8%

Seasonal Habitat Flow Table 7. Flooded Area by Plot at Base Flow and High Flow.

The percent landform type flooded per plot also varied considerably (Seasonal Habitat Flow Table 8), demonstrating the range of landform types and conditions found within the Lower Owens River. For example, Plot 1, located in the dry incised floodplain reach type, contains narrow floodplains flanked by high terraces, experienced flooding on only 13.2% of its floodplains during base flows and 29.6% during high flows (Seasonal Habitat Flow Table 8). In contrast, Plot 4, located in the graded wet floodplain reach type, which contains a mix of floodplains and low terraces flanked by high terraces (WHA 2004b), experienced flooding on 76.9% of its floodplains at base flow and nearly 90% at high flows (Seasonal Habitat Flow Table 8).

As the table demonstrates, during the high flows, the amount of flooded acres was the greatest in the floodplain landforms; the undifferentiated upland landforms were not inundated at all and the high terraces experienced few increases in flooded acres. The number of acres inundated for each cover type (cover types and their codes are found in Seasonal Habitat Flow Table 9) per plot at base flows and during high flows is presented in Seasonal Habitat Flow Table 10. All cover types except for Tamarisk Cuttings-Saltbush Scrub (cover type code 3) experienced some flooding during the high flows. Most flooding occurred in cover types that are located on floodplains and near the river channel. Under base flow conditions, Willow/Cattail-Rush Wetland (654), Gooding's Willow Woodland (219), and Saltgrass Meadow (99) experienced the greatest flooded area (Seasonal Habitat Flow Table 10). At high flows, the same cover types were most often inundated (Seasonal Habitat Flow Table 9). The difference in flooded area between base flow and high flow was greatest for the Saltgrass Meadow (99), Tamarisk/Saltbush Woodland (22) and Gooding's Willow Woodland (219) cover types (Seasonal Habitat Flow Table 10). These vegetation types and landforms represent appropriate areas for willow and cottonwood recruitment and establishment, an objective of the seasonal habitat flows.

Plot	Flow	Flooded Area (Acres)	FP (Acres)	FP%	LT (Acres)	LT %	HT (Acres)	HT %	UN UP	UN UP %
1	47	5.7	4.9	13.2%	0.0	N/A	0.8	0.6%	0.0	N/A
1	195	13.7	11.0	29.6%	0.0	N/A	2.6	2.1%	0.0	N/A
2	48	15.3	13.8	30.6%	0.0	N/A	1.3	1.2%	0.0	N/A
2	180	35.4	30.1	66.7%	0.0	N/A	4.5	4.2%	0.0	N/A
3	48	43.2	30.3	83.4%	12.5	17.9%	0.3	0.7%	0.0	N/A
3	171	57.4	32.8	90.4%	22.5	32.1%	1.8	4.2%	0.0	N/A
4	50	84.9	69.4	76.9%	15.4	21.9%	0.0*	0.0*	0.0	N/A
4	202	122.5	80.4	89.0%	41.3	58.7%	0.4	6.3%	0.0**	0.1%
5	60	61.7	44.2	69.8%	17.4	12.3%	0.1	0.5%	0.0	N/A
5	161	97.6	55.9	88.3%	41.5	29.4%	0.1	1.1%	0.0	N/A

Seasonal Habitat Flow Table 8. Landforms Flooded Per Plot.

FP = Floodplain, LT = Low Terrace, HT = High Terrace, UN UP = Undifferentiated Upland
N/A = does not occur in plot
*0.0 minimal flooding on the high terrace at 50cfs in Plot 4
**0.0 minimal flooding of undifferentiated upland in Plot 4

Cover Type Code	Cover Type Name
0	Unknown
1	Greasewood-Saltbush Scrub
2	Greasewood/Russian Thistle Scrub
3	Tamarisk Cuttings-Saltbush Scrub
9	Saltbush/Russian Thistle Scrub
13	Saltbush/Saltgrass Scrub Meadow
15	Alkali Sacaton/Saltgrass Meadow
17	Greasewood/Seepweed-Shadscale Scrub
19	Rabbitbrush-Saltbush/Saltgrass Scrub Meadow
22	Tamarisk/Saltbush Woodland
23	Open Water
24	Barren Ground
42	Smotherweed-Mixed Shrubland
99	Saltgrass Meadow
219	Gooding’s Willow Woodland
358	Sunflower-Licorice Wet Meadow
420	Baltic Rush-Saltgrass Wet Meadow
516	Seepweed-Saltbush/Saltgrass Scrub Meadow
654	Willow/Cattail-Rush Meadow
664	Shadscale Scrub
685	Bull Rush-Cattail-Willow Wetland
708	Chairmaker’s Bullrush-Saltgrass Wet Meadow
754	Common Reed-Coyote Willow/Yerba Mansa
793	Coyote Willow/Saltgrass Riparian Shrubland
917	Wildrye-Saltgrass Meadow

Seasonal Habitat Flow Table 9. Cover Type Codes and Names.

Plot	CFS	0	1	2	3	9	13	15	17	19	22	23	24	42	99	219	358	420	516	654[1]	664	685[1]	708[1]	754	793	917
		Vegetation and Cover Types Inundated (Acres) Base Flow																								
1	47	0.0	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.3	3.9	0.0	0.8	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	48	0.6	0.1	0.3	0.0	1.1	0.2	0.0	0.0	0.0	9.1	0.0	0.8	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	48	0.0	0.0	0.0	0.0	0.0	0.6	1.6	0.2	2.6	1.4	1.8	0.1	0.1	1.9	8.7	0.2	1.8	0.0	17.5	0.0	1.2	2.5	0.5	0.1	0.5
4	50	0.3	0.0	0.0	0.0	0.0	1.7	1.5	0.0	1.9	0.2	10.5	0.2	0.1	10.1	8.3	1.7	2.3	0.0	29.9	0.1	8.1	3.0	2.9	0.6	1.5
5	60	0.0	0.0	0.0	0.0	0.0	0.8	0.7	0.1	2.0	0.4	4.7	0.0	0.0	4.7	16.3	4.8	0.9	0.1	9.1	0.0	5.6	1.3	4.4	4.2	1.7
Base Flow (BF) Total	**0.9**		**0.4**	**0.4**	**0.0**	**1.1**	**3.4**	**3.8**	**0.3**	**6.8**	**15.0**	**17.0**	**1.9**	**0.2**	**16.7**	**36.4**	**6.7**	**5.0**	**0.1**	**56.5**	**0.1**	**14.9**	**6.8**	**7.8**	**4.9**	**3.7**
		Vegetation and Cover Types Inundated (Acres) High Flow																								
Plot	**CFS**	**0**	**1**	**2**	**3**	**9**	**13**	**15**	**17**	**19**	**22**	**23**	**24**	**42**	**99**	**219**	**358**	**420**	**516**	**654[1]**	**664**	**685[1]**	**708[1]**	**754**	**793**	**917**
1	195	0.0	0.5	1.1	0.0	0.3	0.3	0.0	0.0	0.5	9.4	0.0	1.3	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	180	0.7	0.8	1.0	0.0	3.7	0.4	0.0	0.0	0.0	21.0	0.0	1.3	0.0	0.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	171	0.0	0.0	0.0	0.0	0.0	1.5	4.0	0.4	6.1	2.7	1.8	0.2	0.1	2.7	11.2	0.7	2.0	0.0	18.2	0.0	1.2	2.9	0.7	0.1	1.0
4	202	0.6	0.1	0.0	0.0	0.0	3.8	6.1	0.2	7.5	0.5	10.8	0.3	0.2	21.9	12.8	2.6	3.2	0.0	32.2	0.5	8.7	3.3	4.3	0.8	2.3
5	161	0.0	0.0	0.0	0.0	0.0	3.4	2.3	0.1	5.0	0.9	4.8	0.1	0.0	17.0	22.8	6.4	1.7	0.1	9.6	0.0	6.2	1.8	5.1	5.4	4.9
High Flow (HF) Total	**1.3**		**1.4**	**2.1**	**0.0**	**4.0**	**9.4**	**12.4**	**0.7**	**19.1**	**34.5**	**17.4**	**3.2**	**0.3**	**41.6**	**53.5**	**9.7**	**6.9**	**0.1**	**60.0**	**0.5**	**16.1**	**8.0**	**10.1**	**6.3**	**8.2**
F – BF)	**0.4**		**1.0**	**1.7**	**0.0**	**2.9**	**6.0**	**8.6**	**0.4**	**12.3**	**19.5**	**0.4**	**1.3**	**0.1**	**24.9**	**17.1**	**3.0**	**1.9**	**0**	**3.5**	**0.4**	**1.2**	**1.2**	**2.3**	**1.4**	**4.5**

Seasonal Habitat Flow Table 10. Acres of Cover Types Inundated Per Plot.

See Appendix C for description of vegetation/cover types

[1]Vegetation Type is emergent and thus was most likely inundated prior to seasonal habitat flow.

3.14.5. Reach- River Wide Analysis

The results derived from the site scale analysis were used to extrapolate the amount of inundated acres by reach type, reach, landforms per reach type and to the entire Lower Owens River. River reaches responded in dynamic ways to flows, illustrating the usefulness of reach designation. Understanding the nature of these responses will aid managers in creating realistic goals and expectations for individual reaches. Acres inundated for both base flow and seasonal habitat flow were extrapolated from observed conditions. Flooding area per reach varied throughout the Lower Owens River as did the amount of landform flooded per reach type. Generally, flooded area per reach and landform increased with the onset of the seasonal habitat flow, but was not consistent among reaches. Under base flow conditions, the wet incised floodplain reach type (Reaches 1, 3 and 5) experienced the greatest flooded area, with 433.2 acres of floodplain and 208.6 acres of low terrace inundated. The wet incised floodplain reach type encompasses the greatest overall area of the Lower Owens River, with approximately 3,020 acres. Conversely, the dry incised floodplain reach type (Reach 2) experienced the least flooded area of all reaches, with a total of 57.3 acres inundated under base flow conditions. Under base flow conditions, 1,233.6 acres of Lower Owens River landforms were inundated (Seasonal Habitat Flow Table 11).

Reach Type	Reaches	Plots in Reaches	Landform	Acres	Multiplier	Acres Inundated
Dry Incised Floodplain	2	1 and 2	Floodplain	223.7	0.219	49.0
			High Terrace	925.6	0.009	8.3
			Low Terrace	99.0	0.0	0.0
			Undiff. upland	37.2	0.0	0.0
Wet Incised Floodplain	1,3 and 5	3	Cut/Fill	2.3	N/A	0.0
			Ditch/Canal	13.7	N/A	0.0
			Floodplain	519.7	0.834	433.2
			High Terrace	1241.9	0.007	8.7
			Low Terrace	1165.3	0.179	208.6
			Undiff. Upland	76.8	0.0	0.0
Graded Wet Floodplain	6	4 and 5	Aeolian	204.7	N/A	0.0
			Cut/Fill	0.8	N/A	0.0
			Floodplain	303.3	0.734	222.6
			High Terrace	60.2	0.003	0.2
			Low Terrace	454.8	0.221	100.5
			Undiff. Upland	1.8	0.001	0.0
Aggraded Wet Floodplain	4	No plots	Floodplain	404.9	0.5	202.5
			High Terrace	169.6	0.0	0.0
			Low Terrace	590.7	0.0	0.0
			Undiff. Upland	6.8	0.0	0.0
					Total	**1233.6**

Seasonal Habitat Flow Table 11. Reach Extrapolation Flooding Exent per Landform. – Baseflow as of 4/07/2008

During the 200 cfs flows, the flooded area per reach and landform increased considerably over base flow conditions. Most notable was the extent of floodplain inundation at 200 cfs. For example, in the graded wet floodplain reach type, over 90% (279.6 acres) of floodplain was inundated (Seasonal Habitat Flow Table 12). Conversely, in the dry incised floodplain reach type only 51.2% (114.5 acres) of floodplain was flooded at 200 cfs (Seasonal Habitat Flow Table 12). Similar to base flow conditions, the dry incised floodplain reach type experienced the least flooded area, with only 134.9 acres inundated in the entire reach (Seasonal Habitat Flow Table 12). For the entire Lower Owens River approximately 700 additional acres were inundated as a result of the seasonal habitat flows (Seasonal Habitat Flow Table 13).

During the seasonal habitat flows, the floodplains and low terraces are the landforms that experienced the majority of inundation. About 88% of floodplains and 25% of low terraces in the Lower Owens River were inundated at 200 cfs (Seasonal Habitat Flow Table 13).

Reach Type	Reaches	Plots in Reach	Landform	Acres	Multiplier	Acres Inundated
Dry Incised Floodplain	2	1 and 2	Floodplain	223.7	0.512	114.5
			High Terrace	925.6	0.022	20.4
			Low Terrace	99.0	0.0	0.0
			Undiff. upland	37.2	0.0	0.0
Wet Incised Floodplain	1,3 and 5	3	Cut/Fill	2.3	N/A	0.0
			Ditch/Canal	13.7	N/A	0.0
			Floodplain	519.7	0.921	478.6
			High Terrace	1241.9	0.050	62.1
			Low Terrace	1165.3	0.354	412.5
			Undiff. Upland	76.8	0.0	0.0
Graded Wet Floodplain	6	4 and 5	Aeolian	204.7	0.0	0.0
			Cut/Fill	0.8	0.0	0.0
			Floodplain	303.3	0.922	279.6
			High Terrace	60.2	0.013	0.8
			Low Terrace	454.8	0.360	163.7
			Undiff. Upland	1.8	0.001	0.0
Aggraded Wet Floodplain	4	No plots	Floodplain	404.9	1.0	404.9
			High Terrace	169.6	0.0	0.0
			Low Terrace	590.7	0.0	0.0
			Undiff. Upland	6.8	0.0	0.0
					Total	**1937.1**

Seasonal Habitat Flow Table 12. Reach Extrapolation Flooding Extent Per Landform-200 cfs.

Landform	Total Acres	Base Flow (BF) Inundated Acres	High Flow (HF) Inundated Acres	Acreage Increase (HF – BF)	% Landform inundated during seasonal habitat flow
Floodplain	1455.1	907.3	1277.6	370.3	87.8 %
High Terrace	2440.9	17.2	83.3	66.1	3.4 %
Low Terrace	2313.6	309.1	576.2	267.1	24.9 %
Total	6209.6	1233.6	1937.1	703.5	

Seasonal Habitat Flow Table 13. River Landform Inundation Change and Percent Flooded During Seasonal Habitat Flow.

3.14.6. Extrapolated vs. Predicted at 200 cfs

The predicted flooded extent was greatest for the wet incised floodplain reach type, at over 440 acres of inundated area (303.4 acres of floodplain, 28.6 acres of high terrace and 108.5 acres of low terrace) (Seasonal Habitat Flow Table 14). Predicted flooded area was lowest for the aggraded wet floodplain reach type, with a total of 89.8 acres of inundated area.

Extrapolated flooded extent and predicted flooded extent were only similar for the dry incised floodplain reach type; all others reach types differed (Seasonal Habitat Flow Table 15). For example, in the graded wet floodplain reach type, predicted inundation on floodplains totaled 100 acres, while the extrapolated conditions totaled 279.6 acres; a difference of 179.6 acres (Seasonal Habitat Flow Table 15). The greatest difference between the predicted and extrapolated methods occurred in the aggraded wet floodplain reach type, where it was estimated that

330.6 additional acres of floodplain were inundated compared to predicted conditions. For the entire Lower Owens River the extrapolated method, which is based on observed conditions, estimated a total inundated area of 1,937.1 acres while the predicted method estimated 810.2 acres; a difference of 1126.9 acres (Seasonal Habitat Flow Table 15).

Reach Type	Reaches	WHA Buffer[1]	Landform	Total Acres	Acres Inundated
Dry Incised Floodplain	2	40ft.	Floodplain	223.7	123.2
			High Terrace	925.6	24.2
			Low Terrace	99.0	3.7
			Undiff. upland	37.2	0.0
Wet Incised Floodplain	1,3 and 5	80ft.	Cut/Fill	2.3	0.2
			Ditch/Canal	13.7	0.0
			Floodplain	519.7	303.4
			High Terrace	1241.9	28.6
			Low Terrace	1165.3	108.5
			Undiff. Upland	76.8	0.9
Graded Wet Floodplain	6	50ft.	Aeolian	204.7	0.6
			Cut/Fill	0.8	0.0
			Floodplain	303.3	100.0
			High Terrace	60.2	0.2
			Low Terrace	454.8	22.9
			Undiff. Upland	1.8	0.0
Aggraded Wet Floodplain	4	100ft.	Floodplain	404.9	74.3
			High Terrace	169.6	0.0
			Low Terrace	590.7	19.5
			Undiff. Upland	6.8	0.0
				Total	**810.2**

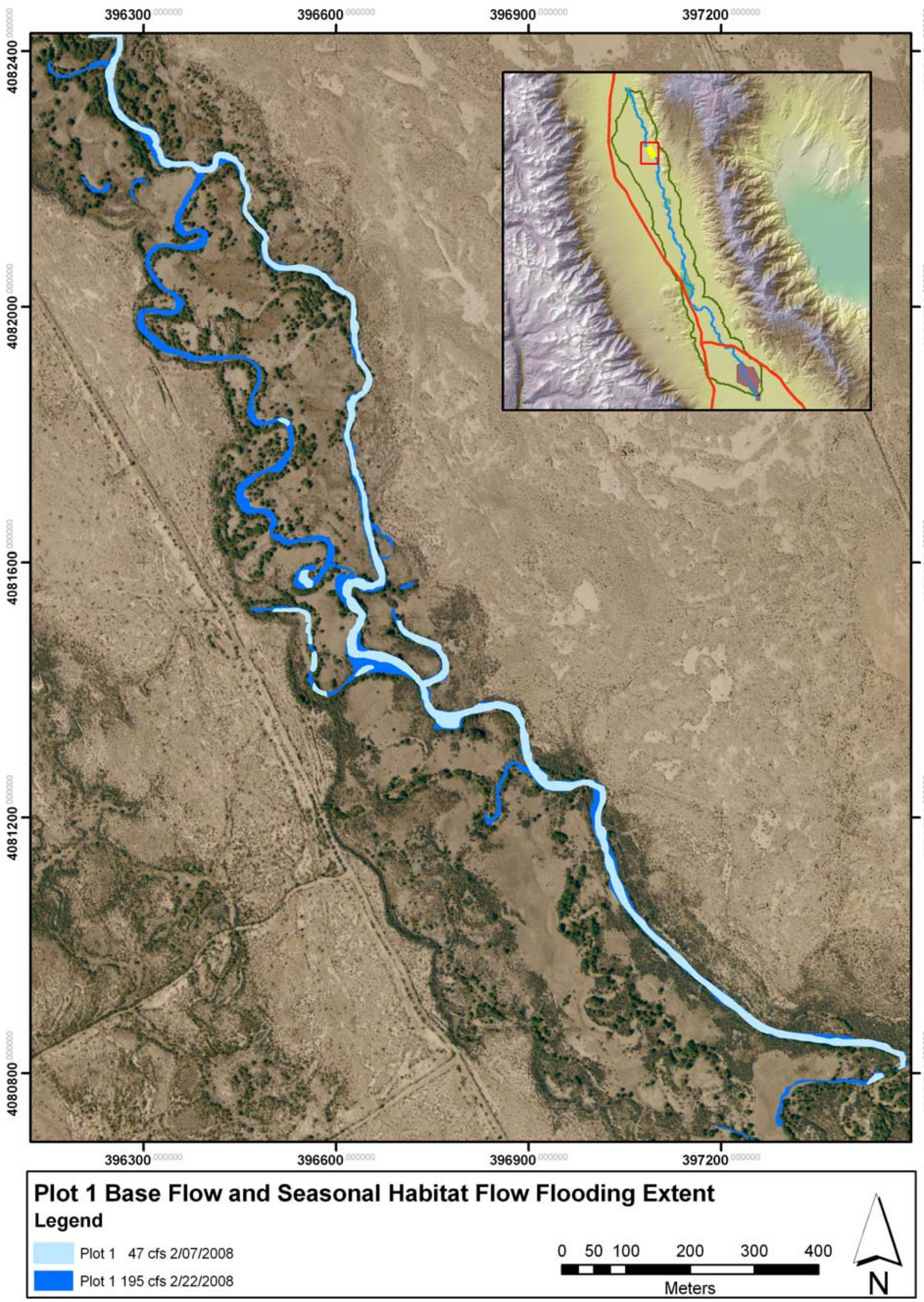
Seasonal Habitat Flow Table 14. Predicted Reach Flooding Extent Per Landform (WHA 2004)

[1]Page 37 of WHA 2004 – Lower Owens River Project Delineation, Prediction, and Assessment of Wetland/Riparian Resources.

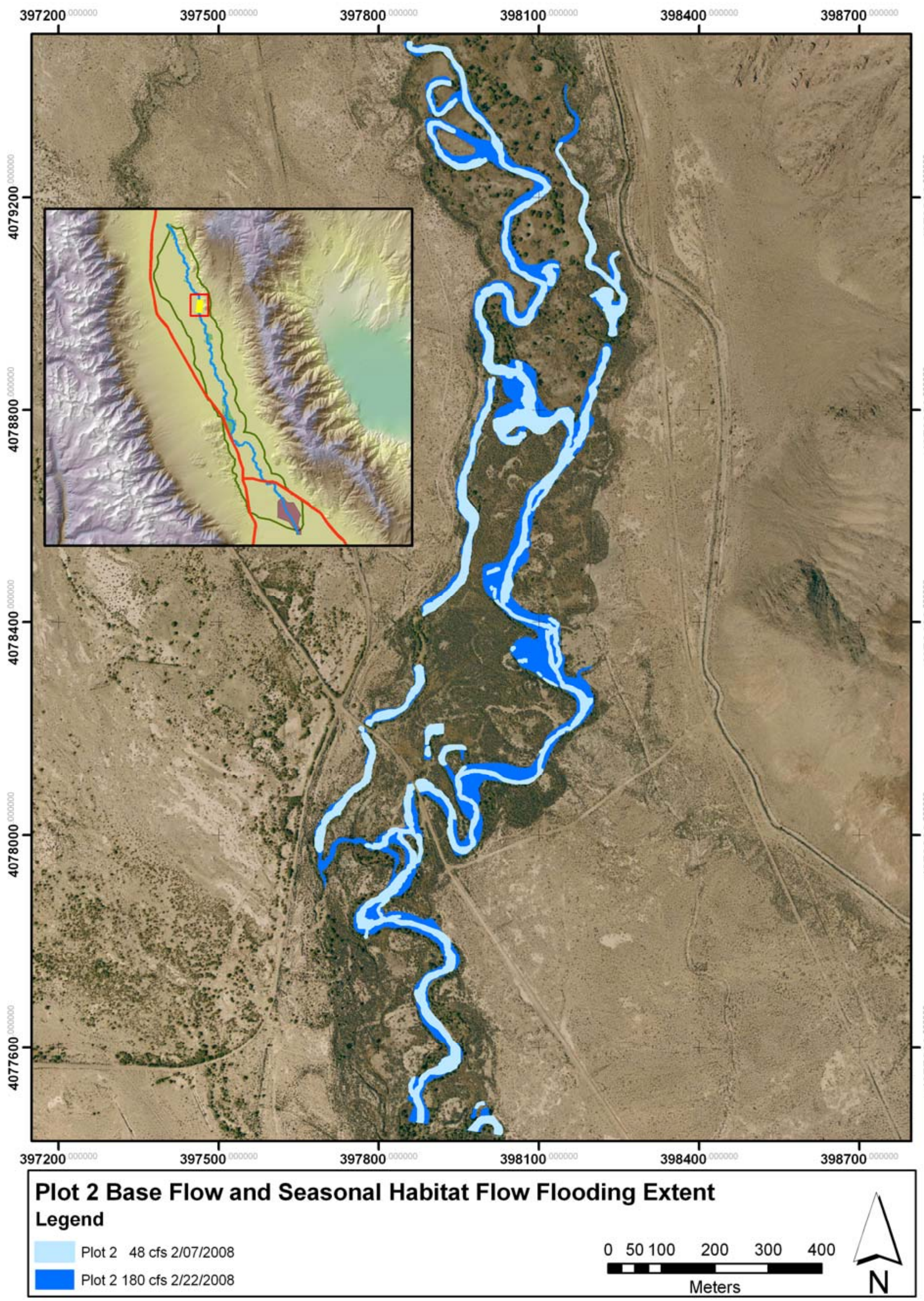
Reach Type	Reach	Landform	Extrap. Acres	Pred. Acres	Difference
Dry Incised Floodplain	2	Floodplain	114.5	123.2	-8.7
		High Terrace	20.4	24.2	-3.8
		Low Terrace	0.0	3.7	-3.7
		Undiff. upland	0.0	0.0	0.0
Wet Incised Floodplain	1,3 and 5	Cut/Fill	0.0	0.2	-0.2
		Ditch/Canal	0.0	0.0	0.0
		Floodplain	478.6	303.4	175.2
		High Terrace	62.1	28.6	33.5
		Low Terrace	412.5	108.5	304.0
		Undiff. Upland	0.0	0.9	-0.9
Graded Wet Floodplain	6	Aeolian	0.0	0.6	-0.6
		Cut/Fill	0.0	0.0	0.0
		Floodplain	279.6	100.0	179.6
		High Terrace	0.8	0.2	0.6
		Low Terrace	163.7	22.9	140.8
		Undiff. Upland	0.0	0.0	0.0
Aggraded Wet Floodplain	4	Floodplain	404.9	74.3	330.6
		High Terrace	0.0	0.0	0.0
		Low Terrace	0.0	19.5	-19.5
		Undiff. Upland	0.0	0.0	0.0
		Total	**1937.1**	**810.2**	**1126.9**

Seasonal Habitat Flow Table 15. Extrapolated vs. Predicted (WHA 2004) Flooding Extent Per Reach.

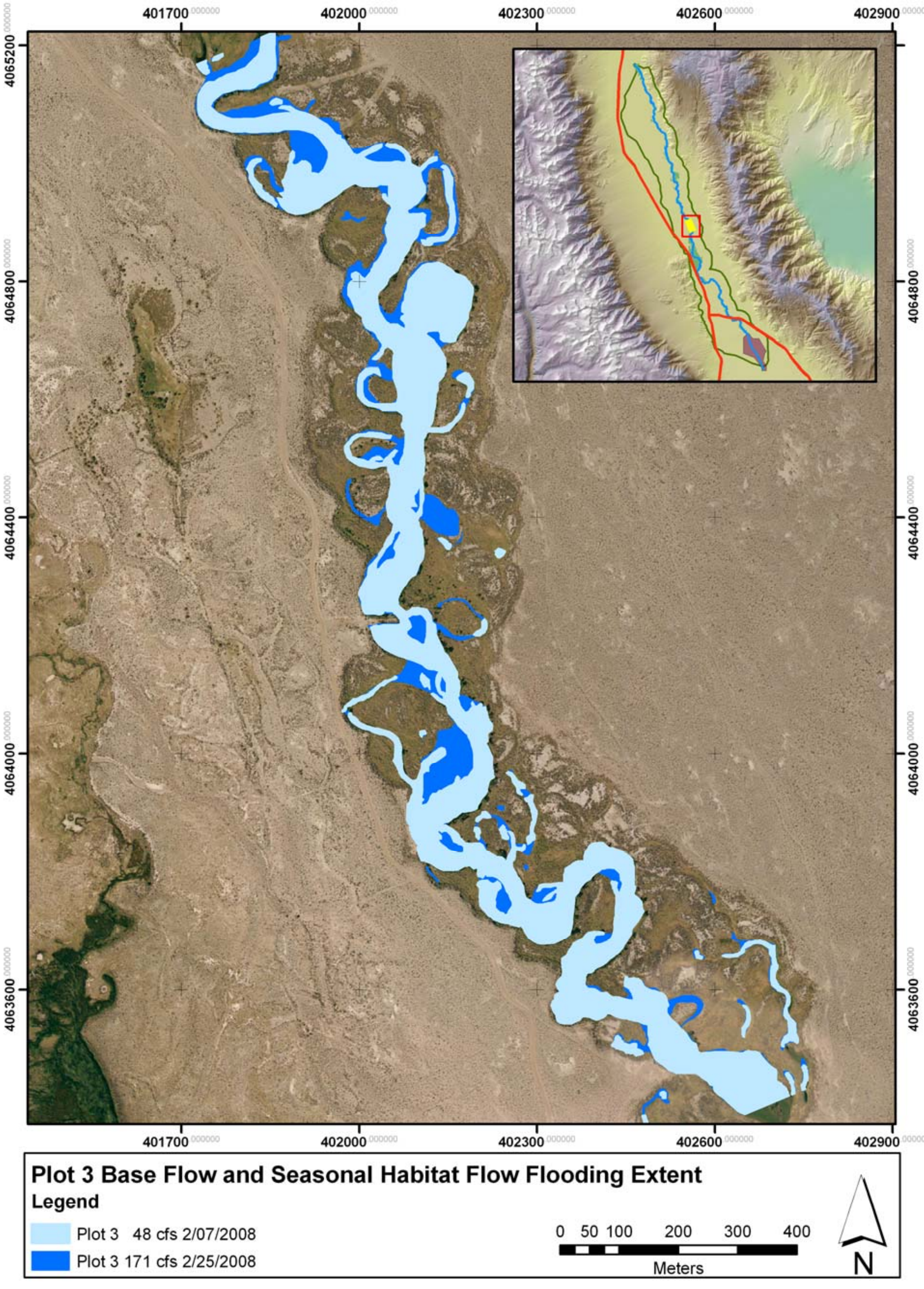
The large differences between the predicted and the extrapolated flooding extent estimates can be partially explained by the data and methods used to calculate the predicted acreage. The predicted acres were derived from WHA 2004(a) data, which involved a buffer of the stream channel based on an in-stream model (HEC 2) that assumed inundation of only the main channel of the Lower Owens River. This model did not incorporate the effect of high flows and elevated groundwater on side channels, old canals, oxbow lakes or low-lying geomorphic surfaces.



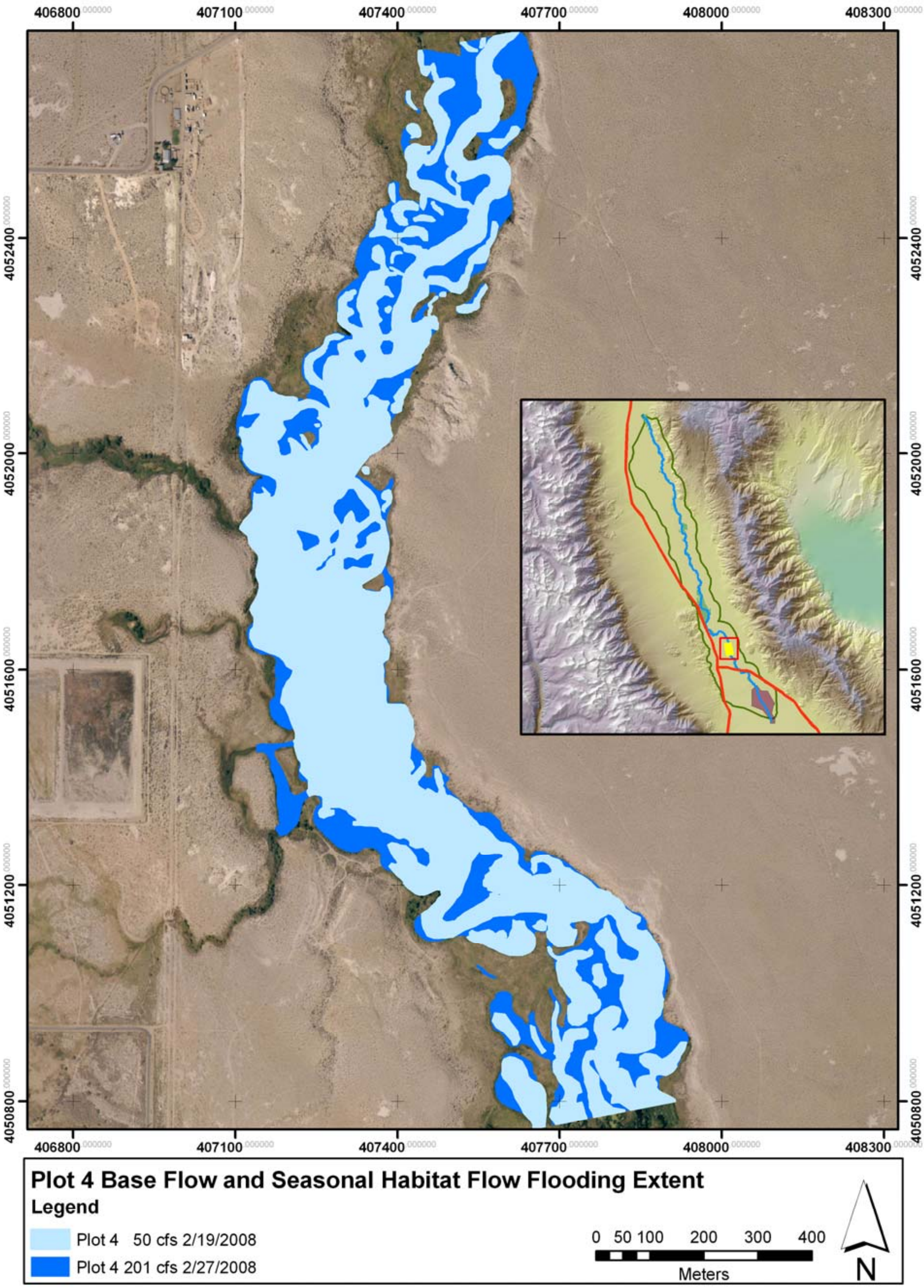
Seasonal Habitat Flow Figure 23. Plot 1 Flooding Extent.



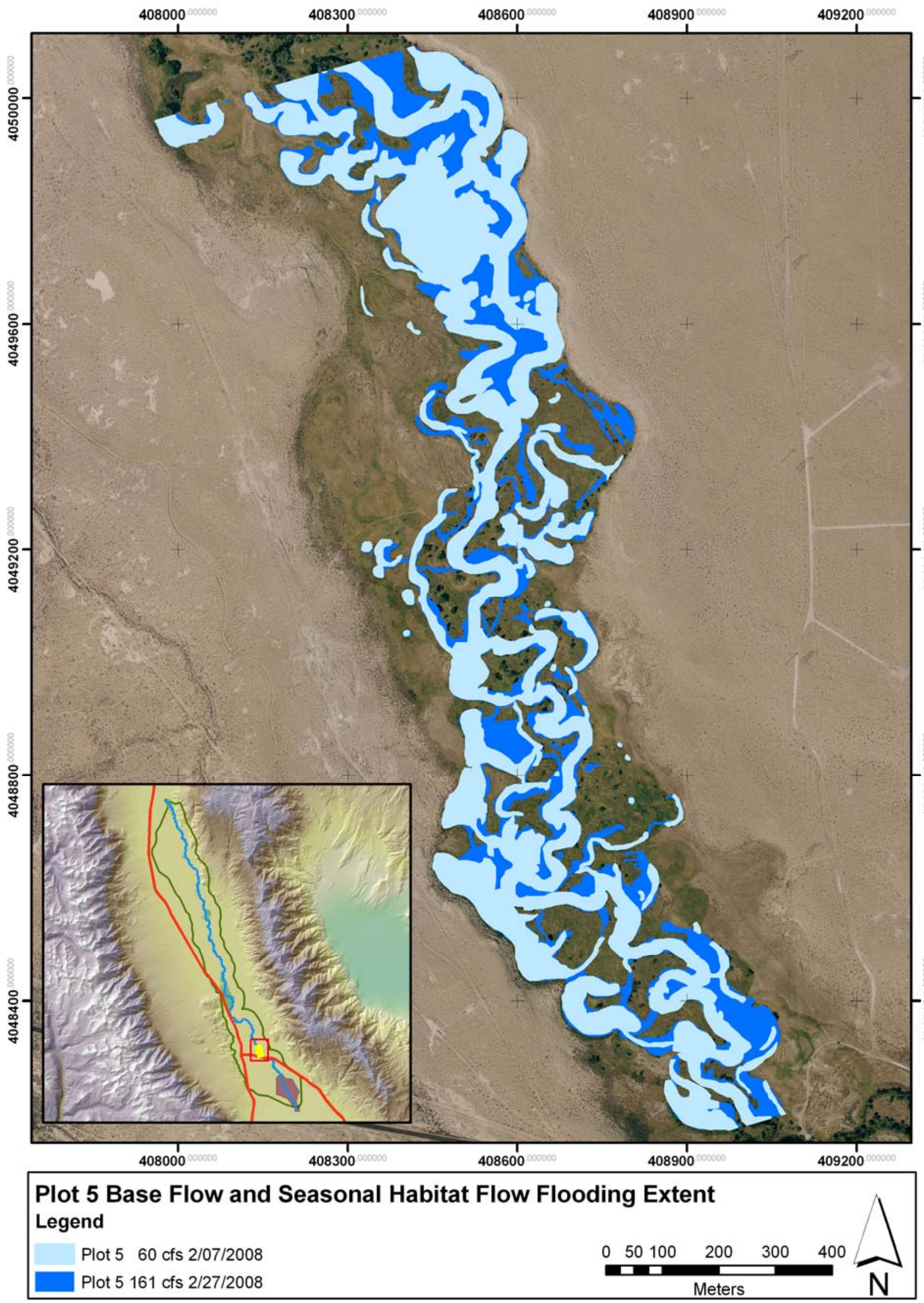
Seasonal Habitat Flow Figure 24. Plot 2 Flooding Extent.



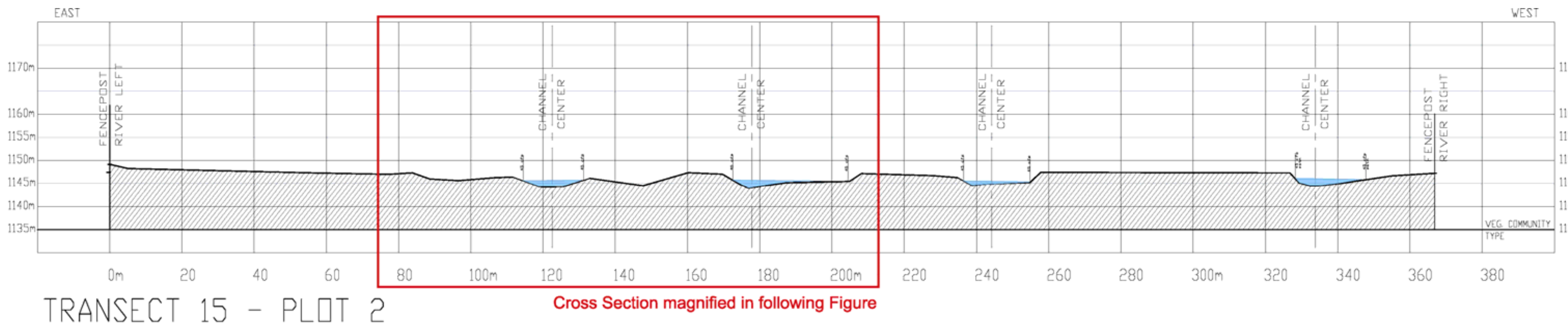
Seasonal Habitat Flow Figure 25. Plot 3 Flooding Extent.



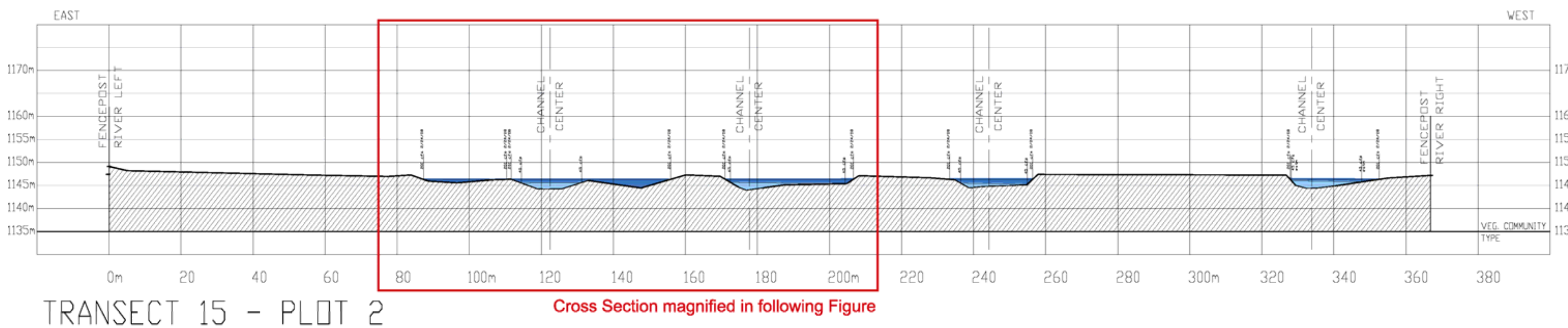
Seasonal Habitat Flow Figure 26. Plot 4 Flooding Extent.



Seasonal Habitat Flow Figure 27. Plot 5 Flooding Extent.



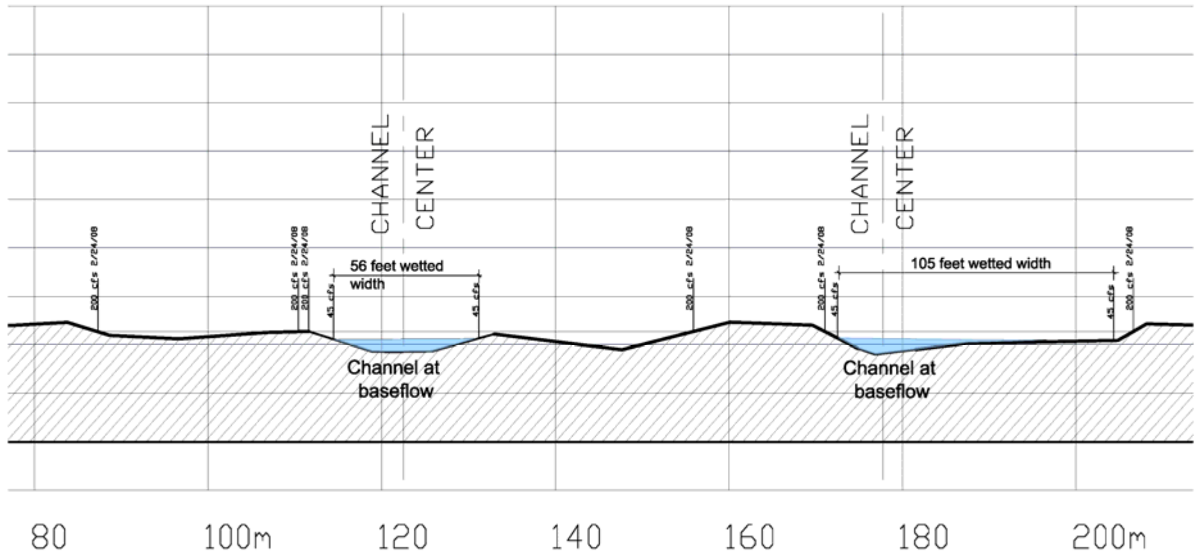
Channel Cross Section at Plot 2 Transect 15 Baseflow 45 cfs



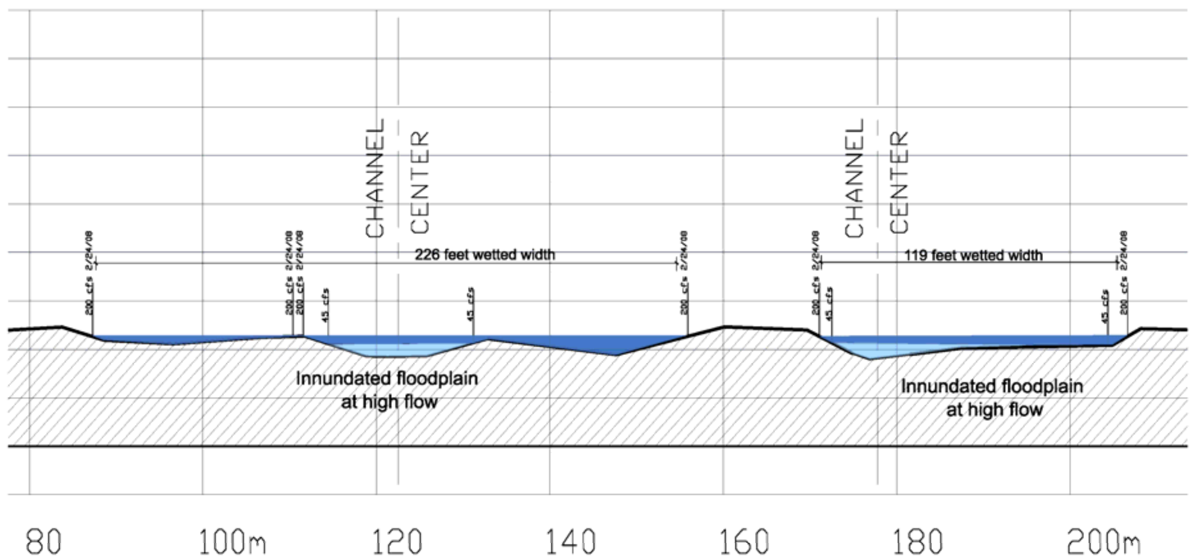
Channel Cross Section at Plot 2 Transect 15 High flow 200 cfs

Seasonal Habitat Flow Figure 28. Plot 2 Transect 15 Flooding Extent Cross Section.

See Figure 33 on next page for magnified cross section referenced



Channel Cross Section at Plot 2 Transect 15 Baseflow of 45 cfs



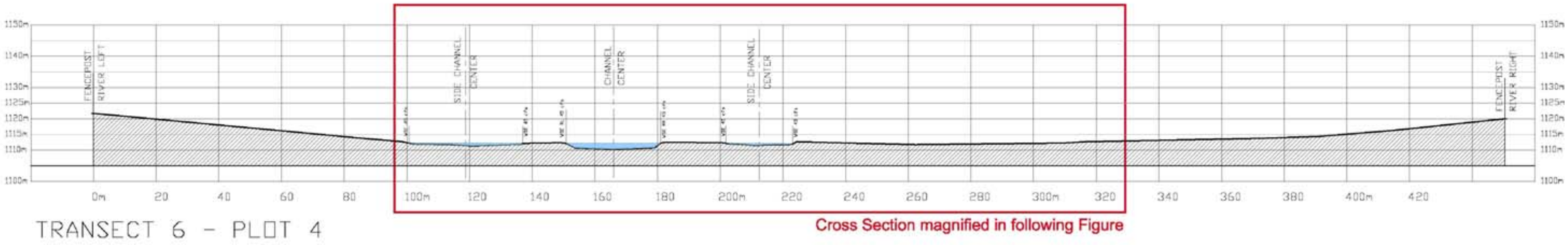
Channel Cross Section at Plot 2 Transect 15 High flow of 200 cfs

At this representative reach cross section:

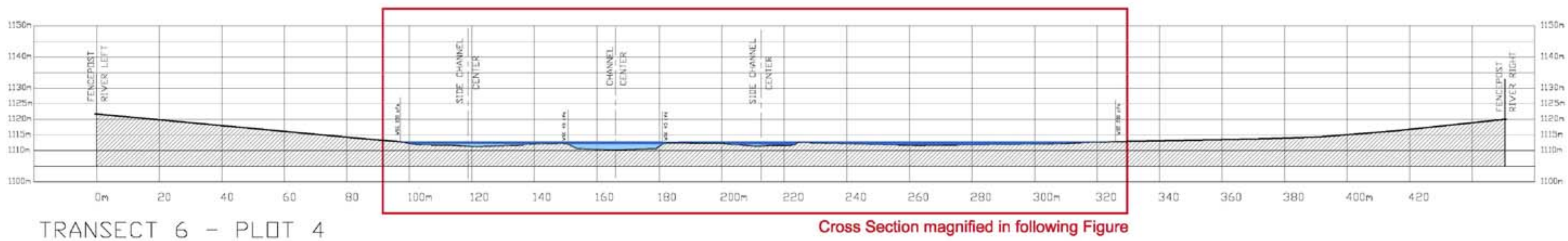
Average Water Surface Elevation increased + 2.5 feet

Wetted Width increased from 56 feet to 226 feet (left channel); and from 105 feet to 119 feet (right channel); a total increase of 184 feet of floodplain are innundated with high flows

Seasonal Habitat Flow Figure 29. Plot 2 Transect 15 Flooding Extent Cross Section.



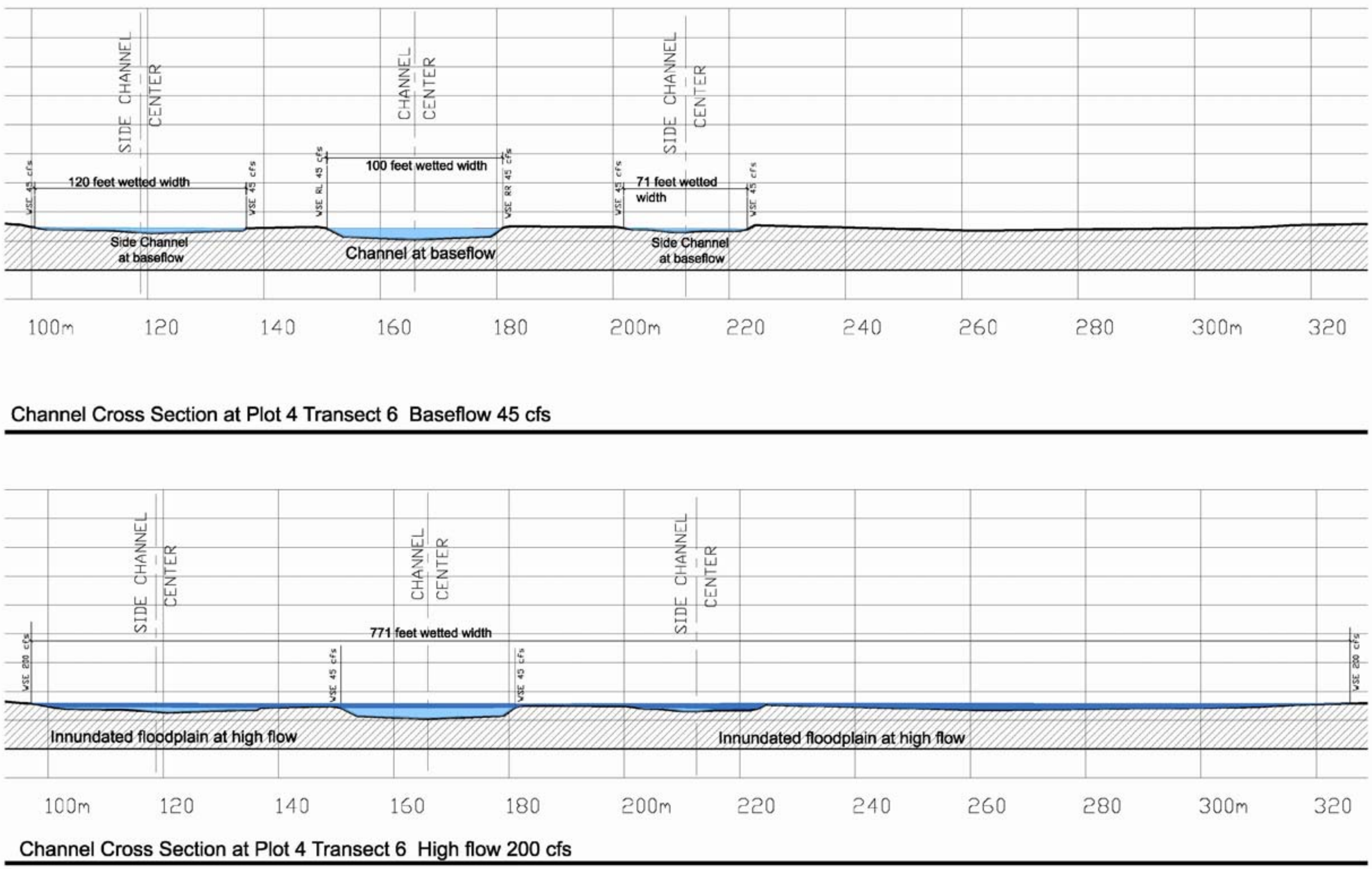
Channel Cross Section at Plot 4 Transect 6 Baseflow 45 cfs



Channel Cross Section at Plot 4 Transect 6 High flow 200 cfs

Seasonal Habitat Flow Figure 30. Plot 4 Transect 6 Flooding Extent Cross Section.

See Figure 35 on next page for magnified cross section referenced.



At this representative reach cross section:

Average Water Surface Elevation increased + 1.95 feet

Wetted Width increased from 291 feet (both main and side channels) to 771 feet for a total increase of 480 feet of floodplain innundated with high flows

Seasonal Habitat Flow Figure 31. Plot 4 Transect 6 Flooding Extent Cross Section.

3.15. Overall Findings and Conclusions

The 2008 seasonal habitat flow was an anomaly in that there were specific objectives of the flow release not pertinent to all MOU objectives. Future seasonal habitat flows will be initiated and conducted in conformance with MOU goals and objectives. However, this first flow event initiated in winter conditions was intended to protect water quality and the fishery, evaluate the effects on LADWP and Inyo County infrastructure, test monitoring instruments and techniques, develop analytical tools, and provide more definitive information about flood extent and hydrologically varying reaches. The following is a summary of the overall findings and conclusions from the first seasonal habitat flow:

- Water was successfully released and conveyed from the Intake to the Delta.
- No significant blockages or flooding of roads and structures were observed.
- Flooding was estimated to cover 1,937 acres within the Lower Owens River. This was an increase of 703 acres above base flow (measured between 41 and 60 cfs) conditions and 1,127 acres more than model predictions.
- During the seasonal habitat flows, the floodplains and low terraces experienced the majority of inundation. About 88% of floodplains and 25% of low terraces in the Lower Owens River were inundated. The flooded area per reach and landform increased considerably over base flow conditions. For example, in the graded wet floodplain reach type, over 90% (280 acres) of the floodplain was inundated. Conversely, in the dry incised floodplain reach type only 51% (115 acres) of the floodplain was flooded. Similar to base flow conditions, the dry incised floodplain reach type experienced the least flooded area, with only 135 acres inundated in the entire reach.
- Prior to the 2008 seasonal habitat flow, the Delta had standing water due to elevated groundwater tables as a result of a combination of irrigation from the lake dust control project and recent precipitation events. The 2008 habitat flow added more water causing the flow to break-out and flood down the west side of the Delta adjacent to a gravel dust control area. The effects of this flow will not be completely understood for a period of time. Continued monitoring of the response of the vegetation and channel to the habitat flows during and following a year of .5 cfs base flow will reveal more information regarding the Delta habitat response to seasonal habitat flows.
- As the magnitude of the seasonal habitat flow increased, water quality conditions declined. While no water quality parameter reached a lethal stage or threatened aquatic biota, dissolved oxygen declined to below 3 mg/L at one point in time and temperature increased throughout the flow event.
- The time for the peak 200 cfs flow to move down the Lower Owens River was 8 ½ days from the Intake to the Pumpback Station. Based on previous studies, that indicates the velocities averaged around 1ft/sec during the flushing flows.
- In general, hydro monitoring stations performed well and actions were taken to compensate for sediment problems at some stations.
- Aerial videos combined with ground level photos and surveys provided effective tools to measure flooded extent.

- Channel losses and flow changes are accurately displayed in Seasonal Habitat Flow Figures 7-15. The illustrations display 27 days of river flow data from February 12 through March 9, 2008 (base flow to high-flow and return to base flow). Because flows were augmented at the Alabama Spillgate, it cannot be estimated how much water would have reached the Pumpback Station, or if there will be more or less water at the Pumpback Station during the next seasonal habitat flow.
- It is unclear what effect the additional releases from the Alabama Spillgates had on water quality. These releases were designed as a "flushing" flow during winter months. Water quality levels were maintained within acceptable ranges for fish and other aquatic biota. Future flows released under higher air and water temperature conditions, however, may cause water quality parameters to move beyond lethal thresholds. Managers and the public need to plan for those possible conditions.

3.16. Recommendations for Future Seasonal Habitat Flows

It must be recognized that the results of this flow event are complicated for several reasons: this is the first time since the early 1980s that flows of this magnitude were released to the Lower Owens River channel; the flows were released in the winter time as opposed to the spring or summer; and flows were augmented at the Alabama Spillgate. It is not possible, therefore, to predict with precision what effect future seasonal habitat flows will have on wetted area, landform inundation, gains and losses, travel time, or water quality in reaches below the Alabama Spillgate. Thus, it is too early to make recommendations to alter future seasonal habitat flows or to recommend any adaptive management actions.

3.17. Recommendations for Future Helicopter Monitoring

The georeferenced digital video acquired using LADWP's helicopter was an excellent method for monitoring the initial seasonal habitat flow. LADWP personnel narrated each video and even took hand-held video when the *FLIR Systems* camera was not operational. The resolution of the video was sufficient to identify inundated areas and detect change based on increasing flow. It is recommended that future seasonal habitat flows be monitored in a similar fashion. The following are a few suggestions aimed at streamlining the helicopter video monitoring methodology. The suggestions represent changes to the initial methodology solely for the purpose of monitoring the seasonal habitat flow.

1. **Reduce the number of flights.** Eight helicopter flights were flown to capture the seasonal habitat flow (Seasonal Habitat Flow Table 6). Data from four of the flights were used to monitor the flooding extent of the seasonal habitat flow. Future seasonal habitat flows could be monitored using five flights. Below is a suggested flight schedule.

Flight	Capture Area and Time	Notes
1	Entire River – two weeks prior to seasonal habitat flow release.	This flight will serve to document base flow conditions.
2	Reaches 1 and 2 - 24hrs after peak high flow release from intake.	In 2008 high flows occurred in reaches 1 and 2 roughly 24hrs after the peak high flow release.
3	Reaches 3 and 4 – 3 days after peak high flow release from intake.	In 2008 high flows reached the Reinhackle monitoring station 3 days after the peak high flow release.
4	Reaches 5 and 6 – 5 days after peak high flow release from intake.	In 2008 high flows occurred in reaches 5 and 6 5 days after the peak high flow release.
5	Entire River – two weeks after base flows return to normal.	This flight will document immediate changes to the river due to the seasonal habitat flow release.

Seasonal Habitat Flow Table 16. Suggested Flights for Future Seasonal Habitat Flow Monitoring.

2. **Follow the same flight path and elevation for all flights.**
   This recommendation will be hard to attain considering the variable weather conditions and severe wind of the Eastern Sierra, but following the same flight path makes comparing multiple videos significantly easier. Often, it was hard to detect change in flooded extent from one video to another due to the video being captured at different angles and altitudes. Following the same flight path at the same altitude will make comparisons from one video to another much easier. This recommendation does not mean that the helicopter needs to fly at the same altitude for the entire time, as changing altitude is necessary to accommodate capturing the entire width of the Lower Owens River floodplain.

3. **Take still frame photos of river from the helicopter.**
   This recommendation requires having an additional person in the helicopter for all flights. This additional person will take digital photos of the river channel during the flight. These photos should attempt to be taken as vertical (straight down) as possible. The obliqueness of the digital video made aligning video still frames difficult to impossible. Digital photos that are taken at a vertical angle will allow for alignment with existing imagery and also were very helpful in mapping the flooded extent of the Lower Owens River.

3.18. References

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3.19. APPENDICES

3.19.1. Appendix A: Water Quality Data

3.19.1.1. ES Water Quality Data

WQ0: LAA Intake **WQ 0**

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	8:48am	69	NA	No	Green/ Brown	Low (<1')	10.33	4.2	208.0	345.1	NA
2/17/2008	9:31am	118	NA	No	Green	< 1m	10.24	4.0	218.8	350.1	0.2
2/18/2008	9:00am	142	NA	No	Green/ Brown	Low (1'+)	10.46	6.0	218.8	343.2	0.2
2/19/2008	9:15am	182	NA	No	Brown/ Green	Low (1')	9.20	6.8	227.2	341.3	0.2
2/20/2008	9:30am	187	NA	No	Green/ Grey	Low (1')	9.51	7.2	223.5	339.2	0.2
2/21/2008	9:00am	210	NA	No	Green/ Grey	Low (1')	9.22	7.1	222.5	338.1	0.2
2/22/2008	9:15 AM	190	NA	No	Grey- Green	Low (1')	8.83	7.1	213.3	323.4	0.2
2/24/2008	8:20 AM	135	138.7	None	Green	Low	9.30	6.6	213.9	329.3	0.2

WQ1: Blackrock below Blackrock Ditch Return **WQ1**

Date	Time	Flow (cfs) (LADWP)*	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/12/2008	10:53am	50	None	Green	Medium	11.03	8 to 6	268.9	319.9	0.2
2/15/2008	9:18am	61	No	Green/ Brown	Low (1'+)	10.90	3.8	220.9	371.4	none entered
2/17/2008	10:15am	93	No	Green	< .5m	10.42	5.4	235.8	365.0	0.2
2/18/2008	10:30am	115	No	Green/ Brown	Low/Mediu m (<3')	9.95	7.0	239.2	364.5	0.2
2/19/2008	10:45am	153	No	Green/ Brown	Low (2')	9.25	7.7	293.4	358.1	0.2
2/20/2008	10:00am	152	No	Green/ Grey	Low (1')	8.45	7.7	241.0	361.0	0.2
2/21/2008	10:15am	176	No	Green/ Grey	Low (2')	8.71	7.5	234.8	352.4	0.2
2/22/2008	9:45 AM	195	No	Green- Grey	Low (1')	8.72	7.9	238.0	352.0	0.2
2/24/2008	8:54 AM	142	None	Green	Low-Med (+/- 1m)	8.85	6.7	233.2	358.3	0.2

* Flow values measured upstream of Blackrock Ditch Return.

WQ2: East of Goose Lake Gage WQ2

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/12/2008	11:56am	50	NA	None	Green	Medium	10.77	7.7	265.1	321.8	0.2
2/17/2008	10:47am	72	NA	None	Green	< 1m	10.63	5.8	241.2	381.0	0.2
2/18/2008	11:00am	109	NA	No	Green/Brown	Low (2')	9.80	6.4	243.0	377.8	0.2
2/19/2008	11:00am	126	NA	None	Green/Brown	Low (1'-2')	9.32	7.0	244.2	372.0	0.2
2/20/2008	10:25am	148	NA	None	Green/Brown	Low (1'-2')	8.73	7.2	242.2	368.1	0.2
2/21/2008	10:30am	170	NA	None	Green/Grey	Low (1'-2')	9.32	6.9	240.0	367.1	0.2
2/22/2008	11:00 AM	195	NA	No	Green-Grey	Low (1'-2')	8.89	8.1	242.8	358.8	0.2
2/24/2008	9:25 AM	141	137.8	None	Green	Med/M+	9.27	6.5	236.8	366.3	0.2

WQ3: Two Culverts WQ3

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/12/2008	1:51pm	48	NA	None	Green	Medium	10.84	9.0	274.4	396.4	0.2
2/15/2008	10:00am	54	NA	No	Green	Medium (3 ft)	11.75	2.4	218.0	383.8	none entered
2/17/2008	not entered	71	NA	None	Green	1m (+/-)	11.03	6.0	239.1	375.8	0.2
2/18/2008	11:50am	92	NA	No	Green/Brown	Low (2')	9.85	6.7	247.5	380.8	0.2
2/19/2008	11:20am	115	NA	No	Green/Brown	Low (1'-2')	9.49	6.7	244.1	374.9	0.2
2/20/2008	10:45am	141	NA	No	Green/Brown	Low (1'-2')	9.47	6.9	240.7	368.1	0.2
2/21/2008	11:00am	164	NA	No	Green/Brown	Low (1'-2')	8.75	6.6	241.4	371.2	0.2
2/22/2008	11:20 AM	180	NA	None	Green	Low	8.68	7.8	245.0	365.6	0.2
2/24/2008	9:48 AM	141	132.75	None	Green	Med	9.15	6.5	237.7	367.7	0.2

WQ4: Mazourka Canyon Road

WQ 4

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/12/2008	2:20pm	46	NA	None	Green	Medium	9.65	7.7	276.5	413.6	0.2
2/15/2008	10:20am	45	NA	No	Green	Medium (3'+)	11.6	3.2	242.5	420.8	none entered
2/17/2008	11:20am	55	NA	None	Green/ Tea	1.5m	9.85	5.7	235.6	335.6	0.2
2/18/2008	12:15pm	72	NA	No	Green/ Brown	Medium/ Low (2'-3')	8.78	6.7	255.6	393.2	0.2
2/19/2008	11:30am	114	NA	No	Green/ Tea Brown	Low/Medium (3'-4')	8.38	7.0	257.0	395.3	0.2
2/20/2008	11:00am	133	NA	No	Green/ Tea Brown	Low/Medium (2'-3')	8.42	7.1	252.0	384.0	0.2
2/21/2008	11:15am	133	NA	No	Green/ Tea Brown	Low (2')	8.51	6.9	249.7	381.4	0.2
2/22/2008	11:55 AM	171	NA	None	Brown	Low (>2')	7.87	7.9	250.7	372.7	0.1

WQ5: Manzanar Reward Road

WQ 5

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/12/2008	not entered	51	NA	None	Green	Medium	9.23	6.9	299	459.6	none entered
2/15/2008	10:40am	51	NA	None	Green	Medium (5'-6')	10.05	3.7	70.0	140.0	none entered
2/17/2008	11:45am	56	NA	None	Tea	2 -2.5m	9.63	4.8	133.0	165.0	0.1
2/18/2008	12:30pm	61	NA	None	Green/ Clear	High (+ 6'-8')	8.73	5.4	279.0	446.7	0.2
2/19/2008	12:10pm	68	NA	None	Green/ Clear	High (6'+)	8.32	6.1	293.2	458.6	0.2
2/20/2008	11:30am	95	NA	None	Green/ Clear	High (6'+)	8.32	6.1	293.2	458.6	0.2
2/22/2008	12:14 PM	123	NA	None	Brown	Low	6.34	7.6	390.4	586	0.3
2/24/2008	5:15 PM	164	176.9	None	Brown, "Tea"	Med	7.32	7.5	395.1	594	0.3

WQ6: Reinhackle Gage

WQ6

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	11:05am	52	NA	No	Green/Brown/Amber	High (6'+)	8.30	3.6	288.0	498.7	NA
2/17/2008	12:20pm	50	NA	None	Clear	High (2m+)	7.76	4.8	304.6	496.7	0.2
2/18/2008	4:00pm	51	NA	No	Tea/Clear	High (6'-10')	8.65	6.2	317.0	495.0	0.2
2/21/2008	12:10pm	81	NA	No	Tea	High (6')	7.54	6.3	319.0	496.3	0.2
2/22/2008	3:33 PM	102	NA	None	Brown	Med	6.15	7.7	394.9	590.0	0.3
2/24/2008	4:47 PM	164	163.6	None	Brown, "Tea"	Med	5.56	7.6	442.8	663.0	0.3
2/25/2008	10:04 AM	171	195.7	None	Brown	Med	5.07	6.5	428.4	663	0.3
2/26/2008	10:52 AM	156	179.9	None	Brown-Amber	Med	5.11	7.3	416.7	630	0.3
2/27/2008	8:00 AM	147	167.94	None	Brown	Med	4.4	7.3	381.4	576	0.3

WQ7: Below Alabama Gates

WQ7

Date	Time	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	11:30am	No	Tea	High (4'-6')	9.75	3.6	515.0	875.0	none entered
2/17/2008	12:45pm	None	Tea	1-2m	7.72	6.5	610.2	787.0	0.2
2/21/2008	12:45pm	None	Tea	Medium (5'-6')	7.85	7.3	477.0	721.0	0.4
2/24/2008	4:10 PM	None	Brown, "Tea-like"	Good - Med	7.55	7.1	641	976	0.5
2/25/2008	5:00 PM	None	Brown	Low-Med	5.60	8.6	768	1122	0.6
2/26/2008	Midday?	None	Brown	Med	4.18	8.5	670	978	0.5
2/27/2008	8:30 AM	None	Brown	Med	3.92	8.8	660	957	0.5

WQ8: Lone Pine Ponds at Trestle

WQ8

Date	Time	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	12:00pm	No	Tea	High (5'-6')	7.65	4.2	465.0	774.0	none entered
2/17/2008	1:00pm	None	Tea	High (2m+)	7.83	5.5	563.0	810.0	none entered
2/26/2008	3:49 PM	None	Brown "Amber"	Med	4.11	8.7	730	1068	0.5

WQ9: Lone Pine Narrow Gauge Road

WQ 9

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	12:10pm	50	NA	No	Tea	High (6'+)	8.71	4.2	461.0	766.0	none entered
2/17/2008	1:15pm	49	NA	None	Tea	High (2-3+)	8.63	5.6	547.0	871.0	0.4
2/18/2008	3:30pm	49	NA	No	Tea	Medium (5'-6')	8.92	6.8	519.0	794.0	0.4
2/19/2008	12:30pm	50	NA	No	Tea	High (6'+)	7.57	6.7	485.0	747.0	0.4
2/21/2008	1:50pm	53	NA	No	Tea	Medium (5'-6')	7.85	7.3	477.0	721.0	0.4
2/22/2008	1:15 AM	58	NA	None	Brown	Med (>1m)	7.13	7.5	483	725	0.4
2/24/2008	3:45 PM	80	93.7	None	Tea	Med	7.22	7.4	501	755	0.4
2/25/2008	4:07 PM	100	121.97	None	Brown	Med	6.60	7.6	598	894	0.4
2/26/2008	1:56 PM	162	170.65	Non	Brown - Amber	Med	4.36	8.5	761	1112	0.6
2/27/2008	10:00 AM	202	187.15	None	Brown	Med	3.46	8.4	673	986	0.5
2/28/2008	11:00 AM	214	206	High H2S/ NH+	Tea	1'	3.26	9.5	676	967	NA

WQ10: Keeler Weir

WQ10

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	12:35pm	57	NA	No	Tea	High (5'-6')	8.89	4.4	478.0	787.0	NA
2/17/2008	2:05pm	58	NA	None	Tea	2m	9.18	5.9	478.0	754.0	0.4
2/18/2008	2:40pm	60	NA	No	Tea	High (+6')	9.05	6.5	528.0	817.0	0.4
2/19/2008	3:30pm	58	NA	No	Tea	Med/High (4'-5')	8.72	6.8	550.0	842.0	0.4
2/21/2008	3:30pm	59	NA	No	Tea	High (+6')	8.27	7.6	511.0	764.0	0.4
2/25/2008	3:00 PM	78	81.2	None	Brown	Low-Med	6.88	8.3	580	852	0.4
2/27/2008	1:50 PM	161	139.62	None	Brown	Med	3.83	9.4	861	1229	0.6
2/28/2008	NA	214	145	smelly	Tea	1'	3.56	9.4	806	1149	NA
3/1/2008	8:30 AM	218	147	none	brown	low <.5m	2.82	10.1	727	1016	0.5
3/2/2008	11:00 AM	141	128	None	Black Tea	Low	4.25	8.4	640	937	0.5

WQ10: Keeler Weir

Date	Time	Flow (cfs) (LADWP)	Flow (cfs) (meter)	Odor	Color	Visibility	D.O. (mg/L)	Temp. (°C)	Conductivity (µS)	Spec. Cndctvty. (µS)	Salinity (ppt)
2/15/2008	12:35pm	57	NA	No	Tea	High (5'-6')	8.89	4.4	478.0	787.0	NA
2/17/2008	2:05pm	58	NA	None	Tea	2m	9.18	5.9	478.0	754.0	0.4
2/18/2008	2:40pm	60	NA	No	Tea	High (+6')	9.05	6.5	528.0	817.0	0.4
2/19/2008	3:30pm	58	NA	No	Tea	Med/High (4'-5')	8.72	6.8	550.0	842.0	0.4
2/21/2008	3:30pm	59	NA	No	Tea	High (+6')	8.27	7.6	511.0	764.0	0.4
2/25/2008	3:00 PM	78	81.2	None	Brown	Low-Med	6.88	8.3	580	852	0.4
2/27/2008	1:50 PM	161	139.62	None	Brown	Med	3.83	9.4	861	1229	0.6
2/28/2008	NA	214	145	smelly	Tea	1'	3.56	9.4	806	1149	NA
3/1/2008	8:30 AM	218	147	none	brown	low <.5m	2.82	10.1	727	1016	0.5
3/2/2008	11:00 AM	141	128	None	Black Tea	Low	4.25	8.4	640	937	0.5

3.19.1.2. ICWD Water Quality Data

Water quality (collected by ICWD) in the Owens River at Mazourka Canyon Road

Date	Time	D.O.	Turbidity	pH	E.C.	Temp	Ammonia	Hydrogen Sulfide	Tannins and Lignins
2/14/2008	11:21	11.76	8.7	6.59	0.453	4.03	0.0	0.0	0.0
2/15/2008	12:06	13.08	10.4	6.43	0.447	3.04	0.0	0.0	0.7
2/19/2008	11:44	9.50	12.5	7.14	0.400	6.71	0.0	0.0	1.4
2/20/2008	11:21	9.43	12.1	7.20	0.390	6.75	0.0	0.0	1.2
2/21/2008	12:20	9.61	12.5	7.2	0.385	6.82	0.0	0.0	1.5
2/22/2008	12:12	9.25	13.4	7.15	0.375	7.64	0.0	0.0	1.0
2/25/2008	10:16	9.54	12.5	7.35	0.383	6.77	0.0	0.0	1.0
2/26/2008	8:11	9.14	13.7	7.22	0.385	6.79	0.0	0.0	0.0
2/27/2008	12:37	9.77	16.7	7.81	0.401	7.91	0.0	0.0	1.0
2/28/2008	11:33	9.24	25.4	7.95	0.446	8.62	0.0	0.0	1.0
2/29/2008	12:15	8.93	13.2	7.80	0.479	9.70	0.0	0.0	0.8
3/4/2008	12:50	10.44	11.7	7.63	0.465	7.08	0.0	0.0	1.2
3/6/2008	12:12	10.22	14.5	7.75	0.469	6.54	0.0	0.0	0.6
3/12/2008	13:11	8.60	12.0	7.75	0.440	10.98	0.0	0.0	0.6

Water quality (collected by ICWD) in the Owens River at Manzanar Reward Road

Date	Time	D.O.	Turbidity	pH	E.C.	Temp	Ammonia	Hydrogen Sulfide	Tannins and Lignins
2/14/2008	12:08	11.00	6.0	6.54	0.497	3.97	0.0	0.0	0.8
2/15/2008	12:53	11.70	6.5	6.49	0.495	3.78	0.0	0.0	1.0
2/19/2008	12:35	10.12	5.5	6.98	0.466	5.92	0.0	0.3	1.0
2/20/2008	12:00	9.00	8.0	nd	0.543	6.46	0.0	0.0	2.0
2/21/2008	13:20	8.00	8.0	7.01	0.595	7.1	0.0	0.0	0.6
2/22/2008	12:51	7.50	9.4	7.16	0.590	7.34	0.0	0.0	1.6
2/25/2008	10:48	8.30	10.4	7.30	0.548	6.81	0.0	0.1	1.8
2/26/2008	8:35	7.47	8.1	7.39	0.487	6.89	0.0	0.0	2.0
2/27/2008	13:08	7.76	11.0	7.69	0.478	8.39	0.0	0.0	1.6
2/28/2008	11:07	7.35	16.6	7.79	0.481	8.65	0.0	0.0	1.6
2/29/2008	12:50	7.02	6.1	7.71	0.492	9.73	0.0	0.0	1.5
3/4/2008	13:35	8.10	6.8	7.74	0.544	7.29	0.0	0.0	1.4
3/6/2008	12:37	8.75	6.9	7.71	0.523	6.27	0.0	0.0	1.0
3/12/2008	13:38	7.62	4.4	7.62	0.504	9.60	0.0	0.0	0.8

Water quality (collected by ICWD) in the Owens River at Reinhackle Springs

Date	Time	D.O.	Turbidity	pH	E.C.	Temp	Ammonia	Hydrogen Sulfide	Tannins and Lignins
2/14/2008	12:42	10.30	5.4	6.51	0.530	3.55	0.0	0.0	1.2
2/15/2008	13:30	10.41	5.8	6.55	0.531	3.94	0.0	0.0	1.0
2/19/2008	13:32	8.97	4.7	7.11	0.497	5.43	0.0	0.1	0.8
2/20/2008	14:07	8.95	4.7	7.13	0.500	6.12	0.0	0.1	2.0
2/21/2008	15:00	8.71	5.6	7.11	0.505	6.73	0.0	0.0	1.6
2/22/2008	14:29	6.92	7.2	7.19	0.59	7.27	0.0	0.0	0.8
2/25/2008	12:38	6.2	7.5	7.29	0.689	7.01	0.0	0.0	3.2
2/26/2008	9:05	5.38	7.8	7.36	0.651	6.47	0.0	0.0	4.4
2/27/2008	11:50	5.75	15.0	7.65	0.580	7.96	0.0	0.0	2.2
2/28/2008	10:40	5.49	11.7	7.71	0.538	8.23	0.0	0.0	2.2
2/29/2008	13:33	5.75	16.3	7.77	0.527	9.97	0.0	0.0	1.6
3/4/2008	15:32	7.00	6.5	7.66	0.564	8.25	0.0	0.0	nd
3/6/2008	13:08	7.52	6.7	7.77	0.579	6.76	0.0	0.0	1.2
3/12/2008	11:24	5.57	7.3	7.69	0.550	8.40	0.0	0.0	1.0

Water quality (collected by ICWD) in the Owens River at Keeler Bridge

Date	Time	D.O.	Turbidity	pH	E.C.	Temp	Ammonia	Hydrogen Sulfide	Tannins and Lignins
2/14/2008	13:24	10.60	6.2	6.65	0.835	4.67	0.0	0.0	4.0
2/15/2008	14:41	10.96	6.5	6.35	0.843	4.93	0.0	0.0	2.0
2/19/2008	14:18	9.70	5.1	7.22	0.865	6.2	0.0	0.0	1.6
2/20/2008	13:00	9.17	5.5	7.18	0.800	6.42	0.0	0.0	2.2
2/21/2008	12:20	9.3	6.1	7.13	0.771	7.08	0.0	0.0	1.5
2/22/2008	13:40	8.93	7.2	7.3	0.758	7.24	0.0	0.0	1.5
2/25/2008	11:49	7.51	8.3	7.32	0.875	6.93	0.0	0.0	3.0
2/26/2008	9:43	6.49	9.5	7.58	0.929	6.40	0.0	0.0	4.8
2/27/2008	10:53	4.72	13.8	7.80	1.227	7.70	0.0	0.0	5.4
2/28/2008	9:52	4.38	10	7.78	1.166	8.38	0.0	0.0	5.2
2/29/2008	14:26	3.88	8.5	7.7	1.094	11.46	0.0	0.0	4.6
3/3/2008	9:33	5.32	8.3	7.47	0.935	6.99	0.0	0.0	4.0
3/4/2008	14:40	5.39	7.0	7.69	0.935	9.13	0.0	0.0	3.4
3/6/2008	13:47	6.21	7.5	7.67	0.88	7.97	0.0	0.0	2.4
3/12/2008	10:29	5.62	7.2	7.61	0.811	8.81	0.0	0.0	2.2

3.19.2. Appendix B: Photo Points

Photo Points are not included in the printed copy of this report. Photo Points are displayed in the digital version of the report.

3.19.3. Appendix C: Vegetation Cover Type Descriptions

A summary sheet for each of the 22 vegetation cover types referred to by this report is found below. The information pertaining to each vegetation type, along with a representative picture, is presented here for easy reference.

Vegetation Type: Greasewood – Saltbush Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	10.3	7.5	3.5	0	0	3.3
Mean plot pos.:						1.8
Ave. patch length (m):						26
WWI score:						(FACU-)3.5
Dominant sp. origin:						native
Community complex:						saline scrub
Species abundance:						
# of dominant species in transects:						6
Total species in subplots						10

			n=56	**Groundcover**	n=17
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
Sarcobatus vermiculatus	2.7	100	31	bareground	58
Atriplex lentiformis	2.0	84	9	litter	33
Chrysothamnus nauseosus	0.2	21	1	vegetation	5
Tamarix ramosissima	0.1	4	0	downed wood	4
unknown forb	0.1	2	1	cow manure	<1
Ephedra nevadensis	0	2	0	dead shrub	<1

Cover percentage and diversity measures:

Max (%)	**LCL (%)**	**Mean (%)**	**UCL (%)**	**Structure**	**S**	**E**	**H′**
19.9	2.5	3.3	4.4	shrub	15	0.7	1.9

Canopy Cover:

n	**lcl**	**mean**	**ucl**
17	9	17	39

Crosswalk:

Whitehorse Associates (2004)	**NDDB/ Holland (1986)**	**Greenbook (1990)**	**Sawyer and Keeler-Wolf (1995)**
Alkali scrub	Desert greasewood scrub or Desert sink scrub	Desert greasewood scrub or Desert sink scrub	Greasewood series

Vegetation Type: Tamarisk Cuttings/-Saltbush Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	21.8	18.0	2.3	0.5	0	3.0
Mean plot pos.:						1.5
Ave. patch length (m):						22
WWI score:						(FACU) 3.9
Dominant sp. Origin:						exotic
Community complex:						tamarisk
Species abundance:						
# of dominant species in transects:						14
Total species in subplots						12

			n=44	**Groundcover**	N=16
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
tamarisk cuttings	3.0	100	97	litter	40
Atriplex lentiformis	0.8	27	1	downed wood	30
Salsola tragus	0.3	11	1	bare ground	24
				vegetation	7

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
49.2	1.5	3.0	5.9	shrub	3	0.7	0.8

Canopy Cover:

n	lcl	mean	ucl
16	0	7	91

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub	Desert saltbush scrub	Nevada saltbush scrub*	Mixed saltbush series

Vegetation Type: Greasewood/ Russian Thistle Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	21.8	18.0	2.3	0.5	0	8.8
Mean plot pos.:						1.5
Ave. patch length (m):						22
WWI score:						(FACU) 3.9
Dominant sp. Origin:						exotic
Community complex:						tamarisk
Species abundance:						
# of dominant species in transects:						14
Total species in subplots						12

Most Common Dominant Species	Dom. score	%Freq	IV (n=138)	Cover type (Groundcover)	% (N=31)
Salsola tragus	3.0	100	44	bare ground	74
Sarcobatus vermiculatus	0.4	13	1	litter	19
Bassia hysssopifolia	0.1	6	0	vegetation	4
Atriplex lentiformis	0.1	5	0	cow manure	2
Atriplex confertifolia	0.1	4	0	downed wood	1
Chrysothamnus nauseosus	0	2	0		
Malva neglecta	0	2	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
45.3	6.6	8.8	11.5	shrub	14	0.4	1.0

Canopy Cover:

n	lcl	mean	ucl
31	4	6	10

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub	Desert greasewood scrub or Desert	Desert greasewood scrub or Desert	Greasewood series

Vegetation Type: Saltbush/ Russian Thistle Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	28.8	18.1	2.2	0.3	0	9.7
Mean plot pos.:						1.5
Ave. patch length (m):						23
WWI score:						(FAC) 3.2
Dominant sp. Origin:						exotic
Community complex:						tamarisk
Species abundance:						
# of dominant species in transects:						15
Total species in subplots						10

n=146

Most Common Dominant Species	Dom. score	%Freq	IV
Salsola tragus	3.0	99	43
Atriplex lentiformis	2.4	82	10
Tamarix ramosissima	0.8	26	4
Chrysothamnus nauseosus	0.3	14	1
Distichlis spicata	0.3	11	0
Atriplex pusilla	0.2	8	5

Groundcover N=43

Cover type	%
litter	47
bare ground	35
vegetation	11
downed wood	4
rock	1
cow manure	1
dead shrub	1
water	<1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
62.2	6.9	9.7	13.1	shrub	15	0.6	1.5

Canopy Cover:

n	lcl	mean	ucl
43	18	25	35

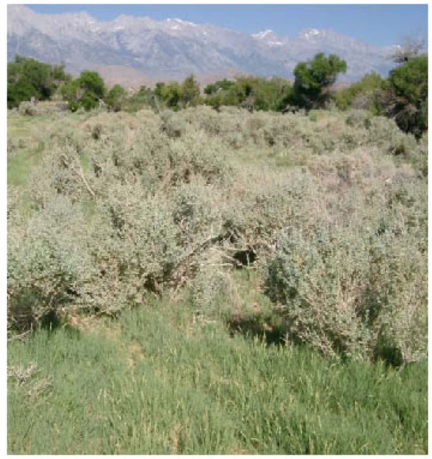
Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub	Desert saltbush scrub	Nevada saltbush scrub*	Mixed saltbush series

Vegetation Type: Saltbush/ Saltgrass Scrub Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	3.7	17.5	11.5	2.0	7.9	8.3
Mean plot pos.:						3.2
Ave. patch length (m):						23
WWI score:						(FAC+)2.6
Dominant sp. Origin:						native
Community complex:						Saltbush/ saltgrass scrub
Species abundance:						
# of dominant species in transects:						11
Total species in subplots						12



Most Common Dominant Species	Dom. score	%Freq	IV (n=146)
Atriplex lentiformis	3.0	99	15
Distichlis spicata	2.0	66	6
Chrysothamnus nauseosus	0.4	21	1
Phragmites australis	0.1	3	0
Sarcobatus vermiculatus	0.1	3	0
tamarisk cuttings	0.0	1	0
Suaeda moquinii	0.0	1	0
Sporobolus airoides	0.0	1	0

Groundcover n=42

Cover type	%
litter	49
vegetation	27
bare ground	18
downed wood	4
cow manure	1
dead shrub	<1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
55.9	6.3	8.3	11.2	shrub	11	0.5	1.2

Canopy Cover:

n	lcl	mean	ucl
42	39	50	64

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub/meadow	Desert saltbush scrub	Nevada saltbush meadow*	Mixed saltbush series

Vegetation Type: Alkalai Sacatone/ Saltgrass Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	2.8	0.8	18.3	19.6	15.5	11.1
Mean plot pos.:						4
Ave. patch length (m):						23
WWI score:						(FAC+)2.5
Dominant sp. Origin:						native
Community complex:						Saltbush/ saltgrass scrub
Species abundance:						
# of dominant species in transects:						28
Total species in subplots						23

Most Common Dominant Species	Dom. score	%Freq	n=212 IV	Groundcover Cover type	n=57 %
Sporobolus airoides	2.9	100	67	vegetation	38
Distichlis spicata	2.5	84	9	litter	29
Chrysothamnus nauseosus	1.4	51	10	bare ground	29
Atriplex lentiformis	1.3	53	3	downed wood	2
Suaeda moquinii	0.3	13	1	cow manure	1
Juncus balticus	0.2	10	1	dead grass	1
Glycyrrhiza lepidota	0.2	10	1	dead shrub	1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
62.3	8.7	11.1	13.9	grass	28	0.6	1.9

Canopy Cover:

n	lcl	mean	ucl
57	49	61	71

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Dry alkali meadow	Valley sacaton grasslands	Alkali meadow	Alkali sacaton series

Vegetation Type: Rabbitbrush- Saltbush/ Saltgrass Scrub Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	5.8	4.7	16.4	1.2	4.9	6.1
Mean plot pos.:						3.3
Ave. patch length (m):						20
WWI score:						(FAC+) 2.6
Dominant sp. Origin:						native
Community complex:						Saltbush/ saltgrass scrub
Species abundance:						
# of dominant species in transects:						24
Total species in subplots						17

Most Common Dominant Species	Dom. score	%Freq	IV (n=123)
Chrysothamnus nauseosus	2.7	98	36
Atriplex lentiformis	1.6	75	6
Distichlis spicata	1.4	47	3
Suaeda moquinii	0.4	13	1
Glycyrrhiza lepidota	0.4	12	1
Juncus balticus	0.3	12	1
Anemopsis californica	0.3	11	1

Groundcover n=35

Cover type	%
litter	44
vegetation	32
bare ground	19
downed wood	4
cow pie	1
dead shrub	1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
38.1	4.5	6.1	7.9	shrub	24	0.7	2.1

Canopy Cover:

n	lcl	mean	ucl
35	57	71	85

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub/meadow	Desert saltbush scrub	Rabbitbrush meadow*	Rubber rabbitbrush series

Vegetation Type: Tamarisk / Saltbush Woodland

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	6.1	16.5	0.1	1.2	0.3	4.7
Mean plot pos.:						1.9
Ave. patch length (m):						22
WWI score:						(FAC+)2.4
Dominant sp. Origin:						exotic
Community complex:						tamarisk
Species abundance:						
# of dominant species in transects:						14
Total species in subplots						10

			n=123	Groundcover	n=35
Most common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
Tamarix ramosissima	3.0	99	51	litter	61
Atriplex lentiformis	2.0	69	7	vegetation	25
Distichlis spicata	0.8	26	1	bare ground	7
Chrysothamnus nauseosus	0.1	5	0	downed wood	6
Elaeagnus angustifolia	0.1	2	1	cow manure	1
Malva neglecta	0	2	0		
Anemopsis californica	0	2	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
41.9	3.4	4.7	6.6	tree	14	0.5	1.3

Canopy Cover:

n	lcl	mean	ucl
35	53	67	78

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Tamarisk	Tamarisk scrub	Tamarisk scrub	Tamarisk series

Vegetation Type: Smotherweed-Mixed Shrubland

Community Characteristics:						
Plot	1	2	3	4	5	Total
Cover %	3.2	0.6	0.7	0.7	0.1	1.2
Mean plot pos.:						2.2
Ave. patch length (m):						19
WWI score:						(FAC+)3.1
Dominant sp. Origin:						exotic
Community complex:						Saline scrub
Species abundance:						
# of dominant species in transects:						12
Total species in subplots:						9

Most Common Dominant Species	Dom. score	%Freq	IV (n=20)	Cover type (Groundcover)	% (n=5)
Bassia hyssopifolia	3.0	100	88	bare ground	50
Sarcobatus vermiculatus	1.1	35	4	litter	31
Distichlis spicata	1.1	35	2	vegetation	18
Atriplex lentiformis	1.0	40	2	downed wood	<1
Leymus triticoides	0.4	15	1	cow manure	<1
Salsola tragus	0.2	10	0		
Salix gooddingii	0.2	5	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
18.7	0.6	1.2	2.2	herbaceous	12	0.7	1.8

Canopy Cover:

n	lcl	mean	ucl
5	0	37	421

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub	Desert saltbush scrub	Non-native vegetation and misc. lands*	Mixed saltbush series

Vegetation Type: Saltgrass Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.2	0.2	1.5	5.7	19.2	5.3

Mean plot pos.:	4.6
Ave. patch length (m):	20
WWI score:	(FACW) 2.0
Dominant sp. Origin:	native
Community complex:	Saltbush/ saltgrass scrub
Species abundance:	
# of dominant species in transects:	6
Total species in subplots	14

Most common Dominant Species	Dom. score	%Freq	IV (n=137)	Cover type (Groundcover)	% (n=24)
Distichlis spicata	3.0	100	13	litter	41
Anemopsis californica	0.1	4	0	vegetation	41
Lolium sp.	0	1	0	bare ground	10
Ambrosia acanthicarpa	0	1	0	road	4
Atriplex pusilla	0	1	0	cow manure	2
Juncus balticus	0	1	0	downed wood	2
				ant hill	<1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
36.8	3.8	5.3	7.5	grass	6	0.1	0.3

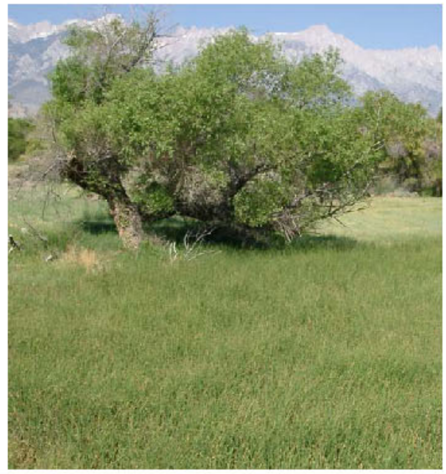
Canopy Cover:

n	lcl	mean	ucl
24	55	70	82

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Dry alkali meadow	Alkali meadow	Alkali meadow	Saltgrass sereies

Vegetation Type: Goodding's Willow Woodland



Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.4	4.9	10.0	5.6	7.8	5.7
Mean plot pos.:						3.8
Ave. patch length (m):						15
WWI score:						(FACW+) 1.8
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						39
Total species in subplots						32

			n=162	Groundcover	
Most common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
Salix gooddingii	2.9	96	51	vegetation	42
Distichlis spicata	1.7	58	4	litter	40
Atriplex lentiformis	0.9	31	1	bare ground	9
Leymus triticoides	0.8	29	4	downed wood	6
Scirpus americanus	0.5	20	2	dead shrub	1
Tamarix ramosissima	0.5	24	2	water	1
Anemopsis californica	0.5	17	2	cow manure	1
				rock	<1
				dead tree	<1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
34.2	4.4	5.7	7.5	tree	39	0.7	2.4

Canopy Cover:

n	lcl	mean	ucl
43	78	93	110

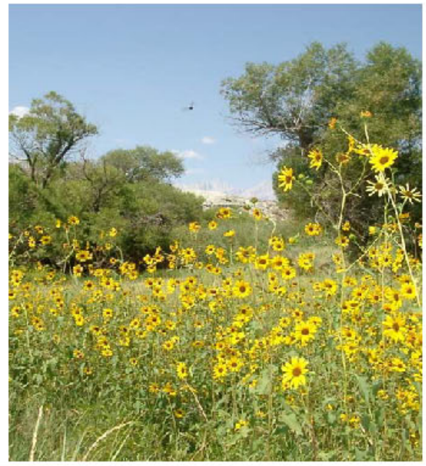
Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Riparian Forest (willow)	Modoc-Great Basin cottonwood/willow riparian forest and Mojave riparian forest	Modoc-Great Basin cottonwood/willow riparian forest and Mojave riparian forest	Black willow series

Vegetation Type: Sunflower-Licorice Wet Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0	0.2	0.3	0.7	2.3	0.7
Mean plot pos.:						4.6
Ave. patch length (m):						10
WWI score:						(FACW) 2.1
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						30
Total species in subplots						19



Most Common dominant Species	Dom. score	%Freq	IV (n=33)	Groundcover: Cover type	% (n=7)
Helianthus annuus	1.2	46	24	litter	50
Glycyrrhiza lepidota	0.7	30	7	vegetation	34
Distichlis spicata	0.7	27	1	bare ground	7
Rosa woodsii	0.5	15	7	downed wood	4
Xanthium strumarium	0.5	21	10	water	4
Anemopsis californica	0.4	15	1	cow manure	1
Malva neglecta	0.4	15	10		
Leymus triticoides	0.4	18	1		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
9.3	0.4	0.7	1.1	herbaceous	30	0.9	2.9

Canopy Cover:

n	lcl	mean	ucl
7	25	95	172

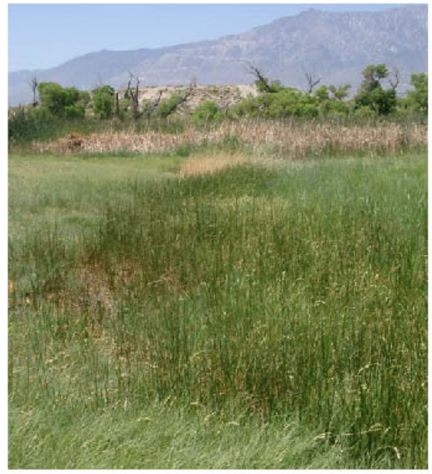
Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Wet Alkali meadow (rush/sedge)	Transmontane alkali marsh	Rush-sedge meadow*	Sedge series

Vegetation Type: Baltic Rush – Saltgrass Wet Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0	0.6	3.5	4.8	3.5	2.5
Mean plot pos.:						4.2
Ave. patch length (m):						15
WWI score:						(FACW+) 1.6
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						30
Total species in subplots						41



Most Common Dominant Species	Dom. score	%Freq	n=74 IV	Groundcover Cover type	%
Juncus balticus	2.7	97	60	vegetation	46
Distichlis spicata	1.3	60	3	litter	36
Anemopsis californica	0.7	35	5	water	9
Salix gooddingii	0.4	15	1	bare ground	6
Tamarix ramosissima	0.4	14	1	downed wood	2
Atriplex lentiformis	0.4	14	0	cow manure	1
Glycyrrhiza lepidota	0.3	15	2		
Helianthus annuus	0.3	14	2		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
23.5	1.7	2.5	3.6	grass	30	0.7	2.5

Canopy Cover:

n	lcl	mean	ucl
21	59	84	109

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Wet Alkali meadow (rush/sedge)	Transmontane alkali marsh	Rush-sedge meadow*	Sedge series

Vegetation Type: Seepweed-Saltbush/ Saltgrass Scrub Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0	2.1	3.9	1.8	3.5	2.1
Mean plot pos.:						3.7
Ave. patch length (m):						19
WWI score:						(FAC+) 2.6
Dominant sp. Origin:						native
Community complex:						Saltbush/ saltgrass scrub
Species abundance:						
# of dominant species in transects:						12
Total species in subplots:						15

Most Common Dominant Species	Dom. score	%Freq	n=51 IV	Cover type (Groundcover)	%
Suaeda moquinii	3	100	47	bare ground	57
Atriplex lentiformis	1.9	65	6	litter	23
Distichlis spicata	1.8	61	5	vegetation	19
Atriplex confertifolia	0.3	10	1	downed wood	1
Sarcobatus vermiculatus	0.2	10	0	cow manure	1
Chrysothamnus nauseosus	0.1	6	0	human trash	<1
Stephanomeria pauciflora	0.1	4	2		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
18.4	1.4	2.1	3.1	shrub	12	0.6	1.6

Canopy Cover:

n	lcl	mean	ucl
16	30	44	65

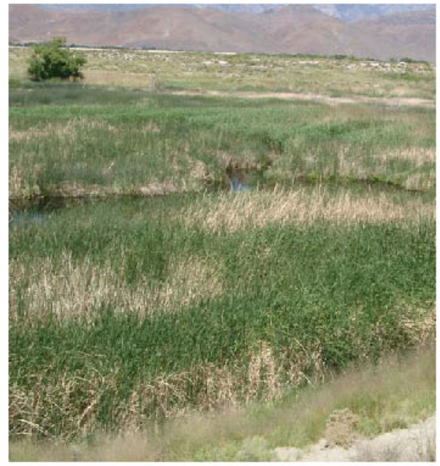
Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub/meadow	Desert saltbush scrub	Nevada saltbush meadow*	Mixed saltbush series

Vegetation Type: Willow/ Cattail – Rush Wetland

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	7.9	16.6	4.9	6.2
Mean plot pos.:						4.2
Ave. patch length (m):						24
WWI score:						(OBL) 1.1
Dominant sp. Origin:						native
Community complex:						Emergent wetland
Species abundance:						
# of dominant species in transects:						20
Total species in subplots						15



			n=102	Groundcover	n=20
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
Typha latifolia	3.0	100	58	vegetation	44
Salix gooddingii	0.9	30	5	litter	31
Scirpus americanus	0.6	26	3	water	18
Lemna sp.	0.1	4	3	bare ground	5
Juncus balticus	0.1	4	0	downed wood	2
Tamarix ramosissima	0.1	4	0	dead tree	<1
Scirpus acutus	0.1	3	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
46.0	4.5	6.2	8.5	emergent	20	0.5	1.5

Canopy Cover:

n	lcl	mean	ucl
20	39	63	89

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Marsh	Transmontane alkali marsh	Transmontane alkali marsh	Cattail series

Vegetation Type: Shadscale Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	2.6	8.2	6.0	3.3
Mean plot pos.:						4.2
Ave. patch length (m):						24
WWI score:						(UPL)3.8
Dominant sp. Origin:						native
Community complex:						Saline scrub
Species abundance:						
# of dominant species in transects:						15
Total species in subplots:						11

Most Common Dominant Species	Dom. score	%Freq	IV (n=64)	Groundcover Cover type (n=13)	%
Atriplex confertifolia	2.8	95	60	bare ground	91
Sarcobatus vermiculatus	1.2	45	6	litter	5
Psorothamnus polydenius	1.0	41	37	vegetation	4
Chrysothamnus nauseosus	0.6	25	2	dead shrub	<1
Atriplex canescens	0.4	17	13	downed wood	<1
Salsola tragus	0.2	8	0	cow manure	<1
Suaeda moquinii	0.2	9	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
19.9	2.5	3.3	4.4	shrub	15	0.7	1.9

Canopy Cover:

n	lcl	mean	ucl
13	6	12	28

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Alkali scrub	Shadscale scrub	Shadscale scrub	Shadscale series

Vegetation Type: Bull Rush- Cattail-Willow Wetland

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	2.0	12.3	2.6	4.1
Mean plot pos.:						4.3
Ave. patch length (m):						22
WWI score:						(OBL) 1.0
Dominant sp. Origin:						native
Community complex:						Emergent wetland
Species abundance:						
# of dominant species in transects:						10
Total species in subplots						7

Most Common Dominant Species	Dom. score	%Freq	IV (n=51)	Groundcover: Cover type (n=10)	%
Scirpus acutus	2.7	100	83	water	38
Typha latifolia	1.4	55	15	litter	31
Salix gooddingii	0.7	24	3	vegetation	25
Salix laevigata	0.1	4	1	downed wood	5
Atriplex lentiformis	0.1	2	0	bare ground	1
Polygonum hydropiperoides	0.1	4	2	cow manure	<1
Lemna sp.	0.1	2	1		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
48.5	2.5	4.1	6.7	emergent	10	0.6	1.3

Canopy Cover:

n	lcl	mean	ucl
10	15	57	92

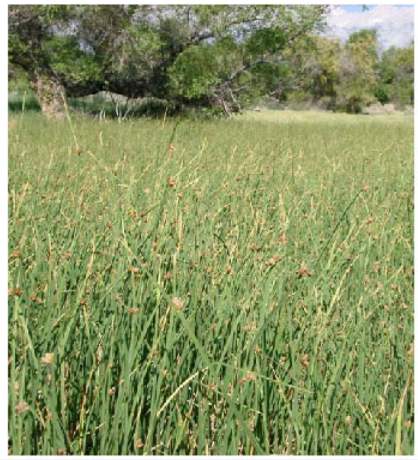
Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Marsh	Transmontane alkali marsh	Transmontane alkali marsh	Bullrush series

Vegetation Type: Chairmaker's Bullrush/Saltgrass Wet Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	1.1	2.9	1.3	1.2
Mean plot pos.:						4.1
Ave. patch length (m):						8
WWI score:						(OBL-) 1.4
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						21
Total species in subplots						19



Most Common Dominant Species	Dom. score	%Freq	IV (n=54)
Scirpus americanus	2.9	100	63
Distichlis spicata	1.2	48	3
Anemopsis californica	0.9	33	6
Juncus balticus	0.4	15	1
Tamarix ramosissima	0.2	7	0
Polypogon monspeliensis	0.1	6	2
Xanthium strumarium	0.1	6	1

Groundcover n=8

Cover type	%
vegetation	45
litter	45
bare ground	10
cow manure	1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
14.8	0.7	1.2	1.9	emergent	21	0.6	1.9

Canopy Cover:

n	lcl	mean	ucl
8	57	87	128

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Wet Alkali meadow (rush/sedge)	Transmontane alkali marsh	Rush-sedge meadow*	Sedge series

Vegetation Type: Common Reed/ Yerba Mansa

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	0.1	2.4	1.9	0.9

Mean plot pos.: 4.5
Ave. patch length (m): 16
WWI score: (FACW+) 1.7
Dominant sp. Origin: native
Community complex: Common Reed
Species abundance:
# of dominant species in transects: 15
Total species in subplots 12

Most Common Dominant Species	Dom. score	%Freq	IV (n=27)	Cover type (Groundcover n=6)	%
Phragmites australis	3.0	100	87	litter	65
Anemopsis californica	1.4	48	13	vegetation	32
Salix exigua	1.0	33	8	water	2
Apocynum cannabinum	0.3	15	15	bare ground	1
Chrysothamnus nauseosus	0.3	15	1	cow manure	<1
Typha latifolia	0.3	11	1		
Helianthus annuus	0.2	11	1		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H'
10.3	0.5	0.9	1.5	shrub	15	0.7	1.9

Canopy Cover:

n	lcl	mean	ucl
6	55	99	241

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Reedgrass	Transmontane alkali marsh	Transmontane alkali marsh	Common reed series

Vegetation Type: Wildrye/ Saltgrass Meadow

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	0.6	2.8	6.4	2.0
Mean plot pos.:						1.5
Ave. patch length (m):						11
WWI score:						(FAW-) 2.2
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						21
Total species in subplots:						23

			n=89	Groundcover	
Most Common Dominant Species	Dom. score	%Freq	IV	Cover type	%
Leymus triticoides	2.8	99	46	vegetation	60
Distichlis spicata	2.3	78	8	litter	28
Glycyrrhiza lepidota	0.6	26	5	bare ground	6
Atriplex lentiformis	0.5	18	0	downed wood	4
Juncus balticus	0.3	12	1	dead shrub	1
Scirpus ameicanus	0.2	9	0	cow manure	1
Anemopsis californica	0.2	9	0		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
23.7	1.3	2.0	3.1	grass	21	0.6	1.8

Canopy Cover:

n	lcl	mean	ucl
7	78	113	184

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Dry alkali meadow	Valley wildrye grasslands	Alkali meadow	Creeping ryegrass series

Vegetation Type: Coyote Willow/ Saltgrass Riparian Shrubland

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	0.0	0.0	0.2	0.7	3.0	0.8
Mean plot pos.:						1.5
Ave. patch length (m):						11
WWI score:						(FAC+)1.8
Dominant sp. Origin:						native
Community complex:						Willow wet meadow
Species abundance:						
# of dominant species in transects:						19
Total species in subplots:						18

			n=36	Groundcover	n=7
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
Salix exigua	3	100	71	litter	45
Distichlis spicata	1.2	42	2	vegetation	33
Leymus triticoides	1.1	36	6	bare ground	13
Glycyrrhiza lepidota	0.6	22	4	downed wood	9
Atriplex lentiformis	0.5	31	1	cow manure	<1
Anemopsis californica	0.5	19	2		
Chrysothamnus nauseosus	0.3	17	1		

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
15.5	0.4	0.8	1.6	shrub	19	0.8	15.5

Canopy Cover:

n	lcl	mean	ucl
7	78	113	184

Crosswalk:

Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Riparian Shrub (willow)	Modoc-Great Basin riparian scrub	Modoc-Great Basin riparian scrub	Narrowleaf willow series

3.19.4. Appendix D: River Flow Data for LORP
January 1 to March 31, 2008

Appendix/Table 17. Flow data (cfs) in the Lower Owens River and it's tributaries for January through March, 2008.

River flow data is maintained by LADWP and presented at the following website: http://www.ladwp.com/ladwp/cms/ladwp009121.jsp

Flow Gaging Station / Date	LAA Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	*Above* PS	~~Above~~ Pump-back	Release to Delta	Weir Flow to Delta	Average
1/1/2008	47	45	3.0	46	1.0	47	1.0	49	0.0	48	0.0	49	0.0	47	49	52	46	6.0	0.0	47.3
1/2/2008	47	45	4.0	46	2.0	45	1.0	47	0.0	46	0.0	46	0.0	45	46	50	44	6.0	0.0	45.7
1/3/2008	47	50	5.0	47	3.0	47	1.0	47	0.0	43	0.0	49	0.0	43	50	51	45	6.0	0.0	46.8
1/4/2008	47	45	4.0	50	2.0	47	1.0	49	1.0	47	0.0	48	0.0	47	47	49	43	6.0	0.0	47.0
1/5/2008	47	48	5.0	58	8.0	54	2.0	61	2.0	55	0.0	62	0.0	53	58	54	45	6.0	3.0	54.1
1/6/2008	47	47	4.0	54	5.0	62	2.0	71	1.0	57	0.0	65	0.0	81	63	66	47	6.0	13.0	59.4
1/7/2008	47	44	5.0	45	5.0	49	2.0	67	0.0	57	0.0	67	0.0	75	72	72	48	6.0	18.0	57.1
1/8/2008	48	47	4.0	47	4.0	48	2.0	52	0.0	59	0.0	66	0.0	65	83	85	44	6.0	35.0	55.9
1/9/2008	48	46	4.0	46	4.0	48	1.0	52	0.0	55	0.0	63	0.0	63	78	82	43	6.0	33.0	54.2
1/10/2008	47	46	4.0	45	4.0	50	1.0	49	0.0	49	0.0	56	0.0	62	72	76	47	6.0	23.0	52.3
1/11/2008	47	47	4.0	44	5.0	50	1.0	49	0.0	47	0.0	56	0.0	62	71	62	46	4.0	12.0	51.9
1/12/2008	47	48	5.0	45	3.0	50	1.0	48	0.0	46	0.0	51	0.0	64	70	63	46	4.0	13.0	51.5
1/13/2008	47	48	5.0	44	3.0	50	1.0	49	0.0	46	0.0	51	0.0	63	72	72	46	6.0	20.0	51.6
1/14/2008	47	47	6.0	45	2.0	50	1.0	46	0.0	45	0.0	53	0.0	57	72	73	46	6.0	21.0	50.8
1/15/2008	47	46	5.0	45	3.0	48	1.0	46	0.0	47	0.0	52	0.0	56	63	64	46	6.0	12.0	49.6
1/16/2008	47	46	6.0	41	2.0	45	1.0	46	0.0	45	0.0	53	0.0	55	65	59	46	4.0	9.0	48.9
1/17/2008	47	39	6.0	41	4.0	45	1.0	45	0.0	45	0.0	50	0.0	53	62	65	47	6.0	12.0	47.4
1/18/2008	48	43	5.0	42	2.0	45	1.0	44	0.0	47	0.0	50	0.0	55	62	64	48	6.0	10.0	48.4
1/19/2008	47	43	6.0	44	2.0	49	1.0	45	0.0	47	0.0	49	0.0	52	56	63	48	6.0	9.0	48.0
1/20/2008	46	42	7.0	46	1.0	48	1.0	46	0.0	46	0.0	46	0.0	51	59	61	48	6.0	7.0	47.8
1/21/2008	46	40	5.0	42	2.0	46	0.0	45	0.0	47	0.0	46	0.0	51	58	61	48	6.0	7.0	46.9
1/22/2008	47	41	5.0	41	2.0	46	5.0	43	0.0	48	0.0	45	0.0	50	54	59	46	6.0	7.0	46.1
1/23/2008	46	41	4.0	44	1.0	47	1.0	43	0.0	47	0.0	47	0.0	50	57	59	38	6.0	15.0	46.0
1/24/2008	47	42	5.0	47	3.0	46	0.0	44	0.0	47	0.0	46	0.0	49	61	60	47	6.0	7.0	47.6
1/25/2008	46	39	5.0	47	3.0	46	0.0	44	1.0	47	0.0	47	0.0	52	63	58	47	5.0	6.0	47.8
1/26/2008	47	38	5.0	46	3.0	46	0.0	44	1.0	48	0.0	49	0.0	57	64	61	48	6.0	7.0	48.7
1/27/2008	47	47	5.0	49	3.0	47	0.0	45	1.0	48	0.0	44	0.0	58	65	65	49	6.0	10.0	49.9
1/28/2008	47	45	4.0	47	3.0	48	0.0	47	1.0	51	0.0	46	0.0	62	65	66	48	6.0	12.0	50.6
1/29/2008	46	43	5.0	46	3.0	48	1.0	47	0.0	51	0.0	50	0.0	62	64	67	49	6.0	12.0	50.6
1/30/2008	47	42	4.0	44	3.0	45	1.0	46	0.0	51	0.0	50	0.0	58	64	65	47	6.0	12.0	49.4

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	*Above* PS	~~Above~~ Pump-back	Release to Delta	Weir Flow to Delta	Average
1/31/2008	47	44	3.0	45	3.0	47	0.0	43	0.0	51	0.0	48	0.0	55	63	65	46	6.0	13.0	48.9
2/1/2008	48	44	3.0	45	3.0	47	0.0	44	0.0	50	0.0	50	0.0	54	60	62	47	6.00	9.0	48.9
2/2/2008	47	43	3.0	45	3.0	48	0.0	44	0.0	49	0.0	46	0.0	54	58	60	47	6.0	7.0	48.1
2/3/2008	47	43	3.0	46	3.0	49	0.0	46	1.0	50	0.0	48	0.0	55	58	59	47	6.0	6.0	48.9
2/4/2008	46	42	3.0	43	3.0	44	0.0	46	0.0	51	0.0	47	0.0	56	58	58	48	6.0	4.0	48.1
2/5/2008	47	43	3.0	44	4.0	46	0.0	46	0.0	51	0.0	49	0.0	54	57	59	48	6.0	5.0	48.5
2/6/2008	48	45	3.0	47	4.0	46	1.0	45	0.0	50	0.0	49	0.0	52	59	59	48	6.0	5.0	48.9
2/7/2008	48	41	2.0	47	3.0	48	1.0	44	0.0	48	0.0	48	0.0	51	60	58	47	6.0	5.0	48.2
2/8/2008	49	47	2.0	46	3.0	46	1.0	45	0.0	48	0.0	48	0.0	53	58	57	46	6.0	5.0	48.6
2/9/2008	47	51	3.0	48	4.0	49	1.0	46	0.0	48	0.0	47	0.0	53	58	57	46	6.0	5.0	49.3
2/10/2008	47	50	3.0	47	4.0	48	1.0	47	0.0	49	0.0	46	0.0	54	59	58	47	6.0	5.0	49.4
2/11/2008	47	49	3.0	47	3.0	47	1.0	47	0.0	49	0.0	49	0.0	53	59	59	48	6.0	5.0	49.5
2/12/2008	47	50	5.0	50	3.0	48	0.0	46	0.0	51	0.0	49	0.0	51	59	58	47	6.0	5.0	49.8
2/13/2008	55	51	3.0	49	3.0	47	1.0	47	0.0	50	0.0	50	0.0	51	56	57	48	6.0	3.0	**50.4**
2/14/2008	61	59	3.0	52	3.0	46	0.0	46	0.0	50	0.0	52	0.0	51	58	55	48	6.0	1.0	**52.3**
2/15/2008	69	61	3.0	53	3.0	54	0.0	45	0.0	51	0.0	52	0.0	50	57	56	48	6.0	2.0	**54.0**
2/16/2008	88	69	3.0	58	3.0	60	0.0	49	0.0	51	0.0	50	0.0	50	55	57	48	6.0	3.0	**57.8**
2/17/2008	118	93	3.0	72	3.0	71	0.0	55	0.0	56	0.0	50	0.0	49	58	56	47	6.0	3.0	**66.9**
2/18/2008	142	115	3.0	109	3.0	92	0.0	72	0.0	61	0.0	51	0.0	49	60	58	48	6.0	4.0	**79.9**
2/19/2008	182	153	6.0	126	3.0	115	0.0	114	0.0	68	0.0	58	0.0	50	58	59	47	6.0	6.0	**97.1**
2/20/2008	187	152	6.0	148	3.0	141	0.0	133	0.0	95	0.0	65	0.0	51	58	59	48	0.0	11.0	**107.8**
2/21/2008	210	176	6.0	170	3.0	164	0.0	133	0.0	100	0.0	81	0.0	53	59	59	48	0.0	11.0	**119.4**
2/22/2008	190	195	2.0	195	3.0	180	1.0	171	0.0	123	0.0	102	0.0	58	58	60	48	0.0	12.0	**132.0**
2/23/2008	160	166	2.0	166	3.0	167	1.0	174	0.0	143	0.0	132	0.0	68	63	62	46	0.0	16.0	**128.5**
2/24/2008	135	142	2.0	141	3.0	141	1.0	156	0.0	164	0.0	164	30.0	80	67	68	46	0.0	22.0	**123.6**
2/25/2008	106	110	2.0	116	3.0	120	1.0	137	0.0	144	0.0	171	44.0	100	78	81	47	0.0	34.0	**112.9**
2/26/2008	79	98	2.0	101	3.0	105	1.0	122	0.0	134	0.0	156	53.0	162	103	89	48	0.0	41.0	**110.8**
2/27/2008	55	69	2.0	85	3.0	88	1.0	98	0.0	119	0.0	147	78.0	202	161	126	44	16.0	66.0	**106.8**
2/28/2008	47	45	2.0	46	3.0	66	1.0	76	0.0	104	0.0	135	66.0	214	214	197	48	6.0	143.0	**99.5**
2/29/2008	47	43	2.0	52	3.0	55	1.0	58	0.0	90	0.0	117	0.0	223	223	195	48	6.0	141.0	**95.6**

Flow Gaging Station / Date	Intake	Black-rock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	*Above* PS	~~Above~~ Pump-back	Release to Delta	Weir Flow to Delta	Average
3/1/2008	47	44	4.0	54	3.0	51	1.0	51	0.0	76	0.0	103	0.0	157	218	227	48	6.0	173.0	**84.9**
3/2/2008	48	43	4.0	52	3.0	48	1.0	49	0.0	64	0.0	85	0.0	118	141	181	48	6.0	127.0	**69.6**
3/3/2008	47	42	4.0	44	3.0	48	1.0	47	0.0	58	0.0	65	0.0	90	116	139	48	6.0	85.0	**60.5**
3/4/2008	47	42	3.0	43	3.0	47	1.0	46	0.0	54	0.0	57	0.0	63	101	122	47	6.0	69.0	**54.7**
3/5/2008	47	42	3.0	41	3.0	44	1.0	46	0.0	54	0.0	55	0.0	56	91	106	47	6.0	53.0	**52.3**
3/6/2008	47	42	3.0	41	3.0	45	1.0	43	0.0	53	0.0	52	0.0	49	79	94	47	6.0	41.0	**49.8**
3/7/2008	47	42	3.0	41	3.0	45	1.0	43	0.0	47	0.0	49	0.0	53	71	85	47	6.0	32.0	**48.5**
3/8/2008	47	42	3.0	41	3.0	44	1.0	42	0.0	46	0.0	48	0.0	51	64	76	47	6.0	23.0	**47.2**
3/9/2008	47	41	3.0	40	3.0	44	1.0	42	0.0	44	0.0	45	0.0	47	48	71	48	6.0	17.0	44.6
3/10/2008	48	43	3.0	42	3.0	45	1.0	41	0.0	49	0.0	44	0.0	56	58	69	48	6.0	15.0	47.4
3/11/2008	47	42	3.0	42	3.0	46	1.0	42	0.0	47	0.0	43	0.0	57	57	66	47	6.0	13.0	47.0
3/12/2008	47	43	3.0	42	3.0	45	1.0	40	0.0	44	0.0	43	0.0	57	52	64	47	6.0	11.0	46.0
3/13/2008	47	42	3.0	39	3.0	45	1.0	40	0.0	45	0.0	45	0.0	54	49	63	47	6.0	10.0	45.3
3/14/2008	47	43	3.0	39	3.0	43	1.0	39	0.0	45	0.0	45	0.0	52	49	61	45	6.0	10.0	44.7
3/15/2008	47	40	3.0	38	3.0	43	1.0	39	0.0	44	0.0	45	0.0	53	47	59	47	6.0	6.0	44.3
3/16/2008	47	40	3.0	38	3.0	43	1.0	39	0.0	44	0.0	45	0.0	53	47	56	48	6.0	2.0	44.4
3/17/2008	46	61	3.0	45	2.0	51	1.0	43	0.0	42	0.0	45	0.0	49	45	55	48	6.0	1.0	47.5
3/18/2008	48	42	3.0	39	3.0	43	1.0	41	0.0	42	0.0	42	0.0	51	44	55	47	6.0	2.0	43.9
3/19/2008	46	39	2.0	39	3.0	44	0.0	38	0.0	46	0.0	41	0.0	58	43	54	46	6.0	2.0	44.0
3/20/2008	46	40	6.0	39	2.0	42	1.0	37	0.0	44	0.0	43	0.0	49	43	54	45	6.0	3.0	42.8
3/21/2008	52	50	5.0	45	2.0	46	1.0	38	0.0	42	0.0	46	0.0	49	44	55	46	6.0	3.0	45.8
3/22/2008	53	48	5.0	48	3.0	51	1.0	44	0.0	40	0.0	45	0.0	49	43	54	47	6.0	1.0	46.8
3/23/2008	53	51	5.0	50	3.0	52	1.0	46	0.0	41	0.0	42	0.0	48	44	54	47	6.0	1.0	47.4
3/24/2008	53	49	5.0	50	3.0	54	0.6	47	0.0	47	0.0	42	0.0	50	43	54	47	6.0	1.0	48.2
3/25/2008	51	51	5.0	50	3.0	52	0.6	47	0.0	48	0.0	45	0.0	50	45	55	48	6.0	1.0	48.7
3/26/2008	46	45	6.0	48	2.0	52	0.6	48	0.0	53	0.0	48	0.0	48	44	54	47	6.0	1.0	47.9
3/27/2008	48	47	6.0	47	2.0	49	0.6	45	0.0	52	0.0	48	0.0	50	50	54	47	6.0	1.0	48.3
3/28/2008	46	44	6.0	46	2.0	50	0.6	45	0.0	50	0.0	50	0.0	51	47	53	47	6.0	0.0	47.6
3/29/2008	47	46	6.0	44	2.0	47	0.6	44	0.0	47	0.0	49	0.0	55	46	54	48	6.0	0.0	47.3
3/30/2008	47	45	5.0	44	2.0	49	0.6	43	0.0	49	0.0	49	0.0	57	48	54	48	6.0	0.0	47.9
3/31/2008	48	47	5.0	45	2.0	47	0.6	51	0.0	53	0.0	47	0.0	52	52	54	48	6.0	0.0	49.0

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Blue text indicates intended period of flooding.

4.0 Assessment of River Flow Gains and Losses

Lower Owens River,
February 2007 - July 2008

Prepared by:
Ecosystem Sciences, Inc.
September, 2008

4.1. Executive Summary

This chapter describes river flow gains and losses for all reaches in the Lower Owens River from the Los Angeles Aqueduct Intake (Intake) to the Pumpback Station during periods of 2007 and 2008 (River Flows Figure 1). The Lower Owens River, over the time period evaluated, lost an average daily flow of approximately 18 cfs (cubic feet per second). This loss equaled 26 percent of the flow released at the Intake.

During a selected winter period (January 8 through January 17, 2008) the Lower Owens River increased its flow from the Intake downstream to the Pumpback Station by 14 cfs. During a selected summer period (July 1 through July 12, 2008) the river lost 35 cfs by the time it reached the Pumpback Station. Increases and losses did not occur during seasonal habitat flow events but during maintenance of base flow levels. This demonstrates the effect that climatic and other conditions have on the availability of water in the system at any given time.

The base and seasonal habitat (or winter release) flows, initiated in December 2006 and February 2008, respectively, were released into a channel with miles of dry river reach or had not experienced this magnitude of flow for many decades. Because some of the flow conditions experienced may not be repeated, (i.e., dry channels and bank soils; changing instream and streamside plant structure and volume; and different timing and amounts of supplemental flows) it will be difficult to accurately predict or model future flow losses or gains from known flow releases to date. The data analysis does, however, provide a first approximation of the magnitude of flow loss that might be expected in future years.

4.2. Introduction

Flows in the Lower Owens River and its tributaries, including return ditches, are monitored by Los Angeles Department of Water and Power (LADWP's) automatic and manual metering sites. This chapter uses flow data measured at ten different gaging stations on the Lower Owens River to determine the flow losses or gains during different time periods. The ten gaging stations include: the Intake, Blackrock, Goose, Two Culverts, Mazourka, Manzanar, Reinhackle, Lone Pine, Keeler, and the Pumpback Station. The reaches referred to in this report indicate areas of river between specified gaging stations. LADWP maintains the metering equipment, manages the measured flow data and verifies the accuracy of flow measurements that are used in this assessment.

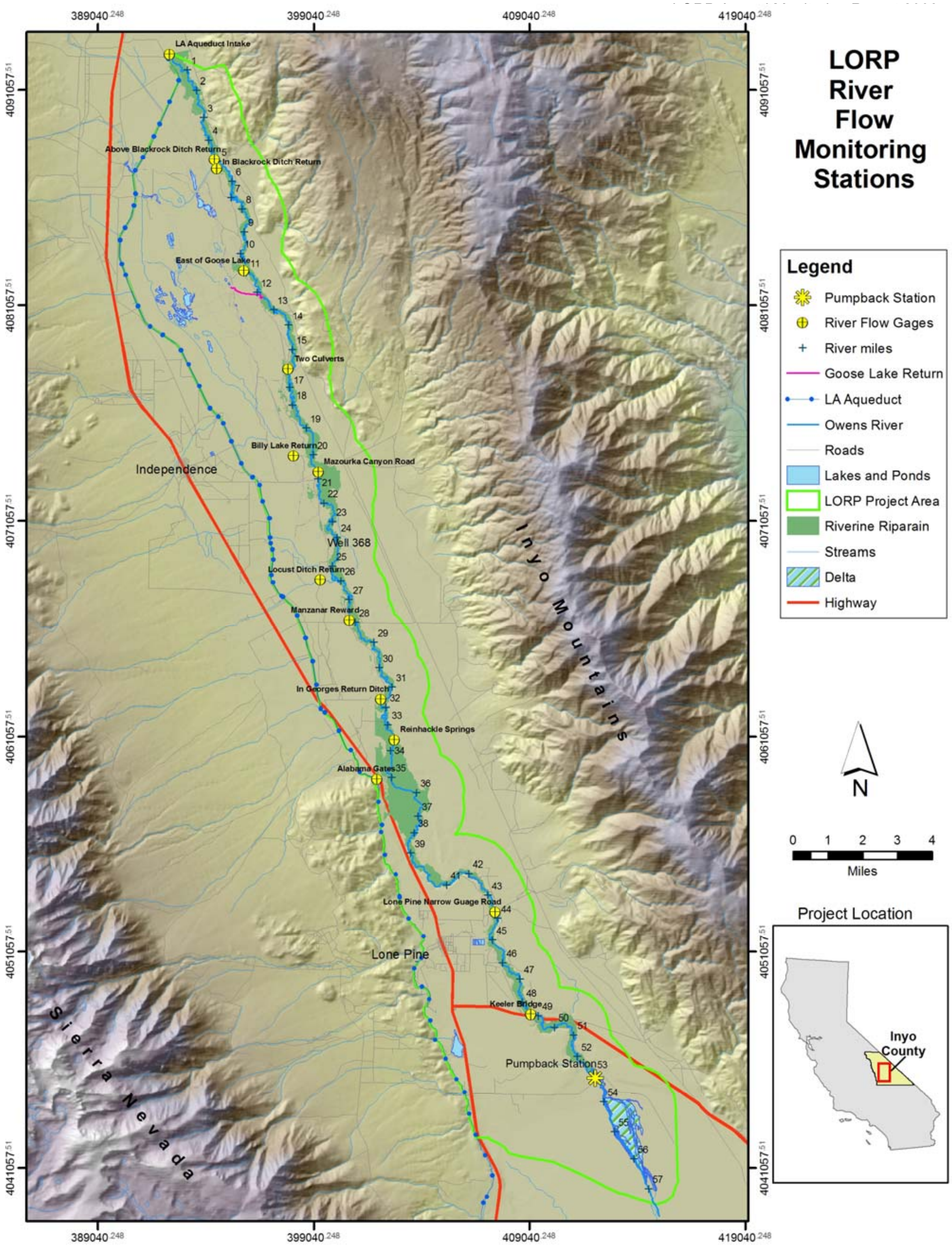
The LORP average base flow release of 53 cfs in the Lower Owens River (to gain approximately 40 cfs total flow from the Intake to the Pumpback Station, as required by stipulation), was initially released at the Intake in December 2006. A seasonal habitat flow, hereinafter referred to as the winter habitat flow, was initiated in the Lower Owens River from the Intake to the Pumpback Station in February 2008 to meet the goals stipulated in the 1997 Memorandum of Understanding (MOU) and objectives of the Lahontan Regional Water Quality Control Board (LRWQCB) permit. Winter habitat flows were released and gradually ramped up, over a period of days, starting on February 12, 2008. Flow releases ramped up from 47 cfs to 210 cfs at the Intake. Supplemental flows were released from the Alabama Spillgates to augment the Intake release as mandated by the LRWQCB, beginning February 23, 2008. The data documenting these releases and resulting flows are recorded by date, flow, and gaging station (River Flows Appendix A).

The initial base flow (to attain 40 cfs) was released into a mostly dry river bed and the winter habitat flow (200 cfs minimum) was released into a river reach that had not seen this type of flow for decades. These flows were released into channels, soils, and subsurface alluvium capable of absorbing and holding part of the released water. These flows also accessed plants that are capable of using and transpiring water that previously did not have access to these amounts of water.

The release of the base flows (ranging from 41 to 77 cfs at the Intake) permanently inundated and created 1,234 acres of surface water in the Lower Owens River. The winter habitat flow (up to 210 cfs release at the Intake) increased the water-inundated surface acres to 1,937. In total, 88 percent of those floodplains adjacent to the river and 25 percent of low terraces were inundated during the winter habitat flow (Ecosystem Sciences, Inc., *Initial Seasonal Habitat Flow Report*, 2008). Other much smaller flows entered the river from return ditches as required or needed.

River reaches had the opportunity to utilize the supplemental water received as a result of these additional flows, or add water (gain) to these flow releases. Water released at the Intake, Alabama Gates, or other return ditches, has the potential of flowing all the way to the Pumpback Station and out of the system, evaporating or transpiring into the atmosphere, entering sub-surface soils for storage, or be temporarily stored and later released back into the river. Flows trapped by sub-surface soils can, in turn, also be captured by plant roots and transpired out of the system at a later time. The surface and sub-surface water available to biological systems can have an important effect upon the productive potential of aquatic and riparian ecosystems.

This section describes and displays the temporal patterns of water losses and gains in the Lower Owens River as it flows downriver between the Intake and the Pumpback Station. Because of the transient conditions that are unlikely to be repeated (i.e., release of water into dry soils and subsurface alluvial deposits; release of a winter flushing flow that may not occur again; changes to instream and adjacent plant communities and structure; changes in flow demand and timing), it will be difficult to accurately predict or model future river losses and gains solely from the information provided in this report. In the future, analysis of a more stable flow regime is required to accurately determine future flow conditions and predict future responses. This analysis is an attempt at understanding flow losses and gains in the Lower Owens River so that preliminary estimates of future flow conditions can be made.

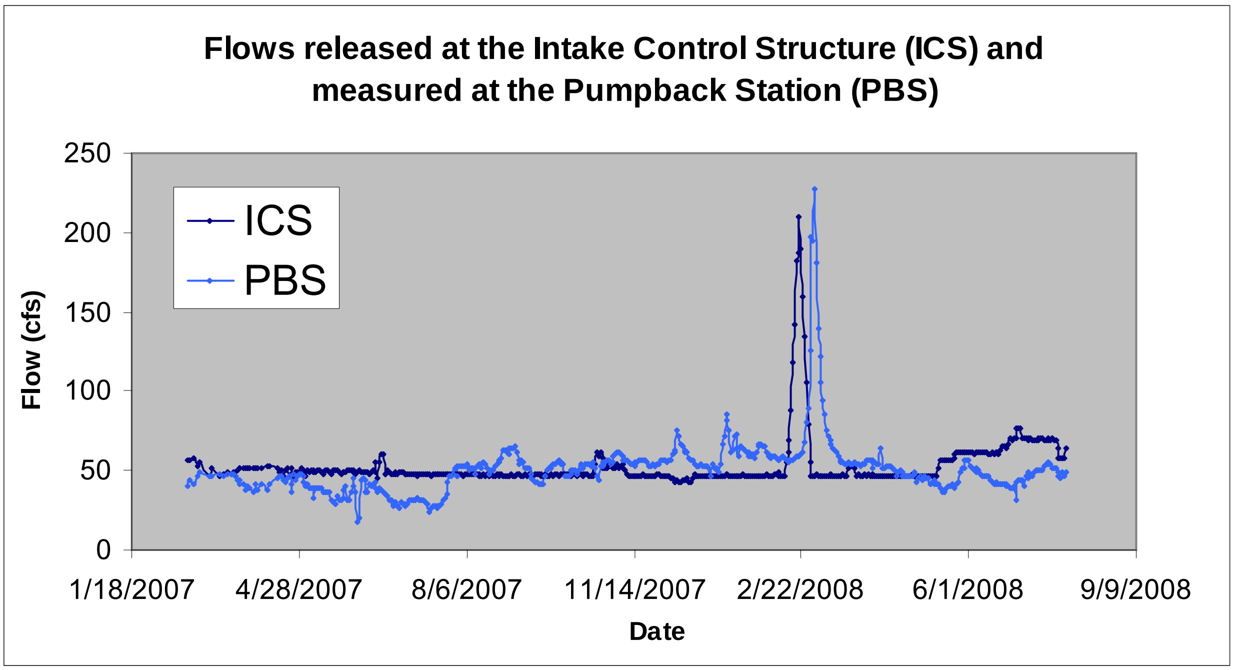


River Flows Figure 1. LORP River Flow Monitoring Stations

4.3. River Flow Loss or Gain by Month and Year

Flow losses or gains by river reach differ over time and space (River Flows Tables 1 and 2, Figure 2). Evaporation-transpiration (ET) rates fall sharply during late fall and winter and increase dramatically during the spring-summer plant growing seasons. Thus, a river can lose water to subsurface storage during certain periods of the year and maintain or gain water during other periods of the year. Similarly, due to differences in subsurface storage and hydraulic conductivity, some river reaches can lose water while other river reaches can gain water during any period of the year. Beginning February 20, 2007 flows released at the Intake decreased downstream every month except December (River Flows Table 1). November through January are winter periods with low ET that, in the future, could result in gains from increased flows from water stored in adjacent floodplains, terrace soils and underlying alluvium. Other incoming winter water sources could also result in flow increases for specific reaches.

The flow losses for February and March 2007 are not likely to be typical for predicting future losses. Flows released during these winter months begin to occupy a mainly dry river channel and are probably captured by subsurface alluvium as well as floodplain soils adjacent to the channel. In the future, less water will likely be needed in February and March to recharge subsurface alluvium and soils.



River Flows Figure 2. Flows Released at Intake

In 2007 the river lost a daily average of approximately 18 cfs between the Intake and the Pumpback Station, which amounts to an average of 35 acre-feet (acft) loss per day and approximately 12,775 acft loss per year. The average release flow of 68 cfs at the Intake amounts to approximately 48,910 acft per year. Water loss during 2007 (February through December) represents about 26 percent of the total released flow from the intake into the river channel.

	2007		2008	
Month	Flow (cfs)	Acre-Feet	Flow (cfs)	Acre-Feet
JAN	no release	no release	-11	-22
FEB**	-12	-24	-33*	-65
MAR	-7	-14	+21*	+42
APR	-8	-16	-4	-8
MAY	-20	-40	-20	-40
JUN	-28	-55	-30	-60
JUL	-48	-95	-34	-68
AUG	-44	-87		
SEP	-24	-48		
OCT	-19	-38		
NOV	-5	-10		
DEC	+6	+12		

River Flows Table 1. Average Monthly River Flow Losses or Gains from Intake to Pumpback Station During 2007 and 2008.

* Influenced by the 200 cfs winter flushing flow release
** Flow releases at the Intake Control Structure started on February 2

January 2007 base flows are not included in the table because flows into the river below the Intake were not initiated until February 20, 2007. To date, only seven months (January through July) of data are available for 2008. If January 2008 data is used to substitute January 2007 data, a rough approximation of the flow losses and gains can be estimated for 2007 (River Flows Table 2).

	2007	2008
Month	Loss or Gain (cfs)	Loss or Gain (cfs)
JAN	-11*	-11
FEB	-12	-33**
MAR	-7	+21**
APR	-8	-4
MAY	-20	-17
JUN	-28	-30
JUL	-48	-34
AUG	-44	-44***
SEP	-24	-24***
OCT	-19	-19***
NOV	-5	-5***
DEC	+6	+6***
Monthly Average	**-18 cfs**	**-16 cfs**

River Flows Table 2. Water Loss or Gain by Monthly Average for 2007 and 2008.

* Substituted data from year 2008 data
** Data influenced by the 200 cfs winter release flow
*** Substituted data from year 2007

4.4. Flow Loss or Gain by River Reach during a Selected Winter Period

From January 8 through January 17, 2008, an average flow of 47 cfs was released into the Lower Owens River from the Intake. An additional 8 to 9 cfs was provided from return ditches, for a total accumulated release of 56 cfs. The average flow that reached the Pumpback Station was 70 cfs, an increase of 14 cfs during this period. During the winter, ET is low and any "make water" coming into the river is additive. Part of the "make water" was probably stored during earlier periods in subsurface aquifers.

The river reach from the Intake to the East of Goose Lake gaging station was a losing flow reach (-9 cfs) (even under winter conditions), while the reach from the Reinhackle gaging station to the Pumpback Station gained 21 cfs. A water "gaining" reach, during harsh winter conditions, can benefit an ecosystem in many ways. Incoming water, especially if it is subsurface, tends to increase winter river water temperatures, reduces icing effects, increases dissolved oxygen, and adds nutrients.

Recording Station	Average Flow (cfs)	Gain or Loss (cfs)	Accumulative (cfs)
Intake	47	N/A	N/A
Blackrock*	46	-2	-2
Goose**	45	-7	-9
Two Culverts	49	+1	-8
Mazourka	49	-1	-9
Manzanar	49	0	-9
Reinhackle	55	+7	-2
Lone Pine	60	+5	+3
Keeler	71	+11	+14
Pumpback	70	-1	+13

River Flows Table 3. Flow Losses or Gains at Gaging Stations, January 8-January 17, 2008.

Note: All numbers are rounded to nearest whole value

* 5 cfs added at the Blackrock Return Ditch

** 3 cfs added at the Goose Return Ditch

4.5. Flow Losses or Gains by River Reach during a Selected Summer Period

From July 1 through July 12, 2008, almost all river reaches lost water (River Flows Table 4). The only gaining reaches were from Lone Pine to Keeler (+3 cfs). This small increase, however, is insignificant and probably within the estimated margin of error. Nevertheless, effects of ET and possible storage are evident by the high total flow loss (-35 cfs) from the Intake to the Pumpback Station. Summer flow losses were much higher than winter flow losses. The largest flow losses occurred at the Reinhackle to Lone Pine reach (-12 cfs). The average flow loss during this summer period from the Intake to the Pumpback Station reach was -35 cfs as compared to a gain of 14 cfs during the winter period (January 8-17).

River Reach	Average Flow (cfs)	Gain or Loss (cfs)	Accumulative Average (cfs)
Intake	70	N/A	N/A
Blackrock	70	0	0
Goose	68	-6	-6
Two Culverts	63	-8	-14
Mazourka	64	0	-14
Manzanar	61	-2	-16
Reinhackle	58	-8	-24
Lone Pine	46	-12	-36
Keeler	49	+3	-33
Pumpback	46	-2	-35

River Flows Table 4. Summer Flow Losses and Gains, by Reach from July 1-July 12, 2008.
Note: All numbers are rounded to nearest whole value
5 cfs added at the Blackrock Return Ditch
3 cfs added at the Goose Return Ditch
1 cfs added at Billy Return
5 cfs added at Georges Return

4.6. Flow Losses or Gains by River Reach from the Intake to the Pumpback Station

The differing length of a river reach did not appear to affect flow losses (River Flows Table 5). Longer river reaches lost or gained flow in about the same amount as shorter river reaches. The addition of approximately 16 cfs (as the river moves downstream) to maintain the required 40 cfs flow at each station, strongly confuses the analysis.

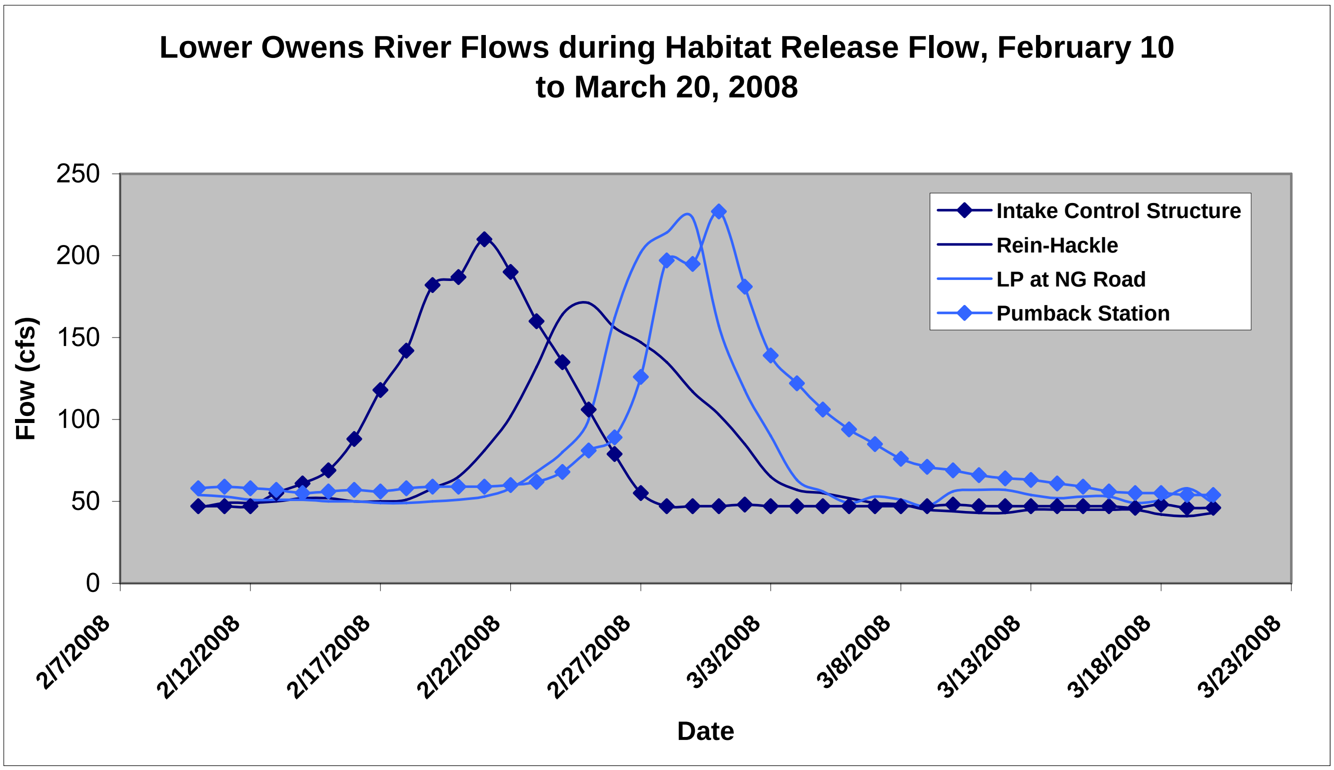
Reach Distance (miles) to next Upstream Station	Stations	Average Flow
4 to 4.9	Blackrock, Mazourka, Pumpback Station	50
5 to 5.9	Culverts, Keeler, Reinhackle	51
6 to 6.9	Goose	51
7 to 7.9	Manzanar	51
8 to 8.9	None	--
9 to 9.9	None	--
10 to 10.9	Lone Pine	51

River Flows Table 5. Average River Flow (cfs) by Increasing Distance (miles) Between Monitoring Station (river reaches).

4.7. 2008 Winter Habitat Release Flow

The 2008 winter habitat flow, released from the Intake, resulted in a peak release of 210 cfs immediately below the Intake (River Flows Table 6 and River Flows Figure 3). Flows were ramped up from the base flow of 47 cfs to the peak flow of 210 cfs and then ramped back down. The leading edge of this peak flow (210 cfs) traveled downriver faster than was previously modeled or expected. This leading edge reached the Pumpback Station 8.5 days after its release from the Intake (See River Flows Appendix 3). Water was added to the river at the Alabama Gates (River Flows Table 6). The supplemental flows from the Alabama Gates resulted in a later high peak flow of 227 cfs at the Pumpback Station. The winter habitat release flow ended on March 9.

The results of the 2008 winter habitat flow (River Flows Table 6) may not accurately represent future river flow losses or gains if another winter habitat flow is released, which is not anticipated. The Owens Valley floor, prior to the release of the 2008 winter habitat flow, received above average amounts of precipitation; therefore, channel-bank soil moisture and adjacent shallow water tables could have been much higher than under normal precipitation conditions. The analysis of the 2008 winter habitat flow also does not allow much insight into losses that would occur from future late spring habitat flows. ET rates by plants and water surfaces were low during the 2008 winter habitat flow release, mainly because of the dormant plant conditions. Because of the colder winter conditions, flow loss to adjacent surrounding soils would probably be lower than under warmer spring conditions. The results of the first spring habitat flow (released in 2009) should illuminate differences, if they exist.



River Flows Figure 3. Lower Owens River Flows During Habitat Release Flow

Station	Intake	Blackrock	Goose	2 Culverts	Mazourka	Manzanar	Rheinackl	Lone Pine	Keeler	PB&O
DATE										
February										
13	55	51	49	47	47	50	50	51	56	57
14	61	59	52	46	46	50	52	51	58	55
15	69	61	53	54	45	51	52	50	57	56
16	88	69	58	60	49	51	50	50	55	57
17	188	93	72	71	55	56	50	49	58	56
18	142	115	109	92	72	61	51	49	60	58
19	182	153	126	115	114	68	58	50	58	59
20	187	160	148	140	133	95	65	51	58	59
21	210	176	170	164	133	100	81	53	59	59
22	190	195	195	180	171	123	102	58	58	60
23	160	166	166	167	174	143	132	68	63	62
24	135	142	141	145	156	164	164	83	67	68
25	106	110	116	120	137	144	171	100	78	81
26	79	98	101	105	122	134	156	162	103	89
27	55	69	85	88	98	119	147	202	161	126
28	47	45	46	66	76	104	135	214	214	197
29	47	43	52	55	58	90	117	223	223	195
March										
1	47	44	54	51	51	76	103	157	218	227
2	48	43	52	48	49	64	85	118	141	181
3	47	42	44	48	47	58	65	90	116	139
4	47	42	43	47	46	54	57	63	101	122
5	47	42	41	44	46	54	55	56	91	106
6	47	42	41	45	43	53	52	49	79	94
7	47	42	41	45	43	47	49	53	71	85
8	47	42	41	44	42	46	48	51	64	76
9	47	41	40	44	42	44	45	47	48	71
10	48	43	42	45	41	49	44	56	58	69
11	47	42	42	46	42	47	43	57	57	66
12	47	43	42	45	40	44	43	57	52	64
13	47	42	39	43	39	45	45	54	49	63
14	47	43	39	43	39	45	45	52	49	61
15	47	40	38	43	39	44	45	43	47	59
16	47	40	38	43	39	44	45	53	47	56
17	46	61	45	51	43	42	42	51	44	55
18	48	42	39	43	41	42	42	51	44	55
19	46	39	39	44	38	46	41	58	43	54
20	46	40	45	42	37	44	43	49	43	54

River Flows Table 6. Winter Habitat Flows (cfs) at River Gaging Stations

From the Intake to the Pumpback Station. The data also include the temporary release of supplemental water from the Alabama Gate and other return ditches during this period.

February	Flow (cfs)
23	0
24	30
25	44
26	53
27	78
28	66
29	0
Average	**54.2 cfs**

River Flows Table 7. Average Supplemental Flow Released to the Lower Owens River at the Alabama Gate in 2008.

4.7.1. Flow Travel Time

During the 2008 winter habitat flows, the peak flow at the Intake occurred on February 21; the peak flow at the Pumpback Station downriver occurred on March 1. The travel time of the peak between the two stations was 8½ days (Appendix 3). The peak flow leading edge travel time averaged 5.4 miles per day. The peak flow pulse travel time from the Reinhackle gaging station to the Lone Pine gaging station was four days.

4.7.2. Discussion

The initial base flow was released into a partially dry river channel (several miles) and additional wetted channels that had not experienced high flows recently. The winter habitat flow, released in February 2008, was also released into a channel that had not experienced this amount of high flow for many decades. Therefore, the results cannot be used to accurately predict future results. Because of conditions that may not be repeated (i.e., dry channel and bank soils, changing instream and streamside plant structure and volume; different timing of supplemental flows) it will be difficult to accurately predict or model future river flow losses or gains from the information gathered to date. However, estimates of how future flows will function can be made based on the short-term flow responses discussed in this report.

In 2007, as flows released at the Intake moved downstream, the river lost water during every month except December. November through January is the time period the river has the best chance to increase flows higher than those released at the Intake. May through September is when the river loses the most flow, primarily because of ET demands from riparian plant communities and evaporation from the river water surface. During 2007, the river lost an average of approximately 18 cfs over the year. This amounts to a loss of 12,775 acft per year. The average release flow at the Intake was approximately 68-69 cfs or 48,910 acft per year. The water loss during 2007 was about 26 percent of the water released into the river. These values provide a first approximation of the magnitude of loss that might be expected in future years.

4.8. Appendices

4.8.1. Appendix A. River Flows Tables

River Flows Table 8. Lower Owens River Project River Flows from February 20, 2007 - July 29, 2008.

River flow data is maintained by LADWP and presented at the following website: http://www.ladwp.com/ladwp/cms/ladwp009121.jsp

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
2/20/07	56	50	0.0	41	0.0	49	0.0	44	0.0	47	0.0	42	0.0	38	44	43	40	3.0	0.0	45.4
2/22/07	56	53	0.0	*N/A	0.0	48	0.0	46	0.0	49	0.0	*N/A	0.0	44	51	47	44	3.0	0.0	49.3
2/24/07	58	60	0.0	52	0.0	46	0.0	50	0.0	52	0.0	*N/A	0.0	48	50	44	41	3.0	0.0	51.1
2/26/07	53	53	0.0	50	0.0	41	0.0	41	0.0	49	0.0	44	0.0	58	50	50	47	3.0	0.0	48.9
2/28/07	55	53	0.0	53	0.0	48	0.0	40	0.0	46	0.0	42	0.0	41	49	52	49	3.0	0.0	47.9
3/5/07	47	51	0.0	51	0.0	44	0.0	43	0.0	44	0.0	44	0.0	48	51	50	47	3.0	0.0	47.3
3/7/07	52	55	0.0	52	0.0	44	0.0	41	0.0	49	0.0	N/A	0.0	43	53	50	47	3.0	0.0	48.8
3/12/07	46	47	0.0	46	0.0	49	0.0	43	0.0	45	0.0	42	0.0	48	53	53	48	3.0	2.0	47.2
3/14/07	48	45	0.0	42	0.0	43	0.0	45	0.0	41	0.0	N/A	0.0	40	53	50	47	3.0	0.0	45.2
3/16/07	49	48	0.0	43	0.0	42	0.0	47	0.0	43	0.0	N/A	0.0	42	53	51	48	3.0	0.0	46.4
3/19/07	48	47	0.0	44	0.0	39	0.0	47	0.0	43	0.0	N/A	0.0	42	53	53	48	3.0	2.0	46.2
3/20/07	49	49	0.0	42	0.0	41	0.0	41	0.0	43	0.0	34	0.0	46	51	52	48	3.0	1.0	44.8
3/21/07	47	47	0.0	45	0.0	40	0.0	43	0.0	43	0.0	36	0.0	42	47	50	47	3.0	0.0	44.0
3/22/07	50	44	0.0	42	0.0	39	0.0	40	0.0	41	0.0	31	0.0	40	46	47	44	3.0	0.0	42.0
3/23/07	51	48	0.0	43	0.0	38	0.0	38	0.0	40	0.0	38	0.0	41	46	47	44	3.0	0.0	43.0
3/24/07	52	49	0.0	46	0.0	41	0.0	36	0.0	39	0.0	38	0.0	41	44	45	42	3.0	0.0	43.1
3/26/07	52	46	0.0	47	0.0	43	0.0	42	0.0	39	0.0	41	0.0	40	43	44	41	3.0	0.0	43.7
3/27/07	52	51	0.0	46	0.0	42	0.0	41	0.0	43	0.0	39	0.0	40	46	41	38	3.0	0.0	44.1
3/28/07	52	49	0.0	48	0.0	42	0.0	39	0.0	41	0.0	36	0.0	40	48	43	40	3.0	0.0	43.8
3/29/07	52	46	0.0	47	0.0	41	0.0	41	0.0	40	0.0	37	0.0	37	43	42	39	3.0	0.0	42.6

Notes: These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
4/1/07	51	53	0.0	47	0.0	44	0.0	42	0.0	40	0.0	38	0.0	39	45	40	37	3.0	0.0	43.9
4/2/07	52	52	0.0	51	0.0	46	0.0	42	0.0	43	0.0	35	0.0	38	45	45	42	3.0	0.0	44.9
4/3/07	52	50	0.0	50	0.0	44	0.0	48	0.0	45	0.0	43	0.0	39	42	41	38	3.0	0.0	45.4
4/5/07	52	51	0.0	48	0.0	44	0.0	50	0.0	47	0.0	47	0.0	45	47	44	41	3.0	0.0	47.5
4/9/07	53	52	0.0	51	0.0	48	0.0	51	0.0	49	0.0	49	0.0	50	49	41	38	3.0	0.0	49.3
4/10/07	53	55	0.0	52	0.0	50	1.9	48	0.0	46	5.2	44	0.0	42	46	44	41	3.0	0.0	48.0
4/15/07	51	50	0.0	53	0.0	44	1.2	51	0.0	49	2.0	40	0.0	53	53	48	45	3.0	0.0	49.2
4/16/07	49	48	0.0	48	0.0	44	1.7	54	0.0	49	2.1	39	0.0	53	54	49	46	3.0	0.0	48.7
4/17/07	47	55	0.0	44	2.0	44	2.0	52	0.0	49	2.3	43	0.0	53	54	49	46	3.0	0.0	49.0
4/18/07	50	50	0.0	45	0.0	41	1.9	51	0.0	50	2.2	41	0.0	47	54	49	46	3.0	0.0	47.8
4/19/07	47	55	0.0	45	1.0	42	1.6	49	0.0	49	2.5	45	0.0	47	54	47	44	3.0	0.0	48.0
4/20/07	50	55	0.0	45	1.0	43	1.6	50	0.0	48	2.5	46	0.0	48	54	46	43	3.0	0.0	48.5
4/21/07	51	58	0.0	45	1.0	42	1.6	50	0.0	47	2.4	45	0.0	48	54	48	45	3.0	0.0	48.8
4/22/07	47	63	0.0	48	1.0	45	1.5	50	0.0	47	2.7	45	0.0	49	50	50	47	3.0	0.0	49.4
4/23/07	51	45	0.6	48	2.0	44	1.4	52	0.0	47	2.7	45	0.0	51	53	44	41	3.0	0.0	48.0
4/24/07	48	49	1.0	45	3.0	45	1.4	44	0.0	40	2.3	44	0.0	43	42	40	37	3.0	0.0	44.0
4/25/07	47	52	1.0	47	3.0	43	1.3	44	0.0	41	0.7	43	0.0	43	54	51	48	3.0	0.0	46.5
4/26/07	49	47	1.0	45	3.0	42	1.1	44	0.0	38	0.6	42	0.0	43	52	48	44	4.0	0.0	45.0
4/27/07	49	49	1.5	48	3.1	43	1.1	42	0.0	38	0.5	40	0.0	42	50	54	47	3.0	4.0	45.5
4/28/07	48	48	1.0	46	3.0	45	1.0	48	0.0	38	0.4	42	0.0	48	52	51	48	3.0	0.0	46.6
4/29/07	51	49	1.0	48	3.0	47	1.0	49	0.0	38	0.4	40	0.0	49	52	51	48	3.0	0.0	47.4
4/30/07	50	51	1.0	47	2.7	47	1.2	44	0.0	41	0.3	37	0.0	45	51	49	46	3.0	0.0	46.2

Notes: These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
5/1/07	49	52	1.0	50	4.0	47	1.3	46	0.0	43	0.3	38	0.0	40	51	46	43	3.0	0.0	46.2
5/2/07	47	50	1.0	49	4.0	46	1.2	46	0.0	45	0.4	37	0.0	41	48	43	40	3.0	0.0	45.2
5/3/07	50	49	1.0	48	3.0	44	1.2	45	0.0	45	0.4	37	0.0	41	44	44	41	3.0	0.0	44.7
5/4/07	49	50	1.0	49	3.0	44	1.3	44	0.0	46	0.7	35	0.0	40	43	42	39	3.0	0.0	44.2
5/5/07	50	49	0.5	48	3.0	43	1.4	44	0.0	46	2.6	37	0.0	37	42	42	39	3.0	0.0	43.8
5/6/07	49	49	0.5	48	3.0	42	1.6	44	0.0	45	2.8	37	0.0	35	40	42	39	3.0	0.0	43.1
5/7/07	50	49	0.5	46	2.4	44	1.6	44	0.0	45	2.7	42	0.0	34	36	37	33	3.0	1.0	42.7
5/8/07	49	49	1.0	44	2.0	42	1.6	40	0.0	38	2.7	43	0.0	38	40	42	39	3.0	0.0	42.5
5/9/07	50	51	1.0	48	2.0	42	1.6	40	0.0	42	2.5	40	0.0	40	42	42	39	3.0	0.0	43.7
5/10/07	50	52	1.0	50	1.0	41	1.9	46	0.0	41	2.2	40	0.0	42	40	42	39	3.0	0.0	44.4
5/11/07	49	51	1.0	50	1.0	41	3.0	47	0.0	42	2.3	40	0.0	41	41	42	39	3.0	0.0	44.4
5/12/07	49	51	1.0	49	1.0	41	3.0	47	0.0	42	2.3	40	0.0	41	41	40	37	3.0	0.0	44.1
5/13/07	48	50	1.0	49	1.0	41	3.4	48	0.0	43	2.3	40	0.0	41	40	40	37	3.0	0.0	44.0
5/14/07	50	49	0.2	45	1.0	40	4.0	40	0.0	40	2.0	40	0.0	39	38	39	36	3.0	0.0	42.0
5/15/07	50	49	0.2	45	1.0	42	3.2	40	0.0	43	2.2	44	0.0	38	40	42	36	6.0	0.0	43.3
5/16/07	49	49	1.0	46	2.5	42	2.4	42	2.1	43	3.2	42	0.0	36	37	41	36	5.3	0.0	42.7
5/17/07	48	49	1.0	47	2.7	42	1.9	44	5.3	48	4.0	44	0.0	36	37	37	31	5.5	0.0	43.2
5/18/07	50	48	1.0	47	1.5	43	1.9	42	5.2	47	4.0	46	0.0	37	38	36	30	5.5	0.0	43.4
5/19/07	50	49	1.0	46	1.5	44	1.8	43	5.0	48	3.9	46	0.0	37	38	36	30	5.7	0.0	43.7
5/20/07	50	48	1.0	45	1.0	43	2.0	44	5.4	48	4.0	46	0.0	36	38	35	29	5.7	0.0	43.3
5/21/07	50	48	1.0	46	1.0	45	1.4	41	4.8	43	3.5	50	0.0	36	37	40	34	5.5	0.0	43.6
5/22/07	49	50	1.0	47	2.4	44	1.4	41	4.8	42	4.5	49	0.0	36	37	37	31	5.5	0.0	43.2
5/23/07	48	60	1.0	49	2.4	43	1.3	41	4.7	43	4.3	48	1.0	38	38	37	32	5.3	0.0	44.5
5/24/07	49	51	1.0	52	2.4	46	4.0	42	4.9	45	4.7	49	5.1	40	39	38	33	5.3	0.0	45.1
5/25/07	49	50	1.0	52	2.4	45	4.8	42	4.6	46	4.5	50	5.0	40	41	43	38	5.3	0.0	45.8
5/26/07	49	50	1.0	50	2.4	44	2.8	42	4.5	45	4.3	50	5.1	42	41	46	40	5.3	0.2	45.9
5/27/07	50	51	1.0	50	2.4	44	1.8	41	3.9	44	4.1	50	5.0	41	42	37	32	5.3	0.0	45.0
5/28/07	50	52	1.0	49	2.4	43	1.7	41	3.6	43	3.8	48	5.0	43	44	36	31	5.3	0.0	44.9
5/29/07	50	52	1.0	48	2.6	43	2.9	42	5.4	44	3.8	50	5.0	44	44	44	37	5.5	1.0	46.1
5/30/07	50	52	1.0	47	2.6	43	4.6	43	5.4	47	4.1	51	5.0	45	46	46	40	5.5	0.0	47.0
5/31/07	49	51	1.0	45	2.8	43	4.8	43	5.4	48	4.2	50	5.0	45	46	50	45	5.5	0.0	47.0

Notes: These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
6/1/07	48	52	0.0	43	2.4	44	4.8	43	5.0	48	4.3	49	5.0	46	46	43	37	5.5	0.0	46.2
6/2/07	49	52	0.0	44	2.4	44	4.8	43	5.0	48	4.3	48	5.0	48	48	34	18	5.3	11.0	45.8
6/3/07	50	52	0.0	45	2.4	44	5.0	44	5.0	49	4.2	48	5.0	49	50	49	20	5.3	24.0	48.0
6/4/07	49	50	1.0	49	2.6	43	4.8	44	5.6	48	4.4	50	5.0	49	50	50	44	5.5	0.5	48.2
6/5/07	49	49	1.0	48	2.2	45	4.6	45	5.1	48	7.8	50	5.0	50	49	50	45	5.5	0.0	48.3
6/6/07	49	47	1.0	45	2.9	46	4.3	44	5.6	47	8.6	55	5.0	50	49	50	44	5.3	0.0	48.2
6/7/07	49	46	1.0	46	2.0	43	4.1	41	5.7	45	7.2	54	2.0	48	46	43	37	5.3	1.0	46.1
6/8/07	49	46	1.0	46	2.3	43	4.1	41	5.3	45	7.0	54	2.0	48	46	42	36	5.5	0.5	46.0
6/9/07	48	46	1.5	40	2.5	46	2.0	45	4.7	49	4.8	51	0.0	49	48	47	41	5.5	0.0	46.9
6/10/07	49	47	1.0	42	2.1	45	3.1	46	6.1	48	4.1	52	0.0	50	51	46	40	5.5	0.0	47.6
6/11/07	50	46	1.0	43	2.5	45	3.9	47	5.9	43	3.7	51	0.0	49	49	46	41	5.3	0.0	46.9
6/12/07	49	45	1.7	50	2.7	48	4.3	52	5.7	53	4.5	50	0.0	50	48	46	39	5.5	0.0	49.1
6/13/07	55	48	1.7	55	2.5	49	4.7	53	5.8	54	6.2	50	0.0	50	47	48	43	5.3	0.0	50.9
6/14/07	45	41	1.3	51	2.4	48	5.1	50	5.9	50	6.3	50	0.0	44	48	43	37	5.5	0.0	47.0
6/15/07	55	50	1.1	50	1.4	44	5.1	49	5.6	48	5.6	50	0.0	45	47	45	39	6.0	0.0	48.3
6/16/07	60	55	1.2	48	1.5	44	4.9	48	5.5	47	5.5	50	0.0	46	45	44	38	6.0	0.0	48.7
6/17/07	60	58	1.4	47	2.9	45	4.9	47	3.0	46	4.0	50	0.0	45	45	43	37	6.0	0.0	48.6
6/18/07	48	50	1.5	57	2.5	49	4.8	48	2.7	47	4.2	51	0.0	45	44	41	35	6.0	0.0	48.0
6/19/07	48	49	1.5	55	2.3	51	4.6	52	2.7	44	4.0	49	0.0	40	43	41	35	6.0	0.0	47.2
6/20/07	50	50	1.0	51	2.4	48	4.5	52	2.9	46	3.7	51	0.0	40	44	40	34	6.0	0.0	47.2
6/21/07	49	49	1.5	50	2.2	46	4.6	45	2.4	50	3.5	48	0.0	39	41	40	32	7.0	0.0	45.7
6/22/07	48	48	1.5	51	2.0	45	5.1	49	2.0	56	3.3	49	0.0	45	41	40	32	8.0	0.0	47.2
6/23/07	48	47	1.5	49	2.0	44	5.4	48	1.9	50	3.1	50	0.0	44	37	36	28	8.0	0.0	45.3
6/24/07	48	47	1.5	48	1.8	43	5.4	47	2.0	49	3.3	49	0.0	43	37	38	30	8.0	0.0	44.9
6/25/07	49	47	1.5	47	1.8	42	5.5	45	2.0	49	4.5	47	0.0	42	39	37	29	8.0	0.0	44.4
6/26/07	48	48	1.0	50	1.7	43	5.5	45	2.0	48	4.0	47	2.5	41	38	36	28	8.0	0.0	44.4
6/27/07	49	48	1.5	48	1.4	44	5.5	46	2.0	47	4.7	49	6.0	41	38	35	27	8.0	0.0	44.5
6/28/07	49	49	1.1	48	1.8	44	5.5	47	2.0	48	5.3	49	8.0	42	41	38	30	8.0	0.0	45.5
6/29/07	49	47	1.0	47	1.4	44	5.5	46	1.6	48	7.5	50	8.0	43	40	37	29	8.0	0.0	45.1
6/30/07	48	47	1.2	47	1.3	44	5.6	45	2.0	47	9.5	51	8.0	43	41	36	28	8.0	0.0	44.9

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These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
7/1/07	48	47	1.3	47	1.4	43	5.6	44	2.0	47	9.6	52	8.0	42	40	37	29	8.0	0.0	44.7
7/2/07	48	47	1.5	49	1.8	44	5.5	43	2.0	43	9.3	51	8.0	41	41	37	29	8.0	0.0	44.4
7/3/07	48	47	1.0	48	1.0	43	5.3	45	1.7	43	8.9	51	0.0	42	43	39	31	8.0	0.0	44.9
7/4/07	48	44	1.0	47	1.1	41	5.0	47	1.4	43	8.8	50	5.0	43	47	40	32	8.0	0.0	45.0
7/5/07	48	44	1.0	45	1.0	38	4.9	44	1.8	42	8.8	50	5.0	44	48	40	32	8.0	0.0	44.3
7/6/07	48	43	4.0	48	1.9	39	5.0	45	2.0	44	8.3	49	8.0	45	48	40	32	8.0	0.0	44.9
7/7/07	48	43	4.0	48	1.6	40	5.1	46	2.1	44	8.3	48	8.0	46	47	41	33	8.0	0.0	45.1
7/8/07	47	42	4.0	48	1.9	40	5.0	47	2.2	44	8.4	47	8.0	46	46	41	33	8.0	0.0	44.8
7/9/07	48	43	4.0	48	2.0	40	5.0	46	2.3	42	8.4	46	8.0	43	46	40	32	8.0	0.0	44.2
7/10/07	48	43	4.0	48	2.5	40	4.8	43	2.1	43	8.3	47	5.0	44	46	40	32	8.0	0.0	44.2
7/11/07	48	43	4.0	47	2.2	39	5.1	43	2.1	44	8.2	47	5.0	44	45	39	31	8.0	0.0	43.9
7/12/07	48	42	2.8	46	2.0	38	5.0	45	2.0	45	8.2	47	7.0	44	46	38	30	8.0	0.0	43.9
7/13/07	48	41	5.0	46	1.8	39	5.1	44	2.1	44	8.8	47	8.0	45	43	37	29	8.0	0.0	43.4
7/14/07	48	41	7.0	46	1.9	40	5.2	44	2.2	47	8.9	46	8.0	46	41	37	29	8.0	0.0	43.6
7/15/07	48	41	7.0	47	1.7	40	5.2	45	2.3	47	8.8	47	8.0	45	39	32	24	8.0	0.0	43.1
7/16/07	47	40	8.0	48	2.2	41	5.3	46	2.1	47	9.1	48	10.0	46	37	37	26	8.0	2.5	43.7
7/17/07	48	40	7.4	44	2.6	42	5.3	46	2.1	48	9.0	49	15.0	48	40	33	28	8.0	0.0	43.8
7/18/07	48	43	8.0	46	2.6	42	5.0	46	2.1	47	8.8	52	17.0	48	41	36	28	8.0	0.0	44.9
7/19/07	48	43	9.0	46	2.3	43	4.4	49	2.1	45	8.6	51	19.0	50	40	34	26	8.0	0.0	44.9
7/20/07	48	43	10.0	45	2.6	43	4.6	50	2.0	45	8.5	52	25.0	49	41	36	28	8.0	0.0	45.2
7/21/07	48	43	10.0	44	2.1	43	4.7	49	2.0	46	8.3	53	25.0	48	43	36	28	8.0	0.0	45.3
7/22/07	48	42	10.0	44	2.0	43	4.6	49	1.9	48	8.4	51	25.0	51	46	37	29	8.0	0.0	45.9
7/23/07	48	42	10.0	43	2.0	44	4.6	49	1.9	49	8.4	52	20.0	52	47	39	31	8.0	0.0	46.5
7/24/07	48	42	8.0	44	2.0	44	5.0	49	2.0	49	9.0	53	20.0	53	50	41	33	8.0	0.0	47.3
7/25/07	48	43	8.0	46	3.0	44	5.0	50	2.0	49	9.0	53	23.0	53	49	43	35	8.0	0.0	47.8
7/26/07	48	43	8.0	47	2.0	45	5.0	50	2.0	48	8.0	54	23.0	54	51	43	35	8.0	0.0	47.5
7/27/07	48	42	8.0	46	2.0	45	5.0	49	2.0	47	9.0	54	25.0	55	53	46	38	8.0	0.0	47.7
7/28/07	48	43	9.0	46	2.0	45	4.0	48	2.0	46	8.0	53	23.0	55	58	47	39	8.0	0.0	48.1
7/29/07	48	42	8.0	46	2.0	44	5.0	47	2.0	45	9.0	53	23.0	55	61	48	40	8.0	0.0	48.1
7/30/07	48	42	8.0	48	2.0	45	5.0	47	2.0	40	9.0	51	23.0	56	57	51	43	8.0	0.0	47.7
7/31/07	47	44	8.0	48	2.0	46	5.0	44	2.0	40	9.0	51	23.0	56	49	47	44	3.0	0.0	46.9

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Revised Page – Beginning row dated 7/26/07 – 7/31/07
Pumpback data switched with Above Pumpback

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
8/1/07	48	44	8.0	48	2.0	47	4.0	45	3.0	40	8.0	55	21.0	50	60	*53*	*45*	8.0	0.0	48.2
8/2/07	48	46	8.0	55	2.0	47	4.0	45	5.0	42	8.0	56	20.0	52	61	*53*	*45*	8.0	0.0	49.7
8/3/07	48	43	8.0	54	2.0	47	4.0	43	7.0	46	8.0	58	16.0	58	62	*53*	*45*	8.0	0.0	50.4
8/4/07	47	45	8.0	55	2.0	48	5.0	44	7.0	46	8.0	57	18.0	58	62	*53*	*45*	8.0	0.0	50.7
8/5/07	48	45	8.0	55	2.0	48	4.0	43	7.0	46	8.0	59	18.0	57	62	*53*	*45*	8.0	0.0	50.8
8/6/07	48	45	8.0	52	2.0	47	5.0	42	7.0	46	7.0	59	20.0	56	61	*54*	*46*	8.0	0.0	50.2
8/7/07	48	44	8.0	52	2.0	47	5.0	43	7.0	47	9.0	58	20.0	56	59	*50*	*42*	8.0	0.0	49.6
8/8/07	48	45	7.0	53	2.0	46	5.0	43	7.0	47	9.0	56	20.0	55	57	*52*	*44*	8.0	0.0	49.4
8/9/07	48	46	8.0	53	2.0	46	6.0	43	7.0	47	9.0	55	20.0	52	55	*51*	*43*	8.0	0.0	48.8
8/10/07	48	46	8.0	53	2.0	46	5.0	44	7.0	47	9.0	54	20.0	53	57	*51*	*43*	8.0	0.0	49.1
8/11/07	48	44	8.0	52	2.0	45	6.0	45	7.0	48	9.0	54	20.0	54	59	*48*	*40*	8.0	0.0	48.9
8/12/07	48	46	8.0	53	2.0	46	5.0	44	7.0	46	8.0	53	20.0	54	60	*53*	*35*	13.0	5.0	48.5
8/13/07	48	46	8.0	51	2.0	47	5.0	44	7.0	49	8.0	54	17.0	56	58	*53*	*30*	22.0	1.0	48.3
8/14/07	47	46	8.0	52	2.0	47	6.0	45	7.0	49	9.0	57	14.0	56	60	*54*	*46*	8.0	0.0	50.5
8/15/07	47	45	9.0	54	2.0	47	6.0	45	7.0	49	9.0	57	14.0	56	60	*52*	*44*	8.0	0.0	50.4
8/16/07	48	45	9.0	51	2.0	48	6.0	46	7.0	49	9.0	55	14.0	57	61	*55*	*47*	8.0	0.0	50.7
8/17/07	47	45	9.0	50	2.0	49	6.0	47	7.0	50	9.0	56	14.0	57	60	*54*	*46*	8.0	0.0	50.7
8/18/07	48	46	9.0	49	3.0	49	6.0	47	6.0	49	9.0	55	14.0	56	58	*52*	*44*	8.0	0.0	50.1
8/19/07	47	45	9.0	51	2.0	49	6.0	48	7.0	50	9.0	56	14.0	56	57	*48*	*40*	8.0	0.0	49.9
8/20/07	46	45	9.0	52	2.0	49	6.0	47	7.0	50	9.0	56	14.0	55	58	*50*	*42*	8.0	0.0	50.0
8/21/07	48	45	7.0	53	2.0	50	6.0	50	7.0	51	9.0	57	10.0	53	51	*50*	*42*	8.0	0.0	50.0
8/22/07	46	46	11.0	52	2.0	48	6.0	50	7.0	51	10.0	58	14.0	53	57	*50*	*32*	16.0	2.0	49.3
8/23/07	46	46	10.0	52	2.0	48	5.0	47	7.0	49	9.0	59	14.0	54	57	*53*	*45*	8.0	0.0	50.3
8/24/07	48	46	10.0	52	2.0	48	5.0	47	7.0	54	9.0	59	20.0	55	56	*54*	*46*	8.0	0.0	51.1
8/25/07	48	47	10.0	53	2.0	48	5.0	46	7.0	54	9.0	59	18.0	59	59	*55*	*47*	8.0	0.0	52.0
8/26/07	46	47	10.0	53	2.0	48	5.0	44	8.0	55	9.0	60	14.0	64	62	*57*	*49*	8.0	0.0	52.8
8/27/07	48	47	10.0	54	2.0	49	6.0	50	8.0	56	10.0	61	14.0	62	66	*58*	*49*	9.0	0.0	54.2
8/28/07	46	46	10.0	55	2.0	49	6.0	52	7.0	56	9.0	62	11.0	64	68	*63*	*49*	12.0	2.0	54.7
8/29/07	46	46	10.0	55	2.0	50	6.0	52	7.0	56	6.0	60	9.0	62	67	*63*	*49*	14.0	0.0	54.3
8/30/07	46	47	10.0	53	2.0	50	6.0	51	7.0	59	6.0	57	5.0	69	65	*61*	*49*	12.0	0.0	54.6
8/31/07	47	46	10.0	54	2.0	49	6.0	50	7.0	59	5.0	56	5.0	66	66	*60*	*49*	10.0	1.0	54.2

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9/1/07	46	46	10.0	54	2.0	50	5.0	50	7.0	58	5.0	55	5.0	65	66	64	48	8.0	8.0	53.8
9/2/07	48	47	10.0	54	2.0	49	5.0	50	7.0	57	4.0	54	5.0	63	65	64	48	8.0	8.0	53.5
9/3/07	47	46	10.0	53	2.0	50	5.0	51	7.0	57	3.0	53	5.0	61	65	64	48	8.0	8.0	53.1
9/4/07	47	47	10.0	54	2.0	50	5.0	50	4.0	56	4.0	53	5.0	60	65	65	49	13.0	3.0	53.1
9/5/07	48	49	9.0	50	2.0	51	5.0	50	0.0	52	7.0	55	5.0	57	60	61	49	12.0	0.0	52.1
9/6/07	48	47	4.0	52	2.0	47	5.0	50	0.0	51	7.0	53	5.0	56	63	54	47	7.0	0.0	51.4
9/7/07	48	46	5.0	49	2.0	45	5.0	48	0.0	49	6.0	51	5.0	55	62	56	49	6.0	1.0	50.2
9/8/07	47	47	5.0	48	2.0	44	5.0	47	0.0	51	5.0	52	5.0	53	56	56	50	6.0	0.0	49.5
9/9/07	47	49	5.0	49	2.0	45	5.0	46	0.0	48	5.0	50	5.0	54	54	55	49	6.0	0.0	49.1
9/10/07	48	49	5.0	48	2.0	46	5.0	47	0.0	47	5.0	50	5.0	48	53	52	46	6.0	0.0	48.2
9/11/07	47	50	5.0	49	2.0	45	5.0	47	0.0	47	5.0	47	5.0	49	56	52	46	6.0	0.0	48.3
9/12/07	48	48	5.0	49	2.0	46	5.0	47	0.0	47	5.0	49	5.0	48	52	52	46	6.0	0.0	48.0
9/13/07	48	45	5.0	49	2.0	45	5.0	47	0.0	47	6.0	49	5.0	45	48	48	42	6.0	0.0	46.5
9/14/07	48	46	5.0	47	2.0	44	5.0	47	0.0	47	6.0	49	5.0	46	50	45	39	6.0	0.0	46.3
9/15/07	47	47	5.0	47	2.0	44	5.0	47	0.0	46	6.0	50	5.0	45	49	44	38	6.0	0.0	46.0
9/16/07	48	47	5.0	47	2.0	43	5.0	46	0.0	46	6.0	50	5.0	45	48	43	37	6.0	0.0	45.7
9/17/07	48	47	5.0	46	2.0	43	5.0	45	0.0	46	5.0	45	5.0	43	47	43	37	6.0	0.0	44.7
9/18/07	48	46	5.0	45	2.0	42	5.0	43	0.0	44	5.0	44	5.0	42	45	41	35	6.0	0.0	43.4
9/19/07	48	46	3.0	45	2.0	40	5.0	43	0.0	43	5.0	43	6.0	42	44	41	35	6.0	0.0	42.9
9/20/07	47	43	3.0	40	2.0	39	5.0	43	0.0	41	5.0	44	7.0	47	40	41	35	6.0	0.0	41.9
9/21/07	47	43	2.0	40	2.0	41	5.0	44	0.0	41	5.0	46	5.0	49	40	42	36	6.0	0.0	42.7
9/22/07	48	43	2.0	43	2.0	41	5.0	45	0.0	42	5.0	45	10.0	49	47	46	40	6.0	0.0	44.3
9/23/07	47	44	7.0	45	2.0	42	5.0	45	0.0	53	5.0	46	10.0	51	50	50	44	6.0	0.0	46.7
9/24/07	47	42	6.0	45	2.0	44	5.0	47	0.0	43	5.0	47	10.0	54	53	52	46	6.0	0.0	46.8
9/25/07	48	42	7.0	41	2.0	42	5.0	46	0.0	44	5.0	52	10.0	54	59	51	45	6.0	0.0	47.3
9/26/07	48	43	9.0	46	2.0	41	5.0	45	0.0	44	5.0	52	10.0	54	60	53	47	6.0	0.0	48.0
9/27/07	47	44	9.0	48	2.0	47	5.0	47	0.0	44	5.0	52	15.0	54	61	54	48	6.0	0.0	49.2
9/28/07	48	44	9.0	59	2.0	52	5.0	48	0.0	45	5.0	52	10.0	54	60	54	48	6.0	0.0	51.0
9/29/07	48	45	13.0	59	2.0	51	5.0	49	0.0	46	5.0	53	5.0	54	59	55	48	6.0	1.0	51.2
9/30/07	47	43	6.0	59	2.0	52	5.0	49	0.0	47	5.0	52	5.0	50	61	56	49	6.0	1.0	50.9

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Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
10/1/07	48	43	6.0	43	2.0	47	4.0	47	0.0	49	5.0	51	5.0	46	56	*55*	*48*	6.0	1.0	47.8
10/2/07	48	44	8.0	44	2.0	49	5.0	42	0.0	50	5.0	53	5.0	44	53	*54*	*47*	6.0	1.0	47.4
10/3/07	48	45	7.0	45	2.0	47	5.0	49	0.0	44	5.0	55	5.0	46	49	*54*	*48*	6.0	0.0	47.6
10/4/07	48	42	10.0	50	2.0	48	5.0	51	0.0	46	5.0	55	5.0	46	48	*47*	*41*	6.0	0.0	47.5
10/5/07	48	42	12.0	50	2.0	47	5.0	50	0.0	47	5.0	55	5.0	47	49	*46*	*40*	6.0	0.0	47.5
10/6/07	48	42	9.0	49	2.0	47	6.0	50	0.0	48	5.0	54	5.0	47	50	*46*	*40*	6.0	0.0	47.5
10/7/07	48	41	9.0	49	2.0	47	5.0	49	0.0	48	7.0	54	5.0	47	52	*48*	*42*	6.0	0.0	47.7
10/8/07	47	41	8.0	49	2.0	46	5.0	49	0.0	49	7.0	55	5.0	47	54	*50*	*44*	6.0	0.0	48.1
10/9/07	48	43	10.0	49	2.0	46	5.0	49	0.0	48	5.0	53	5.0	48	53	*50*	*44*	6.0	0.0	48.1
10/10/07	48	44	9.0	49	2.0	45	4.0	50	0.0	49	4.0	53	3.0	49	51	*50*	*44*	6.0	0.0	48.2
10/11/07	47	43	10.0	48	2.0	49	6.0	53	0.0	46	4.0	50	5.0	49	50	*48*	*42*	6.0	0.0	47.7
10/12/07	48	44	10.0	50	2.0	48	5.0	52	0.0	47	4.0	52	5.0	50	52	*50*	*44*	6.0	0.0	48.7
10/13/07	48	43	11.0	50	2.0	48	5.0	52	0.0	47	2.0	52	5.0	51	52	*54*	*48*	6.0	0.0	49.1
10/14/07	47	43	9.0	50	2.0	47	5.0	52	0.0	48	2.0	52	5.0	52	52	*52*	*46*	6.0	0.0	48.9
10/15/07	48	45	10.0	50	2.0	48	4.0	50	0.0	48	7.0	50	5.0	52	55	*53*	*47*	6.0	0.0	49.3
10/16/07	48	45	12.0	50	2.0	51	5.0	52	0.0	48	5.0	53	5.0	53	56	*54*	*48*	6.0	0.0	50.4
10/17/07	48	44	11.0	50	2.0	52	5.0	53	0.0	49	5.0	54	5.0	53	56	*54*	*48*	6.0	0.0	50.7
10/18/07	47	41	9.0	50	2.0	50	5.0	52	0.0	49	5.0	54	2.0	52	56	*54*	*47*	6.0	0.0	49.8
10/19/07	47	44	8.0	48	2.0	50	5.0	50	0.0	50	5.0	54	0.0	52	51	*53*	*44*	6.0	0.0	49.0
10/20/07	48	42	9.0	48	2.0	47	5.0	50	0.0	48	5.0	55	0.0	53	51	*55*	*46*	6.0	0.0	48.8
10/21/07	47	37	10.0	41	3.0	44	4.0	50	0.0	48	5.0	56	0.0	51	50	*53*	*46*	6.0	0.0	47.0
10/22/07	54	43	5.0	39	2.0	37	4.0	48	0.0	48	5.0	56	0.0	50	49	*51*	*37*	6.0	8.0	46.1
10/23/07	61	54	7.0	48	2.0	45	4.0	43	0.0	48	7.0	50	0.0	49	50	*47*	*28*	6.0	13.0	47.6
10/24/07	59	58	10.0	55	2.0	57	3.0	52	0.0	46	5.0	46	0.0	49	52	*44*	*34*	6.0	4.0	50.8
10/25/07	62	51	13.0	55	2.0	61	3.0	60	0.0	46	5.0	47	0.0	51	52	*53*	*45*	6.0	2.0	53.0
10/26/07	58	55	9.0	55	2.0	59	3.0	60	0.0	49	5.0	48	0.0	51	52	*53*	*46*	6.0	1.0	53.3
10/27/07	52	54	5.0	55	2.0	58	3.0	60	0.0	53	5.0	49	0.0	51	53	*55*	*47*	6.0	2.0	53.2
10/28/07	51	53	5.0	54	2.0	56	3.0	61	0.0	57	5.0	51	0.0	51	53	*55*	*46*	6.0	3.0	53.3
10/29/07	52	47	5.0	52	2.0	50	3.0	57	0.0	60	5.0	56	0.0	51	54	*56*	*47*	6.0	3.0	52.6
10/30/07	54	47	6.0	50	2.0	47	2.0	52	0.0	58	5.0	62	0.0	51	53	*56*	*48*	6.0	2.0	52.2
10/31/07	54	47	6.0	49	2.0	48	1.0	49	0.0	56	1.0	63	0.0	54	54	*54*	*46*	6.0	2.0	52.0

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

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Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
11/1/07	52	47	4.0	50	2.0	49	1.0	50	0.0	53	1.0	59	0.0	58	56	55	46	6.0	3.0	52.0
11/2/07	53	48	5.0	50	2.0	48	1.0	50	0.0	53	1.0	56	0.0	58	59	59	48	6.0	5.0	52.3
11/3/07	52	48	4.0	49	2.0	47	1.0	49	0.0	52	0.0	54	0.0	57	60	60	47	6.0	7.0	51.5
11/4/07	54	47	4.0	49	2.0	46	1.0	49	0.0	50	0.0	52	0.0	56	62	61	47	6.0	8.0	51.2
11/5/07	52	47	5.0	50	2.0	47	1.0	49	0.0	50	0.0	51	0.0	54	60	62	47	7.0	8.0	50.7
11/6/07	53	48	5.0	50	2.0	48	1.0	49	0.0	49	0.0	50	0.0	52	54	60	47	6.0	7.0	50.0
11/7/07	54	50	5.0	53	2.0	50	1.0	49	0.0	49	0.0	50	0.0	51	57	59	48	6.0	5.0	51.1
11/8/07	51	50	6.0	53	2.0	50	1.0	50	0.0	49	0.0	51	0.0	51	57	57	47	6.0	4.0	50.9
11/9/07	50	49	7.0	51	2.0	49	1.0	49	0.0	50	0.0	52	0.0	52	56	56	47	6.0	3.0	50.5
11/10/07	48	47	5.0	50	2.0	49	1.0	49	0.0	49	1.0	52	0.0	50	56	56	48	6.0	2.0	49.8
11/11/07	47	45	6.0	49	2.0	48	1.0	49	0.0	48	0.0	52	0.0	50	55	55	48	6.0	1.0	49.1
11/12/07	47	45	2.0	48	2.0	47	1.0	49	0.0	49	0.0	52	0.0	50	55	54	48	6.0	0.0	49.0
11/13/07	47	46	5.0	49	3.0	48	1.0	48	0.0	49	0.0	52	0.0	51	54	54	48	6.0	0.0	49.2
11/14/07	46	45	6.0	50	2.0	48	1.0	47	0.0	48	1.0	50	0.0	52	54	53	47	6.0	0.0	48.7
11/15/07	46	43	6.0	49	2.0	46	2.0	49	0.0	47	1.0	51	0.0	53	55	55	48	6.0	1.0	48.7
11/16/07	47	44	6.0	51	3.0	45	2.0	48	0.0	46	0.0	50	0.0	52	54	55	44	6.0	5.0	48.1
11/17/07	47	42	6.0	51	3.0	45	1.0	48	0.0	47	0.0	48	0.0	52	55	57	46	6.0	5.0	48.1
11/18/07	47	48	6.0	53	3.0	46	2.0	48	0.0	46	0.0	48	0.0	52	54	57	47	6.0	4.0	48.9
11/19/07	48	46	6.0	50	3.0	50	1.0	49	0.0	48	0.0	48	0.0	52	55	57	48	6.0	3.0	49.4
11/20/07	47	44	7.0	52	2.0	50	1.0	51	0.0	46	0.0	49	0.0	51	56	56	46	6.0	4.0	49.2
11/21/07	46	44	6.0	50	3.0	49	1.0	50	0.0	46	0.0	49	0.0	52	55	56	47	6.0	3.0	48.8
11/22/07	46	44	5.0	50	3.0	49	1.0	50	0.0	46	0.0	49	0.0	51	55	55	46	6.0	3.0	48.6
11/23/07	46	44	7.0	50	3.0	49	1.0	49	0.0	47	0.0	50	0.0	52	54	53	46	6.0	1.0	48.7
11/24/07	46	43	6.0	51	3.0	48	1.0	49	0.0	46	0.0	49	0.0	51	54	53	46	6.0	1.0	48.3
11/25/07	47	43	6.0	52	3.0	48	1.0	48	0.0	46	0.0	50	0.0	50	54	54	47	6.0	1.0	48.5
11/26/07	47	44	7.0	50	3.0	48	1.0	48	0.0	46	0.0	49	0.0	50	53	53	47	6.0	0.0	48.2
11/27/07	47	44	6.0	47	3.0	48	1.0	48	0.0	47	0.0	47	0.0	49	51	53	47	6.0	0.0	47.5
11/28/07	48	45	7.0	51	3.0	47	1.0	48	0.0	48	0.0	49	0.0	50	52	54	48	6.0	0.0	48.6
11/29/07	48	46	6.0	50	3.0	48	2.0	49	0.0	49	0.0	49	0.0	50	53	54	47	6.0	1.0	48.9
11/30/07	47	45	6.0	49	3.0	48	1.0	49	0.0	49	0.0	50	0.0	51	53	57	47	6.0	4.0	48.8

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Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
12/1/07	47	45	8.0	49	3.0	48	2.0	48	0.0	49	0.0	51	0.0	51	54	57	47	6.0	4.0	48.9
12/2/07	46	44	7.0	49	3.0	48	1.0	49	0.0	49	0.0	51	0.0	51	54	56	48	6.0	2.0	48.9
12/3/07	46	44	6.0	48	3.0	47	1.0	48	0.0	48	1.0	49	0.0	50	53	56	48	6.0	2.0	48.1
12/4/07	46	44	6.0	47	3.0	48	2.0	48	0.0	49	0.0	50	0.0	50	53	55	47	6.0	2.0	48.2
12/5/07	46	44	6.0	49	3.0	47	2.0	48	0.0	49	0.0	51	0.0	51	53	56	48	6.0	2.0	48.6
12/6/07	45	43	1.0	47	3.0	48	2.0	49	0.0	49	0.0	52	0.0	51	54	57	46	6.0	5.0	48.4
12/7/07	45	42	2.0	46	3.0	47	2.0	48	0.0	51	0.0	61	0.0	57	53	60	46	6.0	8.0	49.6
12/8/07	44	42	2.0	45	3.0	46	2.0	48	0.0	52	0.0	61	0.0	63	57	61	47	6.0	8.0	50.5
12/9/07	43	42	1.0	45	4.0	47	1.0	49	0.0	54	0.0	62	0.0	69	64	63	47	6.0	10.0	52.2
12/10/07	44	42	1.0	43	3.0	45	2.0	47	0.0	48	0.0	55	0.0	64	75	75	48	6.0	21.0	51.1
12/11/07	43	39	2.0	40	4.0	38	2.0	42	0.0	46	0.0	52	0.0	59	67	72	47	6.0	19.0	47.3
12/12/07	43	40	2.0	42	4.0	40	2.0	41	0.0	43	0.0	48	0.0	57	63	67	46	6.0	15.0	46.3
12/13/07	44	40	2.0	42	4.0	41	3.0	42	0.0	43	0.0	47	0.0	56	58	65	47	6.0	12.0	46.0
12/14/07	44	40	2.0	41	2.0	42	2.0	43	0.0	43	0.0	45	0.0	55	56	63	47	6.0	10.0	45.6
12/15/07	44	41	1.0	42	3.0	43	2.0	43	0.0	43	0.0	44	0.0	53	53	62	47	6.0	9.0	45.3
12/16/07	45	41	2.0	41	3.0	44	2.0	42	0.0	43	0.0	45	0.0	51	53	62	47	6.0	9.0	45.2
12/17/07	43	40	1.0	41	3.0	43	4.0	42	0.0	45	0.0	45	0.0	49	52	58	47	6.0	5.0	44.7
12/18/07	43	40	2.0	41	3.0	43	2.0	44	0.0	44	0.0	45	0.0	49	52	56	45	6.0	5.0	44.6
12/19/07	45	40	2.0	40	3.0	40	2.0	43	0.0	44	0.0	44	0.0	49	50	56	47	6.0	3.0	44.2
12/20/07	48	40	2.0	43	3.0	38	1.0	45	0.0	47	0.0	43	0.0	53	52	54	47	6.0	1.0	45.6
12/21/07	47	47	2.0	43	1.0	44	1.0	46	0.0	44	0.0	44	0.0	47	52	53	47	6.0	0.0	46.1
12/22/07	46	46	2.0	44	1.0	43	2.0	46	0.0	49	0.0	45	0.0	47	49	53	47	6.0	0.0	46.2
12/23/07	47	47	2.0	44	1.0	43	1.0	46	0.0	54	0.0	41	0.0	46	48	53	47	6.0	0.0	46.3
12/24/07	47	47	2.0	44	1.0	44	1.0	46	0.0	43	0.0	41	0.0	46	49	54	48	6.0	0.0	45.5
12/25/07	47	47	2.0	43	1.0	43	1.0	46	0.0	46	0.0	40	0.0	46	50	53	47	6.0	0.0	45.5
12/26/07	47	47	2.0	43	1.0	44	1.0	46	0.0	44	0.0	44	0.0	47	52	53	47	6.0	0.0	46.1
12/27/07	46	45	1.0	44	4.0	32	1.0	39	0.0	41	0.0	41	0.0	46	51	53	47	6.0	0.0	43.2
12/28/07	47	45	2.0	44	1.0	44	1.0	44	0.0	43	0.0	44	0.0	46	50	53	47	6.0	0.0	45.4
12/29/07	47	45	4.0	47	1.0	47	1.0	46	0.0	44	0.0	45	0.0	46	49	52	46	6.0	0.0	46.2
12/30/07	47	45	5.0	48	1.0	48	1.0	47	0.0	45	0.0	46	0.0	46	49	46	38	6.0	2.0	45.9
12/31/07	47	44	3.0	44	1.0	47	1.0	48	0.0	49	0.0	48	0.0	47	49	54	48	6.0	0.0	47.1

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Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
1/1/08	47	45	3.0	46	1.0	47	1.0	49	0.0	48	0.0	49	0.0	47	49	52	46	6.0	0.0	47.3
1/2/08	47	45	4.0	46	2.0	45	1.0	47	0.0	46	0.0	46	0.0	45	46	50	44	6.0	0.0	45.7
1/3/08	47	50	5.0	47	3.0	47	1.0	47	0.0	43	0.0	49	0.0	43	50	51	45	6.0	0.0	46.8
1/4/08	47	45	4.0	50	2.0	47	1.0	49	1.0	47	0.0	48	0.0	47	47	49	43	6.0	0.0	47.0
1/5/08	47	48	5.0	58	8.0	54	2.0	61	2.0	55	0.0	62	0.0	53	58	54	45	6.0	3.0	54.1
1/6/08	47	47	4.0	54	5.0	62	2.0	71	1.0	57	0.0	65	0.0	81	63	66	47	6.0	13.0	59.4
1/7/08	47	44	5.0	45	5.0	49	2.0	67	0.0	57	0.0	67	0.0	75	72	72	48	6.0	18.0	57.1
1/8/08	48	47	4.0	47	4.0	48	2.0	52	0.0	59	0.0	66	0.0	65	83	85	44	6.0	35.0	55.9
1/9/08	48	46	4.0	46	4.0	48	1.0	52	0.0	55	0.0	63	0.0	63	78	82	43	6.0	33.0	54.2
1/10/08	47	46	4.0	45	4.0	50	1.0	49	0.0	49	0.0	56	0.0	62	72	76	47	6.0	23.0	52.3
1/11/08	47	47	4.0	44	5.0	50	1.0	49	0.0	47	0.0	56	0.0	62	71	62	46	4.0	12.0	51.9
1/12/08	47	48	5.0	45	3.0	50	1.0	48	0.0	46	0.0	51	0.0	64	70	63	46	4.0	13.0	51.5
1/13/08	47	48	5.0	44	3.0	50	1.0	49	0.0	46	0.0	51	0.0	63	72	72	46	6.0	20.0	51.6
1/14/08	47	47	6.0	45	2.0	50	1.0	46	0.0	45	0.0	53	0.0	57	72	73	46	6.0	21.0	50.8
1/15/08	47	46	5.0	45	3.0	48	1.0	46	0.0	47	0.0	52	0.0	56	63	64	46	6.0	12.0	49.6
1/16/08	47	46	6.0	41	2.0	45	1.0	46	0.0	45	0.0	53	0.0	55	65	59	46	4.0	9.0	48.9
1/17/08	47	39	6.0	41	4.0	45	1.0	45	0.0	45	0.0	50	0.0	53	62	65	47	6.0	12.0	47.4
1/18/08	48	43	5.0	42	2.0	45	1.0	44	0.0	47	0.0	50	0.0	55	62	64	48	6.0	10.0	48.4
1/19/08	47	43	6.0	44	2.0	49	1.0	45	0.0	47	0.0	49	0.0	52	56	63	48	6.0	9.0	48.0
1/20/08	46	42	7.0	46	1.0	48	1.0	46	0.0	46	0.0	46	0.0	51	59	61	48	6.0	7.0	47.8
1/21/08	46	40	5.0	42	2.0	46	0.0	45	0.0	47	0.0	46	0.0	51	58	61	48	6.0	7.0	46.9
1/22/08	47	41	5.0	41	2.0	46	5.0	43	0.0	48	0.0	45	0.0	50	54	59	46	6.0	7.0	46.1
1/23/08	46	41	4.0	44	1.0	47	1.0	43	0.0	47	0.0	47	0.0	50	57	59	38	6.0	15.0	46.0
1/24/08	47	42	5.0	47	3.0	46	0.0	44	0.0	47	0.0	46	0.0	49	61	60	47	6.0	7.0	47.6
1/25/08	46	39	5.0	47	3.0	46	0.0	44	1.0	47	0.0	47	0.0	52	63	58	47	5.0	6.0	47.8
1/26/08	47	38	5.0	46	3.0	46	0.0	44	1.0	48	0.0	49	0.0	57	64	61	48	6.0	7.0	48.7
1/27/08	47	47	5.0	49	3.0	47	0.0	45	1.0	48	0.0	44	0.0	58	65	65	49	6.0	10.0	49.9
1/28/08	47	45	4.0	47	3.0	48	0.0	47	1.0	51	0.0	46	0.0	62	65	66	48	6.0	12.0	50.6
1/29/08	46	43	5.0	46	3.0	48	1.0	47	0.0	51	0.0	50	0.0	62	64	67	49	6.0	12.0	50.6
1/30/08	47	42	4.0	44	3.0	45	1.0	46	0.0	51	0.0	50	0.0	58	64	65	47	6.0	12.0	49.4
1/31/08	47	44	3.0	45	3.0	47	0.0	43	0.0	51	0.0	48	0.0	55	63	65	46	6.0	13.0	48.9

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Revised Page –
Pumpback data switched with Above Pumpback

Flow Gaging Station / Date	Intake	Blackrock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
2/1/2008	48	44	3.0	45	3.0	47	0.0	44	0.0	50	0.0	50	0.0	54	60	62	47	6.0	9.0	48.9
2/2/2008	47	43	3.0	45	3.0	48	0.0	44	0.0	49	0.0	46	0.0	54	58	60	47	6.0	7.0	48.1
2/3/2008	47	43	3.0	46	3.0	49	0.0	46	1.0	50	0.0	48	0.0	55	58	59	47	6.0	6.0	48.9
2/4/2008	46	42	3.0	43	3.0	44	0.0	46	0.0	51	0.0	47	0.0	56	58	58	48	6.0	4.0	48.1
2/5/2008	47	43	3.0	44	4.0	46	0.0	46	0.0	51	0.0	49	0.0	54	57	59	48	6.0	5.0	48.5
2/6/2008	48	45	3.0	47	4.0	46	1.0	45	0.0	50	0.0	49	0.0	52	59	59	48	6.0	5.0	48.9
2/7/2008	48	41	2.0	47	3.0	48	1.0	44	0.0	48	0.0	48	0.0	51	60	58	47	6.0	5.0	48.2
2/8/2008	49	47	2.0	46	3.0	46	1.0	45	0.0	48	0.0	48	0.0	53	58	57	46	6.0	5.0	48.6
2/9/2008	47	51	3.0	48	4.0	49	1.0	46	0.0	48	0.0	47	0.0	53	58	57	46	6.0	5.0	49.3
2/10/2008	47	50	3.0	47	4.0	48	1.0	47	0.0	49	0.0	46	0.0	54	59	58	47	6.0	5.0	49.4
2/11/2008	47	49	3.0	47	3.0	47	1.0	47	0.0	49	0.0	49	0.0	53	59	59	48	6.0	5.0	49.5
2/12/2008	47	50	5.0	50	3.0	48	0.0	46	0.0	51	0.0	49	0.0	51	59	58	47	6.0	5.0	49.8
2/13/2008	55	51	3.0	49	3.0	47	1.0	47	0.0	50	0.0	50	0.0	51	56	57	48	6.0	3.0	50.4
2/14/2008	61	59	3.0	52	3.0	46	0.0	46	0.0	50	0.0	52	0.0	51	58	55	48	6.0	1.0	52.3
2/15/2008	69	61	3.0	53	3.0	54	0.0	45	0.0	51	0.0	52	0.0	50	57	56	48	6.0	2.0	54.0
2/16/2008	88	69	3.0	58	3.0	60	0.0	49	0.0	51	0.0	50	0.0	50	55	57	48	6.0	3.0	57.8
2/17/2008	118	93	3.0	72	3.0	71	0.0	55	0.0	56	0.0	50	0.0	49	58	56	47	6.0	3.0	66.9
2/18/2008	142	115	3.0	109	3.0	92	0.0	72	0.0	61	0.0	51	0.0	49	60	58	48	6.0	4.0	79.9
2/19/2008	182	153	6.0	126	3.0	115	0.0	114	0.0	68	0.0	58	0.0	50	58	59	47	6.0	6.0	97.1
2/20/2008	187	152	6.0	148	3.0	141	0.0	133	0.0	95	0.0	65	0.0	51	58	59	48	0.0	11.0	107.8
2/21/2008	210	176	6.0	170	3.0	164	0.0	133	0.0	100	0.0	81	0.0	53	59	59	48	0.0	11.0	119.4
2/22/2008	190	195	2.0	195	3.0	180	1.0	171	0.0	123	0.0	102	0.0	58	58	60	48	0.0	12.0	132.0
2/23/2008	160	166	2.0	166	3.0	167	1.0	174	0.0	143	0.0	132	0.0	68	63	62	46	0.0	16.0	128.5
2/24/2008	135	142	2.0	141	3.0	141	1.0	156	0.0	164	0.0	164	30.0	80	67	68	46	0.0	22.0	123.6
2/25/2008	106	110	2.0	116	3.0	120	1.0	137	0.0	144	0.0	171	44.0	100	78	81	47	0.0	34.0	112.9
2/26/2008	79	98	2.0	101	3.0	105	1.0	122	0.0	134	0.0	156	53.0	162	103	89	48	0.0	41.0	110.8
2/27/2008	55	69	2.0	85	3.0	88	1.0	98	0.0	119	0.0	147	78.0	202	161	126	44	16.0	66.0	106.8
2/28/2008	47	45	2.0	46	3.0	66	1.0	76	0.0	104	0.0	135	66.0	214	214	197	48	6.0	143.0	99.5
2/29/2008	47	43	2.0	52	3.0	55	1.0	58	0.0	90	0.0	117	0.0	223	223	195	48	6.0	141.0	95.6

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Blue text indicates intended period of seasonal habitat flows and flooding.

Flow Gaging Station / Date	Intake	Black-rock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
3/1/2008	47	44	4.0	54	3.0	51	1.0	51	0.0	76	0.0	103	0.0	157	218	*227*	*48*	6.0	173.0	84.9
3/2/2008	48	43	4.0	52	3.0	48	1.0	49	0.0	64	0.0	85	0.0	118	141	*181*	*48*	6.0	127.0	69.6
3/3/2008	47	42	4.0	44	3.0	48	1.0	47	0.0	58	0.0	65	0.0	90	116	*139*	*48*	6.0	85.0	60.5
3/4/2008	47	42	3.0	43	3.0	47	1.0	46	0.0	54	0.0	57	0.0	63	101	*122*	*47*	6.0	69.0	54.7
3/5/2008	47	42	3.0	41	3.0	44	1.0	46	0.0	54	0.0	55	0.0	56	91	*106*	*47*	6.0	53.0	52.3
3/6/2008	47	42	3.0	41	3.0	45	1.0	43	0.0	53	0.0	52	0.0	49	79	*94*	*47*	6.0	41.0	49.8
3/7/2008	47	42	3.0	41	3.0	45	1.0	43	0.0	47	0.0	49	0.0	53	71	*85*	*47*	6.0	32.0	48.5
3/8/2008	47	42	3.0	41	3.0	44	1.0	42	0.0	46	0.0	48	0.0	51	64	*76*	*47*	6.0	23.0	47.2
3/9/2008	47	41	3.0	40	3.0	44	1.0	42	0.0	44	0.0	45	0.0	47	48	*71*	*48*	6.0	17.0	44.6
3/10/2008	48	43	3.0	42	3.0	45	1.0	41	0.0	49	0.0	44	0.0	56	58	*69*	*48*	6.0	15.0	47.4
3/11/2008	47	42	3.0	42	3.0	46	1.0	42	0.0	47	0.0	43	0.0	57	57	*66*	*47*	6.0	13.0	47.0
3/12/2008	47	43	3.0	42	3.0	45	1.0	40	0.0	44	0.0	43	0.0	57	52	*64*	*47*	6.0	11.0	46.0
3/13/2008	47	42	3.0	39	3.0	45	1.0	40	0.0	45	0.0	45	0.0	54	49	*63*	*47*	6.0	10.0	45.3
3/14/2008	47	43	3.0	39	3.0	43	1.0	39	0.0	45	0.0	45	0.0	52	49	*61*	*45*	6.0	10.0	44.7
3/15/2008	47	40	3.0	38	3.0	43	1.0	39	0.0	44	0.0	45	0.0	53	47	*59*	*47*	6.0	6.0	44.3
3/16/2008	47	40	3.0	38	3.0	43	1.0	39	0.0	44	0.0	45	0.0	53	47	*56*	*48*	6.0	2.0	44.4
3/17/2008	46	61	3.0	45	2.0	51	1.0	43	0.0	42	0.0	45	0.0	49	45	*55*	*48*	6.0	1.0	47.5
3/18/2008	48	42	3.0	39	3.0	43	1.0	41	0.0	42	0.0	42	0.0	51	44	*55*	*47*	6.0	2.0	43.9
3/19/2008	46	39	2.0	39	3.0	44	0.0	38	0.0	46	0.0	41	0.0	58	43	*54*	*46*	6.0	2.0	44.0
3/20/2008	46	40	6.0	39	2.0	42	1.0	37	0.0	44	0.0	43	0.0	49	43	*54*	*45*	6.0	3.0	42.8
3/21/2008	52	50	5.0	45	2.0	46	1.0	38	0.0	42	0.0	46	0.0	49	44	*55*	*46*	6.0	3.0	45.8
3/22/2008	53	48	5.0	48	3.0	51	1.0	44	0.0	40	0.0	45	0.0	49	43	*54*	*47*	6.0	1.0	46.8
3/23/2008	53	51	5.0	50	3.0	52	1.0	46	0.0	41	0.0	42	0.0	48	44	*54*	*47*	6.0	1.0	47.4
3/24/2008	53	49	5.0	50	3.0	54	0.6	47	0.0	47	0.0	42	0.0	50	43	*54*	*47*	6.0	1.0	48.2
3/25/2008	51	51	5.0	50	3.0	52	0.6	47	0.0	48	0.0	45	0.0	50	45	*55*	*48*	6.0	1.0	48.7
3/26/2008	46	45	6.0	48	2.0	52	0.6	48	0.0	53	0.0	48	0.0	48	44	*54*	*47*	6.0	1.0	47.9
3/27/2008	48	47	6.0	47	2.0	49	0.6	45	0.0	52	0.0	48	0.0	50	50	*54*	*47*	6.0	1.0	48.3
3/28/2008	46	44	6.0	46	2.0	50	0.6	45	0.0	50	0.0	50	0.0	51	47	*53*	*47*	6.0	0.0	47.6
3/29/2008	47	46	6.0	44	2.0	47	0.6	44	0.0	47	0.0	49	0.0	55	46	*54*	*48*	6.0	0.0	47.3
3/30/2008	47	45	5.0	44	2.0	49	0.6	43	0.0	49	0.0	49	0.0	57	48	*54*	*48*	6.0	0.0	47.9
3/31/2008	48	47	5.0	45	2.0	47	0.6	51	0.0	53	0.0	47	0.0	52	52	*54*	*48*	6.0	0.0	49.0

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4/1/08	46	46	5.0	46	2.0	50	0.6	52	0.0	53	0.0	44	0.0	49	52	*56*	*47*	6.0	3.0	48.5
4/2/08	48	48	5.0	45	2.0	49	0.6	52	0.0	52	0.0	45	0.0	49	52	*56*	*45*	6.0	5.0	48.5
4/3/08	46	45	6.0	46	2.0	49	0.6	52	0.0	52	0.0	45	0.0	48	51	*57*	*45*	6.0	6.0	47.9
4/4/08	48	46	6.0	48	2.0	49	0.6	51	0.0	52	0.0	44	0.0	47	51	*52*	*17*	6.0	29.0	45.3
4/5/08	46	44	5.0	48	2.0	49	0.6	53	0.0	52	0.0	43	0.0	46	50	*56*	*24*	6.0	26.0	45.5
4/6/08	47	44	5.0	46	2.0	48	0.6	52	0.0	53	0.0	44	0.0	46	50	*55*	*45*	6.0	4.0	47.5
4/7/08	47	45	4.0	46	2.0	47	0.6	51	0.0	53	0.0	45	0.0	46	48	*54*	*47*	6.0	1.0	47.5
4/8/08	47	45	4.0	47	2.0	49	0.6	52	0.0	53	0.0	47	0.0	46	48	*54*	*47*	6.0	1.0	48.1
4/9/08	47	46	4.0	46	2.0	47	0.6	52	0.0	52	0.0	47	0.0	46	49	*64*	*48*	6.0	0.0	48.0
4/10/08	47	44	5.0	46	2.0	47	0.6	52	0.0	52	0.0	45	0.0	45	46	*51*	*44*	6.0	1.0	46.8
4/11/08	46	46	6.0	47	2.0	48	0.6	51	0.0	52	0.0	44	0.0	48	46	*52*	*45*	6.0	1.0	47.3
4/12/08	47	45	5.0	47	2.0	50	0.6	53	0.0	52	0.0	43	0.0	45	46	*51*	*45*	6.0	0.0	47.3
4/13/08	47	46	4.0	48	3.0	49	0.6	53	0.0	52	0.0	42	0.0	45	48	*53*	*47*	6.0	0.0	47.7
4/14/08	47	47	3.0	48	3.0	49	0.6	53	0.0	53	0.0	43	0.0	45	48	*53*	*47*	6.0	0.0	48.0
4/15/08	47	41	3.0	47	0.0	46	0.6	52	0.0	53	0.0	44	0.0	47	47	*53*	*47*	6.0	0.0	47.1
4/16/08	46	39	3.0	45	3.0	45	0.6	52	0.0	53	1.0	45	0.0	45	46	*51*	*45*	6.0	0.0	46.1
4/17/08	47	40	4.0	46	3.0	45	0.6	48	0.0	49	0.0	45	0.0	44	49	*51*	*45*	6.0	0.0	45.8
4/18/08	47	38	4.0	46	3.0	47	0.6	50	0.0	49	0.0	40	0.0	42	49	*50*	*44*	6.0	0.0	45.2
4/19/08	47	41	4.0	47	3.0	48	0.6	50	0.0	49	0.0	42	0.0	43	52	*47*	*41*	6.0	0.0	46.0
4/20/08	47	39	4.0	46	3.0	47	0.6	50	0.0	49	0.0	42	0.0	44	50	*49*	*43*	6.0	0.0	45.7
4/21/08	47	47	4.0	43	3.0	46	0.6	49	0.0	49	0.0	39	0.0	42	49	*50*	*44*	6.0	0.0	45.5
4/22/08	47	48	2.0	41	3.0	46	0.6	49	0.0	49	0.0	39	0.0	41	49	*49*	*43*	6.0	0.0	45.2
4/23/08	47	46	2.0	41	3.0	44	0.6	49	0.0	49	0.0	48	0.0	54	50	*47*	*41*	6.0	0.0	46.9
4/24/08	47	49	4.0	43	3.0	46	0.6	48	0.0	48	0.0	46	0.0	39	45	*47*	*41*	6.0	0.0	45.2
4/25/08	47	47	4.0	45	3.0	47	0.6	51	0.0	48	0.0	47	0.0	44	45	*47*	*41*	6.0	0.0	46.2
4/26/08	47	48	4.0	44	3.0	47	0.6	50	0.0	49	0.0	46	0.0	42	45	*47*	*41*	6.0	0.0	45.9
4/27/08	46	47	4.0	44	3.0	47	0.6	50	0.0	50	0.0	46	0.0	42	45	*47*	*41*	6.0	0.0	45.8
4/28/08	48	49	5.0	44	3.0	48	0.6	49	0.0	50	0.0	46	0.0	46	47	*47*	*41*	6.0	0.0	46.8
4/29/08	47	50	6.0	47	2.0	49	0.6	50	0.0	50	0.0	48	0.0	46	46	*48*	*42*	6.0	0.0	47.5
4/30/08	47	48	4.0	44	2.0	48	0.6	52	0.0	49	0.0	46	0.0	44	47	*49*	*43*	6.0	0.0	46.8

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5/1/08	46	48	4.0	44	2.0	46	0.6	50	0.0	49	0.0	46	0.0	43	44	*43*	*37*	6.0	0.0	45.3
5/2/08	47	48	3.0	43	2.0	47	0.6	49	0.0	51	0.0	44	0.0	43	45	*45*	*39*	6.0	0.0	45.6
5/3/08	47	48	3.0	44	2.0	46	0.6	49	0.0	50	0.0	43	0.0	43	45	*46*	*40*	6.0	0.0	45.5
5/4/08	47	47	3.0	43	2.0	46	0.6	49	0.0	50	0.0	44	0.0	44	44	*44*	*38*	6.0	0.0	45.2
5/5/08	47	47	4.0	43	2.0	45	0.6	48	0.0	50	0.0	43	0.0	44	45	*46*	*40*	6.0	0.0	45.2
5/6/08	47	48	3.0	44	2.0	46	0.6	48	0.0	50	0.0	43	0.0	44	44	*45*	*39*	6.0	0.0	45.3
5/7/08	47	47	4.0	43	2.0	45	0.6	48	0.0	49	0.0	44	0.0	45	45	*45*	*39*	6.0	0.0	45.2
5/8/08	47	45	4.0	42	2.0	45	0.6	48	0.0	48	0.0	46	0.0	44	45	*45*	*39*	6.0	0.0	44.9
5/9/08	47	43	3.0	41	2.0	43	0.6	47	0.0	48	0.0	45	0.0	43	44	*42*	*36*	6.0	0.0	43.7
5/10/08	47	42	4.0	42	2.0	42	0.6	46	0.0	48	0.0	43	0.0	41	45	*43*	*37*	6.0	0.0	43.3
5/11/08	47	43	4.0	42	2.0	44	0.6	46	0.0	47	0.0	45	0.0	45	45	*44*	*38*	6.0	0.0	44.2
5/12/08	47	43	5.0	41	2.0	42	0.6	46	0.0	46	0.0	41	0.0	45	45	*42*	*36*	6.0	0.0	43.2
5/13/08	47	41	5.0	42	2.0	43	0.6	45	0.0	46	0.0	45	0.0	45	44	*42*	*36*	6.0	0.0	43.4
5/14/08	52	42	5.0	41	2.0	43	0.6	45	0.0	46	2.0	37	0.0	40	44	*41*	*35*	6.0	0.0	42.5
5/15/08	56	48	5.0	46	2.0	43	0.6	45	0.0	46	5.0	38	4.0	40	43	*39*	*33*	6.0	0.0	43.8
5/16/08	56	50	5.0	48	2.0	48	0.5	48	0.0	46	5.0	45	0.0	40	43	*37*	*30*	7.0	0.0	45.4
5/17/08	56	50	5.0	51	3.0	51	0.5	50	0.0	47	5.0	50	0.0	40	44	*38*	*31*	8.0	0.0	47.0
5/18/08	56	50	5.0	50	2.0	51	0.5	52	0.0	49	5.0	52	0.0	42	44	*36*	*28*	8.0	0.0	47.4
5/19/08	56	50	5.0	47	2.0	51	0.5	52	0.0	52	1.0	54	0.0	41	39	*39*	*31*	8.0	0.0	47.3
5/20/08	56	51	5.0	49	2.0	51	0.6	52	0.0	53	5.0	51	0.0	40	39	*40*	*32*	8.0	0.0	47.4
5/21/08	56	51	4.0	43	2.0	49	0.6	52	0.0	52	5.0	49	0.0	40	39	*40*	*32*	8.0	0.0	46.3
5/22/08	56	50	3.0	42	2.0	50	0.6	52	0.0	50	5.0	48	0.0	39	39	*41*	*33*	8.0	0.0	45.9
5/23/08	58	51	3.0	48	2.0	51	0.6	50	0.0	53	5.0	51	5.0	39	38	*39*	*31*	8.0	0.0	47.0
5/24/08	60	54	3.0	49	2.0	51	0.6	50	0.0	54	5.0	52	10.0	41	39	*40*	*32*	8.0	0.0	48.2
5/25/08	62	56	4.0	53	2.0	54	0.6	52	0.0	55	5.0	52	10.0	43	39	*41*	*33*	8.0	0.0	49.9
5/26/08	61	58	5.0	56	2.0	54	0.6	54	0.0	56	5.0	53	10.0	45	40	*43*	*35*	8.0	0.0	51.2
5/27/08	61	57	4.0	56	3.0	57	0.6	55	0.0	57	5.0	54	10.0	47	42	*49*	*41*	8.0	0.0	52.7
5/28/08	61	58	4.0	56	3.0	57	0.6	55	0.0	59	5.0	51	5.0	48	52	*51*	*43*	8.0	0.0	54.0
5/29/08	61	56	4.0	56	3.0	57	0.6	55	0.0	61	5.0	55	0.0	47	52	*52*	*44*	8.0	0.0	54.4
5/30/08	61	55	4.0	56	3.0	56	0.6	55	0.0	61	5.0	56	0.0	46	51	*56*	*47*	8.0	1.0	54.4
5/31/08	61	55	2.0	58	3.0	57	0.6	55	0.0	61	5.0	55	0.0	45	51	*57*	*48*	8.0	1.0	54.6

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Flow Gaging Station Date	Intake	Black-rock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
6/1/08	61	55	3.0	55	3.0	56	0.6	55	0.0	62	5.0	56	0.0	44	47	*56*	*48*	8.0	0.0	53.9
6/2/08	61	56	7.0	58	2.0	55	0.6	53	0.0	62	1.0	57	0.0	47	47	*53*	*45*	8.0	0.0	54.1
6/3/08	61	57	4.0	59	2.0	57	0.6	56	0.0	61	5.0	55	0.0	50	47	*51*	*43*	8.0	0.0	54.6
6/4/08	60	56	3.0	55	2.0	54	0.6	56	0.0	62	3.0	50	0.0	50	49	*50*	*42*	8.0	0.0	53.4
6/5/08	61	55	2.0	54	2.0	53	0.6	54	0.0	63	2.0	52	0.0	48	48	*49*	*41*	8.0	0.0	52.9
6/6/08	61	56	2.0	54	2.0	54	0.6	53	0.0	64	4.0	52	0.0	47	48	*51*	*44*	7.0	0.0	53.3
6/7/08	61	55	2.0	52	2.0	51	0.6	51	0.0	62	4.0	52	0.0	47	47	*50*	*42*	8.0	2.0	52.0
6/8/08	61	55	4.0	54	2.0	52	0.6	52	0.0	62	4.0	52	0.0	46	46	*48*	*40*	8.0	0.0	52.0
6/9/08	61	56	4.0	56	2.0	55	0.6	53	0.0	61	4.0	52	0.0	47	47	*47*	*39*	8.0	0.0	52.7
6/10/08	62	57	4.0	55	2.0	55	0.6	53	0.0	61	4.0	49	0.0	47	47	*47*	*39*	8.0	0.0	52.5
6/11/08	61	57	4.0	54	2.0	53	0.6	53	0.0	61	3.0	47	0.0	47	46	*46*	*38*	8.0	0.0	51.7
6/12/08	61	57	4.0	55	2.0	53	0.6	52	0.0	62	3.0	48	0.0	46	46	*47*	*39*	8.0	0.0	51.9
6/13/08	60	57	4.0	56	2.0	55	0.6	53	0.0	62	3.0	48	0.0	45	46	*46*	*38*	8.0	0.0	52.0
6/14/08	60	57	4.0	57	2.0	55	0.6	54	0.0	60	3.0	48	0.0	45	46	*44*	*36*	8.0	0.0	51.8
6/15/08	61	57	5.0	55	2.0	55	0.5	53	0.0	62	3.0	48	0.0	45	44	*43*	*35*	8.0	0.0	51.5
6/16/08	60	59	5.0	56	2.0	55	0.6	55	0.0	56	3.0	48	0.0	45	43	*42*	*34*	8.0	0.0	51.1
6/17/08	61	58	5.0	55	2.0	56	0.3	55	0.0	55	3.0	48	0.0	45	43	*42*	*34*	8.0	0.0	51.0
6/18/08	61	57	4.0	53	2.0	53	0.6	55	0.0	53	3.0	45	0.0	45	44	*43*	*35*	8.0	0.0	50.1
6/19/08	60	58	4.0	55	2.0	54	0.5	54	0.0	54	3.0	47	0.0	44	43	*42*	*34*	8.0	0.0	50.3
6/20/08	63	59	4.0	55	2.0	56	0.2	54	0.0	54	3.0	46	0.0	44	44	*42*	*34*	8.0	0.0	50.9
6/21/08	65	63	5.0	52	2.0	54	0.3	54	0.0	54	3.0	47	0.0	44	42	*42*	*34*	8.0	0.0	50.9
6/22/08	65	65	5.0	52	2.0	48	0.4	54	0.0	53	3.0	48	0.0	44	42	*41*	*33*	8.0	0.0	50.4
6/23/08	65	65	5.0	63	1.0	59	0.5	57	0.0	54	3.0	47	0.0	44	41	*41*	*33*	8.0	0.0	52.8
6/24/08	64	66	5.0	66	3.0	59	0.5	57	0.0	54	3.0	47	0.0	43	42	*40*	*32*	8.0	0.0	53.0
6/25/08	67	67	5.0	68	3.0	60	0.4	58	0.0	56	3.0	48	5.0	39	41	*40*	*32*	8.0	0.0	53.6
6/26/08	70	70	5.0	69	3.0	61	0.8	59	0.0	57	3.0	49	10.0	38	41	*39*	*31*	8.0	0.0	54.5
6/27/08	69	72	5.0	74	3.0	63	0.7	60	0.0	58	3.0	50	10.0	38	41	*39*	*31*	8.0	0.0	55.6
6/28/08	70	74	5.0	77	3.0	71	0.8	65	0.0	59	3.0	49	0.0	38	41	*40*	*32*	8.0	0.0	57.6
6/29/08	70	74	5.0	77	3.0	71	0.9	65	0.0	59	3.0	49	0.0	40	43	*32*	*32*	0.0	0.0	58.0
6/30/08	77	74	4.0	77	3.0	72	0.9	66	0.0	60	3.0	50	10.0	43	46	*43*	*35*	8.0	0.0	60.0

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

These measurements are not on the main channel of the Owens River, therefore blue text rows (period of flooding) are not included in average calculations.

Revised Page –
Pumpback data switched with Above Pumpback

Flow Gaging Station / Date	Intake	Black-rock	Blackrock Return	E/O Goose	Goose Return	Two Culverts	Billy Return	Mazourka	Locust Return	Manzanar	Georges Return	Rein-hackle	Alabama Gates	LP at NG Rd	Keeler Weir	Above PS	Pump-back	Release to Delta	Weir Flow to Delta	Average
7/1/08	77	74	4.0	78	3.0	65	0.9	64	0.0	59	3.0	50	0.0	43	45	*44*	*36*	8.0	0.0	59.1
7/2/08	77	73	4.0	63	2.0	62	0.8	64	0.0	61	5.0	55	0.0	44	46	*44*	*36*	8.0	0.0	58.1
7/3/08	70	72	4.0	63	3.0	63	0.8	64	0.0	62	5.0	56	0.0	44	48	*44*	*36*	8.0	0.0	57.8
7/4/08	70	72	5.0	65	3.0	64	1.0	63	0.0	61	5.0	56	0.0	43	47	*40*	*32*	8.0	0.0	57.3
7/5/08	70	73	5.0	68	3.0	64	1.0	64	0.0	61	5.0	57	0.0	44	47	*47*	*34*	8.0	5.0	58.2
7/6/08	70	72	5.0	69	3.0	64	1.0	64	0.0	61	5.0	57	0.0	46	48	*49*	*41*	8.0	0.0	59.2
7/7/08	69	68	5.0	69	3.0	63	1.0	64	0.0	61	5.0	62	0.0	47	49	*45*	*37*	8.0	0.0	58.9
7/8/08	70	68	5.0	68	3.0	62	1.3	64	0.0	62	5.0	60	0.0	48	50	*48*	*40*	8.0	0.0	59.2
7/9/08	69	68	6.0	70	2.0	62	1.3	63	0.0	62	5.0	60	0.0	49	51	*47*	*39*	8.0	0.0	59.3
7/10/08	69	67	6.0	70	3.0	63	1.3	63	0.0	62	4.0	60	0.0	48	51	*49*	*41*	8.0	0.0	59.4
7/11/08	69	66	5.0	69	3.0	62	1.2	63	0.0	62	4.0	59	0.0	48	50	*50*	*42*	8.0	0.0	59.0
7/12/08	69	67	5.0	70	3.0	62	1.1	63	0.0	62	4.0	59	0.0	49	51	*50*	*42*	8.0	0.0	59.4
7/13/08	70	67	5.0	71	3.0	62	1.0	63	0.0	63	5.0	59	0.0	49	51	*50*	*42*	8.0	0.0	59.7
7/14/08	70	69	5.0	71	3.0	63	0.8	64	0.0	63	5.0	60	0.0	52	53	*50*	*42*	8.0	0.0	60.7
7/15/08	70	70	6.0	72	3.0	62	0.7	64	0.0	63	5.0	60	0.0	51	53	*50*	*42*	8.0	0.0	60.7
7/16/08	69	70	5.0	73	3.0	63	0.7	64	0.0	64	5.0	60	0.0	50	53	*53*	*45*	8.0	0.0	61.1
7/17/08	69	67	5.0	69	2.0	65	0.6	64	0.0	64	6.0	60	0.0	51	53	*54*	*46*	8.0	0.0	60.8
7/18/08	70	68	6.0	68	1.0	64	0.7	63	0.0	64	8.0	61	0.0	52	50	*54*	*46*	8.0	0.0	60.6
7/19/08	69	68	5.0	70	1.0	64	0.7	62	0.0	64	8.0	60	0.0	51	54	*55*	*47*	8.0	0.0	60.9
7/20/08	69	67	5.0	69	1.0	63	0.8	61	0.0	63	8.0	60	0.0	49	53	*54*	*46*	8.0	0.0	60.0
7/21/08	70	68	5.0	69	1.0	63	0.9	61	0.0	63	9.0	60	0.0	48	52	*52*	*44*	8.0	0.0	59.8
7/22/08	69	69	5.0	70	1.0	63	1.0	61	0.0	63	8.0	59	0.0	49	50	*51*	*43*	8.0	0.0	59.6
7/23/08	69	68	5.0	70	1.0	64	1.0	61	0.0	62	9.0	58	0.0	49	51	*51*	*43*	8.0	0.0	59.5
7/24/08	64	67	5.0	69	1.0	63	1.2	61	0.0	61	9.0	59	0.0	48	50	*49*	*41*	8.0	0.0	58.3
7/25/08	58	59	5.0	67	1.0	63	1.2	61	0.0	61	9.0	58	0.0	47	49	*47*	*40*	7.0	0.0	56.3
7/26/08	58	57	6.0	59	1.1	58	1.3	60	0.0	61	9.0	58	0.0	47	47	*45*	*37*	8.0	0.0	54.2
7/27/08	58	56	6.0	58	1.0	56	1.2	58	0.0	61	9.0	58	0.0	47	48	*49*	*41*	8.0	0.0	54.1
7/28/08	58	56	6.0	58	1.0	55	1.2	58	0.0	61	8.0	58	0.0	47	48	*46*	*38*	8.0	0.0	53.7
7/29/08	64	55	6.0	57	1.0	55	1.2	56	0.0	57	9.0	64	0.0	47	48	*49*	*41*	8.0	0.0	54.4
Average 3/20/07-present	52.9	50.4	4.4	51.2	2.3	49.6	2.2	50.4	1.0	51.0	3.0	51.2	3.4	50.6	52.8	*51.1*	*43.2*	6.3	4.3	50.3
Min	43.0	37.0	0.0	38.0	0.0	32.0	0.0	36.0	0.0	38.0	0.0	31.0	0.0	34.0	36.0	*18.0*	*1.0*	0.0	0.0	41.9
Max	210	195.0	13.0	195.0	8.0	180.0	6.0	174.0	8.0	164.0	10.0	171.0	78.0	223.0	223.0	*227.0*	*50.0*	22.0	173.0	132.0

Notes: Yellow cells indicate that measurements were estimated by LADWP staff due to technical problems.

4.8.2. APPENDIX B. Distance Between River Flow Measuring Stations.

River Flows Table 9. The Distance (miles) Between Flow Measuring Stations and the Distance of Each Flow Measuring Station From the Intake Control Structure.

Accumulative River Miles	Measuring Station	Distance Between Stations
0.0	Intake	0
4.9	Blackrock	4.9
10.9	Goose	6.0
16.1	Culvert	5.2
20.7	Mazourka	4.6
27.7	Manzanar	7.0
33.6	Reinhackle	5.9
43.7	Lone Pine N.G.	10.1
48.7	Keeler	5.0
53.5	Pumpback	4.8
62.3	Downstream end of Delta	8.8

4.8.3. APPENDIX C. Timing of the 2008 Winter Flushing Peak Flows by Time and Over Space as it Moved Downriver.

River Flows Table 10. Travel Timing of Recorded Peak Flows at Individual Measuring Stations During the 2008 Winter Habitat Flow Release Period.

Flow at the Intake peaked on February 21st at 10:00 am
Flow at Blackrock peaked on February 22nd at 7:00 am
Flow at Goose peaked on February 22nd at 3:00 pm
Flow at Culverts peaked on February 22nd at 12:00 midnight
Flow at Mazurka peaked on February 23rd at 12:00 noon
Flow at Manzanar peaked on February 24th at 12:00 noon
Flow at Reinhackle peaked on February 25th
Flow at Lone Pine peaked on February 29th
Flow at Keeler peaked on February 29th
Flow at Pumpback peaked on March 1

4.8.4. APPENDIX D. River Flow Loss or Gain

River Flows Table 11. River Flow Gain or Loss (cfs) by 10 Day Averages for 2007 and 2008.

Date	Total Flow Released	Flow Leaving the System	Loss/Gain
2007			
2-20 to 2-28	56	44	- 12
3-1 to 3-10	52	50	- 2
3-11 to 3-20	48	52	+ 4
3-21 to 3-30	51	42	- 9
4-1 to 4-10	55	43	- 12
4-11 to 4-20	54	48	- 6
4-21 to 4-30	55	49	- 6
5-1 to 5-10	56	42	- 14
5-11 to 5-20	61	39	- 22
5-21 to 5-31	65	41	- 24
6-1 to 6-10	71	45	- 26
6-11 to 6-20	70	44	- 26
6-21 to 6-30	68	37	- 31

Date	Total Flow Released	Flow Leaving the System	Loss/Gain
2007			
7-1 to 7-10	74	36	- 38
7-11 to 7-20	87	36	- 51
7-21 to 7-31	98	43	- 55
8-1 to 8-10	97	52	- 45
8-11 to 8-20	106	52	- 54
8-21 to 8-31	91	57	- 34
9-1 to 9-10	75	59	- 16
9-11 to 9-20	75	45	- 30
9-21 to 9-30	76	51	- 25
10-1 to 10-10	74	58	- 16
10-11 to 10-20	73	53	- 20
10-21 to 10-31	73	52	- 21
11-1 to 11-10	70	59	- 11
11-11 to 11-20	57	55	- 2
11-21 to 11-30	57	54	- 3
12-1 to 12-10	54	60	+ 6
12-11 to 12-20	51	62	+ 11
12-21 to 12-31	52	52	0
Average	**68**		
Date	**Total Flow Released**	**Flow Leaving the System**	**Loss/Gain**
2008			
1-1 to 1-10	57	74	+ 17
1-11 to 1-20	56	65	+ 9
1-21 to 1-31	55	62	+ 7
2-1 to 2-10	54	59	+ 5
2-11 to 2-20	107*	57	- 50*
2-21 to 2-29	149*	94*	- 55*
3-1 to 3-10	55	117*	+ 62*
3-11 to 3-20	54	59	+ 5
3-21 to 3-31	58	54	- 4
4-1 to 4-10	54	56	+ 2
4-11 to 4-20	54	51	- 3
4-21 to 4-30	54	48	- 6
5-1 to 5-10	53	44	- 9
5-11 to 5-20	64	40	- 24
5-21 to 5-31	72	46	- 26
6-1 to 6-10	71	50	- 21
6-11 to 6-20	71	44	- 27
6-21 to 6-30	82	40	- 42
7-1 to 7-10	85	46	- 39
7-11 to 7-20	83	52	- 31
7-21 to 7-31	81	48	- 33

* Influenced by the winter habitat flushing flow

5.0 2008 Rapid Assessment Survey Report

Prepared by:
Los Angeles Department of Water and Power
and Inyo County Water Department
in Cooperation with Ecosystem Sciences, Inc.

The 2008 Rapid Assessment Survey (RAS) of the Lower Owens River Project (LORP) area was a collaborative effort by the Los Angeles Department of Water and Power (LADWP), Inyo County Water Department (ICWD) and Ecosystem Sciences, Inc. (ESI). The 2008 RAS was conducted as year one monitoring of the post-implementation phase of the LORP.

LADWP and ICWD staff worked cooperatively with ESI in any modification of protocols, field planning, and the conduction of field work during the 2008 season. The data entry and data proofing were conducted by ICWD. LADWP prepared a draft report which was reviewed by ICWD. LADWP and ICWD prepared this final draft which was sent to ESI for comment.

5.1. Introduction

The RAS is being conducted in the LORP area in order to identify problems that may require mitigation or an adaptive management response. The intent of annual RAS is to identify problems during intervals between monitoring years and between monitoring sites before they manifest themselves into large, more expensive management problems. The RAS also provides qualitative feedback regarding changes within the project area. The RAS will allow the early detection of such problems such as noxious weed infestations, which will then allow for prompt management intervention. The results of the rapid assessment survey will be used primarily to alert project managers to areas of special concern or land use impacts that may not be compatible with the goals of the LORP. This information can then be used to assess the need for further evaluation, contingency monitoring or adaptive management actions.

The Lower Owens River Monitoring and Adaptive Management Plan (MAMP) (Ecosystem Sciences, Inc., 2008) states that RAS will be performed once a year for the first 10 years following project implementation. After 10 years, the need to continue RAS into the future will be assessed.

Flows in the LORP were initiated in December 2006. Following a period of ramping and flow stabilization, the management goal of an average of 40 cfs throughout the river channel was certified by Inyo County ***Superior*** Court in July 2007. The first LORP seasonal habitat flow occurred from mid-February to early March 2008.

In 2007, a LORP RAS was conducted primarily as a pilot project. The RAS conducted in 2008 will be considered year one of post-implementation monitoring.

Impacts that were identified during the rapid assessment survey included, but were not limited to: the presence, establishment or spread of noxious weeds, the presence of roads resulting in excessive impacts or access to sensitive habitats, damaged livestock fences, or beaver activity. Areas of new riparian woody recruitment were also noted as recruitment of riparian vegetation is an important component of a healthy, functioning riparian system.

5.2. Survey Areas

The RAS protocol was conducted in the four LORP management areas: the Riverine-Riparian Management Area, the Blackrock Waterfowl Management Area (BWMA), the Delta Habitat Area (DHA), and Off-River Lakes and Ponds. RAS Figure 1 shows the location of general LORP features and management areas. In the Riverine-Riparian Management Area, surveys followed both sides of the Owens River from the margin of the water to the outer edge of the floodplain. In the BWMA, DHA, and Off-River Lakes and Ponds surveys circumnavigated ponds and flooded areas or traversed wetland habitats. All surveys were on foot, except as noted below. Further description of the survey areas can be found below.

5.2.1. Riverine-Riparian Management Area

The LORP Riverine-Riparian area follows the Owens River from the Los Angeles Aqueduct Intake (Intake) in the north to the pumpback station at the north end of the DHA to the south. The Riverine-Riparian area encompasses 6,437 acres and follows approximately 53 miles of the Lower Owens River channel. The east and west boundaries of the Riverine-Riparian area generally correspond to transitions of stream terraces along the river - where wetland/riparian vegetation is present – to higher terraces supporting upland habitat. In the Riverine-Riparian Management Area, the RAS followed both sides of the entire Lower Owens River channel from the Intake to the Pumpback Station. Surveys were conducted in floodplain areas on both the west and east sides of the river but did not extend beyond the outer edge of the floodplain.

Blackrock Waterfowl Management Area

The BWMA is located south of the Intake and lies between the Los Angeles Aqueduct to the west, and the Owens River to the east. The BWMA encompasses 1,987 acres and consists of four management units: Drew, Thibaut, Waggoner, and Winterton. The BWMA contains upland habitats as well as the managed wetland units that will undergo periodic wetting and drying cycles designed to create suitable habitats for waterfowl and shorebirds. Although not all units will be flooded each year, management problems may arise during a drying period, and therefore, all units are surveyed when conducting RAS. Because the extent of flooding in each unit will vary yearly, the exact route followed will also vary. In general, surveys followed the wetted perimeter or traversed areas subjected to periodic wetting and drying. Dry upland areas within the BWMA that will not be subject to periodic managed flooding events are not being surveyed as part of the RAS.

Off-River Lakes and Ponds

The Off-River Lakes and Ponds component of the LORP is composed of a series of small lakes and ponds primarily situated along the Owens Valley fault line, and within the vicinity of the BWMA. Many of the lakes and ponds are recreational fishery locations. Thibaut Ponds, which are considered part of the Off-River Lakes and Ponds, are contained wholly within the Thibaut Management and will be surveyed as part of the Thibaut Unit as described under the BWMA section. Other Off-River Lakes and Ponds include Upper and Lower Twin Lakes, the Coyote/Grass Lakes complex, Upper and Lower Goose Lake and Billy Lake. Under LORP, water levels in the Off-River Lakes and Ponds are to be maintained and thus these areas will not undergo the wetting and drying cycles as will occur in the BWMA units. The survey of Billy Lake was conducted from a vehicle by driving on the dirt road that circumnavigates this small lake. Surveys for all other Off-River Lakes and Ponds were conducted on foot.

Delta Habitat Area

The DHA is a large wetland complex located at the delta of the Owens River and the northernmost edge of Owens Lake bed. The northern boundary of the DHA is located at the pumpback station and the southern boundary of the DHA corresponds with a subtle transition from vegetated wetland confined by shallow dunes and playa to the broadly depressed, unconfined brine pool on the lake bed (White Horse Associates [WHA] 2005). Due to recent expansion of the area subject to dust control under the State Implementation Plan, the DHA is now confined on the east and west by a series of dikes and raised roads containing cells which are at least partially flooded for a minimum nine months of the year.

The entire DHA is 3,578 acres and includes 755 acres of wetland habitats, based on 2005 conditions. Vegetated wetlands in the DHA are distributed along main channel of the Owens River which follows a north-south course, as well as across a broad area east of the main channel. The DHA will be managed to maintain and enhance habitats for waterfowl and shorebirds. The DHA will receive a base flow with an annual average release of 6-9 cfs from the Pumpback Station. The DHA will also be subject to a series of four pulse flows spaced throughout the year ranging from 20-30 cfs/day and 5-10 days as described in the MAMP. These pulse flows will commence in 2009. The DHA may also receive excess riverine flows that are above and beyond the capacity of the Pumpback Station. Surveys were conducted on each side of the main river channel, as well as across the vegetated areas to the east. Surveys did not extend beyond the vegetated areas.

5.3. Impacts Noted or Items of Interest Recorded

The following items were documented because of their importance to project managers in determining if adaptive management or mitigation measures are needed, or to evaluate the success or progress of the project or project components. The abbreviation that follows each category is the impact code used for field documentation.

1. **Beaver Activity** (BEA) - Beaver activity can include dams, tree cutting, huts or other evidence of beaver activity such as excessive ponding of water along the river. If evidence of beaver activity was encountered, the observer noted if the activity was recent or not. This was determined by looking for fresh material on dams, fresh chew marks on trees, or fresh vegetative material on huts. In some cases a dam was not visible, but the sound of water falling over the top of the dam could be heard. If a "waterfall" was heard, it was noted as a possible beaver dam. Slow-moving water or ponded water behind a possible dam was also recorded as potential beaver activity. Beaver sometimes respond to the presence of humans by slapping their tail against the water. This is a very loud and distinct sound and indicative of the presence of beaver. Any site that the beaver tail slap was heard was also documented.

2. **Disturbance** (DIST) – Areas of construction or maintenance-related disturbance.

3. **Exotic Weeds** (EXW) – A number of nonnative plants may be found scattered throughout the LORP area. It is neither feasible nor necessary to document all nonnative species, but observers may choose to document the presence of weeds other than A or B noxious weeds (see Section 5.3.6) if they formed extensive stands or were otherwise noteworthy.

4. **Fencing Problems** (FEN) - Any vandalism or damage to fences was recorded. The field personnel identified if the fence had been cut, impacted by wildlife, livestock, or age. Field personnel also noted if a particular repair should be given high priority, based on the presence of livestock in the area or the presence of other potential notable impacts. If wildlife, anglers, or other recreationists were repeatedly attempting to access a fenced portion of the river, the need for an additional access point was noted. Fence lines varying from those depicted on field maps, or open gates allowing driving access to the floodplain were also documented.

5. **Grazing Management** (GRZ) - Grazing management issues that were documented included the presence of livestock supplement sites in the floodplain, excessive trampling of vegetation, high-lining of vegetation, or water gaps resulting in excessive impacts. Since future grazing management plans do not include grazing on the river during July and August, except with prior authorization from LADWP, the presence of livestock on the river was also recorded when encountered.

6. **Noxious Weeds** (NOX) – The Noxious Weed Documentation and Reporting Form was used to record information on California Department of Food and Agriculture rated “A” or “B” noxious weeds, other than tamarisk (see below).

7. **Recreation** (REC) - Evidence of overnight camping or presence of fire rings.

8. **Roads** (ROAD) – Roads that access or may allow access to the floodplain, or evidence of off-road vehicular activity in the floodplain. Roads in areas prone to erosion or flooding may also be noted.

9. **Russian olive** (ELAN) – Although Russian olive is not listed as a noxious weed in California, the California Invasive Plant Council considers this species highly invasive in riparian systems. Russian olive (*Elaeagnus angustifolia*) plants were documented due to concerns involving potential spread of this species in the project area.

10. **Tamarisk** (TARA) – (*Tamarix ramosissima*) – Established saltcedar or tamarisk plants were recorded. This species is listed as a noxious weed by the California Department of Food and Agriculture.

11. **Tamarisk Seedlings** (TARA_SEED) – Tamarisk seedlings or areas of tamarisk recruitment were documented along with site conditions and an estimate of area or number of seedlings.

12. **Tamarisk Slash** – Tamarisk slash in the floodplain, on the banks (SLASH) or in the wetted river channel (SLASH_OB).

13. **Trash** (TRASH) – Any accumulation of trash, or other waste such as appliance or furniture.

14. **Wildlife** (WILDLIFE) – Use of the project area by wildlife species.

15. **Woody Recruitment** (WDY) - Native riparian woody recruitment site detected were documented. The information recorded included the approximate number of individuals, the height of the seedlings, site conditions, or the presence of competing species, such as tamarisk. Woody species that are of particular interest include any willow species and Fremont cottonwood (*Populus fremontii*). Since it was often difficult to identify willow seedlings to species, observers were asked to note if the seedlings appeared to be tree willow or shrub willow seedlings (usually *S. exigua*) if species identification was uncertain.

16. **Other** (OTH) – Other unclassified items of management concern or interest were recorded as necessary.

17. **Revisit Sites** (Revisit) – Specific sites from the 2007 RAS were selected to revisit. These sites were ultimately selected by the LADWP task leader, after discussion with other task leaders with regard to the nature of the sites to be revisited. Sites from the 2007 survey that were selected to revisit included all perennial pepperweed locations, all Fremont cottonwood recruitment sites, willow recruitment sites involving multiple individuals, tamarisk recruitment sites, and roads in meadow or floodplain areas.

5.4. Methods

5.4.1. Field Planning and Logistics

The RAS involves on-the-ground coverage of 106 river miles, and several large wetland areas. An important component of efficient completion of this effort is logistical planning and the availability of trained staff. The 2008 RAS was completed in nine field days, starting August 18 and completed on August 28. Each entity had a person that performed as the task leader and participated in most if not all field survey days. Mr. Derek Risso was the sole representative of Ecosystem Sciences, Inc. the designated LORP consultant, Ms. Debbie House represented LADWP, and Ms. Irene Yamashita represented ICWD. Task leaders arranged for other crew members to participate, provided project oversight, trained personnel as needed, and reviewed field datasheets. In addition to the task leaders, nine additional staff members of LADWP, and three additional ICWD staff participated in surveys. Mr. Nate Reade of Inyo/Mono County Agricultural Commissioner's Office participated in the survey on two days. In 2008, the RAS involved approximately 48 person days, however 6 of the 48 person days were devoted to training – thus 42 person days represents the minimum staff required to complete the field work in 2008. During periods of training, two people worked together to conduct a survey; but worked alone once training was complete. Any new personnel were sufficiently trained with background information and spent a full day in the field with a trained crew member before going out alone.

Field crews met each morning at a central location (LADWP office in Bishop) and determined the areas to be surveyed, the location to drop off personnel, and made arrangements for shuttle vehicles. Crew leaders also confirmed that GPS units were loaded with waypoint files denoting river miles (in 0.1 mile increments) as reference points, and revisit sites needed for the survey, and that each crew member had other field equipment needed including appropriate field maps and a sufficient number of datasheets. Personnel were provided with Eastern Sierra Weed Management Area Noxious Weed Identification Handbooks and a table listing all noxious weeds species that they should be on alert for and asked to review these items. This information was taken in the field as needed to help with identification.

<u>Equipment Required</u>

The following is a list of items required by personnel in the field:

1. Four-wheel drive vehicles for access to routes
2. Handheld Global Positioning System (GPS) unit (plus extra batteries)
3. Digital Camera (plus extra batteries)
4. Data sheets (3 types): Rapid Assessment Datasheet, Tamarisk Documentation Form, and Noxious Weed Documentation and Reporting Form
5. Clipboard and writing utensils
6. Field maps for the day's survey route plus a colored pen for making notes on the map
7. Noxious weed habitat and morphology descriptions and photographs
8. Waypoints of areas of management interest or concern that need to be revisited, as well as the river mile point file to aid in navigation and orientation.
9. Plastic storage bags for samples of unidentified plants
10. Cell phone and/or two-way radio

Field Procedures

Field personnel generally worked as a team of two. One member dropped the other off at the start point of the reach or area to be surveyed. This first person started walking the route (generally upstream to downstream), while the second person drove farther downstream and started surveying from that point south. Surveyors covered an average of 3.5 river miles a day, but this ranged from one mile to over five miles, depending on difficulty of travel. Also, depending on the number of oxbows, or the specific path taken to cover an area, each surveyor could walk up to three times the number of river miles covered on any one day. Personnel were advised to be prepared to carry all necessary field equipment as well as sufficient water and food to be self-sustaining in harsh field conditions.

The survey generally followed the river's edge however the observer scanned the entire floodplain for potential impact areas. For example, although the emphasis was on walking near the rivers edge, stands of tamarisk in the floodplain, but away from the waters edge, were still recorded. Tamarisk plants previously treated were visited to look for resprouting. In general, care was taken to be alert for any conditions of management interest within the riverine-riparian area.

A GPS point was taken at each area of interest or management concern. GPS units were set to NAD 27 CONUS for all data collection. Field personnel initiated the survey by activating the tracking function of the GPS unit to "track" the entire day's course. The tracking function was set at 0.01 km sensitivity or the "normal or more frequent than normal" setting to record a point every ten meters providing a detailed route. Each time a GPS point was taken, it was recorded on the appropriate datasheet, an "Impact" code was assigned, and detailed notes regarding the location were recorded on the datasheet as described above. To save time in the field, the GPS points bear the default name assigned to them by the GPS unit.

Areas of interest not accessible on foot, or areas encompassing a large geographic area were drawn on maps as opposed to walking the perimeter of the site, in order to save time in the field. These areas are digitized during data compilation.

Photographs of areas of interest or management concern were taken using digital cameras. Camera settings included high resolution settings, wide angle setting, and a date/time stamp (if available). Field staff verified that the date and time settings in the camera were correct prior to using the camera and after changing the batteries. While photographs were not taken at every location at which a GPS point was taken, photographs were taken when the observer felt that a photograph would assist in relaying important information such as visible impacts from roads, the proximity of roads to sensitive habitats, the presence of obstructions in the river, the proximity of tamarisk slash piles to the river channel or riparian habitats, or conditions supporting weed infestations. Other items of interest that were photographed include evidence of woody recruitment, sites or conditions supporting woody recruitment, or evidence of the response of habitat or wildlife to management activities. When a photograph was taken, the observer carefully documented the reason the photograph was taken, and what information the photograph was relaying. As with GPS points, the photographs bear the default name assigned by the camera. After downloading the photographs, the JPEG files were renamed by adding the observer initials as a suffix to the default names due to duplication of file names. Most areas of interest were sufficiently captured by one photograph, however, in rare occasions multiple photographs were warranted. Personnel were required to provide detailed notes associated with multiple photographs per site to ensure accurate cataloging of the photographs.

5.5. Documentation Procedures

Three different datasheets were used during Rapid Assessment Surveys: 1) Rapid Assessment Datasheet; 2) Tamarisk Documentation Form; and 3) Noxious Weed Documentation and Reporting Form. General information that was recorded on these datasheets include the date, observer(s), the field map(s) used, the area or river miles surveyed, and the beginning and end time of each survey.

Rapid Assessment Datasheet

The Rapid Assessment Datasheet was used to document all impacts or areas of interest except established tamarisk plants. On the Rapid Assessment Datasheet, the observer noted the impact code (e.g. FEN), GPS point, photograph number, time of observation, the direction the photograph was taken (if applicable), and detailed information about the observation or photograph.

Tamarisk Documentation Form

The Tamarisk Documentation Form was used to document only established tamarisk plants. The information recorded will assist tamarisk crews in prioritizing areas for treatment, relocating plants, and in the planning of eradication efforts at a site. The observer estimated the distance from the plant(s) to the river, the number of plants, whether or not the plant had re-sprouted after previous treatment, and the approximate height.

In the case of large or extensive stands of tamarisk, the observer drew a polygon on the field map of the affected area, took a GPS point at each end of the stand, and noted that plants were multiple and widespread, as appropriate.

Noxious Weed Documentation and Reporting Form

Any noxious weed with a California Department of Food and Agricultural rating of "A" or "B" (other than tamarisk) was documented using the Noxious Weed Documentation and Reporting Form, as well as recording observations on the Rapid Assessment Datasheet. The Noxious Weed Documentation and Reporting Forms are sent to the Inyo/Mono County Agricultural Commissioner's Office when completed. The Inyo/Mono County Agricultural Commissioner's Office is responsible for the treatment of noxious weeds (other than tamarisk) in the LORP area. These datasheets contain all the information necessary for location and treatment of the noxious weeds.

A photograph was taken of the noxious weed and or the site of occurrence. Samples of plants were taken along with a photograph if the observer was unsure of identification of a species. The affected location was mapped on field maps if possible.

5.6. Data Management and Custody

Field datasheets were checked for completeness by field personnel as well as the project leader. Ideally, each field person would be responsible for downloading their GPS unit and digital cameras on a daily basis. However, not all staff had access to necessary software, equipment, or adequate training to complete these tasks unassisted. The high turnover of personnel available for the project made investing the time each day to train new staff in the use of software and inefficient use of time. Thus, this task often fell to the task leaders and seemed to make the project effort less efficient than is possible.

The Garmin mapping program *Mapsource* was used to manage track and waypoint files. Track and waypoint files were downloaded in *Mapsource* and saved as a GDB file. Task leaders reviewed the *Mapsource* files and removed any extraneous track points. Track and waypoint files were transmitted electronically to ICWD staff. A copy of all photos and datasheets were sent to ICWD for data entry into a *Microsoft Access* database and for the development of *ArcGIS* spatial database layers and *Google Earth* project. LADWP staff digitized information on the field maps that was not documented as a waypoint such as extensive stands of tamarisk or slash. A *Google Earth* project was also developed to allow rapid display of data and to improve the ease of sharing data with other parties and outside agencies.

Field forms were assigned a document control number which consisted of the prefix "RA", indicating the project (e.g. Rapid Assessment), a unique identifier which will be the *Access* database auto number assigned to the record. The Tamarisk Documentation Form also received a suffix – TARA. After ICWD completed data entry and proofing, the database was sent to LADWP for use in drafting the report. All original datasheets were photocopied, scanned, and will be stored at the LADWP office in Bishop. For noxious weeds other than tamarisk, Noxious Weed Documentation and Reporting Forms were filled out by LADWP and ICWD and sent to the Inyo/Mono County Agricultural Commissioner's Office. ICWD staff created maps showing the location of all tamarisk documented during RAS and data associated with the sites. These maps were provided to the ICWD tamarisk control Project Manager. Changes to fence lines, cattle guard or walk through locations were made by LADWP staff. For fencing issues, a Fence Repair Request Form was filled out and submitted to the LADWP LORP Project Manager.

Data compilation, data analysis, and report writing took place in September and October. Office time, which involved pre-planning efforts, map generation, data entry/analysis, error checking, and report writing was estimated at 20 person-days.

5.7. Data Compilation

Access database queries were used to develop tables showing pertinent information such as the impact code, GPS coordinates, general location within the project boundary, and the observer notes (see Appendix). *ArcMap* documents were created for the project area showing locations where impacts/interests were documented. This information was reviewed, summarized, and is presented below.

5.8. Summary of Impacts/Interests

The following is a summary of observer sightings by impact category. The tables in Appendix 1 contain the raw data and notes for each observation by category. The notes for each observation provide details which will be useful in determining whether a particular site warrants mitigation, adaptive management, or contingency monitoring. The RAS Data ID is the unique identifying number in the *Access* database and is included for future referencing as needed and to cross-reference locations noted on accompanying figures.

<u>Beaver Activity</u>

There were twelve locations where confirmed or suspected beaver activity was noted (see table in Appendix 1). No areas of active tree-felling were noted. Documentation of beaver activity largely included the observers noting the sound of falling water or the ponding of water. Dams were generally not visible from the ground due to various factors including the presence of dense vegetation obscuring views of the channel. One area of beaver activity was noted near the Intake, while the remaining locations were from Billy Lake return south.

<u>Disturbance</u>

There were seven locations of general disturbance noted. Two of these sites noted construction-related disturbance and continued barren areas around gauging stations.

Exotic Weeds

The exotic plants noted by observers were bull thistle (*Cirsium vulgare*) and fivehook bassia (*Bassia hyssopifolia*). Bull thistle was noted in the wetland areas of Winterton and Waggoner and along the river downstream of Billy Lake return and near Hidden Lakes. Bassia, although a widespread and common weed, was notable this year because of the tall, largely impenetrable stands that formed along the Owens River in the former dry reach. Observers noted 4-6 foot tall dense stands of bassia covering the floodplain on both the east and west sides of the river from Blackrock Ditch (river mile 5.0) downstream to the east-west fence line just north of Two Culverts (river mile 15.6) (see photos below). Tumbleweed (*Salsola tragus*) was mixed in with the bassia in many areas. RAS Figure 2 shows the approximate extent of the dense bassia stands and the locations of bull thistle. The bassia prevented access to the river banks in many areas in this reach. Bull thistle has an overall rating of "Moderate" in the California Invasive Plant Inventory (Cal-IPC 2006). Bassia has an overall rating of "Limited" under Cal-IPC. Neither species is currently classified as a noxious weed in California.

Fencing

There were 12 locations where a fencing issue was noted, only a few of which may require a management response. The first involve a break in the fence on the Intake Lease. This gap in the fence may allow livestock from the Intake Lease (horses and mules) access onto the aqueduct road. A second fencing issue that may need further evaluation is a section of downed fence on the east side of the Owens River, just north of Lone Pine Depot Road on the Islands Lease. The lessee will be responsible for maintaining this fence, if needed to prevent livestock from wandering onto Lone Pine Depot Road. Also noted on the Island Lease is the downed fence along the boundary of the Carasco Riparian Field South on the east side of the river. As discussed in the LORP Fencing Report, the lessee feels that this fence is not needed; therefore, this fence does not need to be repaired at this time. Other fencing problems noted were walk-throughs, cattle guards and fence alignments different than depicted on field maps. The LADWP fence layer was updated to reflect these findings.

Grazing Management Issues

Eleven observations of livestock management issues were noted. All observations documented the presence of supplement tubs in the floodplain or close to wetlands areas or waterways. Two sites were on the along the Owens River, just north of George's Creek on the Islands lease. All other sites were on the Twin Lakes lease. At some locations, impacts appeared minimal. Further evaluation of all these feeding sites should be conducted with the lessees to ensure minimal impacts to water or vegetation resources.

Noxious Weeds

Perennial pepperweed (*Lepidium latifolium*) was documented in four different areas - two of which had not been previously documented. RAS Figure 3 shows the four general areas where perennial pepperweed was found are Drew Slough and three floodplain areas east of the river – 1) approximately 0.5 miles north of Blackrock Ditch, 2) 0.5 miles south of Manzanar Reward Road, and 3) 2 miles south of Manzanar Reward Road. The Drew Slough site and the sites 0.5 miles south of Manzanar Reward Road had not been previously documented or treated. The perennial pepperweed found in the Winterton Unit last year was not able to be relocated. Noxious Weed Documentation and Reporting Forms were filled out for each site and sent or hand-delivered to the Inyo/Mono County Agricultural Commissioners Office in Bishop. Further details of prior treatment of the sites or treatment since discovery can be found in the 2008 LORP Weed Report.

Perennial pepperweed site north of Blackrock Ditch

Recreation

Three recreational sites of interest were noted. Fire rings were found at the Lone Pine Depot railroad trestles and at the Keeler Bridge measuring station. The only other recreational impact noted was the presence of a wooden pallet being used as a fishing dock in the Delta Habitat area. The observer noted no significant site impacts from the use or placement of the pallet.

Roads

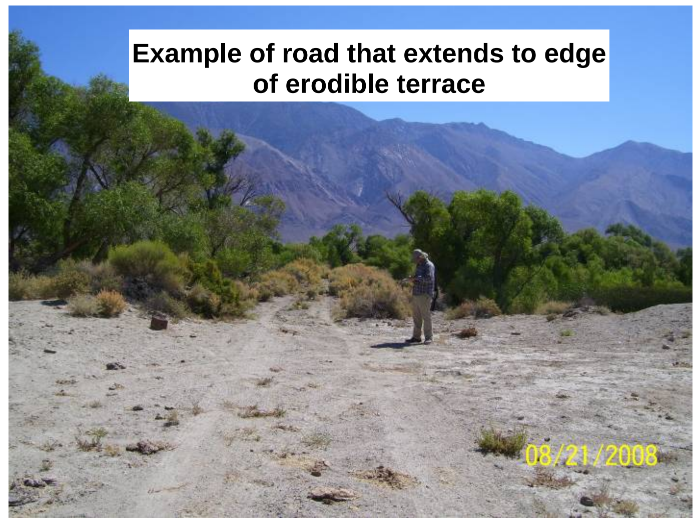
There were 68 locations identified in the project area where roads traversed or provided access to the floodplain or where there was evidence of vehicular travel over intact vegetation (i.e. not on an already established road) (RAS Figure 4). The impacts associated with these roads are variable and very site specific, and each may require further evaluation in order to determine impacts to achieving LORP goals. Some of the roads noted are established roads that are now flooded due to LORP flows. Additional impacts associated with some roads are rutting, new road paths to avoid flooding, or widening of the road in the areas of flooding. Only a few examples will be presented here to demonstrate the range of impacts observed, or to bring to attention specific sites of management interest.

During the 2007 RAS, it was noted that the areas disturbed by the pre-project channel-clearing activities, and subsequently reseeded, were being driven on.

During the 2008 RAS, these areas were revisited. From the Intake downstream to river mile 1.0, it was noted that the revegetated areas did not appear to have been driven on recently, and had revegetated with native alkali meadow species. From mile 1.0 and further downstream, the road adjacent to the bank is receiving vehicular traffic. Some portions of this road are now flooded or muddy as a result of project implementation (see photo below).

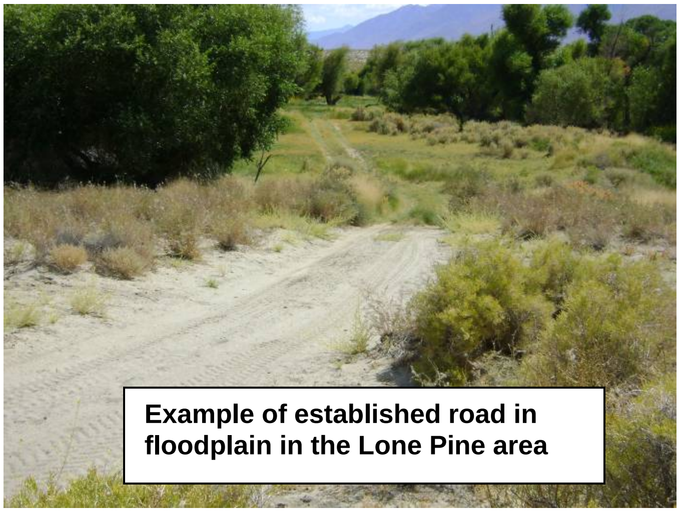
There were a few roads noted as being in the uplands on a terrace, but closely approaching the edge of the terrace (see photo). Although not in the floodplain, observers generally noted these areas due to their proximity to a steep, erodible cliff.

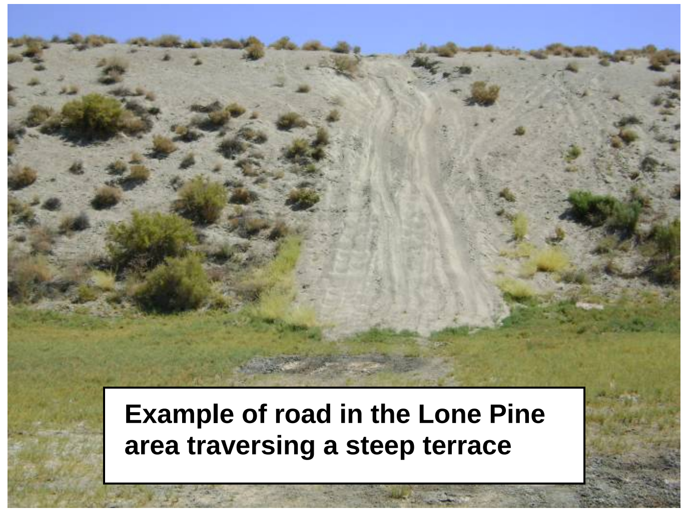
Example of road now flooded due to project implementation



Example of road that extends to edge of erodible terrace

There were also a considerable number of roads noted in the area east of Lone Pine. East of Lone Pine are several existing roads that allow travel through the floodplain (see photo). Although dry at the time of the survey, these floodplain areas are likely to be flooded during the seasonal habitat flows. These are also several roads and/or ATV access sites that traverse the steep terrace in this area in order to access the floodplain (see photo). Vehicular travel off of these pre-existing roads and over otherwise undisturbed vegetation was also noted.


Example of established road in floodplain in the Lone Pine area


Example of road in the Lone Pine area traversing a steep terrace

Roads were also noted in the BWMA and River Lakes and Ponds. In the BWMA, a few existing roads in the Thibaut and Winterton Units were also now flooded. At the south end of the Delta Habitat Area (DHA), ATV tracks were noted through wetland vegetation and across flooded playa (see photo below). The ATV tracks have been present at the south end of the DHA for some time, as workers on the lakebed have used ATVs to access monitoring sites. One observer noted vegetation impacts from travel through flooded marsh habitat, while a second observer noted that tracks through the area appeared more extensive and widespread than in previous years (i.e. not confined to previously-used travel routes).


Vehicular travel noted in the Delta Habitat Area through flooded marsh habitat


Vehicular travel noted at the south end of the Delta Habitat Area

Russian Olive

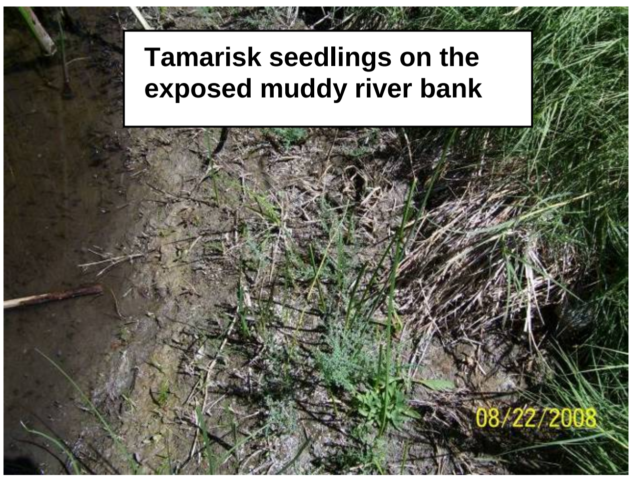
There were 115 notations for Russian olive in the entire project area (RAS Figure 5). In the Riverine-Riparian management area, Russian olive was found primarily in areas north of Manzanar Reward Road. On the 2007 RAS, observers noted that Russian olive trees inundated due to LORP flows were found to be in poor condition. In 2008, several of the observations were of individuals that had resprouted. In addition, seedling Russian olive trees were noted in several locations. Russian olive continued to be prevalent in the BWMA and Off-River Lakes and Ponds. Seedling Russian olive were noted in the Winterton Unit, Coyote-Grass Lakes Complex and the Goose Lake return corridor. Russian olive has an overall rating of “Moderate” in the California Invasive Plant Inventory (Cal-IPC 2006).

Tamarisk – Resprouts and Untreated Plants

There were almost 700 locations of tamarisk documented in the entire project area. Tamarisk was found along the length of the river, in DHA, BWMA and in the Off-River Lakes and Ponds (RAS Figure 6). These locations involved single to multiple plants, and resprouts as well as untreated plants.

Tamarisk Seedlings

There were 44 locations in the entire project area where tamarisk seedlings were noted. (RAS Figure 7). The number of seedlings seen at each site ranged from a few to several hundred. Recruitment sites were typically sandy point bars, the muddy margins of the riverbank, or oxbows, and other areas that were inundated during seasonal flow event in February and March. Tamarisk seedlings were numerous in the Islands area and just downstream of Mazourka Canyon Road. Large numbers of seedling tamarisk were also noted in the Winterton Unit of the BWMA, along the ditch that was deepened and enlarged during construction, and in areas that have been subjected to flooding and drying or elevated water tables at the south end of the unit. Many tamarisk seedling sites also supported native woody riparian seedlings.

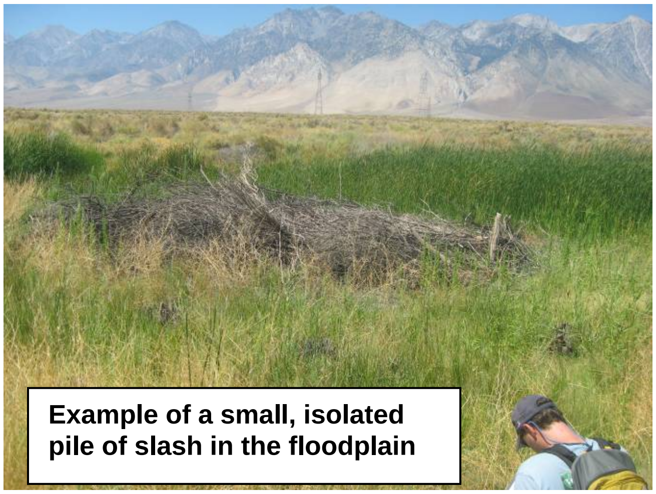


Tamarisk Slash – on river banks and in wetted channel

Tamarisk slash was noted only in the Riverine-Riparian areas. The slash varied from small isolated piles to large extensive patches. Large amounts of slash were noted in the upper reaches of the river, as well as on the west side of the river in the Islands area (RAS Figure 8). Continuous areas of slash as found in a section of the river just north of Blackrock Ditch, and then from river mile 8 to 12. This section of the river was also covered in tall, dense bassia stands, making not only safe travel difficult, but accurate mapping of the slash more difficult as well. These piles were generally in areas that are expected to support riparian, wetland or meadow communities. Although at many site, herbaceous vegetation (including native grasses and bassia) was seen growing up amongst the slash, slash may still inhibit the development of these habitats and will make recreational access difficult or impossible.

During the last two winters, the burning of slash piles in place has been conducted in this area of the river. When accessible, observers inspected slash burn sites. Saltgrass and willow trees were found to be resprouting in the recent burn areas. It was not possible to access all burn areas, but those visited were found to be free of perennial pepperweed and other noxious weeds.

Three point locations of tamarisk slash piles in the wetted channel were noted (see Appendix).


Example of a small, isolated pile of slash in the floodplain

A large amount of slash was present in the Islands area west of the river in 2008

Trash

Five trash or litter locations were noted. Three sites were along the river east of Lone Pine and involved two sites with furniture, and one small pile of furniture stuffing. At the fishing spot at George's Creek Return, miscellaneous trash (bottles, food wrappers, etc) was noted, as was the case in 2007. Parts of what appeared to be an aluminum frame shade canopy were found along the river approximately 2 miles north of Lone Pine Depot Road.

Wildlife

There were 42 notations of wildlife use. It is important to note that these sightings were opportunistic and varied considerably with respect to the details provided. Observers generally noted a number of herons, egrets, rails and ducks including Mallard (*Anas platyrhynchos*), Wood Duck (*Aix sponsa*), American Wigeon (*A. americana*) and Gadwall (*A. strepera*) along the river. One Wood Duck brood was seen just north of George's Creek return. Fish species were noted throughout the river, and large numbers of mosquito fish and bass were noted by observers.

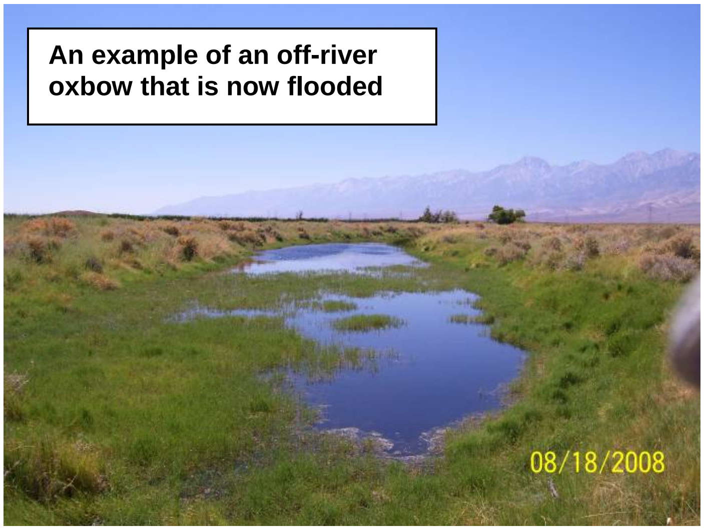
Woody Recruitment

Woody recruitment sites were more abundant and widespread in 2008 as compared to 2007. There were 222 locations on the river where native woody riparian species recruitment was documented, as compared to 49 sites during the 2007 RAS (Figure 9). Many of the cottonwood and willow seedlings noted on the 2007 RAS were relocated, although some observers noted the presence of fewer individuals than the previous year which is not unexpected.

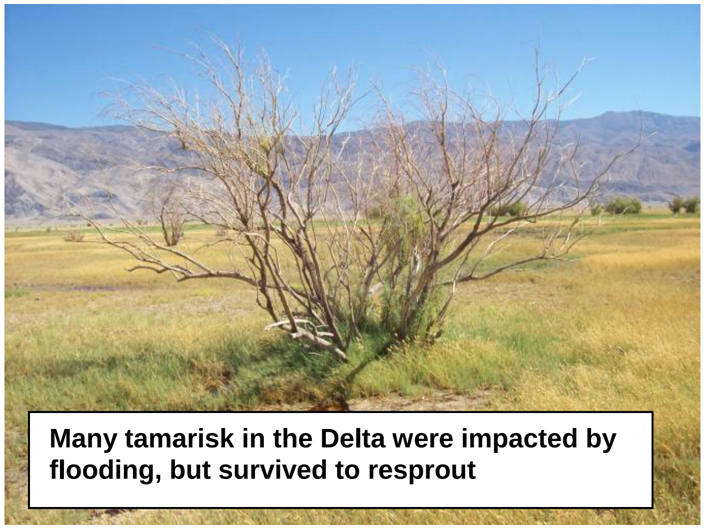
Woody recruitment was noted in all reaches; however the number of sites noted was fewer within the first four miles downstream of the intake, and from Lone Pine Depot Road south. Woody species noted included Fremont cottonwood, tree willow species such as Goodding's willow (*Salix gooddingii*) and red willow (*S. laevigata*) and shrub willows including narrow-leaved willow (*S. exigua*) and arroyo willow (*S. lasiolepis*). Fremont cottonwood recruitment sites involved one to four young trees. Cottonwood recruitment was noted on the muddy margins of the river, sandy banks, as well as dense meadow areas adjacent to the river that may have been inundated during the seasonal flow event in February and March. Willow recruitment sites involved one to several hundred seedlings. Some of the woody recruitment sites involved willows that have resprouted. Willow recruitment was noted on the muddy margins of the river or oxbows, sandy banks, as well as dense meadow areas adjacent to the river that may have been inundated during seasonal flow event in February and March.

Other

There were 16 occurrences of items recorded in the "Other" category. Many of the observations related to habitat changes or vegetation response since project implementation. The increased flow in the river has flooded many old oxbows, and old historic ditches from the presumed increase in the groundwater table (see photo below). Some tamarisk plants appeared to have been killed by the extended flooding (photo), while others survived to resprout (photo).



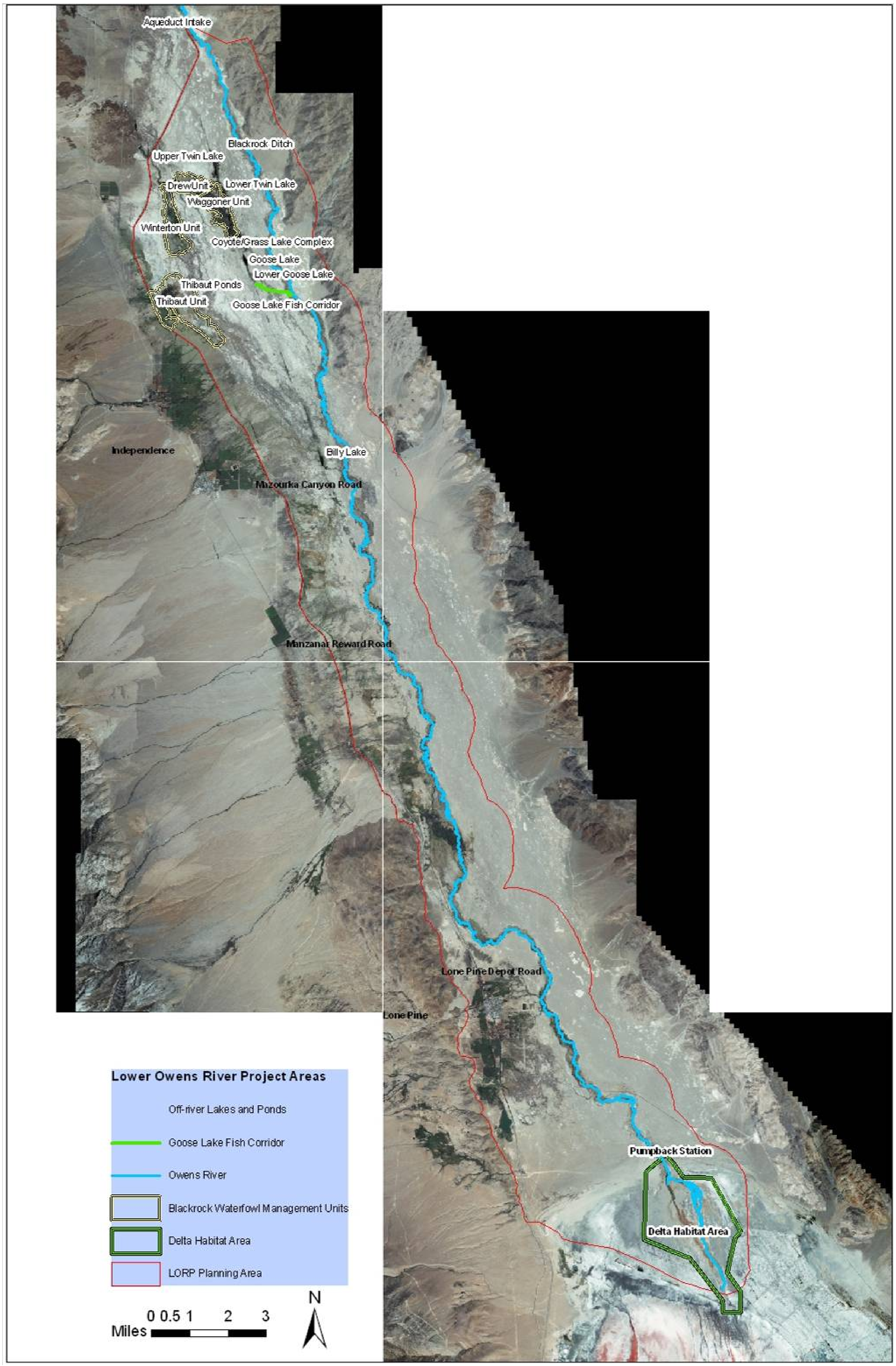
An example of an off-river oxbow that is now flooded



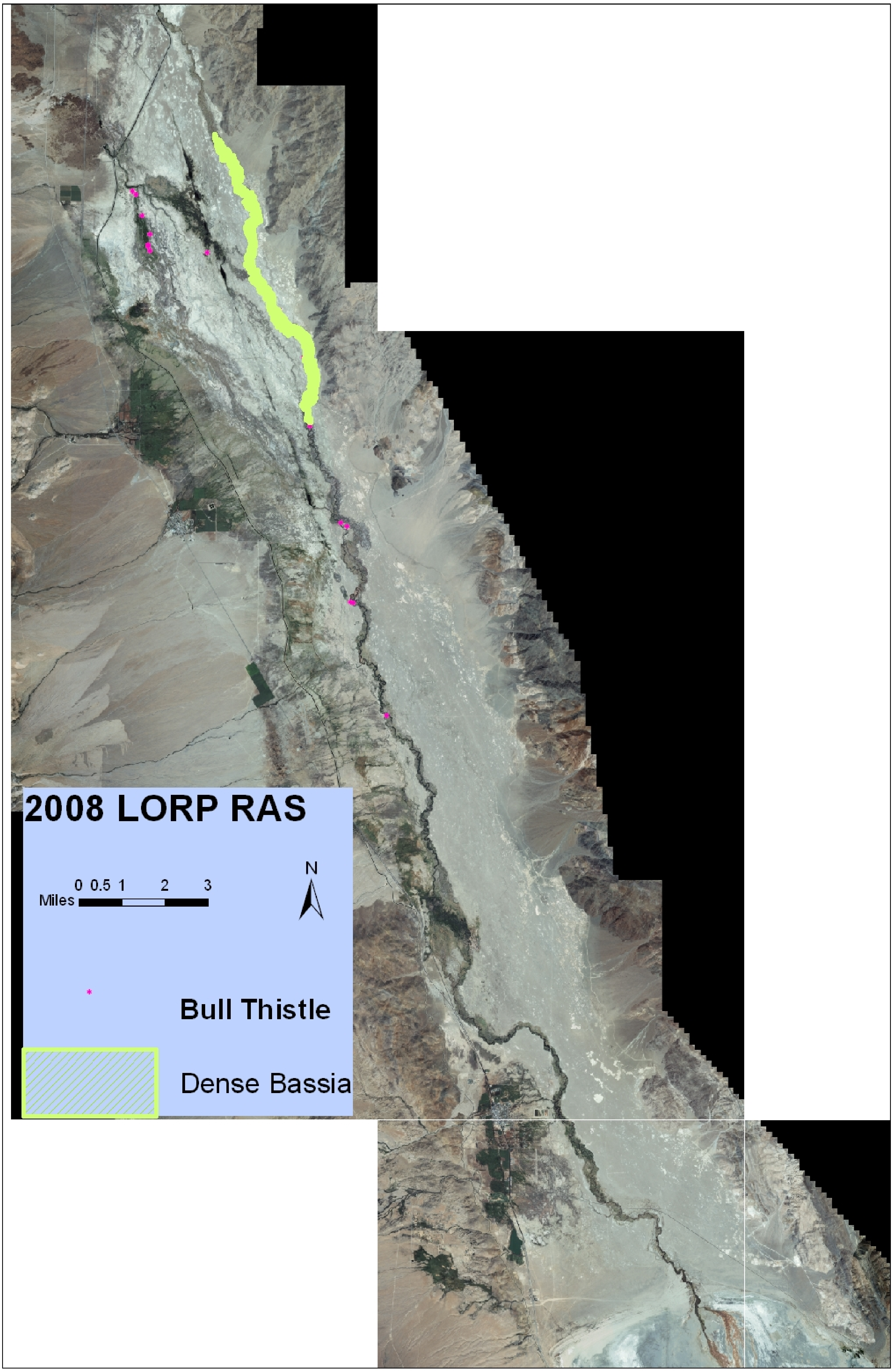
Many tamarisk in the Delta were impacted by flooding, but survived to resprout

5.9. Appendices

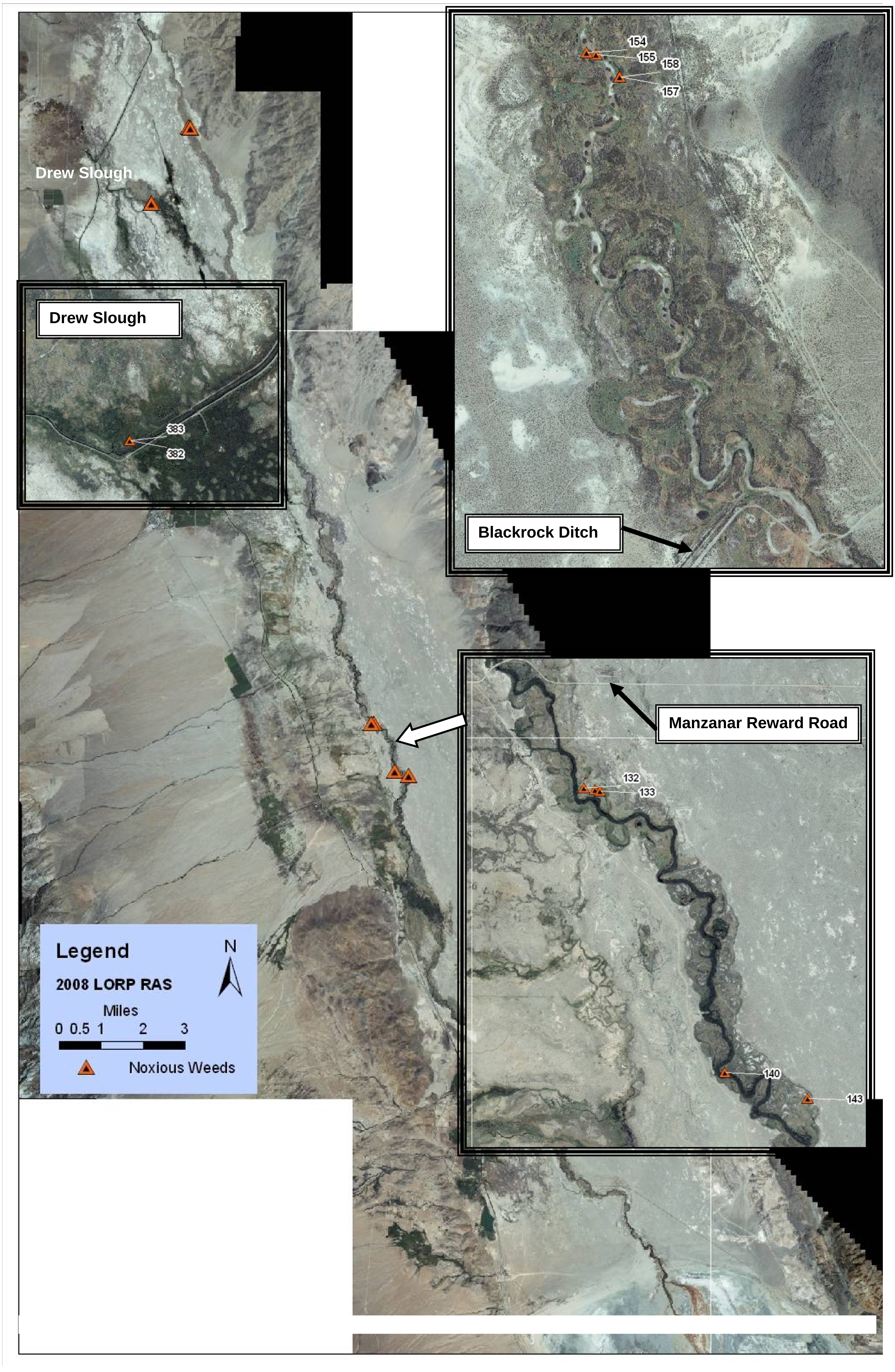
5.9.1. Appendix A. Rapid Assessment Survey Figures



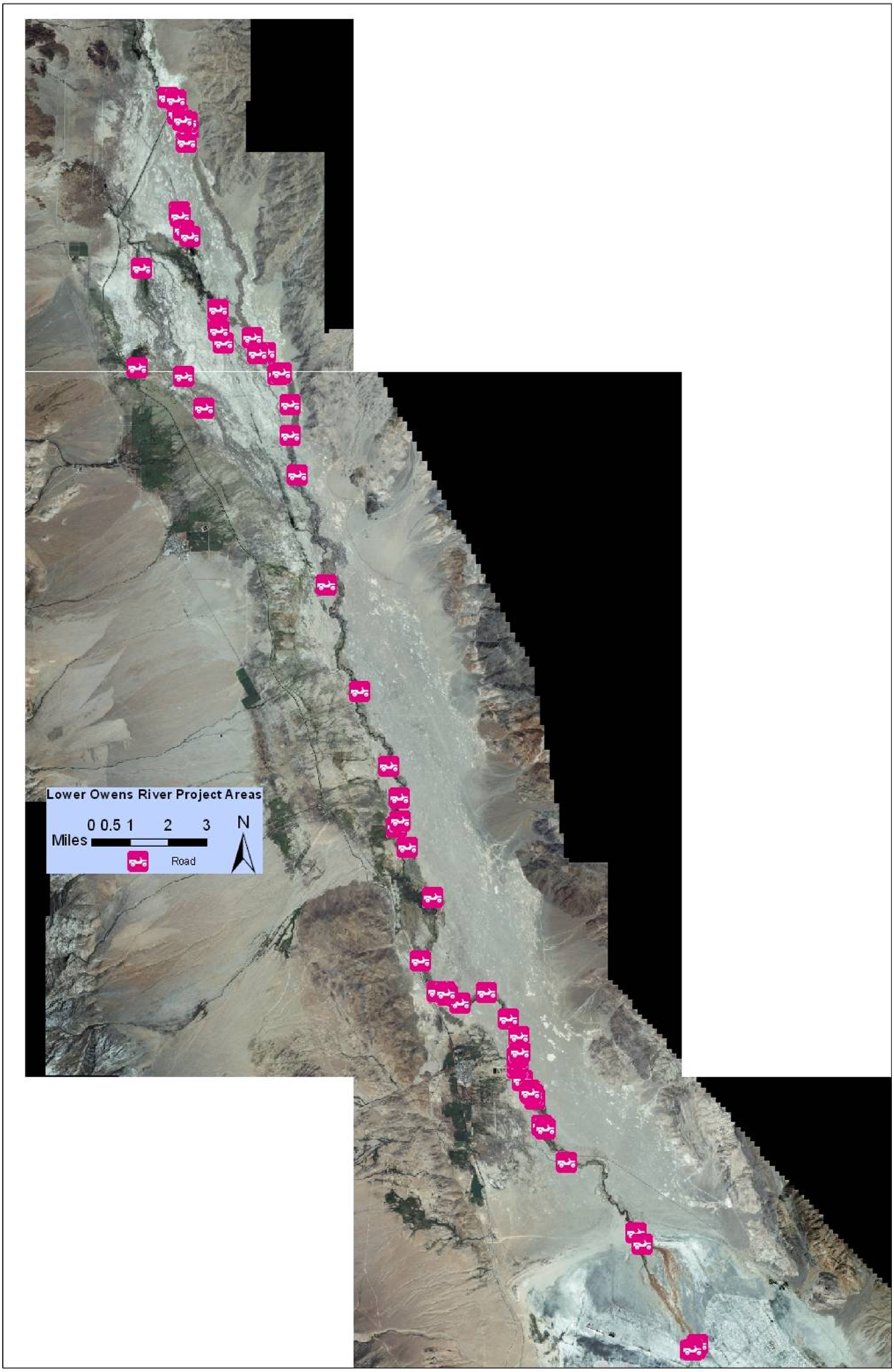
RAS Figure 1. General Features or Management Areas of the LORP



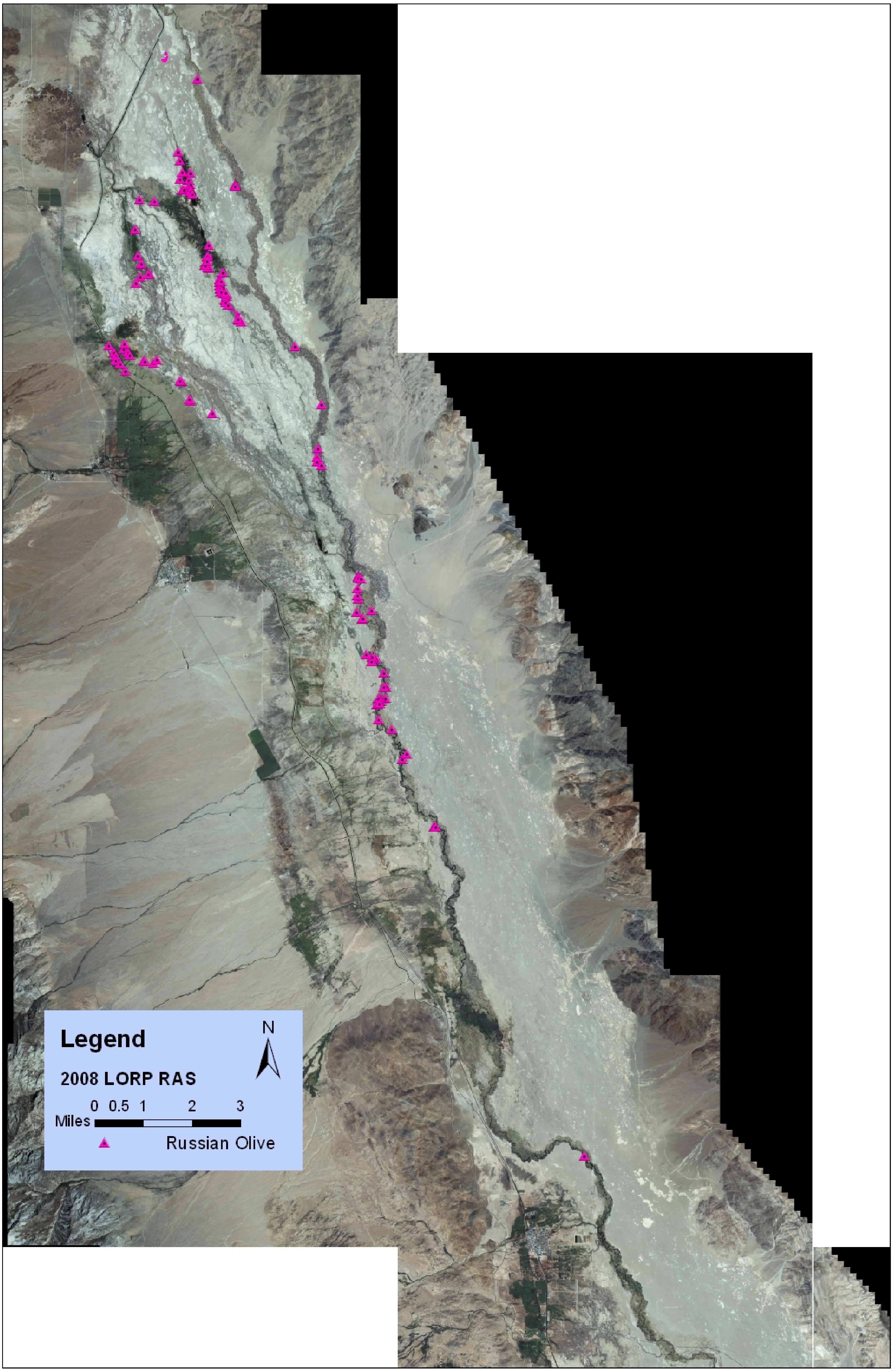
RAS Figure 2. Locations of Bull Thistle and Dense Stands of Fivehook bassia



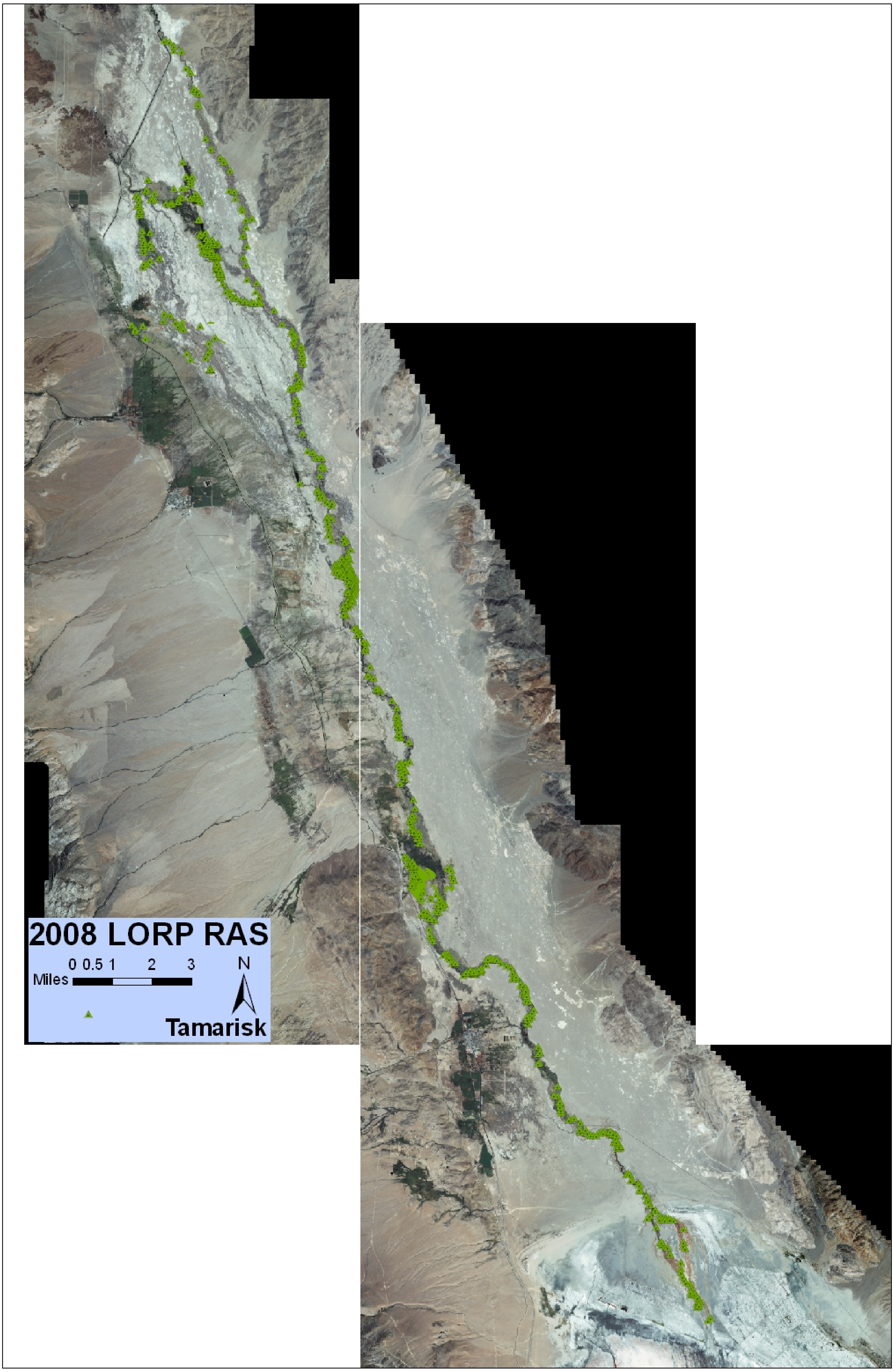
RAS Figure 3. Locations of Noxious Weeds (Perennial Pepperweed – *Lepidium latifolium*)



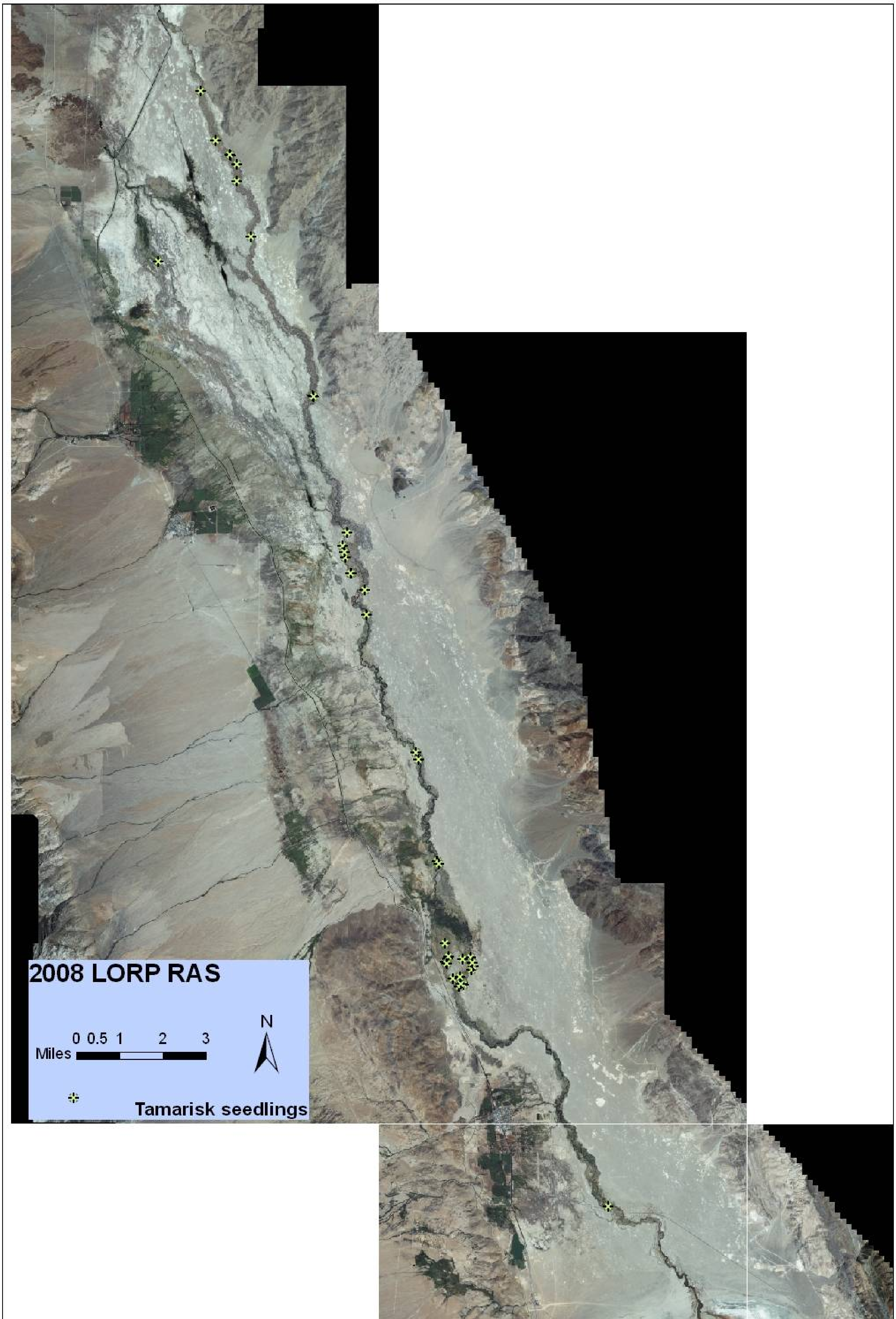
RAS Figure 4. Locations of all Roads and Off-Road Travel Use



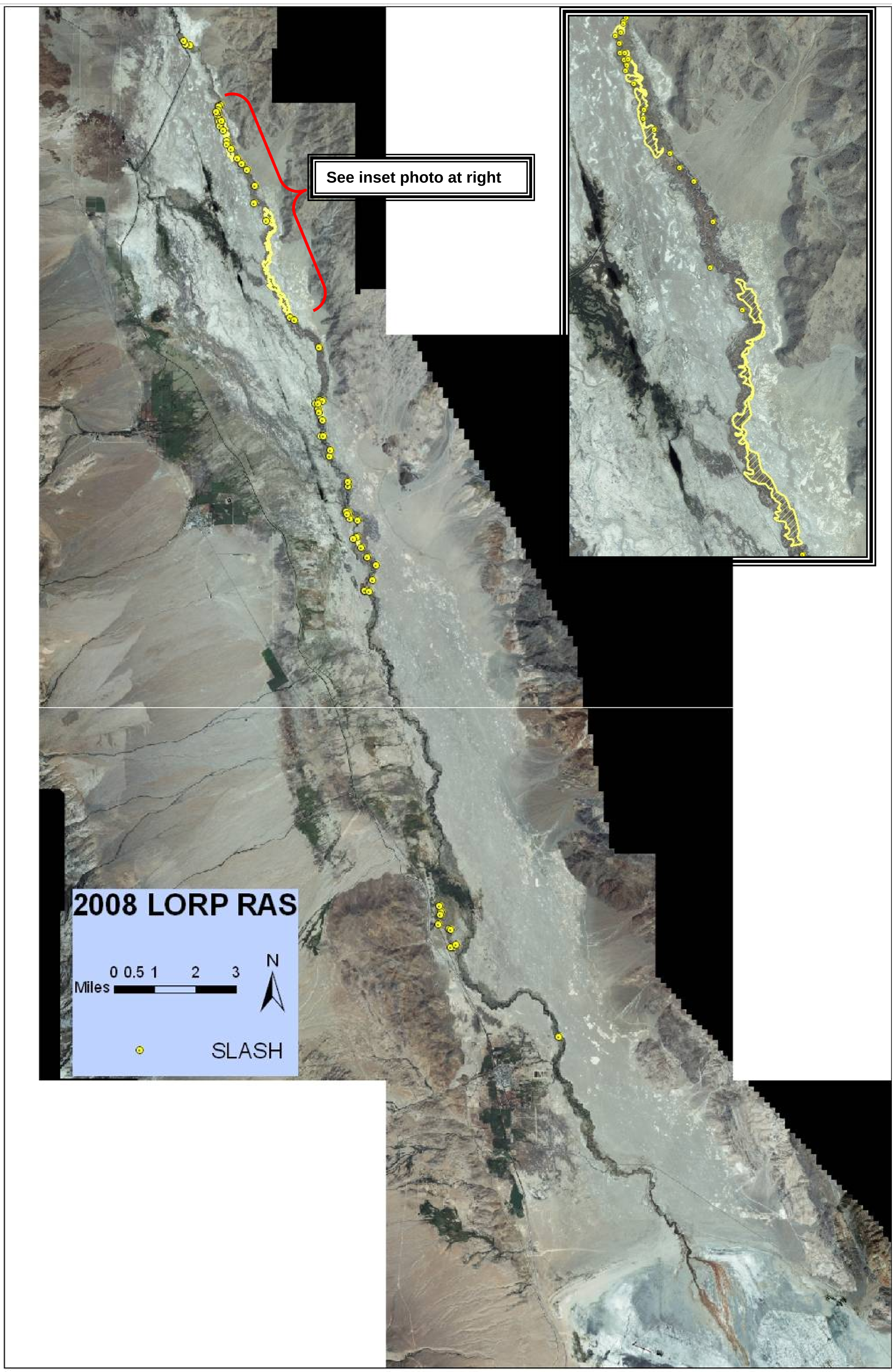
RAS Figure 5. Location of Russian Olive (*Elaeagnus angustifolia*) in the LORP



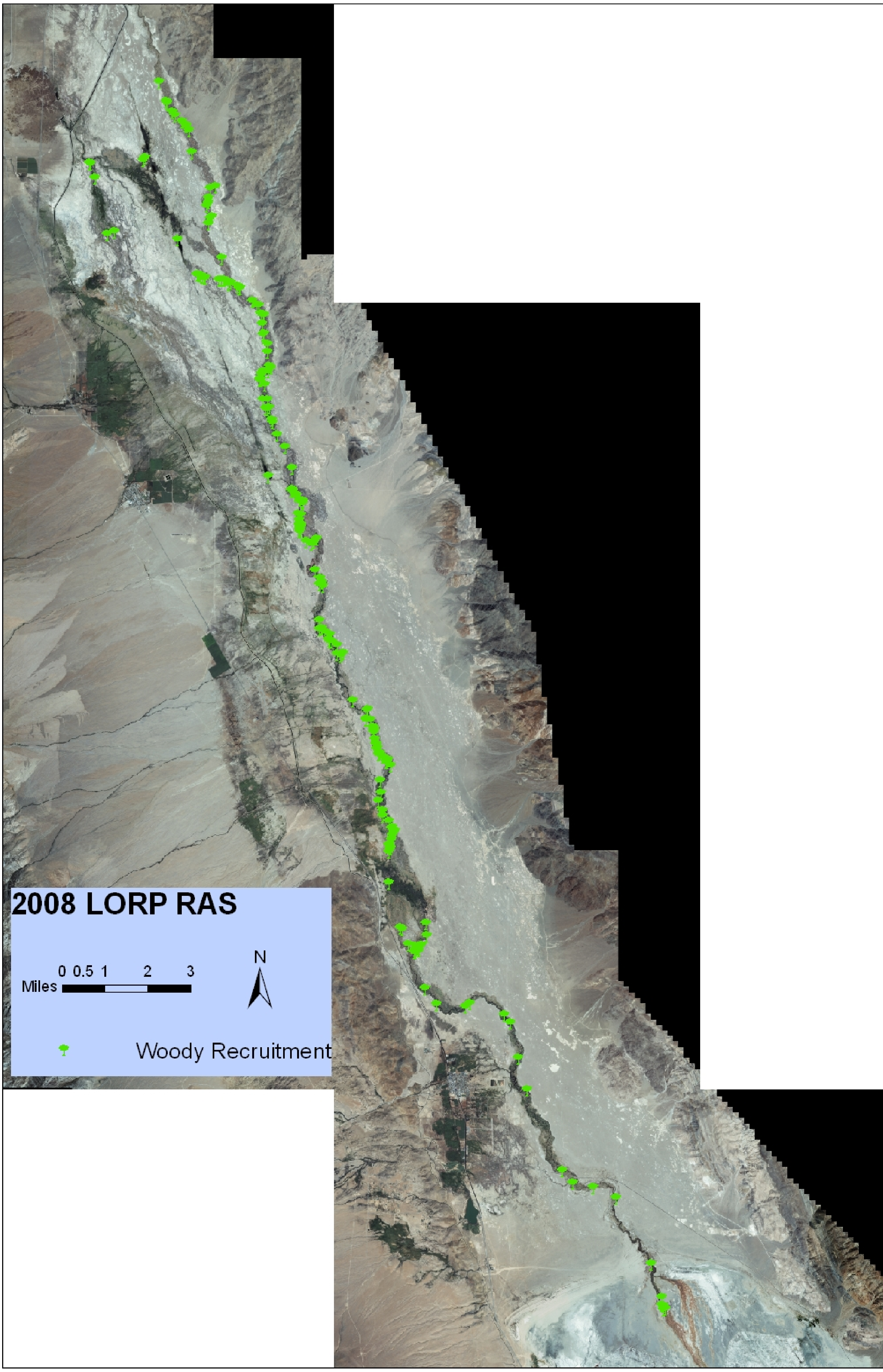
RAS Figure 6. Location of Established Tamarisk (*Tamarisk ramosissima*) Plants



RAS Figure 7. Location of Tamarisk Seedlings



RAS Figure 8. Location of Tamarisk Slash



RAS Figure 9. Native Woody Riparian Species Recruitment Sites

5.9.2. Appendix B. Rapid Assessment Survey Tables

Table 1. 2008 LORP Rapid Assessment Raw Data by Impact Type

Beaver Activity

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
2	392535	4092321	Intake south	Chew marks on willow, not recent but possibly this year, 1/2 of tree fallen. No sound of dam.
67	402638	4060175	Owens River, Reinhackle station, south to fence at 34.35	Water appears ponded and backed up, no other beaver sign.
75	398952	4073624	Owens River - Mazourka Cyn Rd north to Billy Lake return	Ponded water, potential hut?
92	402350	4062365	Owens River - Reinhackle north	Hear sm waterfall, Can't see the base of trees from this pt., sm pond visible.
98	404413	4054351	Owens River	Hear falling water. Too thick w/veg to see or get better picture.
119	409582	4047649	Owens River-Keeler Bridge to pumpback	Hear falling water, can't see past cattails and tules.
123	410313	4047617	Owens River-Keeler Bridge to pumpback	Beaver lodge? Didn't see chewed trees.
286	402246	4062711	Owens River - Manzanar to Islands	Older looking dam, cut trees continue downstream.
543	399666	4070699	Mazourka to Manzanar RR	I can hear falling water; open water pond upstream; dead trees farther upstream (see pt 005).
570	400864	4067547	Mazourka to Manzanar RR	Dam of tules; could be removed w/ helicopter and may want to.
576	400677	4067364	Mazourka to Manzanar RR	Waterfall. No damage to trees visible.
700	402392	4062858	W side river below Manzanar to Georges	Old dam of tules.

Disturbance

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
26	395792	4082671	Owens River	Footprint of gauging station still large and barren.
60	402773	4060818	Owens River, Reinhackle station, south to fence at 34.35	Dredging spoils, DISP and BAHY moving in; turns into rd.
81	402777	4060915	Owens River - Reinhackle north	Disturbance from installation of station. Reveg with salix (>15), TARA, cattails, sedges, SPAI, ATTO, tules.
115	409629	4047921	Owens River-Keeler Bridge to pumpback	Dredging materials stll mainly barren w/some BAHY.
221	399015	4075187	Owens River-2 culverts south	Barbed wire along the side of the river.
311	394031	4085611	Waggoner - East	Road with disturbance area.
314	394342	4084186	Waggoner - East	Big clearing with some orange fencing just laying around.

Table 1, continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Russian Olive				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
47	397887	4077587	Owens River, Two culverts to mile 20.1	Numerous ELAN in water dead or dying, out of water - surviving. Start of ELAN.
48	397872	4077312	Owens River, Two culverts to mile 20.1	Lg ELAN ~ 10m in side moist area.
49	397872	4077163	Owens River, Two culverts to mile 20.1	Lg ELAN along channel.
52	398029	4077053	Owens River, Two culverts to mile 20.1	ELAN recruits.
69	399226	4073361	Owens River - Mazourka Cyn Rd north to Billy Lake return	Mature trees died back but now trees are resprouting.
138	401793	4065119	Owens River	1 plant, 4 m tall and wide, edge of cattails.
139	401769	4065107	Owens River	1 plant, 4m tall, 3m wide.
205	398024	4079051	Fish corridor-south, west side.	ELAN on streambank. Plant 20m SE of GPS pt. BAHY infested floodplain.
224	399231	4073319	Owens River - Mazourka-Manzanar	1 live plant, many dead plants, 3m tall, 3-4m wide.
226	399320	4073290	Owens River - Mazourka-Manzanar	Yound plant 1m tall, 8 wide.
232	399218	4072980	Owens River - Mazourka-Manzanar	1 plant, less than 1m tall and wide.
236	399199	4072766	Owens River - Mazourka-Manzanar	1 plant 1m tall and wide. End of recruitment area for TARA.
237	399229	4072641	Owens River - Mazourka-Manzanar	Large plant mostly dead.
255	399179	4072198	Owens River - Mazourka-Manzanar	1 plant 1.5m tall and wide.
257	399365	4071990	Owens River - Mazourka-Manzanar	1 large plant, mostly dead.
258	399359	4071961	Owens River - Mazourka-Manzanar	1 large plant, mostly dead.
267	399497	4070799	Owens River - Mazourka-Manzanar	3 trees at edge of bluff.
270	399670	4070585	Owens River - Mazourka-Manzanar	1 plant, 1m tall and wide.
275	400082	4069742	Owens River - Mazourka-Manzanar	1m tall and wide.
276	399953	4069393	Owens River - Mazourka-Manzanar	1 plant 2m tall x 4m wide, resprout.
277	399991	4069271	Owens River - Mazourka-Manzanar	1 plant 3m tall x 2m wide, resprout.
278	399909	4069346	Owens River - Mazourka-Manzanar	1 plant 3m tall and wide.
279	399924	4069187	Owens River - Mazourka-Manzanar	1 plant 3m tall & wide.
284	399845	4069163	Owens River	On side channel of river, 2.5m tall in okay condition.
285	399921	4069189	Owens River	3 plants, 3m tall.
304	393675	4086309	Waggoner - East	ELAN 10m away from water.
305	393652	4086197	Waggoner - East	ELAN next to SALA tree on bank.
306	393687	4086148	Waggoner - East	5 ELAN plants just off the bank.
307	393701	4086109	Waggoner - East	3 ELAN on bank.
308	393702	4086073	Waggoner - East	1 ELAN 2m from bank.
309	393752	4085978	Waggoner - East	15 ELAN along bank, picture could not capture all of them.
312	394292	4084312	Waggoner - East	2 ELAN.
317	394698	4083116	Waggoner - East	ELAN lines edge of Goose Lake.
320	394849	4082748	Waggoner - East	2 ELAN on river edge. Same point as some TARA.
321	394870	4082678	Waggoner - East	ELAN on edge of river.
322	394883	4082635	Waggoner - East	ELAN lines lake edge. Same point as TARA.
325	394765	4083406	Waggoner unit and Goose Lake fish corridor.	ELAN, unhealthy w/TARA at edge of marsh. TARA +/- continuous from 001.
326	394274	4083964	Waggoner unit and Goose Lake fish corridor.	Large, healthy ELAN, 10m tall w/young plants near it (bottom rt corner of picture).
327	394252	4083930	Waggoner unit and Goose Lake fish corridor.	W/TARA-young plant.
328	394235	4083785	Waggoner unit and Goose Lake fish corridor.	Large tree w/small plants nearby in center of large area w/ lots of TARA. Several smaller plants 10-15m W and S.
329	394186	4083646	Waggoner unit and Goose Lake fish corridor.	Similar size tree to 024 - further South.
330	394271	4083589	Waggoner unit and Goose Lake fish corridor.	Young plants - 3 individuals, 5-10m apart. Pic of northernmost plant.
331	394286	4083551	Waggoner unit and Goose Lake fish corridor.	2 young plants next to TARA point 028. 1m tall.
332	394156	4083643	Waggoner unit and Goose Lake fish corridor.	8 young ELAN plants, +/- 1m tall.
334	395261	4081859	Waggoner unit and Goose Lake fish corridor.	Young plant along Fish Corridor.
335	394951	4082340	Waggoner unit and Goose Lake fish corridor.	ELAN in TARA patch.
343	391863	4084839	Winterton and side	3-4m tall.
345	391959	4083964	Winterton and side	2m tall on edge of wet.
349	392049	4083700	Winterton and side	ELAN
350	392057	4083680	Winterton and side	Young ELAN, 1m, edge of tules.
376	392486	4085762	BWHA - Drew and Twin Lake Units	One 5m (mostly dead), another very big one 20m W (healthy).
380	391996	4085805	BWHA - Drew and Twin Lake Units	Extra large in mdw area.
390	393439	4086126	BWHA - Drew and Twin Lake Units	ELAN next to revist point OR 37.
391	393495	4086142	BWHA - Drew and Twin Lake Units	N side of Blackrock Ditch - large.
392	393644	4086467	BWHA - Drew and Twin Lake Units	One here, sev. more W on edge of lake heading N.
393	393676	4086700	BWHA - Drew and Twin Lake Units	Forest of ELAN and TARA.
399	393276	4087376	BWHA - Drew and Twin Lake Units	Only one so far.
401	393338	4087102	BWHA - Drew and Twin Lake Units	Large one.
402	393426	4086713	BWHA - Drew and Twin Lake Units	2 on edge of lake, 10m from gps pt.
404	393342	4086479	BWHA - Drew and Twin Lake Units	Lost of ELAN and TARA in all directions.
443	395386	4081785	BWHA - Fish Corridor and Goose Lake	On E bank, 1.5m tall.
444	395291	4081848	BWHA - Fish Corridor and Goose Lake	1.5m tall on N bank.
447	394859	4082415	BWHA - Fish Corridor and Goose Lake	Many, large.
448	394838	4082466	BWHA - Fish Corridor and Goose Lake	2 lg ELAN, 10m apart. No TARA here! (along shoreline, but plenty to W).

Table 1, continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Russian Olive, continued

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
449	394827	4082499	BWHA - Fish Corridor and Goose Lake	X-lg one here, smaller one 30m N.
450	394758	4082697	BWHA - Fish Corridor and Goose Lake	Sm one on edge of lake. No TARA from pt 144 to pt 146 (on shoreline).
451	394717	4082768	BWHA - Fish Corridor and Goose Lake	~ 3m tall.
452	394717	4082768	BWHA - Fish Corridor and Goose Lake	~ 3m tall.
453	394680	4082848	BWHA - Fish Corridor and Goose Lake	2 - (one resprout?) a lot of dead branches, 1-2 m from shoreline.
454	394672	4082895	BWHA - Fish Corridor and Goose Lake	Sev here, one lg (4m), one S 10 m (sm one).
455	394655	4082982	BWHA - Fish Corridor and Goose Lake	Lg one here, (5m) and sm one (2m) just N.
457	394657	4083101	BWHA - Fish Corridor and Goose Lake	Sev lg. ones here, and at pt 156, sm. ones to N.
458	394654	4083173	BWHA - Fish Corridor and Goose Lake	Sev sm ones, w/ BAHY and TARA.
481	406683	4054262	Below Alabama Gates	At base of small cliff.
518	393920	4089804	Intake south on West side	At base of Telegraph Hill and ~ 1m from river. Healthy and ~ 5 ft tall.
521	395168	4086310	Intake south on West side	2 plants ~ 5-10m from water; healthy; <2m tall.
524	395157	4086282	Intake south on West side	Seedling ~ 12" tall- pulled.
525	395155	4086267	Intake south on West side	Small tree on small island; ~ 4ft tall.
536	397144	4080977	Goose Lake Return to 2 Culverts	~2m high plant at base of steep bank, very healthy.
542	399704	4070722	Mazourka to Manzanar RR	Healthy, ~2m tall, in oxbow.
546	399829	4070659	Mazourka to Manzanar RR	One sapling in oxbow - pulled!
548	400077	4070194	Mazourka to Manzanar RR	6 saplings seen; all pulled up; in sandy area where TARA and salix seedlings are also. Revisit.
552	400165	4069735	Mazourka to Manzanar RR	Seedling under a willow tree; pulled.
554	400129	4069358	Mazourka to Manzanar RR	Sapling ~5 ft tall; also pulled a seedling adjacent.
556	399903	4068651	Mazourka to Manzanar RR	4 mature plants; one in water & dead; others ok.
563	400337	4068327	Mazourka to Manzanar RR	2 mature trees; one partially alive; other dead.
572	400838	4067512	Mazourka to Manzanar RR	2 seedlings/saplings - pulled.
577	400677	4067364	Mazourka to Manzanar RR	One mature tree and several saplings.
643	393691	4079180	Thibaut	5 plants along ditch. (One is ~15m north of the large plant.)
644	393654	4079225	Thibaut	1 along ditch.
647	393398	4079797	Thibaut	1 small ELAN along wetted ditch.
648	393351	4079838	Thibaut	2 small ELAN along ditch.
653	392573	4080537	Thibaut	One ~ 1.5 high in wet meadow; appears water stressed.
654	392481	4080422	Thibaut	Plant ~ 1m high; healthy; 10m south of staff gauge #8.
655	392176	4080478	Thibaut	One plant ~ 2m high at edge of flooded ditch; healthy.
656	392153	4080518	Thibaut	One plant ~ 0.6m high at edge of ditch (on east side).
657	391161	4080773	Thibaut	One plant ~ 1.5 m high; along ditch on east side.
658	391231	4080514	Thibaut	One plant, 2m high and healthy.
659	391215	4080638	Thibaut	3 mature healthy plants along ditch.
661	391161	4080773	Thibaut	4 mature healthy plants along ditch and 1 younger one.
662	390974	4080995	Thibaut	2 plants along fenceline at ditch.
665	392296	4083343	Winterton - S end.	Pulled one seedlings. (spreading basin)*
667	392318	4083366	Winterton - S end.	South side pulled 2 ELAN.
668	392030	4083260	Winterton - S end.	6+/- young plants on east side of cow killer ditch.
670	391900	4083069	Winterton - S end.	1 - 8 ft. mature plant.
671	401728	4065125	W side river below Manzanar to Georges	One plant on east side of river edge, healthy.
744	391498	4081068	Thibaut	20 - 25 plants, 1 - 5m tall, spread over 50 sq m, no new recruits seen.
746	391469	4080895	Thibaut	2 plants, 3-4m tall, on edge of cattails and grass. Branches broken/thrashed, not in good shape.
747	391620	4080775	Thibaut	5 - 6 plants, 1-2 m tall, near cattails, spread over 60 sq m.
748	391683	4080672	Thibaut	Single plant, 0.5 m tall, ~ 100m south of last patch, wypt 005.
749	391367	4080390	Thibaut	3 plants, 5 - 7m from Aqueduct.
750	391548	4080153	Thibaut	Single plant, 2m tall, 10m east of canal.
766	399234	4073381	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	1 mature ELAN on bank.
771	399679	4072252	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	ELAN, 2 large adult trees.
777	394414	4078753	Thibaut-East track	1 Large ELAN south of southeastern most pond.

Table 1, continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Exotic Weeds

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
15	395154	4087178	Owens River	BAHY too thick to walk through from start at mile 5.1.
77	398815	4073916	Owens River - Mazourka Cyn Rd north to Billy Lake return	Bull thistle. Several plants on edge of cattails in Billy Lake ditch. Too steep to collect sample.
130	400844	4066346	Owens River	CIVU, 1 plant.
168	395324	4086521	Owens River between Intake and Blackrock	7 to 8 feet tall BAHY blocking path to river. Kyle Schill in pic for scale.
177	396770	4081333	Fish corridor-south, west side.	Bassia-SATR wall - dense barrier to movement.
178	396770	4081333	Fish corridor-south, west side.	2m+ in height. Clipboard for scale.
192	397830	4079852	Fish corridor-south, west side.	Bull thistle-CIVU 1m high - second, larger-downstream 15m.
193	397830	4079852	Fish corridor-south, west side.	Bull thistle-CIVU 1m high - second, larger-downstream 15m.
194	397830	4079852	Fish corridor-south, west side.	Bull thistle-CIVU 1m high - second, larger-downstream 15m.
195	397830	4079852	Fish corridor-south, west side.	Bull thistle-CIVU 1m high - second, larger-downstream 15m.
196	397830	4079852	Fish corridor-south, west side.	Bull thistle-CIVU 1m high - second, larger-downstream 15m.
198	397768	4079738	Fish corridor-south, west side.	BAHY dominates floodplain.
199	397768	4079738	Fish corridor-south, west side.	Burn in foreground, BAHY fill w/in floodplain in back.
213	397986	4077177	Owens River-2 culverts south	BAHY blocking access to river.
268	399510	4070578	Owens River - Mazourka-Manzanar	CIVU, 1 plant (bullthistle).
269	399617	4070565	Owens River - Mazourka-Manzanar	CIVU, 8 plants.
333	394156	4083643	Waggoner unit and Goose Lake fish corridor.	Bull thistle w/ HEAN-ELAN. +/- 10 plants, past bloom.
337	391344	4085942	Winterton and side	Bull thistle: picure of 1. 15+ in area spreading 15m to S.
339	391486	4085809	Winterton and side	Bull thistle.
342	391714	4085016	Winterton and side	Bull thistle (4plants w/in 20m)
344	392002	4084335	Winterton and side	Bull thistle; island w/ 5 plants.
346	391956	4083935	Winterton and side	Thistle patch 20+ plants.
347	391959	4083892	Winterton and side	5+ thistles.
348	392022	4083723	Winterton and side	Thistle and gumweed to point 027.
365	407634	4051221	Owens River - LP Narrow gauge Rd to South	Thick BAHY here and S along channel.
520	395157	4086350	Intake south on West side	Lower floodplain is an impenetrable sea of Bassia. Cannot walk along river.
526	395155	4086226	Intake south on West side	Photo shows bend in river completely taken over by BAHY.
529	396855	4081507	Goose Lake Return to 2 Culverts	Bassia has completely invaded barren floodplain areas & SATR also present.
537	397691	4080656	Goose Lake Return to 2 Culverts	Width of BAHY stands - extends from river east to old ditch.
714	394341	4088115	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Phragmites.
765	399157	4073565	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	1 bullthistle - removed.
767	399379	4073411	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Few bull thistle along Mazourka Cyn Rd.

Fencing

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
3	392651	4092264	Intake south	Walk-thru not depicted on map.
93	402131	4062500	Owens River - Reinhackle north	No fence, but post.
113	407488	4052973	Owens River	Tree broke fence.
127	410999	4047133	Owens River-Keeler Bridge to pumpback	Fence depicted on map in different location (north).
128	411001	4046938	Owens River-Keeler Bridge to pumpback	Fence depicted on map in different location (south).
288	402783	4061063	Owens River - Manzanar to Islands	Fence down.
291	402959	4059849	Owens River - Manzanar to Islands	Fence down.
495	392332	4092521	Intake south on West side	Fence near Intake has been unwound off posts; piles of tules near break. Would allow horses onto LAA Road.
497	392581	4092256	Intake south on West side	There is a walk thru here not on the map - at the lease boundary.
660	391061	4080717	Thibaut	Walk through and gate on new fence.
792	411033	4047192	Keeler Bridge to Pumpback	Fence location different than map.
793	411042	4046926	Keeler Bridge to Pumpback	Fence location different than map.

table 1, continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Noxious Weeds

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
132	401260	4065670	Owens River	LELA2, 4 plants flowering.
133	401364	4065651	Owens River	LELA2, 2 plants, rosettes.
134	401330	4065659	Owens River	LELA2, ~20 plants, rosettes, flowering.
140	402166	4063844	Owens River	LELA2, 20 plants, rosettes, flowering.
143	402697	4063679	Owens River	LELA2 reported in 2007. Plants located along oxbow pond. Some plants look sprayed. Many plants.
154	394261	4088559	Owens River between Intake and Blackrock	Revisit FID 3-4. LELA infestation site from last year. Weed doc form filled out. 11+ plants along river on edge of slash pile.
155	394279	4088555	Owens River between Intake and Blackrock	LELA2 - 10-20 plants, some appear to have been treated.
156	394325	4088512	Owens River between Intake and Blackrock	LELA2 patch extends in patches from 008-010. Several patches along river. Some patches w/ 10-20 plants. Generally w/in 5 m of river.
157	394325	4088512	Owens River between Intake and Blackrock	More picture of patches between wypt 009-010. All points 008-010 and pictures are generally one large infestation. Total infestation.
381	392808	4085619	BWHA - Drew and Twin Lake Units	Pepperweed in among MEAL, CONYZ, tules.
382	392808	4085619	BWHA - Drew and Twin Lake Units	Pepperweed in among MEAL, CONZ, tules.
383	392808	4085619	BWHA - Drew and Twin Lake Units	Pepperweed in among MEAL, Conyza, tules.

Other

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
4	392726	4092212	Intake south	Salix looks sick, leaf tips brown, overall appearance sickly
5	392726	4092212	Intake south	Salix - poor vigor
197	397798	4079758	Fish corridor-south, west side.	Bullfrog w pond - bullfrogs common in most backwater areas.
211	397953	4077575	Owens River-2 culverts south	Tree in river restricting the flow.
396	393248	4087456	BWHA - Drew and Twin Lake Units	T862 new test well.
494	392498	4092565	Intake south on West side	Construction road has reveged w/ DISP & BAHY.
514	393665	4090575	Intake south on West side	Old oxbow has filled w/ water from rising GW table.
531	396893	4081361	Goose Lake Return to 2 Culverts	Photo of area where slash burned in spring '08. HECU3, MALE3, & SATR on site.
538	398191	4079123	Goose Lake Return to 2 Culverts	Channel to E of river, significant standing water.
541	399883	4070915	Mazourka to Manzanar RR	Small 1-2 acre area that is flooded and tree willows, TARA and cattails are dead or dying.
582	404004	4057302	Islands	Flooded oxbow dried and high TARA mortality.
630	414728	4039574	Delta	General photo showing water flowing into BP tran.
631	414799	4039744	Delta	General photo showing water flow at east and west channel gauging stations; emergent veg.
635	414788	4040392	Delta	Photo showing widely scattered mature tamarisk plants throughout DHA.
732	396030	4085103	Twin Lakes boundary to Thibaut	Oxbow extending north from channel, LETR present, thick ATTO and Bassia, mile 8.3 - 8.4.
802	414072	4041294	Delta	Looks like most of TARA died but is starting to come back.

Recreation

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
110	406999	4053930	Owens River	2 campfire rings ~5m from river and ~10m apart.
299	409098	4048165	Owens River	Ashes from fire pit but no trash from last year.
642	412507	4044271	Delta	A new recreational feature at the pond. No major site impacts.

Table 1, Continued   2008 LORP Rapid Assessment Raw Data by Impact Type

Revist Sites

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
20	395813	4085246	Owens River	Only 1 TARA ~ 1m (pulled out), no salix seedlings, no ice plant found.
105	405431	4054433	Owens River	FID 59. Rd still in use, grown in w/weeds in pic. Goes into mdw to E.
106	405640	4054637	Owens River	FID 60. Rd still in use.
109	406887	4054040	Owens River	FID 61. Descrip from 2007 still correct.
111	406999	4053930	Owens River	FID 45. Road access.
120	409608	4047454	Owens River-Keeler Bridge to pumpback	FID 50. Road through mdw from wypt 170 continues.
124	410839	4047575	Owens River-Keeler Bridge to pumpback	FID 106. Salix and TARA. Salix ~ 2yrs, 1-2 m, ~12 plants.
126	410869	4046462	Owens River-Keeler Bridge to pumpback	FID 51. Still obvious rd., not frequently used.
203	397889	4079351	Fish corridor-south, west side.	FID 10. Faint rd to floodplain.
206	398046	4078853	Fish corridor-south, west side.	FID 82. Big patch of willows seedlings. +/- 2m
207	397874	4078057	Owens River-2 culverts south	FID 41. Access road to the river-2 culverts.
216	398184	4076403	Owens River-2 culverts south	FID 40. Road to river, fresh tracks. Acces was not stopped.
223	399065	4074804	Owens River-2 culverts south	FID 39. No more 4-wheel drive access road.
240	399236	4072529	Owens River - Mazourka-Manzanar	FID 88- DH08212007090. 100 plants, SALA3 and SAGO w/ TARA recruits (30-40).
262	399500	4071737	Owens River - Mazourka-Manzanar	FID 86- DH08212007086. 30+ SAGO seedlings up to 1m tall, 40+ TARA seedling up to 1m tall.
274	399990	4070127	Owens River - Mazourka-Manzanar	FID 084. Few of many seedling appear to have survived.
283	400799	4066306	Owens River	FID 105. No POFR seedlings from last year.
290	402625	4060372	Owens River - Manzanar to Islands	FID 89 - DH08222007018. 30+/- coyote willow.
293	408111	4050292	Owens River	FID 19. Road still there.
294	408573	4049057	Owens River	FID 24. Vehicle tracks through saltgrass meadow.
297	409089	4048164	Owens River	FID 97. Seedlings from last year still there.
300	409098	4048165	Owens River	FID 7. No trash from last year.
302	393685	4086362	Waggoner - East	FID 18. Road tracks still there but looks less traveled.
310	394031	4085611	Waggoner - East	FID 1. Road with disturbance area.
313	394342	4084186	Waggoner - East	FID 2. Big clearing with some orange fencing just laying around.
315	394872	4083331	Waggoner - East	FID 42. Access road with power lines along it.
318	394855	4082780	Waggoner - East	FID 17. Access road to Goose Lake. Also a boat launch spot into lake.
323	394903	4082435	Waggoner - East	FID 16. Road to lake ends in a turn about.
373	408047	4050487	Owens River - LP Narrow gauge Rd to South	FID 19. ATV tracks - access rd from bluff.
377	391734	4086181	BWHA - Drew and Twin Lake Units	FID OR0. Cattle tub. Massive amt of BAHY.
389	393439	4086126	BWHA - Drew and Twin Lake Units	FID OR37. Revisit still has 2 POFR, 1.5 - 2m high.
407	394261	4088559	Owens River between Intake and Blackrock	Revisit FID 3-4. LELA infestation site from last year. Weed doc form filled out. 11+ plants along river on edge of slash pile.
460	407278	4051269	Owens River	FID 78. No trash (appliances).
462	407619	4051062	Owens River	FID 62. Road in floodplain.
463	408138	4050020	Owens River	FID 14. Truck tracks no longer present.
464	408506	4049374	Owens River	FID 76. No truck tracks in salt grass meadow.
465	408400	4049210	Owens River	FID 13. Truck tracks still in salt grass meadow.
467	409102	4048139	Owens River	FID 67. TARA seedlings no longer there.
478	404761	4054040	Below Alabama Gates	FID 53. No longer sign of motorized trail. Now foot/animal trail.
482	406991	4053781	Below Alabama Gates	FID 54. No longer road but tracks look like foot traffic from cattle mostly.
484	407016	4053661	Below Alabama Gates	FID 55. Extensive roads noted in 2007 still show some OHV use, mostly cattle tracks. On terrace, not in floodplain.
486	412347	4044708	Delta	FID OR07. Road still in use, 4 x 4. Other OHV use this year.
489	412873	4042951	Delta	FID OR24. SAEX expansion area similar to patches marked on map. Many salix noted in 2007.
491	414634	4039823	Delta	FID OR8. OHV road from lake project road into Delta area.
496	392482	4092315	Intake south on West side	FID 27. Gate is locked now restricting access from this point to rehabed roads..
502	392881	4092063	Intake south on West side	FID 29. Road closure effective; no evidence of traffice as seen last year.
504	393134	4091934	Intake south on West side	FID 30. Site has revegetated w/ cleomella, DISP, SPAI, BAHY, ATTO.
505	393212	4091864	Intake south on West side	FID 36. E-W road does not appear driven on; closure effective; reveged w/ DISP, ATTO.
506	393191	4091508	Intake south on West side	FID 35. Road from W allowing access to banks. Recent vehicle tracks to N and S; traffic not heavy.
508	393404	4091229	Intake south on West side	FID 34. Road getting some use heading south.
511	393581	4090875	Intake south on West side	FID 33. Road probably still getting light use; road is flooded to south. Consider restricting access.
515	393560	4090333	Intake south on West side	FID 32. E-W road to supplement site.
578	400797	4067334	Mazourka to Manzanar RR	FID 77. No trash; impacts from road not extensive or increasing. Photo of area - could probably block road to keep vehicles out of floodplain. Plentyof area to turn on on terrace.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Revist Sites, continued

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
589	403815	4056607	Islands	FID 90. Seedlings, 0.7m (Goodingii willow), five groups. Note: data sheet doesn't clarify whether these may have been the 2007 seedlings.
604	403079	4057851	Islands	FID 45. No evidence of off road vehicular activity. Range trend transect in nearby.
628	403321	4056076	Islands	FID 40. Road will be wet seasonally. Should consider closing where it drops to floodplain.
675	401917	4064888	W side river below Manzanar to Georges	FID 44. Road access blocked by riparian fencing.
682	402000	4064221	W side river below Manzanar to Georges	FID 43. Open gate, as noted in 2007, w/ evidence of grazing and vehicle traffic. Road ends. Recommend closing gate.
698	402448	4062887	W side river below Manzanar to Georges	FID 0. Road leading to water edge has been driven on, but not much.
703	402203	4062725	W side river below Manzanar to Georges	FID 42 and 52. Lots of misc trash at fishing spot and road still to bluff as reported in 2007.
709	395108	4087264	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	FID 37. Site of disturbance reported in 2007 currently totally covered in bassia and SUMO.
725	393972	4088931	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	FID 31. Reported road that leads to river bank, supplement tubs not present. Weeds growing back in, tumbleweed and bassia. Tamarisk slash also present.
733	396047	4085043	Twin Lakes boundary to Thibaut	FID 102. TARA present, other noted species in 2007 not found. (Note: may be on wrong side of river. IY)
736	395926	4084686	Twin Lakes boundary to Thibaut	FID 101. Tree has grown a lot, 2.5m tall. (Note: may be on wrong side of river. IY)
738	395825	4084469	Twin Lakes boundary to Thibaut	FID not clear, reads 10074 on map (IY). Large young tree present.
739	395943	4084022	Twin Lakes boundary to Thibaut	FID 98 (Note: may be on W not E side of river). Salix has gotten larger, 10' - 12', mile 9.5 - 9.6.
751	403335	4056092	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	FID 46. Road noted in 2007 still exists. Double track road starting at gate on 395N. Turnaround is faint but rutted, formerly wet.
755	404032	4054810	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	FID 47. Road reported in 2007 access still present.
757	404053	4054786	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	FID 48. Road from 2007 is same from wypt 015. No access to floodplain in 2008.
758	404108	4054772	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	FID 49. Road from 2007 is the same road as FID 47, 48, and 49. Should be consolidated as one.
776	399092	4074130	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	FID 38. Did not see OHV road as reported in 2007.
779	394295	4079214	Thibaut-East track	FID OR11. Fresh OHV tracks still present in dry basin - Hydro?
781	394634	4080147	Thibaut-East track	FID OR9. Road on east side recently used. TARA lining west side of road (This road is established and should only be revisited for TARA treatment).
782	394105	4080642	Thibaut-East track	FID OR10. Established berm road; road does not need to be revisited in future years.
788	410532	4047784	Keeler Bridge to Pumpback	FID 25. Road reported in 2007 shows very little recent use.
789	410905	4047591	Keeler Bridge to Pumpback	FID 1. Disturbed from channel debris in 2007.
790	410961	4047607	Keeler Bridge to Pumpback	FID 57. Road in swale reported in 2007.
791	410917	4047606	Keeler Bridge to Pumpback	FID 26.
794	411316	4046253	Keeler Bridge to Pumpback	FID 58. Road along river reported in 2007.
795	411721	4045623	Keeler Bridge to Pumpback	FID 56. ORV and cattle impacts reported in 2007.
796	414696	4039809	Delta	No FID on map (4039809, 414697). Road through floodplain from West (T-30) to East (T-24) berm. Road is used by guads. Looks the same as last year.
803	402697	4063679	Owens River	FID 5. LELA reported in 2007 still here.

Roads

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
6	392766	4092205	Intake south	Road all the way to river edge - this year.
7	393090	4092094	Intake south	Road drops into floodplain
27	396293	4082136	Owens River	Goes into floodplain and stopped by BAHY.
61	402773	4060818	Owens River, Reinhackle station, south to fence at 34.35	Road for dredging work? Still barren.
89	402326	4061662	Owens River - Reinhackle north	In saltgrass mdw. River incised so not 1st terrace but 2nd?
95	404384	4054734	Owens River	Through floodplain. Parallel to river. DISP growing in track.
99	404977	4054318	Owens River	May still be same road as wypt 128. Mostly DISP covered.
107	406102	4054754	Owens River	Rd continuing. (See 144, 145.)
114	407456	4052922	Owens River	Vehicle tracks right off paved rd into mdw.
118	409444	4047644	Owens River-Keeler Bridge to pumpback	Not on floodplain but through meadow.
170	396527	4081500	Fish corridor-south, west side.	Road to river from main rd. gate at fence. Rd disappears into BAHY.
182	397361	4080609	Fish corridor-south, west side.	Major road clear, well travelled.
184	397510	4080678	Fish corridor-south, west side.	End of road at river. Same as DH08202007055. Road still exists.
259	399397	4071802	Owens River - Mazourka-Manzanar	Road not in floodplain but in riparian fence.
287	402500	4061927	Owens River - Manzanar to Islands	Road on terrace upland, very nearby river.
292	408111	4050292	Owens River	Access road to river reported in 2007 still here.
295	408573	4049057	Owens River	Vehicle tracks through saltgrass meadow.

table 1, continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Roads, continued				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
303	393685	4086362	Waggoner - East	Road reported in 2007 present, but not heavily used.
316	394872	4083331	Waggoner - East	Access road with power lines along it.
319	394855	4082780	Waggoner - East	Access road to Goose Lake. Also a boat launch spot into lake.
324	394903	4082435	Waggoner - East	Road to lake ends in a turn about.
341	391677	4085043	Winterton and side	Road into unit. Shows flooded tire tracks.
356	407484	4052254	Owens River - LP Narrow gauge Rd to South	Access through grass, jct w/access from E roads.
357	407393	4052037	Owens River - LP Narrow gauge Rd to South	4-track road
360	407398	4051788	Owens River - LP Narrow gauge Rd to South	Access road from bluff - fresh ATV tracks
361	407406	4051721	Owens River - LP Narrow gauge Rd to South	Access rds. and jcts.
363	407406	4051721	Owens River - LP Narrow gauge Rd to South	Main access, heavy use.
364	407399	4051588	Owens River - LP Narrow gauge Rd to South	4 WD "fun hill" (mdw full of tracks - turnaround).
368	407900	4050669	Owens River - LP Narrow gauge Rd to South	Access rd from bluff.
370	407953	4050578	Owens River - LP Narrow gauge Rd to South	Access rd from bluff - not used much.
371	408047	4050487	Owens River - LP Narrow gauge Rd to South	ATV track through mdw.
372	408047	4050487	Owens River - LP Narrow gauge Rd to South	ATV track through riparian veg.
397	393245	4087414	BWHA - Drew and Twin Lake Units	Access rd from W (follows W shore of lake).
400	393298	4087234	BWHA - Drew and Twin Lake Units	End of rd - lake access.
403	393450	4086651	BWHA - Drew and Twin Lake Units	Access rd end/lake access (diff rd from gps pt 100).
408	397889	4079351	Fish corridor-south, west side.	FID 10. Faint rd to floodplain.
410	397874	4078057	Owens River-2 culverts south	Access Road to the river, two culverts. Revisit #41
411	398184	4076403	Owens River-2 culverts south	Road to river, fresh tracks. Revisit #40
445	395086	4081935	BWHA - Fish Corridor and Goose Lake	Sand dumped and smoothed from rd to pond.
461	407619	4051062	Owens River	FID 62. Road in floodplain still accessible.
466	408400	4049210	Owens River	Truck tracks in salt grass meadow.
468	403847	4058717	NE section of Islands-Alabama Gates-S	Road along/into floodplain/oxbow east of river. Several routes to avoid rutted/wet spots.
472	404368	4054791	NE section of Islands-Alabama Gates-S	Road in floodplain going through TYPHA patch.
473	404428	4054664	NE section of Islands-Alabama Gates-S	Road-likely same as 022.
474	404492	4054640	NE section of Islands-Alabama Gates-S	Faint road along seasonally flooded side channel. 022-024-028 likely same.
483	407016	4053661	Below Alabama Gates	Extensive roads noted in 2007 still show some OHV use, mostly cattle tracks. On terrace, not in floodplain.
487	412347	4044708	Delta	OHV use still occurring as reported in 2007.
492	414634	4039823	Delta	Road clearly used this year, impacting veg.
507	393191	4091508	Intake south on West side	Road noted in 2007 still in use.
509	393404	4091229	Intake south on West side	Road noted in 2007 still getting use heading south.
510	393568	4091172	Intake south on West side	Road into hairpin bend of river; recent vehicle traffic.
512	393581	4090875	Intake south on West side	Road noted in 2007 still getting light use; road is flooded to south. Consider restricting access.
513	393612	4090818	Intake south on West side	Same road as wypt 015 showing flooding; does not look driven on to south.
517	393560	4090333	Intake south on West side	E-W road noted in 2007 still there.
528	396855	4081507	Goose Lake Return to 2 Culverts	New road from fence construction, allows access to floodplain.
579	400797	4067334	Mazourka to Manzanar RR	Road reported in 2007 still here but not extensive or increasing. Photo of area - could probably block road to keep vehicles out of floodplain. Plenty of area to turn on on terrace.
629	403321	4056076	Islands	Road identified in 2007 still present.Road will be wet seasonally. Should consider closing where it drops to floodplain.
632	414816	4039855	Delta	Seems like more ATV tracks in new directions this year.
633	414816	4039855	Delta	Seems like more ATV tracks in new directions this year.
634	414922	4040028	Delta	2 sets of ATV tracks; photo also shows east branch - some standing water only.
641	412599	4044217	Delta	Road leads right to bank. Road also parallels banks toward main channel.
683	402000	4064221	W side river below Manzanar to Georges	Open gate, as noted in 2007, w/ evidence of grazing and vehicle traffic. Road ends. Recommend closing gate.
699	402448	4062887	W side river below Manzanar to Georges	Road leading to water edge has been driven on, but not much.
745	391472	4080907	Thibaut	1 vehicle (non-ATV), out-turnaround-and back, wet grassy area, tracks obvious, may be recent.
752	403335	4056092	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	Road noted in 2007 still exists. Double track road starting at gate on 395N. Turnaround is faint but rutted, formerly wet.
756	404032	4054810	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	Road access from bluff over floodplain reported in 2007 showing recent use.
780	394295	4079214	Thibaut-East track	Fresh OHV tracks still present in dry basin as noted in 2007- Hydro?
783	393431	4080514	Thibaut-East track	Road cutting across slick to SW; spur off of berm road.
799	414696	4039809	Delta	Road is used by quad as reported in 2007.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Slash

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
1	392536	4092332	Intake south	On edge of oxbow to E of river. Phragmites growing into pile, mostly surrounded by ATTO.
10	394828	4087472	Owens River	On river edge. Some forbs and weeds invading pile.
14	395050	4087252	Owens River	HECU and BAHY starting to grow in at edges.
17	395813	4085246	Owens River	Slash on floodplain surrounded by BAHY.
34	398051	4078124	Owens River, Two culverts to mile 20.1	Slash on floodplain, ~3/4 covered w/ HECU.
35	397966	4078164	Owens River, Two culverts to mile 20.1	Slash on water's edge of small oxbow pond.
37	397909	4078146	Owens River, Two culverts to mile 20.1	On both sides of bank on water edge, piles small, some veg growing through.
43	397754	4078004	Owens River, Two culverts to mile 20.1	At water edge.
46	397859	4077812	Owens River, Two culverts to mile 20.1	On water edge.
54	397964	4076736	Owens River, Two culverts to mile 20.1	On riverbank to water's edge.
71	399100	4073471	Owens River - Mazourka Cyn Rd north to Billy Lake return	Few piles just out of floodplain but area where trees can grow.
73	399013	4073620	Owens River - Mazourka Cyn Rd north to Billy Lake return	Slash on floodplain.
146	393994	4089827	Owens River between Intake and Blackrock	Isolated pile near ruin/historic site. 3-5 m from water.
147	393946	4089765	Owens River between Intake and Blackrock	Isolated pile near ruin/historic site. 3-5 m from water. Also
148	393946	4089765	Owens River between Intake and Blackrock	Pile 20 m further from river in cent of off channel pond.
149	393952	4089733	Owens River between Intake and Blackrock	Small slash piles every few meters - 2+ visible in picture. Not completely armoring bank. Spaced about ~3+ mostly 5m from the river.
150	393903	4089591	Owens River between Intake and Blackrock	Slash on bank and in backwater area.
151	393903	4089591	Owens River between Intake and Blackrock	Second picture, backwater area.
152	393819	4089542	Owens River between Intake and Blackrock	End of slash pile area.
153	394026	4089174	Owens River between Intake and Blackrock	Slash piles along river, close to mile 3.5
159	394268	4088384	Owens River between Intake and Blackrock	Large slash pile on bank in river. Appears to be inhibiting riparian veg growth.
160	394256	4088245	Owens River between Intake and Blackrock	Slash pile near river. Large, next to rip recruitment patch.
162	394429	4088066	Owens River between Intake and Blackrock	Slash in river and on bank. A few piles downstream along bank also.
165	394679	4087691	Owens River between Intake and Blackrock	Slash along bank - birds using slash as perch.
167	395347	4086621	Owens River between Intake and Blackrock	TARA slash pile 5m on a point bar.
190	397890	4080222	Fish corridor-south, west side.	Slash w/TARA on east bank.
208	397869	4078022	Owens River-2 culverts south	TARA slash 1m away from river.
209	397912	4077657	Owens River-2 culverts south	TARA slash 5m away from river.
212	398042	4077359	Owens River-2 culverts south	TARA slash in floodplain.
214	398060	4076719	Owens River-2 culverts south	TARA slash in floodplain.
218	398337	4076183	Owens River-2 culverts south	TARA slash in floodplain.
219	398330	4075937	Owens River-2 culverts south	TARA slash in floodplain.
222	399031	4074918	Owens River-2 culverts south	TARA slash in floodplain, 2 piles.
238	399246	4072648	Owens River - Mazourka-Manzanar	2-3 m from river edge.
498	392617	4092214	Intake south on West side	Slash piles in old oxbow; would prob support LETR.
501	392810	4092166	Intake south on West side	Single 15m x 15m pile of slash ~30m from river.
527	395311	4085910	Intake south on West side	Very small pile on bench above river; 3 x 4m.
530	396751	4081405	Goose Lake Return to 2 Culverts	10 x 10m pile of slash surrounded by solid BAHY stands.
534	396914	4081313	Goose Lake Return to 2 Culverts	Small isolated piles of TARA slash in this area on steep terrace-upland, some in riparian areas.
540	400025	4071019	Mazourka to Manzanar RR	Small 10x 5m pile in shrub meadow.
544	399700	4070621	Mazourka to Manzanar RR	Slash piles on bank - several in area; all in meadow or old oxbow.
547	399882	4070583	Mazourka to Manzanar RR	Piles of slash scattered along banks.
598	402630	4057434	Islands	Scattered slash; slash left were plants cut; not piled up; on meadow/shrub meadow.
599	402691	4057789	Islands	A mix of slash and untreated TARA in this area.
600	402714	4057924	Islands	Large area of slash; slash left where cut and not piled up.
601	402652	4058142	Islands	Another photo showing extent and amount of slash. Slash dense in this area.
608	403030	4057251	Islands	Widely scattered slash and resprouts.
613	403103	4057209	Islands	High density of slash along oxbow; still many mature trees in area also.
625	403304	4056639	Islands	Dense slash in same oxbow and depression.
626	403113	4056535	Islands	Slash on steep bank of oxbow.
627	403207	4056532	Islands	Slash in depression next to oxbow.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Slash, continued

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
716	393883	4089422	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile in floodplain, mile 3.3.
717	393893	4089267	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile in floodplain, mile 3.4.
718	393967	4089266	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile in floodplain, mile 3.4 - 3.5.
719	393955	4089164	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile in floodplain, mile 3.5-3.6. Largest piles yet.
720	393991	4089111	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile 10', mile 3.5 - 3.6.
721	394004	4089076	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash pile 10', mile 3.5 - 3.6.
723	393977	4088993	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	6 slash piles of tamarisk +/- 10ft in size spread out in floodplain, mile 3.6 - 3.7.
727	394110	4088792	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Tamarisk slash piles, 8' - 10', mile 3.9 - 4.0, +/- 5-6 piles.
759	407386	4052987	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	Lots of TARA slash covering ~ 50m x 20m on river bank.
760	399040	4074750	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Tamarisk slash along bank of old oxbow.
763	398966	4073743	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	12 TARA resprouts, some slash as well.
764	399081	4073675	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Small pile from 4-5 trees, second pile 100m south.
768	399412	4073388	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	~ 10 TARA resprouts w/ small amount of slash in area.
769	399379	4072716	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Many TARA on bank of old channel. Slash on bank as well.
770	399559	4072327	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	TARA slash on bank of old channel, large area, starts at 012 to 013.
772	399810	4071942	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	TARA slash on bank of old channel which is full of water.
774	400152	4071617	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Slash along oxbow or old canal.

Slash_OB

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
144	402708	4063324	Owens River	TARA slash in water.
710	394224	4088266	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Large tamarisk slash pile in channel and surrounded by tules.
711	394224	4088266	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Large tamarisk slash pile in channel and surrounded by tules.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Tamarisk Seedlings				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
13	394978	4087343	Owens River	>= 7 seedlings on flooded river edge, some w/ flowers.
16	395243	4086958	Owens River	>= 4 seedlings.
29	395753	4084268	Owens River	Seedlings scattered in meadow.
31	398093	4078325	Owens River, Two culverts to mile 20.1	Seedlings in boggy swale.
58	398062	4078365	Owens River, Two culverts to mile 20.1	Seedlings scattered in off-river swale meadow.
80	402777	4060915	Owens River - Reinhackle north	Disturbance from installation of station. Reveg with salix (>15), TARA, cattails, sedges, SPAI, ATTO, tules.
82	402689	4061008	Owens River - Reinhackle north	Scattered in area of mainly dried mud, 0.25-1m tall.
164	394459	4087842	Owens River between Intake and Blackrock	TARA recruitment with willows.
228	399355	4073261	Owens River - Mazourka-Manzanar	+/- 20 plants at river edge mixed with SALA2 and SAGO.
235	399180	4072774	Owens River - Mazourka-Manzanar	50+ seedlings with SAGO seedlings up to point 014.
241	399236	4072529	Owens River - Mazourka-Manzanar	TARA recruits (30-40).
246	399276	4072339	Owens River - Mazourka-Manzanar	TARA seedlings.
261	399488	4071753	Owens River - Mazourka-Manzanar	30+ seedings up to 1m tall.
264	399500	4071737	Owens River - Mazourka-Manzanar	40+ TARA seedling up to 1m tall.
301	409091	4048163	Owens River	Seedlings on sand bank near measuring station.
519	393898	4089706	Intake south on West side	30 seedlings pulled from flooded area under slash. May be a few more but got most.
523	395223	4086331	Intake south on West side	3 seedlings in wet area w/ scattered salix seedlings; pulled.
549	400077	4070194	Mazourka to Manzanar RR	4 seedlings pulled; may be others; disturbed open sandy area: SAEX and ELAN also.
580	403964	4057428	Islands	Seedlings along muddy margins 100+ young seedlings.
583	404033	4057245	Islands	Numerous TARA seedlings established on receeding shoreline, 800+. Candidate to revisit in 2009.
584	404033	4057245	Islands	Numerous TARA seedlings established on receeding shoreline, 800+. Candidate to revisit in 2009.
585	404065	4057115	Islands	Numerous Tara seedlings, similar to wypt 004.
587	403997	4056959	Islands	Numerous TARA seedlings on shoreline.
594	403700	4056420	Islands	20 TARA seedlings.
596	403642	4056476	Islands	Numerous, 50+ TARA seedlings.
602	403001	4057974	Islands	At least 50 seedlings (max of 12") in saltgrass meadow; adjacent to slough.
603	403001	4057974	Islands	At least 50 seedlings (max of 12") in saltgrass meadow; adjacent to slough.
605	403127	4057482	Islands	~20 seedlings at muddy margin of receeding waterline - pulled.
606	403101	4057414	Islands	30-50 seedlings, muddy margin and in saltgrass adjacent to receeding water line.
607	403093	4057359	Islands	Hundreds of seedlings to 12" tall, in now-dried depression.
609	403003	4057266	Islands	2 seedlings pulled; muddy edge of receeding waterline.
612	403078	4057202	Islands	3-5 seedlings on muddy bank of oxbow.
614	403667	4057377	Islands	Hundreds of TARA seedlings and saplings in drying depression, many mature trees.
615	403667	4057377	Islands	Hundreds of TARA seedlings and saplings in drying depression, many mature trees.
616	403560	4056709	Islands	~30+ seedlings on muddy bank of oxbow, many scattered mature trees in area.
620	403576	4056450	Islands	30+ TARA seedlings w/ SAGO, margins of dried oxbow.
622	403534	4056336	Islands	5-10 on muddy margin of river bank; SAGO seedlings also.
624	403304	4056639	Islands	Up to 12 TARA seedlings at edge of drying oxbow.
636	414130	4041468	Delta	Plant ~ 12" high; probably a few years old; in wet meadow and currently flooded; pulled.
663	392296	4083343	Winterton - S end.	*(East side of basin, south of road.) 200+/- seedlings, 1-4ft tall.
666	392318	4083366	Winterton - S end.	South side of active spreading basin along rim by road.
674	401902	4065049	W side river below Manzanar to Georges	One tamarisk seedling - removed.
676	401998	4064803	W side river below Manzanar to Georges	2 seedlings removed.
707	395009	4087310	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	6-7, I pulled them out.
775	400017	4071133	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	TARA seedling and resprouts.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Woody Recruitment				
RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
9	394828	4087472	Owens River	>= 4 Salix ~ 0.25 m tall.
11	394964	4087358	Owens River	1 Salix recruit on river edge & 1 further south ~ 10 m.
12	394983	4087341	Owens River	2 POFR (1m) on flooded river edge, +1 ~5 m south (1m tall).
21	395891	4084964	Owens River	1 POFR (1.5 m tall), 3 Salix (1.5 m tall) on sandy bank. Pulled ~10 TARA seedlings.
22	395831	4084623	Owens River	Salix ~ 2m, last year (?).
23	395755	4084314	Owens River	Salix, 2 yrs, on river edge, in water.
30	398093	4078325	Owens River, Two culverts to mile 20.1	Tree salix ~ 1 m tall in boggy swale adjacent to river w/ TARA seedlings.
32	398173	4078238	Owens River, Two culverts to mile 20.1	>= 2 Salix trees, first yr (1.5 - 2m); 1 POFR, 0.25m in saturated soil on edge of cattails.
33	398051	4078124	Owens River, Two culverts to mile 20.1	4 Salix (2 are ~ 2yr, ~2.0m tall; 2 are 1st yr, 0.5m tall), in cattails on low meadow adj to river. Trees follow river west.
38	397928	4078106	Owens River, Two culverts to mile 20.1	>= 6 Salix, 2nd yr on both banks of side channel. Growing in cattails.
39	397881	4078104	Owens River, Two culverts to mile 20.1	3 salix: 2.5 m (3rd yr); 0.75 (1st yr), 1.0 m (1st), also cont' on river across rd (2 more, 2nd yr, 2-3 m tall).
40	397847	4078034	Owens River, Two culverts to mile 20.1	1 salix, 2 m (2nd yr), water edge in HECU.
41	397840	4078013	Owens River, Two culverts to mile 20.1	2 salix - one W, 3m, 2 yr; one E, 2 m, 1 yr; on water edge in HECU, ATTO, BAHY.
42	397818	4078008	Owens River, Two culverts to mile 20.1	Low spot, slightly flooded, DISP at least 6 salix, 1st yr (5) ~ 1-2 m tall; 3rd yr (1) ~3 m tall.Mdw continues to W with at least 2 moe salix recruits (1st yr). ~ 50 m W, more salix. 3 approx 3 trs, 2.5 m tall. All through oxbow ~ 20 more 1st yr.
44	397743	4077824	Owens River, Two culverts to mile 20.1	Salix ~2.5 m, 2nd yr, water edge w/cattails, more along channel.
45	397780	4077782	Owens River, Two culverts to mile 20.1	Numerous > 20 salix in flooded side channel and into river, cattails, MUAS.
50	397871	4077047	Owens River, Two culverts to mile 20.1	Numerous salis on 2 small islands (3m x 3m), 1st yr.
51	398029	4077053	Owens River, Two culverts to mile 20.1	Salix in MUAS, in sat soil ~ 2m tall, 2nd yr, ~ 5 more to S. 1 (2nd yr, 2m); 3 (1st yr, 1m).
53	397964	4076736	Owens River, Two culverts to mile 20.1	>= 2 salix in river, 1st yr.
55	398113	4076769	Owens River, Two culverts to mile 20.1	~25 salix, 3.5 m in cattails, MUAS at water's edge & on sandy bank.
56	398186	4076313	Owens River, Two culverts to mile 20.1	~15, 1st yr salix in ANCA, MUAS, ELAN, DISP. Very moist soil.
57	398381	4075736	Owens River, Two culverts to mile 20.1	Salix in mdw adj to channel, 2nd yr, 2m. DISP, BAHY, ANCA, ATTO, ELAN, JUBA.
59	402782	4060872	Owens River, Reinhackle station, south to fence at 34.35	4-1st yr salix ~0.5 tall in dist soil w/ DISP. To S ~4, 2-3 tr (2 m tall) in DISP, very moist soil
62	402726	4060751	Owens River, Reinhackle station, south to fence at 34.35	5 salix on sandy disturbance adjacent to water ~ 0.25 m w/JUBA & ANCA
63	402690	4060583	Owens River, Reinhackle station, south to fence at 34.35	River sandbar w/ ~ 20 1st yr salix <= 1m. MUAS, DISP, SPAI, cattails; moist.
64	402575	4060388	Owens River, Reinhackle station, south to fence at 34.35	3 salix- 3 yrs (?) 3m tall in water w/ cattails.
65	402630	4060267	Owens River, Reinhackle station, south to fence at 34.35	2 salix - 1 yr, 1.5 m tall, river edge in water w/ cattails.
66	402646	4060235	Owens River, Reinhackle station, south to fence at 34.35	1 POFR, ~ 2 yr, 2.5 m tall, sm leaves, some dieback, in water w/ tules.
68	402594	4060093	Owens River, Reinhackle station, south to fence at 34.35	Scattered salix, ~3-4 yrs, at water's edge from ponded water S on edge of river to GPS point.
70	399119	4073465	Owens River - Mazourka Cyn Rd north to Billy Lake return	Side bar w/ >=25 willow recruits ~ 0.5-1m. Moist, DISP, coyote willow, tree willows, cattails.
72	399094	4073489	Owens River - Mazourka Cyn Rd north to Billy Lake return	POFR in same sidebar as wypt 82. Extensive recruitment of salix.
74	398996	4073624	Owens River - Mazourka Cyn Rd north to Billy Lake return	7 Salix mixed in w/ DISP and CHNA.
76	398929	4073646	Owens River - Mazourka Cyn Rd north to Billy Lake return	4 Salix, 0.74 m, this yr. Saturated soil w/ DISP, cattails, PHAU.
78	398077	4074183	Billy Lake	Salix ~3m tall, (3 yr +?).
79	402777	4060915	Owens River - Reinhackle north	Disturbance from installation of station. Reveg with salix (>15), TARA, cattails, sedges, SPAI, ATTO, tules.
83	402689	4061008	Owens River - Reinhackle north	Salix in flooded now dry swale >=100, 0.5 m tall.
84	402711	4061043	Owens River - Reinhackle north	Salix along river edge w/ cattails, ~3 yrs, 3.5 m tall.
85	402597	4061257	Owens River - Reinhackle north	3 salix on low area adj to river in sedges, ~1m tall, 3.5 m tall, saturated soil.
86	402357	4061459	Owens River - Reinhackle north	~6 salix spaced ~10m apart, heading N. 2 - 4.5m tall in cattails, not sure whether all recruits or resprouts.
88	402360	4061663	Owens River - Reinhackle north	3 salix, 2-3 yr old, 2.5 m high. Among edge of tules on shore w/ ANCA and DISP.
90	402175	4062009	Owens River - Reinhackle north	3, 1st yr salix ~ 1.25m, juncas, DISP, ANCA, ATTO.
91	402295	4062314	Owens River - Reinhackle north	3 yr salix (2.5m tall), sedges, cattails, DISP.
94	406914	4054019	Owens River	Salix ~1m. 2nd or 3rd yr. Died back last year.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Woody Recruitment, continued				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
97	404364	4054394	Owens River	Willow in sat conditions along river ~4m tall, 3 yr. cattails, CHNA, DISP.
102	405438	4054303	Owens River	Muddy bank extending into water, ~1.5m tall, 1st yr. in juncus & dead ATTO.
112	407123	4053708	Owens River	Salix on a log in river, ~0.5m tall, 1st yr.
117	409488	4047723	Owens River-Keeler Bridge to pumpback	2-4 salix in middle of oxbow. 2, 3-4 yrs, 3-4m tall; 2, 1st yr, 1m tall.
122	410245	4047546	Owens River-Keeler Bridge to pumpback	2 salix, not sure age, show die back from previous year, in water with cattails.
125	411109	4047140	Owens River-Keeler Bridge to pumpback	4 salix growing out of cattail debris, 0.75 - 1.5 m tall, 1st or 2nd yr.
131	401224	4065775	Owens River	100-150 SAGO to 2 m tall. Some plants may be 2007 recruits.
135	401755	4065431	Owens River	1 seedling >1 m tall, SAGO.
136	401768	4065430	Owens River	40 seedlings >1m tall, SAGO.
137	401778	4065447	Owens River	9 seedlings > 1m tall, SAGO.
141	402267	4063797	Owens River	70 seedlings, SAGO, >1m tall, low area ~1-2m from river.
142	402546	4063584	Owens River	2 small SAGO, might be 2007 recruits with TARA.
161	394256	4088245	Owens River between Intake and Blackrock	Wdy recruit: willow seedlings, 50+ plants some 1m+ w/main stem and branches - some single-stem seedlings. TARA slash between seedlings and river.
163	394459	4087842	Owens River between Intake and Blackrock	Willow spp. Recruitment patch most 10+ over 15-20m of streambank. TARA seedlings present also.
171	396568	4081441	Fish corridor-south, west side.	Willow (tree-looks like SAGO or SALE) 10+ along side channel w/ TYLA.
172	396568	4081441	Fish corridor-south, west side.	2 POFR seedlings present. Plants 1-3m tall in shallow side channel w/ TYLA.
173	396574	4081387	Fish corridor-south, west side.	Top of another wdy patch - 10 - 12:1 willow/POFR ratio in channel w/TYLA.
174	396574	4081387	Fish corridor-south, west side.	Example of larger SAGO(?) plant. SALE - red willow also.
175	396597	4081391	Fish corridor-south, west side.	Example of larger POFR plant. Middle of recruitment patch in old channel. Possible future POFR/SAGO/TYLA patch. BAHY from pt 003-South.
176	396665	4081431	Fish corridor-south, west side.	End of recruitment patch - South=TYLA-SCAC.
179	396993	4081226	Fish corridor-south, west side.	Vigorous resprouts in burn area. Burned areas may have lower bassia cover than unburned areas. Willows present on east bank also.
180	396993	4081226	Fish corridor-south, west side.	Vigorous resprouts in burn area. Burned areas may have lower bassia cover than unburned areas. Willows present on east bank also.
181	396993	4081226	Fish corridor-south, west side.	3187-3188 HECA groundcover.
183	397489	4080736	Fish corridor-south, west side.	POFR-willow recruit. 2 POFR 1+m, willow 1m, streambank.
185	397650	4080589	Fish corridor-south, west side.	Tree willow patch on East side of river. 3-5 plants, 1+m high.
186	397705	4080592	Fish corridor-south, west side.	SAGO/SALE recruit patch. 3 plants 1-2m high.
187	397808	4080272	Fish corridor-south, west side.	Looks like red willow, 1-2m tall at stream bank w/TYLA, HECU.
188	397856	4080262	Fish corridor-south, west side.	Willow-tree SAGO/SALE. 2m+ w/TYLA. Problem w/ camera-no picture.
189	397901	4080229	Fish corridor-south, west side.	POFR 2+m tall on water edge.
191	397821	4079899	Fish corridor-south, west side.	Salix resprout. Looks like SAGO.
200	397884	4079511	Fish corridor-south, west side.	SALAE? Plant 1.5-2m high w/ muhly.
201	397904	4079517	Fish corridor-south, west side.	POFR w/ salix, 20+ salix. Most look like SALAE, some SAGO 1-2 m tall, POFR 1, 1m tall. Healthy w/ juncus/muhly- multiple wdy age classes.
202	397904	4079517	Fish corridor-south, west side.	point bar community picture.
204	398040	4079146	Fish corridor-south, west side.	POFR (2m) on east streambank, 3+ salix also present.
210	397927	4077631	Owens River-2 culverts south	Willow seedlings 5 to 10 plants. 1m tall.
215	398050	4076687	Owens River-2 culverts south	Willow seedlings, 5 plants, 1m tall.
217	398246	4076202	Owens River-2 culverts south	Willow seedlings, 10 plants, 1m tall.
220	398692	4075278	Owens River-2 culverts south	Willow seedlings, 15 plants, 1m tall.
225	399270	4073299	Owens River - Mazourka-Manzanar	2008 seedlings SAGO, less than 1m tall, 10+ plants along bank down stream ~ 20m, dead ELAN.
227	399355	4073261	Owens River - Mazourka-Manzanar	Current year (2008) seedlings SALA3 & SAGO, mixed w/ TARA. Many plants up to 1 m tall at river edge continuing to point 006.
229	399362	4073236	Owens River - Mazourka-Manzanar	1 POFR seedling from point 006 on, SAGO, SALA3, SAEX, TARA to point 007. Lots of bullfrogs.
230	399366	4073180	Owens River - Mazourka-Manzanar	Many SALA3, SAGO, SAEX, some TARA.
233	399271	4072740	Owens River - Mazourka-Manzanar	1 plant SAGO ~20cm tall.
234	399199	4072766	Owens River - Mazourka-Manzanar	15 plants, SAGO seedlings & 1 yr old plants go for ~ 50m along edge, less than 1m from water in side slough.
239	399235	4072553	Owens River - Mazourka-Manzanar	30 plants, SALA3 & SAGO from point to point 019.
242	399273	4072365	Owens River - Mazourka-Manzanar	11 plants, SAGO, up to 1m tall along bank.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Woody Recruitment, continued				
RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
243	399216	4072363	Owens River - Mazourka-Manzanar	15 plants, SAGO & SALA3 up to 1m tall along bank to 2m from bank.
244	399238	4072349	Owens River - Mazourka-Manzanar	1 plant less than 1m tall.
245	399276	4072339	Owens River - Mazourka-Manzanar	25 plants SAGO, 2-3m tall w/ TARA seedlings.
247	399280	4072321	Owens River - Mazourka-Manzanar	End of patch from wypt 023.
248	399274	4072309	Owens River - Mazourka-Manzanar	5 plants, SAGO up to 1m tall.
249	399270	4072293	Owens River - Mazourka-Manzanar	2 plants SAGO, less than 1m tall.
250	399273	4072279	Owens River - Mazourka-Manzanar	4 plants SAGO, less than 1m tall.
251	399278	4072266	Owens River - Mazourka-Manzanar	5 plants SAGO, up to 1m tall.
252	399266	4072207	Owens River - Mazourka-Manzanar	3 plants SAGO, less than 1m tall.
253	399268	4072188	Owens River - Mazourka-Manzanar	4 plants SAGO less than 1m tall.
254	399259	4072134	Owens River - Mazourka-Manzanar	9 plants SAGO less than 1m tall.
256	399267	4072112	Owens River - Mazourka-Manzanar	2 plants SAGO 1m tall. Close to FID 87, DH08212007089 - but 50+ seedlings not found, many fewer seedlings than 2007.
260	399488	4071753	Owens River - Mazourka-Manzanar	20+ SAGO seedlings, less than 1m tall, 30+ TARA seedling up to 1m tall.
263	399500	4071737	Owens River - Mazourka-Manzanar	30+ SAGO seedlings up to 1m tall.
265	399698	4071651	Owens River - Mazourka-Manzanar	150+ plants SAGO along marshy bank.
266	399779	4071723	Owens River - Mazourka-Manzanar	3 plants SAGO.
271	400006	4070352	Owens River - Mazourka-Manzanar	8 plants, SAGO, SALA3, SALA6.
273	399990	4070127	Owens River - Mazourka-Manzanar	8 plants SALA3, SAGO.
280	400349	4068043	Owens River	SAEX seedlings, 1m tall, 3 plants.
281	400382	4067980	Owens River	Willow seedlings, 1m tall, 5-10 plants.
282	401729	4065071	Owens River	Willow seedlings, 1m tall, 10-15 plants.
289	402806	4060884	Owens River - Manzanar to Islands	Black willows at high water line @ gauging stn. - 60 plants. Most small, also other side one TARA seedling, pulled, one red willow found.
298	409089	4048164	Owens River	Seedlings from 2007 still there.
336	391421	4085904	Winterton - West	4 willow seedlings, 1m tall.
338	391371	4085920	Winterton and side	Cottonwood, 2 seedlings 1-2m on edge of cattails.
340	391575	4085357	Winterton and side	SAGO seedling; 1.5m edge of water.
366	407765	4051201	Owens River - LP Narrow gauge Rd to South	Salix recruit - 2m tall (several)
388	393396	4086013	BWHA - Drew and Twin Lake Units	Healthy POFR ~5m.
409	398046	4078853	Fish corridor-south, west side.	FID 10. Faint rd to floodplain.
412	399236	4072529	Owens River - Mazourka-Manzanar	Noted in 2007. 100 SALA and SAGO.
414	393439	4086126	BWHA - Drew and Twin Lake Units	From 2007 POFR 1.5 - 2 m high. See other notes for this wypt.
419	396428	4081538	BWHA - Fish Corridor and Goose Lake	POFR in water, 1m tall.
420	396408	4081533	BWHA - Fish Corridor and Goose Lake	POFR in water on W side of culvert, 2+m tall.
421	396387	4081532	BWHA - Fish Corridor and Goose Lake	POFR & willow in FC ~ 1m tall (1 each).
422	396333	4081542	BWHA - Fish Corridor and Goose Lake	6+ salix and 1 robust POFR, 1-2m in ht. (few TARA seedlings) * could be revisit OR 23.
423	396311	4081547	BWHA - Fish Corridor and Goose Lake	More salix, 1-1.5m.
424	396296	4081547	BWHA - Fish Corridor and Goose Lake	1 Salix, 2m tall.
426	396229	4081552	BWHA - Fish Corridor and Goose Lake	1 salix, 1.5m
428	395688	4081624	BWHA - Fish Corridor and Goose Lake	2 salix on S. bank, 1.5 and 2.5m tall (diff species).
429	395680	4081626	BWHA - Fish Corridor and Goose Lake	Sev salix, 1 - 1.5m, N bank.
430	395668	4081634	BWHA - Fish Corridor and Goose Lake	Salix, 1.5m.
431	395646	4081645	BWHA - Fish Corridor and Goose Lake	Salix, 1.5m.
434	395607	4081658	BWHA - Fish Corridor and Goose Lake	PORF on S. bank, 1.5m (also lg, dying TARA on N bank).
435	395594	4081669	BWHA - Fish Corridor and Goose Lake	Salix on S. bank, 2+m tall (red trunk & stems), another (diff species) on N bank, 2m W.
436	395580	4081677	BWHA - Fish Corridor and Goose Lake	Another "red" willown on N bank, 1.5 m.
437	395538	4081699	BWHA - Fish Corridor and Goose Lake	Salix (red) on S. bank, 1m tall, another, smaller on N bank ahead and back a few meters.
438	395507	4081721	BWHA - Fish Corridor and Goose Lake	Salix, <1m tall, N bank.
439	395476	4081743	BWHA - Fish Corridor and Goose Lake	Salix (several), 0.5-2.5m and ELAN (?) not too healthy, 2m tall on N bank. Many more salix a few meters W.
440	395432	4081755	BWHA - Fish Corridor and Goose Lake	POFR on N bank, spindly, bent to ground.
442	395394	4081756	BWHA - Fish Corridor and Goose Lake	POFR (2m), and ELAN? (here and one on opp. Bank, 1.5m).
456	394657	4083073	BWHA - Fish Corridor and Goose Lake	Lg POFR (6m+).
459	407438	4052381	Owens River	Willow seedlings, 3 plants 1m tall.
475	402594	4058961	Below Alabama Gates	SAEX spreading into meadow. Not seedlings but young sprouts.
480	405614	4054436	Below Alabama Gates	2 SAGO seedling/young plants. +/- 1m tall, other is 0.5 m tall, poss. 2 ages. Picture is of larger plant.
485	412399	4044674	Delta	Salix seedling/young plant in SCAC-hard to tell if new recruit, possibly resprout, 1m tall.
488	412809	4043133	Delta	SAGO? 1 plant, 2m from tule wall. 0.5m tall w/ JUBA.
490	412873	4042951	Delta	SAEX expansion similar to patches marked on map to the north. Many (30-50+) along tule edge. JUBA floodplain +/- 1m.
522	395190	4086317	Intake south on West side	1 POFR ~ 5ft tall; 2 Salix goodingii; 7 SALA (prob 2 yrs old) off point bar.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Woody Recruitment, continued

RAS Data ID	Easting	Northing	General Survey Area	Observer Comments
532	396901	4081324	Goose Lake Return to 2 Culverts	~ 1.5 m tall shrub-willow at bottom of steep bank (not SAEX). Arroyo willow (S. lasiolepis).
533	396901	4081324	Goose Lake Return to 2 Culverts	~ 1.5 m tall shrub-willow at bottom of steep bank (not SAEX). Arroyo willow (S. lasiolepis).
535	397023	4081245	Goose Lake Return to 2 Culverts	~2m high salix at bottom of steep bank (prob SAEX).
545	399829	4070659	Mazourka to Manzanar RR	3 young tree willows (~1.5m high) in oxbow. Probably SAGO.
550	400077	4070194	Mazourka to Manzanar RR	Possibly red willow; ~12" tall; 6+ other tree willow seedlings from this year seen; disturbed sandy areas.
551	400097	4070073	Mazourka to Manzanar RR	Tree willow sapling ~1.5m tall; 2 others near by.
555	399971	4068780	Mazourka to Manzanar RR	At least a dozen young SAEX up to 20m from bank.
557	399968	4068438	Mazourka to Manzanar RR	A few young SAEX along bank; up to 1.5m tall.
558	400053	4068499	Mazourka to Manzanar RR	Several, ~15, young SAEX in grassy area up to 6m from river bank.
559	400078	4068482	Mazourka to Manzanar RR	Another much larger patch of young SAEX in DISP area.
561	400188	4068365	Mazourka to Manzanar RR	4 young SAEX in dried up depression; ~1m high, max.
564	400391	4068265	Mazourka to Manzanar RR	~15 young SAEX, all <1m; growing on steep, DISP-covered bank.
566	400455	4067994	Mazourka to Manzanar RR	5 small SAEX ~0.5m high, in grassy bank.
568	400637	4067866	Mazourka to Manzanar RR	~25 young SAEX at bottom of steep slope and in grassy area.
571	400864	4067547	Mazourka to Manzanar RR	Sapling POFR in phragmites stand; ~7ft tall.
573	400803	4067479	Mazourka to Manzanar RR	Many, 50+, young SAEX on bank in grassy area.
574	400764	4067478	Mazourka to Manzanar RR	Sapling POFR, growing amongst bulrush, ~5'8" tall.
575	400626	4067538	Mazourka to Manzanar RR	Many young SAEX inside bend of river, grassy site.
581	403964	4057428	Islands	5 young salix tree willows - seedlings on same exposed muddy shore as TARA seedlings.
586	403997	4056959	Islands	Willow (SAGO) seedlings 100+ on shoreline-adjacent to mature salix.
588	403692	4056570	Islands	10 seedlings (SAGO) below huge adult.
590	403815	4056607	Islands	Seedlings, 0.7m (Goodingii willow), five groups.
591	403702	4056500	Islands	Several hundred small seedlings & 10 S. goodingii >15cm, all on muddy banks.
592	403702	4056500	Islands	Several hundred small seedlings & 10 S. goodingii >15cm, all on muddy banks.
593	403700	4056420	Islands	S. goodingii, 12 seedlings.
595	403667	4056471	Islands	2 S. goodingii seedlings, 5 are very young.
597	403589	4056355	Islands	Numerous seedlings around exposed dry margin of oxbow.
610	403003	4057266	Islands	6 Gooding willow seedlings to 6" high; muddy edge of receeding waterline.
611	403078	4057202	Islands	1 Gooding willow on muddy bank of oxbow.
617	403587	4056582	Islands	2 saplings (SAGO) ~1m tall on grassy bank of oxbow.
618	403609	4056490	Islands	Up to 20 very young tree willow seedlings on muddy bank. Elk grazing also.
619	403576	4056450	Islands	300+ tree willow seedlings, mostly <10" high, margin of dried oxbow. Fewer TARA seedlings.
621	403534	4056336	Islands	30-50 SAGO seedlings all < 10" tall, muddy margin of river bank.
623	403304	4056639	Islands	200+ SAGO seedlings in drying oxbow and at edge of wet oxbow.
664	392296	4083343	Winterton - S end.	SAEX, SALA3, POFR (6), 100's of willow (spreading basin)*
669	392030	4083260	Winterton - S end.	SAEX, TARA, SALA3 recruitment in and along ditch, also POFR.
672	401728	4065080	W side river below Manzanar to Georges	SAEX recruitment on west side of river. 40+ seedlings up to +/- 1 meter tall, sandy bank.
673	401902	4065049	W side river below Manzanar to Georges	Mixed tree willow recruitment, 50+, sandy area.
677	401998	4064803	W side river below Manzanar to Georges	50+ tree willow seedlings along oxbow bank margins.
678	402015	4064711	W side river below Manzanar to Georges	POFR recruitment, 3+ feet, 2 individuals on cutbank of right river slope.
679	402028	4064675	W side river below Manzanar to Georges	SAGO recruitment w/in old oxbow, 2 individuals.
680	402031	4064592	W side river below Manzanar to Georges	Tree willow recruitment up to 1 meter tall, 10+ individuals.
681	402045	4064340	W side river below Manzanar to Georges	Tree willow recruitment w/in wet meadow, 30+ seedlings.
685	402105	4064149	W side river below Manzanar to Georges	Woody salix recruitment along muddy river bank.
686	402125	4064131	W side river below Manzanar to Georges	SAGO recruitment along bank. Seedlings and saplings. Tree willow recruitment in wet meadow, 300+ seedlings.
687	402160	4063993	W side river below Manzanar to Georges	POFR seedlings and multiple tree willow seedlings (40+).
688	402160	4063993	W side river below Manzanar to Georges	POFR seedlings and multiple tree willow seedlings (40+).
689	402129	4063975	W side river below Manzanar to Georges	Tree willow in muddy margins of oxbow.
690	402214	4063793	W side river below Manzanar to Georges	2 POFR seedlings ~ 10" tall, 2 tree willow seedlings on narrow muddy bank.
691	402205	4063765	W side river below Manzanar to Georges	4 seedling POFR, 100s tree willows in dense wet meadow and at muddy margins of oxbow.

Table 1, Continued 2008 LORP Rapid Assessment Raw Data by Impact Type

Woody Recruitment, continued				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
692	402205	4063765	W side river below Manzanar to Georges	4 seedling POFR, 100s tree willows in dense wet meadow and at muddy margins of oxbow.
693	402350	4063685	W side river below Manzanar to Georges	2 young tree willows on grassy bank; prob 1-3 yrs old, 0.5m high.
694	402490	4063496	W side river below Manzanar to Georges	~30-40 young tree willows, <= 12" tall, on narrow exposed muddy area.
695	402525	4063462	W side river below Manzanar to Georges	Grassy bank lined w/ seedling tree willows < 12" high, 50-100.
696	402651	4063330	W side river below Manzanar to Georges	Cluster of young tree willows (30 - 40) in river channel.
701	402257	4062780	W side river below Manzanar to Georges	Several (30-40) young SAEX at base of steep slope.
704	394564	4087695	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	3 juvenile tree willow.
706	395009	4087310	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Juvenile willow tree.
708	395114	4087143	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Cottonwood seedling, 1.5m tall.
713	394272	4088174	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Willow juveniles +/- 8-10 around 1m tall.
724	393972	4088967	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Willow tree sprouted from old stump, 10 - 12 ft tall, mile 3.6 - 3.7.
734	396091	4085055	Twin Lakes boundary to Thibaut	Willow sprouting out of base of tree. Mile 8.4 - 8.5.
737	395837	4084448	Twin Lakes boundary to Thibaut	Tree willow sprout, 2m tall, mile 8.9 - 9.0.
740	395955	4083903	Twin Lakes boundary to Thibaut	Salix sprouts lots 4' - 5', mile 9.6 - 9.7.
741	395885	4083846	Twin Lakes boundary to Thibaut	Salix sprouts, 2 at 1m tall.
742	395812	4083660	Twin Lakes boundary to Thibaut	Salix sprouts, 2 at 2' tall.
743	396318	4082356	Twin Lakes boundary to Thibaut	Tree willow sprouts, mile 11 - 11.1.
754	403934	4055009	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	POFR (3) ~ 25cm tall, 3m from water edge, many Salix seedlings (20), excellent woody recruitment site, wide muddy moist bank, open bank, by large willow tree on point, by big bend oxbow. No TARA.
761	398962	4074495	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Willow recruitment ~20 plants, SAEX or SAGO.
762	398944	4073698	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	Willow recruitment ~ 50 plants, likely 2 cohorts, SAGO, also POFR (2).
773	399884	4071834	North of Billy Lake to S of Mazourka and North of Manzanar Reward Rd.	100s of willow seedlings, likely SAGO.
797	412951	4042998	Delta	Willow recruitment just NW of pond at 54.8 miles. Willows 0.5 to 2 m tall.
798	412878	4043101	Delta	More willow recruitment north of waypt.
800	412951	4042998	Delta	Willow recruitment just NW of pond at 54.8 miles. Willows 0.5 to 2 m tall.
801	412814	4043407	Delta	Willow recruitment.
804	402625	4060372	Owens River - Manzanar to Islands	Willow recruitment reported in 2007 now is 30+/- coyote willow.

Table 1, Continued   2008 LORP Rapid Assessment Raw Data by Impact Type

Wildlife				
RAS Data ID	**Easting**	**Northing**	**General Survey Area**	**Observer Comments**
36	397905	4078183	Owens River, Two culverts to mile 20.1	2 mallards on off-river oxbow pond and TARA slash on pond edge.
87	402384	4061600	Owens River - Reinhackle north	1 snipe, 2 rails, 4 mallards, 1 uni.d. duck, large fish jumping in large pond.
96	404387	4054419	Owens River	Great egret.
100	404977	4054318	Owens River	Great egret, heard ducks, didn't see.
101	405274	4054206	Owens River	~20 mallards, 1 great egret, gr blue heron.
103	405438	4054303	Owens River	Small unidentified duck.
108	406102	4054754	Owens River	Sm muddy pond w/ 4 sandpipers to NE of rd ~10m.
116	409649	4047832	Owens River-Keeler Bridge to pumpback	Small duck flushed, not a mallard.
121	410107	4047508	Owens River-Keeler Bridge to pumpback	2 killdeer foraging at small pond.
425	396247	4081554	BWHA - Fish Corridor and Goose Lake	Big fish (~12") heading W (carp? bass?)
469	404126	4058444	NE section of Islands-Alabama Gates-S	5+ egrets, mallard, RWB, cowbirds.
470	403623	4055252	NE section of Islands-Alabama Gates-S	Wildlife pile w/ scat. Possible beaver - unlikely beaver.
471	403623	4055252	NE section of Islands-Alabama Gates-S	Scat pile w/pencil for scale.
476	402704	4058646	Below Alabama Gates	Bull elk, RT Hawk, GBH, N. Harrier, passerines-unident. To wypt 005.
477	402710	4058639	Below Alabama Gates	Bull elk, RT Hawk, GBH, N. Harrier, passerines-unident. From wypt 004.
479	405275	4054161	Below Alabama Gates	Flush of 10+ ducks "in eclipse."
539	398252	4079032	Goose Lake Return to 2 Culverts	GADW female flushed from flooded side channel.
553	400265	4069588	Mazourka to Manzanar RR	2 mallard and male wood duck flushed from off river pond in oxbow, sora here and calling also.
560	400174	4068367	Mazourka to Manzanar RR	2 wood ducks flushed from area, open water pond.
562	400241	4068304	Mazourka to Manzanar RR	Mallard flushed from pond.
565	400500	4068243	Mazourka to Manzanar RR	Pond is full of many large bass.
567	400535	4067913	Mazourka to Manzanar RR	Wood duck flushed from oxbow.
569	400647	4067722	Mazourka to Manzanar RR	Large numbers of bass and a mallard in pond.
637	413962	4041755	Delta	10 White-Faced Ibis and 2 Snowy Egrets feeding in small area of flooded playa; Great Egret nearby.
638	413865	4041956	Delta	Photo shows area being used by 4 Greater Yellowlegs for foraging flooded playa.
639	413814	4042929	Delta	Small fish in flooded saltgrass; do not look like mosquitofish (first fish on east side); area appears fairly saline.
640	412599	4044217	Delta	3 Redhead, 4 Mallard, 3 Black-Crowned Night Heron in pond, 40.1 mile east of river.
645	393670	4079328	Thibaut	16 White-Faced Ibis flushed from emergent veg.
646	393584	4079533	Thibaut	10 more White-Faced Ibis, 4 GADW, 40 MALL came off pond.
649	392916	4080169	Thibaut	Shallow flooded slick w/ 48 Western Least Sandpipers, 2 Blacknecked Stilts, 35 SBDO, 15 White-Faced Ibis, 2 Killdeer, 3 Greater Yellowlegs.
650	392687	4080394	Thibaut	Pond where 380 GWTE, 20 NSNO, 16 LITE, 2 GREG, 4 GADW, Sora were flushed. 8 WFIB in adjacent flooded DISP.
651	392916	4080169	Thibaut	Shallow flooded slick w/ 48 Western Least Sandpipers, 2 Blacknecked Stilts, 35 SBDO, 15 White-Faced Ibis, 2 Killdeer, 3 Greater Yellowlegs
652	392687	4080394	Thibaut	Pond where 380 GWTE, 20 NSNO, 16 LITE, 2 GREG, 4 GADW, Sora were flushed. 8 WFIB in adjacent flooded DISP.
697	402448	4062977	W side river below Manzanar to Georges	Female Wood Duck swimming away with head held low in water, Sora here too.
705	394564	4087695	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Mosquito fish and large carp.
712	394233	4088266	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Mud hen heading down stream.
722	394001	4089036	Mile 3.0 to 5.0 - Telegraph Hill south to Blackrock measuring station. Mile 5.0 to 6.0 - Blackrock Ditch south 1.5 miles.	Great Blue Heron on river bank, mile 3.6 - 3.7.
753	403372	4055989	West side So. of Alabama Gates and Lone Pine Depot Rd. North.	Lots of minnows 1-3", crawfish ~ 6:, frog, observed in several exposed sections of river bank.
778	394321	4079066	Thibaut-East track	~60 birds foraging in shallow pond. D. House to ID - white breasted but cannot get a good visual. See photos 6-7" head to tail, possibly sandpipers, 2 black necked stilts also foraging.
784	392642	4081097	Thibaut-East track	Scat of some variety. See photo
785	392380	4081093	Thibaut-East track	23 White-Faced Ibis foraging in pond SW of point, 2 egrets also using area.
786	392059	4081337	Thibaut-East track	15 ducks, 11 ibis using area NW of point.
787	392964	4080095	Thibaut-East track	10 ibis using Dumbo Pond.

6.0 Hydrologic Monitoring

Prepared by:
Los Angeles Department of Water and Power

October 2008

6.1. River Flows

On July 12, 2007 a Court Stipulation & Order was issued requiring LADWP to meet specific flow requirements for the LORP. From the issue date through September 2008 LADWP has been in compliance with the flow requirements outlined in the Stipulation & Order and listed here:

1. Minimum of 40 cfs released from the Intake at all times.
2. None of the 10 in-river measuring stations has a 15-day running average of less than 35 cfs.
3. The mean daily flow at each of the 10 in-river measuring stations must equal or exceed 40 cfs on 3 individual days out of every 15 days.

The flow data listed in the tables at the end of the Hydrographic Summary show LADWP was in compliance with the Stipulation as at no time was the Intake below 40 cfs, and at no time was the number of days above 40 cfs below 3 days out of the last 15 days.

6.1.1. Web Posting Requirements

The Stipulation & Order also outlined web posting requirements for the LORP Data. LADWP has met all the posting requirements for the daily reports, monthly reports, and real time data.

Daily Reports listing the flows for the LORP, the Delta flows, the Blackrock Waterfowl Area wetted acreage, and the Off-River Lakes and Ponds depths are posted each day on the web at http://www.ladwp.com/ladwp/cms/ladwp009121.jsp.

Monthly reports summarizing each month and listing all of the raw data for the month are posted to the web at http://www.ladwp.com/ladwp/cms/ladwp009817.jsp.

Real time data showing flows at the Intake, Owens River at 2 Culverts, Owens River at Reinhackle Springs, Keeler Bridge, and the Pumpback Station are posted to the web at http://www.ladwp.com/ladwp/aqueduct/showAqueductMap.ladwp?contentId=LADWP_AQUERTD_SCID under the 'Lower Owens River Project' link.

6.1.2. Measurement Issues

LORP flows are measured using Sontek SW acoustic flow meters. All of the Sontek SW meters along the LORP are mounted on the bottom of the river channel. These devices are highly accurate and final records for the LORP generally fall within normal water measurement standards of +/- 5%.

Any factors which change the levels or velocities in the river also affect the accuracy of the Sontek meters. Seasonal changes such as spring/summer vegetation growth causing water levels to increase and velocities to decrease are one such factor. Another factor is sediment build up. As a band of sediment builds up on or near the measuring station section, the water levels of the section can increase or velocities can be shifted--both of which affect the accuracy of the Sontek meters. Gas bubbles under the Teranap Geomembrane artificial mats located at the Above Blackrock Return, East of Goose Lake, and Reinhackle Springs stations is yet another factor which causes water level and velocity changes.

In order to account for these environmental changes, LADWP manually measures flow at all of the stations along the LORP to check the accuracy of the meters. Each time a current metering is done, a 'shift' is applied to the station to take into account the difference in flow determined by the current metering. If a fundamental change in the flow curve is observed then a new index is created from the current metering data and downloaded to the meter. All of the meters on the LORP are calibrated at a minimum of once per month to maintain the accuracy of the meters.

A commentary on each station along the LORP follows:

LORP Intake

Measurement Device: Langemann Gate & Sontek SL Acoustic Flow Meter
The Langemann gate regulates and records the flow values at the Intake and has had very good accuracy and reliability as long as the gate does not become submerged. In case of submergence, the Sontek SL Acoustic Flow meter was installed as a back up to the Langemann Gate, but due to turbulence and constantly changing flow conditions the meter proved very difficult to keep calibrated. LADWP has ordered a Water Log bubbler system to measure downstream water levels which will replace the Acoustic Flow meter and provide a back up flow measuring device in cases where the Langemann Gate may be submerged (submergence may be possible at higher flows such as when the seasonal habitat flows are released).

LORP at Above Blackrock Return

Measurement Device: Sontek SW Meter.
The meter here is installed on one of the artifical mats mentioned above. The main problem associated with this section is the gasses forming below the mat, causing gas bubbles. These bubbles shift the velocity profile, and thus cause the measurement of the meter to shift. To address the gas bubble problem, LADWP crews cut the mat and allow the gases to escape. Sediment also builds up at this station, but it is a mild problem and cleaning or jetting sediment off of the mat is performed approximately once every 3 months.

LORP at East of Goose Lake

Measurement Device: Sontek SW Meter.
The meter here is installed on one of the artifical mats mentioned above. Large amounts of sediment build up at this station, causing shifts in the flow profile and at times completely covering the meter. LADWP personnel clean the mat at this station once and sometimes twice a month, whenever sediment deposits are spotted forming on the meter section. The gas bubble problem is also present at this station.

LORP at Two Culverts

Measurement Device: Two Sontek SW Meters.
The meter section at this station consists of two culverts, each having a Sontek SW meter placed in the bottom. The culverts are new and in excellent condition. Indexing the meters using the Sontek software at stations where the meters are placed in a culvert is not possible due to the profile of the culverts, but a theoretical flow curve has been applied to the culverts based on manual current meter shots and the accuracy of the station has generally been good. Almost no issues of sediment build up have been experienced at this station.

LORP at Mazourka Canyon Road

Measurement Device: Two Sontek SW Meters.
This section consists of two culverts and results have been similar to the experiences at the Two Culverts station. The culverts here are older compared to those at Two Culverts, but are in good condition.

LORP at Manzanar Reward Road

Measurement Device: Two Sontek SW Meters.
This section also consists of two culverts. However, the culverts here are older, smaller in size, and are placed on a steep slope. This combination causes high velocities and turbulent flow so the 'shifts' applied by the manual current metering are much higher here than at other stations.

LORP at Reinhackle Springs

Measurement Device: Sontek SW Meter.
The meter here is installed on one of the artificial mats mentioned above. Sediment build up exist here, but is not a major problem. This station also experiences major problems with the formation of gas bubbles and the mat must be closely monitored so the gas bubbles can be addressed soon after they form.

LORP at Lone Pine Narrow Gage Road

Measurement Device: Two Sontek SW Meters.
The meter section at this station consists of two culverts, each having a Sontek SW meter placed in the bottom. These culverts provide a generally good measuring section, but a major problem of sediment build up exists here. A large investment of manpower has been made at the site to correct sediment issues, which sometimes quickly reoccur. Also the water in these culverts tends to be fairly deep, which causes safety concerns with crews trying to clean sediment out of the culverts.

LORP at Keeler Bridge

Measurement Device: Sontek SW Meter.
This meter is installed in a concrete measuring section. The defined concrete section and laminar flow profile provides ideal conditions for water measurement. Also, very few sediment problems exist at this station. Other than the Langemann Gate at the Intake, this section has been the most accurate and reliable in the LORP.

LORP at Above Pumpback Station

Measurement Device: Pump Station Discharge Meter, Langemann Gate, Weir
The flow at the Above Pumpback Station is a calculated flow resulting from adding three measurement device outputs: The Pump Station's electronic discharge flow meter, the Langemann Gate Release to Delta, and the Weir to Delta. All of these devices are very accurate. The only problem experienced for this station occurred during the high flows of the seasonal habitat when water flowing to the delta backed up to the point where the weir measuring the overflow to the Delta became submerged. This occurred at flows above approximately 150 cfs and for the duration of the higher flows LADWP crews manually current metered the river above the pump station to obtain flow data.

6.2. Flows to the Delta & Brine Pool

Flows have been recorded coming out of the Delta to the Brine Pool at two stations (east and west branches) since July 2007, and flows have been adjusted at the Langemann Gate at the Pump Station to maintain approximately 0.5 cfs flow going into the Brine Pool. The average flows into the Brine Pool have actually been much higher (over 6 cfs) since the Stipulation & Order date of July 12, 2007. Most of the excess has come from flows due to winter rainfall and the flushing flows occurring in late February and early March 2008. During the period of March to September 2008 the flow to the brine pool averaged 0.5 cfs.

The Stipulation & Order requires LADWP to continuously record the flow data going into the brine pool for a year. On three separate occasions last fall and winter the measuring stations in the Delta were washed out due to high flows (twice from rain and once from the flushing flows). The stations were established for the fourth time in March 2008, and no further problems have been experienced since then. LADWP plans to abandon the stations after the full year of flow recordings have been established coming up this March 2009. After March 2009, flows released to the Delta will be managed in order to average 6 to 9 cfs in each year as called for in the LORP EIR.

6.3. Blackrock Waterfowl Area

Wetted Acreage for the Blackrock Waterfowl Area has been measured every 2 weeks since July 2007. During the first year of the LORP (July 2007 to March 2008) the requirement was to maintain approximately 290 flooded acres. Two ponding areas were flooded, Thibaut and Winterton, and the average flooded acreage for the two areas totaled 477 acres for the July 2007 to March 2008 period.

For 2007-2008 the flooded acreage requirement has increased to 430 acres and during the period of April 2008 to September 2008 the average has been 515 acres.

6.3.1. Variation Issues

Although the wetted acreage goals were met, both the Thibaut and Winterton Units experienced large variations in wetted acreage.

For the Thibaut Unit the variation was due mainly to its topography. The Thibaut Unit is very flat with slight undulations which create very shallow pool areas. With only small changes to inflows new pool areas were created or dried up causing large variations in the wetted acreage measurements. Other factors which influence the area such as rainfall, nearby irrigation uses, and changes in evaporation or transpiration also caused the wetted acreage to increase or decrease rapidly.

The wetted acreage variation at the Winterton Unit can be accounted for due to varying inflows. When the Thibaut Unit’s acreage would vary from one measurement to the next then LADWP would respond by lowering or raising the inflows to both Units in order to meet the overall wetted acreage goals. Also, at the start of the project LADWP personnel were unsure of what inflows would be required to meet the wetted acreage goals, especially when other influences such as seasonal changes in evaporation and transpiration affected the project. At times, LADWP overcompensated when assessing current wetted acreage vs. wetted acreage goals.

In response to the variation problems LADWP has:

1) Tracked the inflows and wetted acreage numbers to provide a reference as to what future inflows may be required in order to meet goals.
2) Streamlined their internal flow change protocols to ensure better monitoring of the waterfowl wetted acreages.
3) Replaced the measuring device, which measures inflows into the Winterton Unit, with an AVFM meter. The meter was installed on April 1, 2008 and has been measuring accurately since calibration was completed.

6.4. Wetted Acreage Measurement Issues

In order to measure the flooded acreage, LADWP has been locating the edge of the water using GPS equipment. This has been labor intensive and LADWP has been looking at other methods to measure the wetted acreage.

- One of the methods being studied is to use staff gages throughout the wetted acreage ponding areas and attempt to find a relationship between the depth of water at the gages and the wetted acreage. Another method being looked at is to relate inflows into the waterfowl ponding areas to the wetted acreage. So far, both methods are not having much success due to weak correlations between staff gage depths to wetted acreage and weak correlations between inflows to wetted acreage.

- Additionally, LADWP has looked at satellite imagery to see if the wetted acreage could be determined from the images, but vegetation growth obscured the water and makes using the images unfeasible.

6.5. Off-River Lakes and Ponds

For all of 2007 and 2008 through September the flows into the Off-River Lakes and Ponds were maintained at Goose Lake, Upper Twin Lake, and Lower Twin Lake so the staff gauges at these lakes read between 1.5 and 3.0 feet. At no time did any of the gages indicate below 1.5 feet.

Billy Lake

Due to the topography of Billy Lake in relation to the Billy Lake Return Station, whenever the Billy Lake Return station is showing flow, Billy Lake is full. LADWP maintains Billy Lake by monitoring the Billy Lake Return station to always ensure some flow is registering there. When referring to the table showing the annual summary of flows, at no time did the flow at Billy Lake Return Station fall to zero for a day, Billy Lake remained full for the entire year.

Thibaut Pond

Thibaut Pond is contained completely within the Thibaut Unit of the Waterfowl Area. Each day the Thibaut Unit wetted acreage and the Thibaut Pond acreage is posted to the web in the LORP daily reports found at: http://www.ladwp.com/ladwp/cms/ladwp005341.jsp

Any time the Thibaut Unit is showing wetted acreage above zero, then Thibaut Pond is full. From July 12th, 2007 until September 30th, 2008 Thibaut Unit showed wetted acreage above zero at every read point, so Thibaut Pond was full for the entire period Over the past year, sediment issues have caused problems at many of the temporary stations. At the Above Blackrock Return, East of Goose Lake, and Lone Pine Narrow Gage stations, sediment builds up particularly fast and covers the SonTek meters installed on the stream bed. LADWP personnel must monitor the build up and perform cleaning operations as needed.

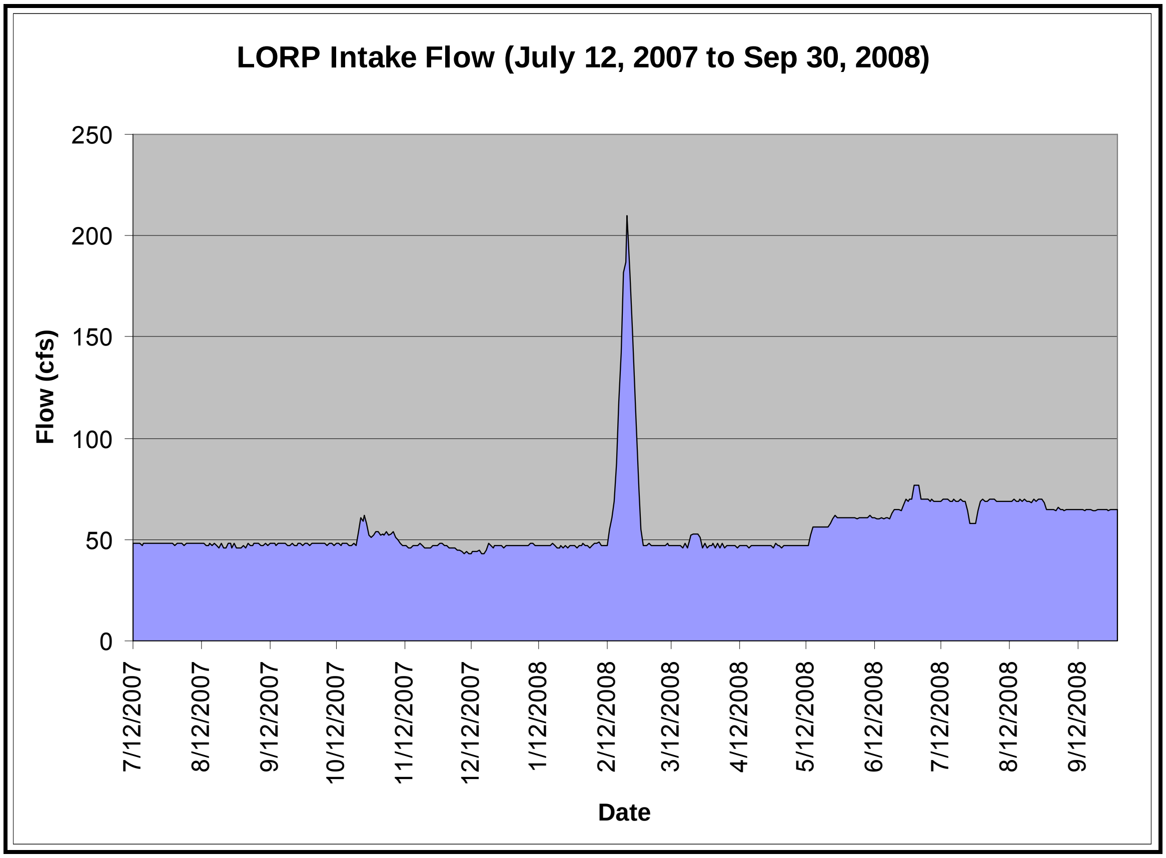
6.6. Appendices

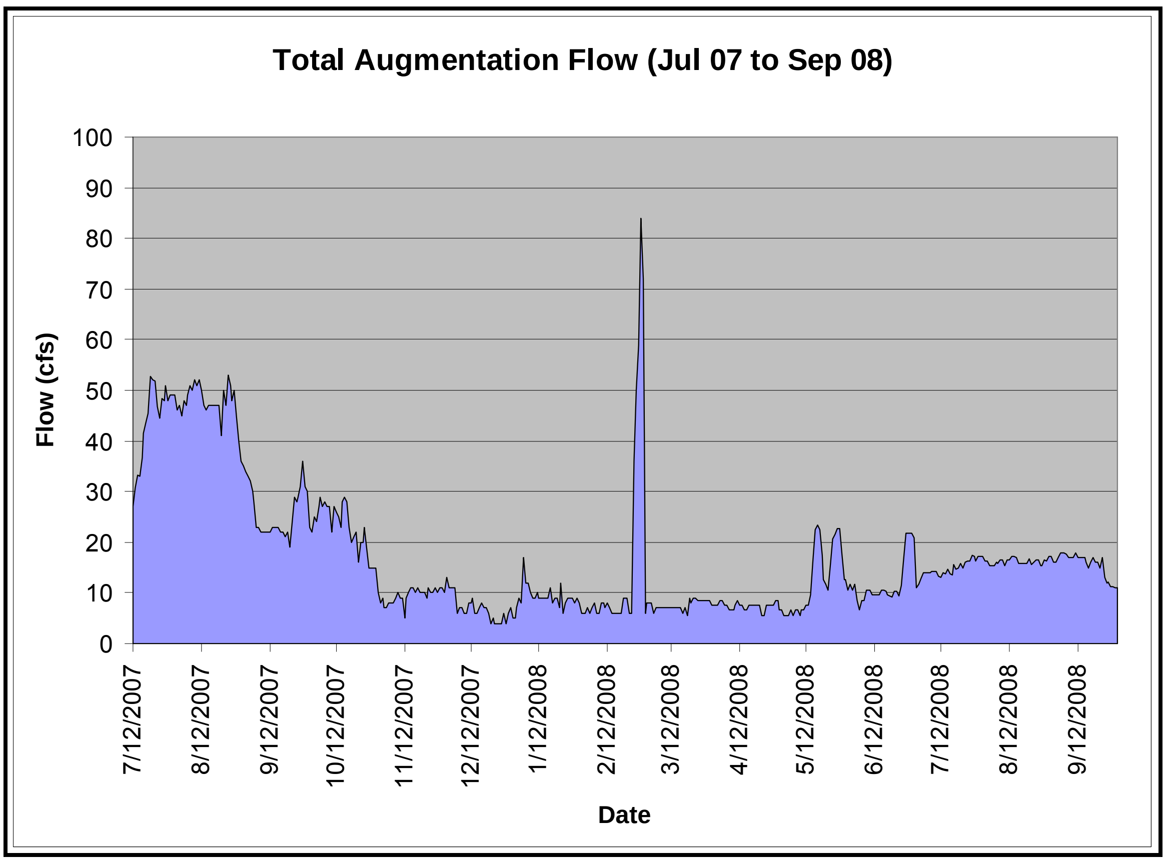
6.6.1. Appendix A Hydrologic Monitoring Tables and Graphs

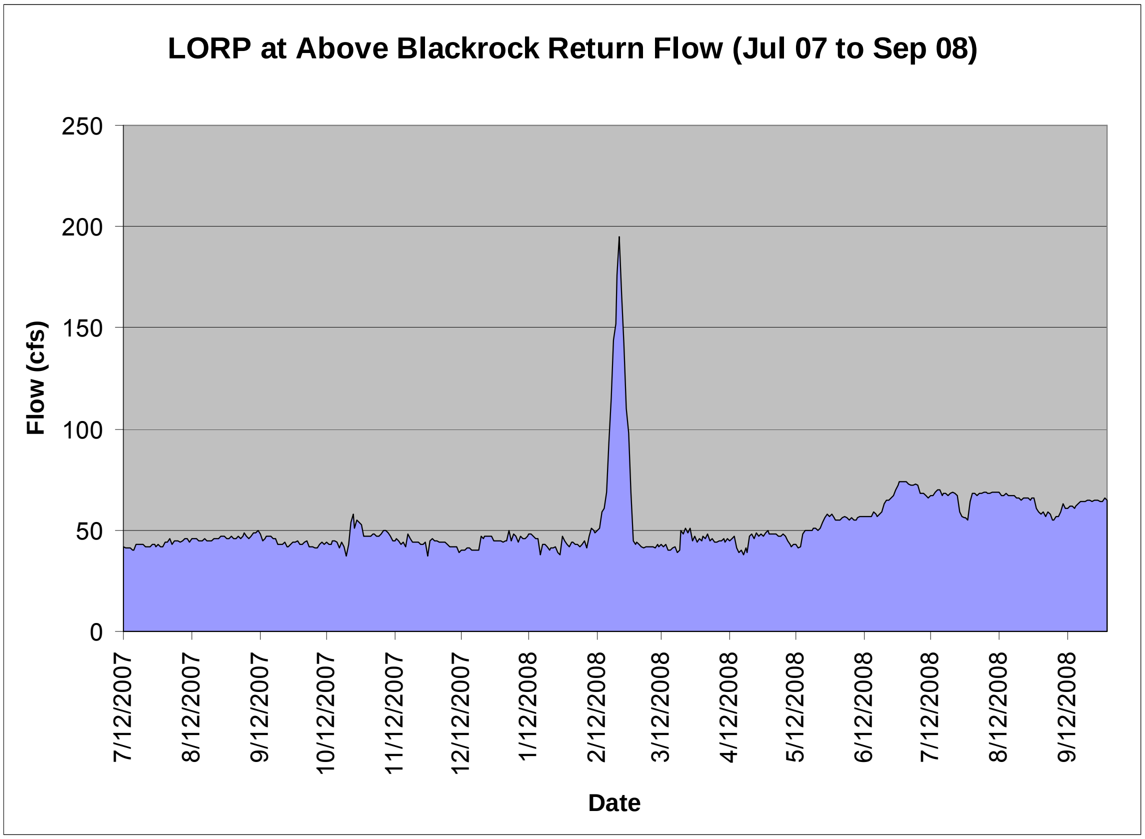
LORP FLOWS - WATER YEAR 2006-07 *			
(JUL 2007 - SEP 2007)			
STATION NAME	AVERAGE FLOW(cfs)	MAX FLOW (cfs)	MIN FLOW (cfs)
Below River Intake	47.6	48	46
Above Blackrock Return	44.2	49	12.6
Blackrock Return Ditch	7.1	11	1.1
East of Goose Lake	54.2	59	40
Goose Lake Return	2.1	2	1.25
Two Culverts	45.1	52	38.3
Billy Lake Return	5.8	6	4.1
Mazourka Canyon Road	46.5	52	42.3
Locust Ditch Return	3.4	8	0
Manzanar Reward Road	55.2	59	40
Georges Ditch Return	7.4	10	2.7
Reinhackle Springs	52.3	61	43.3
Alabama Gates Return	12.4	25	4.94
Lone Pine Narrow Gage Road	51.1	68	37.2
Keeler Bridge	53.7	68	37.9
Pumpback Station	39.7	50	24.6
Langemann Gate to Delta	8.0	18	4.41
Weir to Delta	0.5	8	0
Flow to Brine Pool (east branch)	0.0	0.18	0
Flow to Brine Pool (west branch)	0.8	2.85	0
* These flows only account for flows since the Court Stip & Order issued in July 2007 through the end of the water year.			

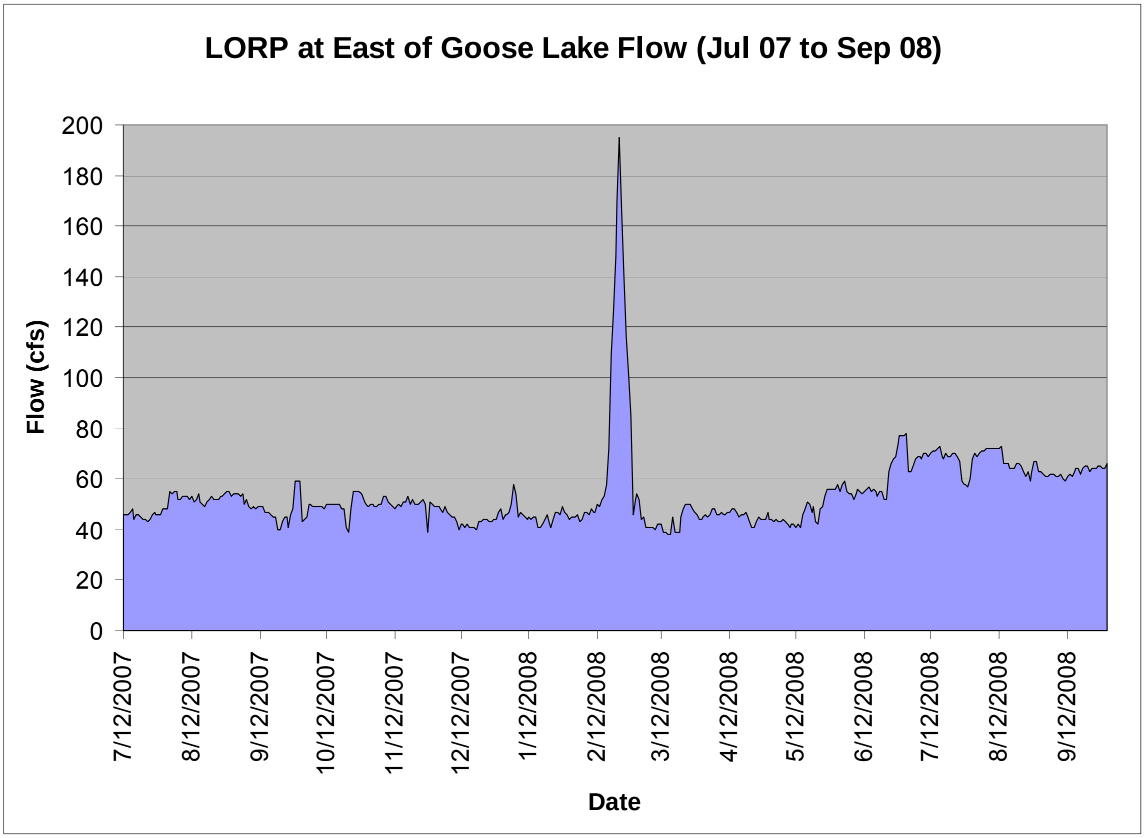
LORP FLOWS - WATER YEAR 2007-08			
(OCT 2007 - SEP 2008)			
STATION NAME	AVERAGE FLOW(cfs)	MAX FLOW (cfs)	MIN FLOW (cfs)
Below River Intake	57.7	204	43
Above Blackrock Return	54.5	187	38.3
Blackrock Return Ditch	4.9	12	0.88
East of Goose Lake	55.2	187	38
Goose Lake Return	2.1	5	1.25
Two Culverts	54.5	176	38.3
Billy Lake Return	1.2	6	0.2
Mazourka Canyon Road	54.2	172	37.3
Locust Ditch Return	0.1	2	0
Manzanar Reward Road	55.5	158	40.3
Georges Ditch Return	3.2	9	0
Reinhackle Springs	54.3	167	37.3
Alabama Gates Return	1.5	79	0
Lone Pine Narrow Gage Road	51.8	217	37.2
Keeler Bridge	54.1	221	38.3
Pumpback Station	43.0	49	24.6
Langemann Gate to Delta*****	6.8	13	4.41
Weir to Delta*****	5.5	160	0
Flow to Brine Pool (east branch)	7.1	174	0
Flow to Brine Pool (west branch)	1.3	5.35	0

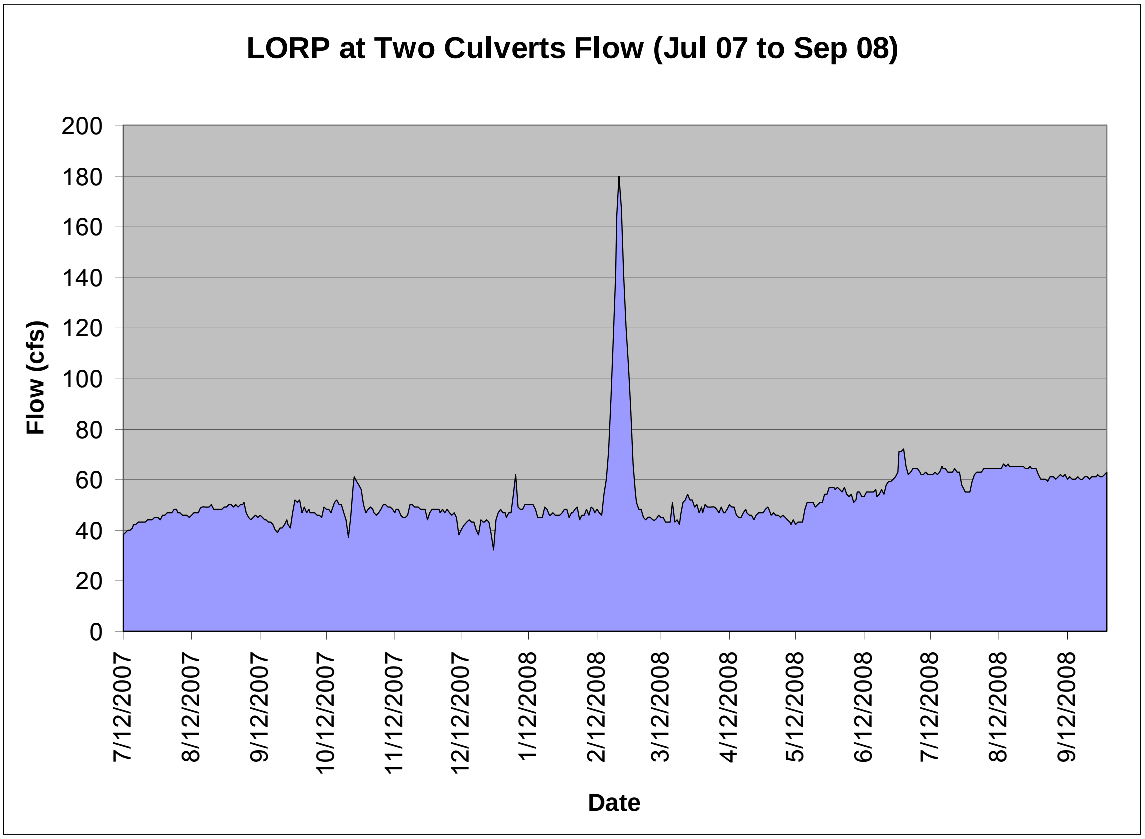
Without the seasonal flow included, the average flow at the Langemann Gate to Delta was 6.5 and at Weir to Delta was 2.4.

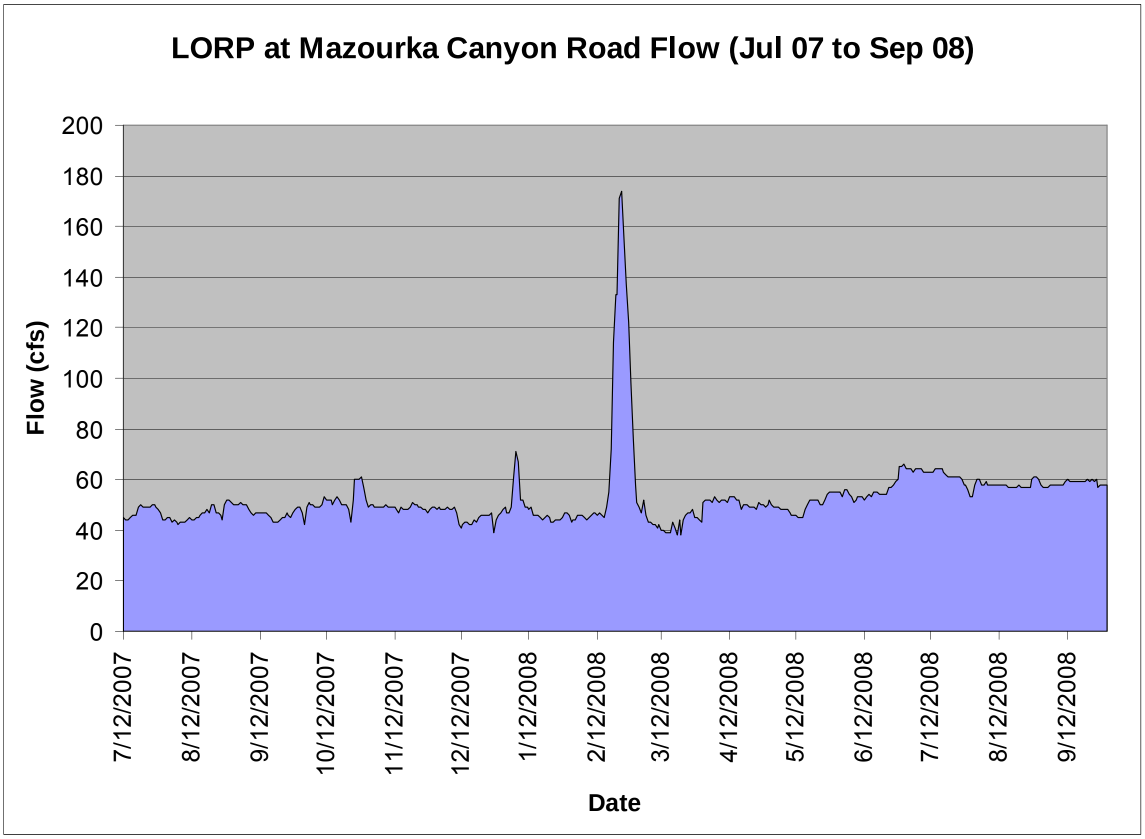

LORP Intake Flow (July 12, 2007 to Sep 30, 2008)
Flow (cfs)
250
200
150
100
50
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

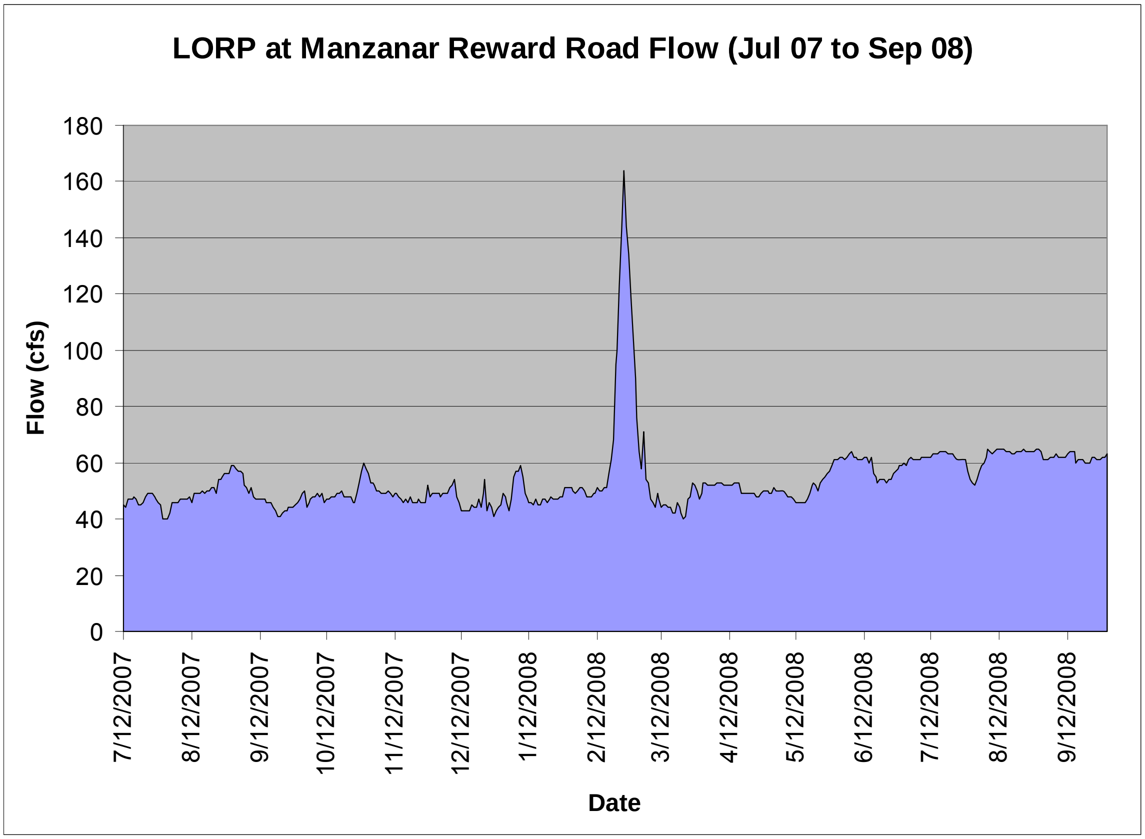

Total Augmentation Flow (Jul 07 to Sep 08)
Flow (cfs)
100
90
80
70
60
50
40
30
20
10
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

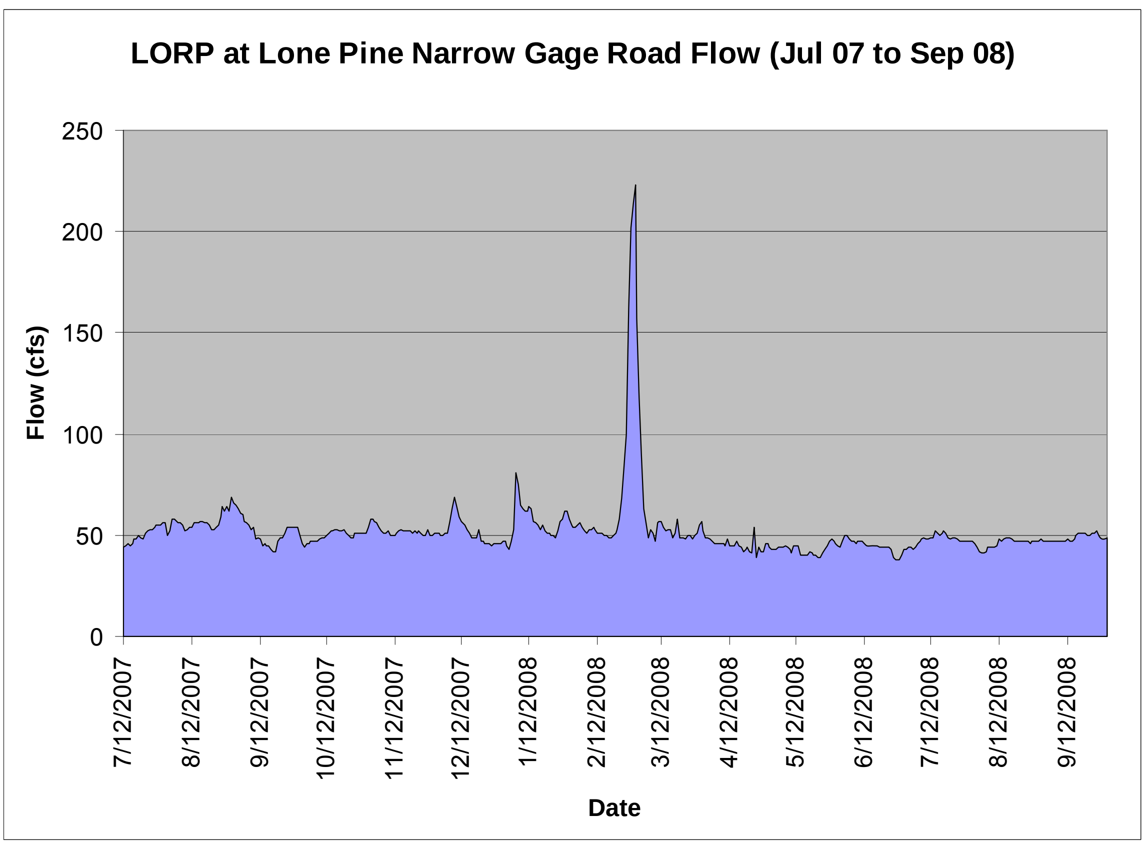

LORP at Above Blackrock Return Flow (Jul 07 to Sep 08)
Flow (cfs)
250
200
150
100
50
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

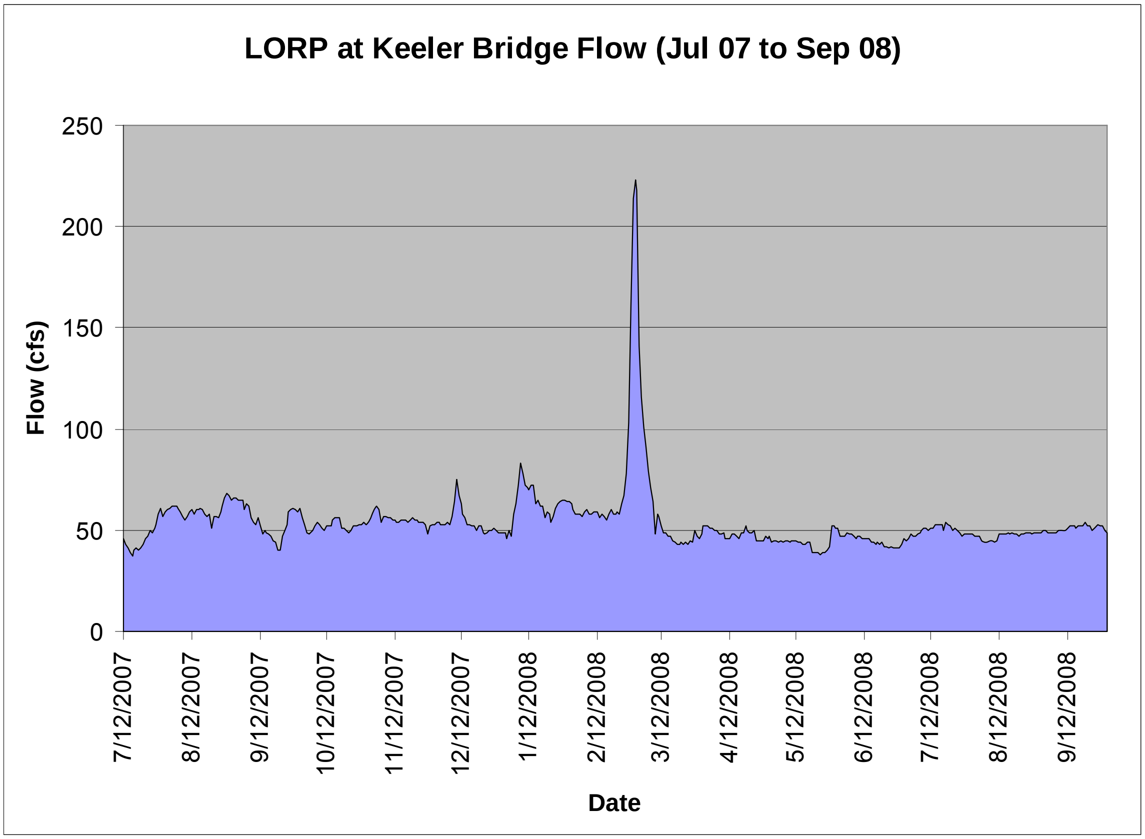

LORP at East of Goose Lake Flow (Jul 07 to Sep 08)
Flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

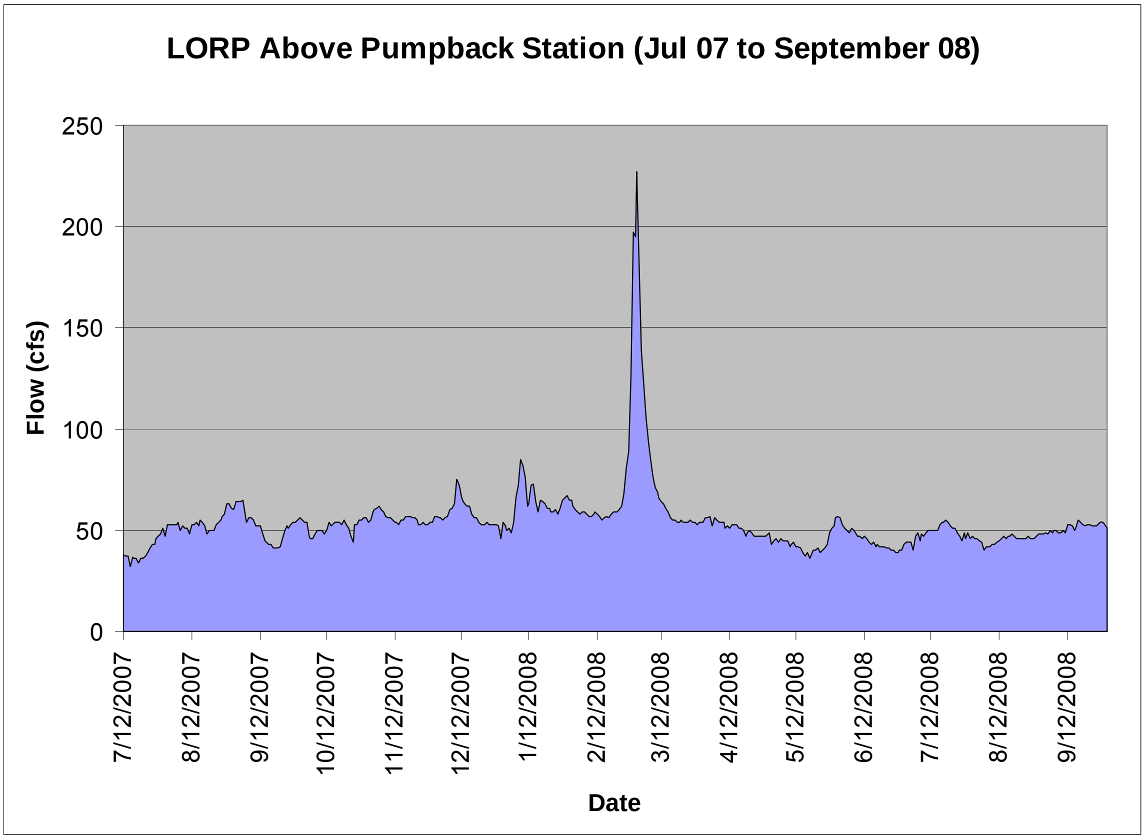

LORP at Two Culverts Flow (Jul 07 to Sep 08)
Flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

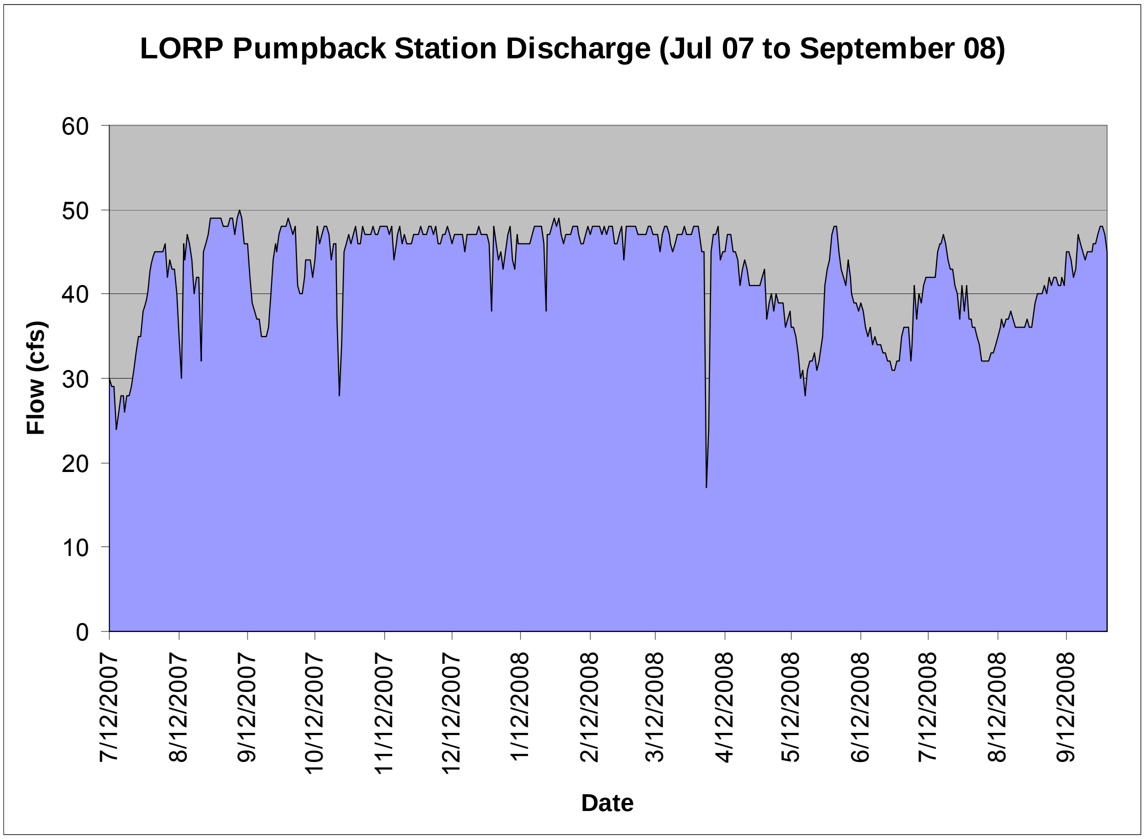

LORP at Mazourka Canyon Road Flow (Jul 07 to Sep 08)
Flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

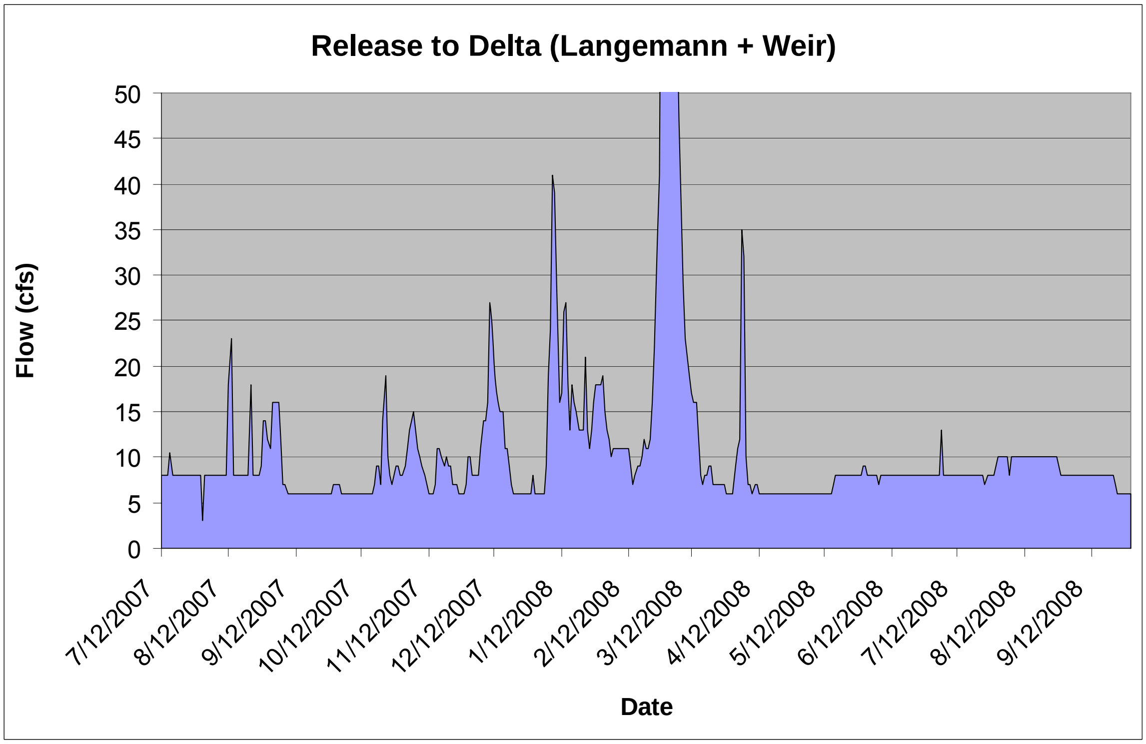

LORP at Manzanar Reward Road Flow (Jul 07 to Sep 08)
Flow (cfs)
180
160
140
120
100
80
60
40
20
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

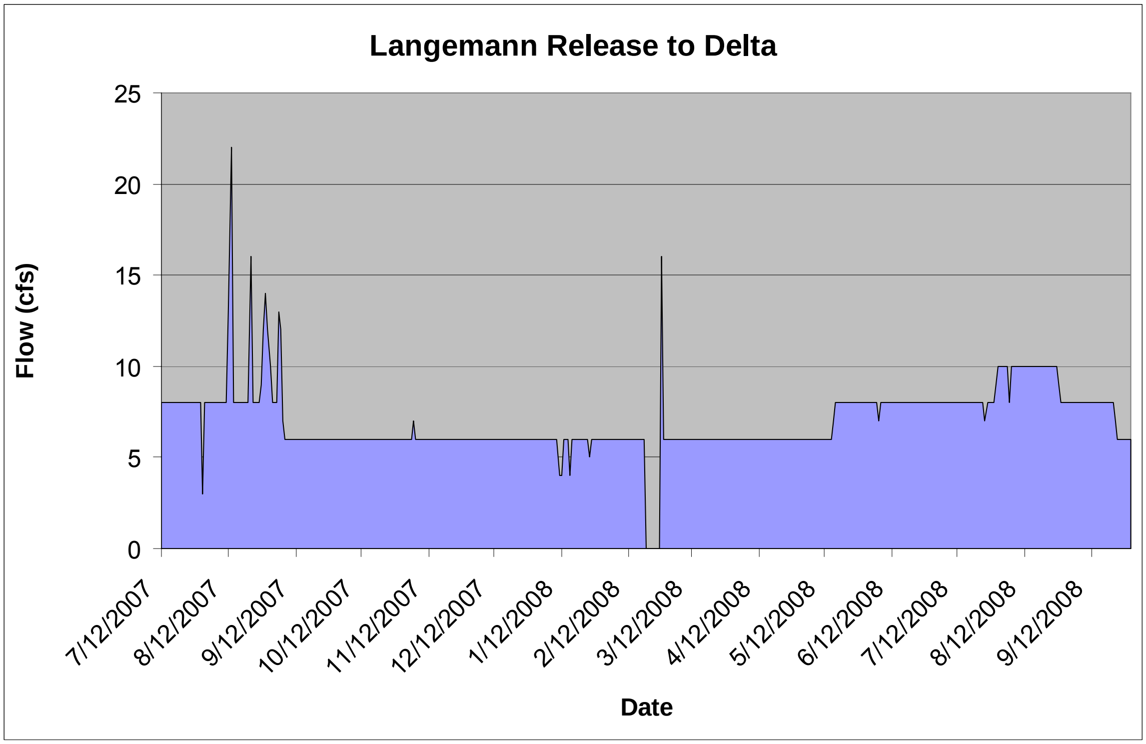

LORP at Lone Pine Narrow Gage Road Flow (Jul 07 to Sep 08)
Flow (cfs)
250
200
150
100
50
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

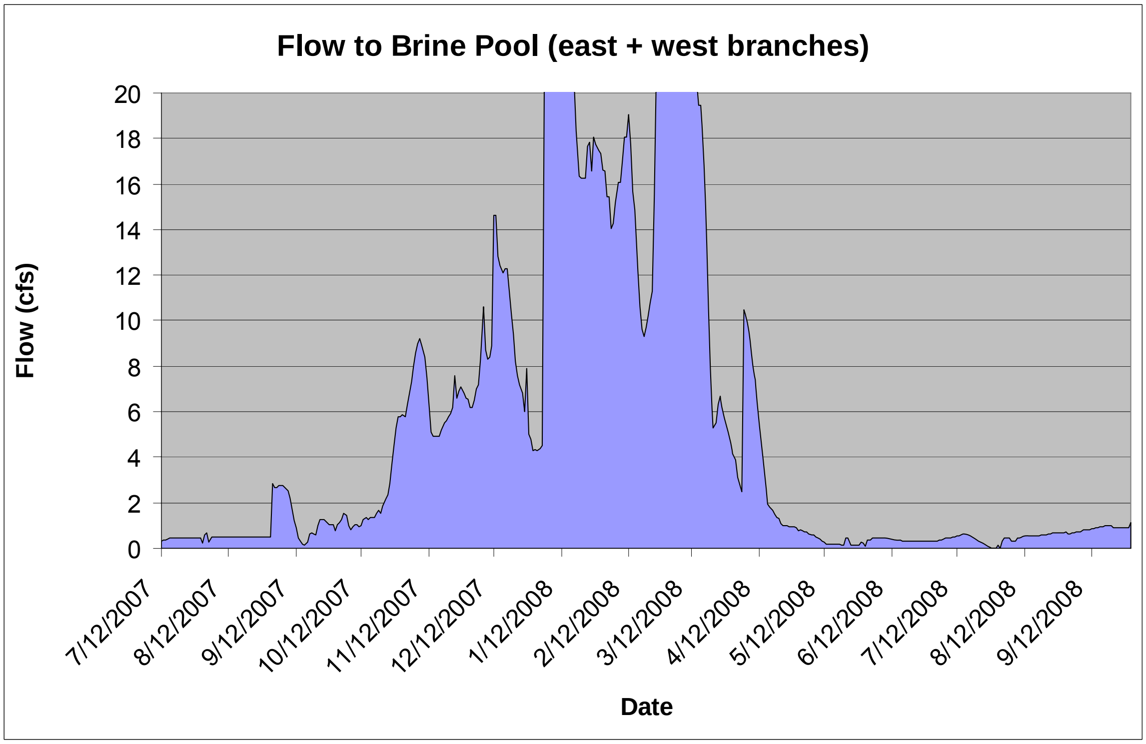

LORP at Keeler Bridge Flow (Jul 07 to Sep 08)
Flow (cfs)
250
200
150
100
50
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

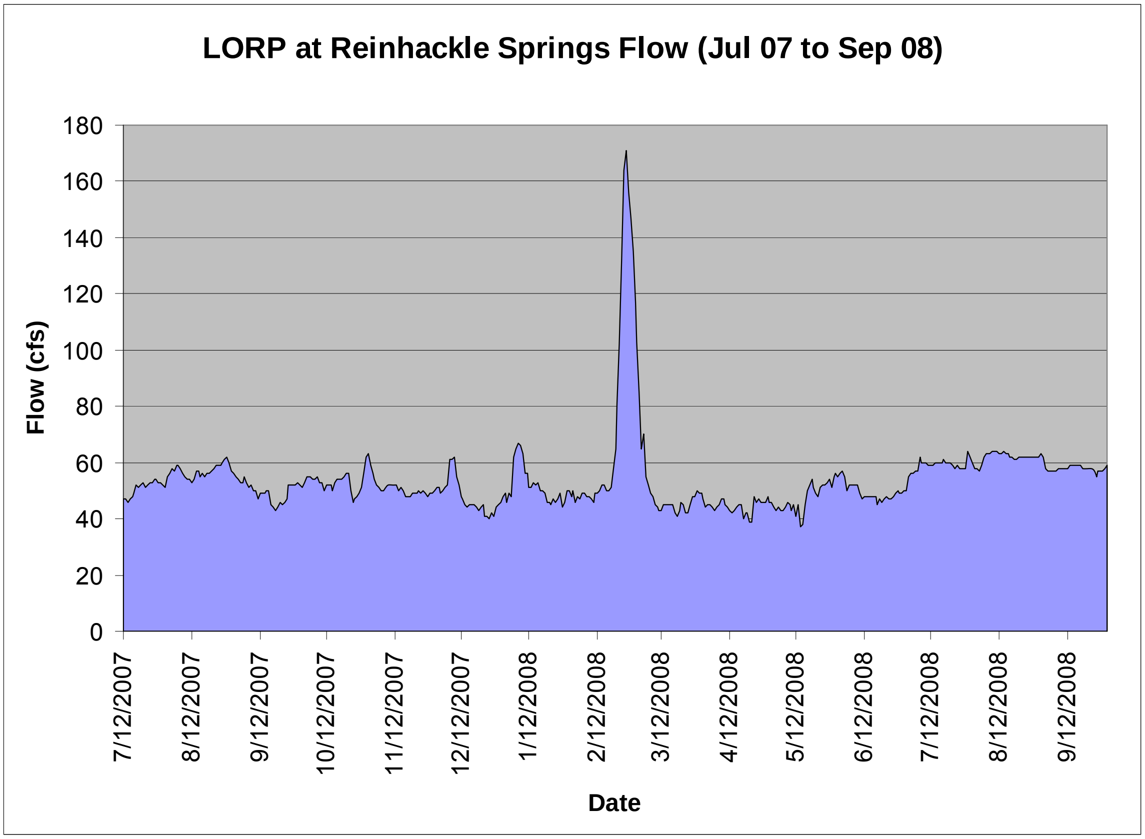

LORP Above Pumpback Station (Jul 07 to September 08)
Flow (cfs)
250
200
150
100
50
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date

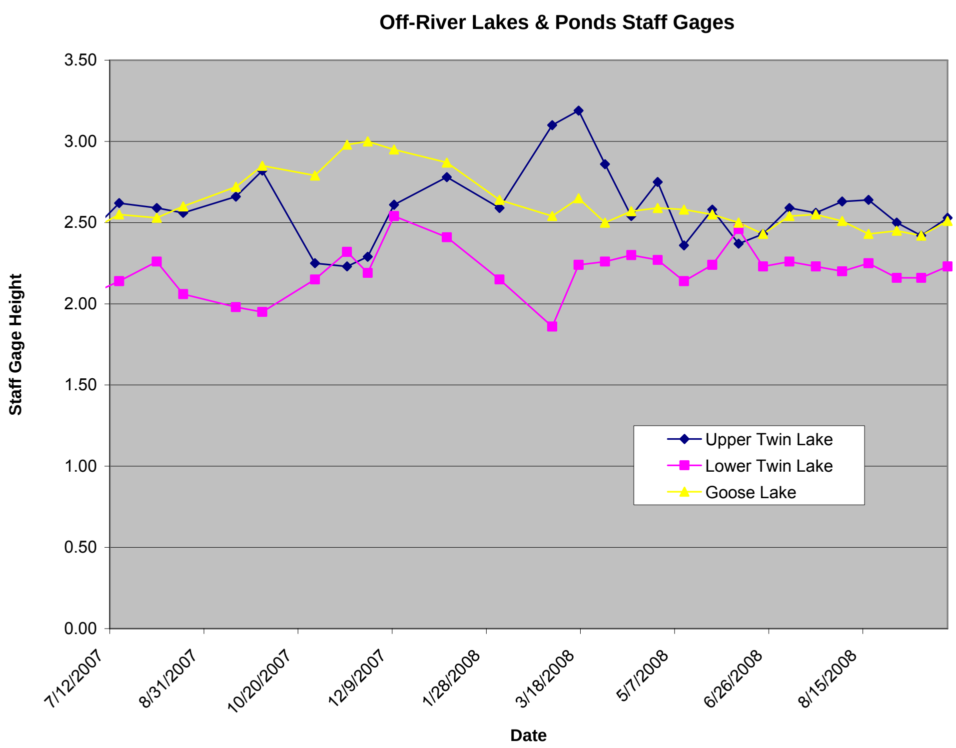

LORP Pumpback Station Discharge (Jul 07 to September 08)
Flow (cfs)
60
50
40
30
20
10
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date


Release to Delta (Langemann + Weir)
Flow (cfs)
50
45
40
35
30
25
20
15
10
5
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date


Langemann Release to Delta
Flow (cfs)
25
20
15
10
5
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date


Flow to Brine Pool (east + west branches)
Flow (cfs)
20
18
16
14
12
10
8
6
4
2
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date


LORP at Reinhackle Springs Flow (Jul 07 to Sep 08)
Flow (cfs)
180
160
140
120
100
80
60
40
20
0
7/12/2007
8/12/2007
9/12/2007
10/12/2007
11/12/2007
12/12/2007
1/12/2008
2/12/2008
3/12/2008
4/12/2008
5/12/2008
6/12/2008
7/12/2008
8/12/2008
9/12/2008
Date


Off-River Lakes & Ponds Staff Gages
Staff Gage Height
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Upper Twin Lake
Lower Twin Lake
Goose Lake
7/12/2007
8/31/2007
10/20/2007
12/9/2007
1/28/2008
3/18/2008
5/7/2008
6/26/2008
8/15/2008
Date

Winterton Unit Wetted Acreage

July 2007 to September 2008

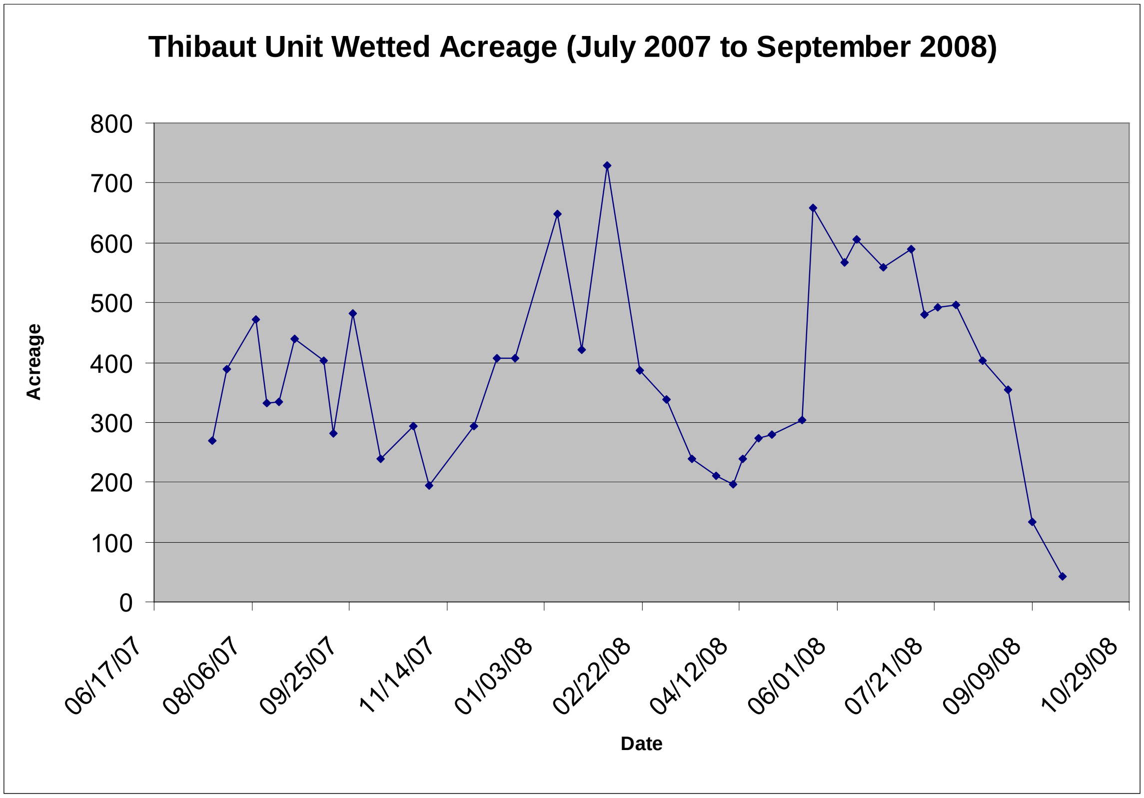
READ DATE	WETTED ACREAGE
07/24/07	160
08/07/07	148
08/14/07	137
08/20/07	76
08/30/07	90
09/11/07	84
09/25/07	128
10/11/07	128
10/30/07	134
11/27/07	47
12/12/07	18
12/18/07	138
01/08/08	127
01/22/08	47
02/06/08	33
03/06/08	19
03/20/08	135
04/02/08	135
04/10/08	106
04/16/08	81
04/21/08	67
04/28/08	59
05/08/08	63
05/14/08	37
05/29/08	135
06/05/08	138
06/12/08	118
06/26/08	111
07/10/08	109
07/16/08	108
07/24/08	117
08/06/08	126
08/20/08	116
09/03/08	159
09/16/08	184

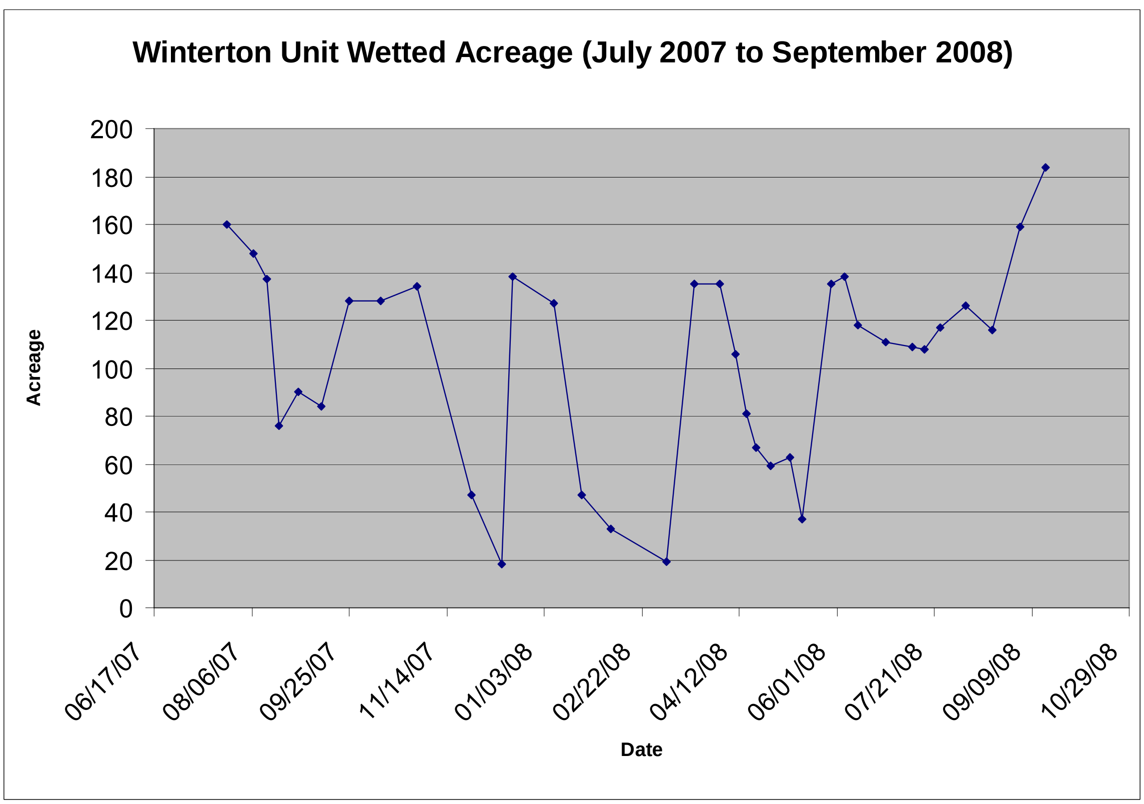
Thibaut Unit Wetted Acreage

July 2007 to September 2008

READ DATE	WETTED ACREAGE*
07/17/07	270
07/24/07	388
08/08/07	472
08/14/07	333
08/20/07	334
08/28/07	439
09/12/07	403
09/17/07	281
09/27/07	483
10/11/07	240
10/28/07	294
11/05/07	195
11/28/07	294
12/10/07	407
12/19/07	407
01/10/08	648
01/22/08	421
02/04/08	730
02/21/08	386
03/06/08	338
03/19/08	238
03/31/08	211
04/09/08	197
04/14/08	238
04/22/08	273
04/29/08	279
05/14/08	304
05/20/08	658
06/05/08	568
06/11/08	606
06/25/08	560
07/09/08	590
07/16/08	479
07/23/08	493
08/01/08	497
08/15/08	404
08/28/08	355
09/09/08	133
09/25/08	43

* This acreage does not include the 28 acres for the flooded Thibaut Pond area.


Thibaut Unit Wetted Acreage (July 2007 to September 2008)
Acreage
800
700
600
500
400
300
200
100
0
06/17/07
08/06/07
09/25/07
11/14/07
01/03/08
02/22/08
04/12/08
06/01/08
07/21/08
09/09/08
10/29/08
Date


Winterton Unit Wetted Acreage (July 2007 to September 2008)
Acreage
200
180
160
140
120
100
80
60
40
20
0
06/17/07
08/06/07
09/25/07
11/14/07
01/03/08
02/22/08
04/12/08
06/01/08
07/21/08
09/09/08
10/29/08
Date

7.0 Land Use

Prepared by:
Los Angeles Department of Water and Power

October 2008

7.1. Introduction

The land use component of the LORP is composed of project elements related to livestock grazing management. Under the land management program, the intensity, location, and duration of grazing is managed through the establishment of new riparian pastures, forage utilization rates, and prescribed grazing periods (described in Section 2.8.1.3 and 2.8.2 LORP EIR 2004). Other actions include protection of rare plant populations, establishment of off-river watering sources (to reduce use of the river and off-river ponds for livestock watering), monitoring of utilization, and rangeland trend throughout the leases to ensure that grazing rates maintain the long-term productivity of the rangelands.

Grazing Management Plans developed for the LORP leases modify grazing practices in riparian and upland areas on seven LADWP leases in order to support LORP goals. The seven leases within the LORP planning area are: the Intake, Twin Lakes, Blackrock, Thibaut, Islands, Lone Pine, and Delta. LORP-related land use activities and monitoring that took place in 2008 are presented by lease, in Section 7.2, Land Use results.

7.1.1. Utilization

The Owens Valley Land Management Plan developed as part of the LORP identifies grazing utilization standards for upland and riparian areas. Utilization is defined as the percentage of the current year's herbage production consumed ~~or destroyed~~ by herbivores. Grazing utilization standards identify the maximum amount of biomass that can be removed by grazing animals during specified grazing periods. LADWP has developed height-weight relationship curves for native grass and grass-like forage species in the Owens Valley using locally-collected plants. These height-weight curves are used to relate the percent of plant height removed with the percent of biomass removed by grazing animals. 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 (mid and end points of a grazing period) will determine compliance with grazing utilization standards, while long-term utilization data will aid in the interpretation of range trend data and will help guide future grazing management decisions.

The calculation of utilization (by transect and pasture) is based on a weighted average of at least 20 samples for each forage species. Therefore, species that only comprise a small part of available forage contribute proportionally less to the overall use value than more abundant species.

7.1.2. Riparian Utilization Rates and Grazing Periods

Under the LORP, livestock will be allowed to graze in riparian pastures during the grazing periods prescribed for each lease (see Sections 2.8.2.1 through 2.8.2.7 LORP EIR 2004). Livestock will be removed from riparian pastures when the utilization rate reaches 40 percent or at the end of the grazing period, whichever comes first. In general, the prescribed grazing periods for riparian pastures will be several months in the spring (shorter than the past grazing practice). The beginning and ending dates of the lease-specific grazing periods may vary from year to year depending on the conditions such as climate and weather, but the duration remains approximately the same. The grazing periods and utilization rates are designed to facilitate the recruitment and establishment of riparian shrubs and trees.

7.1.3. Upland Utilization Rates and Grazing Periods

In upland pastures, the maximum utilization allowed on herbaceous vegetation, in any year, will be 65 percent if grazing occurs between October 1 and April 1. The maximum utilization allowed will be 50 percent if the grazing occurs between April 2 and September 30; however, if all grazing is deferred until after seed-ripe of herbaceous vegetation (i.e., late summer; exact timing depends on precipitation, weather, and other factors), maximum utilization can be increased to 65 percent. If this exception is used, then no additional grazing can occur during any other period of the year on this same upland. If the lessee grazes during both periods (October 1 to April 1 and again from April 2 to September 30), the maximum utilization allowed for the upland field will be reduced to 50 percent. The utilization rates and grazing periods for upland pastures are designed to sustain livestock grazing and productive wildlife through efficient use of forage. If there are upland vegetation types located within fenced riparian pastures, the upland vegetation will be managed using the uplands utilization criteria.

Riparian pastures may also contain upland habitat. If significant amounts of upland vegetation occur within a riparian pasture or field, upland grazing utilization standards, as outlined in this lease plan, will also apply to these upland habitat types. Livestock will be removed from a riparian pasture when either the riparian or the upland grazing utilization standard is met.

Monitoring methodologies are fully described in Section 4.6.2 *of the Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, Inc., 2008).

Utilization monitoring is conducted annually. Permanent utilization transects have been established in upland and riparian areas of pastures within the LORP planning area. An emphasis has been placed on establishing utilization monitoring sites within riparian management areas. Currently, not all LORP pastures have permanent utilization transects. Generally, each monitoring site is visited approximately mid-way through the grazing period (Mid-Season) and again at the conclusion of the grazing period (End-of-Season).

The lessee's will be given up to three years to phase in requirements described above. At the beginning of 2010, the lessee must meet all standards, criteria, and other management directions outlined their grazing plan. Watershed Resources staff will update each lessee with their mid- and end-of-season utilization results for each year. During that time the lessee will also be provided with next years target utilization stubble heights for riparian and upland management areas. This will allow LADWP and the lessees to communicate and make grazing management changes as needed in order to meet LORP goals.

7.1.4. Range Trend

Range trend sampling was not conducted in 2008. LORP-related range trend monitoring is scheduled to take place in 2009.

7.1.5. Irrigated Pastures

Irrigated pasture condition scoring took place on all irrigated pastures within the LORP project boundary during 2007. Any pasture that rated below 80 percent was re-evaluated during the 2008 irrigation season. The results of those pastures evaluated in 2008 will be described within each individual lease description.

7.1.6. Fencing

The LORP EIR identified approximately 44 miles of new fencing to be built in the project area to improve grazing management and help meet LORP goals. The new fencing consists of fenced riparian pastures, upland pastures, riparian exclosures, rare plant exclosures, and rare plant management areas. Fence construction began in September 2006 and was built in lease-specific locations to allow the lessees to rotate livestock between riparian and upland areas while optimizing the distribution of livestock within each lease to achieve the overall habitat goals of the LORP.

All of the riparian fencing along the west side of the Owens River is complete. The eastern drift fence on the Blackrock Lease has also been completed. The Thibaut Riparian Exclosure and Delta Riparian Exclosure have also been completed. Special management area fencing that has been completed includes the Thibaut Waterfowl Management Area and the Rare Plant Management Area. Completion of these new fences totals 38 miles (88%) of the approximately 44 miles of fence to be built for the LORP. Focus has now turned to building grazing and rare plant exclosures and completing drift fences. Most of the drift fences will create new riparian pastures by splitting current large riparian pastures. These remaining fences will be discussed in more detail below as part of each individual lease.

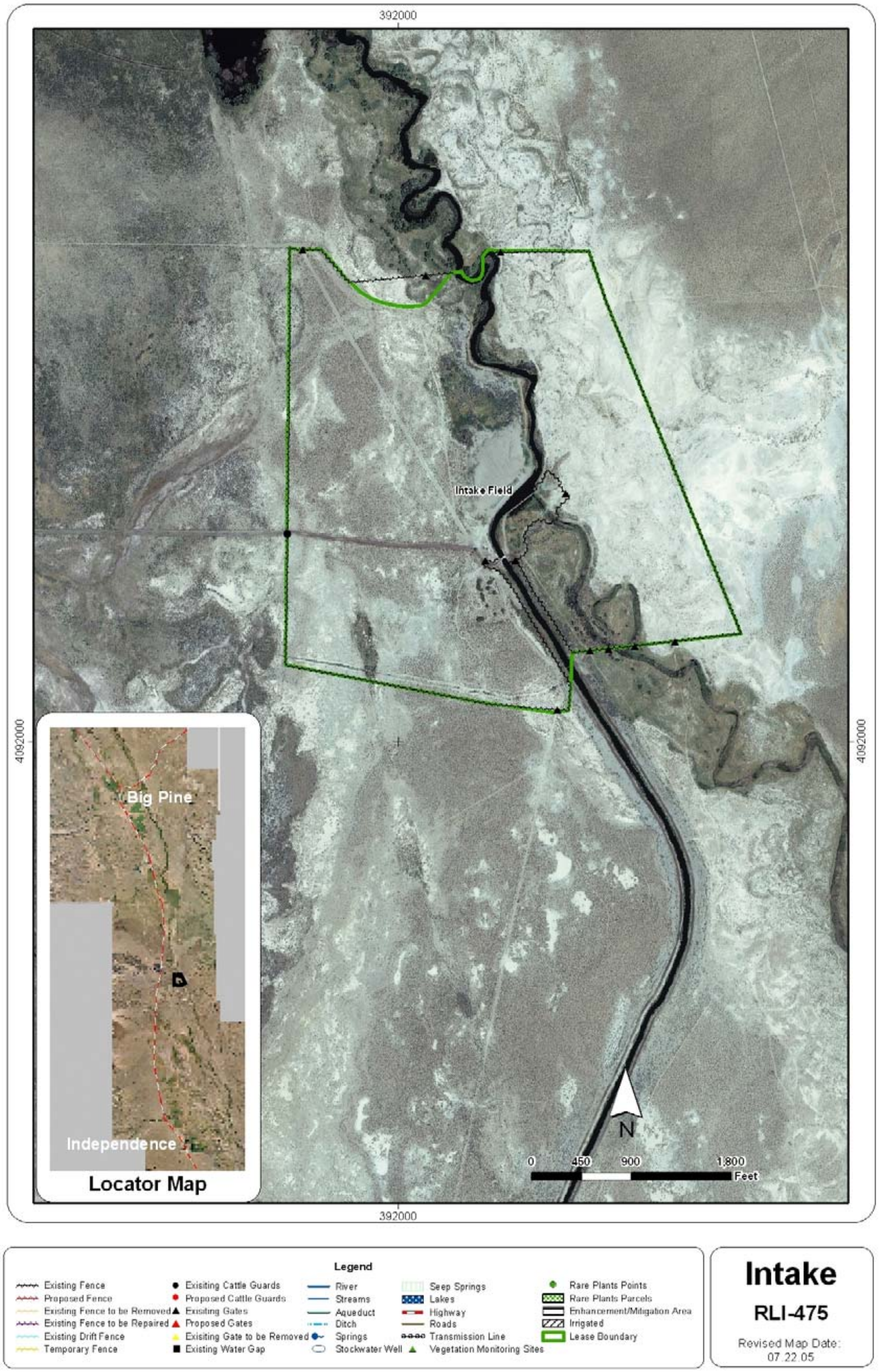
7.2. 2008 Land Use Results

7.2.1. Intake Lease

The Intake Lease (Land Use Figure 1) is used to graze horses and mules employed in a commercial packer operation. The lease is comprised of two pastures – the Intake Field and the Big Meadow Field (approximately 102 acres). The only pasture within this lease that is within the LORP area is the Big Meadow Field. The Big Meadow Field contains upland and riparian vegetation, and the lease plan notes that the pasture will be managed as a riparian pasture. There are no irrigated pastures on the Intake Lease. There are currently no range trend transects in the Big Meadow Field. The Big Meadow Field was not used by livestock during the 2007-2008 grazing season therefore utilization was zero. There are no identified water sites needed for this pasture and no riparian exclosures planned due to the limited amount of riparian area within the pasture. During the 2008 LORP Rapid Assessment Survey (RAS), no supplement sites were documented in this field. The EIR identified 2 miles of new fencing for the Intake Lease (Land Use Figure 1). This fencing consisted of rebuilding the north boundary fence and installing a new fence around the riparian area south of the intake structure. Some repairs were also made to the south boundary fence. A break in the fencing of the Big Meadow Field was noted during the 2008 RAS which would allow livestock access to the Los Angeles Aqueduct. No controlled burns or wildfires occurred on this lease in 2008.

Lease	EIR Proposed (mi)	Completed (mi)
Intake	2	2

Land Use Table 1. 2008 Intake Fencing



Land Use Figure 1. Intake Lease

7.2.2. Twin Lakes Lease

The Twin Lakes lease is a 4,912-acre cow/calf operation situated just south of the Intake of the Los Angeles Aqueduct. It includes a reach of the Owens River that lies mainly north of Twin Lakes, which is located at the southern end of the lease. Of the 4,912 acres, approximately 4,200 acres are used as pastures for grazing; the other 712 acres are comprised of riparian/wetland habitats and open water. In all but dry years, cattle usually graze the lease from late October or early November to mid-May.

There are four pastures on the Twin Lakes lease within the LORP boundary:

- Lower Blackrock Riparian Field
- Upper Blackrock Field
- Lower Blackrock Field
- Holding Field

The first three pastures contain both upland and riparian vegetation. The Holding Field contains only upland vegetation. There are no irrigated pastures on the Twin Lakes Lease. Range trend and utilization transects exist in all fields except the Holding Field. The 2008 mid-season utilization monitoring on the Twin Lakes lease took place January 29 and 30. Most of the transects were below 40 percent utilization in the riparian areas and well below 65 percent in the uplands (Land Use Tables 2-3).

Riparian Management Areas		
PastureName	**Mid-Season**	**End Season**
Lower Blackrock Riparian Field	35%	35%
Upper Blackrock Field	20%	38%

Land Use Table 2. Percent Utilization for Riparian Pastures for both the mid- and end-of-season (allowable 40%).

Upland Management Areas		
PastureName	**Mid-Season**	**End Season**
Lower Blackrock Field	14%	14%

Land Use Table 3. Percent Utilization for Upland Pastures for both the mid- and end-of-season (allowable 65%).

The end-of-season utilization for the Twin Lakes lease took place in the first week of June. It reflected much of the same numbers as mid-season. This was due to a wet January resulting in high forage production of shrubs and annuals (Land Use Tables 4-5). The lessee was contacted and the tubs were moved. The timing and duration of grazing on the pastures is not known to be different than that specified in the grazing monitoring plan.

Riparian Management Areas		DISP	SPAI	Transect Average
PastureName	**UT Transect Name**			
Lower Blackrock Riparian Field	TWINLAKES_03	25%	50%	28%
	TWINLAKES_04			
	TWINLAKES_06			
	BLKROC_RIP_07	60.8%		61%
Upper Blackrock Field	INTAKE_01			
	BLKROC_RIP_08	28.9%	47.4%	38%

Land Use Table 4. Percent Utilization for Riparian End-of-Season by Transect Management Areas (allowable 40%)

Upland Management Areas			DISP	SPAI	Transect Average
	PastureName	UT Transect Name			
	Lower Blackrock Field	BLKROC_37	8%	9%	17%
		TWINLAKES_02	16%	30%	17%
		TWINLAKES_05	21%		21%
		BLKROC_FIELD_04	9.8%	10.3%	10%

Land Use Table 5. Percent Utilization for Upland End-of-Season by Transect Management Areas (allowable 65%)

All data collected showed grazing utilization to be below the currently-established utilization standards except for BLKROC_RIP_07. Utilization was high in this area due to the location of supplement tubs near the transect. The Twin Lakes lease will continue to be monitored during this phase-in-period and grazing management changes will be made if utilization continues to exceed the allowable 40 percent utilization rate. This will be determined by the collection of utilization data during the grazing season. The lessee complied with timing and duration standards within the lease management plan.

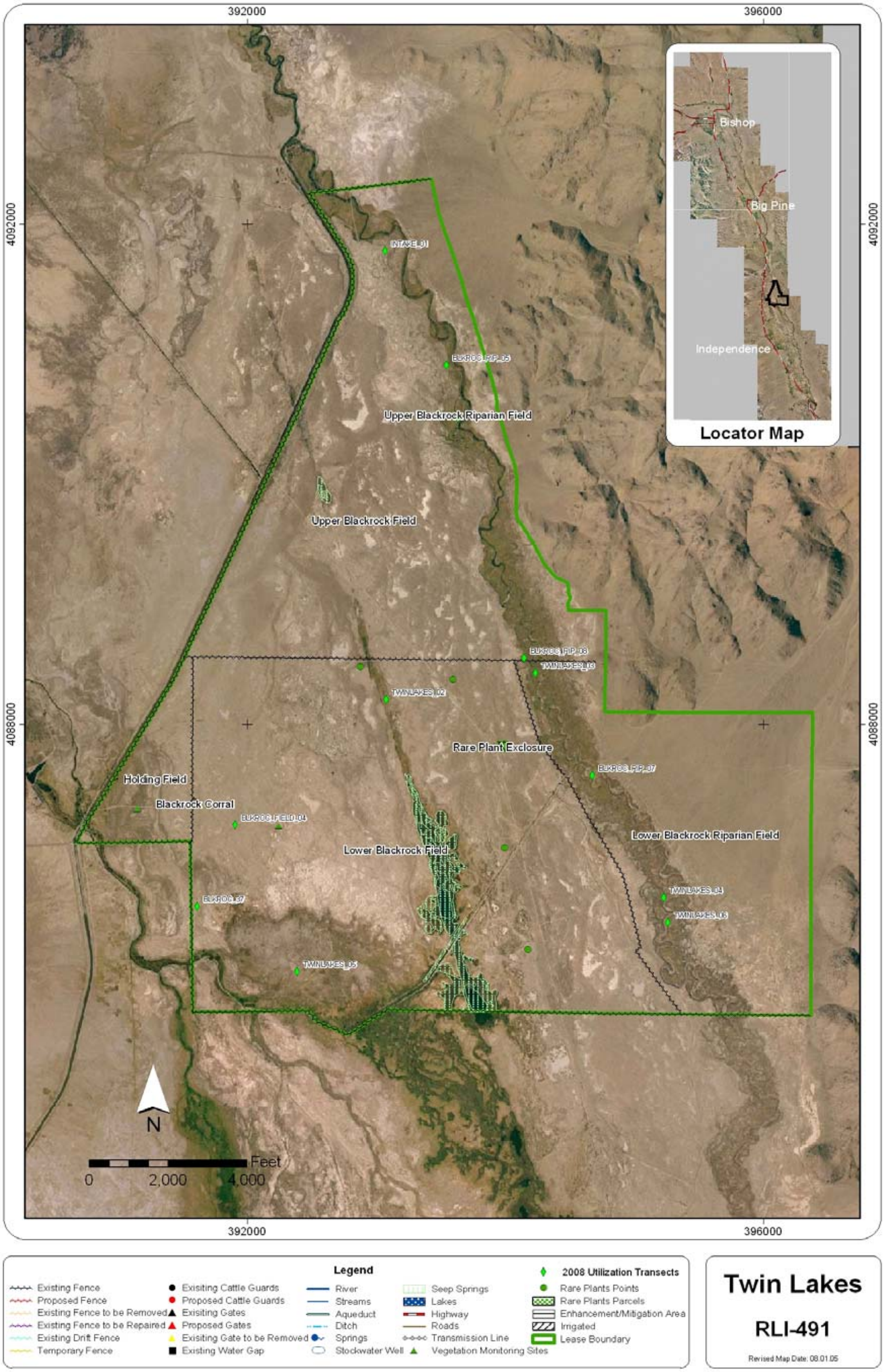
There are no identified water sites needed for the pastures. Fencing on the Twin Lakes Lease (Land Use Table 6) is very close to being completed. Repairs on an existing cross fence have been made and all of the riparian fencing has been completed. The remaining fencing project is the reconstruction of an existing 0.25-acre rare plant exclosure for Nevada oryctes (*Oryctes nevadensis)*. Repairs may also need to be made to the boundary fence between the Twin Lakes and Blackrock leases due to apparent cattle movement between these leases.

Lease	EIR Proposed (mi)	Completed (mi)
Twin Lakes	4.25	4

Land Use Table 6. 2008 Fencing Twin Lakes

Several supplement sites were noted along the riparian corridor on this lease during the 2008 RAS (see RAS report). As noted in the RAS report, a couple of these supplement sites were close to water and were relocated to avoid impacts.

No controlled burns or wildfires occurred on this lease in 2008.



Land Use Figure 2. Twin Lakes

7.2.3. Blackrock Lease

The Blackrock Lease (Land Use Figure 3) is a cow/calf operation consisting of 32,674 acres divided into 24 management units or pastures. The lease is the largest LADWP grazing lease within the LORP area. The lease pastures provide eight months of fall through spring grazing, which begins in early to mid-October and ends in mid-May or June.

There are twenty pastures on the Blackrock Lakes Lease within the LORP boundary:

- North Blackrock Holding
- South Blackrock Holding
- White Meadow Field
- White Meadow Riparian Field
- Reservation Field
- Reservation Riparian Field
- Little Robinson Field
- Robinson Pasture
- East Robinson Field
- North Riparian Field
- Russell Field
- Locust Field
- East Russell Field
- South Riparian Field
- West Field
- Wrinkle Field
- Wrinkle Riparian Field
- Spring Field
- Wrinkle Holding
- Horse Holding

The 2008 mid-season utilization monitoring for the Blackrock Lease took place during the first week of February. All of the data collected showed grazing utilization to be below set utilization standards with pastures looking relatively lightly grazed. The White Meadow Riparian Field had no measurable forage because it is part of the newly rewatered section of the Owens River and therefore utilization was not measured, although these sites were visited to evaluate forage availability (Land Use Tables 7-8).

Riparian Management Areas		
PastureName	**Mid-Season**	**End Season**
North Riparian Field	30%	42%
South Riparian Field	37%	23%
Reservation Riparian Field	Not taken	53%
White Meadow Riparian Field	Not taken	No forage
Wrinkle Riparian Field	20%	16%

Land Use Table 7. Percent Utilization for Riparian Mid- and End-of-Season by Pasture (allowable 40%)

Upland Management Areas		
PastureName	**Mid-Season**	**End Season**
Horse Holding	29%	35%
Locust Field	17%	15%
Reservation Field	31%	33%
Robinson Field	22%	54%
Russell Field	28%	46%
Springer Field	43%	39%
White Meadow Field	13%	12%
Wrinkle Field	23%	35%

Land Use Table 8. Percent Utilization for Upland Mid- and End-of-Season by Pasture (allowable 65%)

The 2008 end-of-season utilization monitoring took place the first week in June. Utilization in the riparian areas tended to be a little above 40 percent utilization while upland utilization remained low. The higher riparian utilization occurred in the North Riparian and Reservation Riparian Fields. On average transects were 2 to 10 percent higher than the target utilization rate of 40 percent (Land Use Tables 9-10).

Upland utilization remained low due to a wet January resulting in high forage production of shrubs and annuals.

Riparian Management Areas		DISP	LETR5	SPAI	Transect Average
PastureName	**UT Transect Name**				
Horse Holding	HORSEHOLD_02	41%		69%	56%
North Riparian Field	BLKROC_12	54%			54%
	BLKROC_22	31%		35%	32%
Reservation Riparian Field	BLKROC_15	Not taken due to lack of forage			
	BLKROC_17	53%			53%
South Riparian Field	BLKROC_13	20%		34%	27%
	BLKROC_23	6%		15%	10%
	SOUTHRIP_03	31%		54%	35%
White Meadow Riparian Field	BLKROC_14	Not taken due to lack of forage			
Wrinkle Riparian Field	BLKROC_18	18%		25%	21%
	BLKROC_19	14%		8%	12%
	BLKROC_20	13%			13%
	BLKROC_21	12%			12%

Table 9. Percent Utilization for Riparian End-of-Season by Transect Management Areas (allowable 40%)

Upland Management Areas		DISP	LETR5	SPAI	Transect Average
PastureName	**UT Transect Name**				
Horse Holding	BLKROC_09	6%		24%	15%
Locust Field	BLKROC_06	10%		20%	15%
Reservation Field	BLKROC_02	26%		33%	30%
	BLKROC_03	23%		63%	43%
	BLKROC_44	20%		36%	28%
	BLKROC_49	9%		19%	13%
	BLKROC_51	29%		64%	46%
Robinson Field	BLKROC_04	42%		75%	58%
	ROBINSON_02	30%		67%	49%
Russell Field	BLKROC_05	25%		57%	41%
	RUSSELL_02	39%		62%	50%
Springer Field	BLKROC_08	34%	70%		39%
White Meadow Field	BLKROC_01	8%			8%
	BLKROC_39	11%			11%
	WHITEMEADOW_03	17%			17%
	WHITEMEADOW_04	11%			11%
	WHITEMEADOW_05	16%			16%
Wrinkle Field	BLKROC_07	20%		34%	27%
	WRINKLE_02	52%		66%	56%
	WRINKLE_03	26%		29%	27%

Table 10. Percent Utilization for Upland End-of-Season by Transect Management Areas (allowable 65%)

Use on the Blackrock Lease exceeded the riparian utilization standard of 40 percent. However, due to the timing of the seasonal habitat flow for 2008, the lessee was unable to adhere to his normal livestock grazing rotation. In future years when the Seasonal Habitat Flow occurs later in the year, the lessee will use his normal grazing rotation and riparian utilization should be within the allowable standard. The lessee complied with timing and duration standards within the lease management plan.

Stock Water Sites

There are five identified water sites needed for the Blackrock Lease. These sites will be located in the White Meadow Field, Reservation Field, Reservation Riparian Field, North Riparian Field, and South Riparian Field. The location of the water sites are identified and are in the process of being budgeted for in the 2009 fiscal year. Once this occurs, installation of the watering sites will begin.

Fencing

The Blackrock Lease (Land Use Figure 3 and 4) comprises most of the new fencing in the LORP area. All of the north and south riparian fencing is completed along with an exclosure that was built around Well 368 to allow for management flexibility of Owens Pupfish habitat. Modifications were also made to the riparian fencing in order to improve access for recreation. These changes include installing cattle guards and widening walk-throughs. A drift fence south of Well 368 has also been completed. The purpose of this fence is to control cattle movement in the riparian area by dividing the North Riparian Field into the North Riparian Field and the South Riparian Field.

There are four rare plant and two riparian exclosures left to build on the lease. The riparian exclosures will be constructed around existing range trend sites and will be used as ungrazed reference transects. There is also an additional fence in the White Meadow Field due to the grazing prescriptions placed on the Winterton Unit of the Blackrock Waterfowl Management Area (BWMA) during periods of flooding. This fence is will be completed by the end of 2008.

Lease	EIR Proposed (mi)	Completed (mi)
Blackrock	20	21

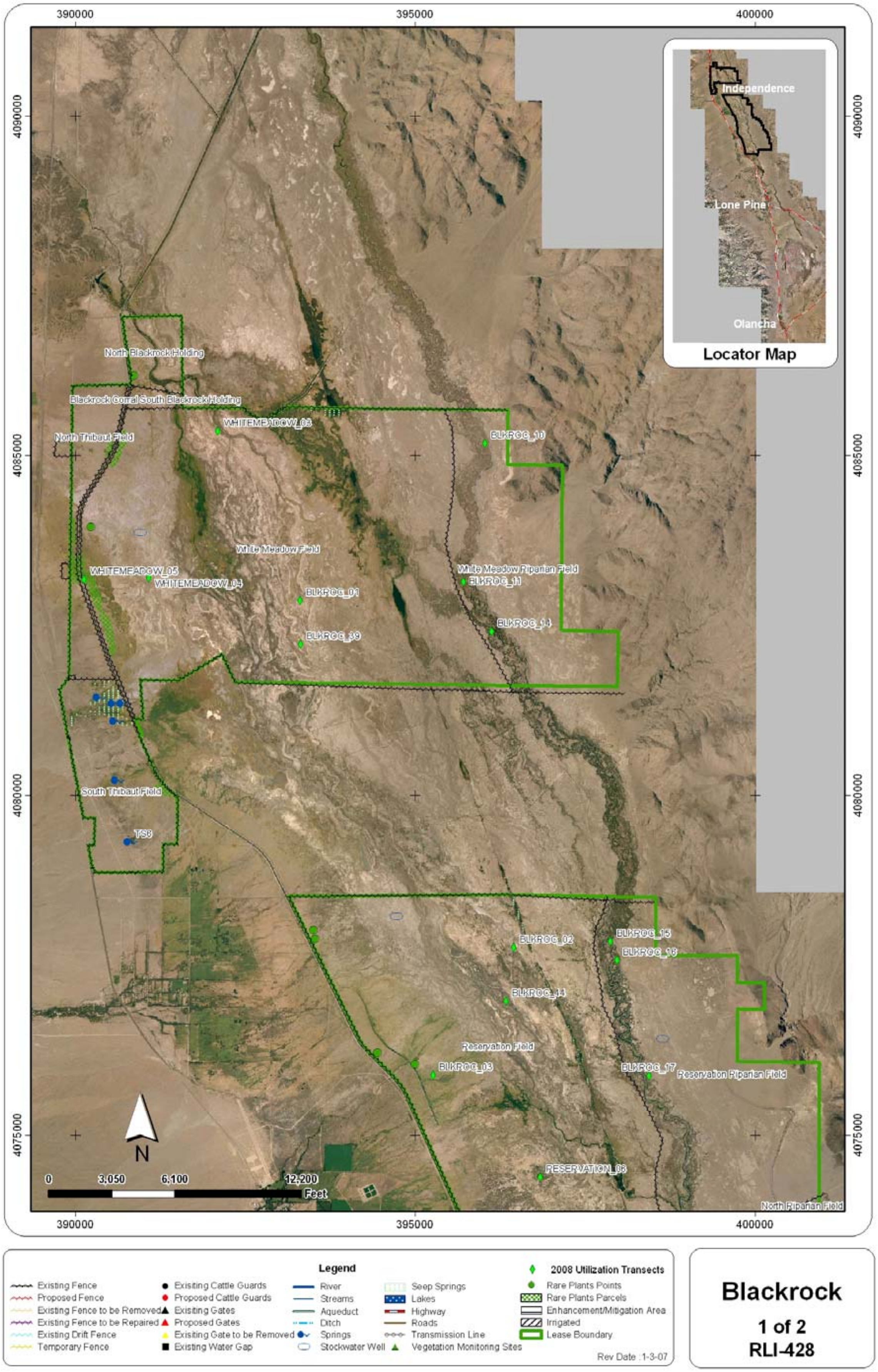
Land Use Table 11. 2008 Fencing Blackrock

Salt and Supplement Sites

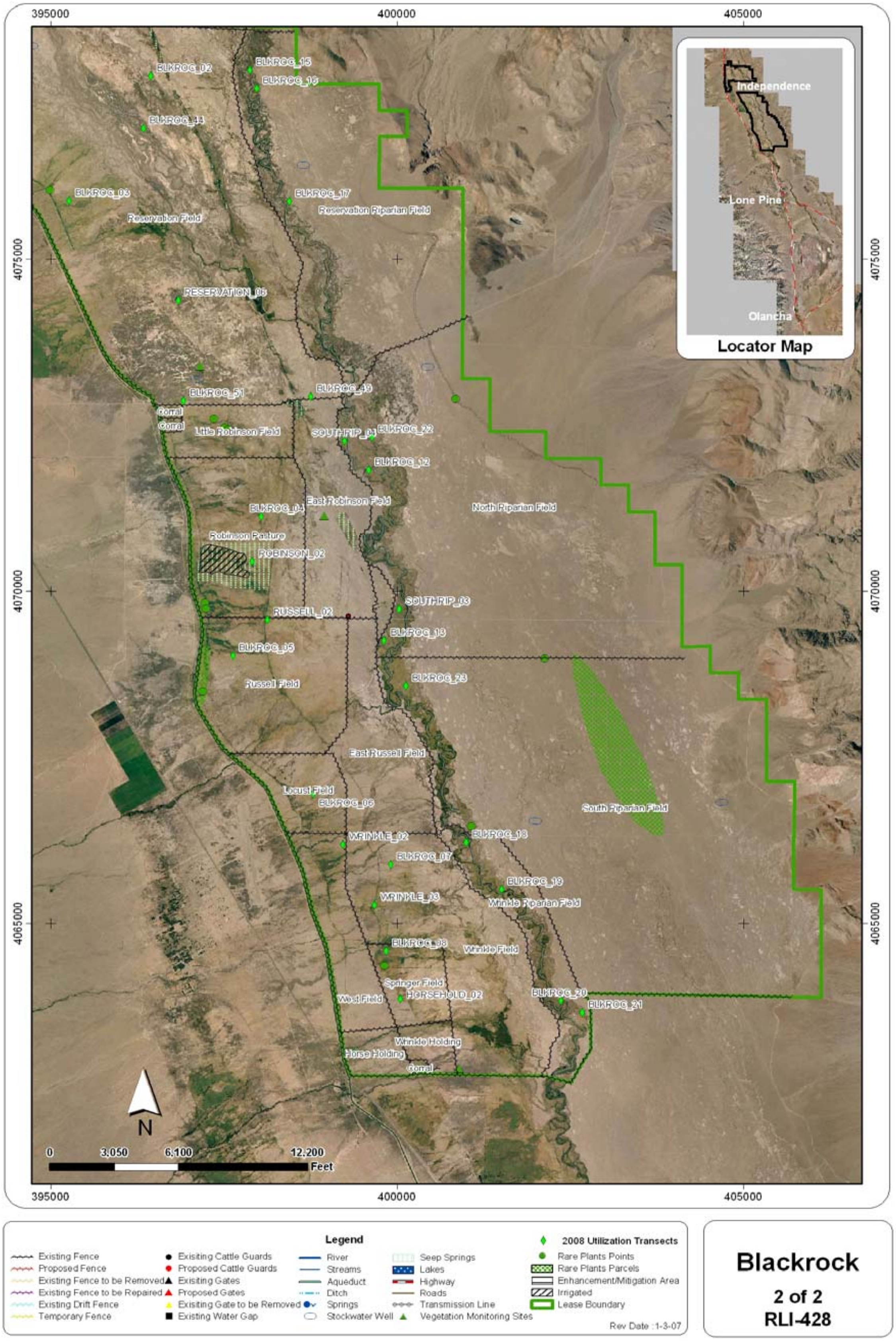
Many of the supplement sites located on the Blackrock lease have been established for many years and are located in upland management areas. Some of these sites have been moved in order to adapt to the installation of new fencing. These sites have been moved in order to better distribute cattle within and near the newly created Riparian pastures.

Burning

There were no wildfires or controlled range improvement fires on the lease during 2008. However, there was the continuation of the burning of tamarisk slash piles occurring within the White Meadow riparian pasture amounting to 20 acres.



Land Use Figure 3. Blackrock 1 of 2



Land Use Figure 4. Blackrock 2 of 2

7.2.4. Thibaut Lease

The 5,259-acre Thibaut Lease (Land Use Figure 4) is leased to three lessees for wintering pack stock. The lease historically was grazed as one large pasture by mules and horses.

There are four fields located within the LORP boundary on this lease:

- Waterfowl Management Area
- Rare Plant Management Area
- Thibaut Field
- Thibaut Riparian Exclosure

The 2008 mid-season utilization monitoring took place in the second week of February. In 2008, the Thibaut Unit of the BWMA was in a wet cycle, which means that riparian utilization standards would apply during the grazing season. Utilization was already approaching 40 percent during mid-season monitoring (Land Use Tables 12-13). There was no end-of-season data available for the Rare Plant Management area because the utilization transects were submerged. However, in February use had exceeded the 40 percent standard. Utilization monitoring was not conducted in the Thibaut Riparian Exclosure since this area is currently excluded from grazing.

Variable Utilization Standard		
PastureName	**Mid-Season**	**End Season**
Waterfowl Management Area	32%	Flooded
Rare Plant Management Area	52%	Flooded

Table 22. Percent Utilization for Riparian Mid- and End-of-Season by Pasture (allowable 40%)

Upland Management Areas		
PastureName	**Mid-Season**	**End Season**
Rare Plant Management Area	34%	Flooded
Thibaut Field	30%	43%

Table 13. Percent Utilization for Upland Mid- and End-of-Season by Pasture (allowable 65%)

The 2008 end-of-season monitoring took place in the middle of June. The Thibaut Field both on average met the 65 percent target utilization prescription. However by species the utilization standard was exceeded for Alkali Sacaton (SPAI) (Land Use Table 14). The higher utilization rate for SPAI is the result of it being the dominant species in the upland areas and the lessee's feed livestock in the upland areas during the winter months.

There was no end-of-season data available for the Waterfowl Management or the Rare Plant Management areas because those areas were in a wet cycle and the utilization transects were submerged.

Upland Management Areas			DISP	LETR5	SPAI	Transect Average
	PastureName	UT Transect Name				
	Rare Plant Management Area	RAREPLANT_03				Flooded
		THIBAUT_02				Flooded
	Thibaut Field	THIBAUT_03	55%		75%	65%
		THIBAUT_08	9%		24%	17%
		THIBAUT_09		9%		9%
		THIBAUTFIELD_02	50%		78%	64%

Table 14. Percent Utilization for Upland End-of-Season by Transect Management Areas (allowable 65%)

With help from LADWP, the lessee's are planning to improve grazing management on the lease to lower the overall utilization rates. The lessees complied with timing and duration standards within the lease management plan.

The irrigated pasture on this lease was changed from the Waterfowl Management Area to a portion of the Thibaut Field. The irrigated portion of the Thibaut Field will be evaluated in 2009.

Stock Water Sites

There is one identified water site needed in the Thibaut Field. This specific location of the water site has been identified and is in the process of being budgeted for during the 2009 fiscal year. Once this occurs, installation of the watering site will begin.

Fencing

The fencing for the Thibaut Lease (Land Use Figure 5) consists of one exclosures and two special management areas: Thibaut Riparian Exclosure, the Waterfowl Management Area, and the Rare Plant Management Area. These projects have been completed and no other fencing is planned for the lease.

Lease	EIR Proposed (mi)	Completed (mi)
Thibaut	5.9	7

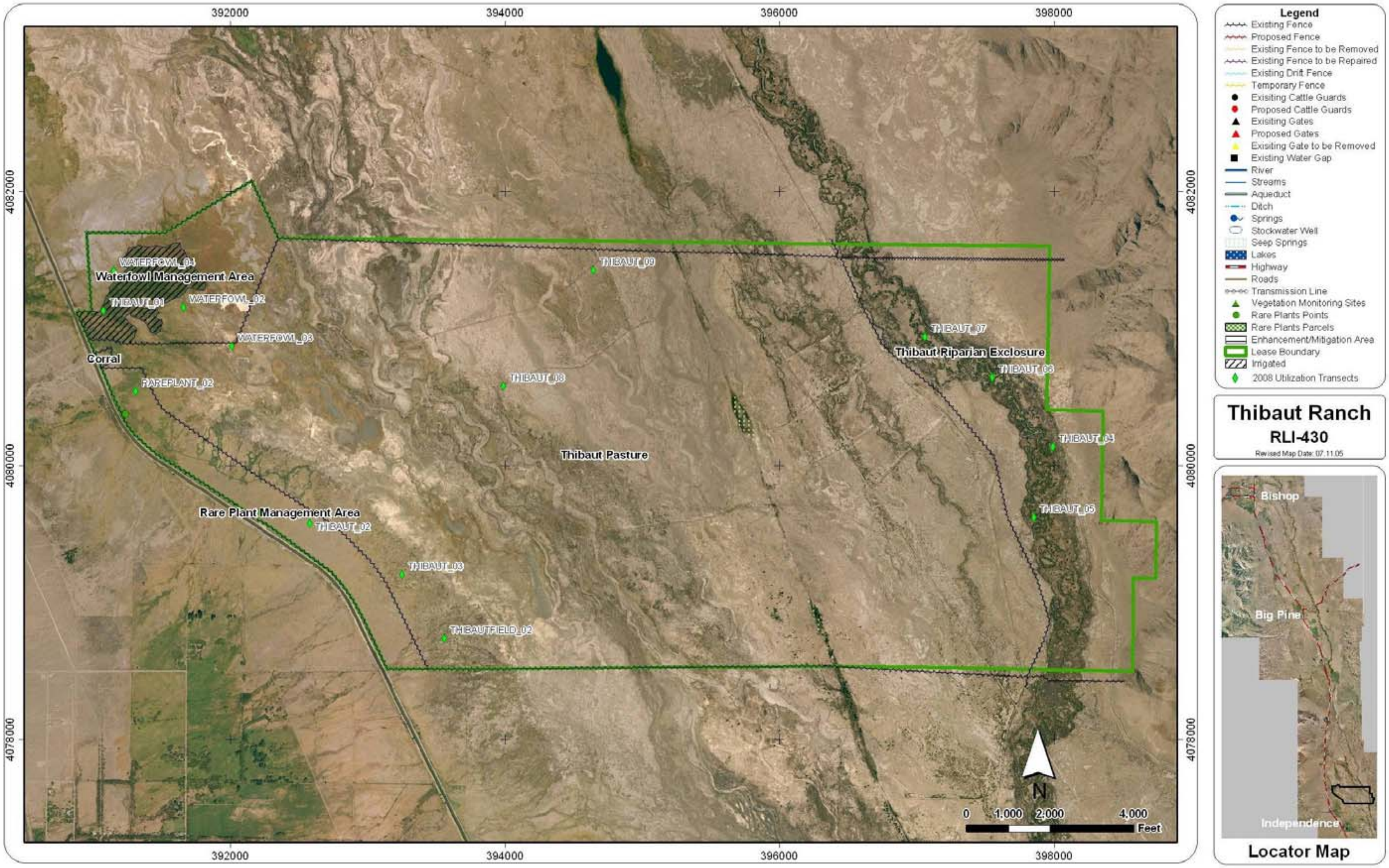
Table 15. 2008 Fencing Thibaut

Salt and Supplement Sites

There are no salt or supplement sites located on the Thibaut Lease.

Burning

There were no wildfires or controlled range improvement fires on the lease during 2008. However, there was continuation of the burning of tamarisk slash piles in the Thibaut Riparian Exclosure. There was a total of 26 acres burned which was equivalent to the entire west side of the river within the exclosure.



Land Use Figure 5. Thibaut Ranch

7.2.5. Islands

The Islands Lease (Land Use Figure 6) is an 18,970-acre cow/calf operation divided into 11 pastures. In some portions of the lease, grazing occurs year round with livestock rotated between pastures based on forage conditions. Other portions of the lease are grazed October through May.

There are eight pastures located with in the LORP boundary of the Islands Lease:

- Reinhackle Field
- A,B,C, D and E Pastures
- Carasco South
- River Field

The 2008 mid-season utilization monitoring occurred during the second week of February. Utilization in riparian and upland areas was very slight with many areas only receiving grazing from Tule Elk (Land Use Table 16).

Upland Management Areas			
	PastureName	**Mid-Season**	**End Season**
	Independence - Springfield Parcel	11%	23%

Table 16. Percent Utilization for Upland Mid- and End-of-Season by Pasture (allowable 65%)

The 2008 end-of-season utilization monitoring occurred during the end of May. Utilization remained low with many areas not being grazed other than Tule Elk (Tables 17-18).

Riparian Management Areas		
	PastureName	**Pasture Average**
	Depot Riparian Field	23%
	Carasco Riparian Field South	18%
	River Field - Islands	16%

Table 17. Percent Utilization for Riparian End-of-Season by Pasture (allowable 40 %)

Riparian Management Areas			DISP	LECI4	SPAI	Transect Average
	PastureName	**UT Transect Name**				
	Carasco Riparian Field South	ISLAND_06	9%		26%	18%
	Depot Riparian Field	ISLAND_08	14%		23%	18%
		ISLAND_09	34%			34%
	River Field - Islands	ISLAND_07	Flooded			
		ISLAND_10	19%			19%
		ISLAND_11	12%			12%

Table 18. Percent Utilization for Riparian Management Areas End-of-Season by Transect (allowable 40%)

There are no changes to grazing management for the Islands Lease. Effects of the LORP project are ongoing as the area adapts to the increased water from the river. Watershed Resources staff will meet with the lessee as needed in order to address any management changes needed to achieve the LORP goals. The lessee complied with timing and duration standards within the lease management plan.

Irrigated Pastures

The B and D pastures located near Reinhackle Spring were rated in 2007 and received an irrigated pasture condition score of 90 percent. These pastures will not be rated again until 2010.

Stock Water Sites

There are no stock water sites planned for the Islands Lease at this time.

Fencing

The Islands Lease (Land Use Figure 6) has proposed riparian fences in the Carasco Riparian and Depot Riparian Fields. These fences will connect an existing drift fence to improve the Depot Riparian Field. Prior to construction the lessee indicated that these proposed fences would not improve cattle management in this area and asked that they not be built. Watershed Resources staff explained that without these fences the lessee would have to adhere to riparian utilization standards for the entire pasture. The lessee understood and agreed to abide by this standard. However, if future monitoring shows forage utilization over 40%, both fences will be constructed.

There is one proposed riparian exclosure to be built around a range trend transect. This exclosure will serve as an ungrazed reference site. The specific location for this exclosure has not yet been determined.

Lease	EIR Proposed (mi)	Completed (mi)
Islands	7.5	0

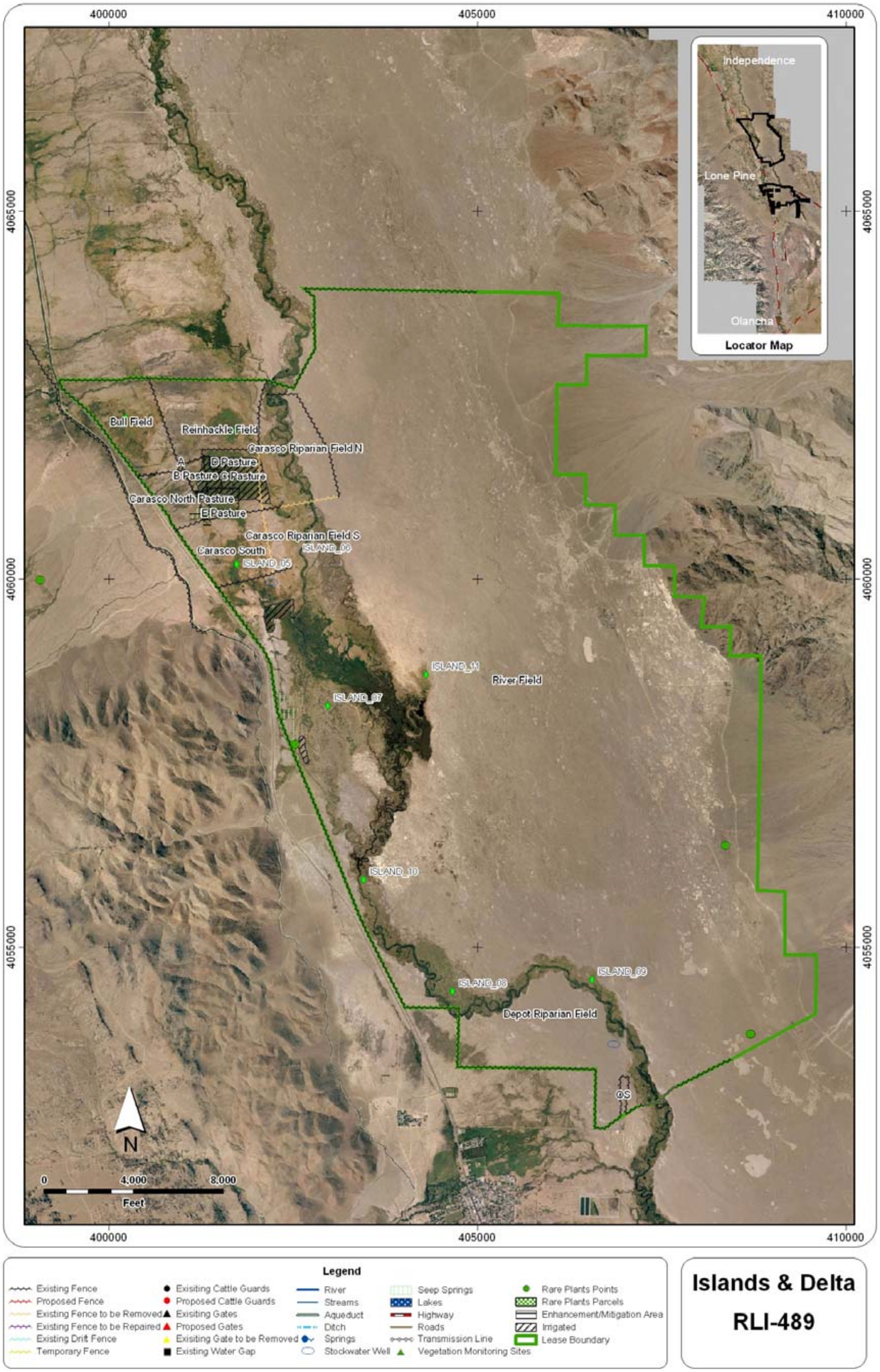
Table 19. 2008 Fencing Islands

Salt and Supplement Site:

There were two supplement sites located adjacent to the Owens River, near Georges Creek during the RAS. These sites were not in the riparian area, but were on steep erodible terraces adjacent to the floodplain, and within the riparian fencing boundaries.

Burning

There were no controlled burns or wildfires on the Islands Lease in 2008.



Land Use Figure 6. Islands Lease

7.2.6. Lone Pine

The Lone Pine Lease (Land Use Figure 7) is an 8,274-acre cow/calf operation divided into 11 pastures and adjacent private ranch land. Grazing within the area not in the riparian pasture occurs year-round, as cows are rotated in different pastures on LADWP and private lands.

There are 11 pastures on the Lone Pine Lease located within the LORP project boundary:

- East Side Pasture
- Edwards Pasture
- Richards Pasture
- Richards Field
- Johnson Pasture
- Smith Pasture
- Airport Field
- Miller Pasture
- Van Norman Pasture
- Dump Pasture
- River Pasture

The 2008 mid-season utilization monitoring occurred during the second week in February. Utilization was getting close to the prescribed 40 percent for the River Field at that time. End-of-season utilization was expected to exceed the riparian grazing prescription (Land Use Tables 20-21).

Riparian Management Areas		
PastureName	**Mid-Season**	**End Season**
River Field - Lone Pine	37%	45%

Table 20. Percent Utilization for Riparian Mid- and End-of-Season by Pasture (allowable 40%)

Upland Management Areas		
PastureName	**Mid-Season**	**End Season**
Johnson Pasture	22%	23%

Table 21. Percent Utilization for Upland Mid- and End-of-Season by Pasture (allowable 65%)

Utilization monitoring data for 2008 end of season was collected during the second week of May. On average there was a 5 to 6 percent increase from the mid season results exceeding the allowable grazing prescription of 40 percent (Land Use Tables 22-23).

Riparian Management Areas		DISP	LETR5	SPAI	Transect Average
PastureName	**UT Transect Name**				
River Field - Lone Pine	LONEPINE_01	49%	43%	99%	85%
	LONEPINE_02	31%		58%	45%
	LONEPINE_03	38%	25%	66%	46%
	LONEPINE_04	43%		59%	51%
	LONEPINE_06	44%			44%

Table 22. Percent Utilization for Riparian End-of-Season by Transect Management Areas (allowable 40%)

Upland Management Areas			DISP	LECI4	SPAI	Transect Average
	PastureName	**UT Transect Name**				
	Johnson Pasture	LONEPINE_05	4%		32%	23%

Table 23. Percent Utilization for Upland End-of-Season Transect Management Areas (allowable 65%)

For the 2009 grazing season the lessee is going to use herding and supplement movement to try and decrease utilization in the River Field. Livestock movement can now be better controlled due to the completion of the new riparian fencing. The lessee complied with timing and duration standards within the lease management plan.

Irrigated Pastures

The irrigated pastures within the LORP project area are the Edwards, Richards, Smith, and Van Norman Pastures. All of these pastures were rated in 2007 with the exception of the Van Norman Pasture. The Van Norman was not irrigated in 2007 due to a supply pump malfunction. Since there was no irrigation water available the pasture could not meet the irrigated pasture evaluation criteria and was not rated. However, the remaining pastures within the project area were rated. All pastures except the Edwards and Richards Pastures met the minimum allowed score of 80 percent. The Edwards and Richards Pastures were reevaluated in 2008 and they receive passing scores. These pastures will continue to be evaluated each year to assure that they maintain a passing score.

Stock Water Sites:

There is one stock water site planned for the Lone Pine Lease located in the Dump Pasture. The specific location of this water site has been identified and is in the process of being budgeted for the 2009 fiscal year. Once this occurs installation of the watering site will begin.

Fencing

Fencing for the Lone Pine Lease (Land Use Figure 7) consists of replacing the existing River Field fence located on the west side of the river between Lone Pine Depot Road and Keeler Bridge and a non-grazed exclosure in the River Field.

The River Field fence has been completed but, some modifications were made to the original fence location near the dump. Changes were necessary because of the eastward expansion of the Lone Pine Dump.

Also proposed is a riparian exclosure located within the River Field. Construction of the riparian exclosure will begin once the Blackrock lease exclosures are completed. The location of the exclosure will have to be modified to include an existing range trend transect. The new location will be verified by Watershed Resources staff and Ecosystem Sciences, Inc. before construction.

Lease	EIR Proposed (mi)	Completed (mi)
Lone Pine	4.5	4

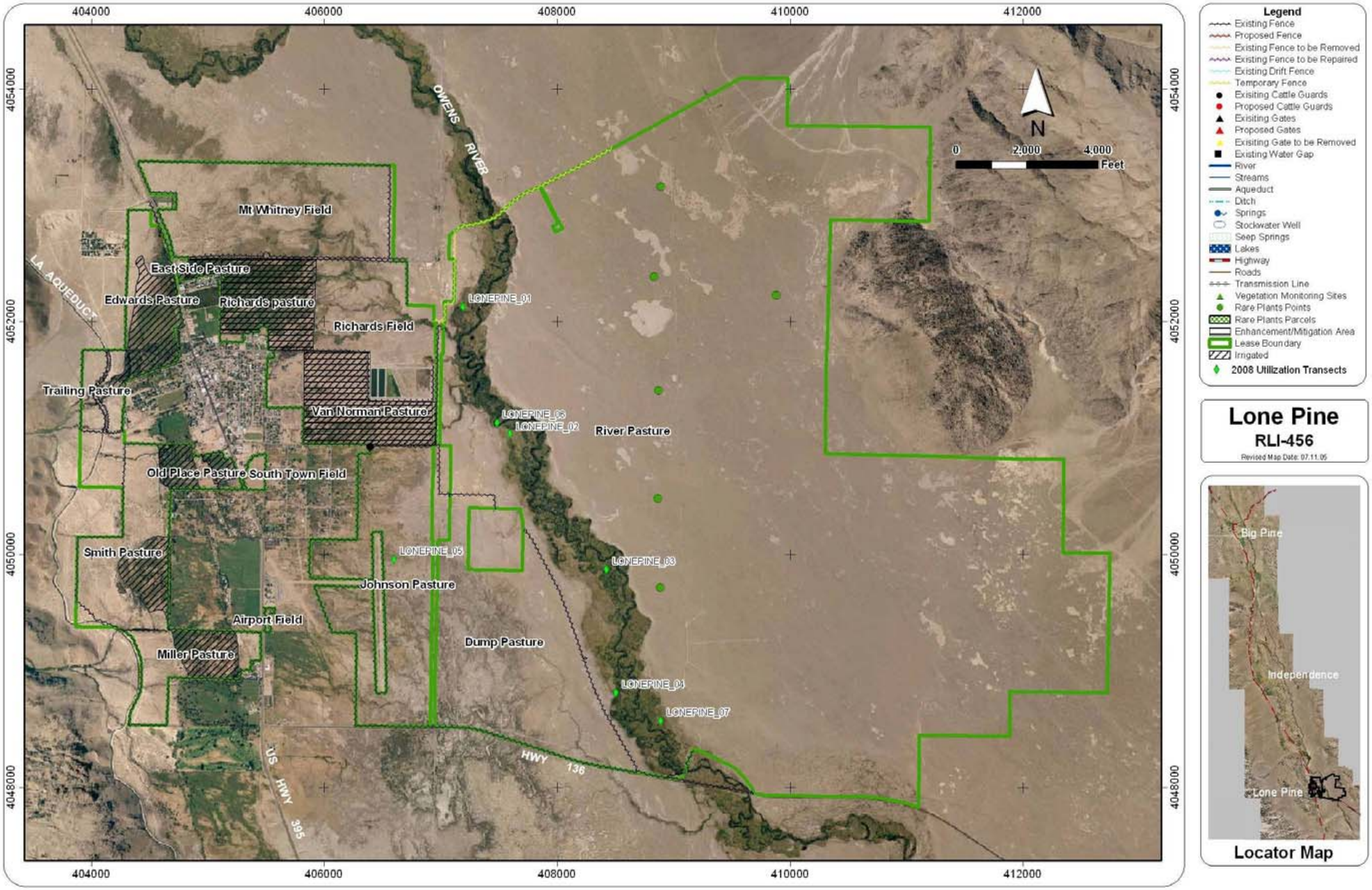
Table 24. 2008 Fencing Lone Pine

Salt and Supplement Site:

There are numerous supplement sites located on the Lone Pine lease and most occur within the floodplain. These supplement sites are going to now be rotated in an effort to keep them away from the river and decrease the amount of disturbed sites in the flood plain. Numerous supplement sites were noted in the floodplain of the River Field during the 2007 RAS, but none were identified during the 2008 RAS.

Burning

There were no controlled burns or saltcedar slash pile burning on the lease in 2008.



Land Use Figure 7. Lone Pine

7.2.7. Delta

The Delta Lease is a cow/calf operation and consists of 7,110 acres divided into four pastures (Land Use Figure 8). Grazing typically occurs for 6 months, from mid-November to April. Grazing in the Bolin Field may occur during the growing season.

There are four fields located with the LORP project boundary:

- Lake Field
- Bolin Field
- Delta Field
- East Field

Grazing utilization is currently only conducted in the Main Delta field which contains the Owens River. Two utilization transects were established in the Bolin Field in the summer of 2008. Because this pasture will be grazed during the growing season, a utilization cage will be necessary in order to provide ungrazed reference plants. A utilization cage will be placed in this field in order to allow utilization to be measured in 2009. The East Field, located on the playa of Owens Lake supports little in the way of forage. The 2008 mid-season utilization monitoring occurred on the February 1. Utilization looked high at that time with many of the meadows exceeding the 40 percent grazing prescription (Land Use Table 25).

Riparian Management Areas			
	PastureName	**Mid-Season**	**End Season**
	Main Delta	63%	51%

Table 25. Percent Utilization for Riparian Mid- and End-of-Season by Pasture (allowable 40%)

The 2008 end-of-season monitoring occurred in the end of May. Transects that were visited at that time appeared to have no change from mid-season utilization. However, when the end of season data was analyzed it was found that utilization on average decreased for the pasture and remained the same or slightly higher by transect (Land Use Table 26).

Riparian Management Areas			DISP	SPAI	**Transect Average**
	PastureName	**UT Transect Name**			
	Main Delta	DELTA_01	46%	58%	49%
		DELTA_02	49%		49%
		DELTA_03	50%	69%	51%
		DELTA_04	41%	56%	44%
		DELTA_05	60%		60%
		DELTA_06	50%		50%
		DELTA_07	54%		54%

Table 26. Percent Utilization for Riparian End-of-Season by Transect Management Areas (allowable 40%)

Use in the Delta exceeded the riparian utilization standard of 40 percent. However, due to the timing of the Seasonal Habitat flow for 2008, the lessee was unable to adhere to his normal livestock grazing rotation. In future years when the Seasonal Habitat flows occur later in the year the lessee will use his normal grazing rotation and riparian utilization should be within the allowable standard. The lessee complied with timing and duration standards within the lease management plan.

Irrigated Pastures

There are no irrigated pastures located on this lease.

Stock Water Sites

There is one proposed stockwater site for the Delta Lease located near the Lone Pine Visitor Center in the Bolin Field. This water sites is identified and is in the process of being budgeted for the 2009 fiscal year. Once this occurs, installation of the watering sites will begin.

Fencing

The Delta Lease (Land Use Figure 8) has two fences: a drift fence located on the north eastern property line below Keeler Bridge and the Delta Riparian Exclosure located north of the Pumpback Station. The drift fence has been completed.

The Delta Riparian Exclosure has also been completed. Some modifications to the original plan were made to allow for better fence alignment while still encompassing several bends in the river for habitat observation. This riparian exclosure was constructed around an existing range trend transect and will serve as an ungrazed reference transect. All the fencing on the Delta Lease has been completed.

Lease	EIR Proposed (mi)	Completed (mi)
Delta	1.5	2

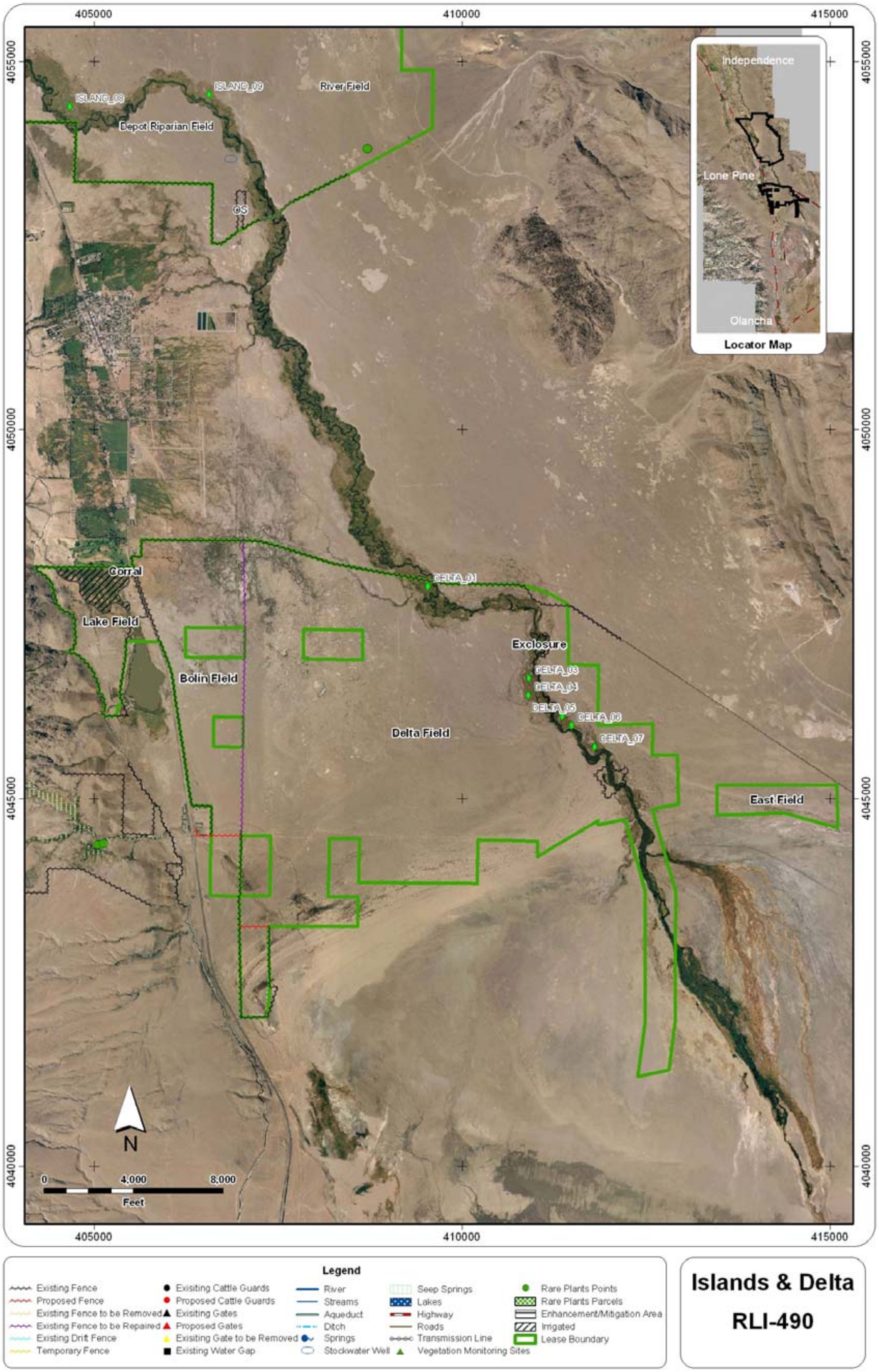
Table 27. 2008 Fencing Delta

Salt and Supplement Sites

There were no salt or supplement site described in the RAS that were an issue.

Burning

There were no controlled burns or saltcedar slash pile burning on the lease in 2008.



Land Use Figure 8. Island & Delta

8.0 Weed Control Report

Prepared by:
Los Angeles Department of Water and Power

October 2008

8.1. Introduction

Terms such as invasive weeds or noxious weeds are often used interchangeably to refer to unwanted, non-native plants that infest large areas or cause economic and ecological damage to an area. In this document, the term noxious weed is used broadly to mean any non-native plant species that is highly competitive, difficult to control, and destructive to native plants and habitats or agriculture. The noxious weeds of primary concern related to implementation of the Lower Owens River Project (LORP) are perennial pepperweed, Russian knapweed, and saltcedar due to their existing presence in the Owens Valley and the potential for economic and ecological damage. Other noxious weeds are present in the Owens Valley, but are not discussed specifically since they do not pose the same level of ecological and economic threat as saltcedar, perennial pepperweed and Russian knapweed. A fourth invasive species, Russian olive, also occurs in the LORP area and is described below.

There are several agencies in the Owens Valley with existing programs to control noxious weeds, including the Inyo-Mono County Agricultural Commissioner's office, the Eastern Sierra Weed Management Area (ESWMA), Inyo County Saltcedar Control Program, and the Los Angeles Department of Water and Power (LADWP).

Early detection of noxious weeds enables timely treatment of weeds and prevents large-scale weed infestations that become costly to treat. Through existing public education, outreach and training in weed identification and reporting, local residents and visitors are asked to help locate previously unknown weed populations and supplement the monitoring efforts by formal weed management programs. ESWMA has developed and distributed a weed identification handbook, which includes photos and descriptions of weeds. ESWMA also conducts public outreach at various local events through use of informational booths, posters, brochures, and handouts. The Agricultural Commissioner's office is also conducting an ongoing mapping and treatment program to document the locations of known populations of noxious weeds in Inyo and Mono Counties.

The Inyo County Saltcedar Control Program also conducts monitoring of previously treated saltcedar populations to identify and treat re-sprouting. Currently, if other noxious weeds are found during these surveys, the saltcedar control crew documents their locations and reports to the Agricultural Commissioner and LADWP.

Treatment of noxious weeds requires species-appropriate methods and involves a combination of mechanical and chemical means. Current treatment methods are discussed below. If new effective methods become available in the future, they may be incorporated into the weed management program under the LORP.

8.2. LORP Specific Mitigation Implemented to Mitigate Noxious Weeds

The following is from Table S-1 of the LORP EIR:

1. Construction and other disturbance of substrates will be minimized.
2. When possible, good water circulation will be provided in project wetlands to minimize accumulation of salts to prevent saltcedar infestation.
3. The use of fire for vegetation management will be minimized.
4. To the extent possible, LADWP will initiate flow releases and initiate dry phases within the Blackrock area between November 1 and March 15 (i.e., when saltcedar is not producing seed) to minimize the chance of invasion by saltcedar.

5. Construction equipment will be maintained “weed free” by washing and inspecting equipment used in weed-infested areas prior to moving to another site.
6. On-site fill materials for construction will be used to the extent possible. If offsite fill materials are necessary, they will be taken from borrow pits located in areas that are free of noxious weeds.

8.3. Noxious Species Descriptions and Treatment Methods

8.3.1. Perennial Pepperweed

Perennial pepperweed (*Lepidium latifolium*) is an herb that grows up to 6 feet in height. It is a widespread, noxious weed in the western United States. Pepperweed flowers from May through September, producing abundant small seeds. It reproduces from both seed and creeping roots. Seeds and root fragments are readily carried by flowing water to new sites. Plants become established in vegetated areas, displacing native vegetation. Aboveground parts die each fall and winter, and new stems sprout from the basal rosette each spring. It typically occurs in moist areas and tolerates saline and alkaline conditions. Typical conditions include wetlands, riparian areas, roadsides, irrigation ditches, irrigated fields and pastures, and orchards. The plant forms dense monocultures, displacing native plants. It provides minimal wildlife benefit, as it does not generally provide foraging habitat for native birds or mammals; however, there is some use of pepperweed by insects. It is an aggressive weed that expands rapidly and is difficult to control.

Perennial pepperweed is well established in northern Owens Valley, and is becoming an increasing problem as it invades wetland areas and irrigated pastures in the northern portion of the Owens River watershed.

The primary treatment method for perennial pepperweed is application of chemical herbicide such as Telar® Pepperweed is a very tenacious plant and is very hard to eradicate. LADWP typically treats each site multiple times per year for several years in a row to control this plant. Plants may be removed by hand when infestations are limited in size, the population is from a seed bank and has not developed an extensive root system and herbicide use is not appropriate (i.e., in the vicinity of open water or rare plants).

8.3.2. Russian Knapweed

Russian knapweed (*Centaurea repens*) is a creeping, herbaceous perennial native of Eurasia. It is a widely established noxious weed in the western United States, and colonizes cultivated fields, orchards, pastures, roadsides, and rangelands. The adult plant is about 3 feet tall. Plants exhibit allelopathic effects (produce biochemicals that inhibit the growth of other plants) and are aggressively competitive, facilitating rapid colonization and development of dense stands. Stems dieback after flowering in summer, and new shoots are generated in spring. Its primary method of reproduction is from vegetative propagation, and severed root pieces as small as 1-inch can generate new shoots. Plants flower between May and September and usually produce small quantities of viable seeds, which disperse passively near the parent plant or with the seed head. Seeds can remain viable for 2 to 3 years. Seeds can also be carried by flowing water to new sites. Russian knapweed can invade and persist in numerous ecosystems, and has been found in saline, alkaline, low lying areas, but prefers deeper soils with more available moisture. The plants are toxic to horses when sufficient quantities are consumed. Under most circumstances livestock will avoid grazing Russian knapweed because of its bitter taste.

Currently, populations of Russian knapweed are present in the Bishop area and along the western LORP boundary south of Independence. No known populations of Russian knapweed are present within the LORP area.

The primary treatment method for Russian knapweed is application of chemical herbicide such as Garlon 4®, Banvel, and 2, 4-D). Plants may be removed by hand when infestations are limited in size and herbicide use is not appropriate (i.e., in the vicinity of open water or rare plants).

8.3.3. Saltcedar

Saltcedar (*Tamarix ramosissima*) is a non-native invasive plant that spreads rapidly in the Owens Valley where conditions are favorable for its establishment. It was introduced into the United States in the early 1800 as a windbreak and ornamental. Since that time, it has invaded most major drainage systems in the Southwest, including the Owens Valley. It colonizes moist areas that have been disturbed by land clearing, grading, or other disturbances that remove native plants. Once established, saltcedar is a very hardy plant that can withstand adverse soil and weather conditions. It displaces native plants as it grows in size and reproduces, creating dense stands of tall shrubs. Saltcedar is undesirable because it threatens native plant communities and the associated wildlife. Several adaptive features contribute to the success of saltcedar as an invasive weed. The high water use by saltcedar often leads to reduced water availability for native plants. Saltcedar is a prolific seed producer; a single plant can produce over 500,000 seeds per year. The seeds are small and easily dispersed by wind. They are produced from April to October and remain viable for several weeks. Saltcedar is also capable of reproducing vegetatively, even when severely damaged. Saltcedar is very resilient to a wide variety of stress factors including fire, drought, flooding, and high salinity. In addition, saltcedar exudes salts from its leaves, suppressing germination of native vegetation. Saltcedar generally provides poor or unsuitable habitat for most wildlife because neither the leaves nor flowers and seeds have any significant forage value. However, saltcedar does provide cover for some bird species, including roosting and nesting habitat. Saltcedar invasion has serious consequences on the structure and stability of native plant communities. It can result in the decline and elimination of native riparian woodlands, which in turn, adversely affects the abundance and variety of wildlife. A secondary effect of saltcedar invasion is the increased frequency of fire because the high plant density and thick litter layer of saltcedar contributes to a higher fuel load. Saltcedar has no economic value (e.g., grazing). In general, saltcedar invades areas where native plant cover has been removed or disturbed, exposing soils to allow the germination of saltcedar seeds. The most common disturbances that lead to saltcedar invasion are associated with man-made disturbances, such as construction and land clearing. However, saltcedar can colonize barren or lightly vegetated areas that are disturbed by natural processes, such as scouring by river flows, wind erosion, and small mammal activity. In these situations, the infestations are usually small and sparse.

Saltcedar occurs mainly in disturbed areas of the central and southern Owens Valley, including the LORP area. The saltcedar populations in the river channel and floodplain of the LORP have been treated and removed by the ongoing Inyo County Saltcedar Control Program.

Saltcedar is widespread within the Blackrock area, but there the plants form bushes rather than tall stands. In the Delta Habitat Area, saltcedar is present primarily along the east and west branches. Saltcedar in the Delta area is not present in dense stands as it is elsewhere in the Valley; however, many large trees are present.

Saltcedar treatment methods used in the Owens Valley include hand pulling of small plants, cut stump treatment (the plant is cut at the base, then Garlon 4®, a chemical herbicide, is applied to prevent re-sprouting), basal bark applications and foliar applications of herbicide Garlon 4®, in addition to cutting and submerging the plants under water for extended periods. The Chinese tamarisk leaf-eating beetle, a natural insect predator to saltcedar, is currently being studied in the Owens Valley under the direction of U.S. Department of Agriculture.

8.3.4. Russian Olive

Russian olive (*Elaeagnus angustifolia*) is a non-native tree that has invaded portions of the river channel, as well as the Blackrock Habitat Area and the River Lakes and Ponds. Russian olive has also invaded native pastures within the LORP area. Like saltcedar, this plant was imported intentionally as an ornamental tree. It is a fast-growing tree of 10 to 25 feet in height, with 1- to 2-inch thorns on branches and trunks. Russian olive reproduces by seed, which is usually produced after trees are 4 to 5 years old. Seeds are ingested with the fruit by birds and small mammals and dispersed in their droppings. Seeds can remain viable for up to 3 years and are capable of germinating over a broad range of soil types. It can also resprout from the root crown. While the fruit of the plant provides a source of food for wildlife, Russian olive habitats are less diverse than the native community they replace. When allowed to spread, Russian olive has the potential to become a serious weed problem.

Treatment methods for Russian olive include hand-pulling of seedlings and sprouts and application of herbicides (e.g., glyphosates such as Roundup®) to cut stumps. The cut-stump method consists of cutting the stem close to the ground and painting a mixture of herbicide and vegetable oil to the stump within 15 minutes. In some cases, follow up treatment consisting of additional herbicide application is needed for a few years. LADWP has applied the cut-stump method to Russian olive populations in the Owens Valley. The Agricultural Commissioner currently does not conduct treatment for Russian olive.

8.4. Summary of Inyo Mono County Agriculture LORP Treatment

LADWP provides $50,000 per year to the Agricultural Commissioner to fund the monitoring and control of new infestations of perennial pepperweed and other noxious weeds (excluding saltcedar) in the LORP project area for the first 7 years of LORP implementation. In addition, LADWP provides $150,000 per year for the first 7 years to the Agricultural Commissioner to fund the control of existing perennial pepperweed and other noxious weed populations outside of the LORP area that could serve as seed sources for the LORP area. The Agricultural Commissioner has developed protocols for monitoring and controlling infestations based upon past experience and current literature. Based on the protocols, the Agricultural Commissioner uses the funds to identify and treat new infestations of noxious weeds within the LORP area in a timely manner, with priority given to the riparian areas. Existing infestations outside of the LORP area that could serve as seed sources for the LORP area will also be monitored and treated.

In 2007-2008 calendar year, the Agricultural Commissioner obtained the following grant funds to support the treatment of perennial pepperweed within the LORP area:

- $156,000 (including a 4x4 Pickup that will continue to be utilized in the LORP area after grant funds are expended) from Sierra Nevada Conservancy
- Approximately $20,000 from California Department of Food and Agriculture
- Approximately $300 in brochures specific to the LORP area outlining the three largest weedy threats to the area

In 2008 Agricultural Commissioner's Office surveyed 4,743 acres within the LORP. Personnel were able to treat a net acreage of 49.91 acres. There were 132 visits to all of the sites and all sites were treated at least once and most were treated twice.

Five sites of perennial pepperweed were treated in the LORP during 2008. These sites include:

- Site 1202, near the river north of Blackrock Ditch (LORP Weed Figure 1);
- Site 1209, in the Drew Slough Unit of the Blackrock Waterfowl Management Area (LORP Weed Figure 1);
- Site 1401, south of Manzanar Reward Road on the eastern side of the river (LORP Weed Figure 2);
- Site 1402, on Georges Ditch (LORP Weed Figure 2); and
- new sites identified during the 2008 LORP Rapid Assessment Survey, north of site 1402, were treated in the fall 2008.

8.5. Summary of LADWP LORP Treatment

LADWP staff are certified in treatment of noxious weeds, staff conducts treatments in known weed infested areas mapped by the Agricultural Commissioner, monitors previously treated areas for resprouting, and respond to reports by lessees, LADWP field staff, and the general public.

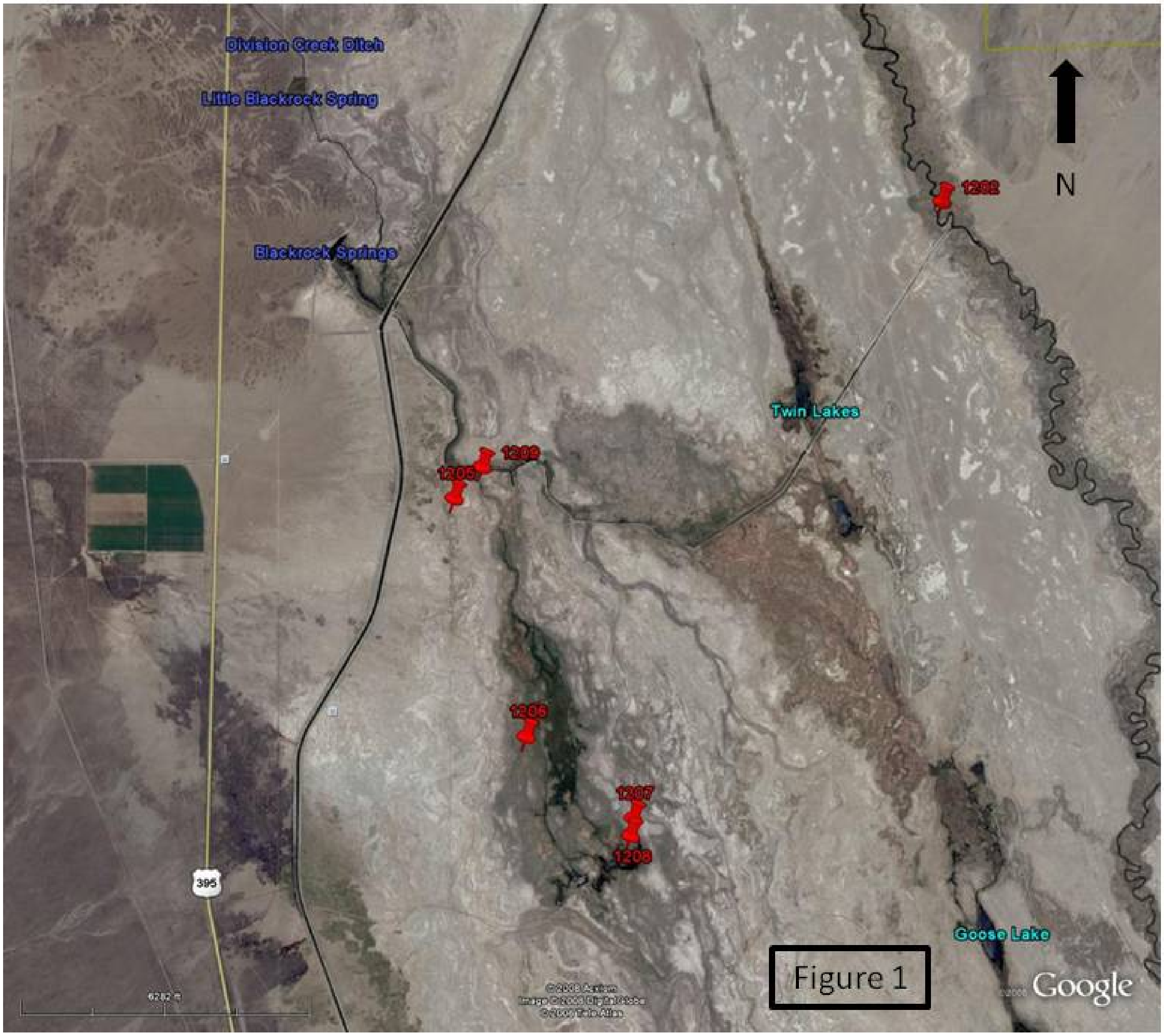
LADWP treated pepperweed multiple times at the three remote sites in the Winterton Unit of the Blackrock Waterfowl Management Area. These sites consist of 1206—1208 (LORP Weed Figure 1)

LADWP treated young saltcedar in disturbed areas along the Goose Lake corridor with Habitat®; a California approved aquatic herbicide for foliar treatment.

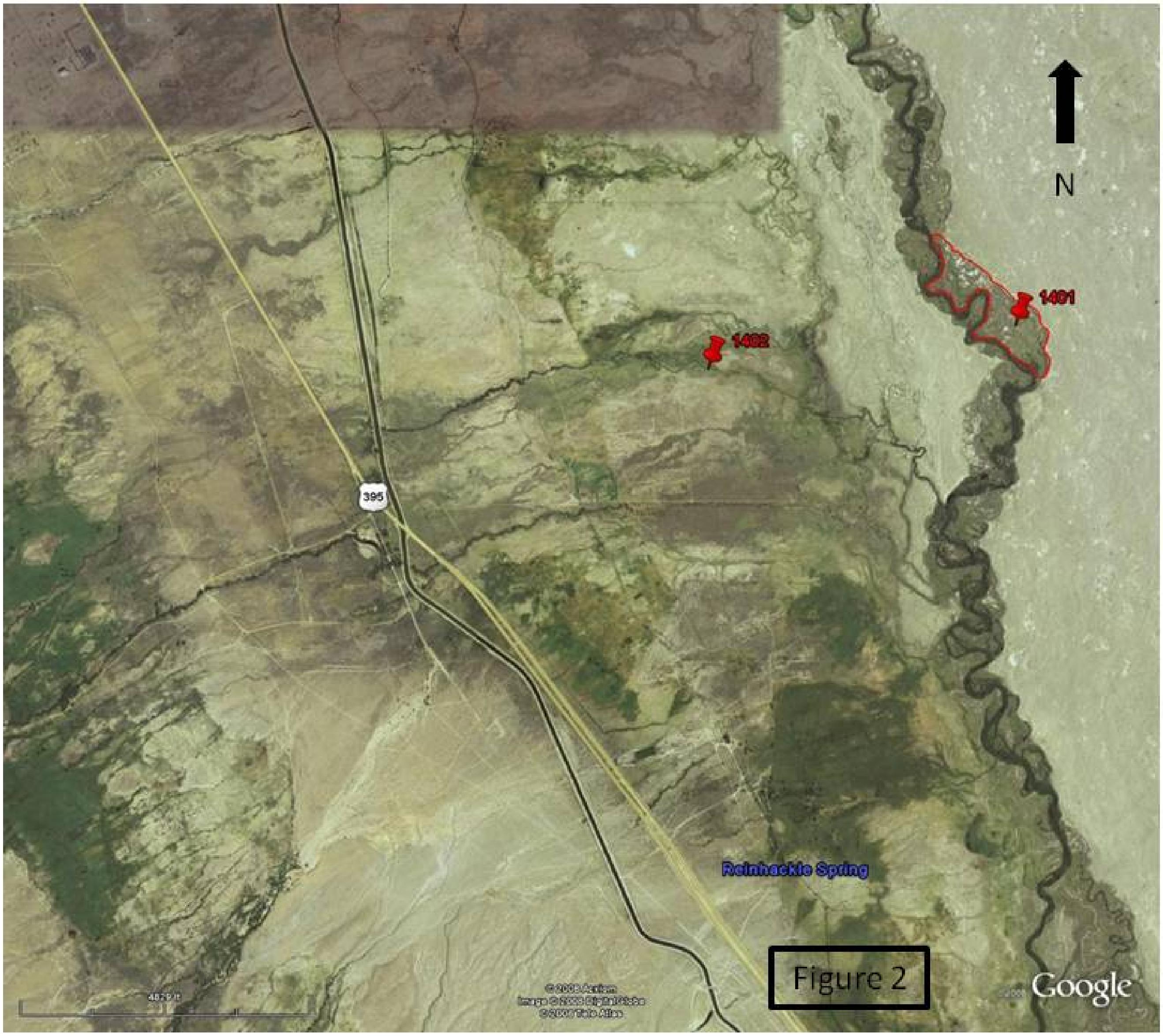
8.6. Training Program for LADWP Personnel 2007-2008 Fiscal Year

LADWP conducted refresher training programs for their personnel, at each of the three construction yards (Bishop, Independence and Keeler) for the employees working within the LORP area. The refresher training was on identification and reporting of noxious weeds, including saltcedar. The Eastern Sierra Weed Management Area Noxious Weed Identification Handbook was provided to program participants. The instruction detailed how to accurately describe their locations to aid in verification and timely response and identify the agencies to which sightings of the species should be reported. The training also covered mitigation procedures for weed populations.

8.7. Appendix A. Weed Treatment Figures



LORP Weed Figure 1. Weed Treatment in the Blackrock Waterfowl Management Area



LORP Weed Figure 2. Weed Treatment Areas in the LORP

9.0 Salt Cedar Treatment Report

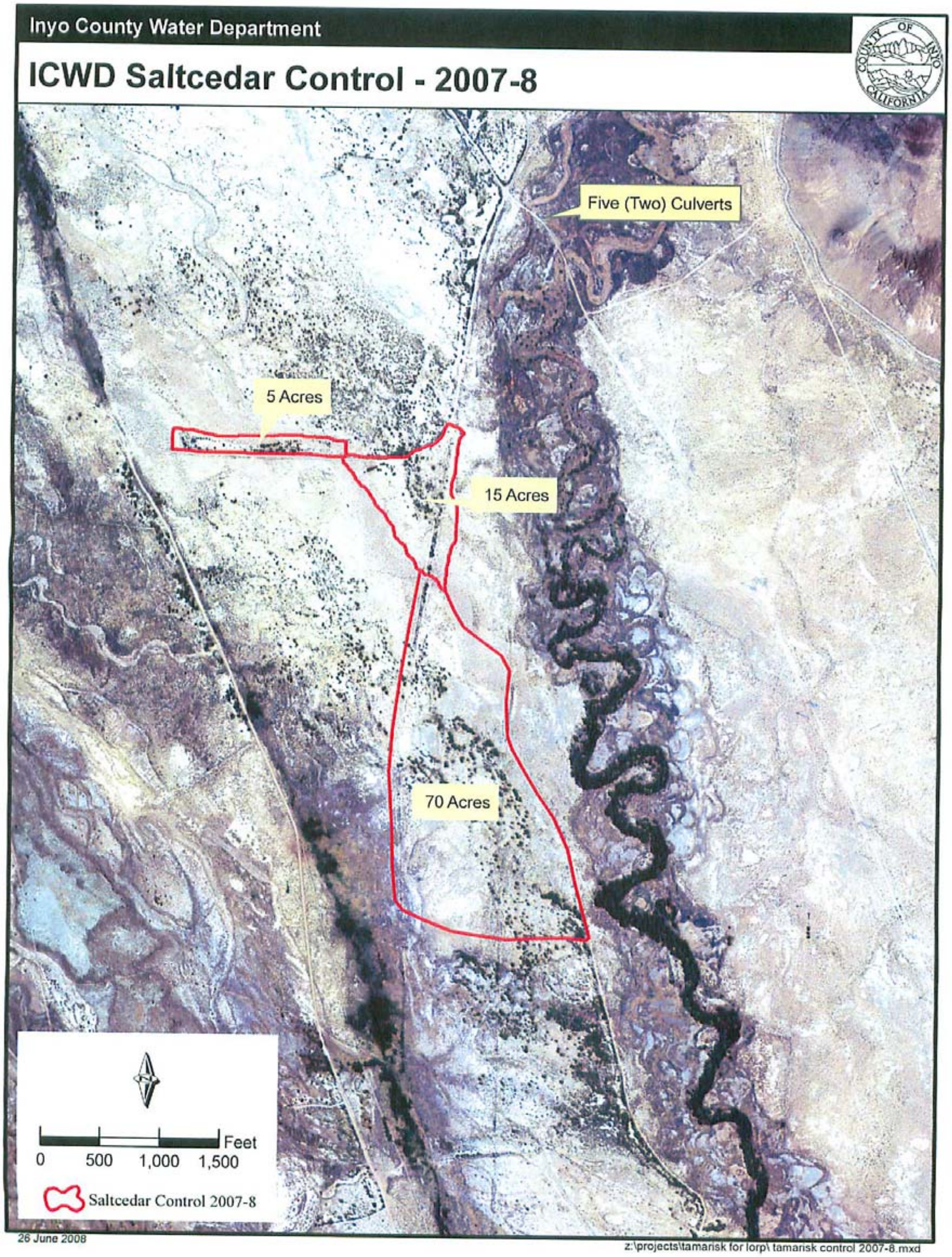
Prepared by:
RICHARD M. PUSKAR
SALTCEDAR CONTROL MANAGER
October 30, 2008

9.1. Salt Cedar Treatment

The short term strategy of the salt cedar control program in the Lower Owens River Project is to widen the corridor along the river. The tributary streams along the LORP contain an abundant seed source which needs to be addressed. In addition to new cutting areas along the LORP, the control program is continuing the annual program of treating resprouts along the LORP as identified in the rapid assessment surveys.

The main efforts during the 2007-08 field season were focused just south of the Two Culverts area. The crew cut and treated approximately 90 acres. The crew also worked in the Georges Creek area and the Blackrock Ditch area. A total of approximately 25 acres were treated in those two areas.

The current field season (2008-09) will continue to treat areas south of the Two Culverts.



Salt Cedar Figure 1.

10.0 Adaptive Management Recommendations

Prepared by:
Ecosystem Sciences, Inc.
November 2008

10.1. Introduction

The LORP Monitoring, Adaptive Management and Reporting Plan (2008) describes the roles and responsibilities of LADWP, ICWD and the MOU consultant (Section 3.3) for collecting, analyzing and reporting monitoring data. Adaptive management recommendations are made by the MOU consultant for inclusion in the LORP Annual Report to the Standing Committee. The MOU parties (through an Advisory Committee) are consulted twice during the process; first following the completion or the draft Rapid Assessment Report and a second time when the draft annual report is complete.

Ecosystem Sciences, Inc. (ESI) has reviewed the draft annual report chapters as provided by LADWP and ICWD. ESI made several requests and comments regarding each chapter for inclusion in the final report. ***Adaptive management recommendations are summarized in Appendix A at the end of this section***.

10.2. Rapid Assessment Survey (RAS)

The LORP Monitoring, Adaptive Management and Reporting Plan (MAMP) (Section 3.3) allows for two consultation periods with the MOU parties through an Advisory Committee. The first consultation began after the Rapid Assessment Survey Report was completed and forwarded to ESI for review and recommendations. A memorandum outlining the RAS report, a summary of findings and recommendations was disseminated by ESI to the MOU Advisory Committee parties on November 19. This memo informed MOU Advisory Committee parties of 2008 RAS results and alerted them to specific issues or concerns.

The 2008 RAS was completed by LADWP and ICWD, and is included as a chapter in this 2008 LORP Annual Report. ESI's summary and recommendations stemming from the 2008 RAS are included below.

<u>Report Composition</u>

Like all RAS efforts, the 2008 RAS data was analyzed and the report was written within a short timeframe. It adequately reports and addresses most of the important results. However, the 2008 report does not address the 2007 RAS results and recommended management actions. A summary of the 2007 RAS results, recommended management actions, and which (if any) of the recommendations were adopted would be a logical and helpful introduction to the 2008 report. The 2008 RAS must be viewed within the context of the 2007 RAS report and recommendations. Otherwise, there is no way of knowing if the data was simply collected, recommendations made, and no actions taken.

The 2007 RAS report results were broken out by management area, while in the 2008 report all areas were grouped together. Consistent reporting will enable comparison between years. It will also aid in the report writing, as the timeline from the end of the data collection to the production of the report is very short and having a template from which to start will facilitate both report writing and analysis. The 2008 format is adequate and should be duplicated in future reports. The 2007 RAS results were integrated into the 2008 RAS effort in that several important points from 2007 were revisited. There is no summary of these results in the 2008 report. ESI requested that a summary for the 2007 revisit sites be included in the 2008 RAS report. This has been requested of LADWP and Inyo County.

<u>Data Organization and Management</u>

The notes section of the 2007 and 2008 RAS efforts include many notes with important details. However, in its current form, this information is of little value. For example, at a tamarisk point, there may be one plant or 5 plants or 40 plants, but this information is found only in the notes and therefore the number of tamarisk points can present a distorted picture of the conditions on the ground. Future RAS efforts should include a categorical data element. Using the tamarisk example, there could be a category for 1-5 plants, 5-10, 10-20, and 20+. This would allow for more meaningful analysis of this data. This approach could be applied to 2007 and 2008 data if desired by converting the notes section to categorical data. Making data categorical is an easy way to ensure data collection is consistent when many people are collecting field data. Future RAS efforts should include a standardized set of categorical variables for each management area and impact code (i.e., Tamarisk, Noxious Weeds).

One of the recommendations from 2007 RAS report was to improve data management and organization. It is unclear if any changes were made to the data management in 2008. The data from 2007 and 2008 should be integrated in order to better analyze the changes from year-to-year. Since the survey is performed every year in roughly the same area, year-to-year comparisons will be useful in determining adaptive management recommendations.

<u>Personnel</u>

There was a large turnover in personnel in both 2007 and 2008 RAS efforts. The detail and descriptions found in the data varies widely and new personnel continually needed to be trained. Minimizing observer turnover would provide more reliable data and reduce training time. In addition, observers should be supplied with the appropriate tools (GPS, camera, etc.) and be trained to use them.

<u>Improvements from 2007</u>

Data sheets, materials, instructions, training, and documentation codes were all improved from 2007 to 2008, in accordance with the recommendations made following the 2007 RAS. There is no description of these improvements in the report. Future RAS reports should include an improvements section as this protocol will be followed for many years and a record of methodological changes throughout the project should be recorded.

10.2.1. Noxious Weeds

Perennial pepperweed was detected at four different sites in the 2008 RAS, an increase from the 2007 RAS. The Inyo-Mono County Commissioner's Office treated five sites in the LORP during 2008, including new sites identified in the 2008 RAS. In recent communication, LADWP indicated that all sites have been treated. The rapid dissemination and subsequent treatment of new sites shows the utility of this protocol when properly executed. Two previously documented sites in the Winerton Unit could not be relocated. New sites were found in the Drew Unit and were treated.

The 2008 RAS identified pepperweed at four points grouped close together about 0.5 miles north of Blackrock Ditch (points 154, 155, 157, and 158) that had been previously identified in 2007. This occurrence appears close to the County Agricultural Commissioner's Site 1202 (the two sites appear several hundred meters apart).

The aforementioned pepperweed site (or sites) appear(s) to have spread. Similarly, the 2008 RAS detected two new sites south of Manzanar Road (2008 RAS points 132 and 133) north of a previously established site (2008 RAS points 140 and 143 - weed treatment point 1401). Whether these new points were previously undetected or if the pepperweed has spread, the locations should be verified with the agriculture office. All sites should be treated multiple times to prevent further expansion. The spread of this aggressive and difficult to control weed is exactly the type of information the RAS is designed to detect. Aggressive efforts to control this weed should be taken.

10.2.2. Exotic Weeds

Although five horned smartweed (*Bassia hysopifolia*) is common throughout the LORP area and the Owens Valley, the 2008 RAS noted dense stands of smartweed 4-6 feet tall and encompassing much or all of the floodplain over a roughly 10-mile section of the river (Blackrock Ditch to Two Culverts – river miles 5.0 to 15.6).

The smartweed has formed dense, nearly monoculture stands, often accompanied only by tumbleweed (*Salsola tragus*). The California Invasive Plant Council (Cal-IPC) reports that smartweed can displace native species, but there is no evidence that it alters ecosystem processes (Cal-IPC 2008). Within the context of the LORP, the spread of smartweed in the 10-mile stretch of river that was completely dewatered prior to flow implementation is likely inhibiting native species recovery and colonization of the floodplain.

The infestation of this 10-mile stretch of river presents possible opportunity for adaptive management. However, this may also be an early successional species which may be naturally regulated in time. We recommend that the extent of smartweed infestation be examined in detail following the 2009 RAS. If the infestation has increased in severity, adaptive management actions will be considered. The Cal-IPC recommends several control methods including physical (mechanical removal and prescribed burning), biological control (insects and fungi, grazing, and plant competition), and chemical control. We may recommend that LADWP, in conjunction and consultation with Inyo-Mono County Agricultural Commissioner's office, determine one or more methods of control to be used and treat selected sections of the infested 10-mile section of river. Treating selected areas will allow managers to determine which treatment (if any) works and will best move the ecosystem toward project goals (i.e. native riverine-riparian habitats). This treatment effort may involve contingency monitoring if it is determined by technical staff that future RAS efforts will be inadequate to monitor the efficacy of treatment methods.

Bull thistle was also noted in several places in the 2008 RAS. However, plants were generally isolated and do not pose an immediate restoration hurdle. Bull thistle sites should be revisited in the 2009 RAS to monitor its spread.

10.2.3. Woody Recruitment

Woody recruitment appears to be occurring throughout the floodplain. The 2007 RAS documented 49 woody recruitment sites. The 2008 RAS documented 222 locations. This suggests that flow changes have presented the conditions for woody native species to establish. Cursory comparison of the 2008 and 2007 data indicates that woody recruitment is occurring throughout the river channel and is not localized to previously dry areas. This is an important aspect of the project that deserves further examination, as section 3.13 of the MAMP describes success in the LORP as the recruitment of native vegetation. Future efforts should include categorical data documenting the number of new sprouts per location. This would allow for statistical comparison from year to year so that future flows can be assessed against native vegetation recruitment.

10.2.4. Grazing Management Issues

The main issue regarding grazing management for the first two years of the RAS involves supplemental feeding sites within the floodplain. The 2007 RAS reported nine supplemental feeding locations; six in the Lone Pine Lease and three in the Twin Lakes Lease. The 2008 RAS reported eleven supplement locations within the floodplain. Two of these locations were in the Islands lease and nine were in the Twin Lakes Lease. The Twin Lakes Lease has now been documented to have supplemental feeding locations in the floodplain two years in a row. The recommended management actions from the 2007 RAS included consultation with the lessees, including and specifically the Twin Lakes lessee, about the grazing management guidelines under the new grazing management plans for the LORP. Feeding/supplement areas are not permitted within the riparian and floodplain areas. Following the November 19, 2008 RAS Summary Memorandum, LADWP sent an e-mail detailing that the lessees were consulted and the supplements will be removed from the floodplain.

10.2.5. Tamarisk

Tamarisk eradication efforts were the number one recommendation from the 2007 RAS. The 2007 RAS detailed five specific actions to control tamarisk infestation. However, the Salt Cedar Annual Report is vague in its use of the 2007 RAS data as well as the efforts that were performed so that it is impossible to tell the status of the effort.

The 2007 RAS report documented 600 locations in the riverine-riparian area, while the 2008 RAS documented 700 tamarisk points. Due to the reporting differences between the two reports(the 2007 RAS broke out results by management area while the 2008 RAS report grouped all management areas together) it is difficult to determine if this represents an increase, decrease, or no change in the extent of tamarisk infestation. The lack of specific information at tamarisk points (# of trees, sprouts, etc. at each point) further confounds these results, as it is unclear if there were more tamarisk points grouped together (i.e. several plants at one point) or if the eradication efforts resulted in more points, but fewer plants (fewer plants at each point). This large difference could simply be a result of field recording differences between personnel. Using categorical data for tamarisk results (i.e. 1-5 trees, 5–10 trees etc.) would alleviate some of these issues. More investigation is needed, but the priority areas for tamarisk should be the riparian area in the formerly dry reach from the Intake down to Billy Lake Return.

10.2.6. Tamarisk Seedlings

The flows that have allowed native seedlings to establish (described below) have also allowed tamarisk seedlings to establish. The 2007 RAS noted only 11 tamarisk seedling locations. The 2008 RAS documented 44 areas of tamarisk seedling recruitment. Seedlings were often found with native species. The survival of native species could increase if tamarisk seedling locations are treated. Removal of tamarisk seedlings was the first recommended management action in the 2007 RAS. Although it is not known if the seedling sites were treated, or if the 2007 sites survived, it is recommended that the 2008 RAS seedling sites all be visited and treated, with first priority given to sites that had native woody recruitment in the same location.

10.2.7. Tamarisk Slash

Tamarisk slash was reported in the floodplain in both 2007 and 2008 RAS efforts. Removal of dense piles of slash along the riverbank was a recommended management action from the 2007 RAS. It is known that some slash piles from 2007 were burned in 2008. To the extent that it is feasible, large slash piles that occur on streambanks, which primarily occur from the Intake to above 5 Culverts should continue to be burned and/or removed from the streambanks. We also reiterate the recommendation that the Inyo County Saltcedar Control program pile new slash in appropriate areas where LADWP can burn or otherwise dispose of them. We also suggest that chipping of green tamarisk be considered as a control technique. This was experimented with previously and appeared like a successful method of control which did not require burning or treatment.

10.2.8. Roads

The 2007 RAS reported 280 points where roads were recorded in the floodplain. The 2008 RAS noted only 68 locations. This data is confusing as roads would not disappear in a one year period. Many of the roads were noted more than once in the 2007 effort and it is difficult to discern if there truly are fewer roads. The 2007 report noted many roads below the intake and near Lone Pine. The 2008 report noted that some of the roads near the intake were in the revegetation process. The roads near Lone Pine were documented again in 2008. The 2007 report suggested further evaluation of roads following the 2008 RAS and the completion of the riparian fencing. Specific adaptive management recommendations can not be made from the existing RAS data. At present Ecosystem Sciences is conducting a roads inventory for LADWP lands in the Owens Valley and Mono County for the HCP. The 2007 and 2008 RAS roads data will be incorporated into the inventory. Doing so will allow for some of the questions posed above to be answered.

10.2.9. Trash

The 2007 RAS recommendations included removal and proper disposal of several large appliances dumped into the floodplain. It is unclear if this was performed.

10.2.10. Beaver

The 2007 RAS reported 15 locations of beaver activity. The 2008 RAS reported 12. It is unclear if these were the same points as 2007, or if there were new locations. Regardless, beaver activity does not appear to be a major issue. No recommended action.

10.3. Water Quality

Protecting the Lower Owens River fishery and avoiding a fish kill remains a principle concern with river management. Monitoring continues to indicate dissolved oxygen is often at dangerously low levels during late summer months at certain locations. Dissolved oxygen reached acute levels during the seasonal habitat flow even though this flow was released in winter conditions, when temperatures would least influence water quality parameters and degradation. Additionally, the initial seasonal habitat flow, as expected, did not cause a great deal of scouring or export of organic material. Consequently, it is important to remain cautious and alert to rapid drops in dissolved oxygen during 2009’s seasonal habitat flow which will not be a winter release and could cause deleterious water quality conditions that pose a risk to the fishery.

During the next seasonal habitat flow, schedule for this coming spring 2009, we recommend establishing a standard of 1.0 mg/l dissolved oxygen exhibiting a downward trend, as the threshold beyond which corrective action may have to be taken. The alternative interventions to prevent or minimize impacts to the fishery resulting from poor water quality are described in the LORP Monitoring, Adaptive Management, and Reporting Plan (2008).

The LRWQCB Basin Plan uses a dissolved oxygen standard of 5 mg/l for warmwater biota. The water quality data for the Lower Owens River indicates that dissolved oxygen can decline to less than 1.0 mg/l in some river reaches, but does not result in a fish kill. Presumably fish are evacuating areas of extremely low dissolved oxygen or are able to tolerate this threshold for short periods. A threshold of 1.0 mg/l was adopted for the LORP Final EIR (2004) and by the LORP Technical Committee during the initial seasonal habitat flow. During the recorded instances of dissolved oxygen levels at or below 1mg/l no fish stress was observed at any time.

Water Quality is discussed further in the next section; Riverine-Riparian.

10.4. River Flow

The LORP envisions a healthy, functioning riverine-riparian ecosystem over time. To achieve the biological and ecological goals specified in the MOU, it is necessary to create a functioning river, not just a channel that conveys the required flows. Currently, there are two immediate concerns related to Lower Owens River flow that should be addressed through adaptive management: tule encroachment in the channel and water quality. Additional issues relevant to riparian habitat conditions are important, but tule encroachment and water quality are the most immediate issues related to river flow management. At a steady flow of 40 cfs the Lower Owens River is acquiring some undesirable characteristics. Tule encroachment is compromising open water habitat, slowing flow velocities and inhibiting habitat diversity. Adaptive management should consider river flow adjustments that can alleviate tule encroachment and abundance, and improve water quality conditions. However, a thorough analysis of flow changes and predicted results is the first critical step.

10.4.1. Tules

Pre-project planning anticipated tule encroachment throughout the river corridor[7], and mapped the predicted tule growth by landform throughout the river. Prediction modeling indicated tules would occupy 55% of riverine landforms totaling 350 acres. Modeling results did not account for the effect of shading on tule control from riparian overstory and water depth. The rapid response of tule production in the first two years of flows demonstrates that the model predictions are fairly accurate. However, the rate of tule colonization on channel, levee, floodplain, and oxbow landforms is more rapid than expected, and is outpacing the establishment of willow and cottonwood vegetation that would eventually provide the shade that would control tule growth.

A steady-state 40 cfs baseflow and the consequential tule encroachment will inhibit achievement of LORP goals for the riverine-riparian system. Tules provide important habitat for fish and wildlife, and while adaptive management should prioritize the control of tules, it should not aim for the complete elimination of tules, but to improve or maintain needed open water habitat and channel connectivity.

Tules occupy channel landforms when the following environmental conditions occur: (1) a shading riparian overstory (particularly tree willows and cottonwoods) is not present; (2) channel water depth is less than four to six feet; (3) light penetration into the water column is greater than three feet; and (4) high flow stream velocities are not great enough to prevent rhizome cloning. Research indicates that all four of the above environmental conditions must be present to encourage significant tule stand density (Technical Memorandum No. 9).

Intervention of any of these conditions will provide better tule control for the LORP. Spring and summer flows higher than 40 cfs will likely increase water depth and flow velocities in the channel and provide an added level of control over tule encroachment. Spring and summer months are the period in which organic inputs and decomposition are highest. Higher flows during this period will also result in improved water quality through increased dilution and promote the continual export of suspended solids and organic material. Increased flow velocities will also inhibit rhizome development. Correspondingly lower winter flows, to allow for higher summer flows without violating EIR conditions, will further improve tule control by desiccating plants growing on dewatered landforms.

[7] See LORP Technical Memorandum #9; Management of Tules and Organic Sediments; and Predicted Future Vegetation Types for the Lower Owens River.

10.4.2. Water Quality

The LORP is required to comply with the Lahontan Regional Water Quality Control Board (LRWQCB) water quality standards by July 2015. Water quality monitoring indicates that water quality standards are not currently being met and warmwater biota conditions are non-compliant. The LORP must meet water quality objectives for ammonia, bacteria/coliform, biostimulatory substances, chemical constituents, color, dissolved oxygen, temperature, and turbidity. Attaining water quality compliance for the LORP is dependent upon implementation of: (1) best management practices on grazing lands to attenuate organic and inorganic inputs; and (2) flow regimes that control, dilute, flush, and leach nutrients, organics, and bacteria/coliforms out of the system.

Reliance on the annual seasonal habitat flow to improve water quality by “flushing” the river system was never expected to be a feasible solution as the river gradient cannot generate the flow velocities needed to scour and export large amounts of accumulated organic material. Although the 200-cfs seasonal habitat flow prescribed by LRWQCB in winter 2008 did not instigate serious water quality impacts, there was little to no channel scouring. These results suggest that flow management over the long-term will have to be modified to ultimately meet water quality standards. This can be achieved by using periods of sustained higher flows to provide a slow but steady export of material combined with land management that limits the input of new material into the system.

Adaptive management decisions on adjusting river flows to improve tule management and water quality should be based on careful analysis of available data and various flow scenarios. Following this year’s (2009) seasonal habitat flow, additional channel depth, landform and water surface elevation data will be collected to model various flow scenarios to achieve added tule control and improve water quality conditions. River flow, channel velocity, and channel geometry models combined with terrain and flow modeling technology will allow three-dimensional analysis and modeling of river depths in relation to channel landforms in several river reaches. It is likely that adaptive management of flows will be necessary for the next six years to meet the water quality compliance deadline, and a robust model using current data will be an important decision making tool.

ESI recommends that a detailed report on flow alternatives be presented to the MOU parties prior to the 2009 LORP Annual Report so that various management scenarios can be reviewed and discussed, and adaptive management recommendations for future flows can be agreed upon.

10.5. Blackrock Waterfowl Management Area

The MOU provides that the overall management goal for the Blackrock Waterfowl Management Area (BWMA) is to:

> *“…maintain the existing habitat in order to provide opportunities for the establishment of resident and migratory waterfowl populations, and to provide habitat for other native species. Diverse natural habitat will be created and maintained through flow and land management, to the extent feasible, consistent with the needs of the ‘habitat indicator species’ for the BWMA[8].”*

The MOU dictates that depending upon the water year, approximately 500-acres of habitat area will remain flooded at any given time to achieve the habitat goals by alternately using the Thibaut, Winterton, Waggoner, and Drew wetland units. The units will be converted from a wet to dry phase when the area of emergent vegetation in an active unit reaches 50 percent of the flooded area.

[8] The BWMA indicator species are: Northern Harrier, Least bittern, Rails, Marsh Wren, resident, migratory, and wintering waterfowl, wading birds, and shorebirds.

Remote imagery indicates tules and other emergent types have encroached to more than 50 percent of the flooded area in Thibaut and Winterton units.

As described in the BWMA discussion in the hydrology section, meeting the wetted area criteria for the water year required considerable manipulation of inflows to respond to changing seasonal and operational conditions. Seasonal fluctuations in water levels is a desirable part of wetland management; however, the extreme variation in wetted acreage shown in the graphs for Thibaut and Winterton units is not the best management to achieve the habitat values for indicator species. The hydrographs do not look like those of the wetland types found in the region. Of course, the purpose of flooding units is to create habitat for indicator species not just inundate an area of land with standing water.

The overall strategy for management of the BWMA is to provide a diverse array of habitats to satisfy the needs of the indicator species. These habitats include open water, emergent vegetation, shallowly flooded habitats, and mudflats. In order to best provide for all indicator species, a diverse array of these habitats must be available at all times, such as wet meadows (used by shorebirds), shallow marsh, deep marsh sub-emergent floating and open water (waterfowl), and unvegetated shallows/flats (shorebirds and waders). All species use a variety of habitats at different life stages. Consideration must be given to the status and distribution, including seasonal movements, of indicator species in the BWMA. Partial drawdowns of flooded wetlands increase food availability, concentrate foods, and manage emergent vegetation. Fluctuating wetlands seasonally (in contrast to bi-weekly) increases the productivity of fringe wetlands. This is a preferred management strategy for the BWMA management units, as detailed in Tech Memo No. 15.

Frequent inflow changes in response to weekly measurements of flooded area in the wetted cells, resulted in extreme variations in depth and wetted area that was not conducive for indicator species habitat. Hydrology is the single most important aspect of wetlands and their functions. Hydrology affects species composition and richness, primary productivity, organic accumulation, and nutrient cycling. It is the hydrology that is the single most important determinant of the establishment and maintenance of specific types of wetlands and wetland processes. The appropriate hydroperiod for a managed or created wetland such as those in BWMA would mimic the processes of natural wetlands of the area. Historically BWMA contained small seep and spring type wetlands similar to those found throughout the Owens Valley. These wetlands have relatively constant inflows (with slight seasonal fluctuations), but the water budget changes seasonally due to factors such as evapotranspiration and precipitation. We recommend maintaining the hydrology of flooded cells to more closely mimic the natural hydroperiod of naturally occurring wetlands of the area. This involves relatively constant inflows that vary slightly between seasons.

In order to maintain the necessary acreage (based on the water year), and, at the same time, create the habitat values for indicator species, the following adaptive management recommendations are made:

(1) Initiate Cycle 2:

- o Prepare Waggoner and Drew units for conversion from dry to wet phase. Burn non-forage, dense vegetation areas (dead tules) in Waggoner this winter (January, February).
- o Repair existing berm in Drew at two identified low spots.
- o Initiate a partial draw down of the Winterton and Thibaut units as Waggoner and Drew are flooded beginning in the spring. Drawdowns should be done gradually. Flooding of the units should be rapid at initiation. Following complete flooding of the Waggoner and Drew Units

and the establishment of the water year, existing and required acreages will be established.

- In the event that completely flooded Drew and Waggoner in addition to the reduced flooding in Thibaut and Winterton does not achieve the required wetted area for the water year, additional flooding can be performed at Thibaut. The EIR requires maintaining the 28 acres of Thibaut ponds. Conduct more field study at Thibaut to determine most effective locations for berm construction and the feasibility of ditching water to the east (instead of berm construction). If berms are constructed, then additional wetted area can be attained in conjunction with flooding beyond the minimum 28 acres for the ponds.

(2) Bi-monthly measurement of wetted area is too frequent, leading to constant inflow modifications. Ecological processes cannot respond to such rapid fluctuations. Measurement and management of wetted area must allow for seasonal variation to achieve desired habitat values.

- Develop a relationship between inflow and area as Waggoner and Drew are flooded so that management is based on inflow with quarterly on-the-ground measurements of wetted area for confirmation and adjustment to maintain the wetted area in relation to the water year.
- Manage wetted area in Waggoner and Drew with a continuous inflow so that natural, seasonal variations in water fluctuations will be emulated, but without extreme fluctuations. Quarterly (seasonal) fluctuations may be made to inflows to increase habitat values.
- In the first year of Cycle 2, identify a method that is applicable to all the BWMA units for developing regression equations that relate wetted area to inflow volume by season. Alternatively, evaluate the use of satellite imagery to delineate wetted area.
- No contingency monitoring will be necessary. Results of monitoring (see Section 4.3.3 of the monitoring plan) in 2010 will provide feedback on habitat conditions for indicator species, and provide an evaluation of flow management in Waggoner and Drew.

(3) During the dry phase in Thibaut, complete construction of the berm described in the project implementation plans at the southern end of the unit. A berm in this location will provide better spreading control so that when the unit is returned to a wet phase, measurement of wetted area will be improved and be more accurate.

10.6. Delta Habitat Area

Two separate management requirements exist for the Delta Habitat Area (DHA); a short-term requirement of providing a minimum flow of 0.5 cfs to the Brine Pool for a full year following project implementation, and a long-term requirement of maintaining and enhancing the 2005 Delta acreage (1,160 acres).

10.6.1. Brine Pool

The Brine Pool flow requirement, specified in the July 11, 2007 Stipulation and Order, is not yet met due to flow recording issues at two weirs measuring DHA outflow. On three separate occasions last fall (2007) and winter (2008) the measuring stations at the bottom of the delta were washed out due to high flows (twice from rain and once from the seasonal habitat flows). The stations were established for a fourth time in March 2008, and no further measuring problems have been recorded. LADWP plans to decommission these two stations after flow compliance is attained; one full year of continuous flow recordings, which will occur in March 2009. In March 2009, if data indicates that a continuous minimum flow of 0.5 cfs has passed through the Delta to the Brine Pool, these two measuring stations can be decommissioned. It should be noted that existing flow data indicates that on average, much more than 0.5 cfs has flowed to the Brine Pool since project implementation.

10.6.2. Delta Habitat Area

The long-term requirement of maintaining and enhancing the DHA requires further investigation. The only project objective met that can be determined with some certainty was that an average annual flow of 6 to 9 cfs passed the Pumpback Station to the DHA. In fact, data from the period of July 12, 2007 to September 30, 2008 indicated that an average annual flow of ~~11.6~~ ***8.8*** cfs flowed to the DHA. These data include the seasonal habitat flow and some additional high flows resulting from precipitation (natural variation) and Pump Station calibration and testing (which allowed river flows to bypass the station and flow into the DHA). Also, it is difficult to analyze the effect that the dust control project in the Owens Lake bed has on the DHA. The dust control project brackets, or confines the DHA on both the east and west sides and, presumably, has raised shallow groundwater conditions which is effecting DHA water spreading and potentially infiltration rates. The prolonged effects of the seasonal habitat flows coupled with the above mentioned effects all have a cumulative impact on the DHA.

The management of the DHA centers on providing the area an annual base flow of 6 to 9 cfs, and supplementing that flow with four seasonal pulse flows designed to enhance habitat for waterfowl and encourage wetland development. The first seasonal pulse flow occurs in early spring, at the end of March to the middle of April, and provides the DHA with flows of 25 cfs per day for 10 days. This flow will occur at the on-set of the growing season and is designed to replenish the freshwater lens as wetland plants are developing. The second pulse flow occurs in the late spring to mid-summer and entails flows of 20 cfs per day for 10 days aimed at providing nutrients for waterfowl. The third pulse flow occurs in September during the late growing season and includes increasing flows to 25 cfs per day for 10 days. This third pulse flow is designed to provide nutrients for migrating waterfowl. The final pulse flow occurs in late fall to early winter (November - December) and will provide the DHA with flows of 30 cfs per day for 5 days. This final flow will directly benefit wildlife that utilize the Delta during this period as well as provide some recharge to the freshwater lens. These four pulse flows are scheduled to be implemented once the Brine Pool requirement is met in March 2009. Further information on the management of the DHA can be found in the *LORP Ecosystem Management Plan, LORP FEIR* and *LORP Monitoring and Adaptive Management Plan*.

The important questions that require investigation relate to how the DHA has responded to a changed surrounding landscape (the dust control project) and a changed water regime since baseline conditions were measured.[9] Dust control structures, levees and roads on the east and west side of the DHA have converted the area from an open ecosystem to a confined or closed ecosystem. Prior to this confinement, the DHA channels could, on occasion, naturally shift over a much larger extent than is currently available as vegetation developed and forced lateral movements. This movement or shifting would thereby create dynamic conditions for the enhancement of wetland areas and habitat. As an example, during the initial seasonal habitat flow water broke out of the west channel at the upper end of the DHA and coursed through a remnant channel flowing west away from the DHA. Prior to the seasonal habitat flow this remnant channel

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[9] Baseline conditions for the DHA were set as those habitat conditions that were mapped in 2005. The DHA was mapped at 1,160 ac. of habitat area that must be maintained and enhanced with management prescriptions. WHA 2005.

was dry and appears to have run a considerable distance to the west onto the lake bed. Rather than allow water to flow to the historic end point of the remnant channel it was diverted by a dust control project levee/road and flowed into a dust control cell, via a culvert near the bottom of the DHA. This water, if left unconstrained, may have created additional Delta Habitat had it been allowed to follow its historic course. This represents a very noticeable effect of the dust control project on the DHA. It appears that this water did not enhance the DHA wetland or contribute to its maintenance.

Initial examination of remote imagery from the years 2000, 2005 and 2008 (recently acquired) indicate that vegetation conditions in the DHA have changed. The amount of acreage (extent) and composition (species assemblage) change is not known at this time. Yet, given the new physical conditions which will influence how water is transported through, beneath and around the DHA, and because the DHA's vegetation appear to have altered since the initial planning and collection of baseline data, the use of the four pulse flows to enhance and maintain the wetlands need to be reevaluated.

The investigation into current DHA conditions will answer the following:

- Has the DHA increased its overall extent as a result of additional water and sustained flow?
- Has the DHA not increased in extent but rather changed vegetation composition due to flows?
- Has the dust control project had a positive or negative effect on the DHA?
- What are the shallow groundwater changes and their effect on vegetation resources? This is less understood and assumed to be influenced by the dust control project.

ESI recommends evaluating the DHA to determine what changes may have occurred to vegetation resources (acreage and composition) prior to making any adaptive management decisions or modifications to seasonal pulse flows this spring. LADWP acquired a September 2008 *Quickbird* satellite image of the DHA that allows for in-depth study of the vegetation resources of the area. Current and past satellite imagery coupled with ground-truthing of vegetation, flow data, and comparisons to baseline conditions will provide insight to DHA changes and allow for adaptive management decisions related to modification of seasonal pulse flows as necessary. Although this recommendation may seem premature, as the Delta has yet to receive pulse flows, it is not. As mentioned above, the conditions in the delta have changed considerably since the pulse flows concept was recommended in the initial LORP project design; changes include the 2008 seasonal habitat and the Lake Project. Thus, evaluating the number of pulse flows, quantity of water and duration of flow needed to achieve to project goals is essential to project success and represents a typical use of Adaptive Management.

10.7. Land Use

The *LORP Monitoring, Adaptive Management and Reporting Plan* (2008) details three types of monitoring 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 to systematically track the effects of grazing on pastures which are irrigated. Irrigated pastures can typically sustain heavier grazing then non-irrigated pastures and fields. Utilization monitoring tracks the amount of biomass removed by grazing in non-irrigated areas of leases. Range trend tracks the long-term effect of grazing and management prescriptions. The detailed protocols for each monitoring activity are displayed in the *LORP Monitoring, Adaptive Management and Reporting Plan* (2008). The Plan also includes other livestock management guidelines such as where to place watering troughs or supplements.

The land use monitoring results are summarized and reported by LADWP in this LORP Annual Report. Results for this year indicate that all irrigated pastures were monitored and all are in compliance. Because LADWP was still in the process of bringing on staff for monitoring, it was not possible to measure utilization for all upland and riparian pastures. However, lessees are not required to meet utilization standards until the end of 2009, which provides additional time to establish and measure transects for baseline conditions in the remaining upland and riparian fields and pastures.

A number of changes or modifications have been made to individual grazing plans in the last two years. Although many of the changes are minor, we recommend that all livestock grazing plans be reviewed and updated so they are compatible with the *LORP Monitoring, Adaptive Management and Reporting Plan*. Since lessees must bring their livestock management into compliance with the lease plans by the end of 2009, now is a good time to ensure that each grazing plan is up-to-date and each lessee is conversant with the requirements. Lessee consultation is a critical aspect toward ensuring performance and effective management are attained. We understand that LADWP has initiated the development of monitoring sub-plans for each grazing lease that includes the location of transects and utilization cages on each pasture and field that will be used for monitoring. These monitoring sub-plans, when completed, will be included as part of the lease plan modifications.

As stated above, lessees must bring their pastures and fields into compliance with their individual grazing plans by the end of this next year. A fundamental tool lessees need to manage livestock so as to meet utilization standards are fences. All fence lines, new and old, which are essential to defining riparian and upland pastures and fields throughout the LORP, are included in the grazing plans; however, as described in the annual report, not all fences have been completed. We recommend that all fences necessary to manage grazing on LORP lands be completed as soon as possible – well before the end of 2009, if lessees are expected to meet their compliance standards.

10.8. Appendix A. Adaptive Management Recommendations

Management Area	Recommendation and/or Action
Rapid Assessment Survey (RAS)	• **Report Composition:** Develop consistent documentation and reporting template that will enable better comparison between years of data collection. • **Data Organization and Management:** Future RAS efforts should include a categorical data element. Annual data collection needs to be integrated in order to better analyze changes from year to year. • **Noxious Weeds:** Perennial pepperweed was detected at four different sites and appear(s) to have spread from previous years. Locations should be verified and treated multiple times to prevent further expansion. • **Exotic Weeds:** 2008 RAS noted dense stands of smartweed encompassing much or all of the floodplain over a roughly 10-mile section of the river. This presents an opportunity for adaptive management. Control methods including physical, biological control, and chemical control. We recommend developing a study design of one or more methods of control to be used to treat selected sections of the infestation and monitor results. • **Woody Recruitment:** Woody recruitment appears to be occurring throughout the floodplain. Future data collection efforts should include categorical data documenting the number of new sprouts per location. • **Grazing Management Issues:** Supplemental feeding sites within the floodplain. Feeding/supplement areas are not permitted within the riparian and floodplain areas. Consultation with lessees and removal. • **Tamarisk:** Request more information and the spatial data on the specific locations where tamarisk eradication was performed. 2008 RAS documented 700 tamarisk points, but reporting issues confounded results. Using categorical data for tamarisk results would alleviate many reporting issues. Data confusion and tabulation makes it difficult to make adaptive management recommendations concerning tamarisk. • **Tamarisk Seedlings:** 2008 RAS seedling sites all need to be visited, verified and treated. • **Tamarisk Slash:** Large slash piles should continue to be chipped, burned and/or removed from the streambanks. Pile new slash in appropriate areas, not on streambanks, where LADWP can dispose of them. • • **Roads:** Data management and clarity of road abundance and impacts is needed as part of ongoing road inventory. • **Trash:** removal and proper disposal of several large appliances dumped into the floodplain. • **Beaver:** No new recommended action.
Water Quality	Recommend establishing a standard of 1.0 mg/l dissolved oxygen exhibiting a downward trend for the seasonal habitat flow, as the threshold beyond which corrective action is taken.
River Flow	Adaptive management decisions on adjusting river flows to improve tule management and water quality should be based on careful analysis of various flow scenarios. Recommend a thorough analysis of possible flow changes using current river baseline conditions and high-resolution modeling to produce a detailed report for MOU parties on flow alternatives and scenarios.

Adaptive Management Recommendations, continued

Management Area	Recommendation and/or Action
Blackrock Waterfowl Management Area (BWMA)	• Prepare Waggoner and Drew units for conversion. Burn non-forage, dense vegetation areas in Waggoner this winter. Temporarily fence Drew to graze off the forage rather than waste it by burning. Construct berms and two water control structures in Drew unit per plan specifications. • Initiate a partial draw down of the Winterton and Thibaut units as Waggoner and Drew are flooded beginning in the spring. Additional flooding can be performed at Thibaut, if acreage is needed. • Maintain the 28 acres of Thibaut ponds. • Develop a relationship between inflow and wetted area so that management is based on inflow with regular on-the-ground measurements of wetted area. • Manage wetted area with a continuous inflow so that natural, seasonal variations in water fluctuations will be emulated without extreme fluctuations. • Identify a method that is applicable to all the BWMA units for developing regression equations that relate wetted area to inflow volume by season. • During the dry phase in Thibaut, complete construction of the berm described in the project implementation plans at the southern end of the unit to confine flow and wetted perimeter.
Delta Habitat Area (DHA)	• Need to meet Brine Pool flow requirements of continuous minimum flow of 0.5 cfs for one year. • Recommend evaluating the DHA to determine what changes may have occurred to vegetation resources (acreage and composition) prior to making any adaptive management decisions or modifications to seasonal pulse flows this spring, 2009.
Land Use	• No data tables that displayed all data collected were available to review. Ecosystem Sciences was not able to verify the conclusions reached for land use compliance without examination of the data set. • Recommend that LADWP complete their transect placement in all pastures and fields and collect and report a complete set of utilization, irrigated pastures and range trend monitoring data for the 2009. • Recommend that all livestock grazing plans be reviewed and updated so they are compatible with the *LORP Monitoring, Adaptive Management and Reporting Plan.* • Lessee consultations as soon as possible. • Recommend that each grazing lease have its own monitoring sub-plan that includes the location of transects and utilization cages on each pasture and field. • Recommend that all fences necessary to manage grazing be completed as soon as possible - well before the end of 2009.

11.0 Response to Comments

Prepared by:
Los Angeles Department of Water and Power,
Inyo County Water Department, and
Ecosystem Sciences, Inc.
February 2009

11.1. Verbal Comments Received at the January 21, 2009 Public Meeting

1. *Comment by Peter Vorster*: A summary table showing potential flows and peaks would be helpful from an organizational standpoint.
Response: Comment noted. This information is already contained in the graphics in Chapter 3 of the report.

2. *Comment by Mark Lacey*: The lessee is concerned about potential injury to his horses and conflicts with operations due to the placement of the proposed rare plant exclosures. In addition, there is a need to continue trend monitoring to determine if grazing is actually detrimental to these rare plants. Currently, there is no data showing that grazing has been detrimental, and *Sidalcea* now exists in some of the grazed pastures where it was never documented before.
Response: Comment noted. Ecosystem Sciences, LADWP, and Inyo County are working together to recommend alternate placement of rare plant exclosures in the LORP that will enable us to monitor population trends with, and exclusive of, grazing, and that will not severely impact the lessee's operations.

3. *Comment by Mark Bagley*: Clarification is needed on production of the report and who the lead authors are. Chapter 10 is clearly not a joint effort.
Response: The LORP Annual Monitoring Draft Report was a collaborative effort between Ecosystem Sciences, LADWP, and Inyo County. Each entity was responsible for sections of the report according to their areas of expertise and who took the lead on specific monitoring efforts. Chapters 1-9 were compiled, reviewed, and discussed by all three entities, and then were jointly released to the Parties and the Public according to provisions in the 2007 Stipulation and Order. (Refer to page 2 of the document for a list of primary authors.) Chapter 10, however, is presented as the independent judgment of Ecosystem Sciences; this chapter is being reviewed by the County and the City, and will go through the appropriate approval process.

4. *Comment by Scott Kemp:* The lessee wants to make sure there is a fair evaluation on his lease, including utilization. Additionally, page 189 of the document refers to fencing, which is currently down; he is moving it. Page 184 refers to salt cedar slash; it is assumed the County will be removing or burning it. Page 243 uses the word "destroyed" to refer to the condition of his lease. Please remove this language.
Response: Comment noted and page 243 was modified.

5. *Comment by Scott Kemp:* When there is a 40 cfs flow that is not ramped down, there is more percolation that is killing the rabbitbrush and saltbush. We should burn to remove these dying shrubs; this would improve grazing conditions, woody recruitment, etc. We need a 20-30 acre project to burn and carefully assess what returns to increase the woody vegetation. We should experiment with this up and down the river for more benefits.
Response: Comment noted. Burning is an adaptive management tool that will be used as appropriate following a thorough evaluation of conditions.

6. *Comment by Peter Vorster*: The tables on page 165 need to be fixed.
Response: The tables on page 165 have been corrected as requested. Similarly, the tables on page 88 and 147 have also been corrected.

Other verbal comments were also addressed during the public meeting or were otherwise submitted in writing and addressed below.

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Written Comments

Page 19 of the 2007 Stipulation and Order states: *"LADWP and the County will release to the public and to the representatives of the Parties identified in the MOU a draft of the annual report described in section 2.10.4 of the Final LORP EIR. The County and LADWP shall conduct a public meeting on the information contained in the draft report. The draft report will be released at least 15 calendar days in advance of the meeting. The public and the Parties will have the opportunity to offer comments on the draft report at the meeting and to submit written comments within a 15 calendar day period following the meeting. Following consideration of the comments submitted, the Technical Group will conduct the meeting described in Section 2.10.4 of the Final LORP EIR."*

No written comments were received within 15 calendar days following the January 21 meeting (February 5, 2009). However, the following comments were received on February 6, 2009, by Sierra Club and the Owens Valley Committee, and were taken into consideration.

1. *Comment:* Process. Our commentary is intended to improve this and future annual reports. We are concerned about the short time currently scheduled (8 days) between the comment due date and the Technical Group meeting where the report will be reviewed. Will there be a final report or a revised draft prepared, considering the public comments (including those of the MOU parties), before the Technical Group meeting?
Response: The 2007 Stipulation and Order describes specific time frames for releasing the Draft LORP Annual Report, schedule of the subsequent public meeting where comments can be addressed, and the time frame for written comments to be received. Under the Stipulation and Order, Ecosystem Sciences, LADWP, and Inyo County must consider comments received prior to the Technical Group Meeting, but are not required to finalize and resubmit a draft to the Parties prior to that date. The comments will be addressed in an additional chapter to the final report.

2. *Comment*: Report Organization. There is lots of good information, data, maps, graphics presented in this report and so it is vital that it is organized and communicated clearly. Graphics showing the organization and flow of information as well as summary tables would be helpful. The report organization is a bit confusing and should be explained if there is a basis for the chapter order. For example, Chapter 6 on hydrological monitoring would seem to be more logically placed before Chapter 4 on gains and losses.
Response: Comment noted. Consideration will be made for future reports.

3. *Comment*: Report Recommendations. Where possible the implications of the collected data and subsequent analysis and the recommendations for future management should be provided. This was done in several of the sections in Chapter 3 and should be done in other chapters. The recommendations then should all be brought together in Chapter 10 and summarized in a table.

At the January 21, 2009 public meeting, Mark Hill mentioned some adaptive management actions, including some studies to investigate tule control methods that are not adequately described in this report. This report is the place where those recommendations should be documented.
Response: Comment noted. Ecosystem Sciences has summarized a table of adaptive management recommendations which has been included as an appendix to the final report. A reference to this appendix has been added to page 281 of the document.

4. *Comment*: Glossary. Consider including a glossary of terms in this and subsequent annual reports and other LORP written products. This is a long-term process that will be generating lots of reports. Unnecessary questions and confusion can occur if people, including the public and the Standing Committee, are not clear on the terms. Terms should be defined so that they are understandable to interested members of the public and decision-makers. Example terms include: baseflow, seasonal habitat flow, floodplain, low terrace, dynamic equilibrium, goals, objectives, adaptive management, etc.
Response: Comment noted. A glossary has been included as an appendix to the final report. (This information was reproduced from the LORP EIR.)

5. Comment: Peizometers. We recommend that peizometers be installed in the Lower Owens River and Delta floodplain. Monitoring the shallow groundwater dynamics in the floodplain is essential for a better understanding of the restoration process and functioning of the surface and ground water system of the Lower Owens riverine and riparian system.

We understand that it is the belief of Inyo County that state law requires monitoring wells, including shallow peizometers, to be installed by a licensed well driller and that this makes their installation cost prohibitive. However, riparian restoration projects along the Mono Basin streams, the San Joaquin River, and the Trinity River have been granted exemptions from this requirement for installation of peizometers. These exemptions have been granted by the local counties. According to staff at the Californina Department of Water Resources (DWR) that we recently contacted, local counties are the enforcing agency for the well regulations and have the authority to grant exemptions for “unusual conditions.”

It is our understanding that DWR is the agency that publishes the standards for wells in California (see: “Water Well Standards: State of California,” DWR Bulletin 74-81, 1981, the supplemental document “California Well Standards,” DWR Bulletin 74-90, 1991, and the DWR website–
http://www.dpla.water.ca.gov/sd/groundwater/california_well_standards/well_standards_content.html). The piezometers that we are recommending technically fall under the “monitoring well” classification as defined in the California Water Code. There is a section in DWR 74-90 titled “Exemptions for unusual conditions.” This section states that under certain circumstances, the enforcing agency may waive compliance with the DWR standards. This is the exemption that has been used by other counties on the aforementioned projects. We urge Inyo County, as the enforcing agency, to consider granting such an exemption for piezometers in the LORP area.

We recommend that Inyo County contact DWR to confirm that it is possible for them to grant an exemption to allow the installation of shallow peizometers in the Lower Owens River riparian floodplain.

In addition, other forms of shallow groundwater monitoring should be considered (including stage height in old oxbows and off-channel ponds in the floodplain). We understand from the January 21, 2009 public meeting that there are existing shallow groundwater monitoring wells near the river. These should also be included in the analysis of floodplain hydrology and included in the annual report.
Response: We don't see the linkage in using piezometers to guide adaptive management decisionmaking for the LORP. Also, what hypothesis are you hoping to test in using piezometers in this case? Regarding an exemption from DWR, we don't believe that an exemption to the required C-57 license would apply in this situation.

In addition, there are numerous monitoring wells that already exist in the LORP area to measure groundwater responses to the project. There are also several other indicators to detect this response, including standing water in the floodplain, vegetation response, soil moisture, etc.

6. *Comment*: Chapter 1, Lower Owens River Project Monitoring Report Introduction
C/R: Explain the period of time that the report covers – whether it's the water year 2007-08 or some other period or if it is different periods for different parameters (e.g. it appears that some monitoring extends back to 2006, water quality data presented in Chapter 2 goes back to November 2006, while others appear to be only for 2008). A table summarizing the different reporting periods for the different parameters would be helpful. Since this is the first annual report and Phase I flows began in December 2006 with achievement of full implementation of baseflows by mid 2007, it is appropriate for this annual report to cover a period longer than 12-months.
Response: Because this report is the first report since the initiation of the LORP, some data go back to the initiation of flows. In the future, this report will only cover activities conducted during the annual monitoring period.

7. *Comment:* Chapter 2, 2.1. Introduction. It would be helpful to explain how the information presented in this chapter for the habitat flows is different than what is presented in Chapter 3.
Response: Comment not understood. What differences does the commentor perceive?

8. *Comment:* 2.6. and 2.11. Summary and Conclusions–Base Flows and Habitat Flows. Explain how fish stress or lack thereof was monitored.
Response: Fish Stress was monitored through visual field observations at all key points. (See LORP Monitoring and Adaptive Management Plan for more information).

9. *Comment:* Chapter 3, 3.1. Executive Summary. A short explanation of why the observed flooded extent significantly exceeded the modeling predictions should be provided in the summary. This significant difference is not explained until much later in the chapter.
Response: The explanation requested is present within the document.

10. *Comment:* 3.7. Hydrometeorology. Did the flooded areas and high groundwater from the January precipitation event persist until the habitat flows?
Response: The flooded areas mainly persisted, but there was some decrease.

11. *Comment*: A date should be given for the photo in Figure 4.
Response: This photo was taken in mid-January 2008.

12. *Comment*: It is conjectured on p. 63 that "The wetted extent of flooding could therefore have been affected by extraordinary January 2008 precipitation." More explanation and analysis of this statement would be helpful. We note that peizometers in the floodplain would have been helpful to understand the influence of the January event.
Response: Comment noted.

13. *Comment:* 3.9. Flows. It would be useful to compare the actual flow hydrograph (velocity, magnitude and duration) with the hypothesized, modeled flows. The actual flows should be compared with the modeled flows developed for the LORP Ecosystem Management Plan to help improve the predictive capability of the model.
Response: Comment noted. The conditions assumed in the model were different from the actual field conditions for the first seasonal habitat flow.

14. *Comment*: 3.10.1. LORP inflows. Are the times given in the table the actual release time or the scheduled release as is stated?
Response: The scheduled release time is the same as the actual release time. Language changes were made on page 76 for clarification.

15. *Comment:* 3.10.2. Methods of Measurement. P.77– "In order to achieve accurate flows, a manual current meter read was taken daily just upstream of the Pumpback Station." How far upstream is the manual read taken, i.e. how far upstream does the backwater effect extend? The location of the manual reads should be shown on a map (a more localized map than Figure 5 on p. 65 would be helpful to show the extent of the backwater and where the manual reads were taken). Are the manual reads reported in any of data tables or are the "Above Pump Station" data the sum of the downstream measurements.
Response: Comment noted. The manual read was taken approximately 800 feet upstream from the Pump Station and the backwater effect extended to the weir at the Pump Station, but not upstream of this location. The manual reads were taken from the current meter when daily flows were above 160 cfs, and subsequently are in the data tables. The "Above Pump Station" data is not the sum of the downstream measurements.

16. *Comment:* P. 78– Flow peaks and travel times. Clarify what is meant by "True peak" in the statement: "The travel times for the lower portion of the Lower Owens River below Alabama Gates and the Islands had to be approximated due to the inflows from Alabama Gates making analysis of when the true peak passing through Reinhackle Springs actually reached the Lone Pine Narrow Gage Station." Does that mean that the times in Table 4 are when the upstream "true peak" is postulated to have arrived at "LP at NG road"? Presumably the gage records show when the "actual peak" occurred. What is the difference between the time of the "true

peak" and "actual peak"? Is it possible to estimate or model what the magnitude of the "true peak" would have been had there been no augmentation?
Response: The true peak was from the Intake to the Alabama Gates; this peak was then modified by augmentation from the Alabama Gates. The times in Table 4 do not reflect when the upstream true peak arrived at LP at NG Road. The difference between true and actual peak is unknown. It is not possible to estimate or model the magnitude of the true peak without augmentation.

17. *Comment:* P. 79– Photo comparison at bottom of page. The photo of the actual stage at 200 cfs (give date of the photo) appears to show less inundated vegetation than the overlay in the middle photo. Is this due to a slightly different perspective?
Response: Yes, the apparent difference in vegetation is due to perspective.

18. *Comment*: P. 80– Photo at bottom should be labeled with location. In general are the flows in the photos that say 200 cfs, the approximate measurement near the photo or does it represent an intake release of 200 cfs?
Response: Comment noted. The flows in the photo represent a 200 cfs intake release.

19. *Comment:* P. 81– The following statement: "Thirty-four minutes of video were recorded at 14 sites in late March, during the LORP 2008 Initial Seasonal Habitat Flow" does not make sense because the seasonal habitat flow was over by late March.
Response: This video footage was taken right after flows ceased; language on page 81 was changed for clarification.

20. *Comment:* 3.13. Field Data Collection Methods. The title of this section is a bit misleading and should be clarified to note that it refers to the flooded extent data collection, which follows in Section 3.14. It is not a general section on field data collection. This section and the ones that follow could use a short context and introduction paragraph on the importance of determining the flooded extent and defining the different landforms that were mapped including floodplain, low terrace, etc. It would be clearer if the fact that the base flow mapping in early February was likely influenced by the January precipitation event was noted in this section; that explanation is not offered until 7 pages later.
Response: Comment noted.

21. *Comment:* 3.14.2. Reach and River-Wide Analysis Methods. P. 90– The basis for the following assumptions should be explained: "Assumptions were made for Reach 4, which is the forth (sic) reach type (aggraded wet floodplain), and consists of the Islands; the assumption was that 100% of the Islands reach floodplain type was inundated during the high flows, while only 50% of the Islands floodplains were inundated at base flows." Given the importance of the Islands (it is shown as the only aggraded wet floodplain reach), the report should also explain why no field mapping or floodplain plot was chosen in the Islands area (presumably because of access and time). A narrative description of the Island area flooding would be helpful.
Response: Comment noted.

22. *Comment:* P. 90– What did the modeling predict for flooding in the Islands area? Did the video or photo monitoring, from the ground or from the helicopter, corroborate the predictions and were either used in arriving at the above assumptions?
Response: Model predictions for inundation were exceeded for the Islands Area.

23. *Comment:* P. 90– On p. 94 it is stated that the flooded extent acreage was adjusted to the 200 cfs flow level for comparison to the previous modeled predictions. That should be included in this section and not let the reader guess as to why it was done 4 pages later.
Response: Comment noted.

24. *Comment:* 3.14.4. Site Scale - Plot Analysis. P. 95– Reference to which "table" (no table number).
Response: Table numbers are located under the tables.

25. *Comment:* 3.16. Recommendations for Future Seasonal Habitat Flows. There should be some discussion of the recommended timing for the next seasonal habitat flow (i.e. basis for when in the coming spring it should be done). It is also appropriate to conjecture the expected downstream hydrograph for a seasonal habitat flow in the spring. This section should also be in Chapter 10.
Response: Comment noted. The intention of future seasonal habitat flows is to time them with peak seed production based on field observations. This is in accordance with the LORP Plan and the LORP EIR.

26. *Comment:* 3.19.4. River flow data for LORP. The data for the "Above PS" and "pumpback" stations are reversed.
Response: Comment noted. Corrections made on pages 147-149.

27. *Comment:* Chapter 4. 4.4. Flow Loss or Gain by River Reach During a Selected Winter Period. Table 3 and Table 4 would be clearer if the return ditch additions and their relative locations were incorporated into the table. The total releases into the river from the Intake and Ditches should be given.
Response: Total releases into the river from the Intake and return ditches are given in the appendices to this document.

28. *Comment*: The antecedent Jan 4/5, 2008 precipitation event should be noted and its possible influence on the gains and losses should be discussed.
Response: Comment noted.

29. *Comment:* 4.6. Flow Losses or Gains by River Reach from the Intake to the Pumpback Station. Discussion of the gains and losses by geomorphic reach type would be helpful. Explain what is meant by "strongly confuses the analysis" in the last sentence. Trends and variations in the seasonal gains and losses between 2007 and 2008 should be noted.
Response: Comments noted. Statement about "strongly confuses the analysis" is explained in the context of this discussion.

30. *Comment*: 4.7. 2008 Winter Habitat Release Flow. Why did the flows travel downriver faster than modeled or expected? Part of the adaptive management process is to understand the shortcomings of the predictions in order to improve on them in the future.
Response: Flows traveled downriver faster than expected because the model did not detect flow patterns to that degree of accuracy. Adaptive management is based on actual empirical data and not on models.

31. *Comment*: 4.8.1 Appendix River Flow Table. The data for "above PS" and "Pumpback" are reversed in some of the pages.
Response: Comment noted; changes made on pages 165-177.

32. *Comment*: Chapter 5, 5.1. Introduction. In the third paragraph, "certified by Inyo County court" should be changed to "certified by Inyo County Superior Court".
Response: Change made on page 181.

33. *Comment:* The 2007 LORP RAS (fourth paragraph) should be documented in this report since no LORP annual report was prepared in 2007. We agree with the statements by ESI in Chapter 10.2. (p. 281, Report Composition) regarding presenting the 2007 results and recommendations, providing consistent reporting, etc.
Response: 2007 was a test year to refine the methodology of the RAS. A copy of this report can be made available upon request.

34. *Comment:* 5.2.1. Riverine-Riparian Management Area. In the first paragraph it is stated that this area "follows approximately 53 miles of the Lower Owens River channel." On p. S-3 of the 2004 LORP EIR it is stated that this is "approximately 62 river miles long." Which is correct? If 62 miles is correct, then the first sentence in 5.4.1. needs correcting.
Response: Both are correct. The 53 miles or river refers to the section from the Intake to the Pump Station; the 62 miles incorporates river reaches below the Pump Station to the bottom of the Owens River Delta.

35. *Comment*: Chapter 6: As described above (Overall Comments and Recommendations), piezometers should be installed in the floodplain and included in the hydrologic monitoring.
Response: Comment noted. See response to comment #5.

36. *Comment*: Existing monitoring wells that are directly influenced by flows in the river should be included in the LORP hydrologic network and reported and analyzed in the annual report.
Response: No adaptive management decisions are triggered by fluctuations in depth to water, therefore, no monitoring or reporting is necessary.

37. *Comment:* 6.2.2. Flows to the Delta & Brine Pool. The 1997 MOU requires (Section II.C.2) an annual average flow "of approximately 6 to 9 cfs (not including water that is not captured by the station during periods of seasonal habitat flows)." The 2008 monitoring report does not

provide the 2007-2008 annual average flow to the Delta (from the Langemann Gate and Weir), not including the water that is not captured by the station during the seasonal habitat flow period. This information should be included in this section. Data on the flow table on p. 230 shows that the flow to the delta in the 2006-07 water year (since the July 2007 Court Stipulation and Order) averaged 8.5 cfs and since there was no seasonal habitat flow in that period it clearly meets the MOU requirement. However, the flow table for 2007-2008 (p. 231) only provides an average flow for the period, without providing a figure that does not include the water that is not captured by the station during the seasonal habitat flow period as per the MOU.
Response: Comment noted. Changes made in document on page 231.

38. *Comment:* Chapter 7, 7.1.3. Upland Utilization Rates and Grazing Periods. "Currently, not all LORP pastures have permanent utilization transects." (fourth paragraph) The report should disclose how many are in place and how many are not; whether there are any issues with not having them all in place yet; what was the schedule for their placement and how is that schedule being met (or not).
Response: The number of transects currently established within each lease has been presented within the specific lease discussions within the report. Placement of additional transects is ongoing and will be completed by the end of the 2009 growing season.

39. *Comment:* 7.2.5. Islands. There is no discussion of the concerns raised by the leesee at the November 6, 2008 Standing Committee meeting in Bishop. It was revealed at that meeting there had been a field visit with the leesee, staff from Inyo County and LADWP, and the MOU Consultants and that the MOU Consultants had prepared a draft report with recommendations. These issues should be included in the 2008 report.
Response: The report is not yet complete and thus is not included in this first annual report. Once complete, the report will be sent to the Standing Committee. Meetings have been held with the lessee, and the lessee agrees postponing recommendations until more data is collected.

40. *Comment:* Chapter 8, 8.3.4. Russian Olive. We are concerned about the potential spread of Russian Olive. As stated in this section "When allowed to spread, Russian olive has the potential to become a serious weed problem." This section mentions that Russian olive has invaded parts of the river, the Blackrock Waterfowl Habitat Area, the off-river lakes and ponds, and native pastures in the LORP area, but it does not give an indication of the extent of the problem. The RAS should have documented the occurrence of Russian Olive, but there is no summary of that presented in the RAS report (Chapter 5). Likewise, there is not clear indication about what control efforts LADWP has conducted. The extent of the problem should be documented in this report and any data gaps noted.
Response: Russian Olive occurrence is noted in Figure 5 (page 201), RAS Table 1 (pages 206-223), and a summary of these findings is at the bottom of page 192 (header added). There are no apparent data gaps from the 2008 RAS survey, as crews surveyed all 62 miles of river channel, off river lakes and ponds, and the Blackrock Waterfowl Area. To date, Inyo County Salt Cedar Crews have cut and eradicated Russian Olive from the Owens River Intake to 2 culverts. At this time, Russian Olive does not appear to be inhibiting riparian recruitment in the LORP and is not a serious weed problem. Ongoing monitoring will identify Russian Olive problems, which will be addressed through adaptive management.

41. *Comment:* The RAS report (Chapter 5) notes problems with tamarisk slash in the LORP riverine-riparian areas. How is this issue being addressed in the salt cedar control program?
Response: Tamarisk slash is currently, and will continue to be, stacked as cut and burned as conditions allow. Alternative measures for managing salt cedar will be considered in the future.

42. *Comment:* The RAS report (p. 193) noted that 44 locations were found with tamarisk seedlings, some with several hundred seedlings. What priority, if any, will be given to tamarisk control in the tamarisk seedling locations identified in the RAS?
Response: RAS will be used as guidance for treatment, and priority will go to riparian areas.

43. *Comment*: Chapter 10, 10.1. Introduction. A summary table of the specific management recommendations for 2009 and beyond should be compiled. A recommendation that is testing a hypothesis (such as tule control) should clearly state the hypothesis and assumptions behind it.
Response: As discussed earlier, this has already been completed.

44. *Comment*: The process for the adoption of these recommendations should be described.
Response: Comment noted. These measures are described in 3.3 of the LORP Monitoring and Adaptive Management Plan.

45. *Comment*: As noted in our Overall Comments and Recommendations, peizometers or some form of shallow groundwater monitoring (including stage height in off-channel ponds in the floodplain) should be installed along the Lower Owens River including the Delta region.
Response: Comment noted. See response to comment #5.

46. *Comment*: 10.2. RAS. Data Organization and Management. We concur with the recommendation that some information in the notes be converted to categorical data and collected that way in the future. This is especially important for observations of tamarisk, noxious weeds, and Russian olive.
Response: Comment noted.

47. *Comment*: 10.2.2. Exotic Weeds. We would like to see an analysis of the problems with Russian olive and recommendations for future monitoring and/or control.
Response: Comment noted. Although Russian Olive is present in the LORP area, it is not currently inhibiting recruitment of riparian vegetation or otherwise impairing the project. If or when this occurs, Inyo County and/or LADWP will respond accordingly.

48. *Comment*: 10.4.1. Tules. Some of the recommended actions for controlling tules through flow management are contained in the next section on water quality. The recommended actions for tules should be consolidated. As it is, it is unclear what the recommendations are for the upcoming year.
Response: Comment noted and discussions are pending to address this issue.

49. *Comment*: In the fourth paragraph it is suggested that flows higher than 40 cfs in the spring and summer may provide some level of control over tule encroachment. Then it is stated that correspondingly lower winter flows would allow for the higher summer flows without violating EIR conditions. This is an egregious error that must be struck from the report. We have on several occasions in the past pointed out to ESI that the MOU very clearly calls for a baseflow of approximately 40 cfs throughout out the river, year-round. Our understanding back in 1995 was that this was the recommendation of the consultants working on the flow tests. Those consultants were Mark Hill and Bill Platts, who are now the principals of ESI. This is not the first time in the past two years that this lack of understanding of the MOU requirements has been expressed by ESI. What is agreed to in the MOU is a flow rate for the river, not a volume of water.

Nevertheless, modifying the flows as suggested may be a reasonable way to control tules and meet the habitat goals of the LORP. As suggested in 10.4.2. more information is needed and perhaps some test flows could be used. However, this will take the agreement of all of the MOU parties. We agree with the assessment in 10.4. that tule encroachment in the channel and water quality are the two most immediate concerns related to the LORP flows. Some very clear recommendations of how to start dealing with these two issues should be included in this report.
Response: Comment noted and discussions are pending to address these issues. It is recognized that a change to the 40 cfs base flow would require modification to the MOU and the Stipulation and Order.

50. *Comment*: 10.5. Blackrock. New monitoring protocols and flow management that would address the difficulties in meeting the wetted area criteria are being discussed by the MOU parties. Perhaps this should be noted in the final 2008 annual report.
Response: Comment noted. Discussions are ongoing.

51. *Comment*: The proposal to initiate cycle 2 (bottom of p. 288), would draw down the Winterton and Thibaut units in the spring and would likely create ideal conditions for tamarisk seedlings to establish in the units. This is a big problem. This points out a difficulty with doing the planning for the project all at once, after the annual LORP monitoring report comes out. Perhaps decisions on the BWHA should be made in the future in the fall, so that draw down in a unit could happen over the fall and winter (or some other time period could be selected) so as to avoid the creation of ideal conditions for tamarisk establishment.
Response: Comment noted. This concept will be further discussed with regard to comment 50 discussions.

52. *Comment:* 10.6.2. Delta Habitat Area. As pointed out in our comment on 6.2.2., the 1997 MOU requires (Section II.C.2) an annual average flow “of approximately 6 to 9 cfs (not including water that is not captured by the station during periods of seasonal habitat flows).” Therefore, the average annual flow of 11.6 cfs cited in the first paragraph here is not the correct figure to look at to see if the project is in compliance with the MOU flow requirement to the delta. That figure needs to be adjusted downward to exclude the water that by-passed the pump station during the 2008 seasonal habitat flows.
Response: Comment noted. 11.6 cfs has been changed to 8.8 cfs on page 290 of the final document to reflect a reduction in 2.8 cfs.

53. _Comment:_ The recommendation to reevaluate the pulse flows due to the changed conditions brought about by the dust control project seems reasonable to us.
Response: Comment noted.

54. _Comment:_ 10.7. Land Use. P. 292 first paragraph– It is pointed out that not all the utilization transects have been established and measured in upland and riparian fields and pastures; that lessees are required to meet utilization standards starting at the end of 2009; and therefore there is time to establish and measure the utilization transacts in 2009. However, somewhere in this report there should be a plan indicating how many of these transects need to be established and how LADWP will accomplish this task in 2009.
Response: Comment noted and previously discussed above.

55. _Comment:_ P. 292 last paragraph– It is pointed out that not all the necessary fences have been completed. However, somewhere in this report there should be a plan indicating how much fence needs to be repaired or constructed and how LADWP will accomplish this task in 2009.
Response: All fencing within the LORP project area will be completed by the end of 2009.

12.0 GLOSSARY

acft – acre feet

Action Plan – A plan prepared by Ecosystem Sciences in 1999 describing the implementation of the Lower Owens River Plan, which they also prepared.

APE – Area of Potential Effect (APE is defined under Section 106 of the National Historic Preservation Act (NHPA) as the geographic area or areas within which an undertaking (i.e., a project activity) may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist.)

BLM – U.S. Department of Interior, Bureau of Land Management

BWMA – Blackrock Waterfowl Management Area

CDFG – California Department of Fish and Game

CEQA - California Environmental Quality Act

CEQA mitigation – Measures to reduce or avoid impacts identified through the environmental impact analyses performed for an EIR or Negative Declaration

cfs – cubic feet per second

CHRIS – California Historical Resources Information System

Class I impact - Unavoidable significant impact that cannot be avoided if the project is implemented, and cannot be mitigated to a less than significant level

Class II impacts - Significant environmental impacts that can be mitigated to a less than significant level

Class III impacts - Other environmental impacts that are considered adverse but not significant. Mitigation measures are recommended to minimize adverse impacts but the lead agencies are not required to adopt them.

Class IV impacts - Beneficial impacts

DHA – Delta Habitat Area

Delta conditions - The amount of water and vegetated wetland within the Delta Habitat Area boundary existing at the time of the commencement of flows to the Delta under the LORP

EPA – U.S. Environmental Protection Agency

ESA – Federal Endangered Species Act

ESI – Ecosystem Sciences, Inc.

fps – feet per second

GBUAPCD – Great Basin Unified Air Pollution Control District

Historic properties – Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. (30 CFR Sec. 800.16 (l) (1))

HEC-2 – Hydraulic model developed by the Corps of Engineers to predict water surface elevations and flow velocities in channels and rivers

HEP – Habitat Evaluation Procedures, an analytic model developed by the US Fish and Wildlife Service to predict how wildlife would respond to habitat changes

ICWD – Inyo County Water Department

Lead Agencies – The agencies with responsibilities under either CEQA or NEPA to prepare environmental documents.

LORP Plan – The plan prepared by Ecosystem Sciences that describes the objectives and major element of the Lower Owens River Project. The most recent version is dated August 2002.

Lower Owens River Rewatering Project - Releases are currently made from the Aqueduct at the Independence, Locust, and Georges spillgates to provide water to the river for fish and habitat purposes under an “Enhancement/Mitigation Project” called the “Lower Owens River Rewatering Project” that was initiated by the LADWP and the County in 1986. The releases under that project will be replaced by the releases under the LORP.

MAMP – Lower Owens River Monitoring and Adaptive Management Plan

MOU – Memorandum of Understanding amongst LADWP, the County, California Department of Fish and Game, State Lands Commission, Sierra Club, the Owens Valley Committee, and Carla Scheidlinger. The MOU specifies goals for the LORP, a timeframe for the development and implementation of the project, specific project actions, and requires that a LORP ecosystem management plan be prepared to guide the implementation and management of the project. It also provides certain minimum requirements for the LORP related to flows, locations of facilities, habitat and species.

NEPA mitigation - Measures to reduce or avoid impacts identified through the environmental impact analyses performed for an EIS or Environmental Assessment

NHPA – National Historic Preservation Act

NRHP – National Register of Historic Places

NTU - Nephelometric Turbidity Units

OHP – California Office of Historic Preservation

RAS – Rapid Assessment Survey

Responsible Agency – State or local agency that can only approve a project after a lead agency has already completed the CEQA environmental review and taken action on the project.

Regional Board – Lahontan Regional Water Quality Control Board

ROD – Record of Decision

RWQCB – Regional Water Quality Control Board

SIP – State Implementation Plan *June 2004 Los Angeles Dept of Water & Power and EPA* 17-3 *Lower Owens River Project Final EIR/EIS*

SLC – California State Lands Commission

TMDL – Total Maximum Daily Load. Section 303(d) of the federal Clean Water Act requires states to identify surface water bodies which are not attaining water quality. For each listed water body/pollutant combination, states must develop a TMDL, which is a plan to limit pollutants from various sources in the watershed to ensure attainment of standards.