2011
Lower Owens River Project
Annual Report

January 19, 2012

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EXECUTIVE SUMMARY

The 2011 Lower Owens River Project Annual Report contains the results of the fourth year monitoring of the Lower Owens River Project (LORP). Monitoring included hydrologic monitoring, seasonal habitat flow including flood extent, fish creel census, rapid assessment survey, avian census in the Blackrock Waterfowl Management Area (BWMA), land (range) management, saltcedar and weed control and conditions.

The hydrologic monitoring section describes flow conditions in the LORP regarding attainment with Stipulation & Order flow and reporting requirements and LORP *1991 Environmental Impact Report* (EIR) goals. For the 2010-11 water year, which covers October 2010 to September 2011, LADWP was fully compliant with all Stipulation & Order flow and reporting requirements. Off-River Lakes and Ponds level goals were fully met and the flows to the Delta achieved the required 6-9 cfs annual flow. The agreement to manage wetted acreage in the BWMA by setting constant flows by seasons, continued with generally good results. The section also describes flow measurement issues and finishes with a commentary on flow losses and gains through the different reaches of the Lower Owens River.

The 2011 seasonal habitat flow was timed to occur with seed release of woody riparian vegetation; which is an objective of the flow release pertinent to the 1997 MOU. The time for the peak 205 cfs flow to move down the Lower Owens River was 15 days 6 hours from the LORP Intake to the Pumpback Station. Flooding was estimated to cover approximately 1,836 acres within the Lower Owens River. There was an increase of 543 acres inundated above base flow conditions that provided areas for recruitment of woody riparian species. During the seasonal habitat flow about 77% of floodplains and 29% of low terraces in the Lower Owens River were inundated. Seasonal Habitat Flow flooded extent this year was similar to the 200+ cfs flow in 2010.

The 2011 LORP land management monitoring efforts continued with monitoring utilization across all leases, rare plant monitoring, and streamside monitoring for woody recruitment. It was an off-year for the range trend monitoring evaluation. Irrigated pasture condition scoring was conducted on leases that rated below 80% the previous year.

In general, pasture utilization adhered to standards established for both riparian and upland areas. Use on Blackrock's White Meadow Riparian Field was estimated at 57%, exceeding the 40% riparian utilization standard. This is the same pasture which was recommended through the adaptive management process to receive heavy use the year before in an attempt to trample fivehorn smotherweed. Both the streamside monitoring and rapid assessment survey (RAS) results showed no impacts from excessive grazing in the White Meadow Riparian Field in 2011. Thibaut Field in the Thibaut Lease was 2% above the upland standard (67%); however, use was extreme on the western side of the field. The lessee and Los Angeles Department of Water and Power (LADWP) will be taking steps to improve livestock distribution in this field during the 2011-12 grazing season. The Delta Lease which previously exceeded riparian standards in the Delta Riparian Pasture was below 40%, as well as the Lone Pine Lease's riparian pasture.

Irrigated pastures in the Islands, Lone Pine, and Delta Leases all had rated above the minimum rating of 80% in 2010; therefore, they did not need to be rated in 2011. The Thibaut Lease rated 68% in 2010 and 82% in 2011. The lessee and LADWP are in the process of improving this score. All irrigated pastures in the LORP will be evaluated again in 2012.

Range trend monitoring was not scheduled for 2011; however, three additional range trend transects were established and read inside the grazing exclosures built in 2009, on the Blackrock and Islands lease. In 2012, the range trend monitoring schedule will be altered to incorporate reading approximately one-third of the LORP transects each year. This change will allow monitoring to occur across the landscape annually. Annual monitoring will ensure the documentation of environmental or management vagaries such as the above average winter precipitation this year, which unfortunately was not captured because the current schedule had 2011 as an off-year.

The 2011 monitoring was the third year of collecting trend plot data for *S. covillei* and *C. excavatus* for the LORP. While no statistical analysis has been conducted on this data, it indicates thus far that populations of both *S. covillei* and *C. excavatus* are generally static. However, *S. covillei* appears to be decreasing in the exclosure in the Robinson Pasture in the Blackrock Lease, as documented in the Robinson 1EX plot. In contrast, plots surveyed in the Springer Pasture in the Blackrock Lease where no plants are excluded are markedly increasing. Future data will be useful to further define trends of *S. covillei* and *C. excavatus* within the LORP area.

Based on the 2011 streamside monitoring effort, woody recruitment is beginning to occur throughout the Lower Owens River. New narrowleaf willow and Goodding's willow seedlings were documented at seven locations in 2011. Most of the willow recruits are not occurring directly at the 40 cfs base flow water's edge; rather, they are sprouting within 1-2 meters of this wetted edge on banks, point bars, or other floodplain areas. The seedlings of both species largely occurred where there was a seed source readily available in the immediate vicinity. However, there was also evidence of seedlings resulting from the 2011 seasonal habitat flow.

Grazing prescriptions and other land management actions are proving beneficial as evidenced by bank stability, high vigor of grasses on the floodplain, and desirable riparian species increasing in cover along the banks. Wildlife use was noted at many of the streamside monitoring sites, particularly by deer, elk, raccoons, riparian birds, and Owens Valley voles. Elk browsing and antler rubs on mature willows were especially prominent in the fall 2011 streamside monitoring surveys.

The 2011 Rapid Assessment Survey (RAS) of the LORP was conducted by Inyo County and LADWP staff between August 1 and August 12, 2011. Findings indicate woody recruitment is occurring on the LORP. Compared to 2010, four times as many woody recruitment sites were found along the river. This may be partly attributable to the timing of the Seasonal Habitat Flow relative to the RAS survey, and the recording of *Salix exigua* root sprouts as woody recruitment. New woody recruitment is persisting. At 74% of the sites, supporting new recruitment in 2010, woody recruitment persisted without any apparent attrition. Decreases were evident at 6 sites (8%), and previous woody recruitment was absent at 13 sites (17%). New recreational access points have been created by the public, but few impacts have been associated with these areas. New roads were found primarily in areas where recent prescribed fires had taken place.

Surveys conducted in 2011, of the Winterton Unit in the BWMA, indicate that the unit is being used by habitat indicator species. Mean indicator species diversity, richness, and abundance have shown statistically significant increases as compared to census data for the unit when in inactive status. The vegetation treatment applied before flooding (prescribed burn) was effective at creating conditions more appropriate for indicator species, once flooding commenced.

The purpose of the creel survey is to track the development and health of the warm-water fishery in the Lower Owens River Project (LORP). Twenty-three volunteer anglers fished five separate fishing areas for a total of 161 hours and caught 214 fish with an overall catch per unit effort of 1.3 fish per hour. Fish caught ranged from young of the year to adults for all warm-water species and were in good condition. The 2011 creel survey results demonstrate that the LOPR contains a healthy, self-sustaining warm-water fishery.

LORP area weed management efforts during 2011 continue the augmented efforts introduced in 2010. Surveys assessed 15,483 acres during 2011. Inyo/Mono Counties' Agricultural Commissioner's Office (AgComm) staff conducted three large surveys within the LORP project boundaries between October 2010 and October 2011. These surveys discovered one new large *Lepidium latifolium* site, and confirmed the eradication of another site. Field staff was still able to treat each known site twice during the 2011 growing season.

In 2010-2011, saltcedar crews worked in the water-spreading basins that border the west side of the Lower Owens River and in the LORP river-riparian area along the river. Crews cut and treated 461 acres in the spreading basins and revisited 89 miles of river bank and floodplain. Surveying the river to locate and remove saltcedar is an annual and ongoing activity. In 2011, a saltcedar work plan was developed to more precisely describe the work to be conducted in 2011-2012. Plans include reducing the amount of slash that have accumulated after years of cutting and clearing the Lower Owens River corridor annually of all saltcedar plants to prevent its spread.

1.0 LOWER OWENS RIVER PROJECT 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, the 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 (LAA) to the Lower Owens River, flooding of up to approximately 500 acres depending on the water year forecast in the Blackrock Waterfowl Management Area (BWMA), 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 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 consultants, Mr. Mark Hill and Dr. William Platts of Ecosystem Sciences (ES) 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, 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 consultants, ES. This LORP Annual Report describes monitoring data, analysis, and recommendations for the LORP based on data collected during 2011. The development of the LORP Annual Report is a collaborative effort between the ICWD, LADWP, and the MOU consultants. 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: Sections 1.0 Introduction; 2.0 Hydrologic Monitoring; 3.0 Seasonal Habitat Flow; 4.0 Land Management; 6.0 Avian Surveys; and 7.0 LORP Fishing Creel Survey.

Section 8.0, Weed Control was authored by the Inyo County Agricultural Commission. ICWD completed the 5.0 Rapid Assessment Survey Summary.

The annual report will be available to download from the LADWP website link: http://www.ladwp.com/ladwp/cms/ladwp014936.jsp.

This document represents the reporting requirements for the LORP Annual Report for 2011.

1.2 2011 Monitoring

2011 was the third year of monitoring for the LORP. The monitoring that was conducted included:

- Seasonal Habitat Flow Flooded Extent and Water Quality (June 2011)
- Assessment of River Flow Gains and Losses (September 2011)
- Rapid Assessment Survey (August 2011)
- Hydrologic Monitoring (throughout 2011)
- Land Management (throughout 2011)
- Weed Monitoring and Treatment (growing Season 2011)
- Streamside Monitoring for Woody Species Regeneration and other Riparian (September 2011)
- Creel Survey (May 2011)
- Avian Surveys

2.0 Hydrologic Monitoring

2.1 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 2011, LADWP has been in compliance with the flow requirements outlined in the Stipulation & Order. The flow requirements are listed below:

1. Minimum of 40 cubic feet per second (cfs) released from the Intake at all times.
2. None of the in-river measuring stations has a 15-day running average of less than 35 cfs.
3. The mean daily flow at each of the in-river measuring stations must equal or exceed 40 cfs on 3 individual days out of every 15 days.
4. The 15-day running average of the in-river flow measuring stations is no less than 40 cfs.

On July 14, 2009, 6 of the 10 original temporary in-river measuring stations were taken out of service, while the Below LORP Intake, Mazourka Canyon Road, Reinhackle Springs, and Pumpback Stations remained in service.

The flow data graphs show that LADWP was in compliance with the Stipulation & Order, from October 2010 through September 2011, for the 4 in-river stations (see Hydrological Appendix 1).

2.1.1 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, Blackrock Waterfowl Management Area (BWMA) wetted acreage, and 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 Below LORP Intake, Owens River at Mazourka Canyon Road, Owens River at Reinhackle Springs, and Pumpback Station are posted to the Web at <http://www.ladwp.com/ladwp/aqueduct/showAqueductMap.ladwp?contentId=LADWP_AQUERTD_SCID> and click on the 'Lower Owens River Project' link.

2.1.2 Measurement Issues

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

The accuracy of the Sontek meters are affected by factors which change the levels or velocities in the river. One of those factors are seasonal changes, such as spring/summer vegetation growth, which cause water levels to increase and velocities to decrease. 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. In order to account for these environmental changes, LADWP manually meter flows at all of the stations along the LORP to check the accuracy of the meters. Each time current metering is performed, 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, per the 1997 Stipulation & Order, to maintain the accuracy of the meters.

A commentary on each station along the LORP follows:

<u>Below LORP Intake</u>

Measurement Devices: Langemann Gate & WaterLOG H-350XL Bubbler System

The Langemann Gate regulates and records the flow values at the Intake. This has had very good accuracy and reliability as long as the gate does not become submerged (submergence may be possible at higher flows such as when the seasonal habitat flows are released). In case of submergence, the WaterLOG H-350XL was installed as a back up to the Langemann Gate measurement. The WaterLOG H-350XL is a bubbler system that uses pressurized air to measure stage, which is applied to a rating curve. The bubbler system could possibly allow for an accurate measurement of stage even in silt/sediment conditions. However, any system of water measurement using stage must be calibrated through the full range of flows and in similar seasonal conditions in order for measurements to be accurate. Also, due to the low slope of the river channel in the LORP, velocities in the river are extremely low causing large fluctuations in stage as conditions in the river channel go through the normal seasonal cycles of vegetation activity and dormancy in the summer and winter respectively.

During the 2011 seasonal habitat flow, the Langemann Gate was used for measurement through the entire schedule of flow releases. Unlike 2010, the LORP Intake downstream level did not rise to a level where submergence of the Langemann Gate occurred. The lower stage height was likely due to cooler temperatures leading up to the seasonal habitat release period, thus resulting in less vegetation growth in the main LORP channel and a corresponding lowered stage height at the LORP Intake.

To date, calibrating the bubbler for seasonal habitat flows has proven difficult and likely will not ever give accurate results. More data points can be collected to allow for a better flow curve to be established, but with the low slope of the upper reaches of the river causing extremely low velocities using stage height only to measure flow at the LORP Intake may not be possible.

<u>LORP at Mazourka Canyon Road</u>

Measurement Devices: Sontek SW Meter

The station utilizes a single Sontek SW flow meter in a concrete measuring section and flow measurement accuracy has been excellent.

LORP at Reinhackle Springs

Measurement Device: Sontek SW Meter

The station utilizes a single Sontek SW flow meter in a concrete measuring section and measurement accuracy has been excellent.

LORP at Pumpback Station

Measurement Devices: Pumpback Station Discharge Meter, Langemann Gate, Weir

At the Pumpback Station flow is a calculated flow resulting from adding the Pumpback Station's electronic discharge flow meter, Langemann Gate Release to Delta, and Weir to Delta. In most flow conditions these stations have proven to be very accurate. However, during the higher flows, the Weir and/or the Langemann Gate can become submerged thus lowering the measuring accuracy of the submerged device.

2.2 Flows to the Delta

Based upon a review of the flow to Brine Pool and flow to Delta data, and after filtering out unintended spillage at the Pumpback Station to average a flow of 6 to 9 cfs, the flows to the Delta were set to the following approximate schedule (per the LORP EIR, section 2.4):

- October 1 to November 30 4 cfs
- December 1 to February 28 3 cfs
- March 1 to April 30 4 cfs
- May 1 to September 30 7.5 cfs

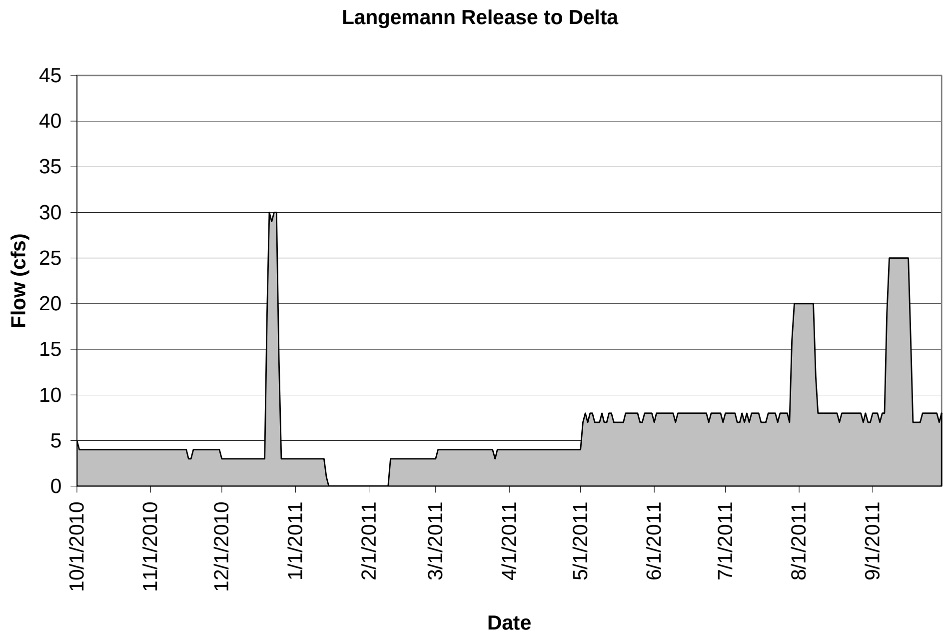
Additionally, pulse flows were scheduled to be released to the Delta (LORP EIR, section 2.4):

- Period 1: March-April 10 days at 25 cfs
- Period 2: June-July 10 days at 20 cfs
- Period 3: September 10 days at 25 cfs
- Period 4: November-December 5 days at 30 cfs

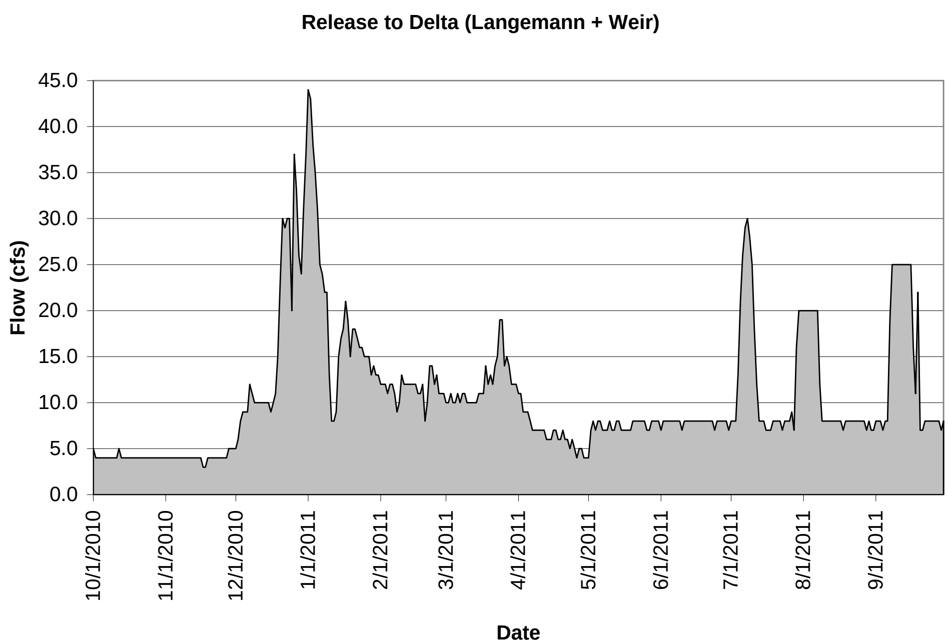
The scheduled base and pulse flows for the 2010-11 water year targeted an average of 7 cfs to the Delta. Due to unintended flows, the release to Delta was much higher than the planned 7 cfs even after excluding Delta releases during the seasonal habitat flow. Unintended flows are released to the Delta when intense rainstorms cause river flows to exceed the limited maximum capacity of the Pumpback Station or when pump outages occur at the Pumpback Station. Flows over the weir are generally unintended flows and flows over the Langemann Gate are scheduled flows (see figures below).

All of the scheduled flows to the Delta were released as planned except for the June-July Delta pulse flow, which occurred 8 days late and the March-April Delta pulse flow, which was canceled. In the weeks leading up to the planned March-April Delta pulse flow, unintended flows exceeding the water volume of the planned release went over the weir at the Pumpback Station and met the Delta's ecological needs.

The final October 2010 to September 2011 average flow to Delta was 10.7 cfs. The flow schedule for the October 2011 to September 2012 period will remain the same as the previous years' schedule unless adaptive management measures are proposed and implemented.



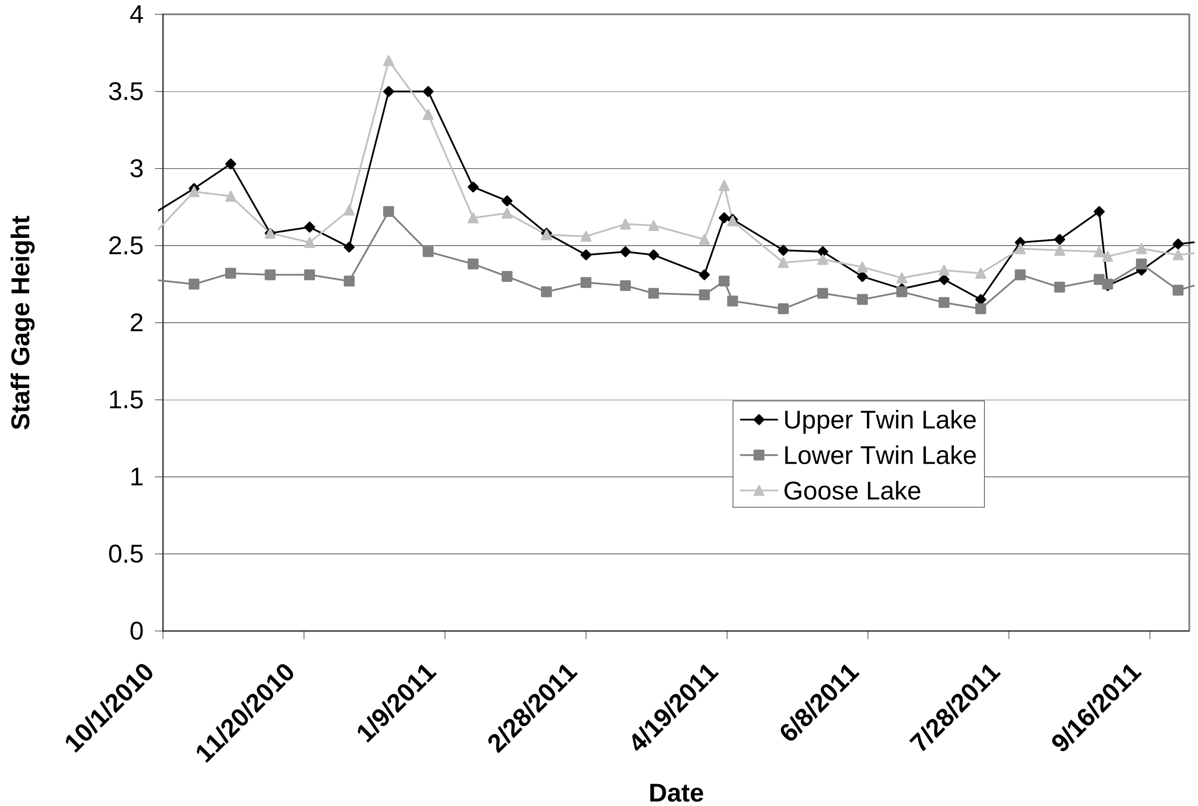
Hydrologic Monitoring Figure 1. Langemann Release to Delta



Hydrologic Monitoring Figure 2. Langemann and Weir Release to Delta

2.3 Off-River Lakes and Ponds

The BWMA and Off-River Lakes and Ponds Hydrologic Data Reporting Plan requires that Upper Twin Lake, Lower Twin Lake, and Goose Lake be maintained between 1.5 and 3.0 feet on their existing staff gauges, and that Billy Lake be maintained full (i.e., at an elevation that maintains flow from the lake). At no time during the period of October 2010 to September 2011, did any of the gages indicate below a 1.5 foot stage height.



Hydrologic Monitoring Figure 3. Off-River Lakes and Ponds Staff Gages

<u>Billy Lake</u>

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 (see Hydrological Appendix 2). Billy Lake Return had a minimum daily average flow of 0.8 cfs for the year, so Billy Lake remained full for the entire year (see table below).

Hydrologic Monitoring Table 1. LORP Flows – Water Year 2010-11

Station Name	Average Flow (cfs)	Maximum Flow (cfs)	Minimum Flow (cfs)
Below River Intake	52.3	192.0	40.0
Blackrock Return Ditch	2.3	10.0	1.0
Goose Lake Return	1.3	2.9	0.9
Billy Lake Return	1.3	1.7	0.8
Mazourka Canyon Road	55.4	120.0	40.0
Locust Ditch Return	0.0	0.7	0.0
Georges Ditch Return	1.3	11.1	0.0
Reinhackle Springs	57.0	111.0	44.0
Alabama Gates Return	0.0	7.1	0.0
At Pumpback Station	53.1	91.0	38.0
Pumpback Station	42.3	48.0	15.0
Langemann Gate to Delta	6.3	30.0	0.0
Weir to Delta*	4.5	41.0	0.0

**Without the seasonal flow included, the average flow at the Weir to Delta was 4.1 cfs.*

Thibaut Pond

Thibaut Pond is contained completely within the Thibaut Unit of the Waterfowl Area. Each day the Thibaut Pond acreage is posted to the web in the LORP daily reports found at <http://www.ladwp.com/ladwp/cms/ladwp009121.jsp>. Anytime the Thibaut Unit is showing wetted acreage above zero; Thibaut Pond is at 28 acres and is full.

An adaptive management recommendation was implemented on April 1, 2011, and flow to Thibaut Pond was turned off to dry out the pond and no further water was released through the end of September 2011.

2.4 Blackrock Waterfowl Management Area

Flows for the BWMA are set based upon previous data relationships between inflows to an area and the resulting wetted acreage measurements during each of the four seasons based on evapo-transpiration (ET) rates.

The seasons are defined as:

Spring	April 16 – May 31
Summer	June 1 – August 15
Fall	August 16 – October 15
Winter	October 16 – April 15

Wetted acreage measurements are collected eight times per year, once in the middle of each season and once at the end of each season. These measurements are done by using GPS and walking the perimeter of the wetted edges of the waterfowl area. The measurement in the middle of the season counts as the average for the entire season with the data collection points at the end of each season being used as reference points (see table below).

Hydrologic Monitoring Table 2. BWMA Wetted Acreage

Winterton Unit

ET Season	Read Date	Wetted Acreage	Inflow
Spring			
Summer			
Fall			
Winter			0.4
Spring	5/10/2011 5/31/2011	84*** 142	4.6
Summer	7/6/2011 8/16/2011	137*** 178	5.3
Fall	9/14/2011	189***	5.5

Thibaut Unit

ET Season	Read Date	Wetted Acreage*	Inflow
Spring	5/4/2010 6/2/2010	40 13	0.9
Summer	7/7/2010 8/17/2010	0 20	1.5
Fall	9/16/2010 10/19/2010	40 64	2
Winter	1/11/2011	37	0.5

Drew Unit

ET Season	Read Date	Wetted Acreage	Inflow
Spring	5/3/2010 6/2/2010	276** 289	6.1
Summer	7/7/2010 8/17/2010	307** 313	6.8
Fall	9/15/2010 10/18/2010	328** 331	6.6
Winter	1/11/2011 4/12/2011	333** 288	2.1
Spring	5/10/2011 5/31/2011	288*** 292	6.3
Summer	7/6/2011 8/16/2011	280*** 280	6.2
Fall	9/14/2011	276***	5.2

Waggoner Unit

ET Season	Read Date	Wetted Acreage	Net Inflow
Spring	5/3/2010 6/1/2010	229** 321	6.6
Summer	7/7/2010 8/16/2010	352** 304	8.1
Fall	9/15/2010 10/18/2010	312** 390	7.2
Winter	1/10/2011 4/12/2011	391** 221	1.6
Spring	5/12/2011	74	0

** This acreage does not include the 28 acres of the Thibaut Pond area.*
*** These measurements count towards the 2010-2011 runoff year acreage goal.*
**** These measurements count towards the 2011-2012 runoff year acreage goal.*

2.4.1 Waterfowl Results for Runoff Year 2010-11 (April 2010 to March 2011)

The BWMA acreage goal for Runoff Year 2010-11 was 475 acres.

Taking into account water use, maximum capacities, and wildlife concerns LADWP chose to maximize the Drew Unit wetted acreage because it uses relatively less water than the Waggoner Unit and because it has displayed more diverse and robust wildlife. From observations during the 2009-10 runoff year, the best guess for the maximum capacity for the Drew Unit was between 290 and 300 acres before water levels reach the point where water starts spilling back into the Blackrock Return Ditch. Due to this, the flows to the Drew Unit will be set with a goal of 275 wetted acres. The remaining 200 acres will be achieved through the Waggoner Unit and flows there were set with that goal in mind.

The preliminary waterfowl operation protocol calls for the previous ET-season flow vs. acreage ratios to be used in order to set new flows. However, the 2009 spring data is skewed to a very high inflow ratio due to the ‘wetting up’ period both Drew and Waggoner Units went through from mid-April through mid-August last year. As such, because the seasonal ET rates of spring and fall are usually similar, the ratios from the fall of 2009 were used instead of the artificially high ratios from the spring of 2009.

Beginning April 20, the new flows were set and based on the fall 2009 ratios, resulting in a 6.6 cfs inflow to the Drew Unit and a 7.2 cfs net inflow to the Waggoner Unit. When the wetted perimeter was measured with GPS in the middle of the spring season, the wetted area was 276 acres for Drew and 229 acres for Waggoner. At the end of spring the wetted area was 289 acres for Drew and 321 acres for Waggoner.

For the 2009 summer flows, the Drew and Waggoner Units were also still ‘wetting up’ for much of the summer, but not as drastically as during the spring. In order to set the flows for summer 2010, the average acreage for middle and end of summer reads were used to set the ratios (instead of using the middle only). Using the average of the two reads resulted in a 6.8 cfs net flow to Drew and an 8.1 cfs flow to Wagoner which were set on June 1. When the acreage was GPS’d on July 7, Drew came in at 307 acres while Waggoner came in at 352 acres (for a total of 659 acres). For the end of summer reads GPS’d on August 17, Drew came in at 313 acres while Waggoner came in at 304 acres (for a total of 617). Clearly the flow ratios set for the summer were too high, but the methods to calculate the flow ratios will automatically adjust to compensate for the summer of 2011, inflows.

Beginning August 16 the new flows were set and based on the fall of 2009, ratios, resulting in a 6.6 cfs inflow to the Drew Unit and a 7.2 cfs net inflow to the Waggoner Unit. When the wetted perimeter was measured with GPS on September 15, in the middle of the fall season, the wetted area was 328 acres for Drew and 312 acres for Waggoner. At the end of the fall season (mid-October), the wetted area was 331 acres and 390 acres respectively.

Beginning October 16, winter flows were set based on the winter 2009-10 ratios, resulting in a 2.1 cfs inflow to the Drew Unit and a 1.6 cfs net inflow to Waggoner Unit. When the wetted perimeter was measured with GPS in the middle of the winter season, the wetted area was 333 acres for Drew and 391 acres for Waggoner.

The average waterfowl wetted acreage for the 2010-11 was 669 acres, which was well above the goal of 475 acres. The high acreage numbers are likely the result of low wetted acreages from the 2009-10 year due to the ‘wetting up’ period for the Drew and Waggoner Unit areas.

For Drew, which will be used again during 2010-11, the wetted acreage is likely to be closer to next year's goal since the ratios of water used to wetted acreage attained for the 2010-11 year are low and will be averaged in to the ratios used to determine waterfowl inflows for the 2011-12 runoff year.

2.4.2 Waterfowl Results for Runoff Year 2011-12 (April 2011 to September 2011)

The runoff forecast for runoff year 2011-12 is well over 100%, so the waterfowl acreage goal for this year is 500 acres. The Waggoner Unit and Thibaut Pond areas were shut off to burn the excessive vegetation growth. The Winterton Unit was turned on to replace the waterfowl acreage lost by turning off Waggoner. The goals for the year were split at 300 acres for Drew and 200 acres for Winterton.

On April 1, 2011, the Winterton Unit inflow was turned on to 4.6 cfs in order to 'pre-wet' the area for use beginning on April 16. Also on this date, Thibaut Pond was turned off. On April 16, inflows to Waggoner were shut off. When the wetted perimeter was measured with GPS in the middle of the spring season, the wetted area was 288 acres for Drew and 84 acres for Winterton, resulting in a spring total wetted area of 372 acres. Winterton's low wetted acreage was likely due to the 'wetting period' of the newly re-wetted waterfowl area.

On June 1 the inflow to Winterton was increased to 5.3 cfs and the inflow to Drew was decreased to 6.2 cfs. When the wetted perimeter was measured with GPS in the middle of the summer season, the wetted area was 280 acres for Drew and 137 acres for Winterton, resulting in a summer total wetted area of 417 acres.

On August 16, the fall season flows were set to a net flow of 5.2 cfs for Drew and a flow of 5.5 cfs to Winterton. This resulted in 276 acres wetted for Drew and 189 acres for Winterton when the GPS measurements were taken on September 14 (the mid-fall reading). Like the summer and spring flows, the flows for fall were set low as the total wetted acreage during the fall period came in at 465 acres. This was due to the new flows being set based on the previous year's ratio, which was clearly too high.

2.5 Assessment of River Flow Gains and Losses

This section describes river flow gains and losses for all reaches in the Lower Owens River from the LORP Intake to the Pumpback Station during the period of October 2010 to September 2011. The reaches referred to in this report indicate areas of river between specified permanent gaging stations. This analysis is an attempt at understanding flow losses and gains in the Lower Owens River so that estimates of future water requirements can be made.

2.5.1 River Flow Loss or Gain by Month and Year

Flow losses or gains can vary over time (table below). Evaporation-transpiration (ET) rates fall sharply during late fall - winter and increase dramatically during the spring - summer plant growing seasons. Thus, the river can lose water to ET during certain periods of the year and maintain or gain water during other periods of the year. December through March are winter periods with low ET that result in gains from increased flows from water stored in the shallow aquifer where groundwater levels are higher than adjacent river levels. Other incoming winter water sources such as local sporadic runoff from storms could also result in flow increases.

Hydrologic Monitoring Table 3. Average Monthly River Flow Losses/Gains From the Intake to the Pumpback Station during 2010 and 2011.

	Month	Flow (cfs)	Acre-Feet-Per-Day
2010	OCT	-1	-1
	NOV	+1	+3
	DEC	+12	+23
2011	JAN	+19	+37
	FEB	+11	+21
	MAR	+12	+23
	APR	+6	+12
	MAY	-2	-4
	JUN	-42*	-84*
	JUL	-26*	-51*
	AUG	-31	-61
	SEP	-24	-47
	AVG MONTH	**-5 cfs**	**-11 Acre-Feet**

** Data influenced by the 2011 seasonal habitat flow*

The summer flow losses for June and July 2011 were influenced by the Seasonal Habitat Flow and may not be typical for predicting future losses.

For the entire river, the overall gain or loss is calculated by subtracting Pumpback Station outflow from inflows from the Intake and augmentation spillgates. Inflows from the Intake were 37,849 acre-feet, inflows from augmentation spillgates were 4,519 acre-feet, and outflows from the Pumpback Station were 38,418 acre-feet. This yields a loss of 3,950 acre-feet for the year, a daily average of approximately 5.5 cfs between the Intake and the Pumpback Station. Water loss during the 2010-11 water year (October 2010 to September 2011) represents about 9% of the total released flow from the Intake and augmentation spillgates into the river channel.

For the year, the river lost an average of 5.5 cfs compared to an average loss of 7.6 cfs last year, 12 cfs for two years ago, and 18 cfs for the first year and a half of operations. Also, the amount of water lost as a percentage of released flows (Intake and augmentations) dropped from 26% for the first year and a half to 20% for two years ago to 13% for last year and down to 9% for the current year. The lower losses could be the result of less water being lost to the shallow groundwater table as the shallow aquifer fills. Another contribution could be the lower than normal precipitation of the previous years compared to the most recent year. It is still unclear whether the lower loss trend will continue, stabilize, or fluctuate based on precipitation.

2.5.2 Flow Loss or Gain by River Reach during the Winter Period

From December 2010 to March 2011, an average flow of 42 cfs was released into the Lower Owens River from the Intake. An additional 5 cfs was provided from augmentation ditches, for a total accumulated release of 48 cfs. The average flow that reached the Pumpback Station was 61 cfs, an increase of 13 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 and may also be a result of higher winter season precipitation.

The river reach from the Intake to the Mazourka Canyon Road gaging station gained 4 cfs, while the reach from Mazourka Canyon Road to the Reinhackle gaging station gained 3 cfs and Reinhackle to the Pumpback Station gained 6 cfs (see table below). 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, when water surface ice is melted by increasing the re-aeration rate, and adds nutrients.

Hydrologic Monitoring Table 4. Winter Flow Losses/Gains, December 2010 to March 2011

Recording Station	Average Flow (cfs)	Gain or Loss (cfs)	Accumulative (cfs)
Intake*	42	N/A	N/A
Mazourka**	52	+4	+4
Reinhackle	55	+3	+7
Pumpback	61	+6	+13

Note: All numbers are rounded to the nearest whole value

* The following augmentation stations are added
  3 cfs added at the Blackrock Return Ditch
  1 cfs added at the Goose Lake Return
  1 cfs added at the Billy Lake Return

** The following augmentation station is added
  0 cfs added at the Georges Ditch Return

2.5.3 Flow Loss or Gain by River Reach during the Summer Period

During the summer period of June 2011 to September 2011, all river reaches lost water. The effects of ET are evident from the high total flow loss (-31 cfs) between the Intake to the Pumpback Station. Summer flow losses were 44 cfs higher than conditions during the winter season. The largest flow losses occurred at the Reinhackle to Pumpback Station reach (-15 cfs) (see table below).

Hydrologic Monitoring Table 5. Summer Flow Losses/Gains, June 2011 to September 2011

Recording Station	Average Flow (cfs)	Gain or Loss (cfs)	Accumulative (cfs)
Intake*	72	N/A	N/A
Mazourka**	65	-11	-11
Reinhackle	64	-4	-15
Pumpback	48	-15	-31

Note: All numbers are rounded to the nearest whole value

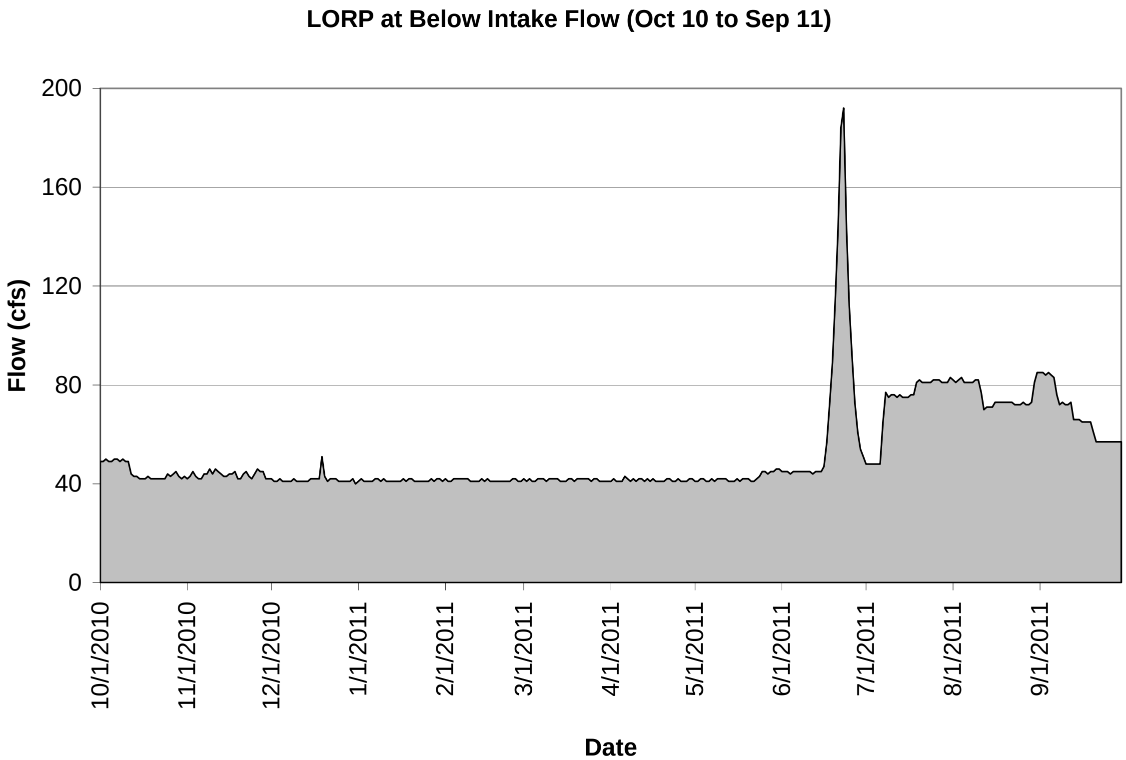
* The following augmentation stations are added
  1 cfs added at the Blackrock Return Ditch
  1 cfs added at the Goose Lake Return
  1 cfs added at the Billy Lake Return

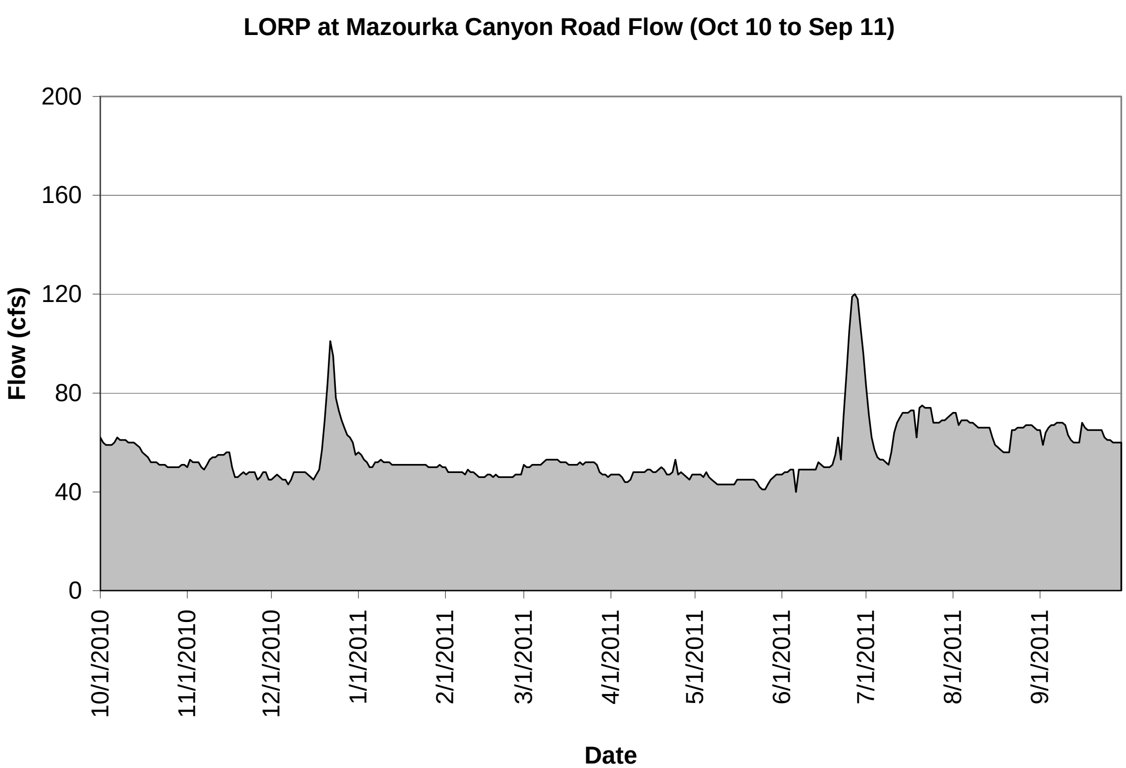
** The following augmentation station is added
  3 cfs added at the Georges Ditch Return
  0 cfs added at the Alabama Gates Return

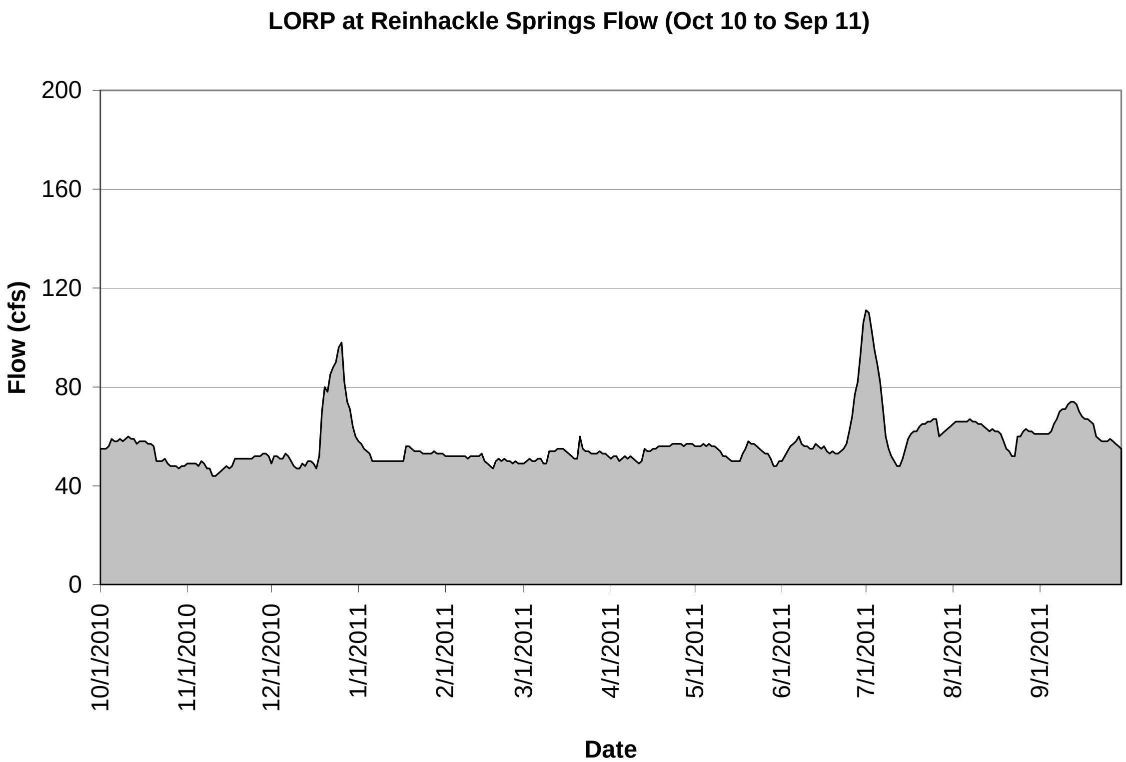
2.6 Hydrologic Monitoring Appendices

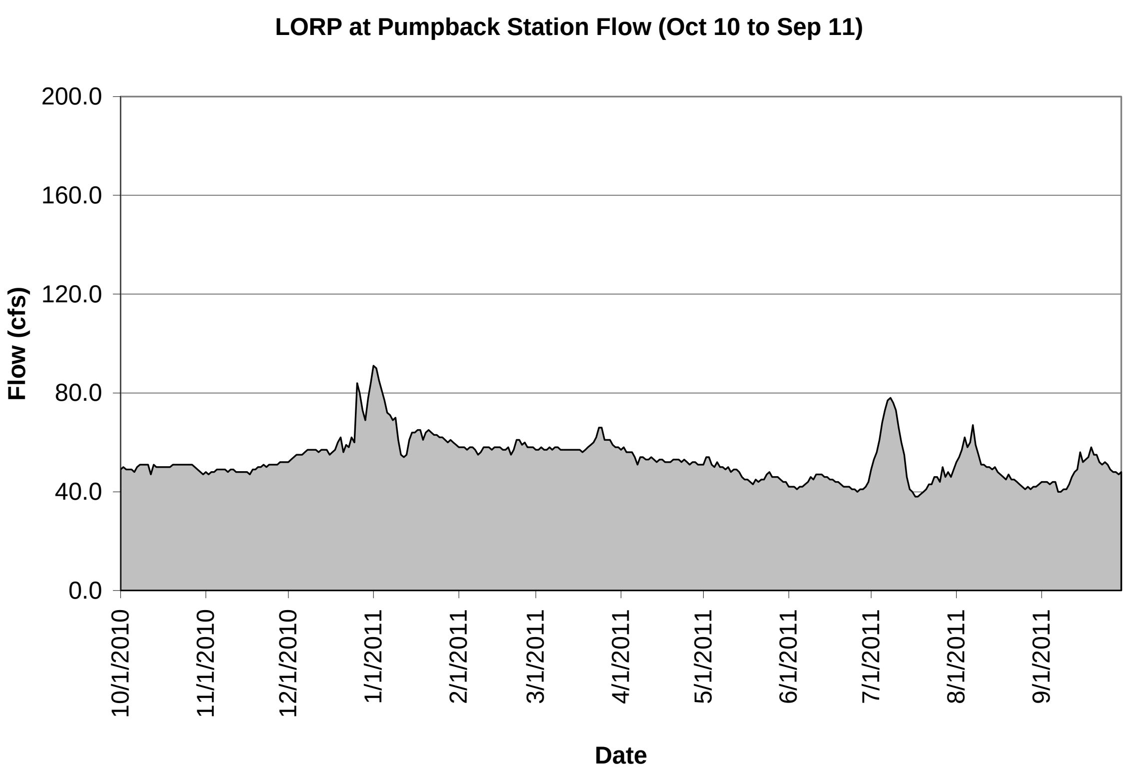
2.0 Appendix

Appendix 1. Hydrologic Monitoring Graphs






LORP at Reinhackle Springs Flow (Oct 10 to Sep 11)
Flow (cfs)
200
160
120
80
40
0
10/1/2010
11/1/2010
12/1/2010
1/1/2011
2/1/2011
3/1/2011
4/1/2011
5/1/2011
6/1/2011
7/1/2011
8/1/2011
9/1/2011
Date


LORP at Pumpback Station Flow (Oct 10 to Sep 11)
Flow (cfs)
200.0
160.0
120.0
80.0
40.0
0.0
10/1/2010
11/1/2010
12/1/2010
1/1/2011
2/1/2011
3/1/2011
4/1/2011
5/1/2011
6/1/2011
7/1/2011
8/1/2011
9/1/2011
Date

Appendix 2. River Flow Tables

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
10/1/2010	49.0	3.0	1.1	1.2	62.0	0.0	0.0	55.0	0.0	49.0	44.0	5.0	0.0	53.8
10/2/2010	49.0	3.0	1.1	1.2	60.0	0.0	0.0	55.0	0.0	50.0	46.0	4.0	0.0	53.5
10/3/2010	50.0	3.0	1.1	1.2	59.0	0.0	0.0	55.0	0.0	49.0	45.0	4.0	0.0	53.3
10/4/2010	49.0	3.0	1.1	1.1	59.0	0.0	0.0	56.0	0.0	49.0	45.0	4.0	0.0	53.3
10/5/2010	49.0	3.0	1.2	1.3	59.0	0.0	0.0	59.0	0.0	49.0	45.0	4.0	0.0	54.0
10/6/2010	50.0	3.0	1.2	1.4	60.0	0.0	0.0	58.0	0.0	48.0	44.0	4.0	0.0	54.0
10/7/2010	50.0	3.0	1.2	1.4	62.0	0.0	0.0	58.0	0.0	50.0	46.0	4.0	0.0	55.0
10/8/2010	49.0	3.0	1.2	1.3	61.0	0.0	0.0	59.0	0.0	51.0	47.0	4.0	0.0	55.0
10/9/2010	50.0	3.0	1.3	1.4	61.0	0.0	0.0	58.0	0.0	51.0	47.0	4.0	0.0	55.0
10/10/2010	49.0	3.0	1.3	1.5	61.0	0.0	0.0	59.0	0.0	51.0	47.0	4.0	0.0	55.0
10/11/2010	49.0	3.0	1.4	1.4	60.0	0.0	0.0	60.0	0.0	51.0	47.0	4.0	0.0	55.0
10/12/2010	44.0	2.0	1.4	1.3	60.0	0.0	0.0	59.0	0.0	47.0	42.0	4.0	1.0	52.5
10/13/2010	43.0	3.0	1.4	1.2	60.0	0.0	0.0	59.0	0.0	51.0	47.0	4.0	0.0	53.3
10/14/2010	43.0	3.0	1.4	1.2	59.0	0.0	0.0	57.0	0.0	50.0	46.0	4.0	0.0	52.3
10/15/2010	42.0	3.0	1.5	1.1	58.0	0.0	0.0	58.0	0.0	50.0	46.0	4.0	0.0	52.0
10/16/2010	42.0	2.0	1.5	1.1	56.0	0.0	0.0	58.0	0.0	50.0	46.0	4.0	0.0	51.5
10/17/2010	42.0	3.0	1.5	1.2	55.0	0.0	0.0	58.0	0.0	50.0	46.0	4.0	0.0	51.3
10/18/2010	43.0	3.0	1.6	1.2	54.0	0.0	0.0	57.0	0.0	50.0	46.0	4.0	0.0	51.0
10/19/2010	42.0	3.0	1.6	1.2	52.0	0.0	0.0	57.0	0.0	50.0	46.0	4.0	0.0	50.3
10/20/2010	42.0	3.0	1.7	1.1	52.0	0.0	0.0	56.0	0.0	51.0	47.0	4.0	0.0	50.3
10/21/2010	42.0	3.0	1.7	1.1	52.0	0.0	0.0	50.0	0.0	51.0	47.0	4.0	0.0	48.8
10/22/2010	42.0	3.0	1.7	1.0	51.0	0.0	0.0	50.0	0.0	51.0	47.0	4.0	0.0	48.5
10/23/2010	42.0	4.0	1.7	1.0	51.0	0.0	0.0	50.0	0.0	51.0	47.0	4.0	0.0	48.5
10/24/2010	42.0	3.0	1.7	1.0	51.0	0.0	0.0	51.0	0.0	51.0	47.0	4.0	0.0	48.8
10/25/2010	44.0	3.0	1.6	1.0	50.0	0.0	0.0	49.0	0.0	51.0	47.0	4.0	0.0	48.5
10/26/2010	43.0	2.0	1.6	1.0	50.0	0.0	0.0	48.0	0.0	51.0	47.0	4.0	0.0	48.0
10/27/2010	44.0	2.0	1.6	1.0	50.0	0.0	0.0	48.0	0.0	51.0	47.0	4.0	0.0	48.3
10/28/2010	45.0	3.0	1.5	0.9	50.0	0.0	0.0	48.0	0.0	50.0	46.0	4.0	0.0	48.3
10/29/2010	43.0	2.0	1.5	1.0	50.0	0.0	0.0	47.0	0.0	49.0	45.0	4.0	0.0	47.3
10/30/2010	42.0	2.0	1.4	1.1	51.0	0.0	0.0	48.0	0.0	48.0	44.0	4.0	0.0	47.3
10/31/2010	43.0	2.0	1.6	1.3	51.0	0.0	0.0	48.0	0.0	47.0	43.0	4.0	0.0	47.3

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
11/1/2010	42.0	2.0	1.3	0.9	50.0	0.0	0.0	49.0	0.0	48.0	44.0	4.0	0.0	47.3
11/2/2010	43.0	1.0	1.3	1.0	53.0	0.0	0.0	49.0	0.0	47.0	43.0	4.0	0.0	48.0
11/3/2010	45.0	2.0	1.3	1.0	52.0	0.0	0.0	49.0	0.0	48.0	44.0	4.0	0.0	48.5
11/4/2010	43.0	1.0	1.2	1.0	52.0	0.0	0.0	49.0	0.0	48.0	44.0	4.0	0.0	48.0
11/5/2010	42.0	2.0	1.2	1.1	52.0	0.0	0.0	48.0	0.0	49.0	45.0	4.0	0.0	47.8
11/6/2010	42.0	2.0	1.2	1.1	50.0	0.0	0.0	50.0	0.0	49.0	45.0	4.0	0.0	47.8
11/7/2010	44.0	2.0	1.2	1.1	49.0	0.0	0.0	49.0	0.0	49.0	45.0	4.0	0.0	47.8
11/8/2010	44.0	2.0	1.2	1.2	51.0	0.0	0.0	47.0	0.0	49.0	45.0	4.0	0.0	47.8
11/9/2010	46.0	2.0	1.2	1.3	53.0	0.0	0.1	47.0	0.0	48.0	44.0	4.0	0.0	48.5
11/10/2010	44.0	2.0	1.2	1.3	54.0	0.0	0.0	44.0	0.0	49.0	45.0	4.0	0.0	47.8
11/11/2010	46.0	2.0	1.2	1.3	54.0	0.0	0.0	44.0	0.0	49.0	45.0	4.0	0.0	48.3
11/12/2010	45.0	1.0	1.2	1.3	55.0	0.0	0.0	45.0	0.0	48.0	44.0	4.0	0.0	48.3
11/13/2010	44.0	2.0	1.2	1.3	55.0	0.0	0.0	46.0	0.0	48.0	44.0	4.0	0.0	48.3
11/14/2010	43.0	1.0	1.1	1.3	55.0	0.0	0.0	47.0	0.0	48.0	44.0	4.0	0.0	48.3
11/15/2010	43.0	1.0	1.1	1.3	56.0	0.0	0.0	48.0	0.0	48.0	44.0	4.0	0.0	48.8
11/16/2010	44.0	2.0	1.1	1.3	56.0	0.0	0.0	47.0	0.0	48.0	44.0	4.0	0.0	48.8
11/17/2010	44.0	2.0	1.1	1.3	50.0	0.0	0.0	48.0	0.0	47.0	44.0	3.0	0.0	47.3
11/18/2010	45.0	2.0	1.1	1.3	46.0	0.0	0.0	51.0	0.0	49.0	46.0	3.0	0.0	47.8
11/19/2010	42.0	2.0	1.1	1.3	46.0	0.0	0.0	51.0	0.0	49.0	45.0	4.0	0.0	47.0
11/20/2010	42.0	2.0	1.1	1.3	47.0	0.0	0.0	51.0	0.0	50.0	46.0	4.0	0.0	47.5
11/21/2010	44.0	3.0	1.1	1.3	48.0	0.0	0.0	51.0	0.0	50.0	46.0	4.0	0.0	48.3
11/22/2010	45.0	2.0	1.0	1.3	47.0	0.0	0.0	51.0	0.0	51.0	47.0	4.0	0.0	48.5
11/23/2010	43.0	2.0	1.0	1.3	48.0	0.0	0.0	51.0	0.0	50.0	46.0	4.0	0.0	48.0
11/24/2010	42.0	2.0	1.0	1.3	48.0	0.0	0.3	51.0	0.0	51.0	47.0	4.0	0.0	48.0
11/25/2010	44.0	2.0	1.0	1.3	48.0	0.0	0.1	52.0	0.0	51.0	47.0	4.0	0.0	48.8
11/26/2010	46.0	2.0	1.1	1.3	45.0	0.0	0.1	52.0	0.0	51.0	47.0	4.0	0.0	48.5
11/27/2010	45.0	3.0	1.1	1.3	46.0	0.0	0.1	52.0	0.0	51.0	47.0	4.0	0.0	48.5
11/28/2010	45.0	2.0	1.1	1.3	48.0	0.0	0.1	53.0	0.0	52.0	47.0	4.0	1.0	49.5
11/29/2010	42.0	2.0	1.1	1.3	48.0	0.0	0.1	53.0	0.0	52.0	47.0	4.0	1.0	48.8
11/30/2010	42.0	2.0	1.2	1.1	45.0	0.0	0.0	52.0	0.0	52.0	47.0	4.0	1.0	47.8

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

Dark grey cells indicate that measurements were estimated by LADWP staff due to technical problems.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
12/1/2010	42.0	2.0	1.1	1.3	45.0	0.0	0.1	49.0	0.0	52.0	47.0	3.0	2.0	47.0
12/2/2010	41.0	2.0	1.1	1.3	46.0	0.0	0.1	52.0	0.0	53.0	47.0	3.0	3.0	48.0
12/3/2010	41.0	2.0	1.1	1.3	47.0	0.0	0.0	52.0	0.0	54.0	46.0	3.0	5.0	48.5
12/4/2010	42.0	2.0	1.1	1.4	46.0	0.0	0.0	51.0	0.0	55.0	46.0	3.0	6.0	48.5
12/5/2010	41.0	2.0	1.2	1.4	45.0	0.0	0.0	51.0	0.0	55.0	46.0	3.0	6.0	48.0
12/6/2010	41.0	2.0	1.2	1.3	45.0	0.0	0.0	53.0	0.0	55.0	46.0	3.0	6.0	48.5
12/7/2010	41.0	2.0	1.2	1.3	43.0	0.0	0.0	52.0	0.0	56.0	44.0	3.0	9.0	48.0
12/8/2010	41.0	2.0	1.2	1.3	45.0	0.0	0.0	50.0	0.0	57.0	46.0	3.0	8.0	48.3
12/9/2010	42.0	2.0	1.1	1.3	48.0	0.0	0.0	48.0	0.0	57.0	47.0	3.0	7.0	48.8
12/10/2010	41.0	2.0	1.1	1.2	48.0	0.0	0.0	47.0	0.0	57.0	47.0	3.0	7.0	48.3
12/11/2010	41.0	2.0	1.1	1.2	48.0	0.0	0.0	47.0	0.0	57.0	47.0	3.0	7.0	48.3
12/12/2010	41.0	2.0	1.2	1.2	48.0	0.0	0.0	49.0	0.0	56.0	46.0	3.0	7.0	48.5
12/13/2010	41.0	2.0	1.2	1.2	48.0	0.0	0.3	48.0	0.0	57.0	47.0	3.0	7.0	48.5
12/14/2010	41.0	2.0	1.2	1.2	47.0	0.0	0.3	50.0	0.0	57.0	47.0	3.0	7.0	48.8
12/15/2010	42.0	2.0	1.2	1.2	46.0	0.0	0.3	50.0	0.0	57.0	47.0	3.0	7.0	48.8
12/16/2010	42.0	2.0	1.2	1.2	45.0	0.0	0.2	49.0	0.0	55.0	46.0	3.0	6.0	47.8
12/17/2010	42.0	2.0	1.2	1.2	47.0	0.0	0.1	47.0	0.0	56.0	46.0	3.0	7.0	48.0
12/18/2010	42.0	2.0	1.3	1.3	49.0	0.0	0.3	52.0	0.0	57.0	46.0	3.0	8.0	50.0
12/19/2010	51.0	3.0	1.8	1.5	57.0	0.0	2.7	70.0	0.0	60.0	45.0	3.0	12.0	59.5
12/20/2010	43.0	4.0	2.1	1.6	69.0	0.0	3.7	80.0	0.0	62.0	39.0	19.0	4.0	63.5
12/21/2010	41.0	7.0	2.2	1.7	84.0	0.0	1.7	78.0	0.0	56.0	26.0	30.0	0.0	64.8
12/22/2010	42.0	9.0	2.2	1.7	101.0	0.0	1.9	85.0	0.0	59.0	30.0	29.0	0.0	71.8
12/23/2010	42.0	10.0	2.2	1.6	95.0	0.0	2.0	88.0	0.0	58.0	28.0	30.0	0.0	70.8
12/24/2010	42.0	9.0	2.2	1.5	78.0	0.0	0.8	90.0	0.0	62.0	32.0	30.0	0.0	68.0
12/25/2010	41.0	9.0	2.2	1.4	73.0	0.0	0.6	96.0	0.0	60.0	40.0	14.0	6.0	67.5
12/26/2010	41.0	8.0	2.2	1.4	69.0	0.0	0.4	98.0	0.0	84.0	47.0	3.0	34.0	73.0
12/27/2010	41.0	9.0	2.2	1.4	66.0	0.0	0.3	82.0	0.0	80.0	47.0	3.0	30.0	67.3
12/28/2010	41.0	6.0	2.2	1.2	63.0	0.0	0.3	74.0	0.0	73.0	47.0	3.0	23.0	62.8
12/29/2010	41.0	5.0	2.2	1.4	62.0	0.0	0.3	71.0	0.0	69.0	45.0	3.0	21.0	60.8
12/30/2010	42.0	5.0	2.2	1.4	60.0	0.0	0.1	64.0	0.0	78.0	47.0	3.0	28.0	61.0
12/31/2010	40.0	5.0	2.0	1.2	55.0	0.0	0.1	60.0	0.0	84.0	47.0	3.0	34.0	59.8

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

Dark grey cells indicate that measurements were estimated by LADWP staff due to technical problems.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
1/1/2011	41.0	5.0	2.1	1.3	56.0	0.0	0.0	58.0	0.0	91.0	47.0	3.0	41.0	61.5
1/2/2011	42.0	4.0	2.1	1.3	55.0	0.0	0.0	57.0	0.0	90.0	47.0	3.0	40.0	61.0
1/3/2011	41.0	5.0	2.1	1.2	53.0	0.0	0.1	55.0	0.0	85.0	47.0	3.0	35.0	58.5
1/4/2011	41.0	5.0	2.1	1.1	52.0	0.0	0.2	54.0	0.0	81.0	46.0	3.0	32.0	57.0
1/5/2011	41.0	4.0	2.0	1.2	50.0	0.0	0.1	53.0	0.0	77.0	46.0	3.0	28.0	55.3
1/6/2011	41.0	4.0	2.0	1.3	50.0	0.0	0.2	50.0	0.0	72.0	47.0	3.0	22.0	53.3
1/7/2011	42.0	4.0	2.0	1.3	52.0	0.0	0.2	50.0	0.0	71.0	47.0	3.0	21.0	53.8
1/8/2011	42.0	4.0	2.0	1.2	52.0	0.0	0.2	50.0	0.0	69.0	47.0	3.0	19.0	53.3
1/9/2011	41.0	4.0	1.9	1.2	53.0	0.0	0.2	50.0	0.0	70.0	48.0	3.0	19.0	53.5
1/10/2011	42.0	4.0	1.9	1.2	52.0	0.0	0.2	50.0	0.0	61.0	48.0	3.0	10.0	51.3
1/11/2011	41.0	4.0	1.8	1.2	52.0	0.0	0.1	50.0	0.0	55.0	47.0	3.0	5.0	49.5
1/12/2011	41.0	4.0	1.8	1.1	52.0	0.0	0.2	50.0	0.0	54.0	46.0	3.0	5.0	49.3
1/13/2011	41.0	4.0	1.8	1.1	51.0	0.0	0.3	50.0	0.0	55.0	46.0	3.0	6.0	49.3
1/14/2011	41.0	4.0	1.7	1.1	51.0	0.0	0.3	50.0	0.0	61.0	46.0	1.0	14.0	50.8
1/15/2011	41.0	3.0	1.7	1.2	51.0	0.0	0.2	50.0	0.0	64.0	47.0	0.0	17.0	51.5
1/16/2011	41.0	3.0	1.7	1.2	51.0	0.0	0.2	50.0	0.0	64.0	46.0	0.0	18.0	51.5
1/17/2011	42.0	3.0	1.6	1.2	51.0	0.0	0.2	50.0	0.0	65.0	44.0	0.0	21.0	52.0
1/18/2011	41.0	3.0	1.5	1.2	51.0	0.0	0.1	56.0	0.0	65.0	46.0	0.0	19.0	53.3
1/19/2011	42.0	3.0	1.5	1.4	51.0	0.0	0.1	56.0	0.0	61.0	46.0	0.0	15.0	52.5
1/20/2011	42.0	3.0	1.3	1.4	51.0	0.0	0.1	55.0	0.0	64.0	46.0	0.0	18.0	53.0
1/21/2011	41.0	3.0	1.3	1.4	51.0	0.0	0.1	54.0	0.0	65.0	47.0	0.0	18.0	52.8
1/22/2011	41.0	2.0	1.3	1.4	51.0	0.0	0.1	54.0	0.0	64.0	47.0	0.0	17.0	52.5
1/23/2011	41.0	2.0	1.3	1.5	51.0	0.0	0.1	54.0	0.0	63.0	47.0	0.0	16.0	52.3
1/24/2011	41.0	2.0	1.3	1.5	51.0	0.0	0.1	53.0	0.0	63.0	47.0	0.0	16.0	52.0
1/25/2011	41.0	2.0	1.3	1.5	51.0	0.0	0.0	53.0	0.0	62.0	47.0	0.0	15.0	51.8
1/26/2011	41.0	3.0	1.3	1.6	50.0	0.0	0.0	53.0	0.0	62.0	47.0	0.0	15.0	51.5
1/27/2011	42.0	3.0	1.3	1.6	50.0	0.0	0.2	53.0	0.0	61.0	46.0	0.0	15.0	51.5
1/28/2011	41.0	2.0	1.3	1.6	50.0	0.0	0.2	54.0	0.0	60.0	47.0	0.0	13.0	51.3
1/29/2011	42.0	2.0	1.3	1.7	50.0	0.0	0.3	53.0	0.0	61.0	47.0	0.0	14.0	51.5
1/30/2011	42.0	2.0	1.2	1.7	51.0	0.0	0.2	53.0	0.0	60.0	47.0	0.0	13.0	51.5
1/31/2011	41.0	3.0	1.4	1.5	50.0	0.0	0.2	53.0	0.0	59.0	46.0	0.0	13.0	50.8

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Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
2/1/2011	42.0	3.0	1.2	1.6	50.0	0.0	0.0	52.0	0.0	58.0	46.0	0.0	12.0	50.5
2/2/2011	41.0	3.0	1.1	1.6	48.0	0.0	0.0	52.0	0.0	58.0	46.0	0.0	12.0	49.8
2/3/2011	41.0	3.0	1.1	1.6	48.0	0.0	0.1	52.0	0.0	58.0	46.0	0.0	12.0	49.8
2/4/2011	42.0	3.0	1.0	1.6	48.0	0.0	0.1	52.0	0.0	57.0	46.0	0.0	11.0	49.8
2/5/2011	42.0	2.0	1.0	1.6	48.0	0.0	0.0	52.0	0.0	58.0	46.0	0.0	12.0	50.0
2/6/2011	42.0	3.0	1.1	1.6	48.0	0.0	0.1	52.0	0.0	58.0	46.0	0.0	12.0	50.0
2/7/2011	42.0	3.0	1.0	1.6	48.0	0.0	0.1	52.0	0.0	57.0	46.0	0.0	11.0	49.8
2/8/2011	42.0	3.0	1.0	1.6	47.0	0.0	0.0	52.0	0.0	55.0	46.0	0.0	9.0	49.0
2/9/2011	42.0	3.0	1.0	1.6	49.0	0.0	0.0	51.0	0.0	56.0	46.0	0.0	10.0	49.5
2/10/2011	41.0	3.0	1.1	1.7	48.0	0.0	0.8	52.0	0.0	58.0	45.0	3.0	10.0	49.8
2/11/2011	41.0	3.0	1.2	1.7	48.0	0.0	0.2	52.0	0.0	58.0	46.0	3.0	9.0	49.8
2/12/2011	41.0	3.0	1.2	1.7	47.0	0.0	0.2	52.0	0.0	58.0	46.0	3.0	9.0	49.5
2/13/2011	41.0	3.0	1.2	1.6	46.0	0.0	0.1	52.0	0.0	57.0	45.0	3.0	9.0	49.0
2/14/2011	42.0	3.0	1.2	1.6	46.0	0.0	0.1	53.0	0.0	58.0	46.0	3.0	9.0	49.8
2/15/2011	41.0	3.0	1.2	1.5	46.0	0.0	0.1	50.0	0.0	58.0	46.0	3.0	9.0	48.8
2/16/2011	42.0	3.0	1.0	1.4	47.0	0.0	0.1	49.0	0.0	58.0	46.0	3.0	9.0	49.0
2/17/2011	41.0	4.0	1.1	1.4	47.0	0.0	0.1	48.0	0.0	57.0	46.0	3.0	8.0	48.3
2/18/2011	41.0	3.0	1.1	1.4	46.0	0.0	0.1	47.0	0.0	57.0	46.0	3.0	8.0	47.8
2/19/2011	41.0	3.0	1.1	1.4	47.0	0.0	0.2	50.0	0.0	58.0	46.0	3.0	9.0	49.0
2/20/2011	41.0	4.0	1.1	1.4	46.0	0.0	0.1	51.0	0.0	55.0	47.0	3.0	5.0	48.3
2/21/2011	41.0	3.0	1.1	1.4	46.0	0.0	0.2	50.0	0.0	57.0	47.0	3.0	7.0	48.5
2/22/2011	41.0	4.0	1.1	1.4	46.0	0.0	0.2	51.0	0.0	61.0	47.0	3.0	11.0	49.8
2/23/2011	41.0	3.0	1.1	1.4	46.0	0.0	0.2	50.0	0.0	61.0	47.0	3.0	11.0	49.5
2/24/2011	41.0	3.0	1.1	1.4	46.0	0.0	0.2	50.0	0.0	59.0	47.0	3.0	9.0	49.0
2/25/2011	42.0	3.0	1.1	1.4	46.0	0.0	0.3	49.0	0.0	60.0	47.0	3.0	10.0	49.3
2/26/2011	42.0	3.0	1.1	1.4	47.0	0.0	0.2	50.0	0.0	58.0	47.0	3.0	8.0	49.3
2/27/2011	41.0	3.0	1.1	1.4	47.0	0.0	0.3	49.0	0.0	58.0	47.0	3.0	8.0	48.8
2/28/2011	41.0	2.0	1.0	1.4	47.0	0.0	0.4	49.0	0.0	58.0	47.0	3.0	8.0	48.8

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Dark grey cells indicate that measurements were estimated by LADWP staff due to technical problems.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
3/1/2011	42.0	2.0	1.1	1.4	51.0	0.0	0.3	49.0	0.0	57.0	47.0	3.0	7.0	49.8
3/2/2011	41.0	2.0	1.1	1.4	50.0	0.0	0.3	50.0	0.0	57.0	47.0	4.0	6.0	49.5
3/3/2011	42.0	2.0	1.1	1.4	50.0	0.0	0.3	51.0	0.0	58.0	47.0	4.0	7.0	50.3
3/4/2011	41.0	2.0	1.1	1.4	51.0	0.0	0.2	50.0	0.0	57.0	47.0	4.0	6.0	49.8
3/5/2011	41.0	2.0	1.1	1.4	51.0	0.0	0.4	50.0	0.0	57.0	47.0	4.0	6.0	49.8
3/6/2011	42.0	2.0	1.0	1.4	51.0	0.0	0.4	51.0	0.0	58.0	47.0	4.0	7.0	50.5
3/7/2011	42.0	2.0	1.0	1.3	51.0	0.0	0.4	51.0	0.0	57.0	47.0	4.0	6.0	50.3
3/8/2011	42.0	2.0	1.0	1.3	52.0	0.0	0.3	49.0	0.0	58.0	47.0	4.0	7.0	50.3
3/9/2011	41.0	2.0	1.0	1.3	53.0	0.0	0.3	49.0	0.0	58.0	47.0	4.0	7.0	50.3
3/10/2011	42.0	2.0	1.0	1.3	53.0	0.0	0.3	54.0	0.0	57.0	47.0	4.0	6.0	51.5
3/11/2011	42.0	2.0	1.0	1.3	53.0	0.0	0.4	54.0	0.0	57.0	47.0	4.0	6.0	51.5
3/12/2011	42.0	2.0	1.1	1.3	53.0	0.0	0.3	54.0	0.0	57.0	47.0	4.0	6.0	51.5
3/13/2011	42.0	2.0	1.2	1.3	53.0	0.0	0.2	55.0	0.0	57.0	47.0	4.0	6.0	51.8
3/14/2011	41.0	3.0	1.2	1.3	52.0	0.0	0.3	55.0	0.0	57.0	47.0	4.0	6.0	51.3
3/15/2011	41.0	3.0	1.3	1.3	52.0	0.0	0.2	55.0	0.0	57.0	46.0	4.0	7.0	51.3
3/16/2011	41.0	3.0	1.3	1.3	52.0	0.0	0.2	54.0	0.0	57.0	46.0	4.0	7.0	51.0
3/17/2011	42.0	3.0	1.3	1.3	51.0	0.0	0.3	53.0	0.0	57.0	46.0	4.0	7.0	50.8
3/18/2011	42.0	3.0	1.3	1.4	51.0	0.0	0.2	52.0	0.0	56.0	42.0	4.0	10.0	50.3
3/19/2011	41.0	3.0	1.3	1.3	51.0	0.0	0.1	51.0	0.0	57.0	45.0	4.0	8.0	50.0
3/20/2011	42.0	3.0	1.2	1.3	51.0	0.0	0.3	51.0	0.0	58.0	45.0	4.0	9.0	50.5
3/21/2011	42.0	3.0	1.3	1.4	52.0	0.0	0.8	60.0	0.0	59.0	47.0	4.0	8.0	53.3
3/22/2011	42.0	3.0	1.3	1.5	51.0	0.0	0.3	55.0	0.0	60.0	46.0	4.0	10.0	52.0
3/23/2011	42.0	2.0	1.3	1.6	52.0	0.0	0.2	54.0	0.0	62.0	47.0	4.0	11.0	52.5
3/24/2011	42.0	3.0	1.3	1.6	52.0	0.0	0.3	54.0	0.0	66.0	47.0	4.0	15.0	53.5
3/25/2011	41.0	3.0	1.3	1.5	52.0	0.0	0.2	53.0	0.0	66.0	47.0	4.0	15.0	53.0
3/26/2011	42.0	3.0	1.3	1.4	52.0	0.0	0.5	53.0	0.0	61.0	47.0	3.0	11.0	52.0
3/27/2011	42.0	3.0	1.3	1.4	51.0	0.0	0.2	53.0	0.0	61.0	46.0	4.0	11.0	51.8
3/28/2011	41.0	3.0	1.2	1.4	48.0	0.0	0.1	54.0	0.0	61.0	47.0	4.0	10.0	51.0
3/29/2011	41.0	3.0	1.2	1.3	47.0	0.0	0.1	53.0	0.0	59.0	47.0	4.0	8.0	50.0
3/30/2011	41.0	3.0	1.2	1.2	47.0	0.0	0.1	53.0	0.0	58.0	46.0	4.0	8.0	49.8
3/31/2011	41.0	3.0	0.9	1.3	46.0	0.0	0.1	52.0	0.0	58.0	46.0	4.0	8.0	49.3

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

low Gaging Station Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
4/1/2011	41.0	3.0	1.1	1.4	47.0	0.0	0.2	51.0	0.0	57.0	46.0	4.0	7.0	49.0
4/2/2011	42.0	3.0	1.1	1.4	47.0	0.0	0.2	52.0	0.0	58.0	47.0	4.0	7.0	49.8
4/3/2011	41.0	3.0	1.1	1.2	47.0	0.0	0.3	52.0	0.0	56.0	47.0	4.0	5.0	49.0
4/4/2011	41.0	3.0	1.1	1.2	47.0	0.0	0.8	50.0	0.0	56.0	47.0	4.0	5.0	48.5
4/5/2011	41.0	3.0	1.0	1.3	46.0	0.0	0.3	51.0	0.0	56.0	47.0	4.0	5.0	48.5
4/6/2011	43.0	3.0	1.0	1.3	44.0	0.0	0.4	52.0	0.0	54.0	46.0	4.0	4.0	48.3
4/7/2011	42.0	3.0	1.0	1.3	44.0	0.0	1.2	51.0	0.0	51.0	44.0	4.0	3.0	47.0
4/8/2011	41.0	3.0	1.0	1.4	45.0	0.0	0.6	52.0	0.0	54.0	47.0	4.0	3.0	48.0
4/9/2011	42.0	3.0	1.0	1.4	48.0	0.0	0.4	51.0	0.0	54.0	47.0	4.0	3.0	48.8
4/10/2011	41.0	3.0	1.0	1.4	48.0	0.0	0.3	50.0	0.0	53.0	46.0	4.0	3.0	48.0
4/11/2011	42.0	2.0	1.0	1.3	48.0	0.0	0.3	49.0	0.0	53.0	46.0	4.0	3.0	48.0
4/12/2011	42.0	3.0	1.1	1.3	48.0	0.0	0.2	50.0	0.0	54.0	47.0	4.0	3.0	48.5
4/13/2011	41.0	3.0	1.0	1.3	48.0	0.0	0.2	55.0	0.0	53.0	47.0	4.0	2.0	49.3
4/14/2011	42.0	3.0	1.0	1.3	49.0	0.0	0.1	54.0	0.0	52.0	46.0	4.0	2.0	49.3
4/15/2011	41.0	3.0	1.0	1.4	49.0	0.0	0.1	54.0	0.0	53.0	47.0	4.0	2.0	49.3
4/16/2011	42.0	3.0	1.0	1.4	48.0	0.0	0.1	55.0	0.0	53.0	46.0	4.0	3.0	49.5
4/17/2011	41.0	3.0	1.0	1.3	48.0	0.0	0.2	55.0	0.0	52.0	45.0	4.0	3.0	49.0
4/18/2011	41.0	3.0	1.0	1.3	49.0	0.0	0.2	56.0	0.0	52.0	46.0	4.0	2.0	49.5
4/19/2011	41.0	3.0	1.0	1.2	50.0	0.0	0.1	56.0	0.0	52.0	46.0	4.0	2.0	49.8
4/20/2011	41.0	3.0	0.9	1.1	49.0	0.0	0.3	56.0	0.0	53.0	46.0	4.0	3.0	49.8
4/21/2011	42.0	3.0	1.0	1.1	47.0	0.0	0.1	56.0	0.0	53.0	47.0	4.0	2.0	49.5
4/22/2011	42.0	3.0	1.0	1.3	47.0	0.0	0.3	56.0	0.0	53.0	47.0	4.0	2.0	49.5
4/23/2011	41.0	3.0	0.9	1.3	48.0	0.0	0.2	57.0	0.0	52.0	47.0	4.0	1.0	49.5
4/24/2011	41.0	3.0	0.9	1.4	53.0	0.0	0.2	57.0	0.0	53.0	47.0	4.0	2.0	51.0
4/25/2011	42.0	3.0	1.0	1.4	47.0	0.0	0.1	57.0	0.0	52.0	47.0	4.0	1.0	49.5
4/26/2011	41.0	3.0	1.1	1.5	48.0	0.0	0.5	57.0	0.0	51.0	47.0	4.0	0.0	49.3
4/27/2011	41.0	2.0	2.3	1.5	47.0	0.0	0.3	56.0	0.0	52.0	47.0	4.0	1.0	49.0
4/28/2011	41.0	3.0	2.9	1.4	46.0	0.0	0.1	57.0	0.0	52.0	47.0	4.0	1.0	49.0
4/29/2011	42.0	3.0	2.3	1.4	45.0	0.0	0.0	57.0	0.0	51.0	47.0	4.0	0.0	48.8
4/30/2011	42.0	3.0	2.1	1.3	47.0	0.0	0.0	57.0	0.0	51.0	47.0	4.0	0.0	49.3

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Dark grey cells indicate that measurements were estimated by LADWP staff due to technical problems.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
5/1/2011	41.0	3.0	1.7	1.4	47.0	0.0	0.3	56.0	0.0	51.0	47.0	4.0	0.0	48.8
5/2/2011	41.0	3.0	1.6	1.3	47.0	0.0	0.3	56.0	0.0	54.0	47.0	7.0	0.0	49.5
5/3/2011	42.0	4.0	1.6	1.4	47.0	0.0	0.3	56.0	0.0	54.0	46.0	8.0	0.0	49.8
5/4/2011	42.0	3.0	1.6	1.4	46.0	0.0	0.0	57.0	0.0	51.0	44.0	7.0	0.0	49.0
5/5/2011	41.0	3.0	1.6	1.4	48.0	0.0	0.0	56.0	0.0	50.0	42.0	8.0	0.0	48.8
5/6/2011	41.0	4.0	1.4	1.4	46.0	0.0	0.4	57.0	0.0	52.0	44.0	8.0	0.0	49.0
5/7/2011	42.0	3.0	1.4	1.5	45.0	0.0	0.2	56.0	0.0	50.0	43.0	7.0	0.0	48.3
5/8/2011	41.0	3.0	1.5	1.5	44.0	0.0	0.1	56.0	0.0	50.0	43.0	7.0	0.0	47.8
5/9/2011	42.0	2.0	1.5	1.4	43.0	0.0	0.0	55.0	0.0	49.0	42.0	7.0	0.0	47.3
5/10/2011	42.0	3.0	1.4	1.4	43.0	0.1	0.0	54.0	0.0	50.0	42.0	8.0	0.0	47.3
5/11/2011	42.0	3.0	1.3	1.4	43.0	0.1	0.0	52.0	0.0	48.0	41.0	7.0	0.0	46.3
5/12/2011	42.0	2.0	1.3	1.4	43.0	0.2	0.0	52.0	0.0	49.0	42.0	7.0	0.0	46.5
5/13/2011	41.0	2.0	1.3	1.4	43.0	0.2	0.0	51.0	0.0	49.0	41.0	8.0	0.0	46.0
5/14/2011	41.0	2.0	1.3	1.4	43.0	0.3	0.0	50.0	0.0	48.0	40.0	8.0	0.0	45.5
5/15/2011	41.0	2.0	1.2	1.3	43.0	0.3	0.0	50.0	0.0	46.0	39.0	7.0	0.0	45.0
5/16/2011	42.0	2.0	1.1	1.3	45.0	0.4	0.0	50.0	0.0	45.0	38.0	7.0	0.0	45.5
5/17/2011	41.0	2.0	1.2	1.4	45.0	0.6	0.1	50.0	0.0	45.0	38.0	7.0	0.0	45.3
5/18/2011	42.0	2.0	1.3	1.4	45.0	0.7	2.0	53.0	0.0	44.0	37.0	7.0	0.0	46.0
5/19/2011	42.0	2.0	1.4	1.4	45.0	0.7	5.1	55.0	0.0	43.0	36.0	7.0	0.0	46.3
5/20/2011	42.0	2.0	1.4	1.3	45.0	0.6	5.4	58.0	0.0	45.0	37.0	8.0	0.0	47.5
5/21/2011	41.0	2.0	1.4	1.3	45.0	0.6	4.7	57.0	0.0	44.0	36.0	8.0	0.0	46.8
5/22/2011	41.0	2.0	1.4	1.3	45.0	0.6	4.4	57.0	0.0	45.0	37.0	8.0	0.0	47.0
5/23/2011	42.0	2.0	1.3	1.3	44.0	0.5	4.4	56.0	0.0	45.0	37.0	8.0	0.0	46.8
5/24/2011	43.0	2.0	1.3	1.3	42.0	0.4	4.4	55.0	0.0	47.0	39.0	8.0	0.0	46.8
5/25/2011	45.0	2.0	1.3	1.2	41.0	0.3	4.4	54.0	0.0	48.0	40.0	8.0	0.0	47.0
5/26/2011	45.0	1.0	1.2	1.2	41.0	0.2	4.8	53.0	0.0	46.0	39.0	7.0	0.0	46.3
5/27/2011	44.0	1.0	1.2	1.2	43.0	0.0	5.9	53.0	0.0	46.0	39.0	7.0	0.0	46.5
5/28/2011	45.0	1.0	1.1	1.2	45.0	0.0	4.6	51.0	0.0	46.0	38.0	8.0	0.0	46.8
5/29/2011	45.0	1.0	1.1	1.1	46.0	0.0	4.4	48.0	0.0	45.0	37.0	8.0	0.0	46.0
5/30/2011	46.0	2.0	1.0	1.2	47.0	0.0	4.4	48.0	0.0	44.0	36.0	8.0	0.0	46.3
5/31/2011	46.0	2.0	0.9	1.2	47.0	0.0	4.3	50.0	0.0	44.0	36.0	8.0	0.0	46.8

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6/1/2011	45.0	1.0	1.0	1.4	47.0	0.0	4.0	50.0	0.0	42.0	35.0	7.0	0.0	46.0
6/2/2011	45.0	1.0	1.1	1.5	48.0	0.0	5.8	52.0	0.0	42.0	34.0	8.0	0.0	46.8
6/3/2011	45.0	1.0	1.3	1.5	48.0	0.0	8.3	54.0	0.0	42.0	34.0	8.0	0.0	47.3
6/4/2011	44.0	1.0	1.4	1.5	49.0	0.0	9.7	56.0	0.0	41.0	33.0	8.0	0.0	47.5
6/5/2011	45.0	2.0	1.5	1.5	49.0	0.0	9.7	57.0	0.0	42.0	34.0	8.0	0.0	48.3
6/6/2011	45.0	1.0	1.5	1.4	40.0	0.0	9.9	58.0	0.0	42.0	34.0	8.0	0.0	46.3
6/7/2011	45.0	2.0	1.5	1.4	49.0	0.0	10.1	60.0	0.0	43.0	35.0	8.0	0.0	49.3
6/8/2011	45.0	1.0	1.6	1.4	49.0	0.0	10.0	57.0	0.0	44.0	36.0	8.0	0.0	48.8
6/9/2011	45.0	1.0	1.6	1.4	49.0	0.0	9.7	56.0	0.0	46.0	38.0	8.0	0.0	49.0
6/10/2011	45.0	1.0	1.6	1.4	49.0	0.0	10.0	56.0	0.0	45.0	38.0	7.0	0.0	48.8
6/11/2011	45.0	1.0	1.6	1.4	49.0	0.0	9.1	55.0	0.0	47.0	39.0	8.0	0.0	49.0
6/12/2011	44.0	1.0	1.5	1.4	49.0	0.0	11.1	55.0	0.0	47.0	39.0	8.0	0.0	48.8
6/13/2011	45.0	2.0	1.4	1.3	49.0	0.0	10.7	57.0	0.0	47.0	39.0	8.0	0.0	49.5
6/14/2011	45.0	2.0	1.4	1.3	52.0	0.0	9.7	56.0	0.0	46.0	38.0	8.0	0.0	49.8
6/15/2011	45.0	1.0	1.3	1.2	51.0	0.0	9.8	55.0	0.0	46.0	38.0	8.0	0.0	49.3
6/16/2011	47.0	2.0	1.3	1.2	50.0	0.0	9.8	56.0	0.0	45.0	37.0	8.0	0.0	49.5
6/17/2011	57.0	1.0	1.2	1.2	50.0	0.0	9.6	54.0	0.0	45.0	37.0	8.0	0.0	51.5
6/18/2011	72.0	2.0	1.2	1.2	50.0	0.0	10.2	53.0	0.0	44.0	36.0	8.0	0.0	54.8
6/19/2011	89.0	2.0	1.2	1.2	51.0	0.0	10.1	54.0	0.0	44.0	36.0	8.0	0.0	59.5
6/20/2011	115.0	1.0	1.2	1.2	55.0	0.0	9.9	53.0	0.0	43.0	35.0	8.0	0.0	66.5
6/21/2011	143.0	1.0	1.3	1.2	62.0	0.0	10.4	53.0	0.0	42.0	34.0	8.0	0.0	75.0
6/22/2011	184.0	1.0	1.3	1.3	53.0	0.0	10.3	54.0	0.0	42.0	34.0	8.0	0.0	83.3
6/23/2011	192.0	1.0	1.3	1.2	71.0	0.0	10.1	55.0	0.0	42.0	34.0	8.0	0.0	90.0
6/24/2011	143.0	1.0	1.2	1.1	88.0	0.0	10.2	57.0	0.0	41.0	34.0	7.0	0.0	82.3
6/25/2011	112.0	1.0	1.2	1.1	105.0	0.0	10.3	62.0	0.0	41.0	33.0	8.0	0.0	80.0
6/26/2011	91.0	2.0	1.1	1.1	119.0	0.0	10.4	68.0	0.0	40.0	32.0	8.0	0.0	79.5
6/27/2011	73.0	1.0	1.1	1.1	120.0	0.0	10.2	77.0	0.0	41.0	33.0	8.0	0.0	77.8
6/28/2011	61.0	1.0	1.1	1.2	118.0	0.0	10.1	82.0	0.0	41.0	33.0	8.0	0.0	75.5
6/29/2011	54.0	2.0	1.0	1.3	107.0	0.0	9.5	93.0	0.0	42.0	34.0	8.0	0.0	74.0
6/30/2011	51.0	1.0	0.9	1.2	96.0	0.0	9.3	106.0	1.5	44.0	37.0	7.0	0.0	74.3

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7/1/2011	48.0	2.0	1.0	1.3	83.0	0.0	9.9	111.0	0.0	49.0	41.0	8.0	0.0	72.8
7/2/2011	48.0	1.0	1.0	1.2	71.0	0.0	9.8	110.0	0.0	53.0	45.0	8.0	0.0	70.5
7/3/2011	48.0	1.0	1.1	1.1	62.0	0.0	9.8	103.0	0.0	56.0	48.0	8.0	0.0	67.3
7/4/2011	48.0	1.0	1.2	1.1	57.0	0.0	10.0	95.0	0.0	61.0	48.0	8.0	5.0	65.3
7/5/2011	48.0	1.0	1.2	1.1	54.0	0.0	10.2	89.0	0.0	68.0	47.0	8.0	13.0	64.8
7/6/2011	48.0	1.0	1.3	1.1	53.0	0.0	9.2	82.0	0.0	73.0	47.0	7.0	19.0	64.0
7/7/2011	65.0	2.0	1.3	1.1	53.0	0.0	1.3	71.0	0.0	77.0	48.0	7.0	22.0	66.5
7/8/2011	77.0	1.0	1.2	1.1	52.0	0.0	0.5	60.0	0.0	78.0	48.0	8.0	22.0	66.8
7/9/2011	75.0	1.0	1.2	1.1	51.0	0.0	0.3	55.0	0.0	76.0	48.0	7.0	21.0	64.3
7/10/2011	76.0	1.0	1.1	1.1	56.0	0.0	0.2	52.0	0.0	73.0	48.0	8.0	17.0	64.3
7/11/2011	76.0	1.0	1.1	1.1	64.0	0.0	0.0	50.0	0.0	66.0	48.0	7.0	11.0	64.0
7/12/2011	75.0	1.0	1.0	1.0	68.0	0.0	0.0	48.0	0.0	60.0	48.0	8.0	4.0	62.8
7/13/2011	76.0	2.0	1.0	1.1	70.0	0.0	0.0	48.0	0.0	55.0	47.0	8.0	0.0	62.3
7/14/2011	75.0	2.0	1.0	1.1	72.0	0.0	0.0	51.0	0.0	46.0	38.0	8.0	0.0	61.0
7/15/2011	75.0	1.0	1.0	1.2	72.0	0.0	0.0	55.0	0.0	41.0	33.0	8.0	0.0	60.8
7/16/2011	75.0	1.0	1.1	1.2	72.0	0.0	0.2	59.0	0.0	40.0	33.0	7.0	0.0	61.5
7/17/2011	76.0	1.0	1.1	1.2	73.0	0.0	0.0	61.0	0.0	38.0	31.0	7.0	0.0	62.0
7/18/2011	76.0	1.0	1.1	1.2	73.0	0.0	0.0	62.0	0.0	38.0	31.0	7.0	0.0	62.3
7/19/2011	81.0	1.0	1.0	1.2	62.0	0.0	0.0	62.0	0.0	39.0	31.0	8.0	0.0	61.0
7/20/2011	82.0	1.0	0.9	1.2	74.0	0.0	0.0	64.0	0.0	40.0	32.0	8.0	0.0	65.0
7/21/2011	81.0	1.0	1.0	1.2	75.0	0.0	0.0	65.0	0.0	41.0	33.0	8.0	0.0	65.5
7/22/2011	81.0	1.0	1.0	1.2	74.0	0.0	0.0	65.0	0.0	43.0	35.0	8.0	0.0	65.8
7/23/2011	81.0	1.0	1.0	1.2	74.0	0.0	0.0	66.0	0.0	43.0	36.0	7.0	0.0	66.0
7/24/2011	81.0	1.0	1.1	1.2	74.0	0.0	0.0	66.0	0.0	46.0	38.0	8.0	0.0	66.8
7/25/2011	82.0	1.0	1.1	1.2	68.0	0.0	1.3	67.0	0.0	46.0	38.0	8.0	0.0	65.8
7/26/2011	82.0	1.0	1.2	1.2	68.0	0.0	4.9	67.0	0.0	44.0	36.0	8.0	0.0	65.3
7/27/2011	82.0	1.0	1.3	1.3	68.0	0.0	0.0	60.0	0.0	50.0	41.0	8.0	1.0	65.0
7/28/2011	81.0	1.0	1.3	1.3	69.0	0.0	0.0	61.0	0.0	46.0	39.0	7.0	0.0	64.3
7/29/2011	81.0	1.0	1.4	1.4	69.0	0.0	0.0	62.0	7.1	48.0	32.0	16.0	0.0	65.0
7/30/2011	81.0	2.0	1.5	1.4	70.0	0.0	0.0	63.0	0.0	46.0	26.0	20.0	0.0	65.0
7/31/2011	83.0	2.0	1.6	1.4	71.0	0.0	0.0	64.0	0.0	49.0	29.0	20.0	0.0	66.8

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8/1/2011	82.0	2.0	1.5	1.4	72.0	0.0	0.0	65.0	0.0	52.0	32.0	20.0	0.0	67.8
8/2/2011	81.0	1.0	1.4	1.4	72.0	0.0	0.0	66.0	0.0	54.0	34.0	20.0	0.0	68.3
8/3/2011	82.0	1.0	1.4	1.3	67.0	0.0	0.0	66.0	0.0	57.0	37.0	20.0	0.0	68.0
8/4/2011	83.0	2.0	1.3	1.3	69.0	0.0	0.0	66.0	0.0	62.0	42.0	20.0	0.0	70.0
8/5/2011	81.0	2.0	1.2	1.3	69.0	0.0	0.0	66.0	0.0	58.0	38.0	20.0	0.0	68.5
8/6/2011	81.0	1.0	1.1	1.2	69.0	0.0	0.5	66.0	0.0	60.0	40.0	20.0	0.0	69.0
8/7/2011	81.0	1.0	1.0	1.1	68.0	0.0	0.1	67.0	0.0	67.0	47.0	20.0	0.0	70.8
8/8/2011	81.0	1.0	1.0	1.0	68.0	0.0	0.0	66.0	0.0	59.0	47.0	12.0	0.0	68.5
8/9/2011	82.0	1.0	1.0	0.9	67.0	0.0	0.0	66.0	0.0	55.0	47.0	8.0	0.0	67.5
8/10/2011	82.0	1.0	1.1	0.8	66.0	0.0	0.0	65.0	0.0	51.0	43.0	8.0	0.0	66.0
8/11/2011	77.0	1.0	1.1	0.8	66.0	0.0	0.0	65.0	0.0	51.0	43.0	8.0	0.0	64.8
8/12/2011	70.0	1.0	1.2	0.9	66.0	0.0	0.0	64.0	0.0	50.0	42.0	8.0	0.0	62.5
8/13/2011	71.0	1.0	1.2	0.9	66.0	0.0	0.0	63.0	0.0	50.0	42.0	8.0	0.0	62.5
8/14/2011	71.0	1.0	1.3	1.0	66.0	0.0	0.0	62.0	0.0	49.0	41.0	8.0	0.0	62.0
8/15/2011	71.0	1.0	1.3	1.1	62.0	0.0	0.0	63.0	0.0	50.0	42.0	8.0	0.0	61.5
8/16/2011	73.0	1.0	1.3	1.1	59.0	0.0	0.0	62.0	0.0	48.0	40.0	8.0	0.0	60.5
8/17/2011	73.0	2.0	1.3	1.1	58.0	0.0	0.0	62.0	0.0	47.0	39.0	8.0	0.0	60.0
8/18/2011	73.0	1.0	1.3	1.1	57.0	0.0	0.0	61.0	0.0	46.0	39.0	7.0	0.0	59.3
8/19/2011	73.0	1.0	1.3	1.1	56.0	0.0	0.0	58.0	0.0	45.0	37.0	8.0	0.0	58.0
8/20/2011	73.0	2.0	1.2	1.1	56.0	0.0	0.0	55.0	0.0	47.0	39.0	8.0	0.0	57.8
8/21/2011	73.0	2.0	1.2	1.1	56.0	0.0	0.0	54.0	0.0	45.0	37.0	8.0	0.0	57.0
8/22/2011	73.0	1.0	1.2	1.2	65.0	0.0	0.0	52.0	0.0	45.0	37.0	8.0	0.0	58.8
8/23/2011	72.0	1.0	1.2	1.4	65.0	0.0	0.0	52.0	0.0	44.0	36.0	8.0	0.0	58.3
8/24/2011	72.0	2.0	1.2	1.3	66.0	0.0	0.0	60.0	0.0	43.0	35.0	8.0	0.0	60.3
8/25/2011	72.0	1.0	1.3	1.3	66.0	0.0	0.0	60.0	0.0	42.0	34.0	8.0	0.0	60.0
8/26/2011	73.0	1.0	1.3	1.3	66.0	0.0	1.5	62.0	0.0	41.0	33.0	8.0	0.0	60.5
8/27/2011	72.0	1.0	1.3	1.2	67.0	0.0	0.9	63.0	0.0	42.0	34.0	8.0	0.0	61.0
8/28/2011	72.0	1.0	1.3	1.2	67.0	0.0	0.0	62.0	0.0	41.0	34.0	7.0	0.0	60.5
8/29/2011	73.0	1.0	1.3	1.2	67.0	0.0	0.0	62.0	0.0	42.0	34.0	8.0	0.0	61.0
8/30/2011	81.0	1.0	1.2	1.3	66.0	0.0	0.0	61.0	0.0	42.0	35.0	7.0	0.0	62.5
8/31/2011	85.0	2.0	1.4	1.4	65.0	0.0	0.0	61.0	0.0	43.0	36.0	7.0	0.0	63.5

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

Flow Gaging Station / Date	Below River Intake	Blackrock Ditch Return	Goose Lake Return	Billy Lake Return	Mazourka Canyon Road	Locust Ditch Return	Georges Ditch Return	Reinhackle Springs	Alabama Gates Return	At Pumpback Station	Pump Station	Langemann Gate to Delta	Weir to Delta	In Channel Average Flow
9/1/2011	85.0	2.0	1.1	1.3	65.0	0.0	0.0	61.0	0.0	44.0	36.0	8.0	0.0	63.8
9/2/2011	85.0	1.0	1.1	1.3	59.0	0.0	0.0	61.0	0.0	44.0	36.0	8.0	0.0	62.3
9/3/2011	84.0	2.0	1.1	1.3	64.0	0.0	0.0	61.0	0.0	44.0	36.0	8.0	0.0	63.3
9/4/2011	85.0	2.0	1.1	1.3	66.0	0.0	0.0	61.0	0.0	43.0	36.0	7.0	0.0	63.8
9/5/2011	84.0	2.0	1.1	1.3	67.0	0.0	0.0	62.0	0.0	44.0	36.0	8.0	0.0	64.3
9/6/2011	83.0	1.0	1.1	1.3	67.0	0.0	0.0	65.0	0.0	44.0	36.0	8.0	0.0	64.8
9/7/2011	76.0	1.0	1.1	1.3	68.0	0.0	0.0	67.0	0.0	40.0	21.0	19.0	0.0	62.8
9/8/2011	72.0	1.0	1.2	1.3	68.0	0.0	0.0	70.0	0.0	40.0	15.0	25.0	0.0	62.5
9/9/2011	73.0	1.0	1.2	1.2	68.0	0.0	0.0	71.0	0.0	41.0	16.0	25.0	0.0	63.3
9/10/2011	72.0	2.0	1.3	1.1	67.0	0.0	0.0	71.0	0.0	41.0	16.0	25.0	0.0	62.8
9/11/2011	72.0	1.0	1.5	1.2	63.0	0.0	0.0	73.0	0.0	43.0	18.0	25.0	0.0	62.8
9/12/2011	73.0	1.0	1.5	1.2	61.0	0.0	0.0	74.0	0.0	46.0	21.0	25.0	0.0	63.5
9/13/2011	66.0	1.0	1.6	1.2	60.0	0.0	0.0	74.0	0.0	48.0	23.0	25.0	0.0	62.0
9/14/2011	66.0	1.0	1.6	1.2	60.0	0.0	0.0	73.0	0.0	49.0	24.0	25.0	0.0	62.0
9/15/2011	66.0	2.0	1.4	1.2	60.0	0.0	0.0	70.0	0.0	56.0	31.0	25.0	0.0	63.0
9/16/2011	65.0	1.0	1.3	1.3	68.0	0.0	0.0	68.0	0.0	52.0	27.0	25.0	0.0	63.3
9/17/2011	65.0	2.0	1.2	1.4	66.0	0.0	0.0	67.0	0.0	53.0	37.0	16.0	0.0	62.8
9/18/2011	65.0	2.0	1.1	1.4	65.0	0.0	0.0	67.0	0.0	54.0	43.0	7.0	4.0	62.8
9/19/2011	65.0	2.0	1.1	1.4	65.0	0.0	0.0	66.0	0.0	58.0	36.0	7.0	15.0	63.5
9/20/2011	61.0	1.0	1.2	1.4	65.0	0.0	0.0	65.0	0.0	55.0	48.0	7.0	0.0	61.5
9/21/2011	57.0	2.0	1.3	1.4	65.0	0.0	0.0	60.0	0.0	55.0	48.0	7.0	0.0	59.3
9/22/2011	57.0	1.0	1.4	1.3	65.0	0.0	0.0	59.0	0.0	52.0	44.0	8.0	0.0	58.3
9/23/2011	57.0	1.0	1.4	1.3	65.0	0.0	0.0	58.0	0.0	51.0	43.0	8.0	0.0	57.8
9/24/2011	57.0	2.0	1.4	1.2	62.0	0.0	0.0	58.0	0.0	52.0	44.0	8.0	0.0	57.3
9/25/2011	57.0	2.0	1.4	1.2	61.0	0.0	0.0	58.0	0.0	51.0	43.0	8.0	0.0	56.8
9/26/2011	57.0	2.0	1.4	1.1	61.0	0.0	0.0	59.0	0.0	49.0	41.0	8.0	0.0	56.5
9/27/2011	57.0	1.0	1.4	1.1	60.0	0.0	0.0	58.0	0.0	48.0	40.0	8.0	0.0	55.8
9/28/2011	57.0	2.0	1.3	1.1	60.0	0.0	0.0	57.0	0.0	48.0	40.0	8.0	0.0	55.5
9/29/2011	57.0	1.0	1.2	1.1	60.0	0.0	0.0	56.0	0.0	47.0	40.0	7.0	0.0	55.0
9/30/2011	57.0	1.0	1.2	0.9	60.0	0.0	0.0	55.0	0.0	48.0	40.0	8.0	0.0	55.0

Notes: These measurements are not on the main channel of the Owens River, therefore highlighted columns are not included in average calculations.

3.0 Seasonal Habitat Flow Report

3.1 Purpose of the Seasonal Habitat Flow

The goal of the LORP, as stated in the *1997 Memorandum of Understanding between the City of Los Angeles Department of Water and Power, County of Inyo, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, and the Owens Valley Committee* (1997 MOU):

> "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."

The 1997 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 1997 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 1997 MOU outlines flow regimes for seasonal habitat flows. For average to above average runoff years, the flow regime includes releasing 200 cubic feet per second (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 (MOU 1997, Section II, page 12).

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 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" (Hill and Platts, 1995).

The 1997 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 the Owens Lake and in consultation with California Department of Fish and Game (CDFG) and to be based on the Lower Owens 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" (MOU 1997, Section II, page 12).

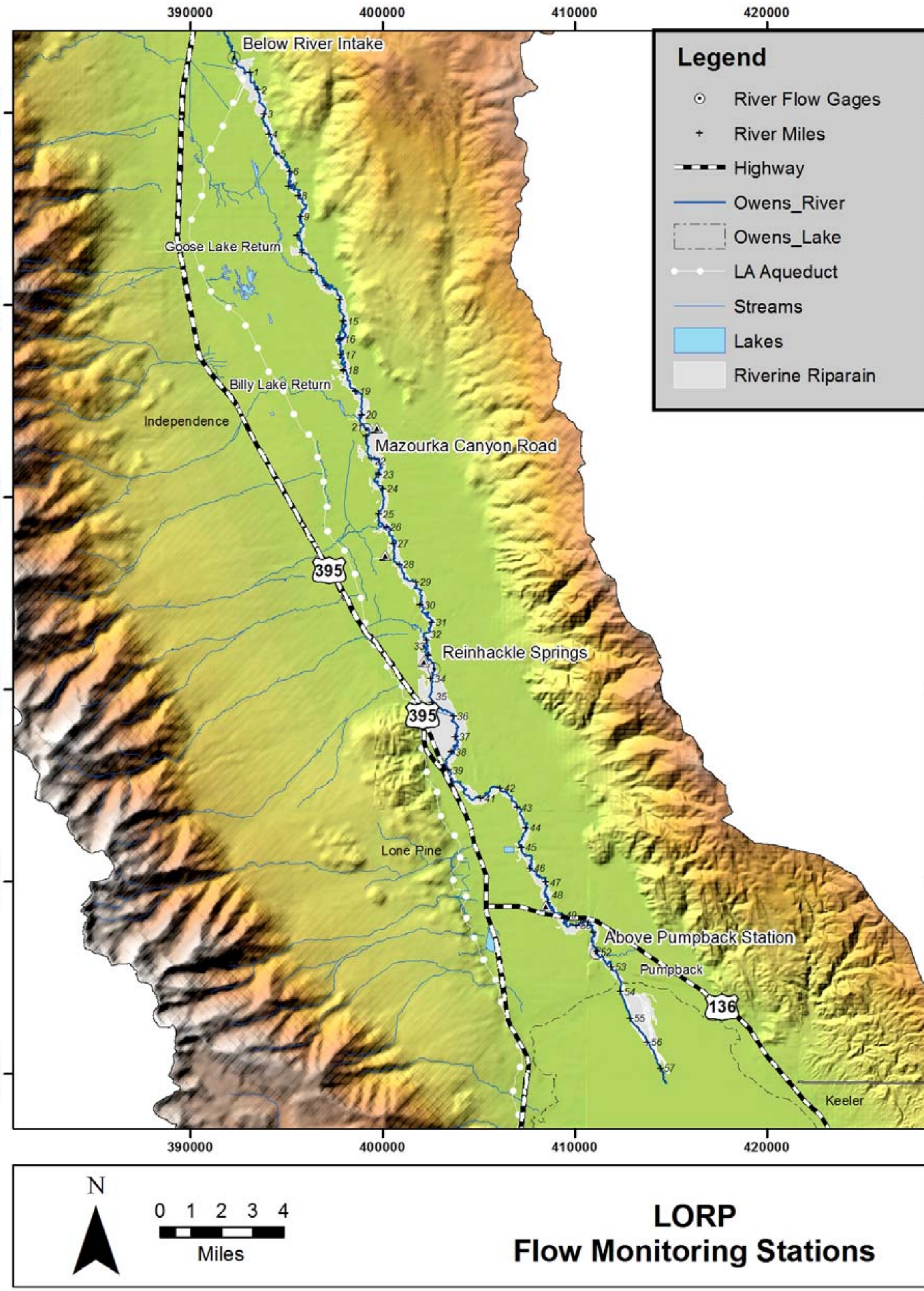
3.2 Hydrologic Infrastructure

Automated flow monitoring in the Lower Owens River occurred at four locations from the gated release at the LORP Intake to the Pumpback Station, upstream of the Delta. Flow is also monitored in six spillgate ditch tributaries. Seasonal Habitat Flow Table 1 lists the flow monitoring stations. Seasonal Habitat Flow Figure 1 displays the locations of the flow monitoring stations. Additional detailed information, including descriptions of base flow monitoring and flow measuring stations can be found in Section 4.3.1 of the *LORP Monitoring, Reporting, and Adaptive Management Plan* (Ecosystems Sciences, 2008).

Seasonal Habitat Flow Table 1. LORP Measuring Stations with Altitude Values

STATION NAME	ALTITUDE (M)
***Below River Intake**	**1,164**
Above Blackrock Ditch Return	1,159
Goose Lake Return	1,154
Billy Lake Return	1,144
***Mazourka Canyon Road**	**1,140**
Locust Ditch Return	1,143
Georges Return Ditch	1,124
***Reinhackle Springs**	**1,119**
Alabama Gates	1,117
***Above Pumpback Station**	**NA**
***Pumpback Station**	**1,098**

**** In-river stations***



Seasonal Habitat Flow Figure 1. Flow Monitoring Stations

3.3 Hydrographic Analysis

3.3.1 Seasonal Habitat Flows

Flows in the Lower Owens River and its tributaries, including return ditches, are monitored by LADWP's automatic and manual metering equipment. The maximum flow released from the LORP Intake was 205 cfs from June 22, 2011 at 11 am to June 23 at 1 pm. An average flow of approximately 120 cfs reached Mazourka station on June 27, 110 cfs at Reinhackle on July 2, and 78 cfs at Above Pumpback Station on July 8. Flows returned to normal base flow conditions at all stations by July 17, 2011. See Seasonal Habitat Flow Appendix 1.

3.3.2 LORP Inflows

Just before the high flow release, the LORP inflows were 45 cfs at the Intake with an additional 13 cfs added down river at various augmentation points. The seasonal habitat flows were scheduled to be released at the Intake as described below. Note that the flow change is not exactly as scheduled as the Langemann Gate was set high in order to meet or exceed the prescribed seasonal habitat flow, the peak flow that occurred can be found in the table below.

Seasonal Habitat Flow Table 2. Prescribed Flow Change

Date	Time	Prescribed Flow Change (from/to)
June 16	11:00 AM	45 to 50 cfs
June 17	11:00 AM	50 to 63 cfs
June 18	11:00 AM	63 to 79 cfs
June 19	11:00 AM	79 to 99 cfs
June 20	11:00 AM	99 to 124 cfs
June 21	11:00 AM	124 to 155 cfs
June 22	11:00 AM	155 to 200 cfs
June 23	1:00 PM	200 to 160 cfs
June 24	11:00 AM	160 to 128 cfs
June 25	11:00 AM	128 to 102 cfs
June 26	11:00 AM	102 to 82 cfs
June 27	11:00 AM	82 to 66 cfs
June 28	11:00 AM	66 to 53 cfs
June 29	11:00 AM	53 to 48 cfs

3.3.3 Flow Peaks and Travel Times

The time for the peak 205 cfs flow to move down the LORP was approximately 15 days from the Intake to the Pumpback Station. Based on previous studies, the velocities averaged well under 1 ft/sec during the seasonal habitat flows. A schedule of the peaks and travel times taken at the Lower Owens River measuring stations is presented in the following table.

Seasonal Habitat Flow Table 3. Flow Peaks and Time Schedule

Station	Peak	Peak Flow (24-hour average cfs)	Travel Time from Intake	Distance (miles)
Intake	June 22 at midnight	205	--	--
Mazourka	June 27 at noon	120	4 days, 0 hour	24
Reinhackle	July 2 at 5 a.m.	110	9 days, 5 hours	13
Above Pumpstation	July 8 at 6 a.m.	78	15 days, 6 hours	21

The travel time for the 2011 seasonal habitat flows to move from the Intake to the Pumpback Station decreased compared to 2010, but increased from previous seasonal habitat flows. In 2008, the total travel time was eight days, while in 2009 the travel time was 13 days, 2010 increasing to 16 days and 13 hours, and 2011 decreasing to 15 days and 6 hours.

3.3.4 Peak Flow Stage Height

At the Intake measuring station the average water depth during peak release was 9.2 feet, 4.4 feet higher at peak flow compared to base flow on May 4. At Mazourka measuring station (River mile 20.7) the stage height was 5.5 feet, an increase of 1.8 feet compared to base flow. At Reinhackle measuring station (River mile 34) the stage height at peak flow was 4.7 feet, an increase of 1.5 compared to base flow. The stage height during the peak flow at Keeler Bridge (River mile 48) increased by 1.2 feet above base flow.

3.4 Flooded Extent Mapping

Aerial digital imagery taken from multiple helicopter flyovers and ground surveys of the LORP study area were used to map the flooded extent at base flow and peak flow during the seasonal habitat flow. These data were used to derive the amount of area flooded (expressed in acres), the types of landforms flooded when the peak high flow occurred at the various monitoring plots during the seasonal habitat flow. These methods are described below. Note that flow measurements discussed through the remainder of Section 3 are daily averages.

3.4.1 Site Scale - Plot Mapping Analysis Methods

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 when the peak occurred in the various river reaches. LADWP staff used a geo-referenced *FLIR Systems* stabilized digital video camera mounted on the LADWP helicopter (Seasonal Habitat Flow Figure 2), which allowed for geo-referencing of video frames in geographic space. The helicopter flights generally progressed from south to north beginning with Owens Lake and followed the Lower Owens River channel north to the LORP Intake. The helicopter's altitude, bearing, and angle of view were recorded on the video and are viewable onscreen and varied depending on weather conditions and width of the floodplain. During 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.

Five helicopter flights were performed from May 4 to July 8, 2011. On May 4, prior to initiation of habitat flows, a helicopter flight recorded the base flow conditions. Video from days that represent the peak flow in the various reaches (Seasonal Habitat Flow Table 4) were used to map the seasonal habitat flow event. The aerial video imagery was used to digitize flooded extent in

ArcView 10.1. Base flow and seasonal habitat flow flooded extent were digitized on screen, side-by-side with the digital video imagery. Additionally, orthorectified aerial photos of the Owens Valley taken during early August 2009 were used as a background for digitizing.

Ground surveys using GPS of the peak flooded extent were performed at the five (2 kilometers in length) plots that are representative of the various Lower Owens River reaches. Section 4.2.7.2 of the *LORP Monitoring, Adaptive Management and Reporting Plan* (Ecosystems Sciences, 2008) describes the five plots used in the overall monitoring of the LORP in greater detail. Plots are located in three of the four reach types (formally dry incised floodplain, wet incised floodplain, and graded wet floodplain) of the Lower Owens River (WHA, 2004). The entire aggraded wet floodplain reach (which does not have site scale plot) was surveyed during peak flow using GPS in 2010. A summary of reach types can be found in Section 3.4.5.

As part of the ground surveys, GPS points of the wetted extent were taken on both sides of the river channel at all of the five plots during the seasonal habitat flow. An effort was made to survey sites when they were close to the peak flows. It was often difficult to determine the precise day that peak flows would move through a site. Field maps depicting the study plot and fence posts were generated and brought to the field along with a Trimble GeoExplorer GPS (loaded with plot information, including river shape, transects and fencepost). LADWP staff walked along the rivers flooded edge, mapping the flooded extent with the GPS units. In some cases there were multiple wetted edges due to oxbows and other landform features. In cases where the peak flow had passed the monitoring plot the apparent inundated area was mapped. Emergent vegetation, such as cattails and tules, were considered flooded. In late winter 2009, cross channel transects were performed on each of the five plots (Section 4.2.7.2 of the *LORP Monitoring, Adaptive Management and Reporting Plan*) the results of which were used to aid digitizing base flow wetted extent. These GPS points were used in the digitizing process to ensure that wetted extent margins were mapped correctly. On-the-ground GPS data allowed accurate identification of off-channel inundated areas that were filling with water via groundwater.

Seasonal Habitat Flow Figure 2. LADWP Helicopter with Mounted FLIR Unit

Seasonal Habitat Flow Table 4. Average Daily Flow (cfs) and Date of Helicopter Flights

	Measuring Station				
Date	Intake	Mazourka	Reinhackle	Above Pumpback Station	Pumpback Station
6/15/2011	45.0	51.0	55.0	46.0	38.0
6/16/2011	47.0	50.0	56.0	45.0	37.0
6/17/2011	57.0	50.0	54.0	45.0	37.0
6/18/2011	72.0	50.0	53.0	44.0	36.0
6/19/2011	89.0	51.0	54.0	44.0	36.0
6/20/2011	115.0	55.0	53.0	43.0	35.0
6/21/2011	143.0	62.0	53.0	42.0	34.0
6/22/2011	184.0	53.0	54.0	42.0	34.0
6/23/2011*	192.0**	71.0	55.0	42.0	34.0
6/24/2011	143.0	88.0	57.0	41.0	34.0
6/25/2011	112.0	105.0	62.0	41.0	33.0
6/26/2011	91.0	119.0	68.0	40.0	32.0
6/27/2011*	73.0	120.0	77.0	41.0	33.0
6/28/2011	61.0	118.0	82.0	41.0	33.0
6/29/2011	54.0	107.0	93.0	42.0	34.0
6/30/2011	51.0	96.0	106.0	44.0	37.0
7/1/2011	48.0	83.0	111.0	49.0	41.0
7/2/2011	48.0	71.0	110.0	53.0	45.0
7/3/2011	48.0	62.0	103.0	56.0	48.0
7/4/2011	48.0	57.0	95.0	61.0	48.0
7/5/2011*	48.0	54.0	89.0	68.0	47.0
7/6/2011	48.0	53.0	82.0	73.0	47.0
7/7/2011	65.0	53.0	71.0	77.0	48.0
7/8/2011	77.0	52.0	60.0	78.0	48.0
7/9/2011	75.0	51.0	55.0	76.0	48.0
7/10/2011	76.0	56.0	52.0	73.0	48.0
7/11/2011*	76.0	64.0	50.0	66.0	48.0
7/12/2011	75.0	68.0	48.0	60.0	48.0
7/13/2011	76.0	70.0	48.0	55.0	47.0
7/14/2011	75.0	72.0	51.0	46.0	38.0
7/15/2011	75.0	72.0	55.0	41.0	33.0
7/16/2011	75.0	72.0	59.0	40.0	33.0
7/17/2011	76.0	73.0	61.0	38.0	31.0
7/18/2011	76.0	73.0	62.0	38.0	31.0
7/19/2011	81.0	62.0	62.0	39.0	31.0

* Date of helicopter flight with aerial video
** 24-hour average release from June 22 at 11 am to June 23 at 1 pm was 205 cfs

Data from the video imagery, digital photos, cross channel transects, and ground surveys were used to create a total of 10 shapefiles during the digitizing process; one shapefile per plot for base flow, one shapefile per plot for the peak flow.

3.4.2 Flooded Area by Plot

Flooded area is used to determine the amount of area (expressed in acres) flooded during the seasonal habitat flow. Flooded area per plot for the base flow and the peak flow (Seasonal Habitat Flow Table 5) was measured using each GIS shapefile digitized from the wetted extent data.

Seasonal Habitat Flow Table 5. Flooded Area by Plot at Base Flow and Peak Flow

Plot	GPS or Flight Date	Plot Size (Acres)	Amount Flooded (Acres)	Percent Flooded
1	5/4/2011	159.9	6.9	4.3%
1	6/23/2011	159.9	15.4	9.6%
2	5/4/2011	164.7	25.6	15.5%
2	6/27/2011	164.7	38.7	23.5%
3	5/4/2011	153.1	36.4	23.8%
3	6/30/2011	153.1	50.5	33.0%
4	5/4/2011	168.8	57.7	34.2%
4	7/7/2011	168.8	70.8	41.9%
5	5/4/2011	215.9	28.8	13.3%
5	7/8/2011	215.9	39.1	18.1%

3.4.3 Landform Types Flooded by Plot

Whitehorse Associates (WHA) mapped the landforms of the Lower Owens River in 2004 (WHA 2004). This mapping effort was performed before LORP flows were initiated, which leads to abnormally high percentage of inundation on these landforms, since these areas are now inundated at base flow. Inundation is calculated from this pre-project mapping, however analysis is also performed that assesses inundation above base flow. It is also important to note that base flows are not consistent throughout the entire river, as the Lower Owens has losing and gaining reaches. Landforms that were identified in the plots include floodplain, low terrace, and high terrace. The *ArcGIS Analysis Intersect Tool* was used to clip the landforms shapefile to each flooded extent shapefile (base flow and peak 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 6). Note that that total acreage inundated may be slightly lower than in Seasonal Habitat Flow Table 5 due to flooding that occurred outside of mapped landforms. 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 and 9).

3.4.4 Cover Types Flooded by Plot

The cover types of each LORP monitoring plots were mapped in 2010. A description of cover types is provided in Appendix 2 (see the 2010 LORP annual report for a complete discussion of the site scale vegetation assessment). Similar to the landforms flooded per plot, the *ArcGIS Analysis Intersect Tool* was used to clip each plots cover type polygons to the flooded extent shapefile (base flow and peak flow for each plot). This resulted in attribute data that shows what cover types at each plot were inundated at each flow. Total acreages for each cover type flooded at base and peak flow are summarized in Seasonal Habitat Flow Table 7.

3.4.5 Reach and River-Wide Analysis Methods

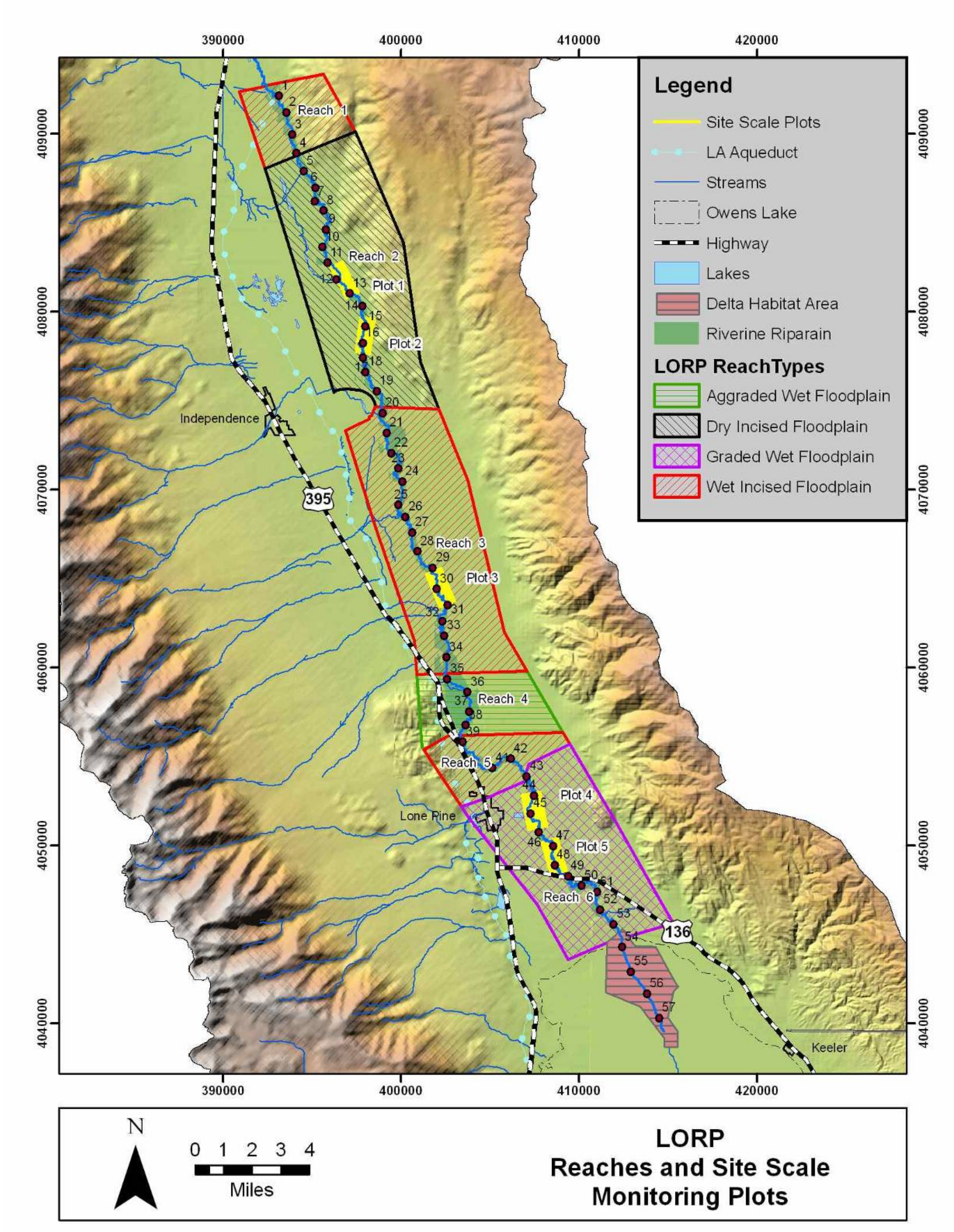
Results derived from the site scale analysis, described above, were used to extrapolate inundated conditions by reach type, and then to the entire Lower Owens River. The extrapolation of flooded area per landform for each reach type (previously dry incised floodplain, wet incised floodplain, and graded wet floodplain) was conducted for base flow and peak seasonal habitat flow. The entire aggraded wet floodplain was digitized in 2010. Lower Owens River reaches were designated and described by White Horse and Associates (WHA, 2004). The six Lower Owens River reaches were assigned reach types (Seasonal Habitat Flow Figure 3); one reach type can be used to describe multiple reaches.

The formerly dry incised floodplain consists of 15.7 miles of river where the floodplain is confined within the Owens River channel. This reach had little wetland vegetation before initiation of flows. The wet incised floodplain reach type is the most common reach type; it consists of multiple reaches that contain 23.1 miles of river. The wet incised floodplain is similar to the dry incised floodplain with the floodplain confined into the Owens River channel but is often much broader, ranging from 150 to 300 feet wide. The wet incised floodplain reaches contained higher groundwater levels or sub-irrigation, which supported more wetland vegetation before the initiation of LORP flows. The third reach type (wet graded floodplain) encompasses 10.5 miles of LORP. This average stream gradient for this reach type is 0.04%, which is half the average grade of the LORP riparian area. The floodplain here is semi-unconfined. The floodplain width is highly variable, with many oxbow channels cutting through terraces. The majority of this reach consisted of wetland vegetation in 2000. The fourth reach type (aggraded wet floodplain) is the least abundant reach type in the LORP, containing 4-river miles. This reach also has about half the average stream grade of the LORP riparian area. The densely vegetated floodplain is unconfined and aggraded, with no continuous channel.

Extrapolation of flooded area per landform occurred in three of the four Lower Owens River reach types (formally dry incised floodplain, wet incised floodplain, and graded wet floodplain) (WHA, 2004). The forth reach type (aggraded wet floodplain) has no site scale plots established in this reach. The aggraded wet floodplain (Islands area) flooded extent data from 2010 was used for analysis purposes in this report.

Flooded area, for both base flow and peak flow, per reach type for Lower Owens River was extrapolated by using a plot's (or multiple plot's) percent landform type inundated as a multiplier. Thus, to determine a reach type's acres inundated for each landform, the percent inundated per landform at the plot level was used as a multiplier (see percent inundated column in Seasonal Habitat Flow Tables 7 and 8); this number was multiplied by 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 inundated of each landform type were used as multipliers to extrapolate to the reach level.

Normalization of peak flow flooded extent to 200 cfs at each plot was not performed because accurate measurements of flow at each plot do not exist. For example, plot 1 is 11 miles downstream and 8 miles upstream from the closest measuring stations and the peak daily average decreases 72 cfs between the two stations. The rough estimates of flow at each plot and assumptions of the rate of increase in inundation of each landform outside of what has occurred makes this normalization to compare reaches so imprecise that any results would be invalid. Furthermore, the seasonal habitat flow this year was quite similar to 2010 making this normalization unnecessary for a realistic comparison of reaches between years.



Seasonal Habitat Flow Figure 3. River Reaches and Site Scale Monitoring Plots

3.5 Results and Discussion

3.5.1 Base Flow and Peak Flow Flooded Extent Mapping

Results of the analyses 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 digital aerial video collected by LADWP's helicopter, digital aerial 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 entire Lower Owens River.

3.5.2 Site Scale - Plot Analysis Results

Seasonal Habitat Flow Table 6 shows the percent flooded area per plot at base flow and peak flow levels. See Seasonal Habitat Flow Figures 4 through 9 for digitized flooded extent at base and peak flow. Plots 1 and Plot 2 in the formally dry incised floodplain reach had the lowest acreage flooded under both peak and high flow. Plot 1 had no off-channel oxbows flooded. Plot 2 had 0.3 acres of off-channel area flooded at base flow which increased to 0.77 acres flooded during peak flow. Plot 2 was the only plot that experienced additional off-channel areas flooded by groundwater during peak flow. Consistent with last year (2010), other plots had many of these low-lying off-channel areas become connected to the main channel during peak flow. Plot 3 had 2.04 acres of off-channel area flooded at base flow which decreased to 1.33 during peak flow. Plot 4, in the graded wet floodplain reach, experienced the highest acreage flooded under both flows (57.7 at base, and 70.8 at peak). Of this inundated acreage, 3.85 acres were off-channel, which decreased to 3.28 during the peak flow. Plot 5 had the highest amount of off-channel area flooded during base flow at 5.69 acres. A large portion of this acreage in Plot 5 became connected to the main channel during peak flow leaving 3.58 acres unconnected to surface flow.

<u>Landforms Flooded</u>

The percent landform type flooded per plot varied considerably, demonstrating the range of landform types and conditions found within the Lower Owens River. For example, Plot 1, located in the formally dry incised floodplain reach type, contains narrow floodplains flanked by high terraces, experienced flooding on only 15.4% of its floodplains during base flows and 32.1% during peak flows. While Plot 2, in the same reach, experienced flooding on over half of its floodplain during base flows and 70.4% during peak flows. Plot 3 had the highest percentage of floodplain flooded of the monitoring plots, 88.6% during peak flow. Most of the flooding at peak flow occurs on the floodplain. There is some inundation of terraces adjacent to the floodplain; the wet incised floodplain (Plot 3) experienced the highest inundated acreage of terraces with 12.4 acres, since most of the floodplain in this reach is inundated at peak flow.

Seasonal Habitat Flow Table 6. Landform Acreage Inundated by Plot at Base Flow and Peak Flow

Plot	Flow	Total Flooded Area (Acres)	Floodplain (Acres)	Floodplain (%)	Low Terrace (Acres)	Low Terrace (%)	High Terrace (Acres)	High Terrace (%)
1	Base	6.7	5.7	15.4%	0.0	0.0%	1.0	0.8%
1	Peak	15.1	11.8	32.1%	0.0	0.0%	3.3	2.7%
2	Base	25.0	23.0	51.0%	0.0	0.0%	2.0	1.7%
2	Peak	37.3	31.7	70.4%	0.0	0.0%	5.5	4.6%
3	Base	36.4	28.2	77.9%	8.0	10.7%	0.2	0.4%
3	Peak	50.4	32.1	88.6%	17.7	23.8%	0.6	1.5%
4	Base	57.6	52.6	58.3%	5.0	7.1%	0.0	0.0%
4	Peak	70.7	61.4	68.1%	9.3	13.2%	0.0	0.0%
5	Base	28.7	21.1	33.3%	7.7	5.4%	0.0	0.0%
5	Peak	39.0	27.4	43.2%	11.7	8.2%	0.0	0.0%

Cover Types Flooded

The number of acres flooded for each cover type per plot at base flow and during peak flow is displayed in Seasonal Habitat Flow Table 7. As expected most flooding occurred in cover types that are located on floodplain near the river channel. Under base flow conditions Cattail–Willow wetland and open water had the greatest flooded area. At peak flow the same cover types are also flooded. There were 0.7 acres of areas mapped as open water that were not flooded at base flow that were flooded during peak flow. This is because Plot 3 had off channel oxbows filled with ground water in the late summer of 2010 when site scale mapping was done that were not flooded during the 2011 seasonal habitat flow. The additional 0.19 acres in Plot 1 and 2 is likely due to mapping error. The increase in inundated area above base flow is highest in Bulrush-Cattail-Willow wetland, Cattail-Willow Wetland, Chairmaker's Bulrush-Yerba Mansa Wet Meadow, Gooding's Willow Riparian Woodland, Saltbush-Greasewood-Seepweed Scrub, Saltbush-Saltgrass Scrub Meadow, Saltgrass Meadow, and Wildrye-Saltgrass Meadow, all with over 3 acres flooded.

Seasonal Habitat Flow Table 7. Acreage of Cover Types Flooded by Plot

Flow	Plot	Baltic Rush-Saltgrass Wet Meadow	Barren Ground	Bulrush-Cattail-Willow Wetland	Cattail-Willow Wetland	Chairmaker's Bullrush-Yerba Mansa Wet Meadow	Common Mallow	Common Reed	Coyote Willow/Saltgrass Riparian Shrubland	Fivehorn Smotherweed	Goodding's Willow Riparian Woodland	Greasewood-Seepweed-Shadscale Scrub	Open Water	Salt Heliotrope	Saltbush Monoculture	Saltbush-Greasewood-Seepweed Scrub	Saltbush-Rabbitbrush-Alkali Sacatone Scrub Meadow	Saltbush-Saltgrass Scrub Meadow	Saltbush-Seepweed-Saltgrass Scrub Meadow	Saltbush-Smotherweed-Russian Thistle Scrub	Saltgrass Meadow	Shadscale Scrub	Sunflower Wet Meadow	Wildrye-Saltgrass Meadow
Base Flow	Plot 1	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Plot 2	0.0	0.0	0.5	19.9	0.0	0.0	0.0	0.0	0.1	0.4	0.0	3.7	0.2	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Plot 3	0.1	0.0	2.3	23.5	2.1	0.0	0.4	0.0	0.0	0.9	0.0	6.1	0.0	0.0	0.0	0.1	0.3	0.0	0.1	0.1	0.0	0.0	0.3
	Plot 4	0.7	0.1	16.4	25.2	1.1	0.0	1.6	0.9	0.0	0.3	0.0	9.1	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.6	0.0	0.3	0.7
	Plot 5	0.0	0.1	8.1	4.9	0.2	0.0	1.2	1.3	0.0	3.1	0.0	5.9	0.0	0.0	0.0	0.2	0.5	0.0	0.0	0.8	0.0	1.5	1.0
Base flow Total		0.8	0.2	27.4	78.3	3.3	0.0	3.2	2.3	0.2	4.7	0.0	26.7	0.2	0.1	0.4	0.7	1.2	0.0	0.1	1.5	0.0	1.8	2.0
Peak Flow	Plot 1	0.5	0.1	0.0	7.0	0.0	0.1	0.0	0.0	1.9	0.0	0.0	1.9	0.3	0.2	0.9	0.1	0.3	0.0	1.3	0.4	0.0	0.0	0.3
	Plot 2	0.0	0.3	0.7	23.4	0.2	0.0	0.0	0.0	0.9	0.9	0.2	3.9	1.4	0.8	3.1	0.3	1.2	0.0	0.0	0.7	0.0	0.0	0.0
	Plot 3	0.5	0.0	2.5	27.6	4.0	0.0	0.6	0.0	0.0	2.1	0.0	6.5	0.0	0.0	0.0	0.8	3.0	0.0	0.0	0.8	0.0	0.0	1.8
	Plot 4	1.6	0.1	18.8	28.8	2.2	0.0	2.3	2.2	0.0	0.9	0.0	9.1	0.0	0.0	0.0	0.4	0.6	0.0	0.2	1.5	0.0	0.4	1.5
	Plot 5	0.1	0.0	9.7	6.2	0.4	0.0	1.4	2.3	0.0	5.0	0.0	5.9	0.0	0.0	0.0	0.4	1.3	0.0	0.0	1.5	0.0	2.3	2.5
Peak Flow Total		2.7	0.5	31.8	93.0	6.9	0.1	4.4	4.5	2.8	9.0	0.2	27.3	1.6	1.0	4.1	2.1	6.3	0.1	1.6	4.9	0.0	2.8	6.1
Increase		**1.9**	**0.3**	**4.4**	**14.7**	**3.5**	**0.1**	**1.2**	**2.3**	**2.6**	**4.3**	**0.2**	**0.7**	**1.4**	**0.9**	**3.7**	**1.4**	**5.1**	**0.0**	**1.4**	**3.3**	**0.0**	**0.9**	**4.1**

3.5.3 Reach-River Wide Results

The results derived from the site scale analysis were used to extrapolate the amount of inundated acres by reach type, 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. Acres inundated for both base flow and seasonal habitat peak flow were extrapolated from observed conditions. Flooded area per reach varied throughout the Lower Owens River as did the amount of landform flooded per reach type. 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 1,293 acres of Lower Owens River landforms were inundated (Seasonal Habitat Flow Table 8). The dry incised floodplain reach type experienced the smallest wetted acreage of all reaches, with a total of 86 acres inundated under base flow conditions. Conversely, the wet incised floodplain reach type (Reaches 1, 3 and 5) experienced the greatest wetted acreage, with 405 acres of floodplain and 125 acres of low terrace inundated. The wet incised floodplain reach type encompasses the largest amount of Lower Owens River miles with 23.1 river miles, and approximately 2,927 acres. The aggraded wet floodplain reach (Islands area) had the highest proportion of floodplain flooded at base flow with 82.8%.

Seasonal Habitat Flow Table 8. Extrapolation of Flooding Extent by Landform at Base Flow

Reach Type	Reach Numbers	Plot Numbers	Landform	Total Acres	Percent Inundated	Estimated Acres Inundated
Dry Incised Floodplain	2	1 and 2	Floodplain	223.7	33.2%	74
			High terrace	925.6	1.3%	12
			Low terrace	99.0	0.0%	0
Wet Incised Floodplain	1, 3, and 5	3	Floodplain	519.7	77.9%	405
			High terrace	1,241.9	0.4%	5
			Low terrace	1,165.3	10.7%	125
Aggraded Wet Floodplain	4	none	Floodplain	404.9	82.8%	335
			High terrace	169.6	0.3%	1
			Low terrace	590.7	28.7%	170
Graded Wet Floodplain	6	4 and 5	Floodplain	303.3	45.8%	139
			High terrace	60.2	0.0%	0
			Low terrace	454.8	6.2%	28
					Total	**1293**

During peak flows, the flooded area per reach and landform increased considerably over base flow conditions. During peak flow the wetted extent for the entire Lower Owens River was approximately 1,836 acres (Seasonal Habitat Flow Table 9). Certain reaches experienced more flooding. For example, in the wet incised floodplain reach type, it was estimated that over 756 acres was inundated. Conversely, in the dry incised floodplain reach type only 149 acres was estimated flooded at peak flow.

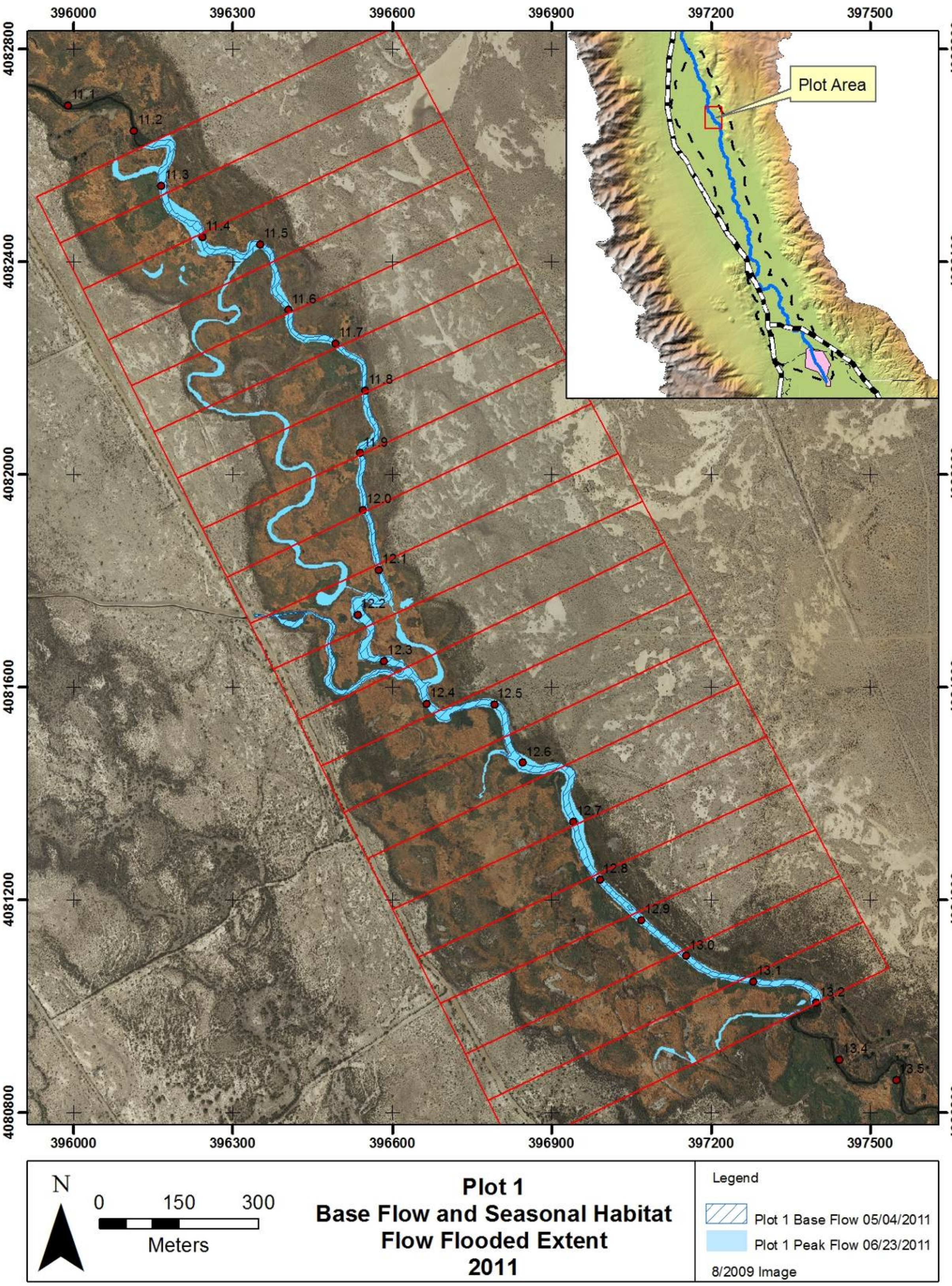
Seasonal Habitat Flow Table 9. Extrapolation of Flooded Extent by Landform at Peak Flow

Reach Type	Reach Numbers	Plot Numbers	Landform	Total Acres	Percent Inundated	Estimated Acres Inundated
Dry Incised Floodplain	2	1 and 2	Floodplain	223.7	51.2%	115
			High terrace	925.6	3.7%	34
			Low terrace	99.0	0.0%	0
Wet Incised Floodplain	1, 3, and 5	3	Floodplain	519.7	88.6%	460
			High terrace	1,241.9	1.5%	19
			Low terrace	1,165.3	23.8%	277
Aggraded Wet Floodplain	4	none	Floodplain	404.9	91.8%	372
			High terrace	169.6	3.1%	5
			Low terrace	590.7	57.1%	337
Graded Wet Floodplain	6	4 and 5	Floodplain	303.3	55.6%	169
			High terrace	60.2	0.0%	0
			Low terrace	454.8	10.7%	49
					Total	**1836**

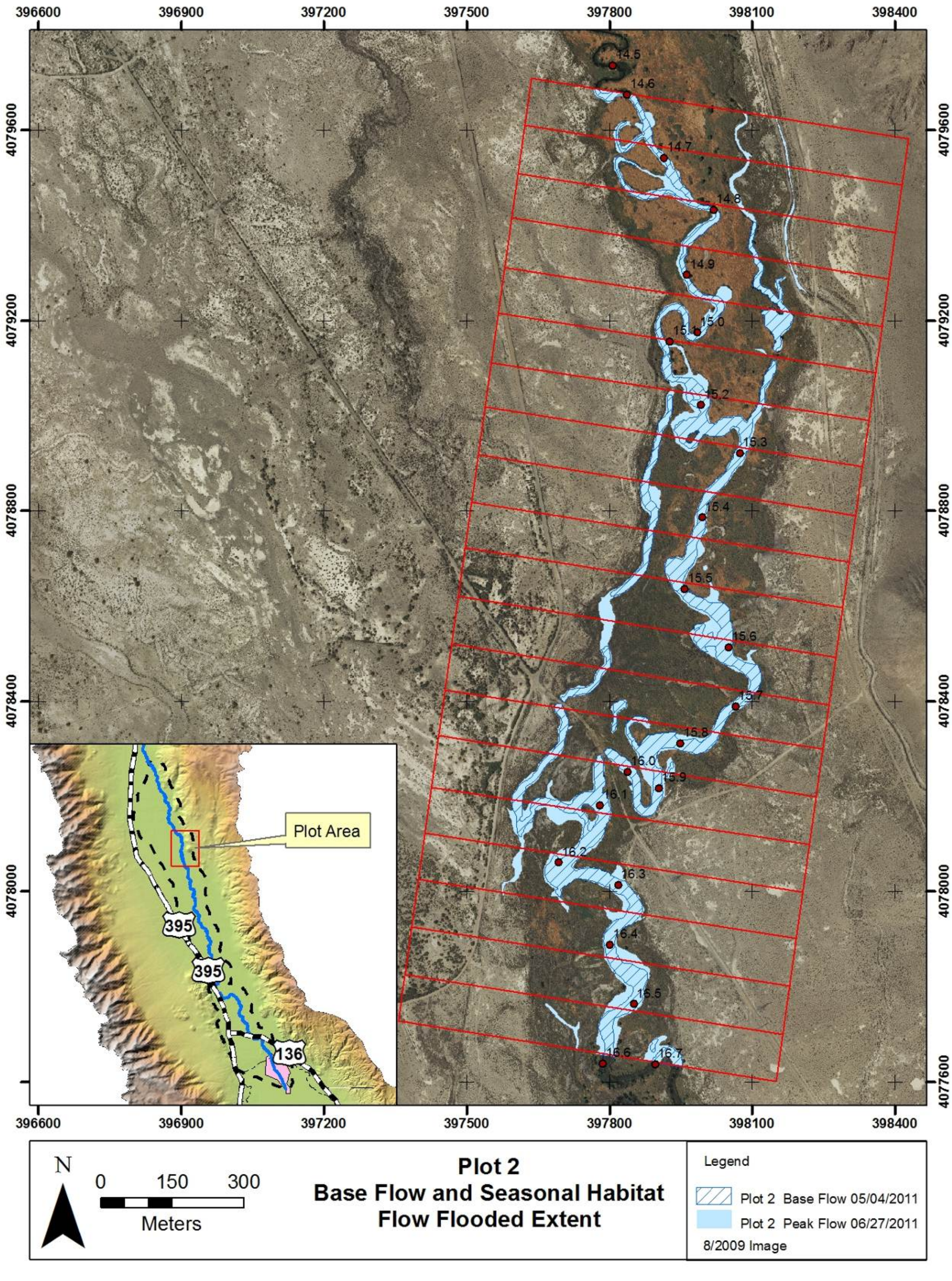
For the entire Lower Owens River, approximately 543 additional acres were inundated as a result of the seasonal habitat flows. During the seasonal habitat flows, the floodplains and low terraces are the landforms that experienced the majority of inundation. On average about 77% of floodplains and 29% of low terraces in the Lower Owens River were inundated (Seasonal Habitat Flow Table 10). Most of the high terrace flooded occurred in the formally dry incised floodplain reach but some also occurred in the wet incised floodplain reach.

Seasonal Habitat Flow Table 10. Landform Inundation Change and Percent Landform Flooding During Peak Flow

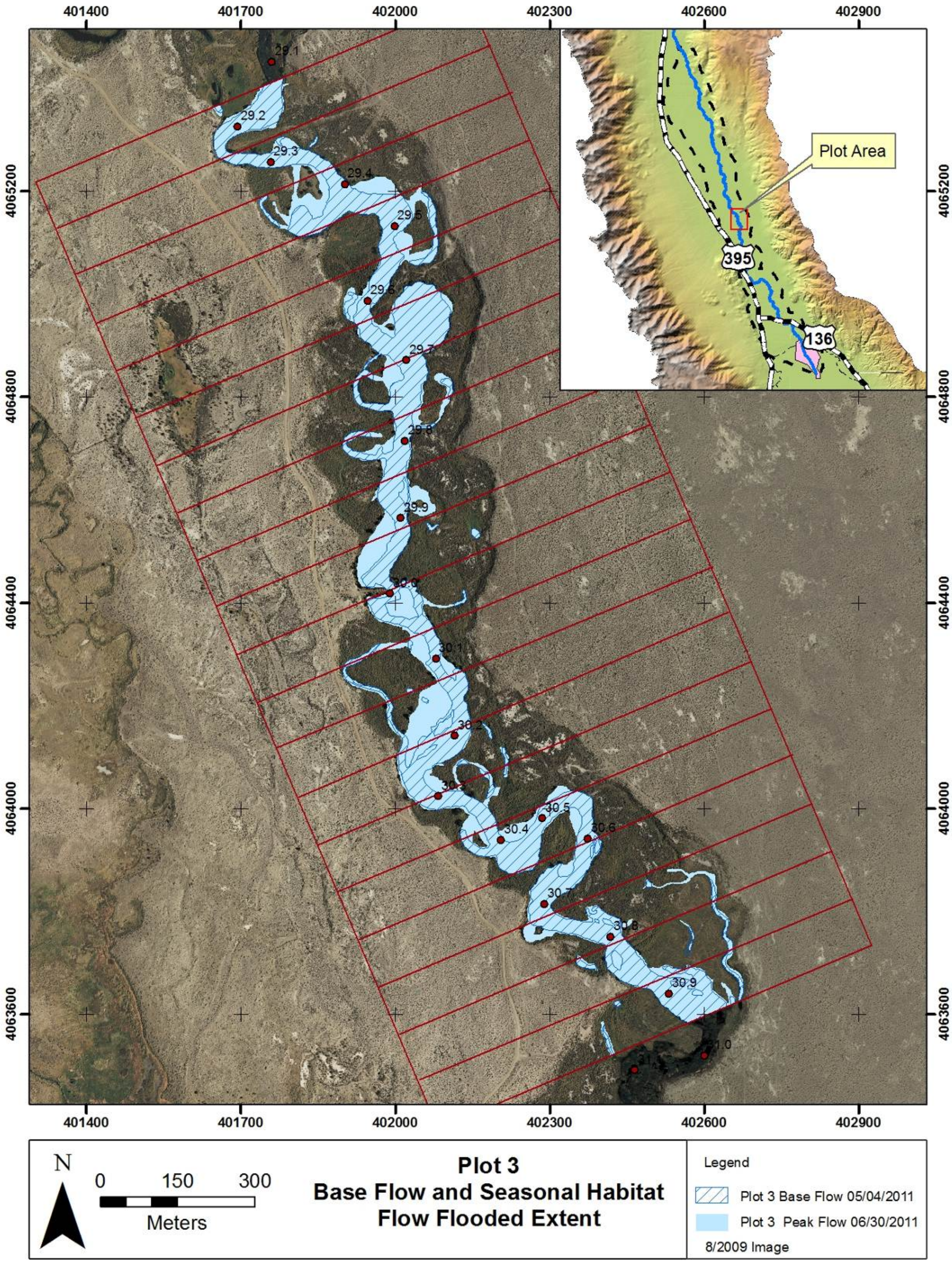
Landform	Total Acres	Base Flow Inundated Acres	High Flow Inundated Acres	Inundated Acreage Increase	Percent of Landform Inundated During Seasonal Habitat Flow
Floodplain	1,452	953	1,115	162	77%
High Terrace	2,397	17	58	41	2%
Low Terrace	2,310	323	663	340	29%
Total	**6,159**	**1,293**	**1,836**	**543**	



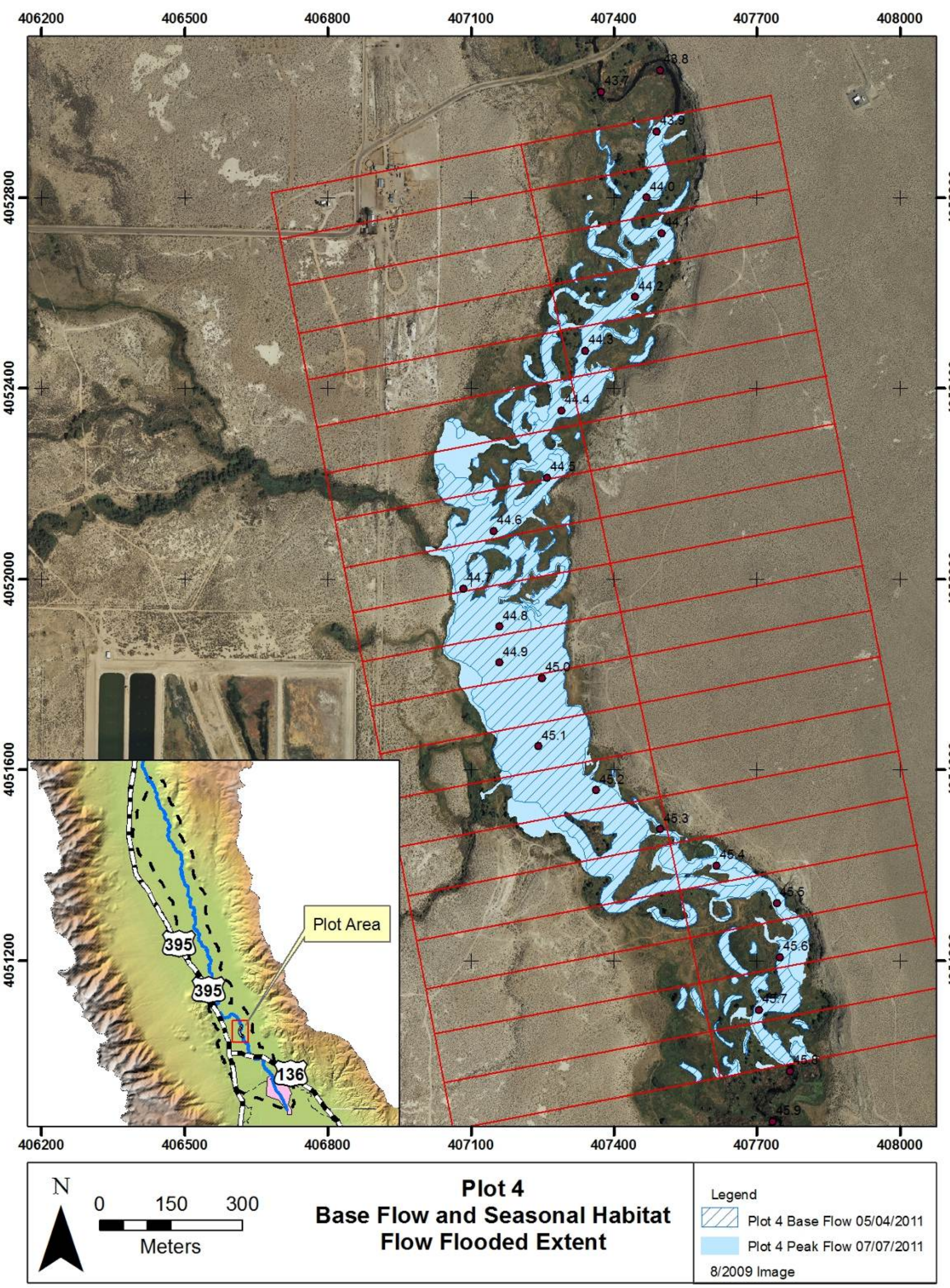
Seasonal Habitat Flow Figure 4. Plot 1 Flooded Extent



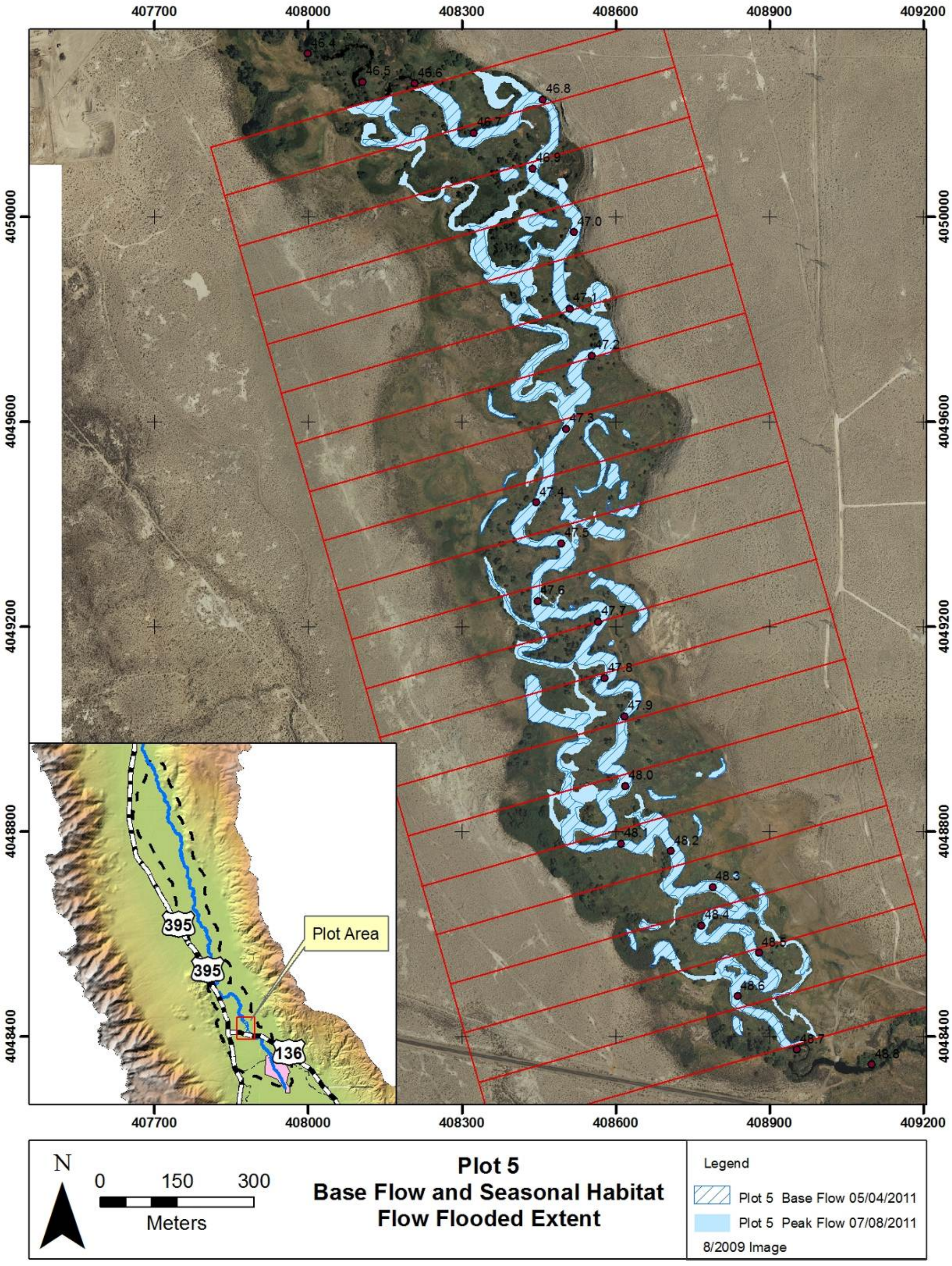
Seasonal Habitat Flow Figure 5. Plot 2 Flooded Extent



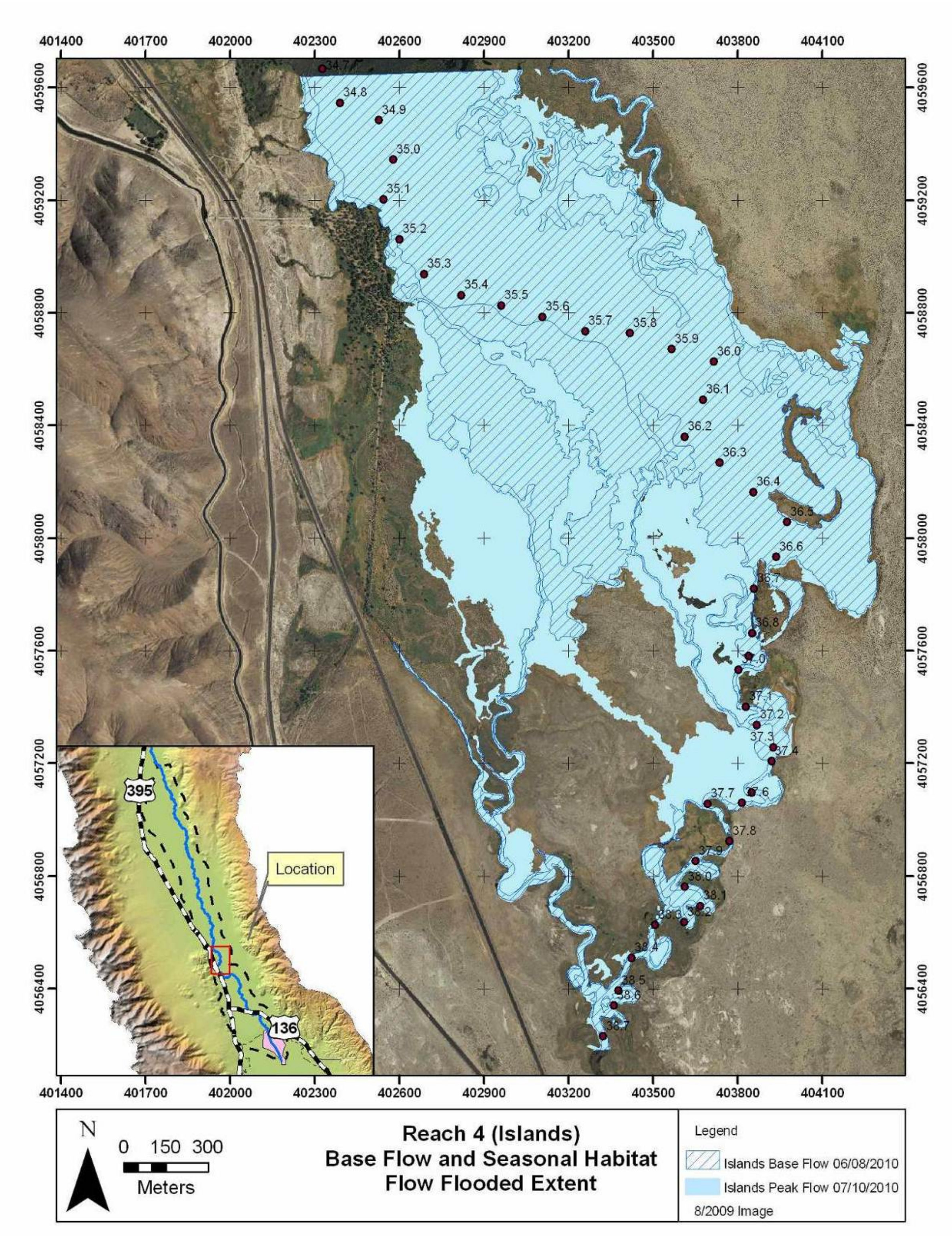
Seasonal Habitat Flow Figure 6. Plot 3 Flooded Extent



Seasonal Habitat Flow Figure 7. Plot 4 Flooded Extent



Seasonal Habitat Flow Figure 8. Plot 5 Flooded Extent



Seasonal Habitat Flow Figure 9. Aggraded Wet Floodplain Flooded Extent

3.6 Flooded Extent Comparisons with Previous Seasonal Habitat Flows

The peak release for the seasonal habitat flow was 205 cfs. The year 2010 also had a 200+ cfs peak that was released during the growing period, only one week later in the year than 2011. Overall the proportion of landforms flooded in each plot was similar between 2010 and 2011, plot and reach specific comparisons are below.

Both of the plots in the formally dry incised floodplain reach had a similar base flow flooded extent and a slightly lower peak flow flooded extent. A portion of the decrease in peak flow flooded extent in plot 1 was due to the flooding of oxbows that took place in 2010 but not 2011, around river mile 12.1 and 12.6. This additional flooding of oxbows was not noted in Plot 2. The fewer 2.7 acres flooded in Plot 2 during peak flow in 2011 was the result of many small areas that were not mapped as flooded in 2010. When extrapolated reach-wide, there was a 1% decrease in flooded acreage during base flow in 2011 when compared to 2010 and an 11% decrease in flooded acreage at peak flow. The peak daily average flow was 125 cfs at Mazourka measuring station in 2010 compared to 120 cfs in 2011, 4% lower peak flow.

The flooded acreage in Plot 3 (wet incised floodplain) was 2% higher during base flow in 2011 compared to 2010. The peak flooded extent mapped in Plot 3 was 3.5 acres less in 2011 compared to 2010. The difference in peak flow inundated acreage reach-wide between 2011 and 2010 was approximately 3% in both the floodplain and low terrace and 1% in high terrace. When extrapolated reach-wide, this produced the greatest decrease in peak flooded acreage between 2010 and 2011 of any reach, which was 59 acres, an 8% difference. Since the wet incised floodplain reach has the largest amount of floodplain and low terrace landforms of any reach it is particularly sensitive to changes in estimates of percent of those landforms flooded. Consistent with Plot 2, the difference in flooded acreage is from many small areas. This reach also has only one plot, which means error of the estimate is higher compared to other reaches with two plots. The peak flow at the closest measuring station (Reinhackle) was 116 cfs in 2010 and 111 cfs in 2011 (4% lower peak flow in 2011).

Plot 4 in the graded wet floodplain had a lower base flow flooded extent mapped in 2011 by 3.9 acres and a 1.1 acre increase in peak flow flooded extent. Flooded extent acreage in Plot 5 during 2011 was very similar to 2010 for peak flow. In the graded wet floodplain reach-wide there was a difference of 4% at base flow and less than 1% in total acreage flooded at peak flow between the two years.

3.6.1 Acreage Inundated above Base Flow

In terms of available area for the recruitment of woody riparian vegetation, a more appropriate way to look at the seasonal habitat flow inundation is the difference between the base flow acreage flooded and the peak flow acreage flooded each year. The difference is the acreage where woody riparian species are most likely to germinate and grow due to the seasonal habitat flow in that year. There were approximately 543 additional acres inundated over base flow this year, which is less than the 626 acres in 2010, a 14% decrease. Estimated inundated acres of the various landforms during 2011 are presented in Seasonal Habitat Flow Table 11 with 2010 data for comparison.

The dry incised floodplain reach experienced an estimated 63 inundated acres due to seasonal habitat flow, which is the second lowest of the four reaches (Seasonal Habitat Flow Table 11). This reach begins four miles from the release point for the LORP flows, which allows for less attenuation of peak flow but the incised channel next to high terraces limits inundation of more area.

The wet incised floodplain experienced 222 inundated acres over base flow in 2011. There was an estimated 28% decrease in acreage inundated comparing the 2011 seasonal habitat flow with 2010.

The graded wet floodplain experienced the least acreage inundated by the peak seasonal habitat flow. There were 6 acres less inundated during 2011 compared to 2010, with most of the difference occurring in the floodplain landform.

Seasonal Habitat Flow Table 11. Comparison of Increase in Area Inundated Over Base Flow between 2010 and 2011

Reach Type	Landform	2011 Acres Flooded over Base Flow	2010 Acres Flooded over Base Flow
Dry Incised Floodplain	Floodplain	40	51
	High terrace	22	29
	Low terrace	0	0
	Total	**63**	**80**
Wet Incised Floodplain	Floodplain	55	70
	High terrace	14	29
	Low terrace	152	195
	Total	**222**	**294**
Aggraded Wet Floodplain	Floodplain	36	36
	High terrace	5	5
	Low terrace	167	167
	Total	**208**	**208**
Graded Wet Floodplain	Floodplain	30	24
	High terrace	0	0
	Low terrace	20	19
	Total	**50**	**44**
All Reaches	**Total**	**543**	**626**

3.7 Overall Findings and Conclusions

The following is a summary of the overall findings and conclusions from the 2011 seasonal habitat flow:

- The 2011 seasonal habitat flow was timed to occur with seed release of woody riparian vegetation; which is an objective of the flow release pertinent to the 1997 MOU.
- The time for the peak 205 cfs flow to move down the Lower Owens River was 15 days 6 hours from the LORP Intake to the Pumpback Station.
- Flooding was estimated to cover approximately 1,836 acres within the Lower Owens River.
- There was an increase of 543 acres inundated above base flow conditions that provided areas for recruitment of woody riparian species.
- During the seasonal habitat flow about 77% of floodplains and 29% of low terraces in the Lower Owens River were inundated.
- Seasonal Habitat Flow flooded extent this year was similar to the 200+ cfs flow in 2010.

3.8 References

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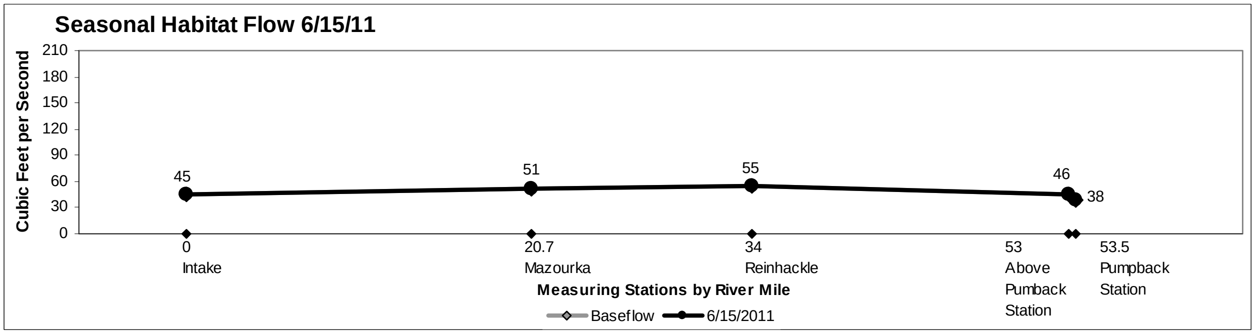
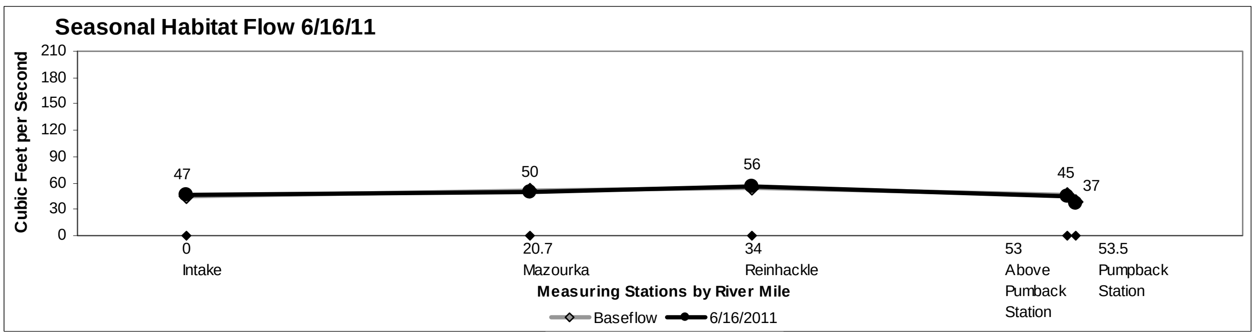
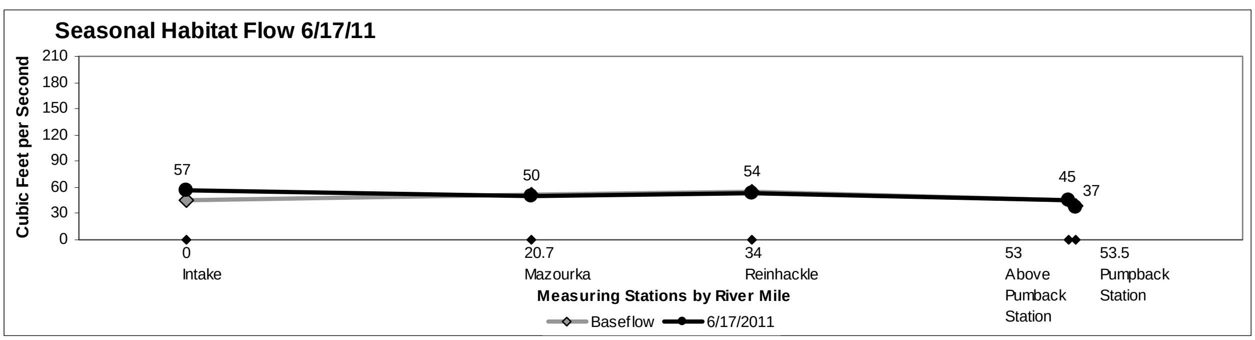
3.9 Seasonal Habitat Flow Appendices

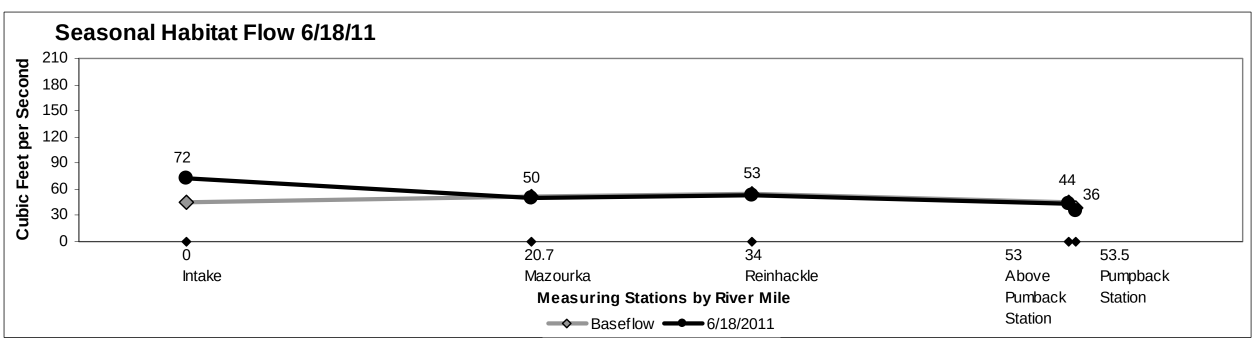
Appendix 1. Daily Average River Flow by Measuring Station and River mile for each day that the flow release occurred.

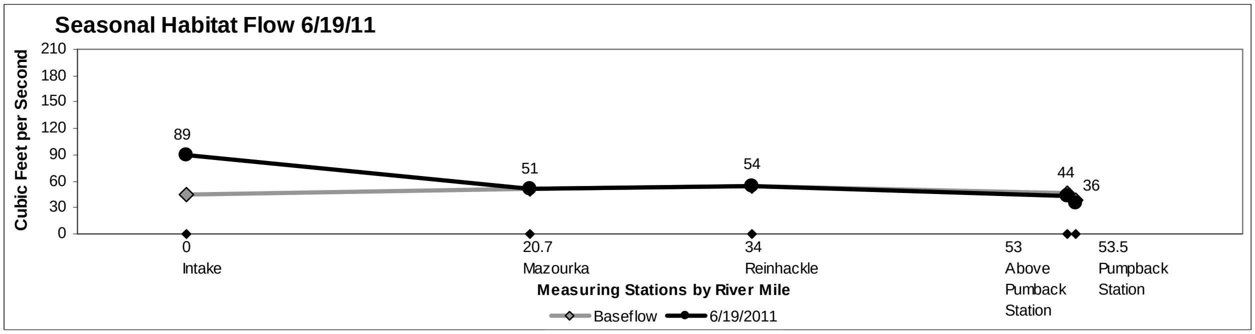
Values reported at the Pumpback Station represent the amount of flow being pumped back to the LAA. The difference between the Above Pumpback Station and Pumpback Station is the amount of water released to the Owens Lake Delta.

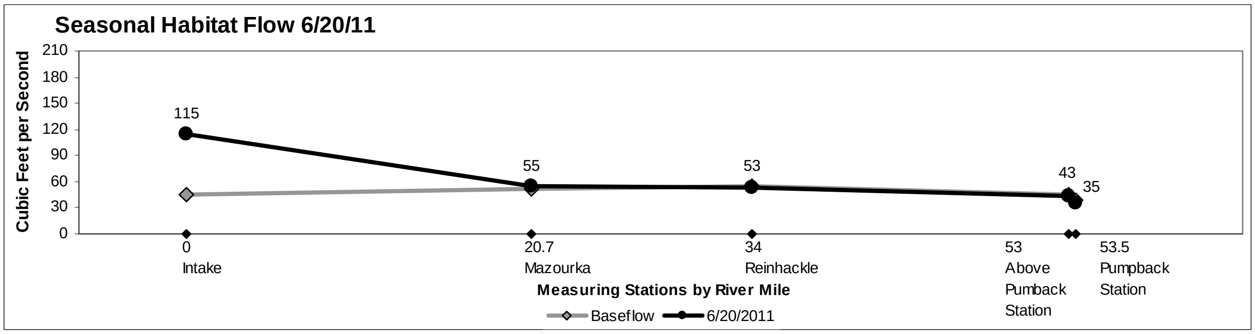


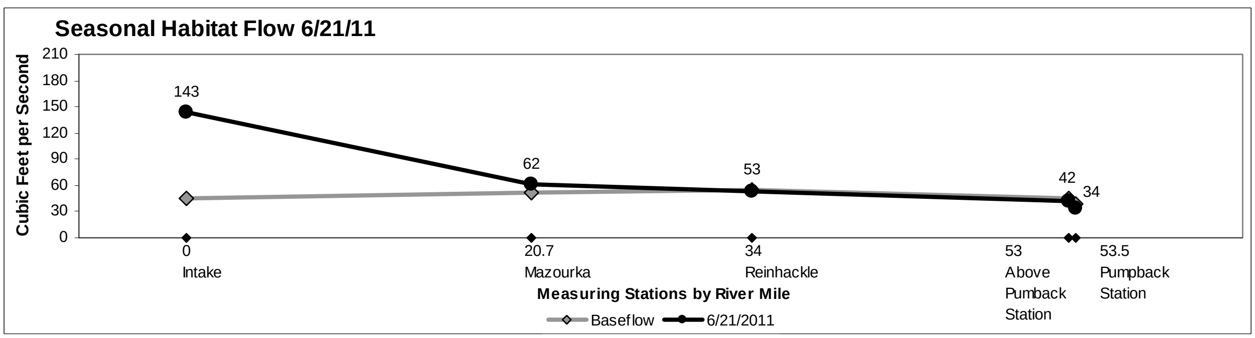


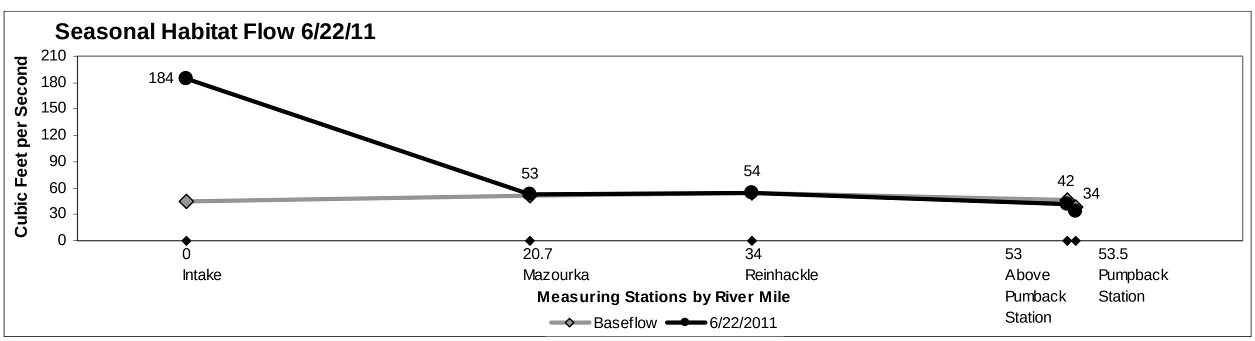


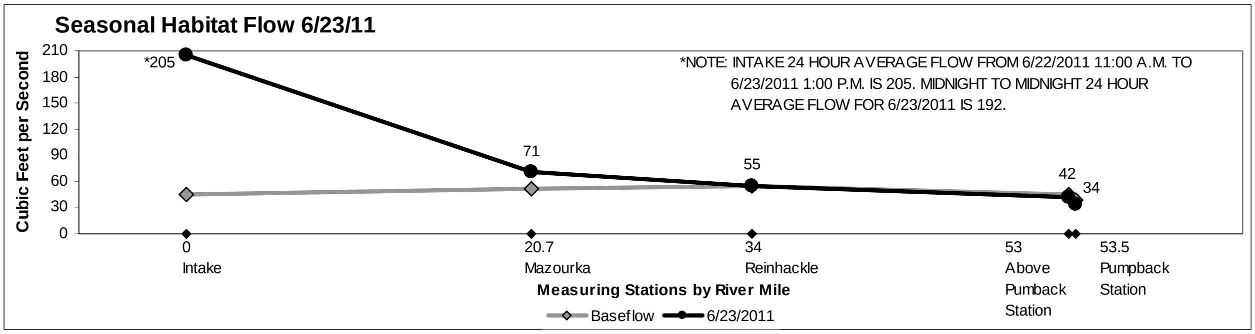


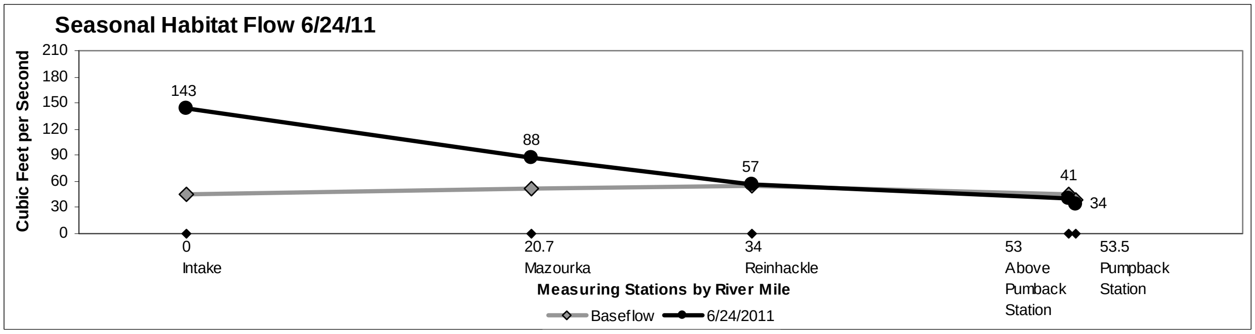

Seasonal Habitat Flow 6/19/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
89
51
54
44
36
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/19/2011

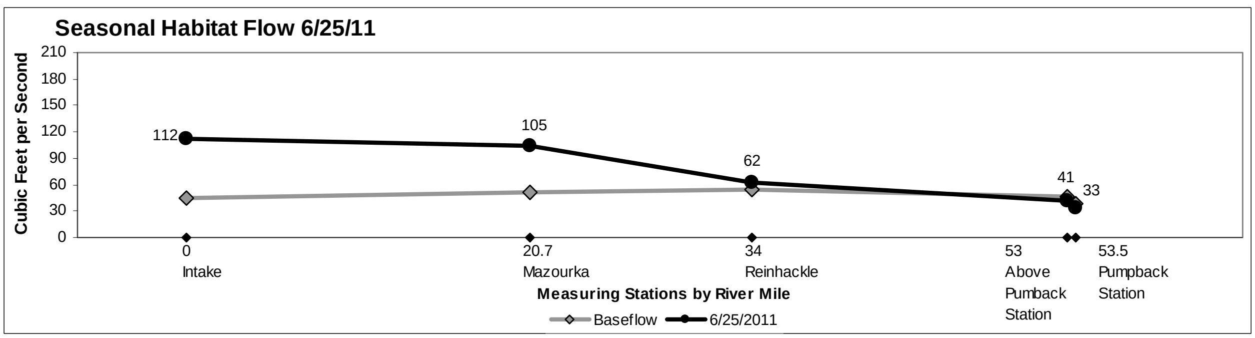

Seasonal Habitat Flow 6/20/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
115
55
53
43
35
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/20/2011

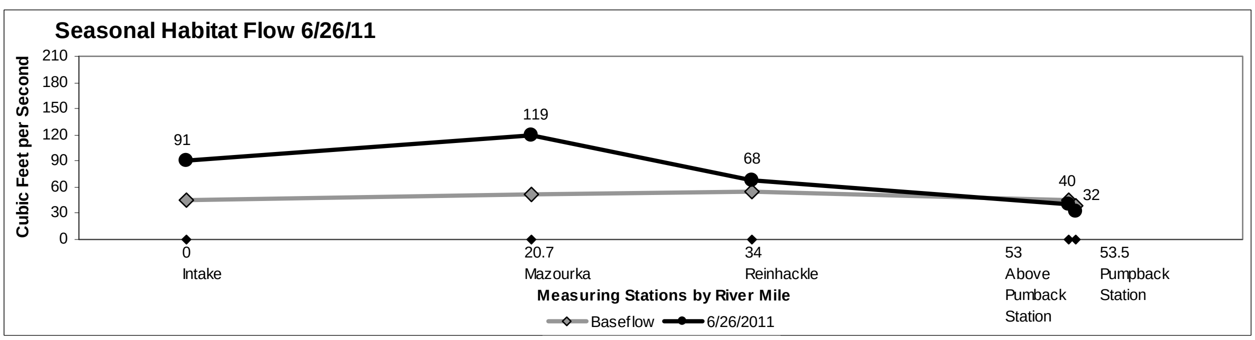

Seasonal Habitat Flow 6/21/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
143
62
53
42
34
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/21/2011

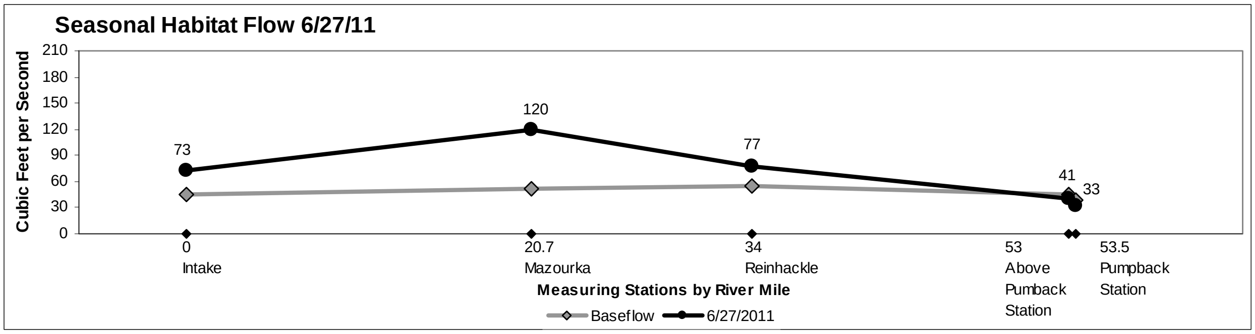

Seasonal Habitat Flow 6/22/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
184
53
54
42
34
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/22/2011


Seasonal Habitat Flow 6/23/11
*NOTE: INTAKE 24 HOUR AVERAGE FLOW FROM 6/22/2011 11:00 A.M. TO 6/23/2011 1:00 P.M. IS 205. MIDNIGHT TO MIDNIGHT 24 HOUR AVERAGE FLOW FOR 6/23/2011 IS 192.
Cubic Feet per Second
210
180
150
120
90
60
30
0
*205
71
55
42
34
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above Pumback Station
53.5
Pumpback Station
Measuring Stations by River Mile
Baseflow
6/23/2011

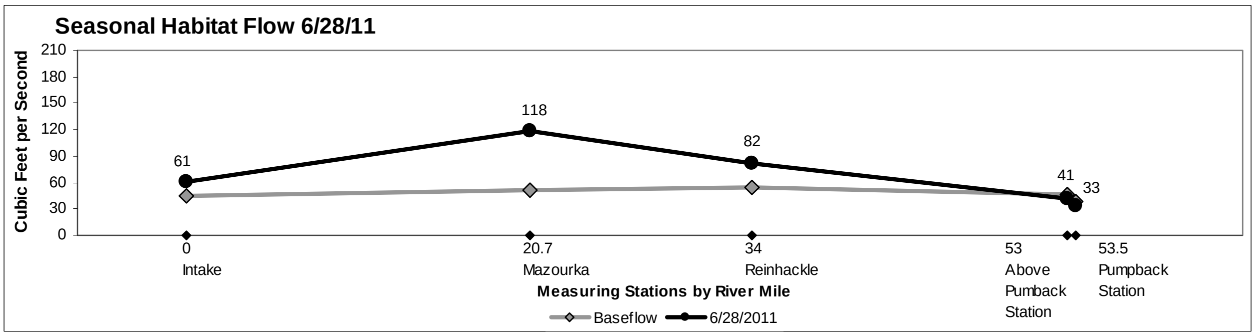

Seasonal Habitat Flow 6/24/11
Cubic Feet per Second
143
88
57
41
34
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above Pumback Station
53.5
Pumpback Station
Measuring Stations by River Mile
Baseflow
6/24/2011


Seasonal Habitat Flow 6/25/11
Cubic Feet per Second
112
105
62
41
33
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above Pumback Station
53.5
Pumpback Station
Measuring Stations by River Mile
Baseflow
6/25/2011

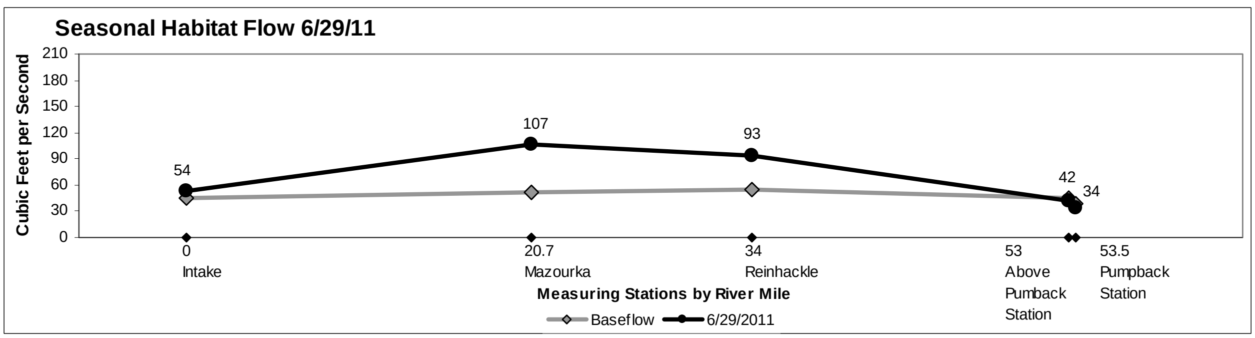

Seasonal Habitat Flow 6/26/11
Cubic Feet per Second
91
119
68
40
32
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above Pumback Station
53.5
Pumpback Station
Measuring Stations by River Mile
Baseflow
6/26/2011



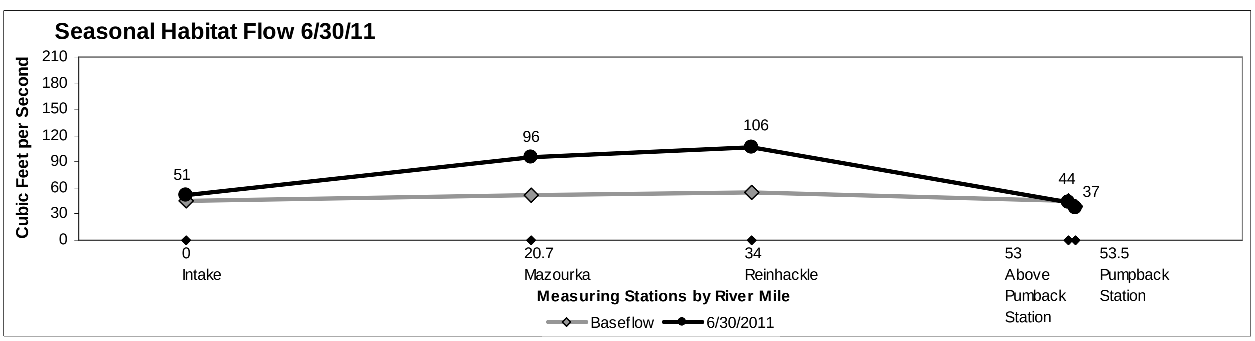
Seasonal Habitat Flow 6/27/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
73
120
77
41
33
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/27/2011



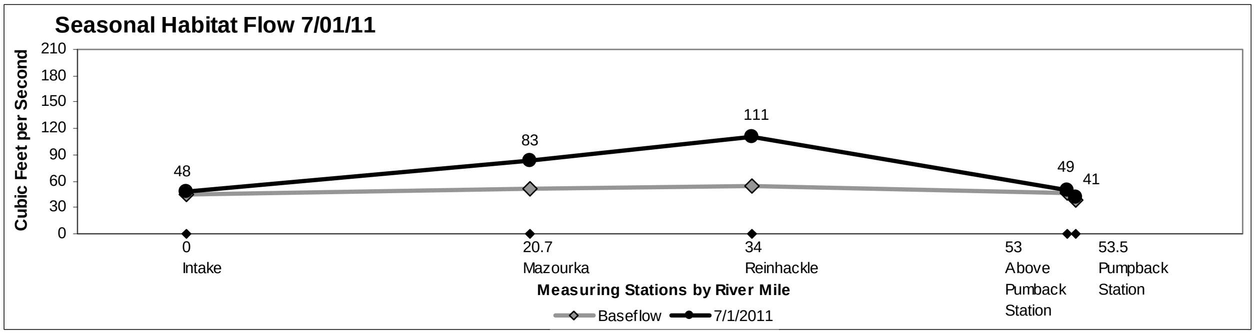
Seasonal Habitat Flow 6/28/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
61
118
82
41
33
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/28/2011

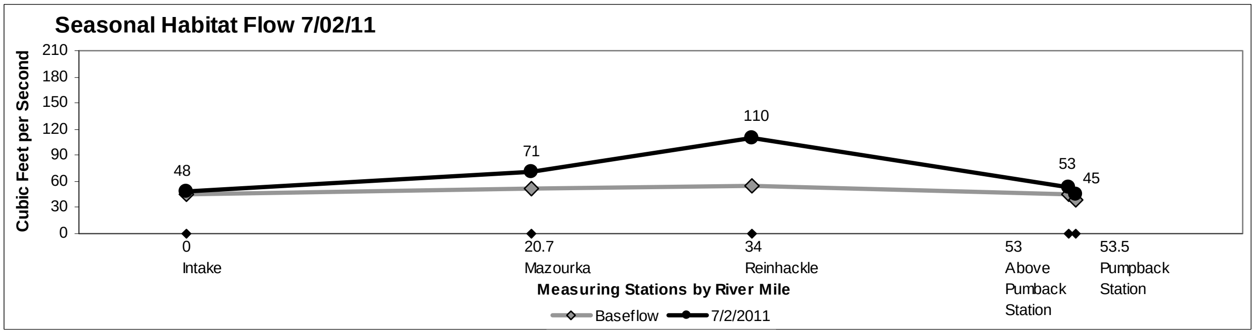


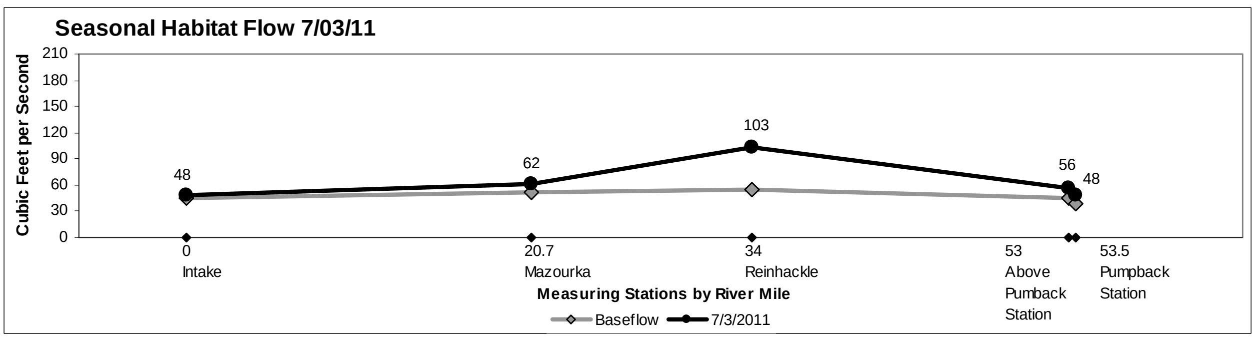
Seasonal Habitat Flow 6/29/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
54
107
93
42
34
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/29/2011

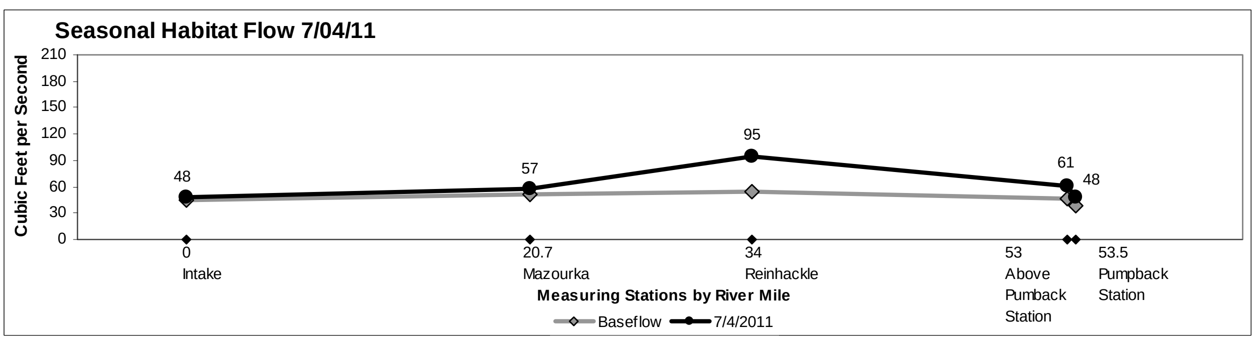


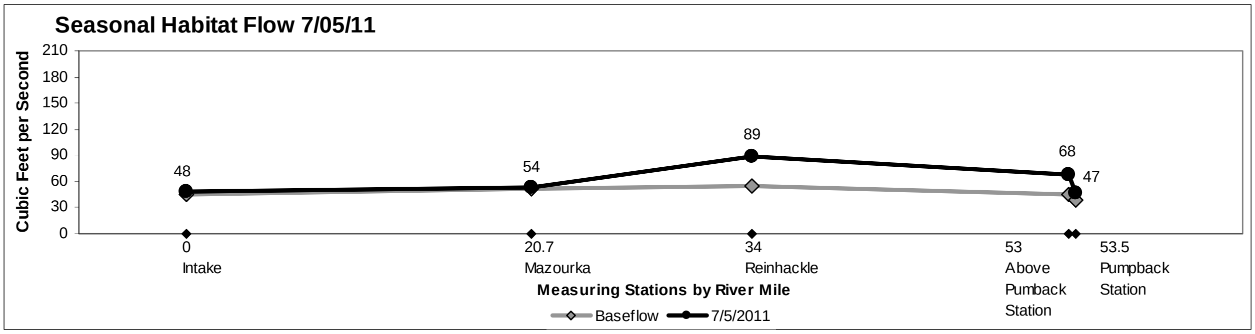
Seasonal Habitat Flow 6/30/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
51
96
106
44
37
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
6/30/2011

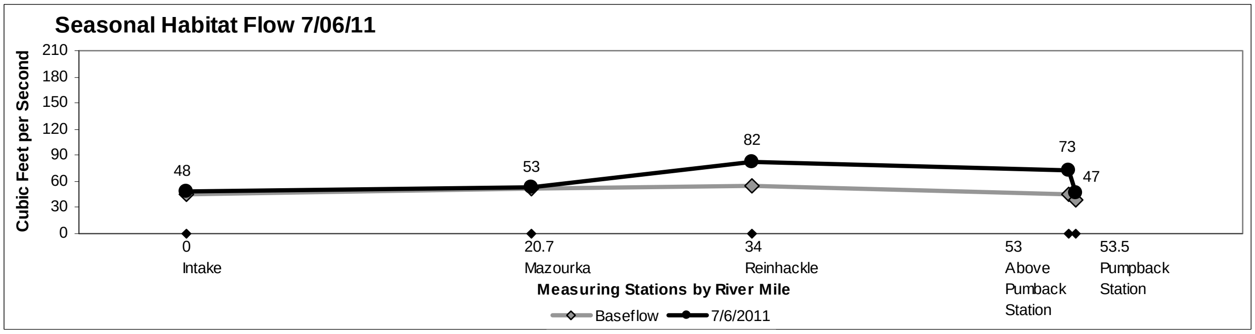

Seasonal Habitat Flow 7/01/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
83
111
49
41
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/1/2011

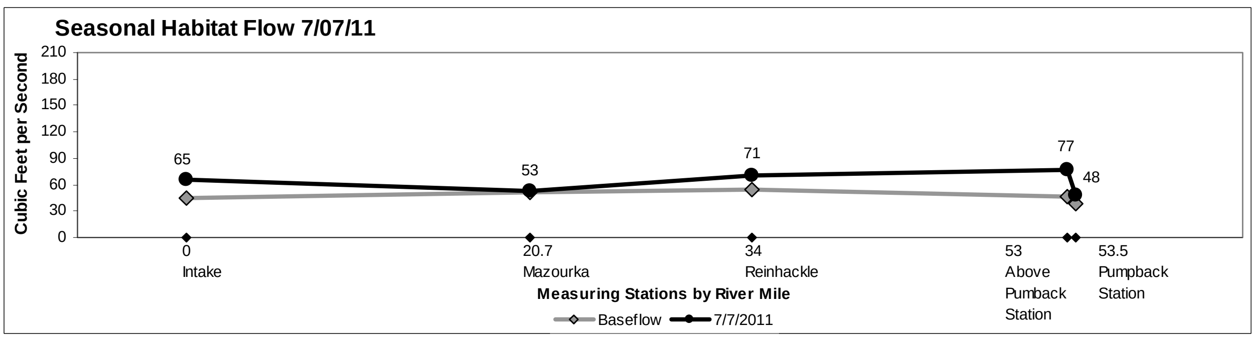

Seasonal Habitat Flow 7/02/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
71
110
53
45
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/2/2011

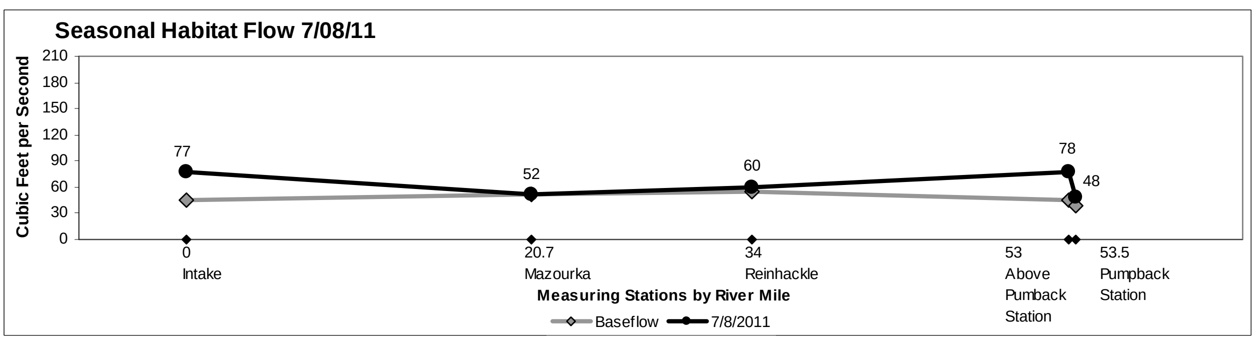

Seasonal Habitat Flow 7/03/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
62
103
56
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/3/2011

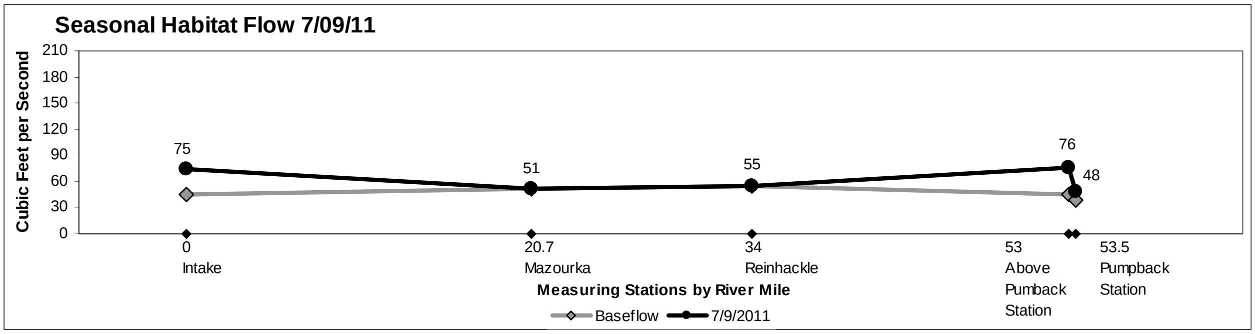

Seasonal Habitat Flow 7/04/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
57
95
61
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/4/2011

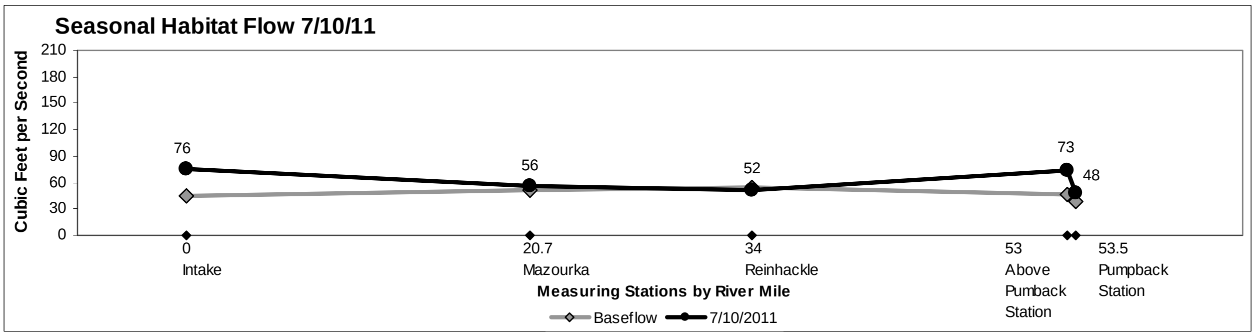

Seasonal Habitat Flow 7/05/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
54
89
68
47
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/5/2011

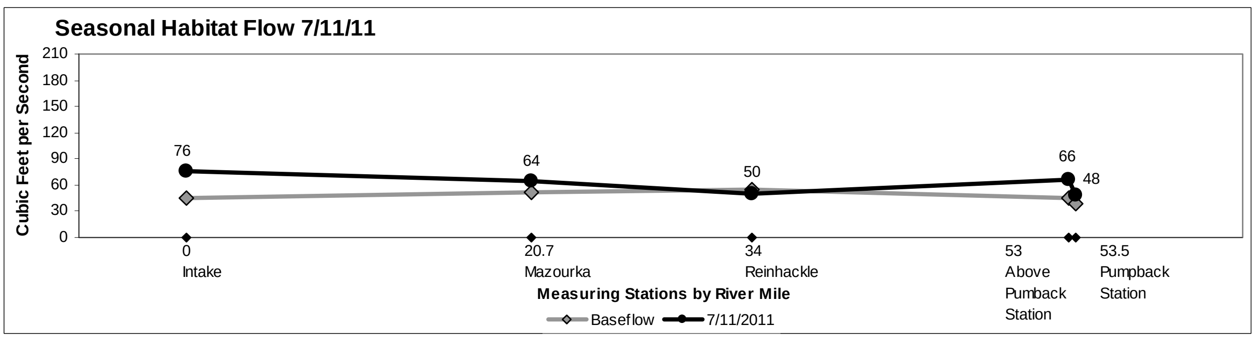

Seasonal Habitat Flow 7/06/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
48
53
82
73
47
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/6/2011

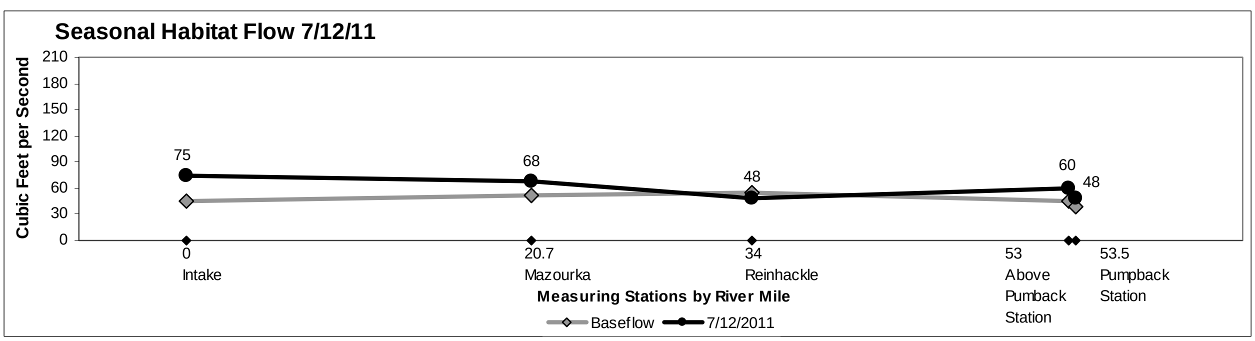

Seasonal Habitat Flow 7/07/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
65
53
71
77
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/7/2011

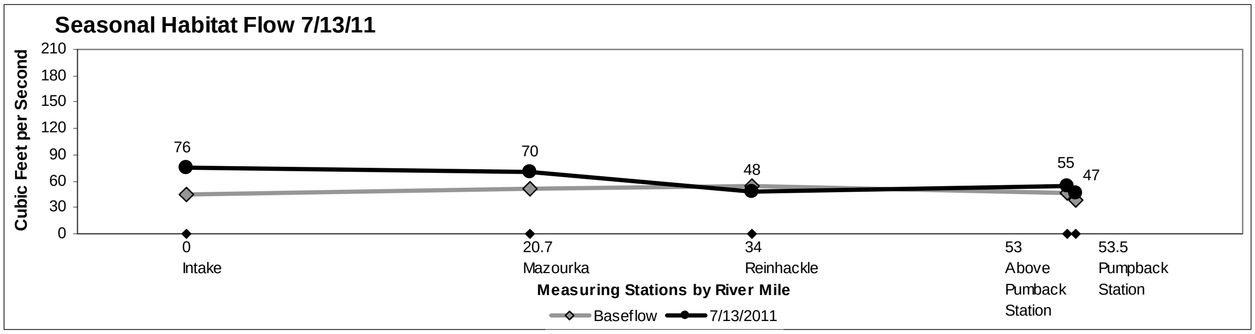

Seasonal Habitat Flow 7/08/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
77
52
60
78
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/8/2011

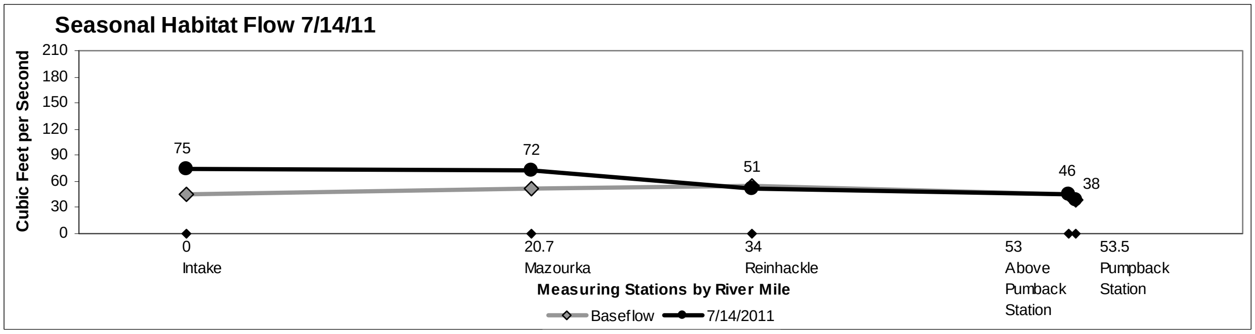

Seasonal Habitat Flow 7/09/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
75
51
55
76
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/9/2011

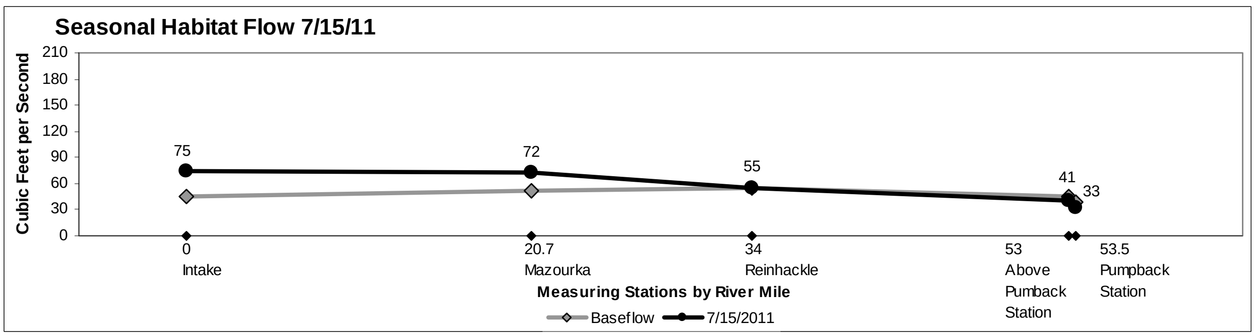

Seasonal Habitat Flow 7/10/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
76
56
52
73
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/10/2011

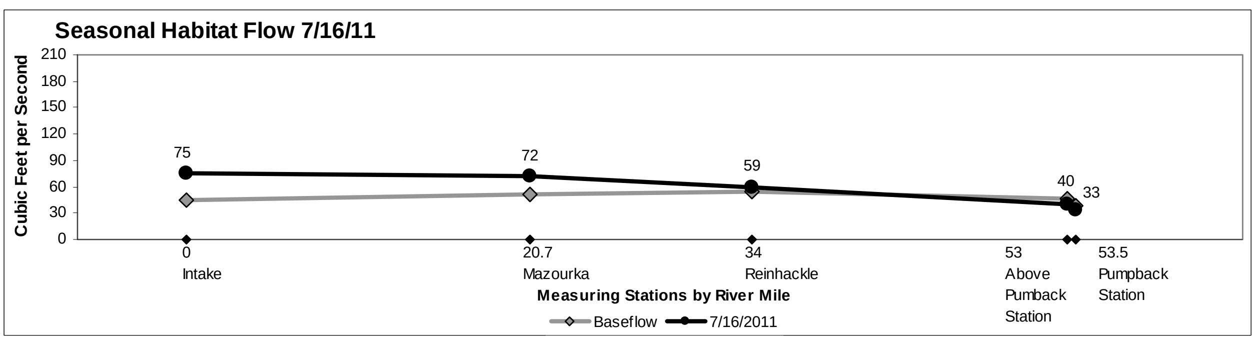

Seasonal Habitat Flow 7/11/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
76
64
50
66
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/11/2011

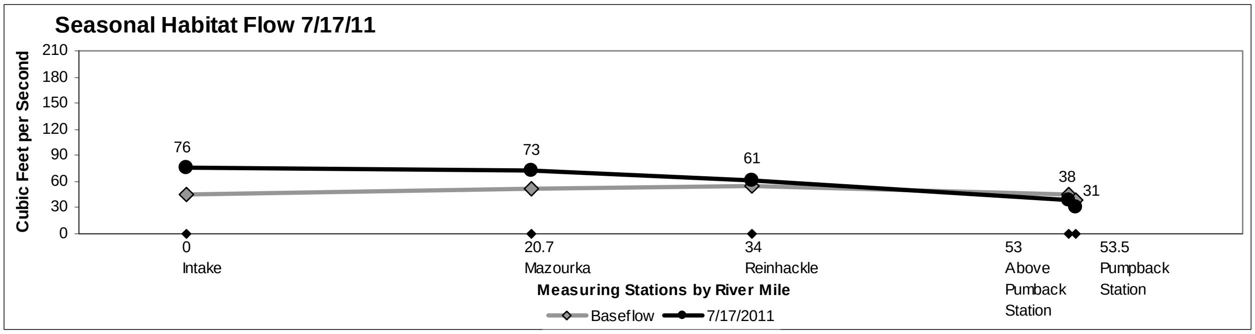

Seasonal Habitat Flow 7/12/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
75
68
48
60
48
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/12/2011

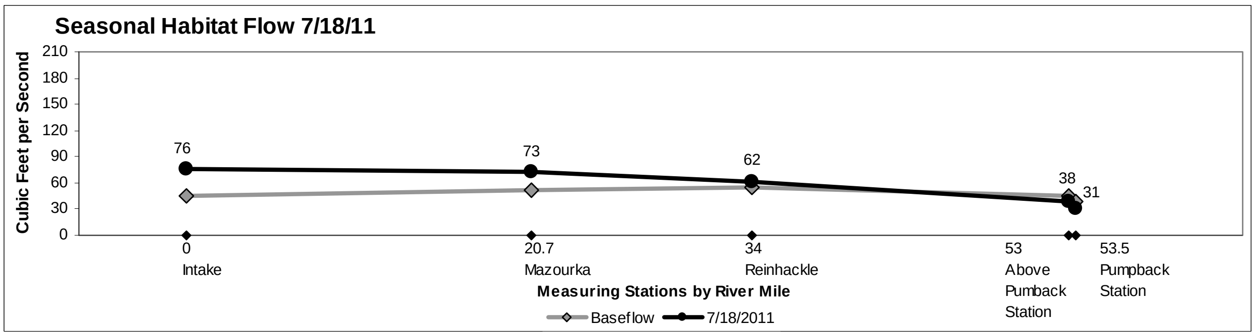

Seasonal Habitat Flow 7/13/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
76
70
48
55
47
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/13/2011

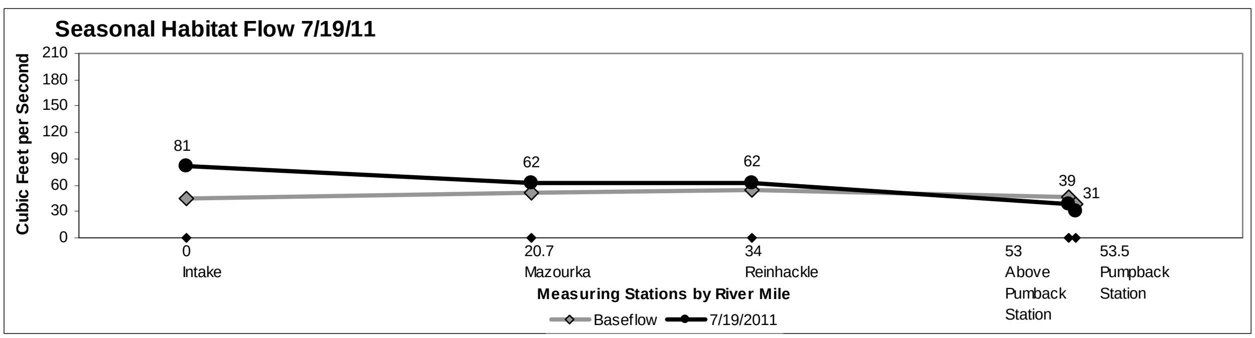

Seasonal Habitat Flow 7/14/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
75
72
51
46
38
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/14/2011


Seasonal Habitat Flow 7/15/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
75
72
55
41
33
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/15/2011


Seasonal Habitat Flow 7/16/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
75
72
59
40
33
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/16/2011


Seasonal Habitat Flow 7/17/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
76
73
61
38
31
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/17/2011


Seasonal Habitat Flow 7/18/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
76
73
62
38
31
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/18/2011


Seasonal Habitat Flow 7/19/11
Cubic Feet per Second
210
180
150
120
90
60
30
0
81
62
62
39
31
0
Intake
20.7
Mazourka
34
Reinhackle
53
Above
Pumback
Station
53.5
Pumpback
Station
Measuring Stations by River Mile
Baseflow
7/19/2011

Appendix 2. Vegetation Cover Type Descriptions

A summary sheet for each of the 22 vegetation cover type first mapped during pre-LORP flows are found below. The information pertaining to each vegetation type, along with a representative picture, is presented here for easy reference. A crosswalk between communities mapped during baseline and 2010 can be found on page

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

Most Common Dominant Species	Dom. score	%Freq	IV (n=56)	Groundcover Cover type (n=17)	%
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

23.

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

			n=138	Groundcover	N=31
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
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	Groundcover	N=43
Most Common Dominant Species	Dom. score	%Freq	IV	Cover type	%
Salsola tragus	3.0	99	43	litter	47
				bare ground	35
Atriplex lentiformis	2.4	82	10		
				vegetation	11
Tamarix ramosissima	0.8	26	4		
				downed wood	4
Chrysothamnus nauseosus	0.3	14	1		
Distichlis spicata	0.3	11	0	rock	1
Atriplex pusilla	0.2	8	5	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

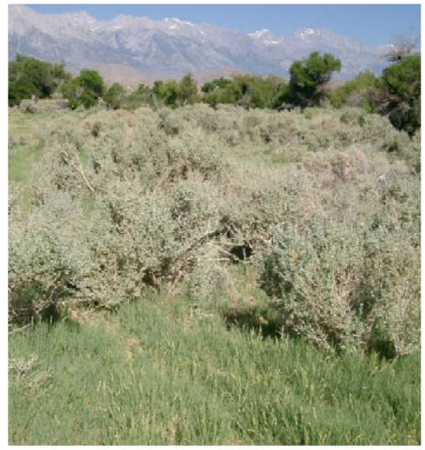
Crosswalk:

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



			n=146
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**
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

			n=212	Groundcover	n=57
Most Common Dominant Species	Dom. score	%Freq	IV	Cover type	%
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: Greasewood-Seepweed-Shadscale Scrub

Community Characteristics:

Plot	1	2	3	4	5	Total
Cover %	2.0	3.5	9.6	8.3	7.7	6.4
Mean plot pos.:						3.8
Ave. patch length (m):						22
WWI score:					(FAC)	3.2
Dominant sp. Origin:						native
Community complex:						Saline scrub
Species abundance:						
# of dominant species in transects:						15
Total species in subplots						13

			n=111
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**
Sarcobatus vermiculatus	2.8	96	30
Suaeda moquinii	2.2	81	27
Atriplex confertifolia	1.3	49	14
Distichlis spicata	1.2	39	2
Sporobolus airoides	0.8	26	5
Atriplex lentiformis	0.8	34	1
Chrysothamnus nauseosus	0.3	14	1

Groundcover	n=24
Cover type	**%**
bare ground	67
litter	18
vegetation	13
downed wood	1
dead shrub	1
cow pie	1

Cover percentage and diversity measures:

Max (%)	LCL (%)	Mean (%)	UCL (%)	Structure	S	E	H′
25.6	5.1	6.4	7.8	shrub	15	0.7	1.9

Canopy Cover:

n	lcl	mean	ucl
24	21	30	50

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: 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

Most common Dominant Species	Dom. score	%Freq	IV (n=123)	Cover type (Groundcover)	% (n=35)
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

			n=20	Groundcover	n=5
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
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

Most common Dominant Species	Dom. score	%Freq	IV (n=162)	Groundcover: 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

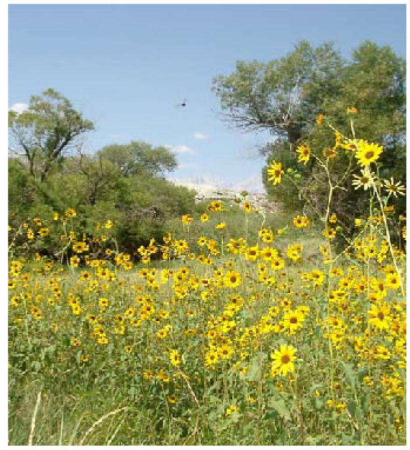
Crosswalk:

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)
Helianthus annuus	1.2	46	24
Glycyrrhiza lepidota	0.7	30	7
Distichlis spicata	0.7	27	1
Rosa woodsii	0.5	15	7
Xanthium strumarium	0.5	21	10
Anemopsis californica	0.4	15	1
Malva neglecta	0.4	15	10
Leymus triticoides	0.4	18	1

Groundcover: Cover type	% (n=7)
litter	50
vegetation	34
bare ground	7
downed wood	4
water	4
cow manure	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
Juncus balticus	2.7	97	60
Distichlis spicata	1.3	60	3
Anemopsis californica	0.7	35	5
Salix gooddingii	0.4	15	1
Tamarix ramosissima	0.4	14	1
Atriplex lentiformis	0.4	14	0
Glycyrrhiza lepidota	0.3	15	2
Helianthus annuus	0.3	14	2

Groundcover

Cover type	%
vegetation	46
litter	36
water	9
bare ground	6
downed wood	2
cow manure	1

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	Groundcover Cover type	%
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

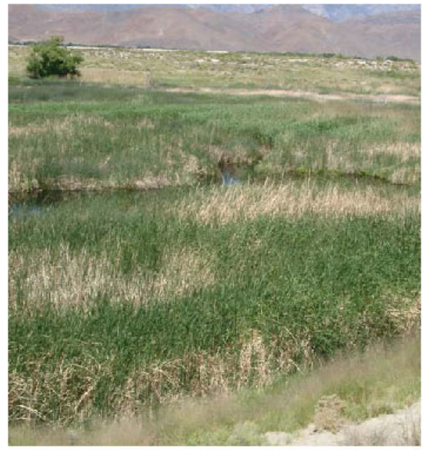
Crosswalk:

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:

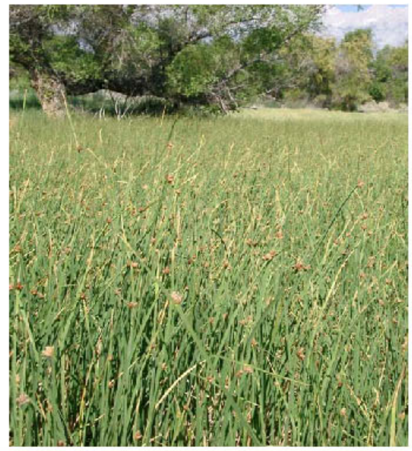
Whitehorse Associates (2004)	NDDB/ Holland (1986)	Greenbook (1990)	Sawyer and Keeler-Wolf (1995)
Marsh	Transmontane alkali marsh	Transmontane alkali marsh	Bullrush series

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)	Groundcover (n=8) Cover type	%
Scirpus americanus	2.9	100	63	vegetation	45
Distichlis spicata	1.2	48	3	litter	45
Anemopsis californica	0.9	33	6	bare ground	10
Juncus balticus	0.4	15	1	cow manure	1
Tamarix ramosissima	0.2	7	0		
Polypogon monspeliensis	0.1	6	2		
Xanthium strumarium	0.1	6	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

			n=27	Groundcover	n=6
Most Common Dominant Species	**Dom. score**	**%Freq**	**IV**	**Cover type**	**%**
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

Most Common Dominant Species	Dom. score	%Freq	IV (n=36)	Cover type (Groundcover)	% (n=7)
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

Crosswalk between Baseline, Whitehorse Associates (2004) and 2010 Site-Scale Vegetation Communities

Baseline Vegetation Communities	Whitehorse Associates (2004)	2010 Vegetation Communities
Open Water	Water	Open Water
Common Reed-Coyote Willow/Yerba Mansa	Reedgrass	Common Reed
Willow/Cattail-Rush Wetland	Marsh	Cattail-Willow Wetland
Bull Rush-Cattail-Willow Wetland		Bulrush-Cattail-Willow Wetland
Sunflower-Licorice Wet Meadow	Wet Alkali meadow (rush/sedge)	Sunflower Wet Meadow
Chairmaker's Bullrush-Saltgrass Wet Meadow		Chairmaker's Bullrush-Yerba Mansa Wet Meadow
Baltic Rush-Saltgrass Wet Meadow		Baltic Rush-Saltgrass Wet Meadow
	Irrigated meadow	
Alkali Sacaton-Saltgrass Meadow	Dry alkali meadow	Saltbush-Rabbitbrush-Alkali Sacatone Scrub Meadow
Saltgrass Meadow		Saltgrass Meadow
Wildrye-Saltgrass Meadow		Wildrye-Saltgrass Meadow
Coyote Willow/Saltgrass Riparian Shrubland	Riparian Shrub (willow)	Coyote Willow/Saltgrass Riparian Shrubland
Goodding's Willow Woodland	Riparian Forest (willow)	Goodding's Willow Riparian Woodland
	Riparian Forest (cottonwood)	
Rabbitbrush-Saltbush/Saltgrass Scrub Meadow	Alkali scrub/meadow	Saltbush-Saltgrass Scrub Meadow
Saltbush/Saltgrass Scrub Meadow		
Seepweed-Saltbush/Saltgrass Scrub Meadow		Saltbush-Seepweed-Saltgrass Scrub Meadow
Greasewood-Saltbush Scrub	Alkali scrub	Saltbush-Greasewood-Seepweed Scrub
Greasewood/Seepweed-Shadscale Scrub		Greasewood-Seepweed-Shadscale Scrub
Shadscale Scrub		Shadscale Scrub
Tamarisk Cuttings/Saltbush Scrub	Disturbed Alkali Scrub*	Saltbush Monoculture
Saltbush/Russian Thistle Scrub		Saltbush-Smotherweed-Russian Thistle Scrub
Greasewood/Russian Thistle Scrub		
Smotherweed-mixed shrubland		Common Mallow
		Salt Heliotrope
		Fivehorn Smotherweed
Tamarisk/Saltbush-Russian Thistle	Tamarisk	None
Tamarisk/Saltbush Woodland		
Barren Ground	Barren	Barren Ground
	Streambar	
	Structure	

*= not originally part of Whitehorse (2004) effort. However the Landscape scale vegetation mapping performed by LADWP for the 2010 Annual Report added a *Bassia* cover type to the Whitehorse legend. This category corresponds to the Disturbed Alkali Meadow cover type

4.0 LAND MANAGEMENT

4.1 Land Management Summary

The 2011 Lower Owens River Project (LORP) land management monitoring efforts continued with monitoring utilization across all leases, rare plant monitoring, and streamside monitoring for woody recruitment. It was an off-year for the range trend monitoring evaluation. Irrigated pasture condition scoring was conducted on leases that rated below 80% the previous year.

In general, pasture utilization adhered to standards established for both riparian and upland areas. Use on Blackrock's White Meadow Riparian Field was estimated at 57%, exceeding the 40% riparian utilization standard. This is the same pasture which was recommended through the adaptive management process to receive heavy use the year before in an attempt to trample fivehorn smotherweed. Both the streamside monitoring and rapid assessment survey (RAS) results showed no impacts from excessive grazing in the White Meadow Riparian Field in 2011. Thibaut Field in the Thibaut Lease was 2% above the upland standard (67%); however, use was extreme on the western side of the field. The lessee and Los Angeles Department of Water and Power (LADWP) will be taking steps to improve livestock distribution in this field during the 2011-12 grazing season. The Delta Lease which previously exceeded riparian standards in the Delta Riparian Pasture was below 40%, as well as the Lone Pine Lease's riparian pasture.

Irrigated pastures in the Islands, Lone Pine and Delta Leases all had rated above the minimum rating of 80% in 2010, therefore they did not need to be rated in 2011. The Thibaut Lease rated 68% in 2010 and 82% in 2011. The lessee and LADWP are in the process of improving this score. All irrigated pastures in the LORP will be evaluated again in 2012.

Range trend monitoring was not scheduled for 2011; however, three additional range trend transects were established and read inside the grazing exclosures built in 2009, on the Blackrock and Islands lease. In 2012, the range trend monitoring schedule will be altered to incorporate reading approximately one-third of the LORP transects each year. This change will allow monitoring to occur across the landscape annually. Annual monitoring will ensure the documentation of environmental or management vagaries such as the above average winter precipitation this year, which unfortunately was not captured because the current schedule had 2011 as an off-year.

2011 was the third year of collecting trend plot data for *S. covillei* and *C. excavatus* for the LORP. While no statistical analysis has been conducted on this data, it indicates thus far that populations of both *S. covillei* and *C. excavatus* are generally static. However, *S. covillei* appears to be decreasing in the exclosure in the Robinson Pasture in the Blackrock Lease, as documented in the Robinson 1EX plot. In contrast, plots surveyed in the Springer Pasture in the Blackrock Lease where no plants are excluded are markedly increasing. Future data will be useful to further define trends of *S. covillei* and *C. excavatus* within the LORP area.

Based on the 2011 streamside monitoring effort, woody recruitment is beginning to occur throughout the Lower Owens River. New narrowleaf willow and Goodding's willow seedlings were documented at seven locations in 2011. Most of the willow recruits are not occurring directly at the 40 cfs base flow water's edge; rather, they are sprouting within 1-2 meters of this wetted edge on banks, point bars, or other floodplain areas. The seedlings of both species largely occurred where there was a seed source readily available in the immediate vicinity. However, there was also evidence of seedlings resulting from the 2011 seasonal habitat flow.

Grazing prescriptions and other land management actions are proving beneficial as evidenced by bank stability, high vigor of grasses on the floodplain, and desirable riparian species increasing in cover along the banks. Wildlife use was noted at many of the streamside monitoring sites, particularly by deer, elk, raccoons, riparian birds, and Owens Valley voles. Elk browsing and antler rubs on mature willows were especially prominent in the fall 2011 streamside monitoring surveys.

It is recommended that the spring and fall LORP streamside monitoring efforts be conducted again in three years (2014) or when it will coincide with collecting new imagery of the LORP, whichever occurs first. The GIS channel mapping effort provided in the 2010 LORP Report, which corresponds with the streamside monitoring transects will also be repeated when LADWP receives new imagery for the LORP area, but not sooner than two years in the future so that changes over time can be effectively noted.

4.2 Introduction

The land use component of this report 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 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) and the monitoring of utilization and rangeland trend throughout the leases to ensure that grazing rates maintain the long-term productivity. In 2010, an additional monitoring component was added to note woody recruitment that is occurring in the LORP following project implementation.

Grazing management plans developed for the LORP leases modified 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: Intake, Twin Lakes, Blackrock, Thibaut, Islands, Lone Pine, and the Delta. LORP-related land use activities and monitoring that took place in 2011, are presented by lease in Section 4.10, LORP Ranch Leases.

4.2.1 Utilization

The *Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, 2008), developed as part of the LORP Plan, 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. Therefore, species that only comprise a small part of available forage contribute proportionally less to the overall use value than more abundant species.

4.2.2 Riparian and Upland Utilization Rates and Grazing Periods

Under the *Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, 2008), livestock are 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 are to be removed from riparian pastures when the utilization rate reaches 40% or at the end of the grazing period, whichever comes first. The beginning and ending dates of the lease-specific grazing periods may vary from year-to-year depending on 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.

In upland pastures, the maximum utilization allowed on herbaceous vegetation is 65% annually if grazing occurs only during the plant dormancy period. Once 65% is reached all pastures must receive 60 continuous days of rest for the area during the plant “active growth period” to allow seed set between June and September. If livestock graze in upland pastures during the active growth period (that period when plants are “active” in putting on green growth and seed), maximum allowable utilization on herbaceous vegetation is 50%. The utilization rates and grazing periods for upland pastures are designed to sustain livestock grazing and productive wildlife through efficient use of forage. Riparian pastures may also contain upland habitat. If significant amounts of upland vegetation occur within a riparian pasture or field, upland grazing utilization standards 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 standards are met. Typically riparian utilization rate of 40% is reached before 65% use in the uplands occurs. Because of this pattern, utilization is not quantitatively sampled in adjacent upland areas, but use is assessed based on professional judgment. If utilization appears greater than 50% then utilization estimates using height weight curves will be implemented on the upland areas in the riparian field.

4.2.3 Utilization Monitoring

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

Utilization is compliance monitoring and involves determining whether the utilization guidelines set forth in the grazing plans are being adhered to. Similar to precipitation data, utilization data alone cannot be used to assess ecological condition or trend. Utilization data is used to assist in interpreting changes in vegetative and soil attributes collected from other trend monitoring methods.

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. Each monitoring site is visited prior to any grazing in order to collect ungrazed plant heights for the season. Sites are visited again approximately mid-way through the grazing period (mid-season) and again at the conclusion of the grazing period (end-of-season).

Utilization estimates are conducted on all range trend transects if there is an adequate amount of the key forage species (Alkali sacaton, saltgrass, etc…). Some range trend sites have been burned or are found in the previous dry reach section of the Owens River and are absent of perennial grasses, therefore no utilization data is available. There are additional utilization transects not associated with range trend sites. These are designated as spatial utilization transects and will be read annually as long as they represent typical use in a pasture. If they fail to be representative (e.g. fire, flooding, and change in grazing patterns) they will be temporarily or permanently abandoned.

Watershed Resources staff will update each lessee with their mid-season 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.

Target stubble heights have been calculated for each transect and pasture on a given lease and distributed to each lessee, to allow compliance with the set utilization standards. To calculate target stubble heights, ungrazed plant heights are collected after the end of the growing season to allow the plants to reach maximum production before the grazing season begins. The ungrazed heights are then averaged by species and transect in order to calculate the stubble heights that will meet the utilization standards for each field. The resulting calculated stubble heights are based on the same height/weight curves used in the mid- and end-of-season utilization calculations. The target stubble height information is provided to the lessees so that they may monitor utilization on their lease throughout the grazing season.

All of the end-of-season utilization data are presented in table format in Section 4.10 results of land use by lease.

4.3 Range Trend

4.3.1 Overview of Monitoring and Assessment Program

Monitoring was conducted at key areas within riparian and upland management areas. Areas not identified as irrigated pasture, riparian management areas, or springs and seeps are considered upland management areas. Monitoring and assessment of key sites in riparian and upland management areas includes utilization and range trend monitoring.

A description of monitoring methods, data compilation, and analysis techniques can be found in the *2008 LORP Monitoring, Adaptive Management and Reporting Plan*. Descriptions of the range trend monitoring sites and their locations on the leases can be found in the individual lease monitoring narratives and maps in this section.

These standards are not expected to be met precisely every year because of the influence of annual climatic variation, livestock distribution, and the inherent variability associated with techniques for estimating utilization. Rather, these levels should be reached over an average of several years. If utilization levels are consistently 10% above or below desired limits during this period then adjustments should be implemented (Holecheck and Galt, 2000; Smith et al., 2007).

Range trend monitoring involves the quantitative sampling of the following attributes: nested frequency of all plant species, canopy cover estimates for herbaceous plant species, line intercept sampling for shrub canopy cover, estimates for ground cover, shrub density, and age classification. Photo documentation of the site conditions is included as part of range trend monitoring.

Range trend monitoring at permanent transects provides quantitative data to determine the state of monitoring sites relative to baseline conditions and how a given site compares to the desired plant community. The desired plant community can be one of several plant communities that may occupy a site or one that has been identified through a management plan to best meet the plan's objective for the site. The desired plant community must protect the site as a minimum and may be described as dynamic, changing through time, or within a range of variability (Bedell, 1988). Until site-specific objectives are established, the desired plant community, which will serve as the benchmark for evaluating condition, will be the "reference plant community" described in the ecological site description for a site. The reference plant community is the historic climax or potential plant community described for each ecological site.

Ecological site descriptions are a tool developed by USDA Natural Resource Conservation Service (NRCS) that can be used to assist in management decisions. Ecological sites are distinct units distinguished between one another by significant differences in potential vegetation composition or production between soils (NRCS, 2003). Ecological site descriptions are represented spatially as soil map units, developed from soil survey data in the Owens Valley.

Soil surveys in the area were conducted by NRCS and the final data can be found in the *Soil Survey of Benton-Owens Valley Area, California, Parts of Inyo and Mono Counties* (USDA NRCS, 2002). Vegetation data used to develop the ecological site descriptions were collected by LADWP between 1984 and 1994. This vegetation data is also referred to as "baseline" as described in the *Green Book for the 1991 Agreement Between the County of Inyo and the City of Los Angeles and its Department of Water and Power on a Long Term Groundwater Management Plan for the Owens Valley and Inyo County*. Ecological site descriptions include the expected production (pounds per-acre) for each soil map unit based on growing conditions (normal, favorable, unfavorable). Yearly growing conditions are based on annual precipitation data (October through September).

Nested frequency, cover, and shrub age classification data are presented for each lease and are presented as range trend transect data tables for each sampling transect and sampling year. To compare range trend sites to the associated reference plant community in the ecological site descriptions, the soil map unit that each transect was located on was cross-referenced to the *Soil Survey of Benton-Owens Valley Area, California*, *Parts of Inyo and Mono Counties* (USDA NRCS, 2002). The soil map unit narrative references the ecological site descriptions. The ecological site description describes the potential plant community by percent composition by dried weight of the major plant species. The potential plant community information does not set a specific percent composition for each species, but specifies an expected range of abundance of each of the major plant species by soil type and ecological site. The ecological site descriptions currently available for this region (Major Land Resource Area-29 [MLRA 29]) only provide plant species composition in terms of percent composition by relative weight. The average cover values for each plant species by transect were converted to biomass (grams per-meter squared), and then pounds per-acre using conversion factors based on locally collected data provided by Montgomery-Watson Harza. Conversion factors were not available for all plant species, particularly annual and perennial forbs. In this case, a conversion factor for another species was selected and used based on similarity of growth form and habits.

The ecological site on the LORP where the majority of land management monitoring transects are located is the Moist Floodplain ecological site (MLRA 29-20). The site describes axial-stream floodplains. Moist Floodplain sites are dominated by saltgrass (*Distichlis spicata* [DISP]) and to a lesser extent alkali sacaton (*Sporobolus airoides* [SPAI]) and beardless wildrye (*Leymus triticoides* [LETR]). Only 10% of the total plant community is expected to be composed of shrubs and the remaining 10% forbs. This ecological site does not include actual river or stream banks. Stream bank information is available from the rapid assessment survey (RAS) reports presented in Section 5.0 of this document. During the late summer of 2010, streamside monitoring was implemented inside each of the riparian pastures within the LORP area. These data from the first year of monitoring will be presented in this chapter of the 2011 LORP Annual Report.

Saline Meadow ecological sites (MLRA 29-2) are the second most commonly encountered ecological sites on the LORP range trend sites. These sites are located on fan, stream, lacustrine terraces, and may also be found on axial stream banks. Potential plant community groups are 80% perennial grass with a larger presence of alkali sacaton than Moist Floodplain sites. Shrubs and trees comprise up to 15% of the community while forbs are only 5% of the community at potential. Saline Bottom (MLRA 29-7) and Sodic Fan (MLRA 29-5) ecological sites were also associated with several range trend sites. These are more xeric stream and lacustrine terrace sites. Saline Bottom ecological sites still maintain up to 65% perennial grasses, the majority of which is alkali sacaton, while shrubs compose up to 25% of the plant community, and forbs occupy the remaining 10%. Sodic Fan ecological sites are 70% shrubs, primarily Nevada saltbush (*Atriplex torreyi*), with a minor component of alkali sacaton of up to 25% and 5% forbs.

A comparison of existing conditions to the reference plant community was done using the protocols outlined in the *National Range and Pasture Handbook* (NRCS, 2003) during the 2002-2007 baseline period. Sites were placed in one of four classes based on their similarity to the reference plant community: (0–25%), (26-50%), (51–75%), and (76-100%). According to Holechek et al. (2004), maintaining sites in “late seral condition” which corresponds to 51-75% similarity to the reference community will provide adequate vegetation cover for soil stability, wildlife diversity, and moderate livestock production. Maintaining sites at 76-100% of climax or site potential may maximize soil stability and returns from livestock production. With regards to the ecological site descriptions for the Owens Valley, management objectives for a given area may or may not correlate directly to high similarity indexes or different seral conditions. For example, a portion of the reference plant communities described for the Moist Floodplain ecological site allow for a species composition (dry weight) of 10% for shrubs and 80% for perennial grass; optimum wildlife habitat for a particular species might require more woody plants than allowed for and livestock production would improve with a greater percent composition of perennial grass and a decrease in shrubs. Each of these scenarios are feasible through different management prescriptions but none would reflect a high similarity to the reference plant community for the ecological site. Furthermore, due to historical or existing disturbances or the presence of nonnative species, attaining “excellent condition” or 76-100% similarity may not be feasible.

It is important to point out that reference plant communities associated with ecological sites are amalgamations of both existing reference sites and professional judgment of what the site’s potential could have been under pristine conditions. The reference plant community is a conceptual model intended to help managers gauge how a site compares to what potentially could be found on similar sites; to expect any existing location to identically match the described community would be erroneous. Estimating how similar a given site is to its potential described in the ecological site description is useful when conducting an inventory across an area but if repeat monitoring is available for the site (as it is for the LORP leases) changes over time (trend), when compared to baseline data collected at the same location, will be a more effective approach to assessing the trend of that particular key area because comparisons are made directly to the site and not between the key area and a reference plant community in an ecological site description which ultimately has no physical existence. For this reason similarity indices were not calculated in 2009 and discussions in trend will not focus on changes in similarity indices. They are presented to assist in describing the general condition of the site.

Reference plant community data is derived from annual aboveground production (dry weight). The vegetative attribute of annual production and canopy cover are very sensitive to annual growing conditions and will therefore vary in accordance to natural climatic fluctuations. Annual production and canopy cover are inappropriate attributes to interpret long-term impacts of management decisions on plant communities when compared to other plant monitoring methods such as nested frequency.

Because frequency data is sensitive to plant densities and dispersion, frequency is an effective method for monitoring and documenting changes in plant communities (Mueller-Dombois and Ellenberg, 1974; Smith et al., 1986; Elzinga, Salzer et al., 1988; BLM 1996; Heywood and DeBacker, 2007). For this reason frequency data was the primary means for evaluating trend at a given site. Based on recommendations for evaluating differences between summed nested frequency plots (Smith et al., 1987 and Mueller-Dombois and Ellenberg, 1974), a Chi-Square analysis with a Yate's correction factor was used to determine significant differences between years. Analysis compared 2010 data to the prior sampling period (2009). If there were significant differences, 2010 results were compared to all sampling events during the baseline period to determine if results in 2010 were ecologically significant or remained within the typical range of variability observed for that particular site.

During the preproject period, a range of environmental conditions were encountered including "unfavorable" growing years when precipitation in the southern Owens Valley was less than 50% of the 1970-2009 average, "normal" years, when precipitation was 50-150% of average, and "favorable" conditions when precipitation was greater than 150% of average. Many of the monitoring sites responded to the variability in precipitation during the baseline period. This provided the Watershed Resources staff an opportunity to sample across a broad amplitude of ecological conditions for these sites, which contributed to a robust baseline dataset. Data from the Lone Pine rain gauges are used to determine the growing conditions for each sampling year on the Islands, Lone Pine, and Delta Leases. Precipitation data from Independence are used for the Thibaut and Blackrock Leases, and data from the Intake will be used for the Intake, Twin Lakes, and the northern portion of the Blackrock Leases.

The current range trend monitoring schedule for the LORP is to read all transects next year (2012) and then subsequent revisits for all transects will occur every five years. A preferred monitoring schedule which we are requesting to be implemented thru the adaptive management process is to monitor one-third of the leases annually. This schedule will ensure that there will be some monitoring across the landscape annually, increasing the probability of documenting the influence of significant changes in climate or management on the various ecological sites in the LORP area. The proposed schedule is designed to sample annually both in the upper and lower reaches of the LORP area and allow for monitoring annually within the former dry reach of the river. The schedule will integrate into range trend monitoring efforts on the Middle Owens as well.

Land Management Table 1. Proposed Range Trend Monitoring Schedule for the LORP

2012	2013	2014	2015	2016	2017
Intake (1)	Blackrock (29)	Thibaut (9)	Intake (1)	Blackrock (29)	Thibaut (9)
Twin Lakes (6)	Delta (7)	Islands (3)	Twin Lakes (6)	Delta (7)	Islands (3)
Lone Pine (8)			Lone Pine (8)		

4.4 Irrigated Pastures

Monitoring of irrigated pastures consisted of Irrigated Pasture Condition Scoring following protocols developed by the (NRCS, 2001). Irrigated pastures that score 80% or greater are considered to be in good to excellent condition. If a pasture rates below 80%, changes to pasture management will be implemented.

All irrigated pastures were monitored in 2010. Pastures that scored 80% or below will be monitored in 2011. The results of the monitoring will be presented in a table format by lease in Section 4.9. Irrigated pasture condition scoring for all pastures will take place again in 2013.

4.5 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 the LORP goals. The new fencing consisted of riparian pastures, upland pastures, riparian exclosures, rare plant exclosures, and rare plant management areas. Fence construction began in September 2006 and was completed in February 2009 with the total fence miles constructed being approximately 50 miles. The fence construction that was completed in January and February of 2009, took place on the Twin Lakes, Blackrock, and Lone Pine Leases. A portion of the boundary fence (1.5 miles) between the Twin Lakes and Blackrock Leases was replaced. The Blackrock Lease has two 0.25-acre rare plant exclosures built in the Robinson and Little Robinson Pastures and two riparian exclosures were constructed in the White Meadow Riparian and Wrinkle Riparian Fields. An additional fence in the White Meadow Field was also constructed due to the grazing prescriptions placed on the Winterton Unit of the Blackrock Waterfowl Management Area during periods of flooding. The Lone Pine Lease had a drift fence constructed just north of California State Route 136 on the east side of the river. This fence was constructed by the lessee with materials provided by LADWP.

4.6 Rare Plants

Baseline data for the LORP rare plant trend plots was collected in 2009. Data has also been collected in 2010 and 2011. There are 15 trend plots within the LORP located in four rare plant populations on two separate ranch leases (Blackrock and Thibaut Leases). Target species are Owens Valley checkerbloom (*Sidalcea covillei*) and Inyo star-tulip (*Calochortus excavatus*). *S. covillei* is a state endangered species, endemic to the Owens Valley that occurs in alkali meadows. *C. excavatus* is not a state or federally listed species but is a Species of Special Concern. A mesic species, *C. excavatus* occurs in alkaline meadows and seeps transitioning into chenopod scrubland.

These plots will be monitored for five years to evaluate population trends. If trends are static or suggest that grazing is beneficial, the exclosure fencing will be removed following the fifth year of monitoring. In contrast, if trends in data support that exclosures are needed to protect these populations of *S. covillei*, then LADWP will construct additional exclosures (or a practical variation thereof) and monitoring will continue as needed.

4.6.1 Rare Plant Monitoring Methods

The LORP rare plant trend plots were established inside and outside exclosures by sinking a piece of rebar into the earth and taking a GPS point of the location. The plots were relocated using a hand-held GPS unit and a metal detector. Two 50-meter measuring tapes were used to delineate the plot into four sections with a radius of 3.62 meters. Target species were marked with a pin flag to aid in accurately identifying all individuals within the plot. Photos were taken in all cardinal directions depicting the plot area containing flagged plants. One measuring tape was then attached to the rebar in the center of the plot to record the distance of individuals within a radius of 3.62 meters. A compass was used to record the bearing of individuals from the center of the plot. The bearing and distance from the center of the plot is utilized in subsequent years to relocate individual plants. Data on recruitment, persistence, size of individuals, and flowering and seed presence were collected. This data is provided below by lease.

4.6.2 Rare Plant Summary

2011 was the third year of collecting trend plot data for *S. covillei* and *C. excavatus* for the LORP. While no statistical analysis has been conducted on this data, it indicates thus far that populations of both *S. covillei* and *C. excavatus* are generally static. However, *S. covillei* appears to be decreasing in the exclosure in the Robinson Pasture in the Blackrock Lease, as documented in Robinson 1EX. In contrast, plots surveyed in the Springer Pasture in the Blackrock Lease where no plants are excluded are markedly increasing. These differences could be due to a number of factors that include, but are not limited to: whether or not the plot is excluded from livestock grazing, recent precipitation patterns, or other surface water uses such as irrigation, or could be a combination of influences at these sites. Future data will be useful to further illustrate trends of *S. covillei* and *C. excavatus* within the LORP area.

4.7 Discussion Range Trends in 2011

2011 was an off-year for long-term trend monitoring on the LORP. Transects were set up and read inside three recently constructed grazing exclosures, two transects on the Blackrock Lease and one transect on the Islands Lease. The results are presented below. No other transects were read in the LORP area in 2011.

4.8 Streamside Monitoring for Woody Species Generation

LADWP implemented a new streamside monitoring program in 2010 following an adaptive management recommendation by the MOU consultants. This monitoring was designed to document recruitment of woody vegetation in the riparian corridor of the LORP and note streamside conditions that were being missed in other monitoring for the project. The monitoring approach evaluates vegetation and bank attributes within a 3-meter wide belt extending from the 40 cfs base flow water's edge into the adjacent riparian area. There are 16 locations on the river that were surveyed, noting conditions on both sides of the river for a total of 32 transects (shown on subsequent lease maps). This streamside monitoring effort was to be conducted twice a year for the first three years (if needed) to establish baseline conditions, and then once annually at three-year intervals until the completion of all project monitoring in 2022. The timing of the monitoring was designed to be completed in the spring and late summer/early fall to correspond with livestock rotation. The complete streamside monitoring protocol can be found in Land Management Appendix 4 in the *2010 Final Lower Owens River Project Annual Report*. LADWP Watershed Resources Staff conducted this monitoring in early June 2011 and a condensed variation of it (see description below) in late September 2011.

The GIS channel mapping effort provided in the 2010 LORP Report that corresponds with the streamside monitoring transects was not repeated in 2011 since new imagery was not available. This mapping effort will be repeated when LADWP receives new imagery for the LORP area, but not sooner than two years in the future so that changes over time can be effectively noted.

4.8.1 Results From Streamside Monitoring for Woody Species Generation

Spring Monitoring (June 2011)

LADWP Watershed Resources Staff surveyed the 32 streamside monitoring transects June 7-9, 2011. Of these, BLK_Belt5b and Delta_Belt1a showed recruitment of narrowleaf willow (*Salix exigua*). Refer to Land Management Tables 2 and 3 below for woody species data collected as rooted or canopy cover at all sites in spring 2011. The 2011 data varied considerably from 2010 data with regard to number of mature narrowleaf willow and wood's rose, indicating some inconsistencies in data collection in how surveyors defined individual plants. A similar issue was brought up during rapid assessment surveys in 2011. Further refinement is needed on the protocol for distinguishing separate individuals from the same plant for shrubby species such as narrowleaf willow and wood's rose in future monitoring of woody vegetation.

Bank condition data for all sites is provided below in Land Management Table 2 (40 sample points per transect). Standing dead was added to the list of bank condition classifications in 2011 to further distinguish areas where standing dead cattails and tules were present on the banks. According to data collected in June 2011, nearly 50% of the banks sampled were vegetated. Only 2.2% was barren and devoid of vegetation, and 1.2% of banks sampled were broken or actively eroding. Additionally, 2.8% of banks were open but root stabilized, and the remaining 44.7% was dead vegetation (standing dead and detached as litter). These results are extremely positive for the LORP, as this data shows that a very small portion of banks are barren or actively eroding at the present time. Further, 84.1% of sampled banks were anchored by vegetation or their roots, indicating that banks are stable or are stabilizing over time. However, it also indicates that there is very little space for new species to move in right along the water's edge. These trends were relatively consistent across all sites.

Land Management Table 2. LORP Streamside Monitoring (Spring 2011)

LORP Streamside Monitoring Spring 2011 (Rooted)		Narrowleaf Willow (SAEX)					Goodding's Willow (SAGO)					Red Willow (SALA3)					Desert Olive (FOPU)					Wood's Rose (ROWO)					Fremont's Cottonwood (POFR)					Desirable Woody					
	Site Name	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Total Seedlings	Total Juvenile	Total Mature	Total Decadent	Total Dead	**Total desirable (no decadent/dead)**
Rooted	TWN_Belt1a																															0	0	0	0	0	**0**
	TWN_Belt1b																															0	0	0	0	0	**0**
	TWN_Belt2a																															0	0	0	0	0	**0**
	TWN_Belt2b																															0	0	0	0	0	**0**
	BLK_Belt1a			1																												0	0	1	0	0	**1**
	BLK_Belt1b																															0	0	0	0	0	**0**
	BLK_Belt2a																															0	0	0	0	0	**0**
	BLK_Belt2b																															0	0	0	0	0	**0**
	BLK_Belt3a																															0	0	0	0	0	**0**
	BLK_Belt3b								2					4																		0	0	6	0	0	**6**
	BLK_Belt4a													2																		0	0	2	0	0	**2**
	BLK_Belt4b								1					1																		0	0	2	0	0	**2**
	BLK_Belt5a		1	1																												0	1	1	0	0	**2**
	BLK_Belt5b	1	9	36					2		1																					1	9	38	0	1	**48**
	BLK_Belt6a												2		1																	0	2	0	1	0	**2**
	BLK_Belt6b																															0	0	0	0	0	**0**
	BLK_Belt7a		7	34	4	1																										0	7	34	4	1	**41**
	BLK_Belt7b			3										1																		0	0	4	0	0	**4**
	Thibaut_Belt1a																												1			0	0	1	0	0	**1**
	Thibaut_Belt1b								1																							0	0	1	0	0	**1**
	Islands_Belt1a																															0	0	0	0	0	**0**
	Islands_Belt1b								2																							0	0	2	0	0	**2**
	Islands_Belt2a								2									7	5													0	7	7	0	0	**14**
	Islands_Belt2b																															0	0	0	0	0	**0**
	Lone Pine_Belt1a								2		2													46								0	0	48	0	2	**48**
	Lone Pine_Belt1b			23																												0	0	23	0	0	**23**
	Lone Pine_Belt2a			1				1	10	1																						0	1	11	1	0	**12**
	Lone Pine_Belt2b																															0	0	0	0	0	**0**
	Delta_Belt1a	4		60																												4	0	60	0	0	**64**
	Delta_Belt1b		1	66																												0	1	66	0	0	**67**
	Delta_Belt2a								1																							0	0	1	0	0	**1**
	Delta_Belt2b																															0	0	0	0	0	**0**
Total		5	18	225	4	1	0	1	23	1	3	0	2	8	1	0	0	7	5	0	0	0	0	46	0	0	0	0	1	0	0	**5**	**28**	**308**	**6**	**4**	**341**

Land Management Table 2. (Continued) LORP Streamside Monitoring (Spring 2011)

	LORP Streamside Monitoring Spring 2011 (Canopy)	Narrowleaf Willow (SAEX)					Goodding's Willow (SAGO)					Red Willow (SALA3)					Desert Olive (FOPU)					Wood's Rose (ROWO)					Fremont's Cottonwood (POFR)					Desirable Woody					
	Site Name	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Seedling	Juvenile	Mature	Decadent	Dead	Total Seedlings	Total Juvenile	Total Mature	Total Decadent	Total Dead	**Total desirable (no decadent/dead)**
Canopy	TWN_Belt1a																															0	0	0	0	0	**0**
	TWN_Belt1b																															0	0	0	0	0	**0**
	TWN_Belt2a																															0	0	0	0	0	**0**
	TWN_Belt2b																															0	0	0	0	0	**0**
	BLK_Belt1a			1										4																		0	0	5	0	0	**5**
	BLK_Belt1b																															0	0	0	0	0	**0**
	BLK_Belt2a													1																		0	0	1	0	0	**1**
	BLK_Belt2b																															0	0	0	0	0	**0**
	BLK_Belt3a													4		2																0	0	4	0	2	**4**
	BLK_Belt3b								11					13		1																0	0	24	0	1	**24**
	BLK_Belt4a													4	3	1																0	0	4	3	1	**4**
	BLK_Belt4b								6					2																		0	0	8	0	0	**8**
	BLK_Belt5a			3																												0	0	3	0	0	**3**
	BLK_Belt5b		2	23					3																							0	2	26	0	0	**28**
	BLK_Belt6a								2		1																					0	0	2	0	1	**2**
	BLK_Belt6b								3	1	1																					0	0	3	1	1	**3**
	BLK_Belt7a		1	20	3																											0	1	20	3	0	**21**
	BLK_Belt7b								14		2																					0	0	14	0	2	**14**
	Thibaut_Belt1a													1																		0	0	1	0	0	**1**
	Thibaut_Belt1b								4																							0	0	4	0	0	**4**
	Islands_Belt1a								3		3																					0	0	3	0	3	**3**
	Islands_Belt1b								9																							0	0	9	0	0	**9**
	Islands_Belt2a								17									1	7													0	1	24	0	0	**25**
	Islands_Belt2b								4										5													0	0	9	0	0	**9**
	Lone Pine_Belt1a													2		2								9								0	0	11	0	2	**11**
	Lone Pine_Belt1b			24										2																		0	0	26	0	0	**26**
	Lone Pine_Belt2a			1										18		1																0	0	19	0	1	**19**
	Lone Pine_Belt2b			1										22	4																	0	0	23	4	0	**23**
	Delta_Belt1a			53																												0	0	53	0	0	**53**
	Delta_Belt1b			99																												0	0	99	0	0	**99**
	Delta_Belt2a								5																							0	0	5	0	0	**5**
	Delta_Belt2b																															0	0	0	0	0	**0**
Total		0	3	225	3	0	0	0	81	1	7	0	0	73	7	7	0	1	12	0	0	0	0	9	0	0	0	0	0	0	0	**0**	**4**	**400**	**11**	**14**	**404**

Land Management Table 3. LORP Streamside Monitoring Bank Condition Summary

2011 LORP Streamside Monitoring Bank Condition Summary						
Site Name	**Barren**	**Broken/ Actively Eroding**	**Root Stabilized Bank**	**Vegetated (Live Cover)**	**Standing Dead (attached)**	**Litter (detached)**
TWN_1a	1	0	1	37	0	1
TWN_1b	0	1	0	14	22	3
TWN_2a	0	1	0	39	0	0
TWN_2b	0	0	0	1	35	4
BLK_1a	1	0	0	2	37	0
BLK_1b	1	0	0	8	30	1
BLK_2a	5	1	3	16	15	0
BLK_2b	0	0	0	12	24	4
BLK_3a	1	0	0	15	7	17
BLK_3b	1	0	1	11	3	24
BLK_4a	1	0	0	16	6	17
BLK_4b	1	0	0	27	4	8
BLK_5a	0	0	0	38	2	0
BLK_5b	1	0	3	30	1	5
BLK_6a	0	1	4	27	6	2
BLK_6b	0	0	0	25	15	0
BLK_7a	0	1	3	26	8	2
BLK_7b	2	1	1	8	20	8
Thibaut_1a	0	1	3	9	26	1
Thibaut_1b	6	3	1	17	10	3
Islands_1a	0	0	1	15	18	6
Islands_1b	0	0	0	31	3	6
Islands_2a	4	0	6	6	15	9
Islands_2b	1	0	0	27	9	3
Lone Pine_1a	2	0	1	6	29	2
Lone Pine_1b	0	0	0	10	26	4
Lone Pine_2a	0	0	4	24	6	6
Lone Pine_2b	0	0	4	20	11	5
Delta_1a	0	1	0	35	4	0
Delta_1b	0	0	0	19	14	7
Delta_2a	0	0	0	36	1	3
Delta_2b	0	4	0	22	5	9
Total	28	15	36	629	412	160
Percentage of total sites	**2.2**	**1.2**	**2.8**	**49.1**	**32.2**	**12.5**

Ground cover values for each site along the wetted edge of the 40 cfs base flow is provided by grazing lease, as are general site observations including wildlife use and evidence of browsing if applicable. There was no statistical analysis run on this data, as it provides baseline information for the LORP Streamside Monitoring effort and no statistical trend has yet been established.

Fall Monitoring (September 2011)

LADWP Watershed Resources Staff conducted fall monitoring for streamside conditions September 19-20, 2011. The entire protocol noting species cover/composition and bank condition was not conducted because it had been completed only three months prior, and it was not likely that bank and cover conditions would have significantly changed in this short time period. Instead, the entire 3 meter-wide belt was surveyed for new woody recruitment along each 100 m transect rather than the forty 0.5 m x 3 m quadrats used in the original protocol. This method was used to note recruitment of all woody riparian species that had occurred since the 2011 seasonal habitat flow of 200 cfs. Other woody species were not noted or age classed as part of this effort since this data was collected only three months before. Field crews also noted browsing that had occurred at each site over the summer months when livestock are not grazing along the river to determine browsing that could be occurring from deer and elk.

The table below summarizes woody use data that was collected in both spring and fall 2011, in addition to recruitment data collected in September 2011.

4.8.2 Streamside Monitoring Summary

Based on Streamside Monitoring data collected in 2011, recruitment of desirable woody species is beginning to occur in several places within the LORP. New narrowleaf willow seedlings were documented at BLK_Belt5, BLK_Belt7, Thibaut_Belt1, and Delta_Belt1, and Goodding's willow seedlings were noted at TWN_Belt1, BLK_Belt2, and BLK_Belt3. No red willow or cottonwood seedlings were observed during the monitoring in 2011.

Cattails and tules still have a strong presence in the channel and are along the water's edge in most locations as reported in 2010. However, 2011 data shows that there is some recruitment of willows occurring in the LORP (particularly in Reaches 2 and 3), indicating that the presence of cattails and tules in the adjacent channel may not be inhibiting new woody growth in the riparian corridor. Further, most of the willow recruits are not occurring directly at the 40 cfs base flow water's edge; rather, they are sprouting within 1-2 meters of this wetted edge on banks, point bars, or other floodplain areas. The seedlings of both species largely occurred where there was a seed source readily available in the immediate vicinity, as in the established narrowleaf willow corridor in BLK_Belt7a (George's Creek Exclosure). In these areas, existing plants likely dropped seeds locally and sprouted onsite, or they are (underground) root sprouts from existing plants that appear to be individual plants. Recruitment of 21 narrowleaf willows at Thibaut_Belt1a however, was an anomaly from this pattern in that there was no sign of this species in the direct vicinity of this transect. This recruitment was likely a result of seed broadcast during the 2011 seasonal habitat flow, when the maximum allowed flow of 200 cfs was released to the LORP.

The 2010 LORP Annual Report referenced rapid assessment survey data from 2008, 2009, and 2010, which indicated a downward trend in woody recruitment since the implementation of the project. In 2011, the LORP rapid assessment surveys recorded an increase in woody recruitment which is consistent with the data recorded in the 2011 streamside monitoring surveys.

Bank condition in the sampled transects was not markedly different than in 2010. According to data collected in June of 2011, nearly 50% of the banks sampled were vegetated and 84% of sampled banks were anchored by vegetation or their roots. These are both positive indicators that most sampled banks in the LORP are stable or are stabilizing over time, leaving only a small portion that is barren or actively eroding at the present time. However, it also indicates that there is very little space for additional recruitment along the water's edge.

Land Management Table 4. Spring and Fall Woody Use and Fall Recruitment Data

LORP Streamside Monitoring Spring and Fall Woody Use and Fall Recruitment Data											
	Woody Use- Spring 2011				Woody Use- Fall 2011				Desirable Woody Recruitment- Fall 2011		
Site Name	Browsing	High Lining	Antler Rubs	Commetns	Browsing	High Lining	Antler Rubs	Comments	SAEX	SAGO	SALA3
TWN_Belt1a				SALA3 with beaver chiseling							
TWN_Belt1b				Beaver gnawing on SAGO				Beaver activity; TARA and LELA present		1	
TWN_Belt2a								TARA present			
TWN_Belt2b											
BLK_Belt1a											
BLK_Belt1b								TARA present			
BLK_Belt2a								Elk trails		1	
BLK_Belt2b								Well worn trails through bassia; TARA present			
BLK_Belt3a								Recent elk tracks		3	
BLK_Belt3b				Something eating bark of mature SALA3	x		x	Stripped branches, broken branches strewn about, fresh elk droppings			
BLK_Belt4a	x		x								
BLK_Belt4b											
BLK_Belt5a											
BLK_Belt5b									5		
BLK_Belt6a	x		x		x			Broken branches, likely from elk			
BLK_Belt6b				Bull elk downriver from transect							
BLK_Belt7a									33		
BLK_Belt7b				Beaver dam near beginning of transect							
Thibaut_Belt1a	x		x					Recent elk prints/trails	21		
Thibaut_Belt1b											
Islands_Belt1a				Ant infestation on northern SAGO							
Islands_Belt1b											
Islands_Belt2a	x			Broken branches	x						
Islands_Belt2b					x		x	Elk browsed			
Lone Pine_Belt1a											
Lone Pine_Belt1b											
Lone Pine_Belt2a	x		x		x			Large bedding areas, broken branches, deer droppings			
Lone Pine_Belt2b					x			Deer/elk browsing			
Delta_Belt1a											
Delta_Belt1b											
Delta_Belt2a											
Delta_Belt2b											

Grazing prescriptions and other land management actions are proving beneficial as evidenced by this bank stability, as well as the high vigor of grasses on the floodplain and desirable riparian species increasing in cover along the banks, particularly in the lower reaches. While there is not a lot of woody recruitment in these areas, native grasses such as creeping wildrye and saltgrass are extremely vigorous, and there appears to be an influx of rushes, bulrush, and spikerush along streambanks in some areas. These changes are positive not only from a vegetation standpoint, but also in their value to wildlife. Wildlife use was apparent at many of the sites, particularly by deer, elk, raccoons, riparian birds, and Owens Valley voles. This use was demonstrated primarily by scat, bedding areas (fall), elk browsing and antler rubs, paw and deer/elk hoof prints, feathers, and remnants of food onsite.

4.8.3 Streamside Monitoring Recommendations

Revisions to Monitoring Protocol

As mentioned previously, the full streamside monitoring protocol was completed in the spring of 2011. The standing dead category for bank condition was added to better depict conditions along the water's edge. While bank condition is an important attribute to note, describing vegetation along the 40 cfs base flow does not adequately depict the vegetation communities where the woody recruitment is actually occurring at these sample sites. 2011 data showed the recruits to be establishing approximately 1-2 meters up from the water's edge, sometimes in completely different vegetation community types than occur along the water's edge. Therefore, it is recommended to revise the spring protocol to describe community types within the 3 meter-wide belt rather than only along the wetted edge. Staff will continue to collect data on species and age class of woody species within the 3 meter-wide belt in future spring monitoring efforts which will aid in determining survivability of these recruits. Methods for counting individual shrubby species will be further refined. Evidence of browsing and other wildlife use will also be noted.

In the fall of 2011, the entire 3 meter-wide belt was surveyed for new woody recruitment and animal use, which was a condensed rendition of the entire protocol. The entire protocol was not necessary since bank and vegetation cover data was collected just three months prior, and the primary goals in the fall were to pick up seedlings that resulted from the seasonal habitat flow as well to as note wildlife use and browsing that was not related to livestock grazing. This condensed approach was effective in noting all recruits within the belt that could otherwise be missed due to placement of the quadrats. It was also effective in noting use of the existing woody species by deer and elk. It is recommended to continue noting only new woody recruits and wildlife use of woody species during fall monitoring in future years.

Frequency of Monitoring

It is recommended that the spring and fall LORP Streamside Monitoring efforts be conducted again in three years (2014) or when it will coincide with collecting new imagery of the LORP, whichever occurs first. The GIS channel mapping effort provided in the 2010 LORP Report that corresponds with the streamside monitoring transects will also be repeated when LADWP receives new imagery for the LORP area, but not sooner than two years in the future so that changes over time can be effectively noted. The frequency of monitoring beyond the next effort will be determined based on results collected at that time; for example, if more frequent monitoring is warranted due to field conditions, then frequency will be increased, or vice versa.

4.9 LORP Ranch Leases

The following sections are presented by ranch lease. The discussion will include an introduction describing the lease operations, pasture types, a map of the lease, and utilization results from 2010-11, a summary of range trend results at the lease level and a presentation of range trend results by transect and presentation of Streamside Monitoring results at the lease level. The tables refer to plant species by plant symbol. Refer to Appendix 1, which contains a list of the plant species, scientific names, common names, plant symbol, and functional group assignment for species encountered on the range trend transects.

4.9.1 Intake Lease (RLI-475)

The Intake Lease is used to graze horses and mules employed in a commercial packer operation. The lease is comprised of three fields: Intake, Big Meadow Field, and East Field (approximately 102 acres). The Intake Field contains riparian vegetation and an associate range trend transect. The Big Meadow Field contains upland and riparian vegetation; however, it is not within the LORP project boundaries. There are no utilization or range trend transects in the Big Meadow Field due to a lack of adequate areas to place a transect that would meet the proper range trend/utilization criteria. Much of the meadow in the Big Meadow Field has been covered with dredged material from the LORP Intake. The East Field consists of upland and riparian vegetation. The Big Meadow and Intake Fields were not used by livestock during the construction of the Intake structure, which lasted until the 2008-09 grazing season. There are no irrigated pastures on the Intake Lease. 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 both pastures.

One new range trend/utilization transect was placed in the Intake Field (Stewart_01) at the end of grazing season during range trend data collection in August. Baseline range trend data was taken at that time and ungrazed plant heights for the 2011 grazing season were collected. The East Field was not grazed by livestock in the 2010-11 grazing season and no utilization estimates were made for the pasture.

End of Grazing Season Utilization for Field and Transects on the Intake Lease, RLI-475, 2011

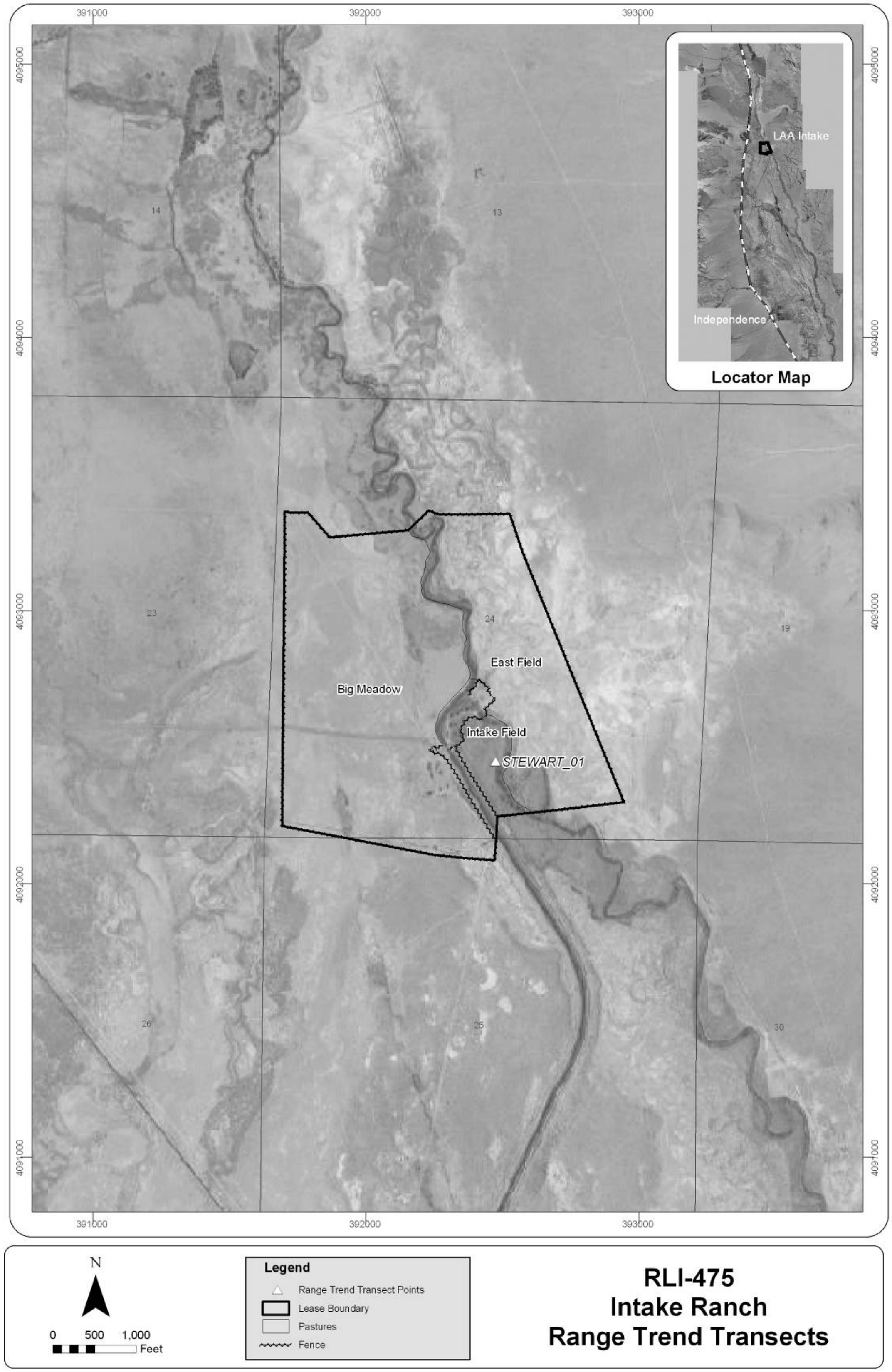
Field	Utilization	Transect	Utilization
Intake Field	28%	*STEWART_01	28%
**Riparian Utilization, 40%*			

<u>Summary of Utilization</u>

Utilization for the Intake Lease in 2011 was well below the allowable 40% utilization standard.

<u>Summary of Range Trend Data and Conditions</u>

No range trend transects were read on the Stewart Lease in 2011.



Land Management Figure 1. Intake Lease RLI-475, Range Trend Transects

4.9.2 Twin Lakes Lease (RLI-491)

The Twin Lakes Lease is a 4,912-acre cow/calf operation situated just south of the Los Angeles Aqueduct Intake. It includes a reach of the Owens River that lies mainly north of Twin Lakes, which is located at the southern end of the Twin Lakes 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, and the Holding Field. The Lower Blackrock Riparian, Upper Blackrock Riparian, and Lower Blackrock Fields 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 following tables present the summarized utilization data for each pasture, all transects in each field, and by species for each transect for the current year.

End of Grazing Season Utilization for Fields, Transects, and Species on the Twin Lakes Lease, RLI-491, 2011

Field	Utilization	Transect	Utilization	DISP	SPAI
Lower Blackrock Field	4%	BLKROC_37	0%	No use	No use
		BLKROC_FIELD_04	0%	No use	No use
		TWINLAKES_02	4%	No use	4%
		TWINLAKES_05	na	No use	No use
Lower Blackrock Riparian Field*	38%	BLKROC_RIP_07	34%	34%	
		TWINLAKES_03	42%	40%	58%
		TWINLAKES_04	0%		
		TWINLAKES_06	0%		
Upper Blackrock Field*	26%	BLKROC_RIP_05	0%	12%	44%
		BLKROC_RIP_06	32%	22%	41%
		BLKROC_RIP_08	30%	12%	43%
		INTAKE_01	30%	5%	50%
Holding Field		No Transect			

**Riparian Utilization, 40%*

<u>Summary of Utilization</u>

The Lower Blackrock Field had very little to no use during the grazing season. Cattle were moved to the Lower Blackrock Field prior to shipping in May. Utilization was concentrated in areas along Blackrock Ditch and Upper Twin Lakes where flooding in Drew Slough produced green forage. Utilization in the Upper Blackrock Field and Lower Blackrock Riparian Field did increase this season, due to the cattle staying in these pastures till May. The utilization transect TWINLAKES_05 was not sampled because it was flooded by Drew Slough.

<u>Summary of Range Trend Data and Conditions</u>

No range trend transects were read on the Twin Lakes Lease in 2011.

Streamside Monitoring

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011 streamside monitoring for the transects in the Twin Lakes Lease. Species and common names that correspond with these plant codes are provided in Land Management Appendix 1.

Land Management Table 5.Streamside Monitoring Twin Lakes Lease (Spring 2011)

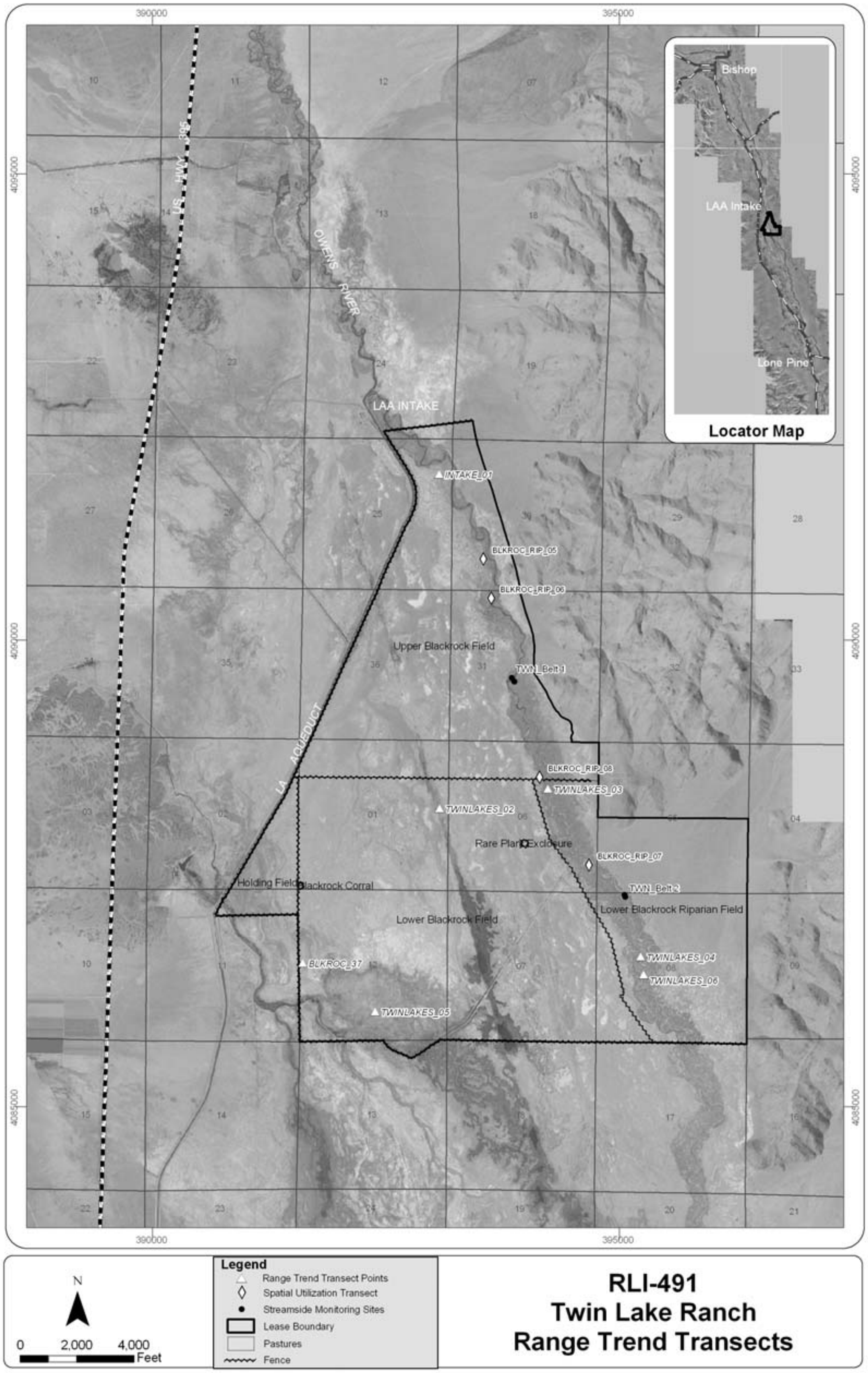
Site Specific Cover Data - Percentage by Species and Other Ground Cover Twin Lakes Lease																														
Site Name	Species																					Other Ground Cover								
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
TWN_Belt1a	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	15	0	0	0	6	0	22	67	5	2	0	5	0	0	0
TWN_Belt1b	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	23	0	0	17	0	41	49	6	1	0	4	0	0	0
TWN_Belt2a	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	16	1	20	78	2	0	0	0	0	0	0
TWN_Belt2b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	14	0	15	79	5	0	1	1	0	0	0

TWN_Belt1

TWN_Belt1a is located just upstream of an outer bend in the river in the Upper Blackrock Field in wet meadow/marsh habitat. TWN_Belt1b is located on a small peninsula on an inside bend of the river and a backwater pond, also considered wet meadow. Vegetation noted along both transects at the 40 cfs base flow water's edge was primarily cattails, tules, and common threesquare. No woody recruitment was documented during spring surveys, however one Goodding's willow seedling was noted during the fall survey along TWN_Belt1b. Saltcedar and pepperweed were also documented near TWN_Belt1b during the fall survey. Wildlife use in this area was apparent, as beaver activity was noted during both surveys, as well coyote scat and crawdad shells in the sampling area. End of grazing season utilization in the Upper Blackrock Field averaged 26%.

TWN_Belt2

TWN_Belt2a is located within the Lower Blackrock Riparian Field just upstream of an inside bend in the river. This area was classified as marsh along the water's edge and was dominated by cattails. This site is difficult to access and maneuver along the bank with heavy bassia, cattail, and saltbush cover near the water's edge. TWN_Belt2b is marsh along the water's edge but is bordered by bassia and saltbush. No woody recruitment was documented during spring or fall surveys. Owens Valley Voles were sighted along TWN_Belt2a during the fall survey. End-of-season utilization in the Lower Blackrock Riparian Field was 38%.



Land Management Figure 2. Twin Lake Lease RLI-491, Range Trend Transects

4.9.3 Blackrock Lease (RLI-428)

The Blackrock Lease is a cow/calf operation consisting of 32,674 acres divided into 24 management units or pastures. Blackrock is the largest LADWP grazing lease within the LORP area. The pastures/leases on the Blackrock Lease provide eight months of fall through spring grazing, which can begin any time after 60 continuous days of rest. A normal grazing season 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: South Blackrock Holding, White Meadow Field, White Meadow Riparian Field, Reservation Field, Reservation Riparian Field, Little Robinson Field, Robinson Field, 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, and North Blackrock Holding. Twelve of these pastures are monitored using range trend and utilization. The other eight pastures are holding pastures for cattle processing or parts of the actual operating facilities.

<u>Summary of Utilization</u>

The following tables present the summarized utilization data for each pasture, for the transects in each pasture, and by species for each transect for the current year.

End of Grazing Season Utilization for Fields, Transects and Species on the Blackrock Lease, RLI-428, 2011

Fields	Utilization	Transect	Utilization	DISP	LETR5	SPAI
North Riparian Field*	31%	BLKROC_12	Flooded			
		BLKROC_22	31%	16%		15%
South Riparian Field*	24%	BLKROC_13	31%	31%	0%	20%
		SOUTHRIP_03	19%	10%	20%	
		BLKROC_23	22%	15%		38%
		SOUTHRIP_04	20%	20%		
White Meadow Riparian Field*	57%	BLKROC_11	68%	71%		64%
		BLKROC_26	45%	50%		25%
Wrinkle Riparian Field*	19%	BLKROC_18	48%	28%		35%
		BLKROC_19	8%	0%		25%
		BLKROC_20	12%	5%	18%	
		BLKROC_21	13%	13%		0%
Horse Holding	30%	BLKROC_09	30%	30%		
		HORSEHOLD_02	0%			
Locust Field	15%	BLKROC_06	15%	4%		25%
Reservation Field	39%	BLKROC_02	7%	2%		12%
		BLKROC_03	53%	37%		66%
		BLKROC_44	6%	0%		6%
		BLKROC_49	0%	0%		0%
		BLKROC_51	41%	17%		59%
		RESERVATION_06	23%	16%		38%
Robinson Field	6%	BLKROC_04	8%	0%		8%
		ROBINSON_02	4%	0%		4%
Russell Field	15%	BLKROC_05	13%	10%		3%
		RUSSELL_02	3%	2%		2%
White Meadow Field	25%	BLKROC_01	0%	0%		0%
		BLKROC_39	0%	0%		0%
		WHITEMEADOW_03	22%	12%		66%
		WHITEMEADOW_04	0%	0%		0%
		WHITEMEADOW_05	36%	18%		45%
Wrinkle Field	24%	BLKROC_07	0%			
		WRINKLE_03	24%	29%		21%
West Field	38%	WRINKLE_02	38%	24%		45%

**Riparian pastures (40% utilization standard)*

<u>Riparian Management Area</u>

Overall riparian use in all fields was low and within the allowable 40% utilization limit. The White Meadow Riparian Field was deferred from the riparian utilization standard for the 2009-2010 grazing season. This was done to promote the use of cattle, to reduce bassia (*Bassia*) litter through concentrated hoof action. During the 2010-2011 grazing season, the riparian standard was reapplied. The mean use for the pasture with the addition of the newly established transect (BLKROC_26) was 57%. Staff are not concerned with the high use level for this year because it was the first time use exceeded the standard for the pasture, combined with the fact that last year surpassing the typical 40% use was an adaptive management objective.

Upland Management Areas

Fields in the upland portions of the Blackrock Lease have increased in utilization but remain within upland utilization standard of 65%.

Summary of Range Trend Data and Condition Blackrock Lease

There are twenty-six range trend sites on the Blackrock Lease. Because 2011 was an off-year for range trend monitoring. Two new transects were established and read in the two existing livestock exclosures on the Blackrock Lease.

Description of 2011 Range Trend Monitoring by Pasture

White Meadow Riparian Field

BLKROC_25

BLKROC_25 is parallel to BLKROC_11, inside of a fenced livestock exclosure. This is the first year the transect was read (2011). BLKROC_25 is located in a riparian management area in the White Meadow Riparian Field. The soils are Torrifluvents-Fluvaquentic Endoaquolls Complex, 0-2% slopes, which corresponds to the Moist Floodplain ecological site. The transect is located within the historical dry reach of the river.

Frequency (%), BLKROC_25

Life Forms	Species	2011
Perennial Forb	SUMO	26
Perennial Graminoid	DISP	107
Shrubs	ATTO	3
Nonnative Species	BAHY	39

Cover (%) Forbs, Graminoids, Sub-shrubs BLKROC_25

Life Forms	Species	2011
Perennial Forb	SUMO	1
Perennial Graminoid	DISP	24
Shrubs	ATTO	0
Nonnative Species	BAHY	3

Cover (m) Shrubs BLKROC_25

Species Code	2011
ATTO	1

Ground Cover (%) BLKROC_25

Substrate	2011
Dung	0
Litter	71
Bare Ground	28

Shrub Densities and Age Classes BLKROC_25

	ATTO
Juvenile	20
Mature	19
Total	39

South Riparian Field

BLKROC_24

BLKROC_24 is inside a fenced livestock exclosure on the east side of the river. This is the first year the transect was read (2011). BLKROC_24 is located in a riparian management area in the South Riparian Field. The soils are Torrifluvents-Fluvaquentic Endoaquolls Complex, 0-2% slopes, which corresponds to the Moist Floodplain ecological site.

Frequency (%), BLKROC_24

Life Forms	Species	2011
Perennial Graminoid	DISP	102
	LETR5	15
Shrubs	ATTO	8
	ERNA10	8

Cover (%) Forbs, Graminoids, Sub-shrubs BLKROC_24

Life Forms	Species	2011
Perennial Graminoid	DISP	10
	LETR5	2
Shrubs	ATTO	0
	ERNA10	0

Cover (m) Shrubs BLKROC_24

Species Code	2011
ATTO	5
ERNA10	7
SAVE4	7
Total	18

Ground Cover (%) BLKROC_24

Substrate	2011
Dung	0
Litter	68
Standing Dead	16
Bare Ground	32

Shrub Densities and Age Classes BLKROC_24

	ATTO	ERNA10	SAVE4
Seedling	1	0	0
Juvenile	4	1	0
Mature	14	27	13
Decadent	0	12	0
Total	19	40	13

Irrigated Pastures

There are no irrigated pastures on the Blackrock Lease.

Stockwater Sites

All the wells for the Blackrock lease have been drilled and are currently being fitted for solar pumps and necessary plumbing for the troughs. The lessee will be responsible for water troughs and installation. There are also three other stockwater sites that will be developed as part of the *1997 Memorandum of Understanding Between the City of Los Angeles Department of Water and Power, the County of Inyo, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, the Owens Valley Committee, and Carla Scheidlinger*, (MOU), which required additional mitigation (1600 Acre-Foot Mitigation Projects). The “North of Mazourka Project” will provide stockwater in the Reservation Field and the “Well 368/Homestead Project” will provide stockwater in the Little Robinson Field and East Robinson Field. These mitigation projects are scheduled to be completed by March 2012.

Rare Plant Trend Plot Monitoring

Little Robinson Pasture, Blackrock Lease

This pasture contains a *S. covillei* population. Trend plots Little Robinson 1EX and Little Robinson 2EX occur within an exclosure; plots Little Robinson 1C and Little Robinson 2C are adjacent to the exclosure. The pasture was moderately grazed during the 2011 season. Phenology included individuals that were vegetative to individuals that were in flower.

Little Robinson Pasture, Blackrock Lease

Plot Number	Year	Species	Seedling	Juvenile	Mature	Total
Little Robinson 1C	2009	*S. covillei*	0	12	28	40
	2010		1	0	45	46
	2011		16	11	17	44
Little Robinson 2C	2009	*S. covillei*	0	12	19	31
	2010		3	0	28	31
	2011*		4	1	0	5
Little Robinson 1EX	2009	*S. covillei*	0	0	40	40
	2010		0	0	39	39
	2011		0	0	29	29
Little Robinson 2EX	2009	*S. covillei*	0	6	23	29
	2010		0	0	15	15
	2011		8	0	15	23

**80% of plot inundated.*

Robinson Pasture, Blackrock Lease

This pasture contains a *S. covillei* population and a *C. excavatus* population. Trend plots Robinson 1EX and Robinson 2EX occur within an exclosure capturing both *C. excavatus* and *S. covillei* species for use in tracking trends of both species. Two *S. covillei* trend plots, Robinson 1C and Robinson 2C along with one *C. excavatus* trend plot, Robinson 3C are outside the exclosure within the same pasture. End-of-season utilization in the Robinson Field in 2011 was 6%. Phenology included individuals that were vegetative to individuals that had already set seed.

Robinson Pasture, Blackrock Lease

Plot Number	Year	Species	Seedling	Juvenile	Mature	Total
Robinson 1C	2009	*C. excavatus*	0	0	12	12
	2010		0	0	38	38
	2011		0	0	30	30
Robinson 1C	2009	*S. covillei*	0	0	6	6
	2010		0	0	2	2
	2011		4	0	2	6
Robinson 2C	2009	*C. excavatus*	0	0	0	0
	2010		0	0	2	2
	2011		0	0	6	6
Robinson 2C	2009	*S. covillei*	0	4	59	63
	2010		1	0	52	53
	2011		22	6	34	62
Robinson 3C	2009	*C. excavatus*	0	0	1	1
	2010		0	0	11	11
	2011		0	0	18	18
Robinson 1EX	2009	*C. excavatus*	0	0	2	2
	2010		0	0	11	11
	2011		0	0	2	2
Robinson 1EX	2009	*S. covillei*	0	43	35	78
	2010		17	0	36	53
	2011		13	8	22	43
Robinson 2EX	2009	*C. excavatus*	0	0	23	23
	2010		2	0	23	25
	2011		0	1	30	31

Springer Pasture, Blackrock Lease

This pasture contains a *S. covillei* population. Trend plots were established but because of concerns raised by the lessee, the MOU Group decided that the planned exclosure would not be constructed. This decision was based on the concerns of the lessee and lack of data concluding that grazing is detrimental to *S. covillei*. Trend plots Springer 1EX and Springer 2EX occur within the area of the planned exclosure but are grazed; plots Springer 1C and Springer 2C are adjacent to the planned exclosure. The pasture was moderately grazed during the 2011 season. Phenology included individuals that were vegetative to individuals that were in flower.

Springer Pasture, Blackrock Lease

Plot Number	Year	Species	Seedling	Juvenile	Mature	Total
Springer 1C	2009	*S. covillei*	0	74	31	115
	2010		15	0	131	146
	2011		9	31	9	108
Springer 2C	2009	*S. covillei*	0	13	24	37
	2010		3	0	49	52
	2011		7	17	33	57
Springer 1EX	2009	*S. covillei*	0	2	5	7
	2010		0	0	16	16
	2011		6	44	42	92
Springer 2EX	2009	*S. covillei*	0	23	13	36
	2010		0	0	37	37
	2011		3	13	29	45

Salt and Supplement Sites

Many of the supplement sites located on the Blackrock Lease have been in place 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 new locations were selected as to better distribute cattle within and near the newly created riparian pastures.

Burning

The lessee conducted several small range burns throughout the winter that consisted of brush piles and decadent forage in the Horse Holding and Wrinkle Fields. All of the burns totaled approximately 78 acres and they were in sites that had a good perennial grass understory. The resulting burn removed shrubs and allowed the perennial grasses in these fields to become more productive and increase in cover. This has resulted in improved wildlife habitat and productivity for the lessee.

A total of 910 acres of the Winterton Unit burned in 2011. This burn removed a large amount of shrubs and decadent tules. This burn has improved grazing for the lessee and also provided improved waterfowl and shorebird habitat by creating areas of open water and flooded meadows.

Slash pile burning, along the river, is planned for the Blackrock Lease in 2011, and will be done by Inyo County. Several range burn sites have also been identified for 2012; these sites are still being evaluated for vegetation composition and acreage.

Streamside Monitoring

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011 streamside monitoring in the Blackrock Lease.

Land Management Table 6. Streamside Monitoring Blackrock Lease (Spring 2011)

Site Specific Cover Data - Percentage by Species and Other Ground Cover Blackrock Lease																														
Site Name	Species																					Other Ground Cover								
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
BLK_Belt1a	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0	9	0	12	71	5	7	0	4	1	0	0
BLK_Belt1b	0	0	0	0	0	0	0	0	0	12	2	0	0	0	0	0	0	0	0	5	0	19	74	1	1	7	0	0	0	0
BLK_Belt2a	0	0	1	1	0	0	0	0	1	5	3	0	0	0	0	0	2	0	0	11	0	21	52	3	3	0	13	9	0	0
BLK_Belt2b	0	1	0	0	0	0	0	0	0	16	1	0	0	0	0	0	0	0	0	18	0	35	63	1	1	0	1	0	0	0
BLK_Belt3a	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	1	0	0	0	15	0	21	19	39	17	0	5	0	0	0
BLK_Belt3b	0	7	1	3	0	0	0	0	0	0	0	0	0	5	0	0	1	5	0	11	0	31	11	21	32	0	6	0	0	0
BLK_Belt4a	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	18	0	0	2	0	25	21	31	16	0	8	0	0	0
BLK_Belt4b	0	3	0	0	0	0	0	0	0	9	4	0	3	0	0	0	5	21	0	10	0	53	20	19	5	0	4	0	0	0
BLK_Belt5a	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3	49	0	0	2	0	55	18	18	0	1	9	0	0	0
BLK_Belt5b	5	1	0	3	1	0	0	2	0	1	7	10	3	0	0	0	2	38	0	9	0	79	10	7	0	0	4	0	0	0
BLK_Belt6a	1	0	0	3	0	0	0	0	0	1	1	0	0	0	0	3	36	0	0	12	0	55	23	16	0	0	0	8	0	0
BLK_Belt6b	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	7	15	0	19	0	55	39	4	0	0	3	0	0	0
BLK_Belt7a	1	0	0	0	0	0	0	0	0	4	0	2	0	0	0	12	0	0	0	15	0	33	44	12	1	0	7	4	0	0
BLK_Belt7b	0	0	0	1	0	0	0	0	0	5	2	0	4	2	1	0	14	4	0	7	0	38	43	11	4	0	6	0	0	0

BLK_Belt1

BLK_Belt1a is located inside the White Meadow Exclosure and is wet meadow dominated by creeping wildrye. The water's edge was dominated by living and dead cattails, which occupied 71% of sampling points. BLK_Belt1b is also marsh dominated by living and dead cattails along the water's edge (74%). However, cover of Baltic rush on BLK_Belt1b increased in 2011, possibly indicating a shift to other desirable riparian obligates in this area. No woody recruitment was documented during spring or fall surveys. However, saltcedar was noted at this site. BLK_Belt1 is located inside an exclosure so there is no data for end–of-season utilization.

BLK_Belt2

BLK_Belt2 is located in the White Meadow Riparian Field. BLK_Belt2a is characterized as a combination of wet meadow, marsh, and woody vegetation, with cattails dominating the water's edge. BLK_Belt2b was classified as marsh along the wetted edge, but was bordered by a wet meadow with primarily saltgrass and creeping wildrye. BLK_Belts2a and b were dominated by standing dead cattails at 52% and 63%, respectively. No woody recruitment was documented during the spring survey at this site; however, one Goodding's willow seedling was noted during the fall survey on a point bar on the inside bend of the river (photo below). There was no evidence of browsing of woody vegetation along either of these transects, yet elk trails were noted in the fall survey at both sites. End of grazing season utilization in the White Meadow Riparian Field averaged 58%.

Goodding's willow seedling documented on BLK_Belt2a during 2011 fall streamside monitoring.

BLK_Belt3

BLK_Belt3a is located in the Reservation Riparian Field in a combination of wet meadow and woody vegetation dominated by bassia, saltbush, creeping wildrye, and Goodding's willow. BLK_Belt3b is located in a wet meadow dominated by saltgrass and creeping wildrye with a large amount of woody cover, but with a field of bassia and saltbush directly to the east. No woody recruitment was noted at either of these sites during spring survey in 2011; however, 3 Goodding's willow seedlings were noted during the fall survey along BLK_Belt3a. Elk use was apparent at both sites during fall surveys, especially at BLK_Belt3b. At this site, there were fresh elk droppings, many broken willow branches, and most significantly, stripped branches and bark which is likely evidence of a bull elk attempting to strip velvet from his antlers. The photos below illustrate this evidence.

BLK_Belt4

BLK_Belt4a is located in the North Riparian Field, and has woody vegetation and marsh along the water's edge with an adjacent wet meadow dominated by saltgrass and saltbush. BLK_Belt4b was characterized as a combination of woody vegetation, wet meadow, and marsh. Dominant species noted on both of these transects were Baltic rush, common threesquare, and cosmopolitan bulrush, all of which are desirable riparian obligates. No woody recruitment was noted at either of these sites during spring or fall surveys. Browsing and antler rubs were noted at BLK_Belt4a during spring surveys, but no other wildlife use was noted in the fall. End of grazing season utilization in the North Riparian Field averaged 31%. SOUTHRIP_03 was the closest transect to BLK_Belt4; end-of-season utilization at this site was 19% in 2011.

Photo demonstrating stripped bark by bull elk at BLK_Belt3b.

Photo showing evidence of elk use at BLK_Belt3b. Note broken branches in foreground.

BLK_Belt5

BLK_Belt5a is located on a peninsula in the South Riparian Field, and is characterized as a combination of marsh and wet meadow. This site was 55% vegetated and was dominated by common threesquare in 2011. BLK_Belt5b was characterized as a combination of marsh and wet meadow with small portions of woody vegetation. Dominant species include cosmopolitan bulrush, creeping wildrye, yerba mansa, and cattails. This site was 79% vegetated in spring of 2011. No woody recruitment was noted during spring or fall surveys in 2011 on BLK_Belt5a. However, the floodplain is responding well to management as shown by other riparian obligate species increasing in cover, such as common threesquare shown in the photo below. One narrowleaf willow seedling was noted in the spring survey on BLK_Belt5b, and five were documented in the fall at this site. End of grazing season utilization in the South Riparian Field averaged 24%. There is only one transect in this pasture, BLKROC_23, and end-of-season utilization at this site was 22% in 2011.

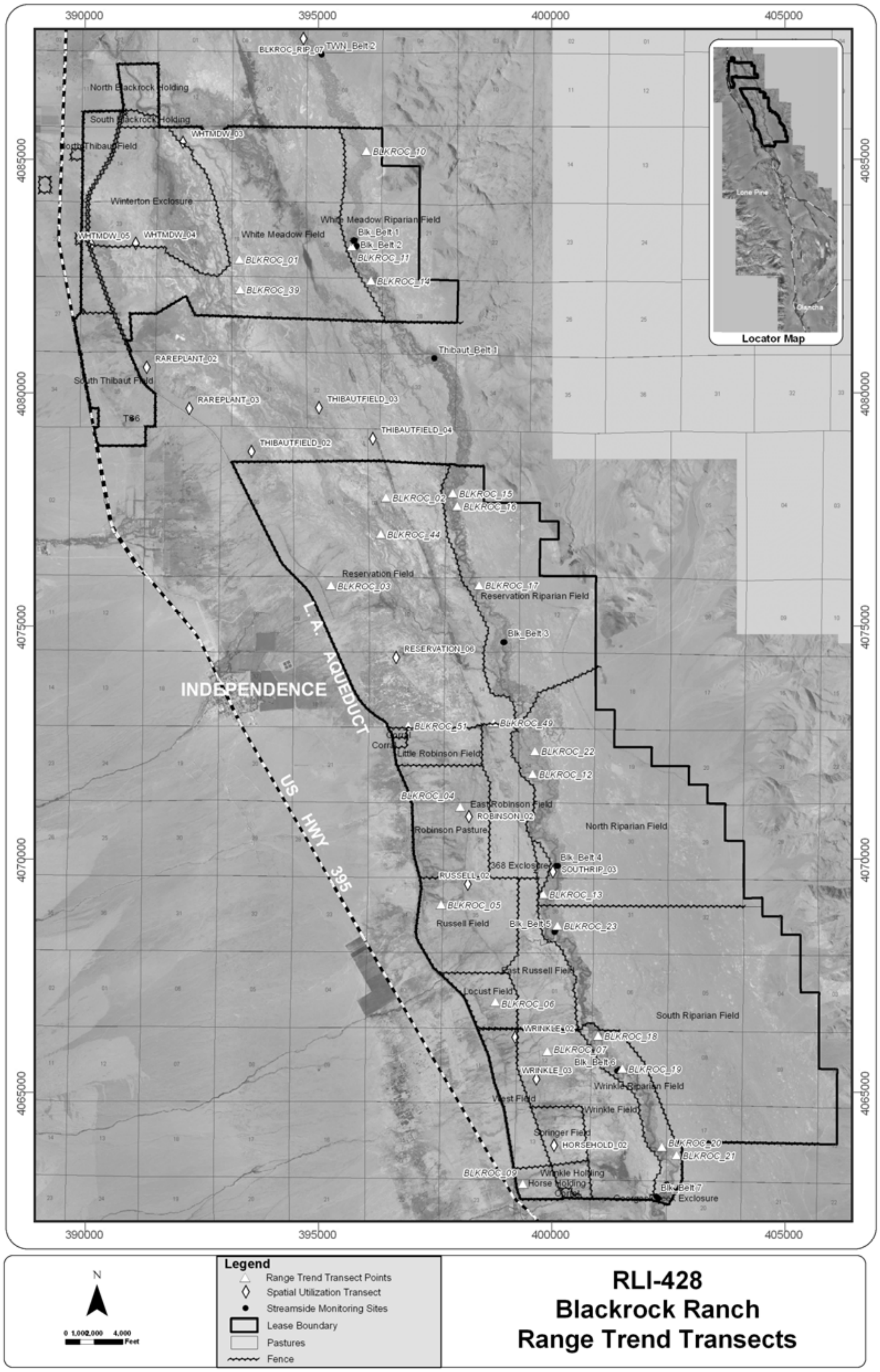
Photo of BLK_Belt5a looking southeast. No woody recruitment was observed at this site in 2011, however, the floodplain is responding well to management, as noted by an influx of desirable riparian obligate species such as common threesquare.

BLK_Belt6

BLK_Belt6a is located in the Wrinkle Riparian Field just upstream of an oxbow in a combination of marsh, wet meadow and woody vegetation. BLK_Belt6b is also wet meadow/marsh. Both belt transects are dominated by saltgrass with common threesquare, cosmopolitan bulrush, and cattails inhabiting the water's edge. Banks were primarily vegetated or were occupied with standing dead cattails. No woody recruitment was noted at either site during spring or fall surveys in 2011. Spring surveys documented evidence of browsing as well as antler rubs present at BLK_Belt6b, and additional broken branches in the fall, likely from elk. There was also evidence of continued raccoon presence at BLK_Belt6a (footprints, scat, crawdad shells, etc.), as noted in 2010. End of grazing season utilization in the Wrinkle Riparian Field averaged 19%. BLKROC_19 is the closest transect to BLK_Belt6, and end-of-season utilization at this site was 8% in 2011.

BLK_Belt7

BLK_Belt7a is located within the George's Creek Exclosure along a steep bank on the western side of the Lower Owens River. This riparian corridor was primarily marsh with a well-established corridor of narrowleaf willow. The 40 cfs base flow water's edge was dominated by living and dead cattails and tules. Access along the bank was difficult due to the slope and established willow corridor, and there are many additional narrowleaf willows inundated by water that were not picked up in the sampled plots. There was no apparent use to any of these individuals by livestock or other wildlife; however, there were trails established from human use (likely for fishing access). BLK_Belt7b is marsh with some woody vegetation and was dominated by common threesquare and living and dead cattails along the water's edge. No recruitment was documented on either transect during spring surveys; however, 33 narrowleaf willow seedlings were noted during fall surveys of BLK_Belt7a. These recruits were single stemmed plants that were up to a meter in height with no branching, and occurred where there was a prominent seed source readily available. Beaver are currently active in this area, which is not surprising because of the large fishing hole that exists between BLK_Belts7a and b, and a beaver dam was observed near the beginning of BLK_Belt7b. There are no utilization transects located within the George's Creek Exclosure, so no data for the end of the grazing season near BLK_Belt7 was collected.



Land Management Figure 3. Blackrock Lease RLI-428, Range Trend Transects

4.9.4 Thibaut Lease (RLI-430)

The 5,259-acre Thibaut Lease is utilized by three lessees for wintering pack stock. The lease historically was grazed as one large pasture by mules and horses. Since the implementation of the LORP and installation of new fencing, four different management areas have been created on the lease. These areas are the Blackrock Waterfowl Management Area, Rare Plant Management Area, Thibaut Field, and the Thibaut Riparian Exclosure. Management differs among these areas. The Blackrock Waterfowl Management Area can be grazed every other year. The 2010-11 season was an on-grazing year and the area was not flooded for waterfowl habitat. Water was only released for stockwater. Thibaut Pond was dried out for burning with utilization standards during an on-grazing status being 65%. During the wetted cycle of the Blackrock Waterfowl Management Area will revert back to a utilization standard of 40%. The irrigated pasture portion located in Thibaut Field was assessed using irrigated pasture condition scoring and the upland portions of the field were evaluated using range trend and utilization transects. The Rare Plant Field is evaluated using range trend and utilization transects. The Riparian Exclosure has been excluded from grazing for 10 years.

Summary of Utilization

The following tables present the summarized utilization data for each pasture, for the transects in each pasture, and by species for each transect for the current year.

End of Grazing Season Utilization for Pasture/Fields, Transects and Species on the Thibaut Lease, RLI-430, 2011

Pasture/Field	Utilization	Transect	Utilization	DISP	SPAI
Rare Plant Management Area	32%	RAREPLANT_02	0%		
		THIBAUT_02	19%	26%	12%
		RAREPLANT_03	46%	37%	55%
Thibaut Field	68%	THIBAUT_03	74%	76%	73%
		THIBAUT_08	17%	0%	27%
		THIBAUT_09	0%	0%	0%
		THIBAUTFIELD_02	76%	68%	82%
		THIBAUTFIELD_03	18%	0%	24%
		THIBAUTFIELD_04	14%	7%	21%
Waterfowl Management Area	39%	THIBAUT_01	0%		
		WATERFOWL_02	30%	30%	
		WATERFOWL_03	33%	33%	
		WATERFOWL_04	51%	51%	
		WATERFOWL_05	48%	48%	

Upland Management Areas

End-of-season use in the Thibaut Field was 68%, exceeding the allowable use level of 65%. Use was extremely high on the western portion of the Thibaut Field while very low on the eastern portion of the field. The poor distribution of livestock has become a perennial problem on the Thibaut Field. The leasee and LADWP have been discussing management changes to improve the distribution of the livestock. One change that can be made by the leasee is to feed in the center of the field. There is a newly improved road that leads to a stockwater well that will allow access. This will help reduce the amount of livestock that spend time on the western portion of Thibaut Field.

Summary of Range Trend Data and Conditions

No range trend monitoring took place in 2011 on the Thibaut Lease.

Irrigated Pastures

The northern portion of the Thibaut Pasture (85 acres) comprises the area managed as irrigated pasture for the Thibaut Lease. With the completion of the new fencing for the LORP creating the Waterfowl management area located directly north, and rare plant management area located south west. A grazing corridor has been created that puts heavy pressure on the irrigated pasture. The subsequent increase in grazing pressure has negatively affected irrigated pasture condition. The negative effects are a low score of 68% due to weeds, uneven grazing, and bare spots. Conditions are not bad at this time but management actions should change in order to increase future forage conditions in the area.

LADWP watershed resources staff recommends that livestock be moved out of the area periodically during the grazing season to allow the area to rest. This may be achieved by supplemental feeding further south in the Thibaut Field, electric fencing, or turning the livestock out in the southern end of Thibaut Field instead of the corral area. This irrigated pasture will be re-evaluated in the 2011-12 grazing season.

Stockwater Sites

There is one developed water site in the Thibaut Field, which consists of a flowing well that has a stockwater well drilled next to it, located in the uplands east of the irrigated pastures in the Thibaut Field. This well has not produced adequately since its installation. Currently the flowing well is still creating a small puddle area for livestock and wildlife. It has not yet been determined what steps are going to be taken next. A new well may need to be drilled.

Rare Plant Management Area Thibaut

This pasture contains both *S. covillei* and *C. excavatus* populations. Trend plots for Rare Plant Management Area 1 and Rare Plant Management Area 4 are within an exclosure that is restricted from grazing from early March through early October per the LORP EIR during the rare plants' flowering, fruiting, and seeding period. The pasture was grazed with end-of-season utilization at 32%. Phenology included individuals that were vegetative to individuals that were in flower.

Rare Plant Management Area, Thibaut Lease

Plot Number	**Year**	**Species**	**Seedling**	**Juvenile**	**Mature**	**Total**
Rare Plant Management Area 1	2009	*C. excavatus*	0	0	3	3
	2010		0	0	12	12
	2011		0	0	4	4
Rare Plant Management Area 1	2009	*S. covillei*	0	9	21	30
	2010		1	0	24	25
	2011		15	5	32	52
Rare Plant Management Area 4	2009	*C. excavatus*	0	0	2	2
	2010		0	0	4	4
	2011		0	0	2	2
Rare Plant Management Area 4	2009	*S. covillei*	0	7	32	39
	2010		0	0	38	38
	2011		9	12	40	61

Salt and Supplement Sites

Hay is spread over an area using a truck or trailer pulled by a truck. Feeding areas have not been rotated resulting in heavy livestock concentrations on the west end of the Thibaut Field and associated negative grazing impacts.

Burning

There are plans to burn Thibaut Pond to maintain open water for waterfowl habitat in 2012.

Streamside Monitoring

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011 streamside monitoring on the Thibaut Lease.

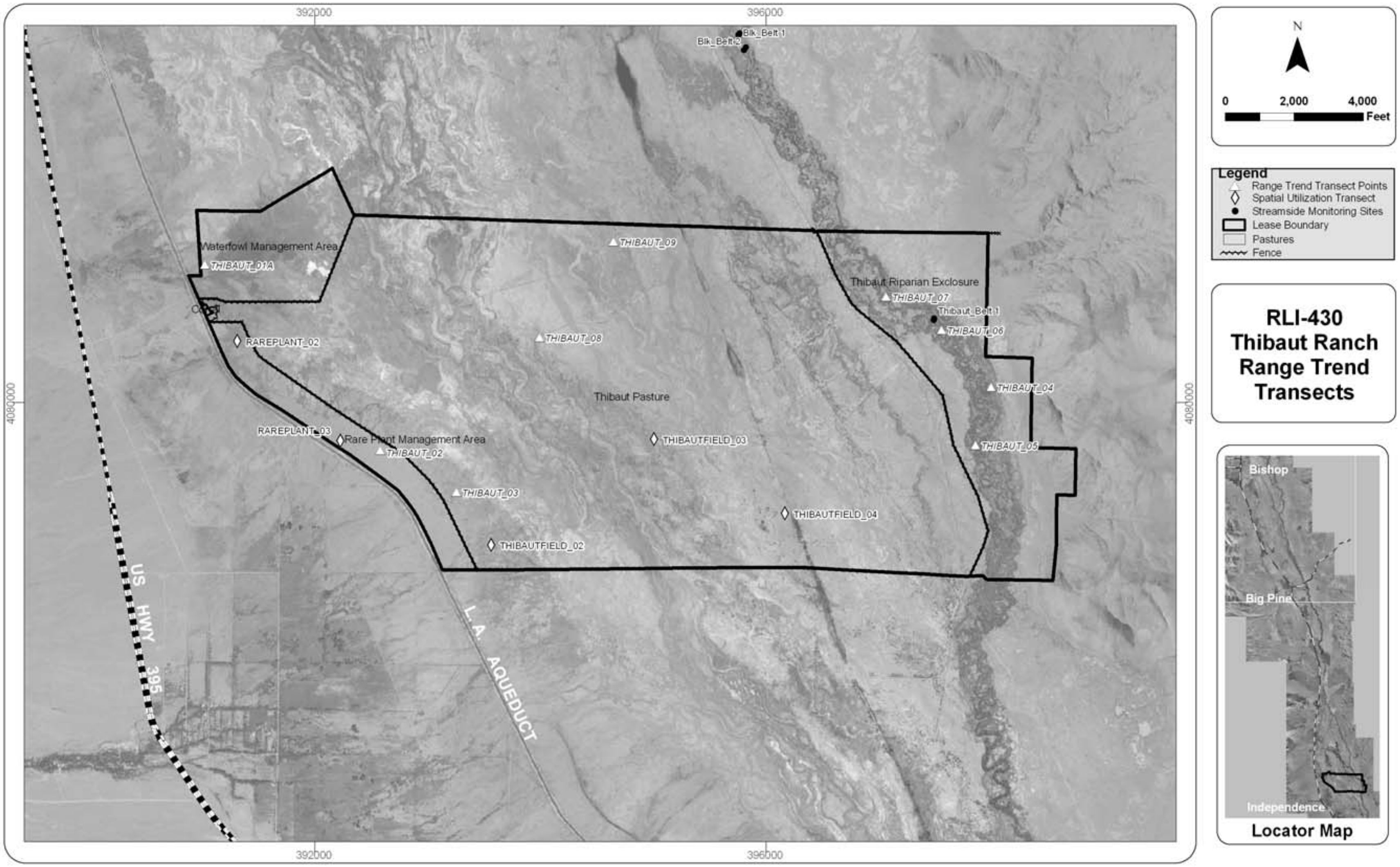
Land Management Table 7. Streamside Monitoring Thibaut Lease (Spring 2011)

Site Specific Cover Data - Percentage by Species and Other Ground Cover Thibaut Lease																														
Site Name	Species																					Other Ground Cover								
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
Thibaut_Belt1a	0	2	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	0	10	3	18	66	7	0	0	9	0	0	0
Thibaut_Belt1b	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	28	0	33	38	5	4	0	21	0	0	0

Thibaut_Belt1

Thibaut_Belts1a and b are marsh dominated by living and dead cattails along the water's edge. Meadows with saltgrass, saltbush, and bassia are directly adjacent to both sites. No recruitment was noted at either site during spring surveys; however, 21 narrowleaf willow seedlings were observed at Thibaut_Belt1a during the fall survey. In 2010 and 2011, staff documented only Goodding's and Red Willows at this site but no narrowleaf willows. This new recruitment demonstrates how the LORP seasonal habitat flows are helping to establish riparian species in areas that do not have an existing seed source in the immediate vicinity. A Goodding's willow seedling was also noted near Thibaut_Belt1a during the fall survey, but was approximately 15 meters from the bank and not in the surveyed belt.

Browsing and antler rubs were apparent on Thibaut_Belt1a during spring surveys, and recent elk prints and trails were noted during the fall survey at this site. None of this animal use was apparent at Thibaut_Belt1b during either survey in 2011. There are no utilization transects located within the Thibaut Riparian Exclosure, so there is no data for the end of the grazing season near Thibaut_Belt1.



Land Management Figure 4. Thibaut Lease RLI-430, Range Trend Transects

4.9.5 Islands Lease (RLI-489)

The Islands Lease 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. The Islands Lease is managed in conjunction with the Delta Lease. Cattle from both leases are moved from one lease to the other as needed throughout the grazing season.

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

- Bull Field
- Reinhackle Field
- Bull Pasture
- Carasco North Field
- Carasco South Field
- Carasco Riparian Field
- Depot Riparian Field
- River Field

<u>Summary of Utilization</u>

The following tables present the summarized utilization data for each pasture, for the transects in each pasture, and by species for each transect for the current year.

End of Grazing Season Utilization for Fields, Transects and Species on the Islands Lease, RLI-489 2011

Pasture	Utilization	Transect	Utilization	DISP	LETR5	SPAI
Carasco Riparian Field*	8%	ISLAND_06	8%	8%		
Depot Riparian Field*	24%	ISLAND_08	21%	21%		
		ISLAND_09	49%	49%		
		RIVERFIELD_09	11%	5%		12%
		RIVERFIELD_12	56%	40%		44%
		RIVERFIELD_07	24%	24%		
Lubkin	0%	LUBKIN_01	0%			
River Field *	36%	ISLAND_07	0%			
		ISLAND_10	6%	6%		
		ISLAND_11	2%	2%		
		ISLAND_12	34%	32%		43%
		RIVERFIELD_8	9%	9%		
		RIVERFIELD_11	58%	56%		60%
South Field	31%	ISLAND_02	23%	0%		30%
		ISLAND_59	0%			
		SOUTHFIELD_02	54%	36%		76%
		SOUTHFIELD_03	14%	25%		7%

**Riparian pastures (40% utilization standard)*

Riparian Management Areas

All of the pastures are below the allowable 40% utilization. A range burn was conducted in Depot Riparian Field and River Field, so far the results have been very good with perennial grasses recovering well.

Summary of Range Trend Data in Islands Exclosure

ISLAND_13

ISLAND_13 is located in the River Field Riparian pasture, inside a livestock grazing exclosure on the east side of the river. The soils are Torrifluvents-Fluvaquentic Endoaquolls Complex, 0-2% slopes, which corresponds to the Moist Floodplain ecological site.

Frequency (%), ISLAND_13

Life Forms	Species	2011
Perennial Forb	FRSA	42
	IVAX	3
Perennial Graminoid	DISP	116
	SPAI	18
Shrubs	ATTO	3

Cover (%) Forbs, Graminoids, Sub-shrubs ISLAND_13

Life Forms	Species	2011
Perennial Forb	FRSA	10
	IVAX	0
Perennial Graminoid	DISP	13
	SPAI	4
Shrubs	ATTO	0

Shrub Cover (m), ISLAND_13

Species code	2011
ATTO	10

Ground Cover (%), ISLAND_13

Substrate	2011
Dung	1
Litter	98
Bare Ground	1

Irrigated Pastures

The B and D Pastures located near Reinhackle Spring were rated in 2010 and received an irrigated pasture condition score of 90%. These pastures will not be rated again until 2012.

Irrigated Pasture Condition Scores 2007-10

Pasture	2007	2008	2009	2010
B Pasture	90%	X	X	90%
D Pasture	90%	X	X	90%

X indicates no evaluation made.

Stockwater Sites

There are two stockwater sites located 1-1.5 miles east of the river in the River Field uplands near the old highway. These wells were drilled in 2010.

Salt and Supplement Site:

Cake blocks and molasses tubs that contain trace minerals and protein are distributed for supplement on the lease. The blocks and tubs are dispersed randomly each time and if uneaten they are collected to be used in other areas.

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. These sites are established sites and have been used for countless years. It would not be feasible to move them and disturb a new area.

<u>Burning</u>

A range burn occurred on the south end of theh River Field bordering the Depot Riparian Field. The north end of the burn was approximately 56 acres and the south end was 92 acres. The purpose of the burn was to improve existing meadows by removing large stands of shrubs. The burn resulted in a positive response from the perennial grasses present and removed all of the shrubs within the burn area. There are currently no range burns planned for the lease for 2012.

<u>Streamside Monitoring</u>

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011 streamside monitoring in the Islands Lease.

Land Management Table 8. Streamside Monitoring Islands Lease (Spring 2011)

Site Specific Cover Data - Percentage by Species and Other Ground Cover Islands Lease																														
Site Name	Species																						Other Ground Cover							
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
Islands_Belt1a	2	2	0	0	0	0	0	0	0	2	2	0	0	0	0	13	5	0	0	3	0	27	47	15	4	0	8	0	0	0
Islands_Belt1b	1	1	0	4	0	1	0	0	0	16	14	0	5	0	0	0	0	13	2	7	0	63	11	16	5	0	6	0	0	0
Islands_Belt2a	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	3	0	0	0	0	9	38	19	13	0	18	4	0	0
Islands_Belt2b	9	3	0	0	0	0	8	0	0	2	1	0	0	0	0	0	14	10	0	20	0	65	27	3	4	0	2	0	0	0

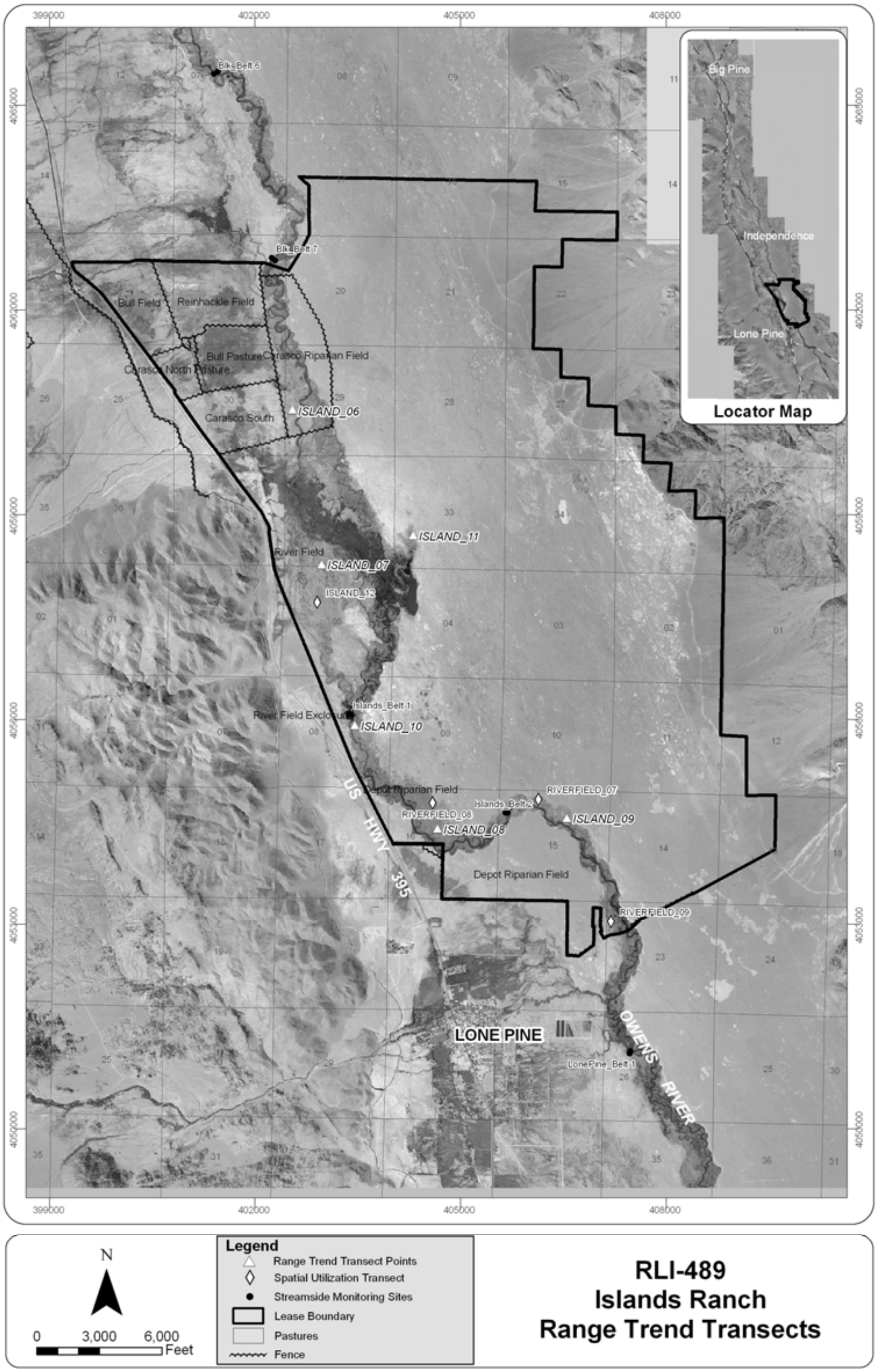
Islands_Belt1

Islands_Belts1a and b are located in the River Field Exclosure in a combination of marsh and wet meadow vegetation with some Goodding's willow also present. Dominant species along the water's edge include living and dead tules, common threesquare and cosmopolitan bulrush, Baltic rush, and creeping wildrye. No woody recruitment was noted during spring or fall surveys in 2011, nor was evidence of browsing or other wildlife use. There are no utilization transects located within the Islands River Field Exclosure, so no utilization data was available for Islands_Belt1.

Islands_Belt2

Islands_Belt2a is located in the Depot Riparian Field and was characterized as marsh and woody vegetation and was dominated by Goodding's willow, saltbush, and saltgrass. Living and dead cattails and tules occupy a good portion of the wetted edge, but there is also notable areas of barren soil, litter or wood along this transect, that generally correspond with Goodding's willow overstory. Islands_Belt 2b is a combination of marsh, wet meadow, and woody vegetation that is dominated by Goodding's willow, saltgrass, living and dead cattails and tules, and threesquare bulrush.

There are many mature Goodding's willow in this reach of the river that could potentially provide a seed source for recruitment. However, there was no recruitment noted at Islands _Belts1a or b during spring or fall surveys in 2011. Browsing was noted during the spring and fall surveys as broken branches likely browsed by elk. End of grazing season utilization in the Depot Riparian Field averaged 24%. ISLANDS_08 is the closest transect to Islands_Belt2, and end-of-season utilization at this site was 21% in 2011.



Land Management Figure 5. Islands Ranch RLI-489 Range Trend Transects

4.9.6 Lone Pine Lease (RLI-456)

The Lone Pine Lease is an 8,274-acre cow/calf operation divided into 11 pastures and adjacent private ranch land. Grazing on the lease occurs from January 1 to March 30 and then again in late May to early June. In early June the cattle are moved south to Olancha and then driven to Forest Service Permits in Monache.

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

<u>Summary of Utilization</u>

The following tables present the summarized utilization data for each pasture, for the transects in each pasture, and by species for each transect for the current year.

End of Grazing Season Utilization for Pastures, Transects and Species on the Lone Pine Lease, RLI-456, 2011.

Pastures	Utilization	Transects	Utilization	DISP	LETR5	SPAI
Johnson Pasture	14%	LONEPINE_05	14%			14%
River Pasture - Lone Pine	34%	LONEPINE_01	28%	28%		
		LONEPINE_02	30%	24%		38%
		LONEPINE_03	52%	50%	25%	74%
		LONEPINE_04	45%	31%		62%
		LONEPINE_07	8%	8%		

<u>Riparian Management Area</u>

Utilization for the River Field was below the 40% utilization. LADWP staff observed some browsing of riparian obligate species while conducting field work during the summer. The conclusion is that since there are not cattle present during the summer that most or all of the damage is the result of Tule Elk browsing and rutting activities. The newly established belt transects should help clarify when and what is using the woody riparian species.

Summary of Range Trend Data

No range trend transects were read on the Lone Pine Lease in 2011

Irrigated Pastures

The irrigated pastures within the LORP project area for the Lone Pine Lease are the Edwards, Richards, Smith, Old Place and Van Norman Pastures. All of these pastures were rated in 2007 with the exception of the Van Norman Pasture. The Van Norman Pasture was not irrigated in 2007-08 due to the irrigation water pump burning up. There was no irrigation water available for this pasture thus it could not meet the irrigated pasture evaluation criteria and was not rated. However, the remaining pastures within the project area on the lease were rated. All pastures except the Edwards and Richards Pastures met the minimum allowed score of 80%.

In 2010, the Edwards and Richards Pastures were evaluated again and both maintained good condition. The Van Norman pasture was also evaluated for the first time since the well that supplies irrigation water was repaired and received a score of 80%. It should only take several years for this pasture to improve from 80%. All irrigated pastures on the lease will be re-evaluated in 2012.

Irrigated Pasture Condition Scores 2007-10

Pasture	**2007**	**2008**	**2009**	**2010**
Edwards	80	80	94	90
Richards	64	82	92	84
Van Norman	X	X	X	80
Smith	88	X	X	96
Old Place	86	X	X	90

X indicates no evaluation made

Stockwater Sites

One stockwater well was drilled on the Lone Pine Lease located in the River Pasture uplands. The approximate location is two miles east of the river on an existing playa. The lessee will be responsible for installing the trough.

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.

Streamside Monitoring

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011 streamside monitoring in the Lone Pine Lease.

Land Management Table 9. Streamside Monitoring Lone Pine Lease (Spring 2011)

Site Specific Cover Data - Percentage by Species and Other Ground Cover Lone Pine Lease																														
Site Name	Species																					Other Ground Cover								
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
Lone Pine_Belt1a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	12	68	5	8	0	7	0	0	0
Lone Pine_Belt1b	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	6	0	28	61	8	3	0	0	0	0	0
Lone Pine_Belt2a	1	0	0	6	0	0	0	0	0	3	15	1	0	2	0	8	16	0	0	1	0	51	19	23	9	0	0	0	0	0
Lone Pine_Belt2b	1	0	0	13	0	0	0	0	0	0	8	1	0	0	0	21	15	0	0	0	0	57	27	12	4	0	0	0	0	0

Lone Pine_Belt1

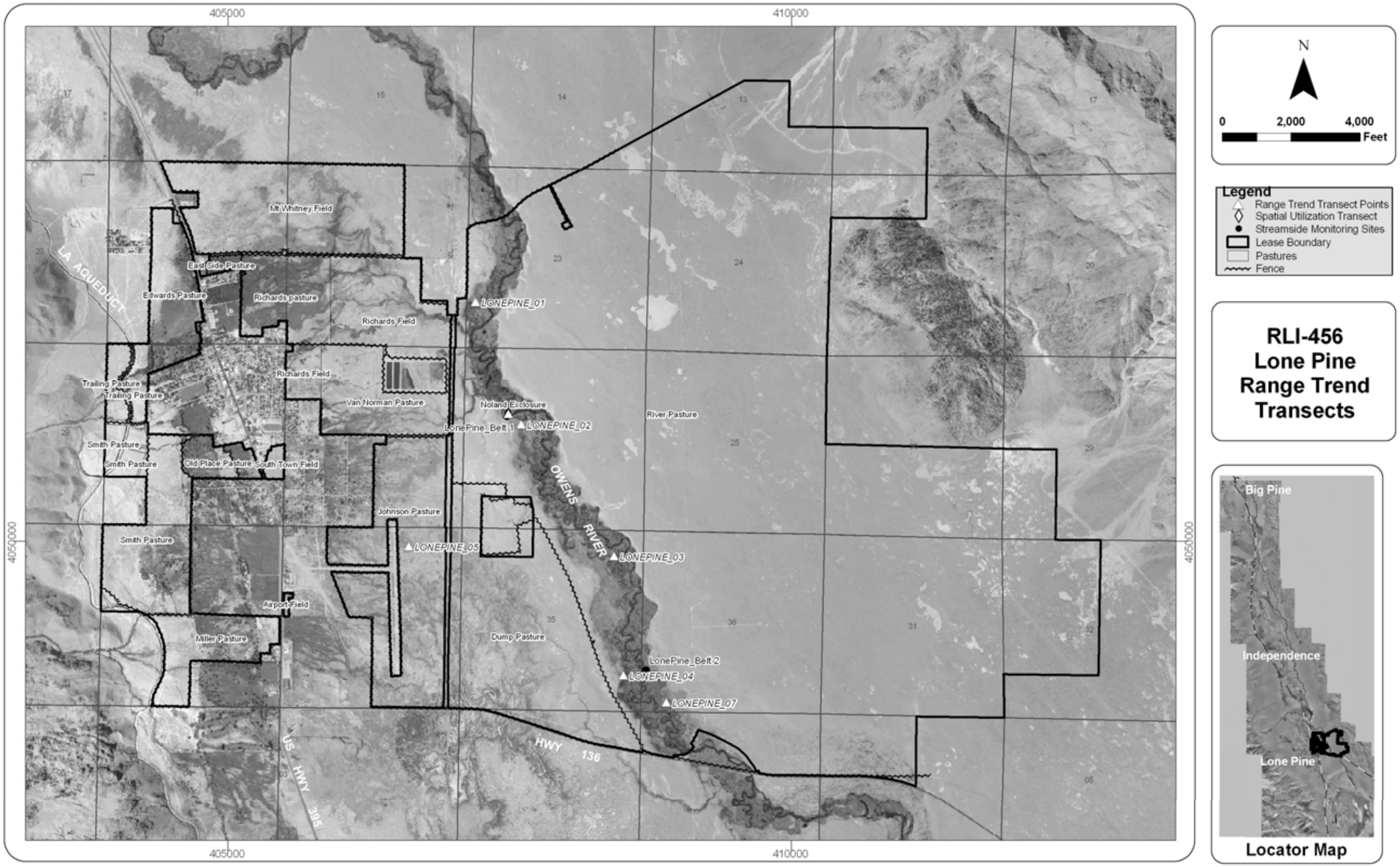
LonePine_Belt1a is located along a steep outer bend in the river in the Riverfield Riparian Exclosure. This vegetation was characterized as a combination of marsh and woody vegetation and was dominated by tules and mature Goodding's willow along most of the water's edge with substantial cover of wood's rose also within the belt. LonePine_Belt1b is located on an inside bend of the river within the Riverfield Riparian Exclosure. This belt was characterized as marsh, wet meadow, and woody vegetation and was dominated by saltgrass, alkali sacaton, and cattails. Much of the water's edge was occupied by living and dead cattails as well as common threesquare and yerba mansa. No woody recruitment was observed at either of these sites during the spring or fall surveys in 2011, nor was there any evidence of browsing or other wildlife use. End-of-season utilization was not available for LonePine_Belt1 in 2011.

LonePine_Belt2

LonePine_Belts2a and b are primarily saltgrass meadow with a notable presence of Goodding's willow. Species documented along the water's edge of both transects included living and dead tules, common threesquare, creeping wildrye, and saltgrass. No woody recruitment was noted on either transect during spring or fall surveys in 2011. The one red willow seedling documented at Lone Pine_Belt2a in 2010 was not picked up in the 2011 monitoring data, indicating that it either did not persist, or the quadrat frame was not placed in the same location to collect data in spring 2011. However, the majority of mature Goodding's willow along LonePine_2a are in good condition and actually are sprouting from their existing (and clearly live) trunks. Further, the condition of LonePine_Belt2a is excellent, as native grasses are vigorous and wetland obligate species are beginning to inhabit the banks, as shown in the photo below.

Beginning of LonePine_Belt2a (looking upstream) showing healthy saltgrass meadow, established Goodding's willow, tules in the channel, and common threesquare and Baltic rush beginning to inhabit the bank.

The area around LonePine_Belt2a also appears particularly valuable to wildlife; antler rubs and evidence of browsing by deer and/or elk were noted in both the spring and fall 2011 surveys, particularly by broken branches, large bedding areas, and fresh deer droppings in the fall. Great blue heron were also present onsite, as were coyote scat, butterflies and dragonflies. Recent browsing by deer or elk was also apparent at LonePine_Belt2b during the fall survey. End of grazing season utilization within the River Pasture averaged 34%. LONEPINE_04 and LONEPINE_07 are both located near LonePine_Belt2; end-of-season utilization for these sites was recorded as 45% and 8%, respectively in 2011.



Land Management Figure 6. Lone Pine Lease RLI-456, Range Trend Transects

4.9.7 Delta Lease (RLI-490)

The Delta Lease is a cow/calf operation and consists of 7,110 acres divided into four pastures. There are four fields located with the LORP project boundary: Lake Field, Bolin Field, Main Delta Field, and the East Field. Grazing typically occurs for 6 months, from mid-November to April. Grazing in the Bolin Field may occur during the growing season. The Delta and Islands Leases are managed as one with state lands leases.

Grazing utilization is currently only conducted in the Main Delta Field which contains the Owens River. The Lake Field is evaluated using irrigated pasture condition scoring. The East Field, located on the upland of Owens Lake, supports little in the way of forage and has no stockwater.

<u>Summary of Utilization</u>

The following tables present the summarized utilization data for each pasture, for the transects in each pasture, and by species for each transect for the current year.

End of Grazing Season Utilization for Fields, Transects and Species on the Delta Lease, RLI-490, 2011

Pasture	Utilization	Transect	Utilization	DISP	SPAI
Main Delta Field*	38%	DELTA_01	38%	38%	
		DELTA_03	18%	18%	
		DELTA_04	33%	33%	
		DELTA_05	50%	50%	
		DELTA_06	42%	42%	
		DELTA_07	51%	51%	
Bolin Field	13%	BOLIN_01	22%	22%	
		BOLIN_02	9%	12%	5%

**Riparian pastures (40% utilization standard)*

<u>Riparian Management Areas</u>

Utilization in the Main Delta was 38% for the end-of-season. The data at the transect level shows use had shifted this season to the east side of the river to Delta 5, 6, and 7. Use on the west side of the river was lower than the past grazing season which kept the utilization lower for the Main Delta Field.

<u>Summary of Range Trend Data</u>

No range trend transects were read on the Delta Lease in 2012.

<u>Irrigated Pastures</u>

The Lake Field is located west of U.S. Highway 395 north of Diaz Lake. This irrigated pasture was last evaluated in 2010 and received a score of 90%. This pasture will be re-evaluated in 2012.

Irrigated Pasture Condition Scores 2007-10

Pasture	2007	2008	2009	2010
Lake Field	84	X	X	90

X indicates no evaluation made.

Stockwater Sites

The Bolin Field was supposed to receive a stockwater site supplied by the Lone Pine Visitors Centers well in 2010. After a more in-depth analysis of water availability was undertaken, it was ascertained that there was not an adequate amount of water to sustain both uses. The resulting analysis has stockwater being supplied from a diversion that runs from the LAA. The status of this stockwater situation has not changed in 2011.

Fencing

A drift fence was constructed by the lessee to keep cattle from drifting on to California State Route 136 in 2011. However, only several miles of the fence was actually on LADWP property the remainder of the fence was on federal and privately owned property.

Salt and Supplement Sites

Cake blocks that contain trace minerals and protein are distributed for supplement on the lease. The blocks are dispersed randomly each time and if uneaten they biodegrade within one grazing season.

Streamside Monitoring

The table below shows percent cover of live vegetation by species, as well as other ground cover classes documented in the June 2011, streamside monitoring in the Delta Lease.

Land Management Table 10. Streamside Monitoring Delta Lease (Spring 2011)

Site Specific Cover Data - Percentage by Species and Other Ground Cover Delta Lease																													
Site Name	Species																					Other Ground Cover							
	ANCA10	ATTO	BAHY	DISPS2	EQAR	ERNA	FOPU	GLLE3	HECU3	JUBA	LETR5	SAEX	SAGO	SALA3	SAVE4	SCAC	SCAM	SCMA	SPAI	TYDO	TYLA	Total Percent Vegetated	Standing Dead	Litter	Wood	Dung	Fine Soil	Sandy Soil	Gravelly Soil	Cobble
Delta_Belt1a	2	0	0	0	0	0	0	0	0	1	5	8	0	0	0	8	0	0	0	0	0	24	60	6	2	10	0	0	0	0
Delta_Belt1b	2	0	0	0	0	0	0	0	0	0	3	6	0	0	0	4	0	0	0	0	0	14	59	22	2	0	5	0	0	0
Delta_Belt2a	1	0	0	0	0	0	0	0	0	1	1	0	3	0	0	14	0	0	0	0	0	18	71	0	6	0	6	0	0	0
Delta_Belt2b	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4	71	14	2	0	10	0	0	0

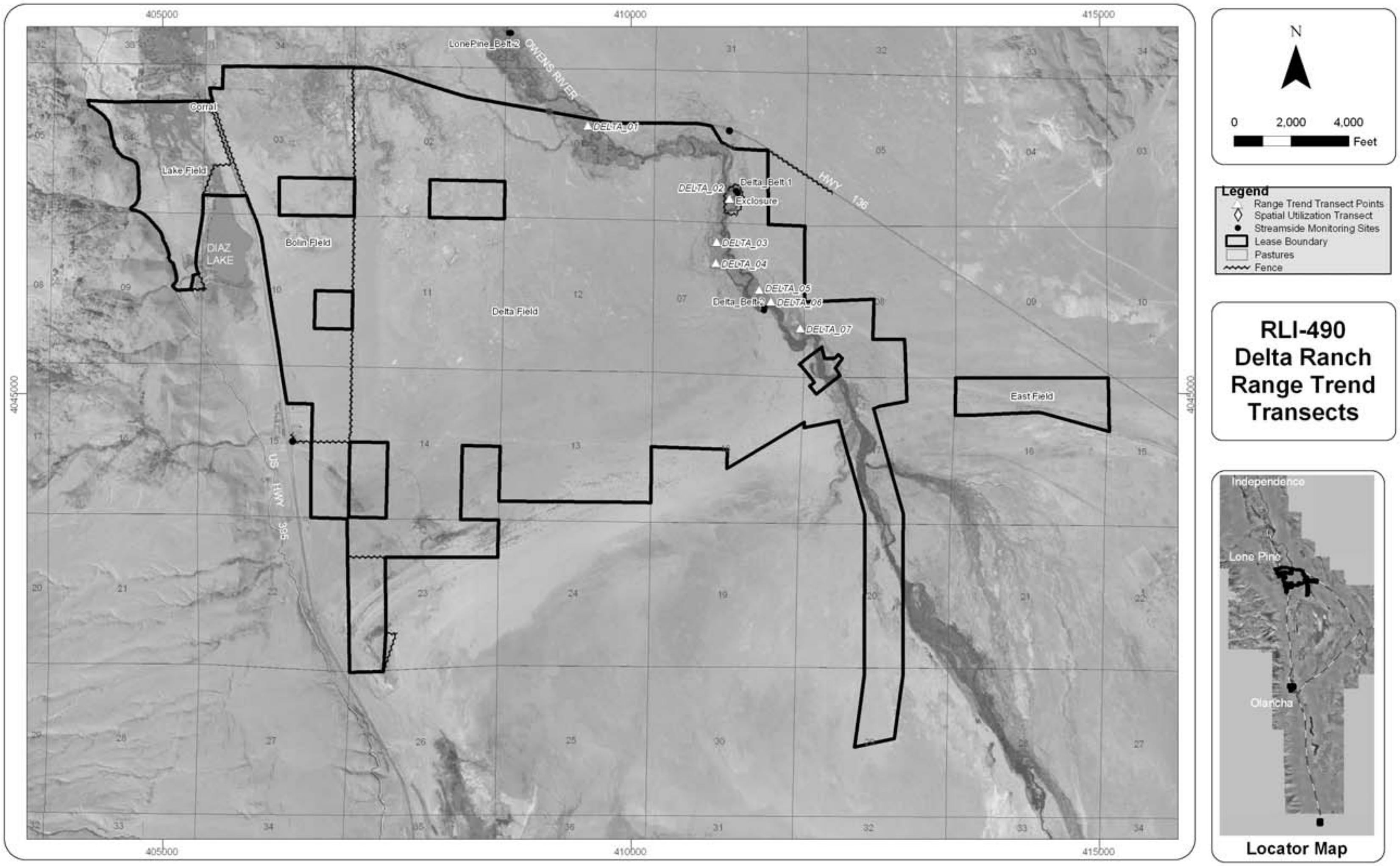
Delta_Belt1

Delta_Belt1a is located in the Main Delta Exclosure and was characterized as marsh along the water's edge and was dominated by living and dead tules with some narrowleaf willow along the southern end of the transect. Delta_Belt1b has a well-established corridor of narrowleaf willow along much of the streambank and is dominated by living and dead tules along the water's edge. Four narrowleaf willow seedlings were noted in the spring survey data at Delta_Belt1a; no additional recruits were noted at this site in the fall. No woody recruitment was documented at Delta_Belt1b during the spring or fall surveys. There was no evidence of browsing during either survey in 2011. End of grazing season utilization data was not collected within the Main Delta Field Exclosure.

Delta_Belt2

Delta_Belts2a and b are located in the Delta Field and are dominated by living and dead tules along the water's edge. Saltgrass, saltbush, and common reed dominate the adjacent wet meadows.

Total percent of the wetted edge that is vegetated or anchored with dead vegetation for Delta_Belts2a and b were 89% and 75%, respectively in spring 2011. No woody recruitment was documented at either site during the spring or fall surveys. There was no evidence of browsing during either survey in 2011. End-of-season utilization within the Main Delta Field averaged 38%. DELTA_06 is located near Delta_Belt2; end-of-season utilization at this site was 42% in 2011.



Land Management Figure 7. Delta Lease RLI-490, Range Trend Transects

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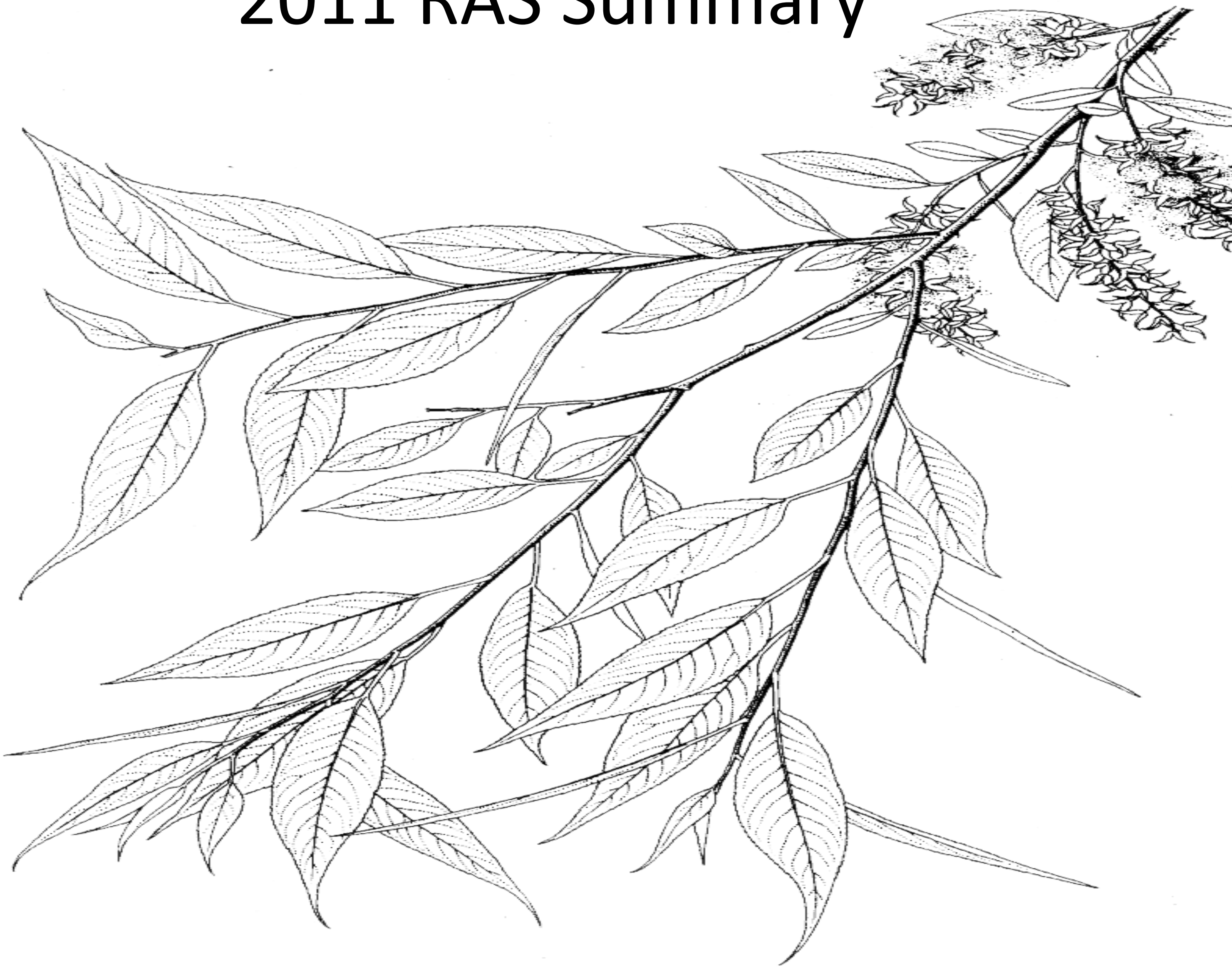
Land Management Appendix 1. Species Encountered Along 40 cfs Base Flow During Spring 2011 Streamside Monitoring.

Plant Code	Species Name	Common Name
ANCA10	*Anemopsis californica*	yerba mansa
ATTO	*Atriplex torreyi*	saltbush
BAHY	*Bassia hysopifolia*	bassia/smotherweed
DISPS2	*Distichlis spicata*	saltgrass
EQAR	*Equisetum arvense*	field horsetail
FOPU	*Forestiera pubescens*	stretchberry
GLLE3	*Glychorrhiza lepidota*	licorice
HECU3	*Heliotropis curvassum*	salt heliotrope
JUBA	*Juncus balticus*	Balitc rush
LELA	*Lepidium latifolia*	broadleaf pepperweed
LETR5	*Leymus triticoides*	creeping wildrye
SAEX	*Salix exigua*	narrowleaf willow
SAGO	*Salix gooddingii*	Goodding's willow
SALA3	*Salix laevigata*	red willow
SAVE4	*Sarcobatus vermiculatus*	greasewood
SCAC	*Schoenoplectus acutus*	tule
SCAM	*Schoenoplectus americanus*	common threesquare
SCMA	*Schoenoplectus maritimus*	cosmopolitan bulrush
SPAI	*Sporobolus airoides*	alkali sacaton
TARA	*Tamarix ramossissima*	saltcedar
TYDO	*Typha domingensis*	southern cattail
TYLA	*Typha latifolia*	broadleaf cattail

5.0 Lower Owens River Project 2011 RAS Summary



Lower Owens River Project (LORP) Summary of RAS Observations

The 2011 Rapid Assessment Survey (RAS) of the LORP was conducted by Inyo County and Los Angeles Department of Water and Power staffs between August 1 and August 12, 2011. The survey was completed in all four of LORP management areas: Riverine-Riparian Management Area, Blackrock Waterfowl Management Area (BWMA), Off-River Lakes and Ponds (OLP) and the Delta Habitat Area (DHA). Inyo County had primary responsibility for monitoring the Riverine-Riparian management area; LADWP had primary responsibility for the other LORP components. Typically, the largest numbers of observations are recorded along the river.

The method used to collect data was similar to previous year's efforts. The largest volume of observations typically occurs in the Riverine-Riparian effort. This year, Inyo County developed the procedures to utilize Trimble Juno data recorders to document observations and streamline the steps between field data collection and preparation of the geodatabase used for data analysis and storage. Field staff was very pleased with the ease in which they could record observations and office staff found that data handling was much improved over previous years. The new collection and management procedures are described in more detail below. Also new, staffs participated in a more formal training jointly conducted one week before the start of the survey. The training presentation was developed by Inyo County with the participation of LADWP.

Specific Impacts or Items of Interest Recorded in the LORP

The following observations (table1) of impacts 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.

Table 1

Code	Observation Type	Description
WDY	Woody Recruitment	Spring cohort of willow and cottonwood seedlings
TARA	Saltcedar (Tamarisk)	Saltcedar seedlings, resprouts from treated plants, and mature plants
ELAN	Russian Olive Recruitment	Seedling and juvenile Russian olive plants (height <2m)
NOX	Noxious Weeds	Any of twenty-one species of locally invasive plants, especially pepperweed
BEA	Beaver	Sightings or evidence of beaver in the LORP
OV VOLE	Owens Valley Vole	Sighting or evidence of Owens Valley Vole (*Microtus californicus vallicola*)
ELK	Elk	Sightings or evidence of tule elk (*Cervus canadensis* ssp. *nannodes*)
FISH	Fish Kill	Large numbers of dead fish
FEN	Fence	Reports of fence damage
GRZ	Grazing	Evidence of off-season grazing, or livestock conflicts with LORP goals
REC	Recreation Impacts & Use	Evidence of recreational activity
ROAD	Road	Unauthorized roads or road/trail building activities

TRASH	Trash	Large refuse or dumping
SLASH	Slash	Substantial piles of recently cut saltcedar
OBST	River Obstruction	Material obstructing river or ditch conveyance
CUTBANK	Cut bank	Riverbank erosion and undercut in meander
OTHER	Other	Observations not captured by other codes

Catalog of impacts recorded by the RAS

A summary of observations and total number of observation made by river-riparian reach or unit, and by impact, is as follows:

Table 2

Code	Observation Type	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	DHA	BWMA	OLP	Total
WDY	Woody Recruitment	2	45	55	3	5	20	—	2	12	**144**
TARA	Saltcedar Plants (Tamarisk)	12	88	119	57	34	40	36	80	94	**560**
ELAN	Russian Olive Recruitment	0	2	10	0	0	0	—	8	14	**34**
NOX	Noxious Weeds (Lepidium)	2	5	0	0	0	0	—	3	—	**10**
BEA	Beaver	1	6	5	0	3	1	—	—	—	**16**
OV VOLE	Owens Valley Vole	4	6	6	1	1	2	—	—	—	**20**
ELK	Elk	0	0	8	4	2	10	3	1	—	**28**
FISH	Fish Kill	0	0	0	0	0	0	—	1	—	**1**
FEN	Fence	0	4	3	0	0	1	—	—	—	**8**
GRZ	Grazing	0	0	2	2	0	0	—	—	—	**4**
REC	Recreation Impacts & Use	0	4	7	0	1	17	—	—	3	**32**
ROAD	Road	4	0	1	2	2	1	—	—	1	**11**
TRASH	Trash	0	1	0	0	2	2	1	—	—	**6**
SLASH	Slash	0	4	0	0	0	2	39	—	—	**45**
OBST	River Obstruction	0	0	0	1	0	2	—	—	—	**3**
CUTBANK	Cut bank	0	3	0	0	0	0	—	—	—	**3**
WILDLIFE	Indicator Species	0	0	4	0	0	1	10	30	—	**45**
OTHER	Other	0	0	4	0	0	1	—	—	—	**5**

Summary by Observation Category and River Reach (Whitehorse 2004)

Table 3

	REACH 1	REACH 2	REACH 3	REACH 4	REACH 5	REACH 6
RIVER-MILES	0 to 4.0	4.1 to 19.6	19.7 to 34.5	34.7 to 38.5	38.6 to 42.8	42.9 to 53.6

River Reach to equivalent River Mile (RM)

Revisited Impacts

Field staff returned to a select list of sites to verify that an impact recorded previously had been corrected (fence repair, saltcedar removal), or to follow the progress of willow and cottonwood recruitment, or to identify recurring problems such as road development and trash dumping.

In total, 147 sites were selected for revisits. The impacts chosen for revisits included saltcedar seedlings, woody recruitment, and roads. Woody recruitment sites from previous years that were revisited in 2010 and still had saplings present were revisited again in 2011 to determine their status. Road locations revisited in 2010 and still had continuing management issues were revisited again in 2011. The results from these revisits are found in the reporting on individual impacts.

In addition to revisiting previously identified sites, staff was directed to inspect the integrity of livestock grazing exclosures.

Table 4

Reach/Area	ROAD	WDY	TARA	FEN*	REC
Delta	0	4	1	0	1
OLP & BWMA	0	0	11	1	0
Reach 1	5	2	0	0	0
Reach 2	2	44	27	0	0
Reach 3	4	24	4	0	0
Reach 4	3	0	5	0	0
Reach 5	2	2	0	0	0
Reach 6	1	3	2	0	0
Total per Category	**17**	**78**	**50**	**1**	**1**

Revisit sites: total number and type of observation made by reach.

Summary of Observations by Category

Woody Recruitment (WDY)

Maps 1a&1, and 6

Compared to 2010, the total number of woody recruitment sites found along the river and in flooded areas increased more than 50%. This is likely, in part, attributable to: 1) the timing of the Seasonal Habitat Flow (SHF) relative to the beginning of the RAS, and 2) the recording of *Salix exigua* root sprouts as woody recruitment.

Last year's RAS was conducted within two weeks of the release of the SHF, and the seedlings that were found were less than 2 cm tall and difficult to spot. This year the RAS was conducted four weeks after the SHF, and seedlings were developed to the point that they could be more easily detected.

In previous years, only SAEX plants believed to have been established by seed were regularly recorded, consistent with the protocols developed in the Monitoring and Adaptive Management Plan. With SAEX, new shoots arise singly or a few together and form clonal stands from spreading lateral roots. In the spring SAEX produces root sprouts in abundance, often in long rows that spread a considerable distance from the parent plant. SAEX also crown sprouts. It can be difficult to differentiate between the spread of existing SAEX colonies by sprouting and recruitment from seed. Notable spread of SAEX by root sprouting was observed beginning by at least 2010, and was recorded under the category of "OTHER" in 2010 by some observers. Methods were refined in 2011 whereby observers recorded both root sprouting and seedling establishment of SAEX (under the "Woody Recruitment" category), thereby improving documentation of the spread of this woody riparian species. The "5 meter" rule was established whereby young SAEX (plants < 1meter tall) and within 5 meters of an existing established plant were considered root sprouts. Root sprouting was recorded as "woody recruitment" in 2011, but the "< 1 meter" height category marked in order to differentiate sprouts from seedlings. SAEX that was less than one meter high and > 5 meters from an existing plant were marked as "seedlings". This method allowed improved documentation of SAEX recruitment, while remaining consistent with methodologies of previous years.

- One hundred forty-four WDY observations were recorded in all project areas, with 114 sites in the riverine-riparian area alone. Seedling recruitment was almost equally split between shrub willow (30 sites) and tree willow (27 sites). (Table 5a).
- Thirty-four SAEX root or crown sprouts were recorded. (Table 5b).
- Four of 14 SALIX were identified in comments as either tree species (*n*=3), or hybrid species (*n*=1).
- The total number of seedling found in 2011 is 45% greater than the number of seedlings observed in 2010. Past recruitment observations were: 2010 (*n* =31), 2009 (*n* =71), 2008 (*n* =222), and 2007 (*n*=49).
- As in previous years, more woody recruitment was found in the northern reaches of the river. Seventy-five percent of recruitment was found in reaches 2 and 3.

- Most seedlings were recorded on a riverbank (*n* =36), but others were found in the channel (*n* =11), and floodplain (*n* =16).
- About half of the WDY locations were of 1-5 individual plants. (Table 6).
- As in 2010, no cottonwood seedlings were found.

Table 5a

Code	Common Name	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	DHA	BWMA	OLP	Total
SAEX	Narrow leaf willow	—	12	15	—	—	1	—	1	2	30
SAGO	Black willow	—	6	8	1	1	—	—	—	—	16
SALA3	Red willow	—	5	4	1	1	—	—	—	1	11
SALIX	Hybrid, or unknown willow	1	6	1	2	1	3	—	—	—	14
POFR3	Cottonwood	—	—	—	—	—	—	—	—	—	0
Total		**1**	**29**	**28**	**4**	**3**	**4**	—	**1**	**2**	**72**

Number of sites where seedling were located, by species and location

Table 5b

Sprouts	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	DHA	BWMA	OLP	Total
SAEX (*h* <1m)	—	—	17	—	2	10	—	1	4	34

Number of sites where SAEX clonal spouts were located by river reach or unit

Table 6

Code	Common Name	1-5 Individuals	6-25 Individuals	26-100 Individuals	>100 Individuals
SAEX	Narrow leaf willow	32	28	6	8
SAGO	Black willow	11	9	3	—
SALA3	Red willow	10	11	1	—
SALIX	Hybrid, or unknown willow	14	4	—	—
POFR3	Cottonwood	2	3	—	—
Total		**69**	**55**	**10**	**8**

Abundance of seedlings per site, by species (one record was submitted without abundance information)

---Woody Recruitment Revisits---

Maps 8a&8b

Staff visited 78 locations where willow and cottonwood had been documented in the 2010 RAS.

- Five cottonwood sites found in previous years continued to persist.

Table 7

Condition:	Present (unchanged)	Absent	Increasing	Decreasing	Not visited
Number of observations	43	13	11	6	5

Condition of previously observed (2010 RAS) plant populations

Saltcedar (TARA)

Maps 2a, 2b, 6&7

Tamarisk is the most abundant noxious weed in the project area, and is seen throughout the LORP. In 2011, resprouts, seedlings, and mature plants were recorded. In 2010 only tamarisk resprouts and seedlings were recorded.

Table 8

Observation Type	River	DHA	BWMA	OLP	Total
Seedlings	91	7	11	0	**109**
Resprouts (<2m)	154	23	34	50	**261**
Mature (>2m)	105	6	35	44	**190**
Total by Unit/Overall	**350**	**36**	**80**	**94**	**560**

Characteristics of saltcedar found on the LORP by location

- Low numbers of plants (1-5 individuals) were most commonly recorded at each site, however four sites had >100 seedlings and sixteen sites supported 26-100 plants. At most sites with low numbers of plants present, observers pulled seedlings when accessible, but many areas still require further treatment.
- The majority of seedlings were in the river-riparian unit.
- About half of all mature plants and a third of all resprouts were found in off-river locations in the LORP area. Resprouts in the DHA were from stumps of plants cut in early 2011, while resprouts in BWMA and OLP were plants resprouting from fire.

Table 9

Observation Type	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Total
Seedlings	3	47	26	4	5	6	**91**
Resprouts (<2m)	5	17	67	29	20	16	**154**
Mature (>2m)	4	24	26	24	9	18	**105**
Total by Reach/Overall	**12**	**87**	**119**	**57**	**34**	**40**	**350**

Characteristics of saltcedar found in the river-riverine unit of the LORP, by type, and reach

- Compared to 2010, three times as many seedling sites were found on the river.
- About 60% of saltcedar locations on the river were in reaches 2 and 3.

---Saltcedar Revisits---

Maps 8&9

All fifty TARA seedling locations found in 2010 were revisited. In the off-river sections of the LORP, saltcedar was present at 18 of 21 sites assessed. In the river corridor, saltcedar was present at 23 of 29 sites.

- Twenty of the 29 revisits were located on the east side of the river.

- Fifty-five percent of the TARA revisit sites were located in Reach 2.
- Eleven of the TARA revisit sites supported more than 100 sapling plants, and in some cases new recruitment.

Russian Olive (ELAN)

Maps 3&6

Although ELAN is not a priority for eradication, for surveillance purposes, surveyors were instructed to record ELAN recruitment.

- In 2011, ELAN seedlings were located at 34 sites; 12 in the river corridor, and 22 combined in the BWMA and ORP. No ELAN was found in the Delta.
- For comparison, in 2010, ELAN seedlings were recorded at six locations.

Noxious Weeds (NOX)

Maps 3&6

Perennial pepperweed (*LELA2*) was the only weed recorded in this management category in 2011. Field staff was directed to not record known infestations, or plants that had been sprayed with herbicide.

- Nine new LELA2 sites were discovered during the 2011 RAS; seven in the river corridor and two in the BWMA (Winterton and Drew Units). These locations have been reported to the Inyo County Agricultural Commission.

Beaver Activity (BEA)

Maps 4a&4b

Beaver activity and evidence was noted at 16 locations as compared to seven locations in 2010.

- Beaver activity and observations of swimming individuals were seen in the upper reaches at river miles (RM) 3.0 and 5.0. Previously, one record had been made of beavers this far north (In 2008 at RM 0.3, there was recorded "chew marks on willow, not recent but possible this year, one-half tree fallen").

Owens Valley Vole (OV VOLE)

Maps 4a&4b

Vole runways and droppings were recorded in every reach and both east and west of the channel. Twenty point locations were noted establishing presence in an area; however vole evidence was generally widespread and not confined to these point locations.

- Vole evidence was widespread; however half of all vole records were made in the northern section of reach 2, and northern section of reach 3.
- Although OVV sign had been previously reported in the off-river units, no evidence of vole activity was recorded in these areas in 2011.

Elk (ELK)

Maps 4a, 4b, & 7

Evidence of elk and elk sightings were noted at 28 locations.

- Most activity was recorded in the middle-reaches of the river, with activity concentrated in three sections of the river: RM 20-25; RM 33-41; and RM 45-51.
- Eighty percent of sightings were made on the west side of the river.
- Seven records were made of browsing.
- Thirteen signs of antler rub were noted.

Fish Mortality (FISH)

Map 6

Fifty dead fish were found in a channel cutoff from larger waters in the Waggoner unit of the BWMA. No other reports were made.

Fencing (FEN)

Maps 5a&5b, and 8a&8b

Staff surveyed exclosure fencing as well as riparian fence. The riparian fence had been reported damaged in eight locations.

- At five sites, the damage was a result of people stretching the wires to gain access. The installation of walk-throughs may be an appropriate adaptive management measure to prevent further damage.
- Riparian fencing was cut presumably to gain access at Manzanar Reward Road and just north of Two Culverts on the west side of the river.
- At a location on the east side of the Islands, a dead calf was hung up in the fence and the wires had been cut.
- The riparian exclosure fence on the west side of the river, east of Goose Lake at range trend site BLKROC_11, had loose wires.
- The riparian exclosure fencing near George’s Creek on the Lacey Lease had many loose wires east of the river.

---Fence Revisits---

Maps 8&9

The fence along the western boundary of the Waterfowl Management Area in the Thibaut Management Unit is still in need of evaluation and potential repair.

Grazing Management Issues (GRZ)

Maps 5a&5b

- Cattle were found in the riparian area on both the east and west side of the river on the Islands Lease
- Two feed supplement sites were found at the western edge of the Islands area in alkali meadow site.

Recreation (REC)

Maps 5a&5b, and 8a&8b

Previously, REC included only evidence of damaging, or incompatible recreational uses, but beginning in 2011, this category has been expanded to include general observations and evidence of all types of recreation occurring in the LORP.

- Twenty-nine impacts were recorded in the river corridor. No evidence of recreational use was found in the BWMA, or DHA. Three records of recreational use were made off-river at Twin Lakes.
- Evidence of fishing (trails, vegetation cleared to the water, and angler related litter) was found at nine locations, two of these at Twin Lakes. Five of the seven observations made on the river were in reach 3.
- Evidence of hunting activity was recorded only once, in reach 2.
- Evidence of ORV use was found in five locations, all within reach 6.
- Trails and purposefully trampled vegetation, leading down to the river, were found at 13 locations. Eight of these locations involved simple openings in the cattails and fishing platforms.
- These access points appeared to have been created in succession, allow fishing access along a quarter mile of river, just downstream of Highway 136.
- Evidence of target shooting was found at three locations on the river.

Roads (ROAD)

Maps 6, and 8a&8b

Observers were provided maps showing roads that were present in 2005, and were instructed to record new roads, or new impacts associated with existing roads. Eleven new observations were made.

- One prominent new road in Reach 4, in the west part of the Islands was thought to have been created by burn crews working in the area.
- Evidence of recent vehicle activity along the bank throughout the area of the recent prescribed burn on the Islands lease, east of the river
- At least one track was recorded in a wetted area in the floodplain.
- A new road was documented in the Coyote/Goose Lake area

---Road Revisits---

Maps 8&9

Four revisits were made to river sites where vehicles were creating new routes into riparian areas, and another revisit looked at a fishing access road in an off-river location. All previously-documented roads and tracks were present and recently used.

Trash (TRASH)

Maps 5a&5b, and 7

Observers were asked to record large trash item. Furniture, appliances, and building materials were recorded at five locations.

- A couch that had been recorded over the past three years has not been removed.

Tamarisk Slash (SLASH)

Maps 5a&5b

Forty-one new piles of recently cut Tamarisk slash were recorded in 2011. Thirty-eight of the 41 new piles were recorded in the DHA where LADWP had recently cut saltcedar.

River Obstructions (OBST)

Maps 5a&5b

Three obstructions to river flow were noted. Vegetation and trees blocked the channel in reach 4, and a large log blocking the channel was identified as a hazard to boats in reach 6.

Cutbank (CUTBANK).

Maps 5a&5b

No new cut bank observations were noted.

Wildlife (WILDLIFE)

This category included opportunistic observations of habitat indicator species in the DHA and Drew Management Unit, which is in active status.

- At the Drew Unit, several species of ducks including Mallard, Gadwall, Redhead, and American Wigeon were seen. Mallard and Gadwall broods were also present. Shorebird and wading bird species seen include Black-necked Stilt, Greater Yellowlegs, Killdeer, dowitchers, phalaropes, Great Egrets, Great Blue Heron and American Bittern. One Black-necked Still brood was seen.
- At the DHA, over 100 waterfowl were seen including Cinnamon Teal and Mallard. Other habitat indicator species seen include White-faced Ibis, Great Blue Heron, Greater Yellowlegs and Northern Harrier.

Other (OTHER)

This category includes observations that may be of interest to project managers, but cannot be categorized under other codes.

- Recorded were *Micropterus* (bass), *Neotoma* (woodrat) midden, and *Cuscuta* (dodder).

RAS Data Collection Design and Preparation

To improve efficiency and quality of data collection and processing for the Lower Owens River Project (LORP) Rapid Assessment Survey (RAS) performed each August, Inyo County Water Department (ICWD) GIS/data manager in March 2011 undertook a review of the data collection and management from previous RAS. The review included LORP Monitoring, Adaptive Management and Report Plan (MAMP); consultant comments, procedures, notes, and data from past RAS; and the ACCESS database and GIS files used to store data collected. Critical deficiencies in the data handling that emerged from this review were: (1) reliance on paper data sheets for recording observations that required multiple and time-consuming steps to integrate with GPS files, transcribe and load to a database; (2) lack of consistency and standards for data collection; and (3) poorly designed ACCESS database for data storage, with most users using GIS or excel for analysis and reporting. To address these issues a review of devices and software for direct collection in the field and re-design of data storage were undertaken.

After investigation of handheld GPS units and related software for data collection, Trimble Juno units and ArcMobile software were selected. The Trimble Juno units are designed for field data collection with 2-5m accuracy, have integrated camera and Windows mobile operating system. The relatively new ArcMobile software is specifically designed for field collection by users with limited to no GIS experience and skills. The collection process may be customized to guide a user through integration of existing data and pull-down menus for collection of new features. Once collected, the data can be transmitted wirelessly to update the geodatabase or synchronized through the desktop at the office without further handling.

To implement the digital data collection with these tools, it was necessary to undertake design and construction of a geodatabase. A spreadsheet was constructed that listed each of the observation categories specified in the MAMP and prior RAS as well as criteria for characterizing each observation type. Both the categories and characteristics were documented by citing the relevant section and page of the MAMP or notes from prior RAS. The spreadsheet was distributed throughout ICWD for review and modified accordingly. In addition to design of digital collection, a revised paper data sheet was also created. The revised spreadsheet, a revised paper data sheet, and draft data dictionary were sent to LA DWP staff in early May. On May 12, Inyo and LA staff met to further refine data collection criteria and the model geodatabase. After consultation with Nate Reade (Inyo/Mono Agriculture Office), criteria were again modified and the geodatabase was constructed in June 2011. The Juno units and ArcMobile software was successfully test in the field in July 2011.

The geodatabase as designed directly incorporates field data. It has the advantage of storing both spatial and tabular data with ability to query, display and analyze. As such it eliminates need for transfer to other programs for these purposes.

Paper data sheet collection was continued for about half of the ICWD observers and all of the LADWP field staff, due to potential uncertainties of implementing a new technology and expense of renting/purchasing the Juno units. As noted, the paper data sheets were modified to use codes and criteria created for the geodatabase.

6.0 Blackrock Waterfowl Management Area Avian Surveys

Introduction

Systematic bird surveys are being conducted in the Blackrock Waterfowl Management Area (BWMA) in order to document bird species use, habitat associations, and breeding status. Bird survey data can be used to better understand the response of bird species, including habitat indicator species, to changing habitat conditions in the project area. The habitat indicator species in the BWMA include all resident, migratory, and wintering waterfowl, wading birds, shorebirds, rails and bitterns, Northern Harrier, Osprey, and Marsh Wren.

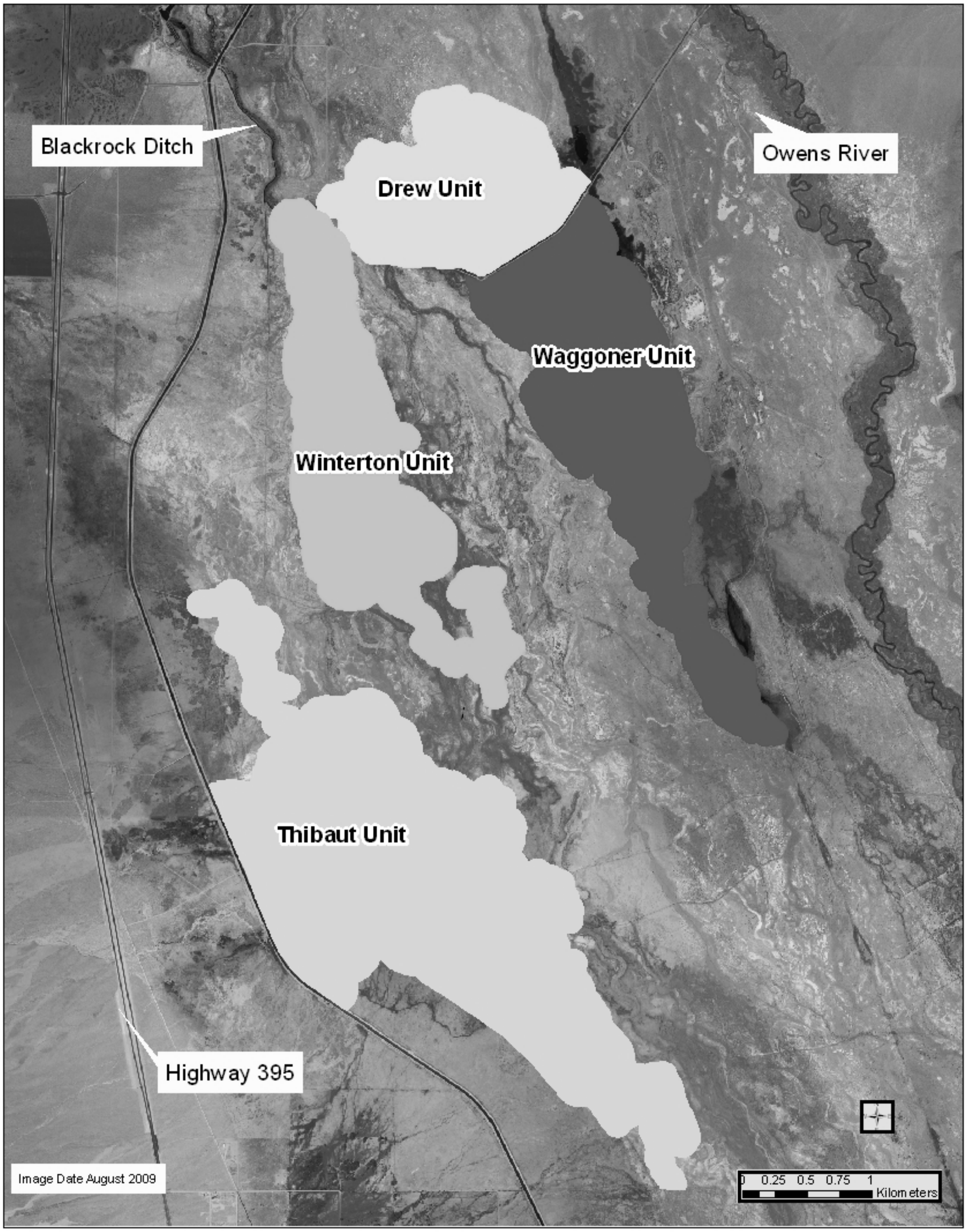
The BWMA is composed of four separate management units: Drew, Thibaut, Waggoner, and Winterton (Figure 1). Under the Lower Owens River Project (LORP), Los Angeles Department of Water and Power (LADWP) is required to flood up to 500 acres in order to provide habitat consistent with the needs of indicator species. The specific amount of flooded acreage to be maintained in any one year is dependent upon the percent forecasted runoff. When runoff is forecasted to be 100% or more of average annual runoff, 500 acres are to be flooded at any given time. When the runoff forecast is 50-99% of the average annual, water supplied to the BWMA will be reduced in general proportion to forecasted runoff, with the specific acreage to be maintained set by the Standing Committee (Ecosystems Sciences, 2008) in consultation with the California Department of Fish and Game. In dry years (<50% annual average runoff), water will still be provided to BWMA, with the amounts and target acreage set by the Standing Committee.

Changes to the operation of the management units generally take place in the month of April, after runoff conditions have been determined. The 2011-2012 runoff forecast was for 150% of normal, thus 500 acres was to be flooded in the BWMA. In April 2011, the Winterton Unit was placed in active status while the Waggonner Unit was taken out of active status and dried. The Drew Unit, initially placed in active status in April 2009, remained active throughout 2011.

Avian surveys were conducted in the Winterton Unit of BWMA only in 2011. In 2011, LADWP staff managed the project, and field surveys were conducted by LADWP Watershed Resources Specialists Debbie House and Chris Allen, and Inyo County Water Department (ICWD) Field Program Coordinator Jerry Zatorski.

6.1 Habitat Indicator Species

LORP Technical Memo #15 *Resource Management in the Blackrock Waterfowl Habitat Area* (Tech Memo 15) provides a list of habitat indictor species for BWMA. This list is supposed to help guide wildlife resource management in the BWMA. This list includes species that occur in the area on a regular basis, although they may be rare or uncommon. Tech Memo 15 states that the list could be expanded or contracted depending on the frequency of occurrence or level of abundance that is considered appropriate. The BWMA has attracted a larger suite of waterbirds than perhaps anticipated, such as grebes, terns, and gulls. These species are responding to the actions taken under the LORP, and thus will be included in the species summaries grouped with other habitat indicator species. The species to be included as habitat indicator species will thus be all waterbird groups including waterfowl (Family Anatidae), wading birds (Order Ciconiformes in part), grebes (Family Podicipedidae), shorebirds (Order Charadriiformes), rails (Family Rallidae) and bitterns, gulls and terns (Family Laridae), as well as the specific species identified in Tech Memo 15, namely Northern Harrier, Osprey, and Marsh Wren.



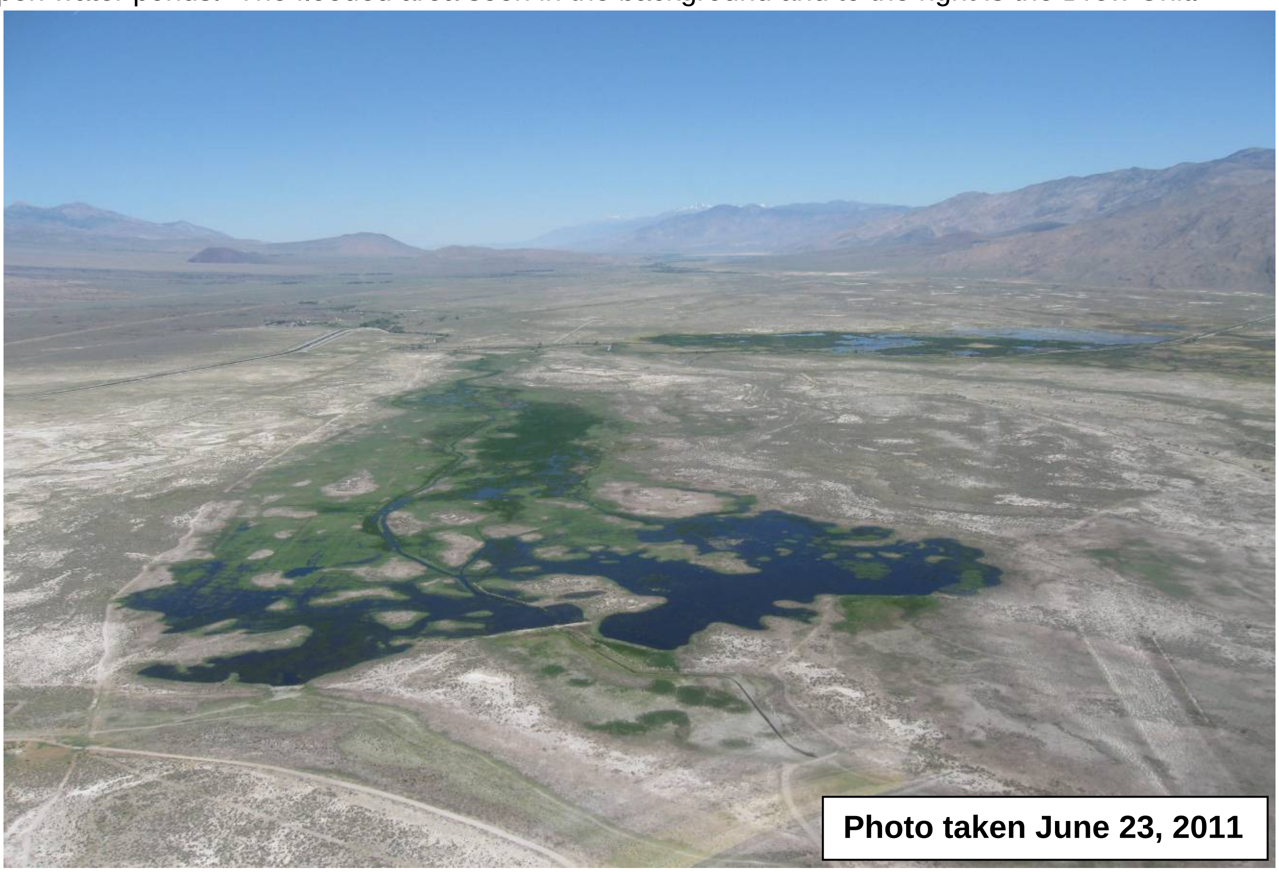
Avian Surveys Figure 1. Location of Blackrock Waterfowl Management Units

6.2 Operation of the Winterton Management Unit

In April 2011, the Winterton Unit entered its second period of active status since implementation of the LORP, having last been flooded from 2007-2009. Under preproject conditions in 2000, this unit was dominated by dry scrub communities and wet alkali meadow. During 2004, when baseline bird surveys were being conducted, there was a temporary water release to the Winterton Management Unit in April during construction activities on the Los Angeles Aqueduct.

No vegetation treatment was done prior to flooding of the unit in 2007-2009. Vegetation in all four units of BWMA were remapped in 2010, and since the unit was inactive, rabbitbrush-Nevada saltbush scrub/meadow and dry alkali meadow continued to dominate the unit. Dense dried emergent vegetation was also present at the center of the unit. Prior to the initiation of water releases in 2011, a prescribed burn was conducted in early March 2011. A total of 963 acres were burned, removing dense brush and dried emergent vegetation. This action ensured that open water habitat would be available once the area was flooded. Flooding was initiated on April 1 at a rate of 4.6 cfs, increasing to 5.1 cfs on June 1. Releases were further increased to 5.5 cfs on August 16.

Figure 2 is a photo taken from a helicopter, looking south to north, showing conditions of the Winterton Unit on June 23, 2011. The northern part of the unit is fairly flat, while the southern part has undulating topography. A historic ditch directs water southward towards the basins, creating open water ponds. The flooded area seen in the background and to the right is the Drew Unit.



Avian Surveys Figure 2. Aerial View of Winterton Management Unit in 2011

6.3 Avian Surveys

Preproject Baseline Surveys

Prior to implementation of the LORP, baseline surveys were conducted in the BWMA during 2002 and 2003 and again in 2004. A limited survey schedule was followed in 2002-2003, resulting in a total of five surveys for this time period. Following an evaluation of the data from the initial baseline inventory effort in 2002-2003, LADWP staff recommended increasing the number of surveys per year in the BWMA in order to improve documentation of use of the units by migratory and breeding waterbirds. This increased effort involved four spring surveys at two-week intervals starting the end of March/beginning of April and ending by mid-May, two surveys in June to detect or confirm breeding, and five fall surveys conducted at two-week intervals starting the first week of August and continuing to the end of September or early October. This more intensive survey schedule was followed during baseline surveys conducted in 2004, with the addition of a mid-November winter period survey.

Post-Implementation Surveys

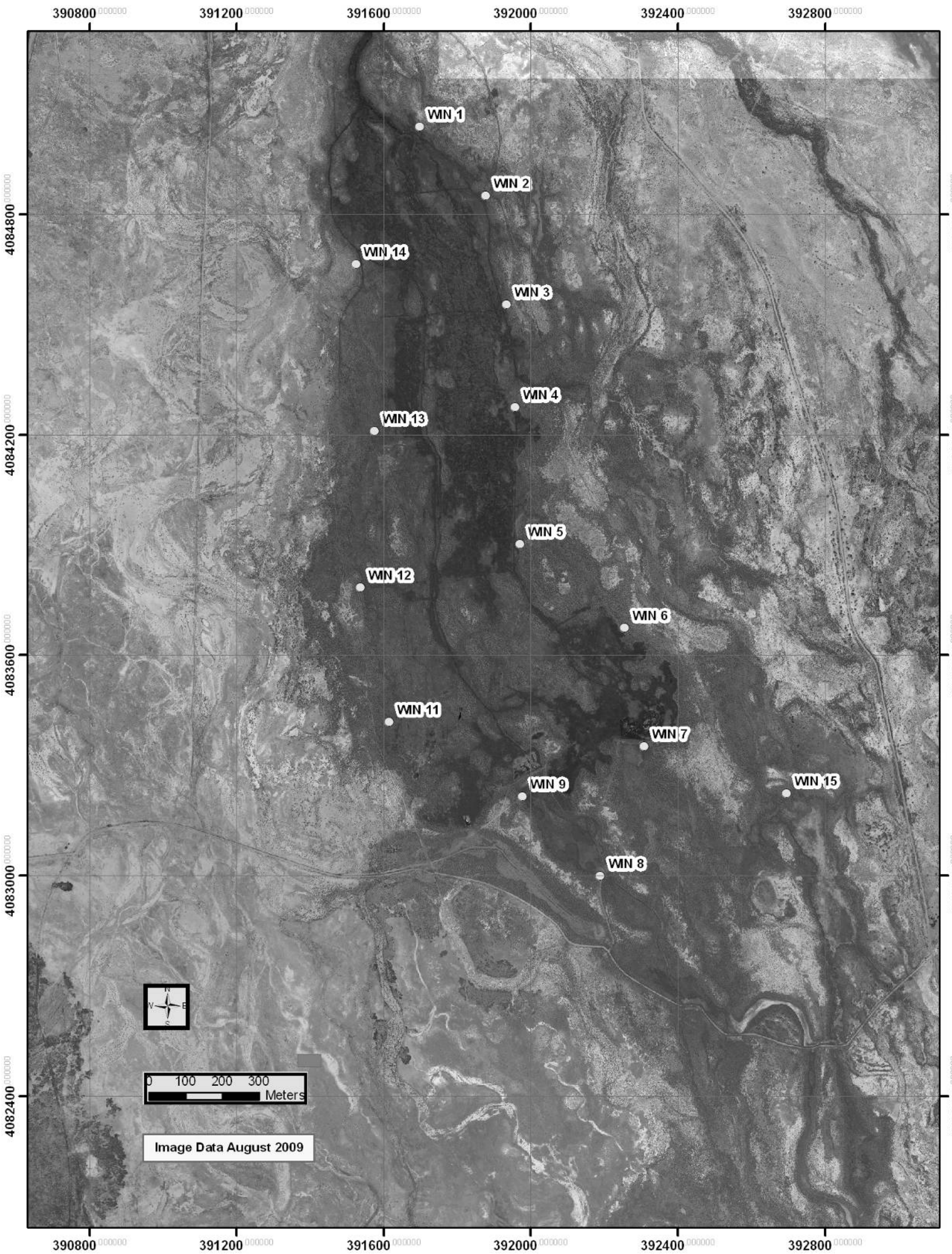
Although the Thibaut and Winterton Units of the BWMA were in active status from the spring of 2007 through April 2009, no avian surveys were specified in the annual monitoring schedule in the LORP Monitoring, Adaptive Management, and Reporting Plan (MAMP) (ES 2008) until 2010. Therefore, no data are available for Winterton during the last period of active status from 2007-2009. In 2011, the Drew and Winterton units were active, but only the Winterton Unit was surveyed and these surveys are the first surveys conducted of this unit while in active status. Surveys were conducted by LADWP and ICWD staff following the same schedule as in 2004 and 2010, namely four spring, two summer, five fall, and two winter surveys. Surveys for the year began in April, just after water releases were started. Since the unit did not become active until April, winter surveys for the 2011-2012 period have not been conducted as of yet.

Prior to conducting the 2011 surveys, LADWP evaluated the routes and made modifications to the Winterton route to provide better coverage of the unit. Figure 3 shows the stations used during surveys in 2011. One station (WIN7) was moved from a basin that was not expected to flood, to the edge of a basin that will flood (based on 2007-2009 wetted extent information). Station WIN10 was then deleted as it was not needed. An additional station (WIN15) was added at the southeastern edge of the unit, in an area that flooded in 2007-2009, when the unit was at its maximum flooded extent. Three additional points were added to the western edge of the route in 2011 (WIN12, WIN13 and WIN14).

Survey Methodology

Surveys used a combined point count/area search methodology. Surveys were started within one hour of local sunrise time, and generally completed within five hours. The starting point for each route was alternated for each visit. Surveys were not scheduled if heavy rain or excessive winds were predicted. Observers recorded all species observed or heard during a 5-minute period at each station. Observers were also instructed to record birds detected between stations, if the observer was certain that the individual had not been already been recorded. The distance from the observer to each bird detected was recorded during all surveys. In addition, the activity of the bird or birds and the habitat being used at initial detection were recorded. The activities defined were: singing, calling, flying (within the habitat), flying over (not using habitat), foraging, perching, breeding, or flushed. If the activity was recorded as “breeding”, one of 10 breeding observation codes was also used to document the specific evidence of breeding seen. Examples of breeding codes include “FC” for food carry and “MC” for material carry. The breeding observations codes used are consistent with those used by Heath and Gates (2002) during baseline bird surveys in the Riverine/Riparian management area of the LORP. The habitat categories used were: water, marsh, wet alkali meadow, phragmites, dry alkali meadow, riparian, rabbitbrush/Nevada saltbush scrub, desert sink scrub, mudflat, and barren.

In 2011, photos were taken at each bird census station several times from April through September in order to document changes in habitat condition throughout the year. These photos will be compared to those taken in 2010 in order to demonstrate habitat changes resulting from the prescribed burn and subsequent flooding.



Avian Surveys Figure 3. Winterton Management Unit Bird Survey Stations

6.4 Data Analysis

Bird survey data was entered into an Access database. Data entry and data verification was performed by LADWP staff. The project lead performed a final proofing of the database prior to analysis.

Bird species recorded were classified as habitat indicator species or non-habitat indicator species. The total detections of each indicator and non-indicator species were summed by survey and season. Habitat indicator species were further classified as belonging to one of five categories: waterfowl and grebes, rails and bitterns, wading birds, shorebirds, and gulls/terns/cormorants/pelicans. The three specific species: Northern Harrier, Osprey and Marsh Wren, were considered separately.

Indicator species diversity, richness, and abundance for indicator and non-indicator species were calculated for each survey and each survey year (2004, 2010, and 2011). Differences in mean habitat indicator species diversity, richness and abundance in active versus inactive status were evaluated for the Winterton Unit using One-way Analysis of Variance (SigmaStat 3.5). Analysis was not done on winter data since none is available while Winteron has been in active status. Data was log-transformed prior to statistical analysis. The total detections of each indicator species category, or specific species were summed by season and survey year. Habitat use data for indicator species was evaluated when at least 30 observations were available for a group. The proportion of total observations in each habitat type for each indicator species group was calculated, excluding flyovers.

6.5 Results - Winterton Management Unit

6.5.1 Habitat Conditions

Figures 4-12 are photos taken at survey stations in the north (Station 1), central (Station 4) and southern (Station 11) portions of the unit. These photos show habitat conditions in 2010 (unit dry, pre-burn), April 2011 (post burn, early releases), and October 2011 (unit flooded, vegetation regrowth). These photos show not only the dramatic change as compared to pre-burn conditions, but also demonstrate how conditions changed markedly from April to October.

The northern portion of the unit developed a narrow corridor of dense marsh. Most of the water accumulated in the southern portion of the unit, creating open water ponds and marshes. In early April, when surveys were initiated, there was little water available in the unit, since releases had just begun. The prescribed burn left the area fairly open and barren, but by April, grasses and wetland vegetation were resprouting. By mid-May, deeper open water areas were present at the southern end of the unit, while flooding at the north end was shallow and less extensive. The wetted extent of the Winterton Unit during spring surveys was 84 acres when measured on May 10, and up to 142 acres when measured on May 31. Flooding of the unit during June remained stable, and the flooded extent in early July was 137 acres. During fall surveys, the flooded extent increased to 178 acres on August 16 and 189 acres on September 14. The southernmost points (WIN8 and WIN15) were dry until August.

Figures 4-6 illustrate the vegetation change from pre-burn conditions dominated by dry scrub and dried emergent vegetation in 2010 to wetland and open water habitats in 2011. Figures 4-6 were taken at WIN01 which is at the north end of the unit. Small ponds were present by early April and are visible in Figure 5. By October (Figure 6), vegetation had recovered to a point that it looked remarkably similar to preburn conditions. Figure 7-9 were taken at WIN04 in the central portion of the unit. The burn removed the dense dried emergent vegetation and shrubs (Figures 7 and 8). Some shallow ponds were present by early April to the west of the station (Figure 8). By October, vegetation in this area supported alkali meadow habitats and dense emergent vegetation. Figures 10-12 were taken at WIN11 at the southern end of the unit. Shrub-filled basins were present at the southern end prior to the burn (Figure 10). Water had not yet reached the southern end of the unit in April as is shown in Figure 11. As releases continued, the basins at the southern end of the unit filled, creating deeper ponded areas (Figure 12). The topography at the south end is highly undulating, and high spots in this area remained above the waterline, creating islands. Waterfowl, shorebirds and wading birds were observed resting on these islands regularly.

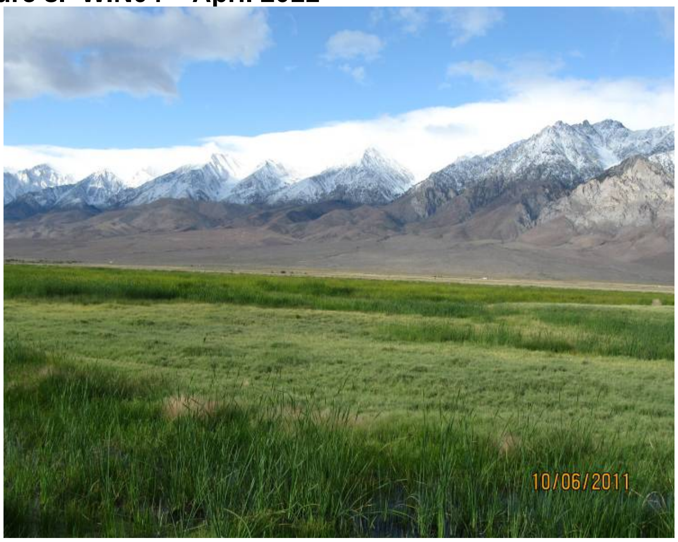
Avian Surveys Figure 4. Indicator Species Figure 4a. WIN01 – July 2010

Avian Surveys Figure 5. WIN01 – April 2011

Avian Surveys Figure 6. WIN01 – October 2011

Avian Surveys Figure 7. WIN04 – July 2010

Avian Surveys Figure 8. WIN04 – April 2011



Avian Surveys Figure 9. WIN04 – October 2011

Avian Surveys Figure 10. WIN11– July 2010

Avian Surveys Figure 11. WIN11 – April 2011

Avian Surveys Figure 12. WIN11 – October 2011

6.5.2 Avian Use

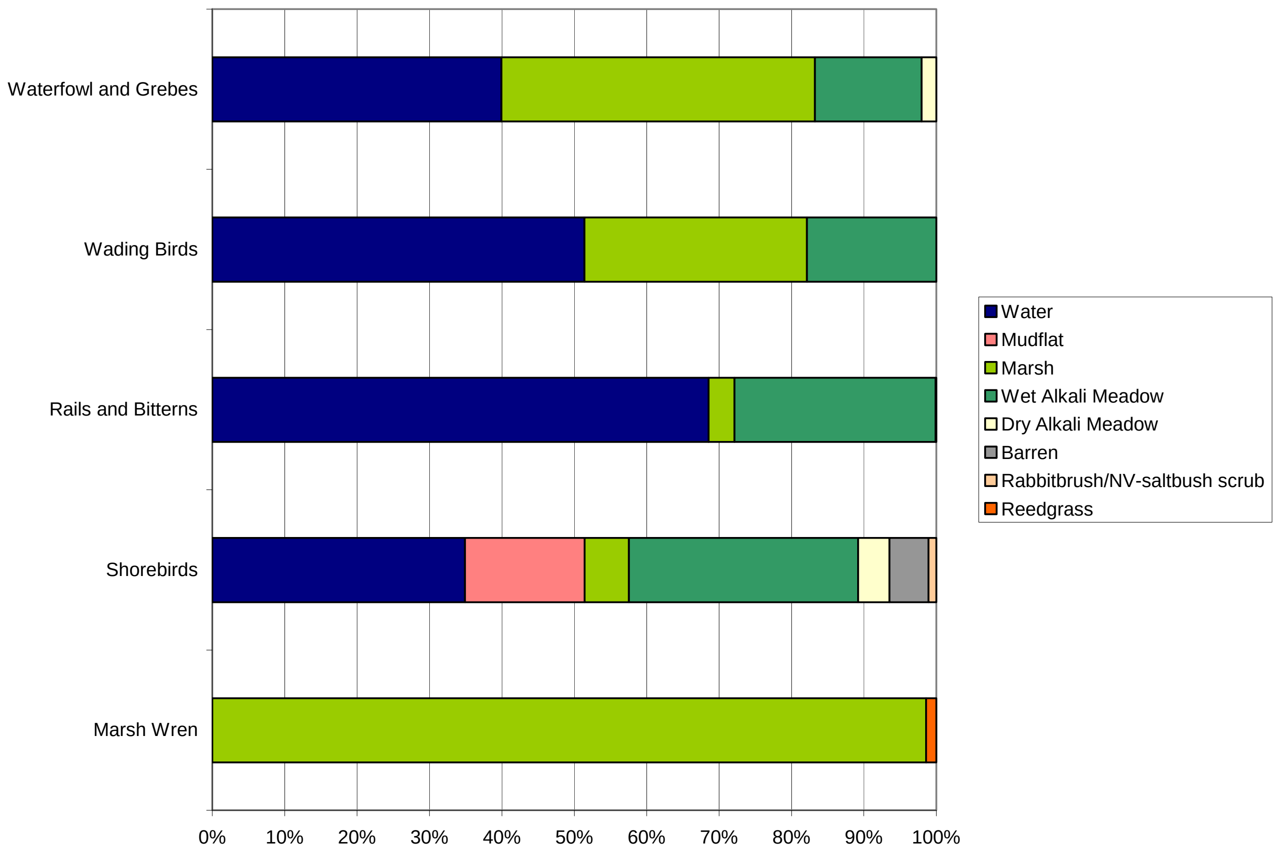
Table 1 shows the total detections of each habitat indicator species group, summed over all 2011 surveys, and as a percent of all indicator species detections. Survey totals for each habitat and non-habitat indicator species can be found in Tables 2 and 3, summed by season. Shorebirds and waterfowl were the most abundant groups in spring. Indicator species use was minimal in the first half of April. By the end of April, ponds at the south end had developed, and indicator species use increased markedly. The most abundant indicator species in spring were Gadwall, Mallard and Killdeer. Marsh Wrens were absent, and only one Northern Harrier was observed in spring. During the summer surveys conducted in June and early July, waterfowl were the most abundant indicator species group present. The most abundant summering waterfowl species was Gadwall, and several broods were seen, confirming breeding. Breeding was also suspected but not confirmed for Mallard and Cinnamon Teal. Pied-billed Grebes were present throughout the summer and very vocal; however, breeding was not confirmed for this species either. American Coots were seen building nests in the emergent vegetation at the south end of the unit, and broods were seen later in summer. Killdeer was the only shorebird that bred at Winterton in 2011. The most abundant non-indicator species was Red-winged Blackbird. Red-winged Blackbird and Sage Sparrow were both confirmed as breeding at Winterton. Other non-indicator species suspected of breeding at Winterton were LeConte's Thrasher, Loggerhead Shrike, Western Meadowlark and Yellow-headed Blackbird.

During fall, waterfowl and grebes, rails and bitterns (primarily American Coot), and wading birds were the most abundant groups. Use by shorebirds in the fall was minimal. In response to the well-developed emergent vegetation present by fall, Marsh Wren were fairly abundant.

Avian Surveys Table 1. Total Detections of Each Habitat Indicator Species Group, Summed Over All 2011 Surveys

	Spring		Summer		Fall		All 2011 Surveys	
Habitat Indicator Species Group	**Total**	**% of total**	**Total**	**% of total**	**Total**	**% of total**	**Total**	**% of total**
Waterfowl and Grebes	151	43%	204	58%	890	26%	1245	30%
Rails and Bitterns	13	4%	82	23%	2266	66%	2361	57%
Wading birds	10	3%	4	1%	152	4%	166	4%
Shorebirds	173	50%	56	16%	54	2%	283	7%
Gulls/Terns/Comorants and Pelicans	1	0.3%	3	1%	1	0.03%	5	0.1%
Marsh Wren			2	1%	69	2%	71	2%
Northern Harrier	1	0.3%	2	1%	12	0.4%	15	0.4%
Osprey							0	0%
Total HIS	349		353		3444		4146	

Figure 13 shows the proportion of observations of each habitat indicator species group by habitat type in which they were observed. Waterfowl and grebes were primarily observed in marsh and open water areas. Wading birds were more heavily associated with open water areas, foraging in flooded meadow habitats. American Coots were primarily associated with water, while Sora and Virginia Rails were heard vocalizing from marsh. Shorebirds were associated with wet meadow habitat, water, and mudflat. Several species including Killdeer, Greater and Lesser Yellowlegs, Wilson's Phalarope, and Wilson's Snipe were observed in wet meadow. *Calidris* sandpipers comprised most of the observations on mudflat, while Black-necked Stilts, Wilson's Phalaropes and Killdeer were species observed using water. Marsh Wren were most strongly associated with marsh, while a few were observed in reedgrass.



Avian Surveys Figure 13. Proportion of Observations of Each Habitat Indicator Species Group by Habitat Type

Avian Surveys Table 2. Number of Habitat Indicator Species by Survey and Season

	Spring				Total	Summer		Total	Fall					Total
Species	4/4/2011	4/14/2011	4/28/2011	5/12/2011	**Spring**	6/15/2011	7/6/2011	**Summer**	8/4/2011	8/22/2011	9/6/2011	9/20/2011	10/6/2011	**Fall**
Canada Goose			2		**2**					1				**1**
Gadwall		14	18	32	**64**	85	26	**111**	48	10	40	5	2	**105**
Mallard	9	5	16	31	**61**		47	**47**	19	125	142	24	181	**491**
Cinnamon Teal			2	6	**8**	6	9	**15**	44	32	76	10	14	**176**
Northern Shoveler				4	**4**		1	**1**						
Northern Pintail											12	5	8	**25**
Green-winged Teal				1	**1**	5	4	**9**			62	4		**66**
Unidentified Duck									1				7	**8**
Ruddy Duck														
Pied-billed Grebe						11	7	**18**	10	3	2		1	**16**
Eared Grebe				1	**1**								2	**2**
American Bittern				1	**1**									
Great Blue Heron			1	1	**2**	3		**3**			1		2	**3**
Great Egret			8	2	**10**	2	1	**3**	1	5	10	3	6	**25**
Snowy Egret			1	4	**5**									
Cattle Egret									1					**1**
Green Heron							1	**1**						
Black-crowned Night-Heron										1				**1**
White-faced Ibis		3			**3**					98	4	2	18	**122**
Northern Harrier				1	**1**	1	1	**2**	2	1	3	1	5	**12**
Virginia Rail									1	1	1	2	1	**6**
Sora						3	2	**5**	1	26	16	12	1	**56**
American Coot				12	**12**	42	35	**77**	20	57	81	321	1725	**2204**
Semipalmated Plover									1					**1**
Killdeer	18	14	17	32	**81**	15	17	**32**	3	3	2	3	2	**13**
Black-necked Stilt				20	**20**	16		**16**	2					**2**
American Avocet			4		**4**									
Spotted Sandpiper				2	**2**									
Greater Yellowlegs	3		4	6	**13**				1	1	3	1	6	**12**
Lesser Yellowlegs	1				**1**									
Least Sandpiper				1	**1**				2					**2**
Calidris sp.			40		**40**									
Wilson's Snipe	1				**1**									
Wilson's Phalarope				7	**7**	5	2	**7**	8		16			**24**
California Gull						3		**3**						
Black Tern										1				**1**
Marsh Wren							2	**2**	21	11	4	13	20	**69**
Long-billed Curlew	1			1	**2**		1	**1**						
Black-bellied Plover	1				**1**									
Franklin's Gull	1				**1**									
Total per survey	**35**	**36**	**113**	**165**	**349**	**197**	**156**	**353**	**186**	**376**	**475**	**406**	**2001**	**3444**

Avian Surveys Table 3. Number of Non-Habitat Indicator Species by Survey and Season

	Spring				Total	Summer		Total	Fall					Total
Species	4/4/2011	4/14/2011	4/28/2011	5/12/2011	**Spring**	6/15/2011	7/6/2011	**Summer**	8/4/2011	8/22/2011	9/6/2011	9/20/2011	10/6/2011	**Fall**
Turkey Vulture					**0**		1	**1**						
Red-tailed Hawk					**0**			**0**	1				1	**2**
American Kestrel					**0**		1	**1**	11	4		1	1	**17**
Prairie Falcon					**0**	1		**1**		2				**2**
Unidentified Hawk					**0**			**0**	2					**2**
Mourning Dove					**0**		2	**2**		7	2			**9**
Greater Roadrunner	1				**1**			**0**						
Say's Phoebe					**0**			**0**		1				**1**
Western Kingbird					**0**			**0**	6					**6**
Loggerhead Shrike	6	3		2	**11**	6	4	**10**	9	4	3	1	1	**18**
Common Raven	2	10	3	1	**16**	9	2	**11**	2	1	8	7	2	**20**
Horned Lark	6	2	1		**9**			**0**		5	4	17	12	**38**
Tree Swallow	23	13			**36**			**0**			1		28	**29**
Violet-green Swallow	2	1		1	**4**			**0**						
Northern Rough-winged Swallow	1	6			**7**			**0**			7			**7**
Bank Swallow				5	**5**			**0**			4			**4**
Cliff Swallow		3	2		**5**			**0**	28	31				**59**
Barn Swallow	16	39	1	11	**67**			**0**		13	15	17	1153	**1198**
Unidentified Swallow					**0**			**0**	15				3	**18**
Bewick's Wren	1	6	4	2	**13**	6	1	**7**	2		1	4	2	**9**
Northern Mockingbird					**0**		1	**1**	2	3				**5**
Sage Thrasher	3				**3**			**0**						
Le Conte's Thrasher	4	3	2	2	**11**	3	3	**6**	4	2	3	3	3	**15**
European Starling				2	**2**			**0**						
American Pipit	1		2		**3**			**0**				26		**26**
Yellow-rumped Warbler				1	**1**			**0**						
Common Yellowthroat					**0**		2	**2**		1	4	5		**10**
Spotted Towhee		1	2		**3**		2	**2**						
Sage Sparrow	4	10	11	4	**29**	5	2	**7**	1			3		**4**
Savannah Sparrow	2	3	7	3	**15**		16	**16**	17	7	12	25	36	**97**
White-crowned Sparrow													22	**22**
Red-winged Blackbird			31	16	**47**	228	23	**251**	120	149	419	826	426	**1940**
Western Meadowlark	8	20	20	6	**54**	7	16	**23**	9	6	9	24	21	**69**
Yellow-headed Blackbird				34	**34**	47	48	**95**	119	66	47	5	2	**239**
Great-tailed Grackle				1	**1**	5	2	**7**						
House Finch		3			**3**			**0**				2		**2**
Lesser Goldfinch					**0**			**0**				2		**2**
Burrowing Owl				1	**1**			**0**						
Eurasian Collared-Dove			2		**2**			**0**						
Total per survey	**80**	**123**	**88**	**92**	**383**	**317**	**126**	**443**	**348**	**302**	**539**	**968**	**1713**	**3870**

6.5.3 Indicator Species Diversity, Richness and Abundance

Table 4 shows the mean species diversity, richness, and abundance by season for habitat indicator species under active and inactive conditions. Mean indicator species diversity, richness, and abundance have shown statistically significant increases as compared to census data for the unit when in inactive status. Indicator species diversity was similar throughout the year in 2011. Indicator species richness and abundance however were lowest in spring, but increased in summer and fall as the flooded acreage increased, and open water ponds developed. Mean indicator species abundance was quite high in fall as large numbers of resident breeding and fall migrant Amercan Coots were recorded.

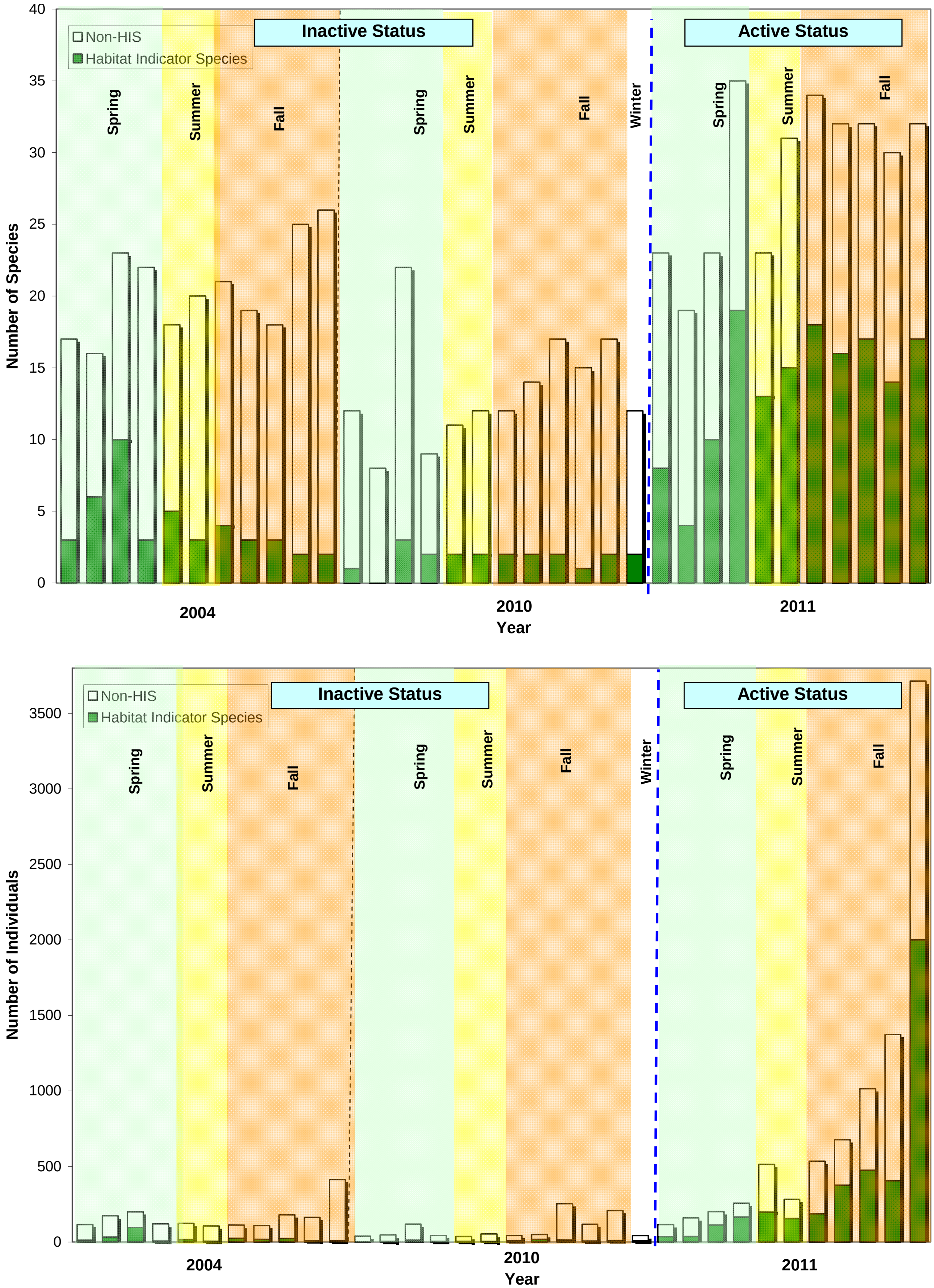
Figure 14 shows the richness and abundance of indicator and non-indicator species for each survey since 2004, by season. In spring of 2004, mean species richness and abundance were higher than might be expected for the unit when inactive because of the temporary water release to the unit that occurred during baseline surveys in spring 2004.

Avian Surveys Table 4. Mean Species Diversity, Richness, and Abundance by Season for Habitat Indicator Species Under Active and Inactive Conditions

		Mean Indicator Species Diversity			
	Year	Spring	Summer	Fall	Winter
Inactive	2004	3.3	3.6	2.2	NA
	2010	1.6	1.9	1.6	1.2
Active Status	2011	6.0	6.6	5.3	NA

		Mean Indicator Species Richness			
	Year	Spring	Summer	Fall	Winter
Inactive	2004	5.5	4.0	2.8	NA
	2010	1.5	2.0	1.8	2.0
Active Status	2011	10.3	14.0	16.2	NA

		Mean Indicator Species Abundance			
	Year	Spring	Summer	Fall	Winter
Inactive	2004	36.5	10.5	16.4	NA
	2010	5.0	3.0	11.2	42.0
Active Status	2011	87.3	176.5	688.8	NA



Avian Surveys Figure 14. Comparison of the Number of Species and Number of Individuals During Inactive and Active Status (limited flooding in 2004)

Avian Surveys Table 5. Seasonal Use of Winterton Management Unit by Year

Spring		**2004**	**2010**	**2011**
Habitat Indicator Species	Waterfowl and Grebes	104	9	151
	Rails and Bitterns	2		13
	Wading birds	2	1	10
	Shorebirds	4		173
	Gulls/Terns/Comorants and Pelicans			1
	Marsh Wren	10	1	
	Northern Harrier	24	9	1
	Osprey			
	Total HIS	146	20	349
Non-Habitat Indicator Species		462	226	383
Summer		**2004**	**2010**	**2011**
Habitat Indicator Species	Waterfowl and Grebes		3	204
	Rails and Bitterns	7		82
	Wading birds			4
	Shorebirds	3		56
	Gulls/Terns/Comorants and Pelicans	5		3
	Marsh Wren			2
	Northern Harrier	6	3	2
	Osprey			
	Total HIS	21	6	353
Non-Habitat Indicator Species		208	84	796
Fall		**2004**	**2010**	**2011**
Habitat Indicator Species	Waterfowl and Grebes			890
	Rails and Bitterns	29		2266
	Wading birds		6	152
	Shorebirds			54
	Gulls/Terns/Comorants and Pelicans		7	1
	Marsh Wren	47		69
	Northern Harrier	6	43	12
	Osprey			
	Total HIS	82	56	3444
Non-Habitat Indicator Species		894	612	3870
Winter		**2004**	**2010**	**2011**
Habitat Indicator Species	Waterfowl and Grebes			
	Rails and Bitterns			
	Wading birds			
	Shorebirds			
	Gulls/Terns/Comorants and Pelicans			
	Marsh Wren		1	
	Northern Harrier		7	
	Osprey			
	Total HIS		8	
Non-Habitat Indicator Species			81	

6.6 Summary of Blackrock Waterfowl Management Area Avian Surveys

Knowledge of wildlife response to wetted conditions of each unit may help in developing a management plan that will provide a diversity of conditions suitable to the various habitat indicator species groups. Surveys conducted in 2011 of the Winterton Unit indicate that the unit is being used by habitat indicator species. The unit has attracted mostly the rail and bittern, and waterfowl and grebe indicator species groups. Use by these two groups accounted for almost 90% of all detections in 2011. Shorebirds were not only more numerous but were also the most abundant indicator species group in spring, when there was only sparse vegetation present, due to the prescribed burn conducted in late winter. The unit attracted waterfowl in spring also, as deep areas are not needed for most species expected to use BWMA (i.e. dabbling ducks). By summer and fall, significant vegetation regrowth had occurred, especially in the northern part of the unit where the topography is fairly flat. The northern part of the unit returned to conditions quite similar to those present pre-burn namely dense emergent vegetation and wet meadow. The dense wet meadow and emergent vegetation, while not appropriate shorebird habitat, should attract other habitat indicator species, notably Marsh Wren, Northern Harrier, and rail species such as Sora and Virginia Rail. The deeper basins in the southern part of the unit filled, creating ponds of varying depths attracting waterfowl and grebes, rails and bitterns, and wading birds. These ponds should continue to attract these indicator species groups as long as appropriate ratios of open water to emergent vegetation cover are maintained as required under LORP. Shorebird habitat might be enhanced in this unit by intermittent flooding of shallow basins, or adjacent desert sinks at key times, such as during spring and fall migration. Opportunities to implement this may exist at the south end of the unit, where short-term seasonal releases into currently dry basins may be done from existing headgates structures.

7.0 FISH CREEL SURVEY

Introduction

The 2011 Lower Owens River Project (LORP) creel survey is being conducted to help track the development and health of the warm-water recreational fishery in the project's ponds, lakes and river areas of the LORP. Creel survey data will assist with the adaptive management decision making process for the LORP warm-water fishery. It provides information about the health, abundance, and distribution of game fish throughout the LORP. Fish habitat within the LORP includes the river channel, oxbows, side channels, off-river lakes and ponds, springs, and artesian well ponds. The main purpose of this creel survey is to evaluate the response of game fish populations, to manage river flows over time, and to document compliance with the LORP warm-water fisheries goals (Ecosystem Sciences 2008). A creel survey was completed in 2003, prior to the release of LORP flows. Future monitoring will be conducted using the same methods that were used in 2003 and are described below.

7.1 Methods

7.1.1 Sites

The LORP area was stratified into five separate fishing areas for the creel survey. Fish Creel Survey Figure 1 illustrates and describes in detail the location of these fishing areas. Four of the fishing areas are located on the Lower Owens River while the fifth covers designated off-river lakes and ponds:

Area 1 - (Owens River from the Pumpback Station Forebay at Owens Lake upstream to the Lone Pine Narrow Gauge Road)

Area 2 - (Owens River from the Lone Pine Narrow Gauge Road upstream to the Manzanar Reward Road)

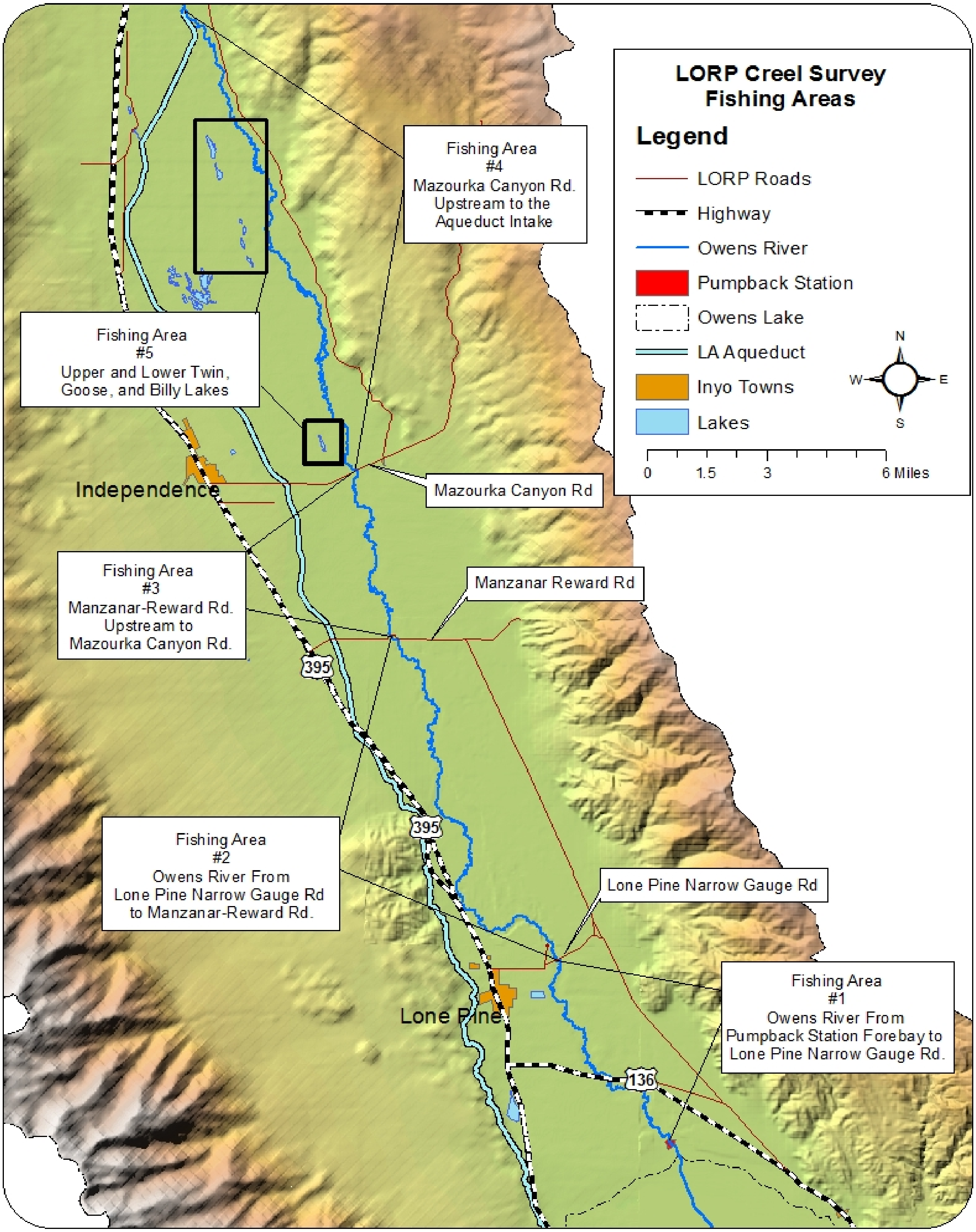
Area 3 - (Owens River form Manzanar Reward Road upstream to the Mazourka Canyon Road)

Area 4 - (Owens River from Mazourka Canyon Road upstream to the Los Angeles Aqueduct [LAA] Intake)

Area 5 - (Upper and Lower Twin, Billy and Goose Lakes)

7.1.2 Volunteers

Anglers from the local area were recruited to help conduct the 2011 creel survey. A total of 24 anglers volunteered and were assigned identification numbers 1 to 24. Each identification number was assigned to one of the above fishing areas. Table 1 presents the identification numbers and assigned areas. Identification numbers 1 to 5 were assigned to Area 1, numbers 6 to 10 were assigned to Area 2, numbers 11 to 15 were assigned to Area 3, numbers 16 to 20 were assigned to Area 4, and numbers 21 to 24 were assigned to Area 5



Fish Creel Survey Figure 1. Fishing Areas

Table 1. Fishermen Identification Numbers and Assigned Areas

FISHERMEN ID NUMBERS	ASSIGNED FISHING AREAS
Numbers 1 to 5	Area 1, Pumpback Station Forebay at Owens Lake upstream to the Lone Pine Narrow Gauge Road
Numbers 6 to 10	Area 2, Owens River from the Lone Pine Narrow Gauge Road upstream to the Manzanar Reward Road
Numbers 11 to 15	Area 3, Owens River form Manzanar Reward Road upstream to the Mazourka Canyon Road
Numbers 16 to 20	Area 4, Owens River from Mazourka Canyon Road upstream to the LAA Intake
Number 21	Area 5, Upper Twin Lake
Number 22	Area 5, Lower Twin Lake
Number 23	Area 5, Goose Lake
Number 24	Area 5, Billy Lake

Volunteers in Areas 1 through 4 were allowed to fish anywhere within their assigned area. In Area 5, each identification number was assigned to an individual lake. Fisherman 21 must fish Upper Twin Lake, fisherman 22 must fish Lower Twin Lake, fisherman 23 must fish Goose Lake, and fisherman 24 must fish Billy Lake.

7.1.3 Season Timing and Methods of Creel Survey

The first creel survey (post implementation) was conducted in the fall of 2010. The second creel survey (post implementation) was conducted in the spring of 2011. Each volunteer fished twice during May 2011. The first spring fishing period was from May 1 through May 15, 2011, with each volunteer fishing one day during this period. The second spring fishing period was from May 16 to May 31, 2011, with each volunteer fishing one day during this period. No survey fishing can occur during any period outside of May.

Volunteers were limited to 3.5 hours of fishing per day during the survey. The 3.5-hour period does not have to be fished all at one time, but must be done in the same day. The reason for the 3.5 hour time limit is because this is the average time an angler in the west fishes, on an average fishing day (Dr. William Platts, Ecosystem Sciences, personal communication, August 18, 2010). During the survey, volunteers can fish only within his or her assigned area; however, they may fish anywhere within that assigned area. Volunteers may use any type of fishing gear available, as long as they abide by all applicable State of California fishing rules and regulations.

7.1.4 Creel Records

Anglers used the LORP Creel Survey form (Figure 2) to record fishing results. Reach number, date, identification number, number of fish caught, species of fish caught, total length (to the nearest inch), condition (good or poor), and total number of fish observed were recorded. Fish species identification was covered during a pre-fishing meeting and fishermen are provided with the LORP Fishing Creel Survey Guide. Total length of fish was visually estimated from the tip of the nose to the end of the tail. For condition, if the fish appeared healthy and showed no signs of sickness or damage, and had no lesions, the fish was listed as good condition (GC). If the fish appeared unhealthy or showed signs of damage or had lesions, the fish was listed as poor condition (PC). Total number of fish observed (by species) while fishing was also recorded. At the end of the second fishing period completed data sheets were placed in the self-addressed stamped envelope and returned.

LORP Creel Survey
Return to: Jason Morgan
300 Mandich Street
Bishop, CA 93514
Office (760) 873-0429
Cell (760) 878-8954

Reach Number:	Date:	Name:	Fisherperson's Number:

Total Number of Fish Observed

Largemouth Bass:	Brown Trout:	Bluegill:	Smallmouth Bass:
Common Carp:	**Channel Catfish:**	**Brown Bullhead:**	**Other Species (Name/Number):**

Fish Caught (Fishing Time 3.5 hours)

Number	Species	Length (Inches)	Condition (Good or Poor)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

Fish Creel Survey Figure 2. Creel Survey Survey Form

7.2 Results

Of the 24 anglers, only 23 fished and returned their data sheets. The missing data was from Area 3.

The LORP consultants feel that some anglers are misidentifying smallmouth bass (*Micropterus dolomieu)* and calling them largemouth bass (*Micropterus salmoides)*. Based on their own fishing experience they feel that smallmouth bass are making up about 5% of their catch. To remedy this problem, they suggested that smallmouth and largemouth bass be combined and referred to as bass. For the remainder of the report, bass refers to both largemouth and smallmouth bass.

Overall, 23 anglers fished 3.5 hours each for a total of 161 hours during the two fishing periods in May 2011. A total of 214 fish were caught, including 138 bass and, 43 bluegill (*Lepomis macrochirus)*, 29 brown bullhead (*Ameiurus nebulosus)*, 1 brown trout (*Salmo trutta)*, and 3 common carp (*Cyprinus carpio)* (Table 2). Over-all, catch per unit effort was 1.3 fish per hour. Bass accounted for 1.0 fish per hour with an average length of 11 inches (maximum 18 inches and minimum 4 inches). Bluegill accounted for 0.3 fish per hour with an average size of 5 inches (maximum 8 inches and minimum length 3 inches). Brown bullhead were caught at a rate of 0.2 fish per hour with an average length of 7 inches. Maximum total length for brown bullhead was 12 inches and minimum length was 9 inches. The only brown trout caught measured 10 inches and was caught at a rate of 0.01 fish per hour. All three common carp caught measured 18 inches and were caught at a rate of 0.02 fish per hour. All fish caught were in good condition. The 23 fishermen observed 774 fish during the creel survey. The fishermen observed 265 bass, followed closely by 261 common carp. Bluegill were the next most observed fish at 234 followed by 14 brown bullhead. No brown trout were observed (Table 3).

Table 2. Results of Overall Fish Caught for the LORP Creel Survey, May 2011

Overall	Bass	Bluegill	Brown Bullhead	Brown Trout	Common Carp	Total
Fish Caught	138	43	29	1	3	214
Average Size (inches)	11	5	7	10	18	9.2
Catch/Hour	1.0	0.3	0.2	0.01	0.02	1.3
Maximum Length (inches)	18	8	12	10	18	18
Minimum Length (inches)	4	3	9	0	18	3

Table 3. Number of Fish Observed During the LORP Creel Survey, May 2011

	Period 1	Period 2	Total
Bass	167	98	265
Bluegill	108	126	234
Brown Bullhead	8	6	14
Brown Trout	0	0	0
Common Carp	136	125	261
Total	419	355	774

During the first period, from May 1-15, 2011 the 23 anglers fished 3.5 hours each for a total of 80.5 hours. During this period a total of 105 fish were caught; 73 bass, 14 bluegill, 16 brown bullhead, 1 brown trout, and 1 common carp (Table 4). Catch per hour was 0.9 for bass, 0.2 for bluegill, 0.2 for brown bullhead, 0.01 for brown trout, and 0.01 for common carp for a total of 1.3 fish per hour. The 23 anglers observed 419 fish during the first period of the creel survey with bass making up the majority of the fish observed at 180 fish (Table 3). Also observed were 108 bluegill, 8 brown bullhead, and 136 common carp.

Table 4. Results for the First Period LORP Creel Survey May 1-15, 2011

Period 1	Bass	Bluegill	Brown Bullhead	Brown Trout	Common Carp	Total
Fish Caught	73	14	16	1	1	105
Average Size (inches)	11	5	7	10	18	10
Catch/Hour	0.9	0.2	0.2	0	0	1.3
Maximum Length (inches)	18	8	12	10	18	18
Minimum Length (inches)	4	4	4	10	18	4

During the second period, from May 16-31, 2011 the 23 anglers again fished for a total of 80.5 hours. During this period a total of 109 fish were caught; 2 carp, 29 bluegill, 13 brown bullhead, and 65 bass (Table 5). Fish were caught at a rate of 1.4 fish per hour during the second period, bass were caught at 0.8 fish per hour, bluegill at 0.4 fish per hour, brown bullhead at 0.2 fish per hour, and carp 0.02 fish per hour. The anglers observed 355 fish during this period; 98 bass, 126 bluegill, 6 brown bullhead, and 125 common carp (Table 3).

Table 5. Results for the Second Period LORP Creel Survey May 16-31, 2011

Period 2	Bass	Bluegill	Brown Bullhead	Brown Trout	Common Carp	Total
Fish Caught	65	29	13	0	2	109
Average Size (inches)	11	4	7	0	18	8.9
Catch/Hour	0.8	0.4	0.2	0	0.02	1.4
Maximum Length (inches)	17	7	11	0	18	18
Minimum Length (inches)	4	3	5	0	18	3

During the first fishing period, Area 5 had the highest catch per unit effort at 2.1 fish per hour, fish were caught at a rate of 1.3 fish per hour in areas 1 and 3, 1.2 fish per hour in Area 4, and Area 1 was lowest at 0.8 fish per hour (Table 6). During the second fishing period Area 5 again had the highest catch per unit effort at 2.0 fish per hour, fish were caught at a rate of 1.6 fish per hour in Area 2, 1.3 fish per hour in Area 4, 1.1 fish per hour in area 1 and 0.9 fish per hour in Area 3 (Table 7).

Table 6. Results by Fishing Area for First Period, May 1-15, 2011

Reach 1	Bass	Bluegill	Brown Bullhead	Brown Trout	Common Carp	Total
Fish Caught	6	6	9	0	1	22
Average Size (inches)	7	5	5	0	18	9
Catch/Hour	0.3	0.3	0.5	0	0.1	1.3
Maximum Length (inches)	8	6	6	0	18	18
Minimum Length (inches)	6	4	4	0	18	4
Reach 2	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	10	2	2	0	0	14
Average Size (inches)	9	6	12	0	0	9
Catch/Hour	0.6	0.1	0.1	0	0	0.8
Maximum Length (inches)	14	8	12	0	0	14
Minimum Length (inches)	5	4	11	0	0	5
Reach 3	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	11	6	0	1	0	18
Average Size (inches)	9	6	0	10	0	8
Catch/Hour	0.8	0.4	0	0.1	0	1.3
Maximum Length (inches)	16	7	0	10	0	18
Minimum Length (inches)	4	5	0	10	0	5
Reach 4	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	17	0	4	0	0	21
Average Size (inches)	11	0	9	0	0	10
Catch/Hour	1.0	0	0.2	0	0	1.2
Maximum Length (inches)	18	0	9	0	0	14
Minimum Length(inches)	5	0	8	0	0	5
Reach 5	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	29	0	1	0	0	30
Average Size (inches)	13	0	12	0	0	12
Catch/Hour	2	0	0.1	0	0	2.1
Maximum Length (inches)	16	0	12	0	0	17
Minimum Length (inches)	8	0	12	0	0	3

Table 7. Results by Fishing Area for Second Period, May 16-31, 2011

Reach 1	Bass	Bluegill	Brown Bullhead	Brown Trout	Common Carp	Total
Fish Caught	4	1	12	0	2	19
Average Size (inches)	6	4	7	0	18	9
Catch/Hour	0.2	0.1	0.7	0	0.1	1.1
Maximum Length (inches)	6	4	10	0	18	11
Minimum Length (inches)	4	4	5	0	18	3
Reach 2	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	7	20	1	0	0	28
Average Size (inches)	8	4	11	0	0	8
Catch/Hour	0.4	1.1	0.1	0	0	1.6
Maximum Length (inches)	10	6	11	0	0	12
Minimum Length (inches)	6	3	11	0	0	5
Reach 3	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	9	3	0	0	0	12
Average Size (inches)	11	5	0	0	0	8
Catch/Hour	0.6	0.2	0	0	0	0.9
Maximum Length (inches)	14	7	0	0	0	18
Minimum Length (inches)	8	4	0	0	0	6
Reach 4	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	22	0	0	0	0	22
Average Size (inches)	11	0	0	0	0	11
Catch/Hour	1.3	0	0	0	0	1.3
Maximum Length (inches)	17	0	0	0	0	15
Minimum Length (inches)	8	0	0	0	0	4
Reach 5	**Bass**	**Bluegill**	**Brown Bullhead**	**Brown Trout**	**Common Carp**	**Total**
Fish Caught	23	5	0	0	0	28
Average Size (inches)	12	4	0	0	0	8
Catch/Hour	2	0	0	0	0	2
Maximum Length (inches)	16	5	0	0	0	16
Minimum Length (inches)	6	4	0	0	0	10

Tabular results from the 2003 creel survey are included (Table 8) for reference (unpublished data).

Table 8. Creel Survey Data for Lower Owens River Project May 2003

Area 1. Owens River From Pumpback Pool to the Lone Pine Station Road							
Angler ID#	Date	Fish Caught	Number Caught	Combined Lengths (inches)	Maximum Length (inches)	Minimum Length (inches)	Condition
1	5/8/2003	Bass	14	188	16	10	good
1	5/26/03	Bass	14	135	13	6	good
2	5/9/2003	Bass	13	129	13	7	good
2	5/16/2003	Bass	18	176	14	6	good
3	5/13/2003	Bass	3	25	9	7	good
3	5/30/2003	Bass	6	57	14	8	good
4	5/22/2003	Bass	16	78	10	3	good
5	5/13/2003	Bass	7	54	11	5	good
5		Bullhead Catfish	1	9	9		good
5	5/30/2003	Bass	3	27	12	7	good
5		Bluegill	3	19	7	6	good

Hours Fished: 31.5
Catch Rate: 3.1 fish per hour
Average Fish Length: 9.2 inches
Maximum Size: 16 inches, Minimum Size: 3 inches
Max Average Size: 11.6 inches, Minimum Average Size: 5.9 inches

Area 2. Owens River From the Lone Pine Station Road to the Manzanar-Reward Road							
Angler ID#	Date	Fish Caught	Number Caught	Combined Lengths (inches)	Maximum Length (inches)	Minimum Length (inches)	Condition
9	5/4/2003	Bass	4	48	14	10	good
9		Bluegill	5	14	3	2	good
9		Bullhead Catfish	3	35	13	10	good
9		Carp	1	15	15		good
9	5/18/2003	Bass	10	84	14	6	good
10	5/12/2003	Bass	6	73	15	10	good
10		Bluegill	2	12	6	6	good
10	5/26/2003	Bass	5	57	12	10	good
10		Bluegill	6	43	8	6	good
6	5/4/2003	Bass	14	151	16	5	good
6	5/19/2003	Bass	14	154	15	6	good
7	5/7/2003	Bass	6	72	14	10	good

Hours Fished: 24.5
Catch Rate: 3.1 fish per hour
Average Fish Length: 9.9 inches
Maximum Size: 16 inches, Minimum Size: 2 inches
Maximum Average Size: 12.1 inches, Minimum Average Size: 6.8 inches

Table 8 (continued) Creel Survey Data for Lower Owens River Project May 2003

Area 3. Owens River From the Manzanar-Reward Road Upstream to Mazourka Canyon Road

Angler ID#	Date	Fish Caught	Number Caught	Combined Lengths (inches)	Maximum Length (inches)	Minimum Length (inches)	Condition
12	5/5/2003	Bass	4	30	9	5	good
12		Bluegill	9	47	6	4	good
12	5/31/2003	Bass	3	29	12	8	good
11	5/31/2003	Bass	7	59	12	5	good/poor
11		Bluegill	7	34	5	4	good
11		Carp	1	15	15	15	good
14	5/15/2003	Bass	3	31	13	8	good
14	5/18/2003	Bass	3	33	12	10	good
14		Bullhead Catfish	1	8	8	8	good
15	5/15/2003	Bass	3	35	15	7	good
15		Bluegill	3	13	5	4	good
15	5/20/2003	Bass	4	30	10	6	good
15		Bluegill	2	9	5	3	good

Hours Fished: 24.5
Catch Rate: 2.0 fish per hour
Average Fish Length: 7.5 inches
Maximum Size: 15 inches, Minimum Size: 3 inches
Maximum Average Size: 9.8 inches, Minimum Average Size: 6.7 inches

Area 4. Owens River From the Mazourka Canyon Road Upstream to the Intake

Angler ID#	Date	Fish Caught	Number Caught	Combined Lengths (inches)	Maximum Length (inches)	Minimum Length (inches)	Condition
No fishable water until flow introduction occurs							

Area 5. Upper and Lower Twin, Billy, Coyote, and Goose Lakes

Angler ID#	Date	Fish Caught	Number Caught	Combined Lengths (inches)	Maximum Length (inches)	Minimum Length (inches)	Condition
21	5/3/2003	Bass	9	128	18	12	good
23	5/15/2003	Bass	1	8	8	8	good
23	5/31/2003	Bass	1	8	8	8	good
23		Bluegill	2	13	7	6	good
22	5/12/2003	Bass	6	68	12	9	good
22	5/20/2003	Bass	18	206	16	6	good
22		Bluegill	1	6	6	6	good
2	5/12/2003	Bass	11	132	14	9	good
2	5/20/2003	Bass	14	156	14	9	good
3	5/15/2003	Bass	1	9	9	9	good
3	5/31/2003	Bass	10	109	13	8	good
24/4	5/11/2003	Bass	10	129	18	10	good
24/4	5/24/2003	Bass	10	119	16	6	good
1	5/3/2003	Bass	12	156	18	10	good
1	5/17/2003	Bass	14	197	18	6	good

Hours Fished: 45.5
Catch Rate: 2.6 fish per hour
Average Fish Length: 12.0 inches
Maximum Size: 18 inches, Minimum Size: 6 inches
Maximum Average Size: 13.0 inches, Minimum Average Size: 8.1 inches

7.3 Discussion

The May 2011 creel survey results demonstrate that the LORP contains a healthy, self-sustaining warm-water fishery. Reasons for this conclusion include: areas of the LORP that were dry during the baseline creel survey are now populated with fish, the LORP contains a diverse warm-water fish community, there are multiple age classes for each of the warm-water species, and all fish caught were in good condition.

Area 4 (LAA Intake downstream to Mazourka Canyon Road) was dry during the 2003 creel survey (approximately 24 miles of river). In 2011, a little over 3 years after the LORP was implemented, the same area produced 1.2 fish per hour and two different species of fish. The data shows that fish are populating former dry sections, using fish corridors and/or moving up and down the river.

Overall, five different species of fish were caught during the May 2011 creel survey which was one species more than the 2003 creel survey. The anglers fishing the LORP caught with the exception of channel catfish every warm-water game fish found in the Owens Valley.

Looking at total fish lengths collected during the September 2010 survey (2010 LORP Annual Report) and the May 2011 surveys it appears there are multiple age classes from young of the year to adults for all warm-water species.

Of the 214 fish caught 100% were reported in good condition. At this time, it appears that managed river flows and available habitat are capable of maintaining the warm-water fishery in good condition.

The next creel survey will be conducted May 2013 in the same manner as the May 2011 survey and will again be compared with baseline.

7.4 Creel Survey Summary

The purpose of the creel survey is to track the development and health of the warm-water fishery in the Lower Owens River Project (LORP). Methods developed during the 2003 creel survey were utilized in May 2011 and will be used in future monitoring. Twenty three volunteer anglers fished five separate fishing areas for a total of 161 hours and caught 214 fish with an overall catch per unit effort of 1.3 fish per hour. Fish caught ranged from young of the year to adults for all warm-water species and were in good condition. The 2011 creel survey results demonstrate that the LOPR contains a healthy, self-sustaining warm-water fishery.

7.5 References

Ecosystem Sciences. 2008. *Lower Owens River Project Monitoring and Adaptive Management and Reporting Plan.* Prepared for Los Angeles Department of Water and Power and Inyo County Water Department. April 28, 2008.

8.0 2011 Inyo/Mono Counties Agricultural Commissioner's Office LORP Weed Report

Background:

In 2005, the Los Angeles Department of Water and Power (LADWP) and the Inyo/Mono Counties' Agricultural Commissioner's Office (AgComm) entered into a seven year agreement with the goal of managing the growing threat of non-native invasive weeds on lands owned by the City of Los Angeles. This agreement provided AgComm with $150,000 per year for weed management activities outside of the Lower Owens River Project (LORP) boundaries, and $50,000 per year for weed management activities within LORP boundaries. In the spring of 2006, AgComm took over treatment of the majority of known weed sites on LADWP lands within Inyo and Mono counties, which in 2005 amounted to 23,560 gross acres.

The Agreement between LADWP and AgComm focuses on the protection of the Lower Owens River Project (LORP) area during habitat restoration from noxious weed invasion. This will be accomplished primarily by efforts to eradicate known weed populations within the LORP area, and also by reducing the threat of new invasions by managing upstream populations aggressively. The detection component is critical to the protection of the LORP, as this region is a recovering habitat with many disturbed areas. Disturbed conditions make this area more conducive to weed establishment.

In addition to treatment, detection of new weed sites within the Lower Owens River Project (LORP) area is a requirement of the Agreement. When conditions do not permit treatment, such as seasons when plants are not growing actively or during weather conditions precluding spraying operations, personnel from AgComm are expected to perform detection surveys to find new sites. Several times each year surveys are conducted in areas within the LORP area, and in other areas outside the LORP where surveys have either not been previously conducted or in areas considered high risk. High risk areas would include areas near the Owens River or tributaries thereof, areas that have been disturbed, and areas where livestock or wildlife that move from place to place are present.

While protecting native habitat during the critical first stage of the lower Owens River re-watering is the paramount goal of this project, there are many other positive consequences resulting from this work. A healthy native plant habitat will support wildlife (including some threatened and endangered species), help to reduce stream bank erosion and dust, maintain healthy fire regimes, preserve the viability of open-space agriculture, and conserve recreational opportunities.

As of October 2011 known weed sites on City of Los Angeles land total 32,096 gross acres, which is more than a 36% larger land area than in the agreement. LORP sites specifically have grown 125%, from 142 gross acres to 320 gross acres. AgComm has applied for and been awarded several grants to supplement the original agreement. This has allowed AgComm to expand efforts to meet the management goals of the agreement despite the addition on newly discovered infestations.

Summary of LORP Weed Management Activities in 2011

LORP area weed management efforts during 2011 continue the augmented efforts introduced in 2010. Enhancements include more field staff, new herbicide types and treatment methods, and more frequent survey efforts. AgComm staff conducted three large surveys within the LORP project boundaries between October 2010 and October 2011. These surveys discovered one new large *Lepidium latifolium* site, and confirmed the eradication of another site. Despite the increase in time spent on detection activities, field staff was still able to treat each known site twice during the 2011 growing season. These treatments occurred despite the 2010 increase in known sites from 17 to 32.

By securing additional resources from grants and agreements, AgComm was able to maintain the field staff increases of 2010. This increase in field staff allows more comprehensive surveys, and more effective management techniques. Surveys assessed 15,483 acres during 2011. The management techniques that higher staff levels facilitate lower habitat impact, which helps the LORP habitat recovery while lowering the ability of new invasive plants to colonize. Additionally, these methods allow a more precise herbicide application, lowering the incidence of off-target damage and total herbicide use.

Survey Methodology

Determining the acreage of weed sites treated is conducted using two methods:

1) Spraying equipment is calibrated at least twice per year. This is done by marking out 1/10 of an acre, and then applying a water/dye mixture in the same manner as would be conducted if it were a solid stand of weeds. The number of gallons used is then multiplied by 10 to establish a gallon per acre figure for every sprayer.

2) Daily figures are collected for sprayer usage and site number. Monitoring usage in each site and then converting usage to acreage can ascertain net acreages. These net acreages are recorded in the weed database for each site yearly to track progress over time.

The data collected from daily usage reports is collected and recorded for 100% of sites. This method has been extremely accurate in past years, and is the primary gauge of success used by AgComm when planning future strategies.

Weed Population Trends

Known weed infestations within the LORP boundaries grew from 304 to 320 gross acres in 2011. Within this infested area, there were .40 net acres of scattered weed infestations. Previously recorded sites declined from .28 to .18 net acres, or more than 35%. Three new sites were discovered by AgComm surveys and LORP RAS surveys, one of which affected net population figures significantly. This site contains .22 net acres of *Lepidium latifolium.* Total net populations increased nearly 43% in 2011. Figure 1 on the following page illustrates these trends through time.

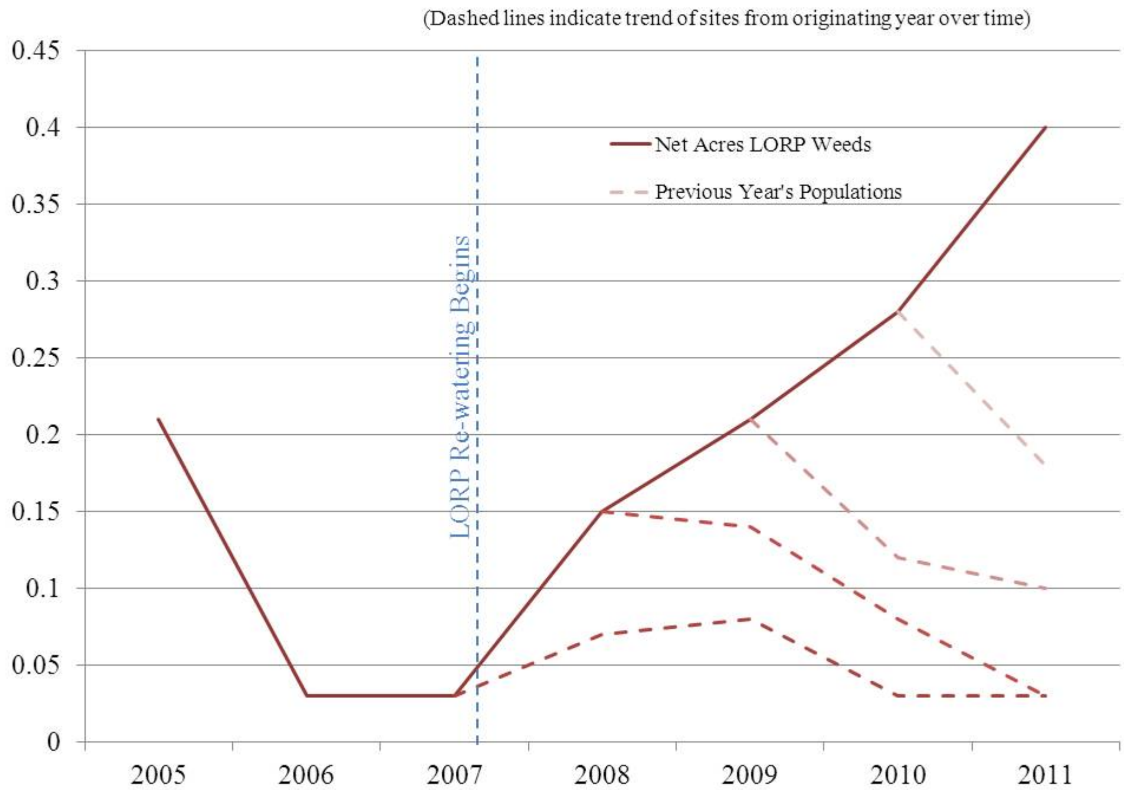


Figure 1

The number of known sites within the LORP area grew slightly during 2011 from 32 to 35 sites. Three new sites were discovered by AgComm staff and RAS participants in 2011. Additional surveys within the LORP area will be conducted throughout the winter. Of the 35 known sites, 16 are expanding (this includes the three new sites), one is declining, and 18 had no growth present in 2011. The 18 sites with no growth is a significant statistic, as it illustrates the effectiveness of rapid detection and treatment; of these 18 sites, nine were first discovered in 2010 and may have been eliminated during the initial year of management, saving future resources.

All weed locations noted in the 2010 RAS were surveyed and incorporated in management activities in 2011. Populations found during the 2011 RAS have also been included in the weed location database, have been visited since the RAS, and will be part of the regular management activities in 2012. Figure 2 on the following page outlines LORP site number statistics through time.

Year	Total Number of Sites	New Sites Discovered	Sites with No Growth
2002	2	0	0
2003	2	0	1
2004	3	1	1
2005	4	1	1
2006	4	0	1
2007	4	0	1
2008	12	8	1
2009	17	5	4
2010	32	15	5
2011	35	3	19

Figure 2

Management Difficulties

The most significant management difficulty continues to be maintaining adequate resources for effective management. Although previously discovered populations continue to decline as a result of control efforts, new populations are appearing that have pushed infested areas up 125%. Detecting small invasive plant populations in the vast LORP project area early in the colonization cycle while treatment activities are most effective, has become a difficult task to maintain. Since known populations are minimal, one small population can skew data once discovered, as occurred during this management season. AgComm continues to supplement LADWP contributions for management activities in the LORP area, but these resources are derived from grant funding and are unstable.

2011 Site Detail - LORP Area

Site Number	Location (lat/long)	Gross Acreage	Times Visited	Net Acreage	Population Trend	Notes
1202	N 36.934412° W 118.186280°	90	2	.01	Unchanged	4 plants
1205	N 36.913793° W 118.223304°	1	2	0	No Growth	1st year no growth
1206	N 36.899237° W 118.217790°	1	2	0	No Growth	1st year no growth
1207	N 36.894251° W 118.209626°	1	2	0	No Growth	1st year no growth
1208	N 36.893197° W 118.209831°	1	2	0	No Growth	1st year no growth
1209	N 36.916071° W 118.220869°	1	2	0	No Growth	1st year no growth
1212	N 36.943252° W 118.190076°	102	2	.03	Expanding	
1213	N 36.918314° W 118.176859°	1	2	.01	Unchanged	15 plants
1214	N 36.915051° W 118.174960°	1	2	.01	Expanding	6 plants
1215	N 36.918349° W 118.177173°	1	2	.01	Unchanged	15 plants
1216	N 36.918728° W 118.177968°	1	2	0	No Growth	1st year no growth
1217	N 36.929658° W 118.181944°	1	2	.01	Unchanged	3 plants
1218	N 36.928276° W 118.180291°	1	2	.01	Unchanged	8 plants
1219	N 36.925170° W 118.178338°	1	2	.01	Declining	6 plants
1220	N 36.899266° W 118.170248°	1	2	0	No Growth	1st year no growth
1221	N 36.884500° W 118.209909°	1	2	0	No Growth	1st year no growth
1222	N 36.891874° W 118.210775°	1	2	0	No Growth	1st year no growth
1223	N 36.894836° W 118.211685°	1	2	0	No Growth	1st year no growth
1224	N 36.915777° W 118.218673°	1	2	0	No Growth	1st year no growth
1225	N 36.914892° W 118.215433°	1	2	0	No Growth	1st year no growth
1226	N 36.914365° W 118.214747°	1	2	0	No Growth	1st year no growth
1227	N 36.914759° W 118.213385°	1	1	.01	Expanding	New
1228	N 36.915306° W 118.210112°	1	1	.01	Expanding	New
1229	N 36.888215° W 118.203077°	14	1	.22	Expanding	New
1303	N 36.831962° W 118.144384°	1	2	0	No Growth	1st year no growth
1308	N 36.749339° W 118.147523°	1	2	0	No Growth	1st year no growth
1401	N 36.715251° W 118.091485°	40	2	.01	Unchanged	
1402	N 36.713190° W 118.109946°	1	2	0	No Growth	Eradicated (absent 5 years)
1407	N 36.737222° W 118.106984°	1	2	0	No Growth	1st year no growth
1408	N 36.734466° W 118.106960°	1	2	0	No Growth	1st year no growth
1409	N 36.728281° W 118.100968°	1	2	.01	Expanding	
1410	N 36.735863° W 118.112003°	1	2	.01	Unchanged	
1411	N 36.727752° W 118.098255°	1	2	.01	Unchanged	
1412	N 36.713457° W 118.113858°	1	2	.01	Unchanged	
1503	N 36.556821° W 118..054905°	44	2	.01	Unchanged	

9.0 SALTCEDAR CONTROL PROGRAM

The goal of Saltcedar Control Program is to eliminate existing saltcedar stands, to prevent the spread of saltcedar throughout the Lower Owens River and associated wetland environments, and to sustain the ecological restoration that is now occurring in the LORP.

PROGRAM BACKGROUND

Saltcedar (*Tamarix ramosissima*) is an invasive non-native shrub or tree that can grow to 25 feet and live up to 100 years. Given favorable conditions, a tree can grow 10 to 12 feet in one season. Saltcedar can compete with native vegetation and degrade wildlife habitat. Its presence in the southern Owens Valley has the potential to interfere with the LORP goals of establishing a healthy, functioning Lower Owens River riverine-riparian ecosystem.

References to the importance of managing saltcedar can be found in documents that guide the saltcedar program and govern the LORP:

- The LORP Monitoring, Adaptive Management, and Reporting Plan (MAMP), notes that saltcedar may increase in some areas of the river because of seed distribution with stream flows. The MAMP states that the potential risk of infecting new areas with saltcedar is considered a significant threat in all management areas

- The 1997 Memorandum of Understanding (MOU), between Inyo County, City of Los Angeles, Sierra Club, Owens Valley Committee, CA Dept. of Fish and Game and California State Lands Commission, expresses that saltcedar reinfestation in the LORP area would compromise the goal of controlling deleterious species whose "presence within the Planning Area interferes with the achievement of the goals of the LORP" (1997 MOU B. 4)

- Parties to the Long-Term Water Agreement (LTWA) recognized that even with annual control efforts saltcedar might never be fully eradicated, but that ongoing and aggressive efforts to remove saltcedar will be required. (Sec. XIV. A).

PROJECT MANAGEMENT AND STAFF

The Salt Cedar Control Program is administered by the Inyo County Water Department, and managed by a Saltcedar Project Manager. Work crews are hired seasonally and consist of seven employees and one shared county employee. In addition, the California Department of Forestry (CDF) can provide work crews to assist in efforts to treat slash. In 2010-2011, the field season began in mid-October and concluded in mid-April.

METHODS

Plants are treated using the two-step, cut-stump method, where the tree and associated root sprouts are cut with a chainsaw or clippers as close to the ground as possible and the stump and plant perimeter sprayed promptly with Garlon 4 (triclopyr). Triclopyr is a systemic herbicide with a soil half-life ranging from 1 to 90 days. It has a low toxicity to animals.

WORK ACCOMPLISHED

In 2010-2011, crews worked in two areas: the water-spreading basins that border the west side of the Lower Owens River and in the LORP river-riparian area (these spreading basins are a concern because they harbor mature saltcedar thickets that function as reservoirs of seed); and along the river, where crews cleared saltcedar by pulling seedlings and treating plants that had resprouted after being cut and treated in previous years (triclopyr is not 100 percent effective, and plants found in water cannot be sprayed). Surveying the river to locate and remove saltcedar is an annual and ongoing activity.

Crews cut and treated 461 acres in the spreading basins and revisited 89 miles of river bank and floodplain.

FUNDING

The County's three-year Wildlife Conservation Board (WCB) saltcedar eradication grant expired in April 2011. This generous funding has enabled a level of effort that would not have been possible with Inyo County and LADWP contributions alone.

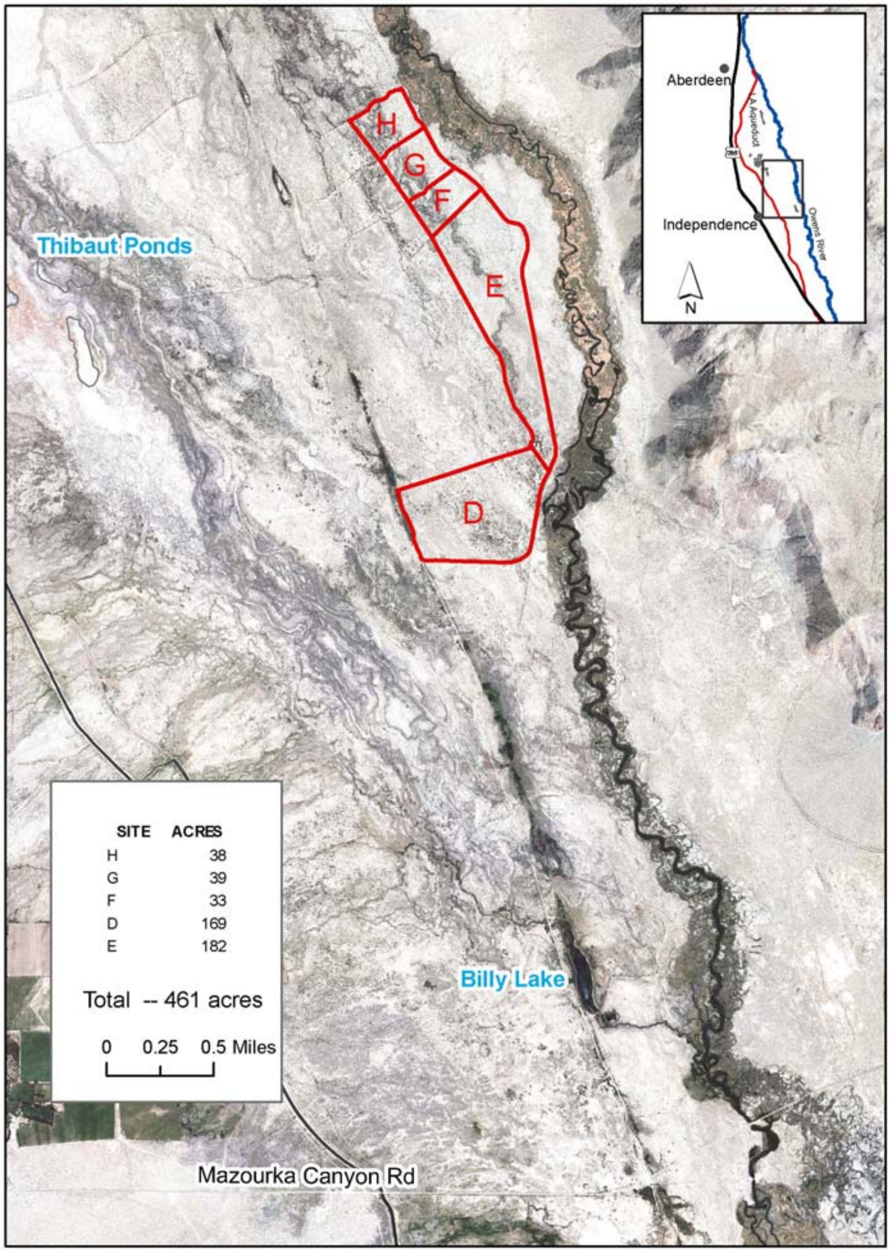
An ongoing responsibility of the Saltcedar Program is to secure grant funding to maintain a strong program. LADWP has assisted the County in its efforts to renew the WCB grant. Additional outside funding will be sought to continue an aggressive saltcedar eradication program in the LORP area.

PLANNING

In 2011, a saltcedar work plan was developed to more precisely describe the work to be conducted in 2011-2012. Plans include:

- Reducing the amount of slash (saltcedar cuttings)that have accumulated after years of cutting
- Further protecting nesting birds
- Coordinating with LADWP to help the saltcedar program and assist range management efforts.
- Clearing the Lower Owens River corridor annually of all saltcedar plants to prevent the aggressive spread of new saltcedar.

Spreading Basins Treated 2010-2011



SECTION 10

ADAPTIVE MANAGEMENT RECOMMENDATIONS

10.1 EXECUTIVE SUMMARY

The roles and responsibilities for collecting, analyzing and reporting monitoring data are described in the 2008 LORP Monitoring, Adaptive Management and Reporting Plan (MAMP). The MOU Consultants reviewed LADWP's and ICWD's 2011 Annual Monitoring Draft Reports and developed adaptive management recommendations to ensure LORP goals are met in the four Lower Owens River management areas: the Riverine-Riparian Area, Blackrock Waterfowl Management Area, Delta Habitat Area, and Off-River Lakes and Ponds. These recommendations are related to and build upon the adaptive management recommendations made in 2010.

The 2011 monitoring included hydrologic monitoring, seasonal habitat flow including flood extent, fish creel census, rapid assessment survey, avian census in the BWMA, land (range) management, and salt cedar and weed control and conditions.

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 elements 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.*"

As in 2010, monitoring analysis indicates that the LORP is attaining many MOU goals. The LORP already supports a healthy warmwater fishery in all reaches. Habitat for all indicator species has developed and continues to develop. Biodiversity in wetlands and riverine habitats has increased. T&E species are using the restored habitat. Grazing and other land uses are continuing, and recreational activities continue to increase. However, some conditions must be addressed, including: base flows and seasonal habitat flows, tule encroachment, future water quality, beaver abundance, woody riparian plant development, and the adaptive management process.

Adaptive management recommendations are described in the sections below and are summarized in the Summary of Adaptive Management Recommendations Table. The MOU Consultants also provide recommendations for improving data collection and analysis in future monitoring. Adaptive management is intended to be responsive to new information and data in order to achieve MOU goals. Thus, monitoring itself is subject to change and improvement.

The MOU Consultants are responsible for issuing Adaptive Management prescriptions, recommendations and actions to be taken in order to ensure the project is succeeding. Each year since 2008 when monitoring was initiated, the MOU Consultants have reviewed the annual reports, discussed project objectives and results with managers, and analyzed conditions and trends in order to form adaptive management actions that need to be taken. These adaptive management prescriptions are made after careful review and in order for the project to proceed in a positive direction and avoid problems.

The LORP can point out many successes; however, adaptive management is not among them. Often, the more difficult or strenuous adaptive management prescriptions are not followed, while the easiest and least restrictive are adopted. Continuing to discriminate against certain prescriptions will ultimately affect the viability and success of the project and its long-term ecological health and benefits.

Actionable adaptive management recommendations and prescriptions must be treated, acted upon, or justified for non-acceptance. The actionable items from each year's annual report, up to and including this 2011 report, must be seriously considered with a plan of action that is transparent, responsible and conclusive. Failure to do so invites failure to meet MOU goals and objectives, or worse, cause ecological setbacks to the project. Consequently, this year the MOU Consultants performed a careful review of adaptive management recommendations made in the last three years and tabulated what has and has not been implemented.

Table 1. Summary of 2011 Adaptive Management Recommendations

Management Area	Recommendation and/or Action to be Taken
Riverine-Riparian Area	• Complete river flow modeling and analyze results. Develop actions to inform tule control and beneficial flow scenarios. • Seasonal Habitat Flow: in addition to normal requirements add needed changes in flow timing, flow duration, and flow magnitude that will maintain and improve LORP resources. • Seasonal Habitat Flow Augmentation: during the SHF, flows can be augmented at selected downriver site(s) as needed to obtain more wetted acreage along the river corridor to benefit the recruitment and maintenance of woody and other riparian vegetation. • Base Flow Augmentation: improve water quality by releasing the required Delta Habitat Area habitat flows from the Intake instead of the Pumpback Station. • Water Quality: monitor selected water quality parameters (mainly dissolved oxygen and temperatures) during the release of the 2012 seasonal habitat flow. • A Bassia treatment feasibility study that includes small test areas with various treatments be investigated. • Beaver populations in the Lower Owens River, from the Intake to and including the Delta, be properly controlled so their influences do not retard the establishment and maintenance of woody tree species in the riverine-riparian corridor.
Blackrock Waterfowl Management Area	• New species be added to the HSI list, but that all occurrences of the new HSI species be updated in previous years data. • Adding new species to the indicator species list should be done through the adaptive management process soliciting input from the scientific team. • Thibaut Pond Management: LADWP complete an analysis of reasonable alternatives to determine if there is a most feasible method to regain and maintain 28 acres of surface water in the Thibaut Ponds over the life of the project. Complete a report by May of 2012 and submit to the Scientific Team for their review and comment. • Blackrock Ditch Maintenance: future mowing, excavation, or other maintenance activities in the Blackrock Ditch be coordinated with LADWP's natural resource and watershed staff. Maintenance actions should be followed that protect cottonwoods and other tree species to the extent possible.
Off-River Lakes and Ponds	• None
Delta Habitat Area	• Pulse Flow Modification: the present number of annual habitat flows now being released into the Delta Habitat Area be increased to 10 habitat flows annually, including the SHF bypass flow.

Rapid Assessment Survey	• Re-examine the present RAS methodology, analysis and reporting procedures and to bring the survey design back to the original intention and purview of the RAS. • The RAS woody species data be used to inform a targeted riparian woody species analysis that pools the data from all of the available sources within the LORP
Land/Grazing Management	• Belt transect Monitoring: characterize the vegetation communities along the entire transect, not just the water's edge. Expand the belt width to 10 meters to encompass a greater percentage of the possible woody species habitat. Transects should also extend across the wetted channel in order to monitor the survival of established woody species within the existing channel. Doubling of the number of sites. All existing and newly established belt transects be performed in 2012. • Range Trend Monitoring: Methods, data collection and timing presently used to monitor range trend transects be modified beginning in 2012. Monitor one-third of all range trend transects each year to provide yearly data for better evaluation.
Saltcedar and Weed Control	• Priority Areas: the top priority of the annual saltcedar control work program is to clear the river corridor annually of all saltcedar plants. • In the 2011 Annual Report, in the Saltcedar section work plan chapter (under the Planning Section), that a fourth work product be added: to keep the Lower Owens River corridor free from new saltcedar invasions on an annual basis.
Other	• Monitoring Protocols: Revisit all previous monitoring data and field tabulations, scanning and electronic filing as described in the MAMP protocols. All future changes or modifications to any protocols be submitted through the adaptive management process for consideration. • The LORP Data Warehouse needs to be established and populated with data as soon as possible. This will allow access to data by all MOU parties and will be a useful device for managing information without the need to include large amounts of data in the annual reports. • The current LORP Data Warehouse design should be reviewed and redesigned to meet contemporary standards, define Quality Assurance/Quality Control (QA/QC) and data management protocols, be based on a spatial/GIS platform, be online and accessible. • Implement QA/QC protocols required in the MAMP to ensure field data is collected and data entry performed correctly. • The MAMP specifies data management and storage protocols for many monitoring actions. In addition to a data warehouse, field forms are supposed to be scanned and stored for future reference in the event there are questions regarding data compilation and tabulation as well as data entry to the LORP warehouse. • Annual Report: annual report schedules with the current imposed deadlines be revisited with a goal of finding at least two months of flexibility in the data analysis, report preparation, review and adaptive management recommendation phase. • MOU and Stipulation and Order: management and legal staff begin the process of developing a new Stipulation and Order to minimize the time lag between determining what river flow change is agreed upon and the legal processes now restricting the capacity of the Pumpback

	system. • Adaptive Management: Actionable adaptive management procedures and recommendations must be treated and acted upon, or thorough justification given for non-action. The actionable items from each year's annual report, up to and including this 2011 report, must be considered and followed upon with a plan of action that is transparent, responsible and conclusive.

10.2 RECOMMENDATIONS

10.2.1 River Flow Modeling

LORP flows were established on the basis of controlled flow studies performed in 1993 in which water was introduced into a largely dry channel so that data could be collected to calibrate models for discharge, fish habitat, and water quality. Since then much has changed in the Lower Owens River. The river is a more complicated system to understand today as a consequence of restoration successes. The models developed and used to design the project over 18 years ago may no longer reflect the conditions of the river of today. Thus, it is becoming increasingly difficult to make informed management recommendations that address tule encroachment (tules and cattails in the river channel), lack of open water habitat, water quality conditions, habitat for fish and target species, and establishment of riparian vegetation.

Following several years of adaptive management recommendations, a flow modeling project was approved in 2011. The goal of a stream flow model is to have a reliable tool for future management and decision making that addresses issues related to flow regime, tules, habitat, and water quality.

The objectives of the modeling effort will inform the following inquiries:

- Are there base flow options that increase open water areas necessary to meet habitat goals for indicator species?
- Are there feasible base flows that will result in depths needed to limit tule encroachment and inhibit growth?
- Can seasonal habitat flows be used to improve temperature, dissolved oxygen and other water quality parameters if necessary?
- Can base and seasonal habitat flows be managed to meet riparian habitat development goals?
- Are there changes in duration and magnitude that would make the seasonal habitat flow more effective?
- Can river flow management be altered without exceeding the capacity of the Pumpback Station?

Managing expectations from the modeling effort means understanding what can and cannot be achieved in river and flow management actions.

- Eliminating tules is not a goal of river management. Tules provide important habitat for fish and wildlife. The Lower Owens is a desert river and as such will always contain tules. However, tules have encroached in many places to the extent that open water habitat necessary for some indicator species has been reduced over predicted conditions. The model will be used to determine if open water habitat can be improved by increasing depth with base flow management.
- Modeling may show that altering base flow without exceeding Pumpback capacity will not create sufficient depths throughout the river to significantly influence tule encroachment or growth.
- Results of modeling the representative river reaches will answer questions about where and to what extent we should expect riparian habitat to develop with different flow scenarios. This will also inform management as to whether a lack of riparian development is a function of flow or other issues, such as grazing and other land uses.
- Water quality conditions during the seasonal habitat flow, especially low dissolved oxygen that risks fish kills, may be improved with changes in duration and magnitude of the base flow.
- Modeling can be used to determine the need for river flow augmentation below the Island reach from the Alabama gates based on the predicted stage (water surface elevation) below the Island to Keeler reach to inundate land forms that will support riparian habitat, and effect tule growth.

Modeling is expected to be completed in March. Alternative flow scenarios will be reviewed and a recommendation made by the MOU consultants through adaptive management. Flow modeling will inform if recommendations need to be made on base and seasonal habitat flow changes.

Tule Control Techniques

Over time, the area of open water in the lower Owens River has been decreasing with the increase in tules and cattails. These two species (often collectively termed "tules") have been expanding in the LORP since project inception. Although tules and cattails perform important ecosystem functions and provide good habitat for fish and wildlife, their continued expansion is a concern in the LORP.

Species of Interest
Schoenoplectus acutus (SCAC)-Common tule

There are three species of cattail in North America. They all hybridize:

- *Typha latifoila* (TYLA) – common cattail or broad leaf cattail
- *T. domingensis* (TYDO) – southern cattail or tall cattail. TYLA and TYDO are known to occur in the LORP
- *T. angustifoia* (TYAN) – Narrow leaf cattail – is likely a hybrid of the native and European species which hybridized and are now indistinguishable from each other. They need genetic studies to determine the relation to the European species (Kantrud 2006).
- The hybrid between narrow leaf (TYAN) and common (TYLA) – is referred to as *T. Glauca.*

General information
In general, a method of cattail control is judged to be effective if it maintains the stature of live and dead cattails stems below water level for a period of 1-3 years. Cattail seeds do not germinate in more than 0.5 inches of water – the growth of cattails in deeper water is by expansion from existing plants. Natural shading reduces germination. Stems above the water line deliver oxygen to the roots, which are very tough and well adapted to anoxic conditions.

Control Methods
In general, cattail control has occurred on wildlife management areas to increase wildlife habitat. They are a natural part of systems that have habitat and ecosystem value. A general rule for waterfowl is to aim for a50-50 open water to marsh ratio, which is generally the management goal when tule control is undertaken. Cattails and other emergent vegetation have been harvested and used as livestock forage (Kantrud 2006). This could represent a benefit to control efforts.

Chemical Control
Glyphosphate has been shown to be successful at cattail control (Solberg and Higgins 2006). The problem with Glyphosphate is that it is a non-discriminatory killer of plants – it would need to be carefully applied. It has been applied with no effect on invertebrate abundance. Depending on the level of herbicide, control lasts 1-2 years. Dalpan and several other herbicides have been used to a limited extent.

Physical Control
Hand or physical pulling results in good control; up to 100% cattail control in some situations when pulled at the right time of year. The best control is achieved when the plants are cut twice in late summer/early fall, and the remaining clippings submerged to at least 3 inches. Clipping too early in the spring can bring an increase in tules (cuttings stimulate more growth). It is best is to cut in the fall, and then submerge the clippings through spring (Nelson and Dietz, 1966, Apfelbaum 1985). Clipped stems and other material need to be removed. In Utah and Montana, cutting shoots below the water line surface 2-3 times before they flower reduced cattail production 90-95% (Stodola 1967).

Fire
Prescribed fire has been found to not control cattails well. It only lasts one season – then they come back.

Shading
Artificial shading techniques are difficult to implement and not practical for the LORP. Natural shading will provide some measure of control, but not on the time frame or scale that people are looking for in the LORP.

Water Level Manipulation
In cattail marshes – flooding to depths of 26 inches has shown a decline – but it took two 2 years to see the effects. TYLA is more susceptible to flooding than TYDO or TYAN, which require above 47 inches (Steenis et al. 1958) to achieve control.

Drawdowns in summer enhance cattail densities by stimulating germination (Sojda and Solberg 1993). Therefore water levels should be managed to avoid summer drawdowns and maintain depth.
The depth of water to kill the plant depends partially on temperatures, the amount of energy stored from the previous year, and the vigor of the plant (Sojda and Solberg 1993). Therefore there is no absolute rule, but a general guide is to maintain a depth of 3-4 feet of water over the tops of existing shoots in the spring. Any shoot that gets above the water level will start pumping oxygen to the roots. High water levels continue to stress the plants, which may help in the next year's control efforts (less stored energy). TYLA is less resistant to deep water. TYDO is more resistant – but the deeper the water – the more stress is put on both.

In a manipulated experiment, TYLA died off almost completely at depths about 3-feet **(**Grace 1989). TYDO's depth at which it completely died was not reached in the experiment. However, as depths increased its density declined, but it still grew at 3.5 feet of inundation. However, cattails produce fewer flowers and the density declines. Deeper water stresses both, but TYDO is more tolerant. Deep water will stress the TYDO and control it to some extent.

Flooding is generally thought of as the most cost effective and efficient method to gain good control over tules. Solberg (1993) recommended flooding 3-4 feet over the *tops of the stems* in the spring. This could be quite deep in some areas of the LORP.

10.2.2 Seasonal Habitat Flow Magnitude, Duration and Timing

<u>Background and Justification</u>

The MOU-Action Plan (1997) is the first document to suggest the need to alter river flows to meet LORP objectives. In the event expectations are not met, SHF's may require augmentation from higher intake releases, augmentation from spill gates, or modification of the flow duration and ramping rates.

The Ecosystem Management Plan states that the magnitude, duration, and timing of the Seasonal Habitat Flow (SHF) can be modified if needed. The EIR (2004) allows for the flow ramping schedule for the SHF to be adjusted under the adaptive management process. The MOU is very plain in that the Standing Committee makes the final decisions on the timing, duration, and magnitude of the SHF. The MOU Consultants only recommend annually to the City and the County SHF timing, duration, and flow magnitude.

The EIR (2004) required two different types of SHF flows. The first was an initial winter flushing flow of about 200 cfs from the Intake continuous to Pumpback Station. After this initial 2008 flushing flow, the MOU direction of releasing a SHF up to a 200 cfs peak flow at the Intake would be followed when the water year precipitation is or above normal.

<u>Recommendation</u>

The MOU Consultants recommend that during their annual requirement of recommending the 2012 SHF to the City and the County, the Consultants will also add needed changes in flow timing, flow duration, and flow magnitude that will maintain and improve LORP resources.

The actual 2012 SHF magnitude, duration, and timing cannot be recommended at this time because the main constraints (the water year percent of normal precipitation) in setting the SHF will not be known until April 1, 2012. The MOU Consultants can, however, provide enhancement flow pattern guides when water year percent of normal precipitation is below average. When water year percent of normal is average or above, the peak flow required is automatically about 200 cfs. The MOU Consultants recommend that when the Water Year is 70% of normal or over, the released SHF peak flow to the Lower Owens River at the Intake always achieve 200 cfs.

<u>Flow Releases Guides</u>

Tables 1 and 2 provide the volume of water available for SHF's at 5 cfs increments based on EIR (2004) guides. The acre feet of water displayed in the Tables is quite close to what was outlined in the EIR (2004). By allocating the volume of water needed to supply the 24 hour 200 cfs flow and subtracting this from the total volume of water available determines how much water is available to ramp up and down and thus, determine the best duration time for the flows.

Table 3 provides suggested seasonal habitat flow guides for water years between 50 percent of normal to normal. All SHF flow guides, except those between 50 and 69 cfs peaks will still have the maximum flow (200 cfs) required in the MOU for normal and above Water Years. The volume of water available at MOU-EIR designated peak flows from 50 to 69 cfs did not have enough water available to efficiently get to the 200 cfs peak and still return to base flow. To simplify and reduce the large potential number of possible flow scenarios, the suggested flow designs are combined into 10 cfs intervals from 50 to 200 cfs (Table 3).

Also, these flows will be modified as needed when the MOU Consultants annually recommend SHF's to the City and County, working in the new direction from the 2010 Addendum to the EIR that bypass flows going into the Delta Habitat Area can be increased up to 928 acre feet per year (AFY) over past flow required releases.

Table 1. Acre-feet of water that could be released from a selected flow (flow is in cfs).

Flow	Acre Feet	Flow	Acre Feet	Flow	Acre Feet	Flow	Acre Feet
50	99* (EIR)	55	188	60	278	65	367
70	457	75	546 (* 664)	80	635	85	725
90	814	95	904	100	993 (*1,045)	105	1,082
110	1,172	115	1,261	120	1,351	125	1,440
130	1,529	135	1,619	140	1,708	145	1,798
150	1,887	155	1,976	160	2,066 (*2024)	165	2,155
170	2,245	175	2,334	180	2,423	185	2,513
190	2,602	195	2,692	200	2,789 (*2,780)		

* EIR (2004) determined acre feet

Table 2. Acre feet of water assigned to flow groups from 0 to 200 cfs in10 cfs increments for seasonal habitat flow releases. Acre feet values are modified from EIR, Table 2-10 on Page 2-22 (Flow is in cfs).

Flow	Acre Feet	Flow	Acre Feet
0-50	0	130-139	1,619
50-59	188	140-149	1,798
60-69	367	150-159	1,976
70-79	546	160-169	2,155
80-89	725	170-179	2,344
90-99	904	180-189	2,513
100-109	1,082	190-199	2,692
110-119	1,261	200 +	2,780
120-129	1,440		

Table 3. Seasonal habitat flow guides, by 10 cfs incremental flow groups, for designated water year percent of normal (flow is in cfs).

Note --- that these flows will probably be modified during the SHF recommendation process to meet direction from the 2010 Addendum allowing 928 additional AFY of water to be bypassed into the Delta.

0 to 49 cfs (0 af available)

No volume of water available therefore no seasonal habitat flows

50 to 59 cfs (188 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	35	75	69
3	40	60	100	119
4	40	0	40	0

60 to 69 cfs (367 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	35	75	69
3	40	125	165	248
4	40	25	65	50
5	40	0	40	0

70 to 79 cfs (546 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	80	120	158
3	40	160	200	317
4	40	36	76	71
5	40	0	40	0

80 to 89 cfs (725 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	80	120	158
3	40	160	200	317
4	40	86	126	250
5	40	0	40	0

90 to 99 cfs (904 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	68	108	135
3	40	80	120	158
4	40	160	200	317
5	40	80	120	158
6	40	68	108	135
7	40	0	40	0

100 to 109 cfs (1,082 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	68	108	135
3	40	127	167	251
4	40	160	200	311
5	40	127	167	251
6	40	68	108	135
7	40	0	40	0

110 to 119 cfs (1,261 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	45	95	89
3	40	68	108	135
4	40	127	167	251
5	40	160	200	311
6	40	127	167	251
7	40	68	108	135
8	40	45	95	89
9	40	0	40	0

120 to 129 cfs (1,440 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	53	93	104
3	40	93	133	184
4	40	140	180	277
5	40	160	200	311
6	40	140	180	277
7	40	93	133	184
8	40	53	93	104
9	40	0	40	0

130 to 139 cfs (1,619 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	76	116	144
3	40	116	156	230
4	40	142	180	281
5	40	160	200	311
6	40	142	180	281
7	40	116	156	230
8	40	76	116	144
9	40	0	40	0

140 to 149 cfs (1,798 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	105	140	207
3	40	125	165	248
4	40	145	185	287
5	40	160	200	311
6	40	145	185	287
7	40	125	165	248
8	40	105	140	207
9	40	0	40	0

150 to 159 cfs (1,976 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	45	85	89
3	40	105	140	207
4	40	125	165	248
5	40	145	185	287
6	40	160	200	311
7	40	145	185	287
8	40	125	165	248
9	40	105	140	207
10	40	45	85	89
11	40	0	40	0

160 to 169 cfs (2,155 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Fee Added
1	40	0	40	0
2	40	75	115	149
3	40	110	150	218
4	40	125	165	248
5	40	155	195	307
6	40	160	200	311
7	40	155	195	307
8	40	125	165	248
9	40	110	150	218
10	40	75	115	149
11	40	0	40	0

170 to 179 cfs (2,344 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	48	88	95
3	40	75	115	149
4	40	110	150	218
5	40	125	165	248
6	40	155	195	307
7	40	160	200	311
8	40	155	195	307
9	40	125	165	248
10	40	110	150	218
11	40	75	115	149
12	40	48	88	95
13	40	0	40	0

180 to 189 cfs (2,513 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	68	108	135
3	40	98	138	194
4	40	120	160	202
5	40	133	173	263
6	40	155	195	307
7	40	160	200	311
8	40	155	195	307
9	40	133	173	263
10	40	120	160	202
11	40	98	138	194
12	40	68	108	135
13	40	0	40	0

190to 199cfs (2,692 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	68	108	135
3	40	100	140	198
4	40	135	175	267
5	40	143	183	283
6	40	155	195	307
7	40	160	200	311
8	40	155	195	307
9	40	143	183	283
10	40	135	175	267
11	40	100	140	198
12	40	68	108	135
13	40	0	40	0

200 cfs and above (2,780 af available)

Day	Base Flow	Added Seasonal Flow	Total Flow	Acre-Feet Added
1	40	0	40	0
2	40	10	50	20
3	40	23	63	46
4	40	39	79	77
5	40	59	99	117
6	40	84	124	166
7	40	115	155	228
8	40	160	200	317
9	40	120	160	238
10	40	88	128	174
11	40	62	102	123
12	40	42	82	83
13	40	26	66	51
14	40	13	53	26
15	40	0	40	0

10.2.3 Seasonal Habitat Flow Augmentation

Background

Neither the MOU (1997), nor the EIR (2004), or the EIR Supplement (2006) referred to or required augmentation of Lower Owens River SHF's. Some of these documents did call for short-term (three year) augmentation, but only if needed to relieve fish stress during the SHF period. There presently is a small amount of flow augmentation going into the Lower Owens River from required releases at aqueduct control structures amounting to an average of 9.7 cfs. The Monitoring and Adaptive Management Plan (2008) calls for flow augmentation if needed and justified.

The recent 2010 Lower Owens Addendum to the EIR calls for augmentation of up to 200 cfs below River Intake to increase flow magnitude and duration if needed. The Addendum states that in changing flow management an additional 928 AFY can pass into the Delta over past flow releases (Flow volumes as stated in the Ecosystem Management Plan). The MOU Consultants will take this added direction into consideration when recommending augmenting future flows.

The Addendum amends the EIR in that if monitoring shows that SHF objectives are not being met, and if the monitoring triggers (Table 2 in the Addendum) have been reached, and resulting needed changes recommended through the adaptive management process, flows can be managed in accordance with the new recommended flow.

The Triggers are:

Trigger 1. A determination that the habitat goals are not being achieved and show that habitats are not achieving desired trends in habitat characteristics that relate to understory structure and composition and recruitment that are important to habitat indicator species, special status wildlife species, and plants of concern to Native Americans.

Trigger 2. Habitat goals are not being achieved. Flow pattern and duration are not being achieved will be based upon monitoring data that show riparian plants are not being recruited within the first 5 years or sustained through the 15 year monitoring period in areas subject to out-of-channel flooding from SHF's.

Background and Justification

A released peak flow of 200 cfs at the Intake during the SHF increases river depth about 4.4 feet over base level in the Intake reach. This increases, through this reach, the amount of inundated flooded area for the benefit of riparian vegetation and the opportunity for higher woody recruitment and the maintenance of this woody recruitment over time.

As this 200 cfs peak flow moves downstream, the 24 hour release of water starts lengthening out because some of the peak flow travels faster than other parts of the peak flow. Thus, as the peak wedge flows downstream it lengthens and river depth decreases. As a result the increased water depth from the peak flow lessens as the peak flow water moves downstream. Thus, less riparian corridor is inundated per unit reach as would have been inundated under a continuous 200 cfs peak flow.

The Lower Owens River exhibits more inundation with less flow below the Islands compared to above the Islands. Yet, there is still a considerable amount of area below the Islands compared to above the Islands that could be inundated with higher flows and thus augmentation from the Islands area would allow more inundation to occur below the Islands. Increasing inundated area below the Islands affords a greater likelihood of riparian vegetation recruitment.

2010 Peak Flow Water Column Depth Decreased In the Downstream Direction

River Location	Depth Increase Over Base
Intake	4.4 feet
Mazurka Station	1.8 feet
Reinhackle Station	1.5 feet
Keeler Station	1.2 feet

Maintaining peak flow magnitude as the peak wedge moves through the lower river reaches will increase the wetted inundated area.

Because of requirements in the MOU (1997) and the EIR (2004), each annual SHF can be different in both flow volume and duration. Therefore, the most productive way to work in augmentation needs is to work these needs in when the MOU Consultants make their annual SHF recommendations to the City and County. At this time MOU Consultants can recommend augmentation needs and recommend that the Alabama Gates would be the most efficient and effective release point as it would increase inundated flooded acreage through the remainder of the Lower Owens River.

Recommendation

The MOU Consultants recommend that the 2012 seasonal habitat flow (SHF) released at the Intake be augmented at selected downriver site(s) as needed to obtain more wetted acreage along the river corridor to benefit the recruitment and maintenance of woody and other riparian vegetation. The results of the new 2012 river model will help determine what augmentation flows are needed to inundate a greater amount of landforms below the islands.

10.2.4 Base Flow Augmentation

Background

The LORP will be assigned water quality regulations and standards for the Lower Owens River by July 2015 by the Lahonton Regional Water Quality Control Board. These coming standards and regulations could conflict with water quality conditions resulting from the implementation of future annual seasonal habitat flows (SHF's).

The MOU (1997) requires a base flow of 40 cfs at or near the Intake to the Pumpback system to be maintained year-around. Therefore, 11.5 months out of the year the river is undergoing steady-state flow conditions. During this time the water column and channel are storing and maintaining in-channel organic biomass. The degree of buildup depends upon the season, plant growth and vigor and the decomposition rate of stored dead plant materials. The build- up and storage of organic biomass becomes part of the channel and the amount stored and moved is in equilibrium with the resulting 40 cfs (actually an average of about 52 cfs average) base flow energy potential. This accumulated biomass becomes part of the downstream moving chemical-biological processes (causing BOD and COD), mainly through solution, and movement increases when flows are released above the average base flow.

Problem

Short-term adverse water quality conditions (mainly low dissolved oxygen and high river water temperature) occurred during the 2010 SHF and to a lesser extent during the 2011 SHF. Part of the reason these adverse conditions form is because the higher SHF's were released late in the growing season to meet willow and cottonwood seed drop timing. The initiation of the SHF starts the movement of the large stored biomass which increases in-column free oxygen demand. During mid-July to late July, atmospheric and river water temperatures are high. High water temperature results in less available dissolved oxygen. Added to this limitation is the high BOD demand resulting from the organic biomass becoming part of the downstream moving water column. These processes resulted in the conditions that came very close to causing fish kills in 2010.

The following demonstrates the unfavorable environmental conditions game fish encountered during the 2010 SHF release:

Site	DO (ppm)	River Temperature (F)
River at Mazurka Bridge	<1.0	75
River at Manzanar Bridge	0.5	76
River at Georges Return	0.15	76
River at Reinhackle Station	1.4	75
River at Keeler Station	1.6	74

Game fish suffered high stress during these conditions. No known significant fish mortality, however, was observed. Water quality conditions were better during the 2011 SHF because of the earlier release and lower average air temperatures than in 2010. If actions are not taken to decrease BOD influences during future SHF release, fish kills could occur and it may be more difficult to meet future water quality regulations.

Justification

The Monitoring and Adaptive Management Plan (2008) references the need to augment flows if:

> "In the event project goals are not being met in lower river reaches, augmentation of flows or increased duration of flows will be modified accordingly".

Although MOU goals are or are in the process of being met, the need to modify flow management to meet river water quality needs has merit. Because in-channel material having high BOD can be moved downriver and out of the system during periods of low river water temperatures, without stripping off excessive amounts of dissolved oxygen, it is probable that water quality conditions can be improved during the following SHF's by releasing cold temperature pulse flows. During late spring-summer-early fall conditions, the opposite dissolved oxygen reaction occurs when water temperatures are higher. Under these warmer conditions the increased breakdown of organic materials can cause very high BOD and easily strip off available free oxygen.

During early spring and winter conditions, the down-river flow is mainly in a neutral water loss situation. Therefore, there would be little loss of the released flow from the Intake as compared to the same Pumpback Station release. The DHA habitat flows can be released 8 to 10 days early at the Intake Station and as this now spreading-out flow arrives at the Pumpback Station, it can then be released into the DHA. Thus, the same amount of water, under the changed point of release, would be released to the DHA, but now the same amount of water would be used for dual benefits. This recommended change in point of release has a chance of increasing water quality conditions in the lower river reaches.

Recommendation

The MOU Consultants recommend improving Lower Owens River water quality by releasing the required 2012 March-April (25 cfs for 10 days) and November-December (30 cfs for 5 days) Delta Habitat Area habitat flows from the Intake instead of the Pumpback Station.

10.2.5 Delta Habitat Area Flow

Background

To ensure DHA goals are met, base and annual habitat flows are released at the Pumpback Station into the DHA. The passage of these two flow types, over-time, have converted DHA xeric vegetation to more mesic vegetation, created less open water, maintained riverine-riparian and wetland habitat, and enhanced forging and nesting areas for waterfowl and shorebirds. The DHA goal is to maintain 755 acres of wetland-riparian areas and surface water suitable for shorebirds, waterfowl, and other animals. Diverse natural habitats are required to be created and maintained through flow and land management, to the extent feasible, consistent with the needs of the "habitat indicator species". These habitats will be as self-sustaining as possible.

Several releases of habitat flows, in conjunction with the continuous base flows, ensure that adequate distribution of water and nutrients enter the DHA. The management strategy for the DHA is to maximize the extent of water, nutrients, and circulation of resources during critical times of the year. Presently four habitat flows are required by the LORP-EIR, Section 2.4 direction, to be released into the DHA as follows:

Period 1:	March-April	25 cfs for 10 days	Replenish water lenses
Period 2:	June-July	20 cfs for 10 days	Meet high ET rates
Period 3:	September	25 cfs for 10 days	Enhance migrant habitat
Period 4:	Nov-Dec	30 cfs for 5 days	Benefit habitat, recharge ground water lenses

The MOU Consultants believe that added DHA benefits can be gained by increasing habitat flow magnitude and frequency to compensate for possible future flow loss from increased flow release efficiency at the Intake.

<u>Justification</u>

Each year LADWP is becoming more efficient in managing Lower Owens River flows. This means there could be less flow delivered into the DHA during winter river water gain conditions. Increased flow also occurs during Pump Back Station break-down periods, and during periods when lower river flows do not match flow released at the Intake for some unplanned condition; for example the sudden arrival of large storms. Flows in excess of required DHA amounts could become less, especially during late fall-winter conditions as more efficiency is gained matching Intake flow release to river reach water gains during winter conditions or light ET periods.

The 2009 DHA Report (LORP 2009) analyzed vegetation development and habitat suitability within the DHA as related to past and present flows. The 2009 report recommended that DHA habitat flows be modified to gain more benefits from the available amount of water. Under MOU 1997 guidelines, if the DHA flows (habitat or base flows) are not meeting MOU goals, these flows can be modified as long as they stay within the 6 to 9 cfs flow requirement.

The habitat flows released into the DHA travels through the DHA and into the Brine Pool in about 18 hours. The DHA then has 18 hours to use these waters to enhance habitat conditions before they are lost. The present 10-day required flow periods could be applying flow after the first few days that do not further benefit DHA resources. Therefore, MOU Consultants believe that more frequent and larger habitat flows will be more favorable to maintaining and improving wildlife cover, plant vigor, soil litter, open water, species richness and species diversity in the DHA. By improving upon the periodicity and management of flows through the DHA, wetland-riparian habitats can be enhanced. The redistribution of more frequent water should maintain the achievement of MOU goals and objectives while increasing DHA values.

The past release of the four required annual habitat flows, in conjunction with the continuous base flow, has resulted in the DHA conditions meeting MOU goals (increased habitat suitability, and maintained required wetland-riverine-riparian acreages). The four habitat flow scenario needs to be modified so more of the DHA is flooded during critical times of the year and more often. This increase in annual flow numbers and selected flow volume will create a more stable environment having less stress during the long “dry out” periods now occurring under present habitat flow applications.

Larger and more frequent habitat flows, for shorter duration, will flood larger areas of the DHA more frequently. In turn, this could increase wetland-riparian vegetation acreage and habitat suitability. Under the recommended 9 habitat flows, plants and wildlife will not have to undergo such long “dry-out” periods between irrigation periods. More water is needed in spring and summer and less water during winter conditions when wetland-riparian plants are physiologically less active. Monitoring and evaluation will determine if the recommended flow changes gain benefits over that gained under the presently used four annual habitat flow scenario.

The recommended annual habitat flow changes and the justification for these changes are:

<u>January</u> No habitat flow Much of the system is dormant

<u>Mid-February</u> 25 cfs for 2.5 days

This flow will improve the quality and depth of the fresh water lens and in turn accelerate initial plant growth.

<u>Mid March</u> 25 cfs for 2.5 days

This flow will improve the quality and depth of the fresh water lens and in turn accelerate initial plant growth. Inland saltgrass, the primary component of the Transmontane Alkaline Meadow type can efficiently utilize soil moisture supplies this early in the growing season. This flow will increase soil moisture in the root zone to ensure sufficient moisture is available as plants come out of dormancy to initiate annual growth.

<u>Mid April</u> 25 cfs for 2.5 days

Marsh and surrounding riparian plants are accelerating growth as warmer air temperatures and longer daylight periods set in. This flow will again increase soil moisture in the root zone and distribute nutrients throughout the DHA for more efficient use. This flow will put another layer of fresh water over the existing fresh water lens enhancing plant growing conditions.

<u>Mid May</u> 40 cfs for 5.0 days

Marsh and surrounding riparian plants are reaching peak growth rates. Plant growth is needed for successful nesting and brooding conditions. This flow will again spread nutrients over the DHA, increase soil moisture, take away salts, and again freshen and build depth in the fresh water lens.

<u>Mid June-Early July</u> Annual daily average projected 75 cfs* for 10.0 days

Flow magnitude depends on the amount of the annual seasonal habitat flow that overflows into the DHA. This flow, on most years, will increase the quality of the fresh water lens and increase soil moisture to benefit plant growth. The insect food base for waterfowl and shorebird broods now starting to come off the nests will be improved. Because of the large released flows on most years, nutrients will be spread and waste carried away over larger areas of the DHA.

* This figure only projects an estimate of the average annual seasonal habitat over-flow that passes into the DHA. This figure is not a set amount.

<u>Mid July</u> 40 cfs for 2.5 days

Drought conditions are setting in within the DHA. Bordering wetland areas and especially higher elevation riparian areas are loosing soil moisture fast. ET rates are extremely high, accelerating the depletion of soil moisture around the root zone. This flow will increase soil moisture which, in turn, pro-longs plant growth and enhances root development. Again, this flow will put a layer of fresh water over the top of the fresh water lens, increasing its quality and depth.

<u>Early August</u> 50 cfs for 2.5 days

Drought conditions will have again set in because hot summer stress is now being applied. This is especially true in border areas of the DHA. The food base for wildlife is decreasing because of the reduction in both surface water and surface soil moisture. Available nutrients have diminished. Plants are setting seed or getting ready to ripen seed. To compensate for these conditions, this flow is larger in volume to counter the above effects over a wider area of the DHA. This high flow will better distribute nutrients and flush out waste products (i.e., salts) from the system. Broods, now in the fast growing stage, will have better feeding and cover conditions.

Mid September 50 cfs for 2.5 days

Plants are again becoming stressed and are easily forced into early plant dormancy. This flow will delay some plant dormancy, and, in turn, increase the food base for wildlife. This flow increases desirable soil moisture conditions so plants and animals have a chance to use the area successfully into the fall.

October No habitat flow --- plants are going into dormancy

Early November 30 cfs for 2.5 days

Some wildlife are leaving the DHA and other migrating wildlife are coming in. More surface water is needed close to escape cover so migrant and native wildlife will have more productive living conditions. This flow will enhance surface water conditions for these incoming migrants and other neo-tropical birds. Soil moisture will increase for better root survival in coming winter conditions. Frozen winter soil-water conditions will be delayed longer.

Late December 30 cfs for 2.5 days

This habitat flow has the same purposes as the November flow. The main purpose is to provide more favorable conditions for migrant wildlife to help make their migration trip more successful. This habitat flow will also send the DHA into the coming winter stress conditions in a more favorable position for wildlife that winter in the area.

Recommendation

The MOU Consultants recommend that the present number of annual habitat flows (4) now being released into the Delta Habitat Area (DHA) be increased to 10 habitat flows annually, including the SHF bypass flow.

The MOU Consultants recommend adopting a new 10 habitat flow release schedule including volume and timing of flows as follows:

Period 1:	January	No habitat flow	
Period 2:	Mid-Feb	25 cfs	2.5 days
Period 3:	Mid March	25 cfs	2.5 days
Period 4:	Mid April	25 cfs	2.5 days
Period 5:	Mid May	40 cfs	5.0 days
Period 6:*	Late June	75 cfs*	10.0 days*
Period 7:	Mid July	40 cfs	2.5 days
Period 8:	Early Aug	50 cfs	2.5 days
Period 9:	Mid Sept	50 cfs	2.5 days
Period 10:	October	No habitat flow	
Period 11:	Early Nov	30 cfs	2.5 days
Period 12:	Late Dec	30 cfs	2.5 days

* The Period 6 flow is an average estimate of the amount of the annual Seasonal Habitat Flow that bypasses into the DHA. The 75 cfs flow is not a set annual amount, but only considered as what could be an average Seasonal Habitat Flow by-pass in the future.

10.2.6 Rapid Assessment Survey

The RAS was conducted between August 1 and August 12, 2011 by a joint staff effort between Inyo County and LADWP. Surveys were conducted in all LORP habitat areas. Trimble Juno handheld units were utilized. These units were used to create a geodatabase. The process results in reduced labor and increased accuracy. A more formal week of training was also included in this year's effort.

Over the years, the RAS effort has had consistent elements, and other efforts that have been added or have changed over the years. The number of observation categories has grown through time.
Selected points were revisited to reassess impact areas of concern or woody species recruitment sites. The following summarizes RAS observations and data.

Woody Riparian Species
Woody species recruitment numbers have varied considerably over the years. The 2011 RAS recorded 50% more sites than 2010. There are a number of reasons for this, including the timing of the RAS in relation to the seasonal habitat flow and changes in methodology. The method and extent to which *Salix exigua* was documented increased. Recruitment sites are more common in the upper half of the river. Recruitment was observed in every reach of the river. Blackrock and Off-River Lakes and Ponds units also had woody species observations. The Delta was the only unit without an observation. The number of seedlings at each observation point varied widely. Only 13 of the 78 2010 RAS woody recruitment sites revisited in 2011 were found to have failed completely.

Exotic/Noxious Plants
Salt cedar (or tamarisk) was again tracked and recorded in the riverine-riparian system. Salt cedar is found throughout the project area. There was an increase in salt cedar sites from 2010, due to the timing of the RAS and natural recruitment variability. The majority of the salt cedar sites are in the riverine-riparian area. The salt cedar data from the RAS is best used in conjunction with the salt cedar control program. By providing the location of mature plants and seedlings, the RAS data can be used to prioritize the salt cedar eradication efforts. The RAS recorded 41 new tamarisk slash pile sites. Most of these sites were in the Delta Habitat Area.

Although not a priority for eradication, for surveillance purposes, surveyors were instructed to record Russian Olive. There were 34 Russian Olive sites.

One of the most important functions of the RAS is to identify and track perennial pepperweed sites. The RAS continued to identify new perennial pepperweed sites. The RAS identified three new sites that were previously unknown to the Ag. Commissioner's Office.

Wildlife Observations
Beaver activity was recorded at 16 sites, and increase from the 2010 total of 7 observations. Observations were made more frequently in the upper part of the river than in past years.

Evidence of Owens Valley Vole were recorded on both sides of the river along its length. The RAS report indicates widespread vole activity in the LORP. Evidence of Elk was noted at 28 locations. A fish kill (carp) in a cut off channel of the Waggoner unit was recorded.

Grazing Management Issues
Riparian fencing was reported damaged at 8 locations.

Other
Five trash locations were recorded where large appliances or furniture was dumped in the project area. Eleven observations of new roads being created in the LORP were recorded.

Overall, the use of Juno handheld units and the modifications made to the technology applied to data collection and the creation of the geo-database appear to be positive changes in this year's protocol. As identified in the RAS report, the modification of protocols has occurred throughout the history of the RAS and compromises the ability to compare data year to year. As it is treated in the report, the RAS data collection techniques must be considered when analyzing and reporting data. The continued expansion of the categories and data recorded may not serve the project as well as fewer data categories.

Recommendations

Woody species is the most important category recorded in the RAS. This category's data recording methods have changed and evolved through the years. The current method asks field personnel to identify seedlings to species and differentiates between seedlings that have grown from seed and coyote willow root suckers and re-sprouts from trees. The RAS is meant to answer the question: is recruitment occurring? The observations show that some of it is. However, the desire to track woody species recruitment through time as well as track woody species populations as a whole requires more analysis and data.

The MOU Consultants recommend that the RAS woody species data be used to inform a targeted riparian woody species analysis that pools the data from all of the available sources within the LORP. All RAS point data (from all years) can be compiled and utilized, landscape scale mapping data, belt transect data and site scale mapping and transect data could all feed into a comprehensive analysis that has the ability to answer important management questions.

An example of why a focused analysis is needed since the RAS began is that there is unreported and underutilized data. The RAS reported this year's recruitment patches only, New, previously unreported recruitment patches that were determined to be seedlings from 2010 were not reported. This is understandable, as reporting 2010 recruitment patches in 2011 could introduce confusion. However, given the importance of riparian woody species to the ecosystem function and habitat quality of the LORP, a targeted analysis and short report that utilizes all the available data is needed.

Fish Mortality was added as a category this year, and appears to be useful. The one fish kill reported was a result of the management of the waterfowl habitat (drying). However, the increased number of categories does not necessarily mean that there is more useful data. The recording of Russian Olive, Elk, River Obstructions, Owens Valley Vole, general Recreation observations, Cutbanks, and Wildlife observation points are interesting and the categories are of management interest. However, it is unclear what management action could possibly result from these observations. If there were a problem related to one of these categories, it could be recorded in the Other category. The RAS was not designed to track positive occurrences. For example, there are targeted surveys designed for indicator species, and management decisions will be based on those efforts, not observations from the RAS. These observation points do not do any harm per se, but they do provide more data to take, analyze, and report.

Grazing, roads, and trash issues described above should be corrected by LADWP staff this coming year.

10.2.7 Bassia Control

Although not recorded and tracked, the 2011 RAS again observed large amounts of *Bassia* that often form nearly impenetrable stands, both when covered in live and decadent vegetation. The 2010 vegetation monitoring reported *Bassia* as frequent and dominant influence on the riparian communities at the landscape and site scales in the upper reaches of the LORP river-riparian area (reaches 1and 2 primarily). The landscape scale mapping documented 326 acres of *Bassia* dominated habitat, while the site scale mapping saw the addition of the *Bassia* complex (which includes many other species) which covered 17% of sampled areas in transect data and mapped 144 acres within the 5 study plots.

Following the reintroduction of base flows in 2004, *Bassia* spread rapidly in the upper reaches of the LORP riparian area. Many of the areas colonized by *Bassia* were dominated by tamarisk and Russian thistle at baseline. As an adaptive management action, managers increased grazing intensity in the affected area with the hope that the *Bassia* would be eaten and/or trampled by the cattle. This proved not to be effective.

As an annual weedy species, *Bassia hyssopifolia* (the most common species of Bassia in the LORP) is an early successional species. Without a clear and viable management option, managers have been watching the *Bassia* population to see if successional processes would result in a decrease of Bassia cover and an increase in native species cover.

The acreage currently affected by *Bassia*, both live and decadent, has not significantly declined in recent years. In many of the areas there is little vegetation cover, but there are some patches where native species like mallow *(Malvacea family)* and salt heliotrope (*Heliotropium curassavicum)* frequently are found in small openings. Cover of these natives is low, but they do appear to be moving into areas that were once exclusively *Bassia*. Managers have expressed concern that the succession at these sites would not result in a desired ecological state (e.g. alkali scrub/meadow or alkali meadow) within a reasonable time frame. It is possible that successional processes will only slightly alter the structure of these communities during the project duration (15 years). For this reason, the options for adaptive management actions to address this issue were examined.

General *Bassia* Information

Bassia is native to Europe and Asia, originating from around the Caspian Sea. *Bassia* was first introduced in Fallon, NV, 1915 from the planting of alfalfa seed. The most common species of *Bassia* in the Owen's Valley is *Bassia hyssopifolia*. It is an annual plant that reproduces from seed. *Bassia* can displace some native species, but there is no evidence that it alters ecosystem processes (fire cycles, soil chemistry, etc.). *Bassia* is toxic to sheep. Germination requires warm, bright light conditions. Therefore, if shaded by native species, it is less likely to germinate.

Bassia occurs widely, but rarely in the kind of monotypic, multiple-acre stands that are found in the LORP. In general, *Bassia* has not presented a large problem in most areas. Therefore, there has not been widespread application of control methods; nor is there a lot of data available on *Bassia* control.
On the Kern River Preserve it covers 5-10 acres in a multiple of small clusters, occasionally forming monotypic stands. Although the preserve has not performed any studies or attempted to quantify the *Bassia* population, their experience dealing with this weed can help managers to make decisions about possible adaptive management actions. They have found that once it is established it is known to be somewhat persistent, although it does not appear to be on the increase on the Kern preserve. In some areas on the preserve, native species are replacing *Bassia*, suggesting that it may be ruderal, or stress tolerant. Indicating the absence of disturbance may lead to its decline. They have seen the population increase and decrease from year to year. They attempted winter grazing but there was a negligible effect on the population.
The control methods available include:

Physical Control

Pulling of *Bassia* is recommended in the spring, when soils are wet (for easy pulling) and plants are large enough to pull, but before they have gone to seed. (Muenscher 1955). It has been proven to be effective when properly applied.

The Bradley Method is one sensible approach to manual control of weeds (Fuller and Barbe 1985). This method consists of hand weeding selected small areas of infestation in a specific sequence, starting with the best stands of native vegetation (those with the least extent of weed infestation) and working towards those stands with the worst weed infestation. Initially, weeds that occur singly or in small groups should be eliminated from the extreme edges of the infestation. The next areas to work on are those with a ratio of at least two natives to every weed. As native plants stabilize in each cleared area, they work deeper into the center of the most dense weed patches. This method has great promise on nature reserves with low budgets and with sensitive plant populations. More detailed information is contained in Fuller and Barbe (1985). Plants can also be hoed and left to dry in the sun. This however, introduces disturbance that may lead to future establishment.

Burning
Burning is proven to work but only if done in the summer. This would kill plants before they produce seed. However, in most systems *Bassia* is not considered a significant enough problem to justify a burn. The burn can kill native species (including woody species), can be costly, and often can burn unintended areas. However, *Bassia* is very capable of re-occupying burned areas.

Biological Control
No biological program for insects or fungi currently exists.

Experience on the Kern Preserve suggests that minimizing disturbance in non-crop settings may allow more desirable plants to out compete and replace *Bassia*. Sowing native seeds may help to reduce *Bassia* recruitment and establishment. Competition from native species could influence the *Bassia* population in the LORP with some active management intervention.

Chemical Control
This has not been applied widely or reported, but would likely respond in a similar way to Russian thistle and Kochia. There are several common herbicides that work on these closely related species. USFS uses chemical control on *Bassia* – which is not specifically targeted, but on a list of species they treat with 4-wheelers and chemical sprayers. This is a possible method that could be applied in the LORP.

Mechanical (mowing)
This method is non-selective, and difficult to bring machinery in to the terrain. This option is likely not a good choice for the LORP.

Recommendations

There is no clear management answer to controlling a *Bassia* infestation other than not causing soil disturbance or complete fire prevention. Without a proven and established treatment technique available, a widespread and expensive program is not prudent. However, the MOU Consultants recommend that the costs of a *Bassia* treatment feasibility study that includes small test areas with various treatments be investigated.

10.2.8 Saltcedar Control

Background

Saltcedar is the most abundant and detrimental noxious weed in the LORP. Saltcedar is undesirable because of the plants ability to eliminate native plant communities and depress associated wildlife populations. The MOU Consultants recommendation is not entirely new as surveying the river corridor to locate and remove saltcedar is an annual ongoing activity. The dense stands of saltcedar that once colonized reaches of the river corridor and especially in the once dry upper river channel reaches have now been mainly controlled. These rehabilitation gains need to be maintained and protected.

Justification

A goal of the saltcedar control program is to prevent the spread of saltcedar throughout the Lower Owens River corridor and associated wetland environments. A second goal is to sustain the ecological restoration (through saltcedar removal) that is now going on. The annual elimination of all saltcedar plants in the river corridor will further these goals.

The annual Rapid Assessment Survey (RAS) identifies and locates existing saltcedar plants in the river corridor. RAS identifies plants that survived past saltcedar elimination efforts or have been recently recruited. The location and quantities of these plants are recorded and this information provided to the

County to assist in their removal and control efforts. For example, in the 2011 RAS report, 50 saltcedar sites previously located in 2010 were revisited in 2011. In the river corridor itself, saltcedar was still present at the 23 of 24 sites assessed. Eleven of the saltcedar sites revisited supported more than 100 saplings and on some sites there was new recruitment. Annual removal of saltcedar in the complete river corridor will take care of this re-invasion problem.

Recommendation

The MOU Consultants recommend that the top priority of the annual saltcedar control work program is to clear the river corridor annually of all saltcedar plants. This includes all seedlings, re-sprouts, and missed older plants from past eradication efforts. The river corridor would be cleaned of saltcedar annually from the Intake Station to and including the Delta. The MOU Consultants also recommend that in the 2011 Annual Report, in the Saltcedar section work plan chapter (under the Planning Section), that a fourth work product be added. The fourth work product would be to keep the Lower Owens River corridor free from new saltcedar invasions on an annual basis.

10.2.9 Beaver Control

Background and Justification

Beavers are not native to the eastern Sierras or the Owens Basin. Beavers were introduced into the Eastern Sierras during the 1930’s and 1940’s as part of the Federal Aid in Wildlife Restoration by State Government.

Beavers modify river morphology and hydrology by cutting down or girdling woody plants and other vegetation types. Live and dead woody plants are removed from river corridors by beaver for dam building and forage utilization. This, in turn, can detrimentally influence plant and animal community composition and diversity. Therefore, to help meet LORP objectives, beaver over-abundance and distribution must be controlled during the on-going river rehabilitation period. The river corridor must be allowed to go through needed rehabilitation unhindered, especially during the initial years, so LORP goals are met.

A primary environmental concern in the riparian corridor is the quality and abundance of woody vegetation, primarily tree willow. The LORP beaver control goal is to control animal numbers to protect the development and sustainability of willow and other woody species. High beaver numbers not controlled, suppress habitat development and inhibit the pace and magnitude of needed woody recruitment. Tree willow and cottonwood need to be increased in upper reaches of the Lower Owens River and maintained in the lower reaches of the river. This can be accomplished by controlling the number of beavers per acre of willow so their capability to inhibit or eliminate willow is less than the rates of recruitment and growth of woody vegetation.

LORP Technical Memorandum #3 (Distribution and Abundance of Beaver In the Lower Owens River --- 1998) suggested that manageable maximum beaver density in the LORP should not exceed one beaver per 29 acres of poor to fair willow habitat and not more than one beaver per eight acres of good to excellent willow habitat. Beaver population surveys are not conducted in the LORP because river systems not receiving heavy annual icing conditions are very difficult to successfully determine beaver numbers. Because it is not feasible to determine beaver numbers in the Lower Owens River because of dominantly non-freeze up conditions, the City and the County will have to depend mainly on Rapid Assessment Surveys (RAS) evaluations to determine when and where detrimental influences by beaver require control interventions.

RAS annual beaver activity evaluations along with enhanced range belt corridor monitoring are the best tools available to determine when, where, and how much beaver control needs to be done. Beaver activity was noted at 16 locations in 2011 while only 7 were noted in 2010. This may indicate beaver numbers are increasing.

In the future, all beaver dams should be left in place unless it is definitely proven that they are damaging LORP resources. The large amount of time and money used in this removal practice in the past should now be directed towards controlling beaver numbers.

Recommendation

The MOU Consultants recommend that beaver populations in the Lower Owens River, from the Intake to and including the Delta, be properly controlled so their influences do not retard the establishment and maintenance of woody tree species in the riverine-riparian corridor.

10.2.10 Range Belt Transect Monitoring

LADWP's staff surveyed 16 sites in 2011 on both sides of the river using the streamside monitoring transects, surveying belt transects, for a total of 32 transects. The surveys provide data on woody species recruitment and information on young and mature plants. It also characterizes stream bank stability and notes use by cattle. The full protocol was performed in the spring, followed by a reduced effort in the fall, since many of the attributes are not likely to change in only a few months. Surveys identified a few *Salix exigua* (narrow leaf willow) seedlings in the spring and several seedlings and/or root sprouts in the fall. The fall sampling also recorded 5 black willow (*Salix goodingii*) sites. Bank conditions were also recorded and did not reveal any cause for concern.

The data provided by the streamside surveys is useful and has recorded woody recruitment and information and young and mature woody species adjacent to the river. These are important ecosystem components that need to be monitored. The bank condition data has shown no need for concern. It does indicate that there are very few open and barren sites along the transects; barren sites with suitable substrates are common germination areas for willow and other riparian species.

The data recorded on these transects is an accurate way to record the woody species along the established transects. Additional information on the established riparian community could prove useful in other efforts. All of the belt transect data would be useful to the Targeted Woody Species monitoring effort recommended in the RAS section. This data, RAS data and the existing mapping and transect data would provide a basis for the new effort.

Some land management conclusions are not supported by the data presented. The conclusions go beyond the scope of inference for the data and appear to be subjective which is misleading. For example, statements like, "floodplains are responding extremely well to current management in most areas" and " Grazing prescriptions and other land management practices are proving beneficial" are not supported by 3-meter belt transects that recorded stable streambanks, 1 shrub seedling in the spring monitoring effort and several shrub seedlings and 5 tree seedlings in the fall. Comments regarding wildlife habitat values are also misleading since neither the range trend nor belt transect methods include metrics for wildlife habitat.

Recommendations

Several revisions to the protocol are proposed in the Annual Report. It makes sense to reduce the fall effort to only things that may have changed since the spring. The added category of standing dead clarifies the bank condition data. It makes sense to characterize the vegetation communities along the entire transect, not just the water's edge. However, the MOU Consultants recommend expanding the belt width to 10 meters to encompass a greater percentage of the possible woody species habitat. Transects should also extend across the wetted channel in order to monitor the survival of established woody species within the existing channel. Many of these trees established prior to project inception under a different hydrologic regime, and may be susceptible to senescence. In addition, the MOU Consultants recommend doubling the number of sites and recording woody riparian only; eliminating other vegetation and cover measurements. Having only 16 sites along the river limits the ability of the protocol to capture an accurate picture of woody species recruitment in the LORP. While it is suggested in this annual report that belt transects not be performed until 2014, the MOU Consultants recommend that the belt transects be performed in 2012.

10.2.11 Range Trend Methodology and Timing

The MOU Consultants recommend that the methods, data collection and timing presently used to monitoring range trend transects be modified beginning in 2012 as follows. Future modified range trend transect monitoring and timing by year and grazing lease:

Year of transect analysis (Grazing lease and number of transects to be analyzed)

2012	2013	2014	2015	2016	2017
Intake (1)	Blackrock (29)	Thibaut (9)	Repeat 2012	Repeat 2013	Repeat 2014
Twin Lakes (6)	Delta (7)	Islands (3)	Schedule	Schedule	Schedule
Lone Pine (8)					

Background and Justification

The current range trend monitoring schedule for LORP range trend transect evaluation is to re-read all LORP range trend transects again in 2012. The Monitoring and Adaptive Management Plan then requires subsequent evaluation of all range trend transects every five years (e.g., 2017, 2022, ---). LADWP range specialists believe that range trend transect data would be of more value to management if one-third of the range trend transects were read every year instead of all transects every fifth year. This change means that the range trend transects would be read more often. The MOU Consultants recommend that all range trend transects be analyzed over a 3-year period instead of a once in a 5-year period.

Monitoring one-third of the trend transects each year will provide yearly data to better evaluate and follow changing climatic and land management conditions. Yearly monitoring data increases the probability of documenting the influence of changes in climatic and/or applied land management on the different ecological sites within the LORP area. The new monitoring schedule will also make LORP range trend monitoring more compatible with on-going range trend monitoring methods now being done in the other LADWP grazing leases in the Owens River Basin.

10.2.12 Monitoring Protocols

As monitoring has proceeded since 2008, there has been a growing propensity to make small or seemingly minor changes to the MAMP protocols, or simply not performing all elements of the protocols. This has occurred with the Rapid Assessment Survey, the BWMA surveys; Flood Extent, Quality Assurance Assurance/Quality Control (QA/QC) and data management protocols.

The manner in which woody riparian plants are recorded in the RAS protocol has been modified each year; additional indicator species were added to the avian census in the BWMA; QA/QC protocols for the RAS, the BWMA surveys, the Delta and other areas have been dropped; the August 1 deadline for the Flood Extent report is not met; and none of the data storage protocols cited in the MAMP have been followed.

Not all of the modifications cited above have been negative; some have improved a protocol. As described in the MAMP, protocols and methodologies are also subject to adaptive management. Monitoring methods can be modified, terminated or new ones prescribed. However, any changes, additions or deletions, must go through the MOU process. It is not appropriate for an individual to make modifications without soliciting input from all of the scientific team; ICWD, LADWP, and the MOU Consultants.

Recommendations
Since the LORP is only into its third monitoring year, and before the data base gets any larger, the MOU Consultants recommend revisiting all previous data collected and filing, scanning and electronically managing the data as described in the protocols. This includes the data warehouse and common-access to the data as required in protocols.

In the future, the MOU Consultants recommend that changes or modifications to any protocols be submitted through the adaptive management process for consideration.

The LORP Data Warehouse needs to be established and populated with data as soon as possible. This will allow access to data by all MOU parties and will be a useful device for managing information without the need to include large amounts of data in the annual reports.

The LORP Data Warehouse design should be reviewed and redesigned to meet contemporary standards, define QA/QC and data management protocols, be based on a spatial/GIS platform, be online and accessible.

Implement QA/QC protocols required in the MAMP to ensure field data is collected and data entry performed correctly.

The MAMP specifies data management and storage protocols for many monitoring actions. In addition to a data warehouse, field forms are supposed to be scanned and stored for future reference in the event there are questions regarding data compilation and tabulation as well as data entry to the LORP warehouse.

10.2.13 Blackrock Waterfowl Management Area

The April 1st 2011 runoff forecast was for 150% of normal and thus 500 acres was required to be flooded within the cells of the BWMA. In April 2011, the Winterton Unit was placed in active status while the Waggoner Unit was taken out of active status (dried). The Drew Unit, activated in April 2009, remained active in 2011. Thus, the 500 acre flooded area requirement began after April 1st and was determined by Winterton and Drew.

Filling Winterton took a while and thus the 500 acre flooded area requirement took some time to meet. It took nearly 4 months to maximize the flooded area of Winterton. Initial response to flooding was slow with only 84 acres flooded by the 10th of May 2011. Ramping flows in a way that exceeds evaporation rates and transpiration rates in the Owens Valley is difficult to achieve especially during summer months, when ET rates are high. Eventually, by September and October, Winterton filled to a sufficient point where 500 acres of flooded area was achieved. The overall average flooded area in the BWMA for 2011 was 506 acres, exceeding LADWP/ICWD’s mandated 500 acres of flooded area (Table 1).

Table 1. BWMA Cells Flooded Acres per Month 2011.

Month 2011	Winterton Date	Winterton Acres	Thibaut Date	Thibaut Acres	Waggoner Date	Waggoner Acres	Drew Date	Drew Acres	BWMA Sum
JAN	N/A	N/A	1/11/2011	65.6	1/11/2011	390.6	1/11/2011	333	789.2
APRIL	N/A	N/A	N/A	N/A	4/12/2011	221.4	4/12/2011	287.8	509.2
MAY	5/10/2011	83.9	N/A	N/A	5/12/2011	74	5/9/2011	287.8	445.7
JUNE	5/31/2011	122.7	N/A	N/A	N/A	N/A	5/37/2011	289.9	412.6
JULY	7/6/2011	136.6	N/A	N/A	N/A	N/A	7/6/2011	280.3	416.9
AUGUST	NET-AUG	178.4	N/A	N/A	N/A	N/A	NET_AUG	280	458.4
SEPT_14	9/14/2011	188.7	N/A	N/A	N/A	N/A	9/14/2011	276.2	464.9
SEPT	NET-SEPT	206.7	N/A	N/A	N/A	N/A	NET-SEPT	277.5	484.2
OCTOBER	NET-OCT	266.7	N/A	N/A	N/A	N/A	NET-OCT	305.8	572.5
								2011 AVG	**506.0**

BWMA Avian Surveys

The avian survey report in Section 6.1 includes a discussion of adding species to the BWMA habitat indicator species list (HSI). While Tech Memo 15 does mention that adding and removing species to/from the HSI list is appropriate, doing so should be done within the adaptive management framework soliciting input from the scientific team.

Additionally, if new species are added to the HSI list then previously collected data should be updated to include the new species. Doing so will insure that previous data matches the updated list. For example, if one compares previous years HSI data to 2010-2011 data one could conclude that a huge increase in indicator species was observe d in 2010-2011. While this may be true, the conclusion is compromised by the addition of a new suite of indicator species. The result of the analysis could simply be the result of adding additional species to the HSI list. Thus, as new indicator species are added to the list, all occurrences of these new indicator species should be added to previous years HSI data to ensure that yearly comparisons are correct.

The HSI data should be compared to some measure of habitat. Since landscape mapping was not performed in 2010 – 2011, it is understandable that no CWHR was performed, but the HSI should be compared to some measure of habitat extent if not quality. For example, a simple graph of HSI abundance compared to flooded extent in Winterton would be sufficient. A simple graph is presented below (Figure 1). Not surprisingly, the data indicates that as flooded acreage increases the abundance of habitat indicator species also increases. We recommended adding some measure of habitat availability and bird abundance comparisons in future years in which landscape mapping is not available. If the opposite trend was observed it would indicate that a management change was warranted.

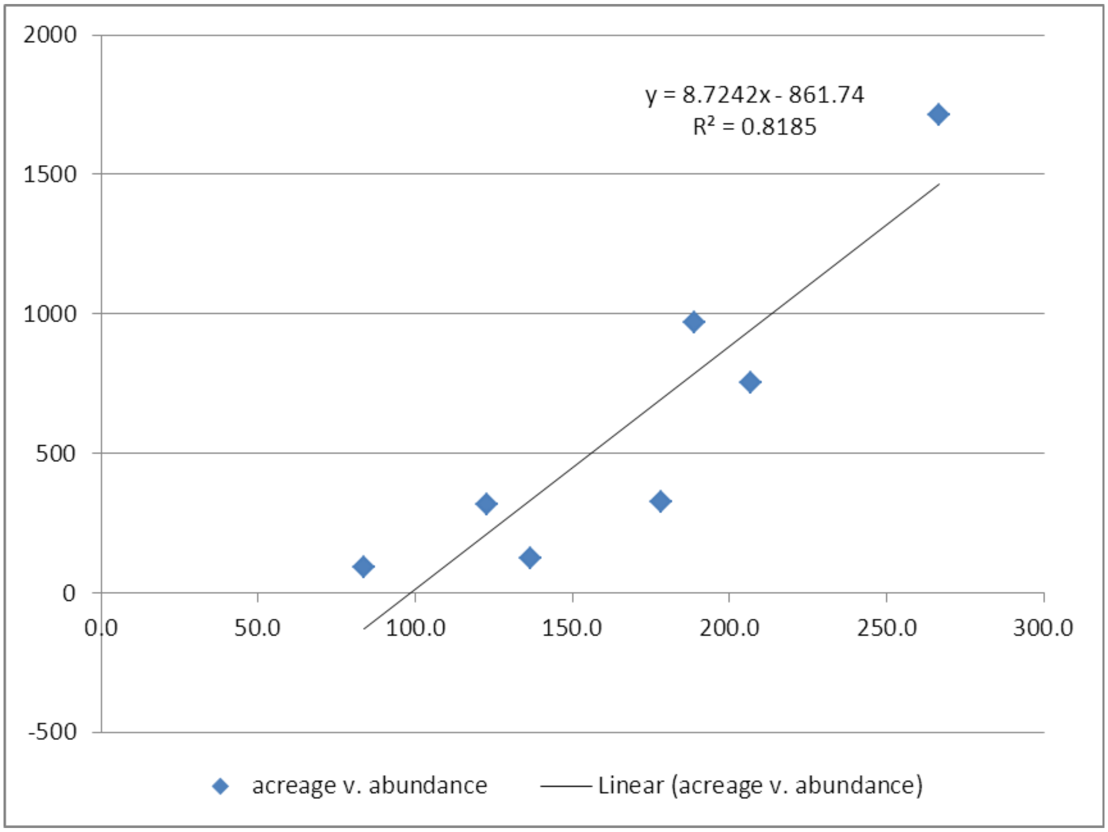


Figure 1. Monthly Flooded Acreage at Winterton compared to Monthly Habitat Indicator Species Abundance (trend Line and Regression Equation added to examine significance).

A suggestion in the report is to enhance shorebird habitat by flooding the unit during the spring and fall migration periods. This should be done if shorebirds decrease; however, at present, shorebird abundance varies seasonally in the Winterton unit. At times shorebirds are the most abundant (spring) habitat indicator species guild, while at other times they are the fourth most abundant (fall).

<u>Recommendations</u>

The MOU Consultants recommend that the new species be added to the HSI list, but that all occurrences of the new HSI species be updated in previous years data. Also, adding new species to the indicator species list should be done through the MOU process soliciting input from the scientific team.

10.2.14 Blackrock Ditch Maintenance

Blackrock ditch is used to convey water from the aqueduct to the Blackrock Waterfowl Management Area and the lower Owens River. Laterals connect the ditch to the wetland units and off channel lakes. As part of the LORP the ditch was incorporated into the overall ecosystem management plan as an integral component linking the restored river to off-channel lakes and ponds and the wetlands. Thus the Blackrock ditch now functions as a critical biological corridor that allows the egress of fish and other biota between the river, wetlands, and lakes and ponds.

This connectivity is not only necessary as a corridor but the ditch is an ecological component in itself. The development of riparian habitat along the ditch provides habitat for a variety of bird life. One of the most important developments has been the establishment and growth of willow and cottonwood trees. If these overstory species are allowed to grow they will provide not only multi-layered habitat, but shading will reduce solar radiation and the total heating of water flowing in the ditch. Lower water temperatures will benefit water quality in the river, lakes and wetlands.

A significant stand of cottonwoods and willows had been established along the ditch approximately parallel with the Drew wetland unit to the flow measuring station. Cottonwood trees had reached a height of about four feet this year. Unfortunately, this stand was destroyed as part of the ditch maintenance program. Willow and all other woody riparian plants were also eliminated.

While it is recognized that some ditch maintenance is required from time to time to maintain flow, maintenance should be done with more care to protect cottonwoods and tree willow to the extent possible. The river corridor has very little cottonwood growth and this area of the Blackrock ditch was one of the very few places where cottonwoods have taken hold.

Recommendations

It is recommended that any future mowing, excavation, or other maintenance activities in the Blackrock Ditch be coordinated with LADWP's natural resource and watershed staff. Maintenance actions should be followed that protect cottonwoods and other tree species to the extent possible.

10.2.15 Water Quality

Background and Justification

Short-term adverse water quality conditions (low dissolved oxygen and high river water temperature) occurred during the 2010 seasonal habitat flow (SHF) and to a lesser extent during the 2011 SHF. The main reason adverse conditions formed was because the habitat flow was released late in the season, running into mid-July, to meet willow and cottonwood seed drop timing. By mid-July to late July, atmospheric and river water temperatures are high. The higher water temperature results in lower dissolved oxygen levels and much higher oxygen demand, especially in the lower river reaches. This combination came close to causing large fish kills in 2010.

The following information provides some examples of unfavorable environmental conditions encountered during the 2010 SHF.

Site	DO (ppm)	River Temperature (F)
River at Mazurka Station	<1.0	75
River at Manzanar Road	0.5	76
River at Georges Return	0.15	76
River at Reinhackle Station	1.4	75
River at Keeler Bridge	1.6	74

Game fish suffered high stress during these conditions. No known significant fish mortality, however, was observed. Water quality conditions were better during the 2011 SHF because of the earlier release and lower average air temperatures than in 2010. Selected monitoring of a few water quality conditions will provide real-time information to help managers take immediate measures, if needed over a short period, to buffer potential damage to LORP resources.

Recommendation

The MOU Consultants recommend that the County monitors selected water quality parameters (mainly dissolved oxygen and river temperatures) during the release of the 2012 seasonal habitat flow. This monitoring effort can be reduced by only tracking peak flow condition as the Intake released peak flow moves downstream to the Pumpback Station.

10.2.16 Thibaut Pond Rehabilitation Progress

The Thibaut Ponds are supported by water from the LADWP aqueduct through the east branch or the Thibaut spillgate. The EIR considers the Thibaut Ponds as part of the off-river lakes and ponds of the LORP. The ponds are required to be kept full of water. No increase in water supply to these ponds is required by the EIR or the LORP Management Plan. The EIR states that lake surface areas in off-river lakes and ponds would not increase or decrease, and existing shoreline conditions would be maintained under proposed flows. The EIR also states that the increasing abundance of marsh vegetation could potentially degrade fish habitat, and this impact is not considered part of the LORP, but, instead is a management issue associated with ongoing practices of LADWP. Therefore, it is probably at the discretion of LADWP whether the ponds should provide the 28 acres of surface water or the occlusion by emergent vegetation is allowable.

These ponds are now chocked with emergent vegetation eliminating most of the past available surface water acreage. Open water in the EIR is considered valuable and very rare “wetland habitat” in the Owens Valley. The MOU does not count the pond wetland acreage as contributing to the 500 or less acres of wetlands required to be maintained in the Blackrock Waterfowl Management Area. The pond did, in the past, contribute 28 acres of surface water to the management area. The pond is too shallow in water depth to prevent emergent vegetation from taking over and covering the pond surface area.

Recommendations

In the 2010 adaptive management recommendations, the MOU Consultants recommended that LADWP complete an analysis of reasonable alternatives to determine if there is a most feasible method to regain and maintain 28 acres of surface water in the Thibaut Ponds over the life of the project. Suggested alternatives to consider included, increasing water depth by excavation, water control dykes to increase pond depth and chemical spraying to eliminate emergent vegetation. This feasibility report was not completed. Therefore, the MOU Consultants again recommend that LADWP complete a report by May of 2012 and submit to the Scientific Team for their review and comment.

10.2.17 Annual Report Scheduling

The schedule to complete the annual LORP report is very compressed. Field work, required by the MAMP, is typically still being conducted through September. While some report work can commence prior to October, the bulk of the data compilation, analysis and report writing must be done within about a month. The draft reports are then passed to the MOU Consultants on November 1, allowing a month, which includes a long holiday, for the MOU Consultants to review, analyze and formulate adaptive management recommendations. Even more disturbing is the short amount of time (about 10 working days) the MOU parties have to examine the reports and adaptive management recommendations which can run to well over 400 pages. As a result the MOU parties are not able to provide meaningful input.

Because of the compressed schedule, too many mistakes are being made in the individual reports. The mistakes are in analysis, tabulation of data, and conclusions. This places the burden of fact-checking on the MOU Consultants. The MOU Consultants must rely upon the accuracy and correctness of the data and reports provided and if the annual reports are not accurate and contain mistakes, adaptive management recommendations can be misdirected.

An essential piece of the process which is sadly missing is input (suggestions, criticisms, ideas) from the other five MOU parties. Given the paucity of time available for their review, understanding and formulation of responses, it is not surprising that the MOU parties feel shut-out of the process.

Currently, a January deadline is set so that the annual report is complete and the next fiscal year's work plan is available for the Technical Group's approval. This allows about six months (February to July) for the LADWP Board and Inyo County Commissioners to approve the work plan and budget. Two months (October and November) to compile and analyze the monitoring data, complete draft reports, evaluate and make adaptive management recommendations, solicit MOU party and public inputs, and finalize the annual report versus six months for administrative processes is an unreasonable allocation of time and invites mistakes and errors.

Recommendations

The MOU Consultants recommend that annual report schedules with the current imposed deadlines be revisited with a goal of finding at least two months of flexibility in the data analysis, report preparation, review and adaptive management recommendation phase.

10.2.18 MOU Changes via Stipulation and Order

As described previously, the MOU Consultants recommend several changes in base flow, seasonal habitat flow and Delta pulse flows. It is expected that the stream flow modeling work will be completed in March, which will allow the MOU Consultants to recommend actual flow rates and amounts. It would be ideal if the anticipated flow changes could be made soon after the decisions on flows are made rather than delay another year to accommodate legal processes.

If in-river flows are increased, it will very likely require a change in the amount of water that is allowed to be pumped back and additional pump capacity will need to be considered. Based on previous Stipulation and Orders, changes in in-river, out-of-channel and Delta release flows will require another court action to amend the MOU.

Recommendations

The MOU Consultants recommend that management and legal staff begin the process of developing a new Stipulation and Order to minimize the time lag between determining what flow change is agreed upon and the legal processes now restricting the capacity of the Pumpback system.

10.2.19 Evaluation of Progress on Previous Adaptive Management Recommendations

The MOU Consultants are responsible for issuing Adaptive Management prescriptions, recommendations and actions to be taken in order to ensure the LORP is succeeding. Each year since the project was initiated the MOU Consultants have reviewed the annual reports, discussed project objectives and results with managers, and analyzed conditions and trends in order to form adaptive management actions recommended to be taken. These adaptive management recommendations are made after careful review and in order for the project to proceed in a positive direction and avoid problems.

It is of fundamental importance that adaptive management actions and recommendations should be followed, adhered to or justification as to why action was not taken. Otherwise, adaptation to on-the-ground conditions does not occur, thus, negating the principal of adaptive management. At this point in the project history it is timely to highlight the most salient adaptive management recommendations for which no action has been taken and/or are annually passed on as actionable items. By not acting on the adaptive management recommendations the project is not addressing issues that will affect the attainment of MOU goals and objectives, and could end up harming or hindering the ecological trajectory of the project.

The following tables are a synopsis of past adaptive management recommendations and an indication of whether the actions were followed or not. Often, the more difficult or strenuous adaptive management procedures are not followed, while the easiest and least restrictive are adopted. Continuing to discriminate against certain recommendations will ultimately affect the viability and success of the project and its long-term ecological health and benefits. The adaptive management recommendations are not made casually; rather, each is based on expert scientific experience and fundamental understanding of conditions and ecological context.

Actionable adaptive management procedures and recommendations must be treated and acted upon, or thorough justification given for non-action. The actionable items from each year's annual report, up to and including this 2011 report, must be considered and followed upon with a plan of action that is transparent, responsible and conclusive. Failure to do so invites failure to meet MOU goals and objectives, or worse, cause ecological setbacks to the project.

The LORP is still in a very early state of development. The project has considerable ecological potential, vigor and resiliency in its future, but only if adaptive management is a priority and functions as was intended.

Summary of Important Adaptive Management Recommendations Not Followed and Actions Not Taken from 2008, 2009 and 2010

Management Area	Recommendation and/or Action to be Taken
Riverine-Riparian Area	• Re-map landforms, including channel landform, to improve accuracy of monitoring seasonal habitat flow events. Re-mapping of landforms can be performed in conjunction with the flow modeling recommendation using current aerial photos and survey data. • LADWP, ICWD and the MOU Consultants participate in a mapping conference to identify a repeatable methodology for the landscape mapping and determine how to account for error when comparing multiple years of data. • Normalize the flooding extent and inundation data for the seasonal habitat flow before extrapolating to the reach and river-wide. Perform the vegetation inundation analysis. • LADWP develop a feasibility analysis addressing alternatives to improve the flow measuring capability of the Lower Owens River Intake Control Structure. •
Blackrock Waterfowl Management Area	• Perform analysis, plan and report of Thibaut Ponds habitat area. Maintain Thibaut Ponds open water area as specified in MOU/FEIR. • 2008 recommendation for wetted perimeter and inflow monitoring in the BWMA wetland cells to produce a reliable alternative to walking the perimeter several times a year. The purpose of relating inflow to area is to create a predictive model rather than the labor intensive method to field GPS the wetted perimeter.
Delta Habitat Area	• 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 • 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
Off-River Lakes and Ponds	• No adaptive management actions are required.

Rapid Assessment Survey	• LADWP, ICWD and MOU Consultants meet to re-examine the present RAS methodology, analysis and reporting procedures and to bring the survey design back to the original intention and purview of the RAS. • Woody Recruitment: RAS is not a comprehensive survey to monitor woody recruitment. If managers desire more systematic information on woody recruitment, then another method should be employed.
Land/Grazing Management	• Develop a “Rangeland Vegetation Management Plan” for the LORP to plan for and implement future rangeland burning prescriptions and needs.
General	• The LORP Data Warehouse needs to be established and populated with data as soon as possible. This will allow access to data by all MOU parties and will be a useful device for managing information without the need to include large amounts of data in the annual reports. • The LORP Data Warehouse design should be reviewed and redesigned to meet contemporary standards, define QA/QC and data management protocols, be based on a spatial/GIS platform, be online and accessible. • Implement QA/QC protocols required in the MAMP to ensure field data is collected and data entry performed correctly. • The MAMP specifies data management and storage protocols for many monitoring actions. In addition to a data warehouse, field forms are supposed to be scanned and stored for future reference in the event there are questions regarding data compilation and tabulation as well as data entry to the LORP warehouse.

Summary of 2008 Adaptive Management Recommendations

Management Area	Recommendation and/or Action to be Taken	Recommendation followed or Action Taken?
Riverine-Riparian Area	• Consider that 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. • 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.	• In progress • No
Blackrock Waterfowl Management Area	• In order to maintain the necessary acreage (based on the water year), and, at the same time, create the habitat values for indicator species, several adaptive management recommendations are made...see annual report.	• Yes
Off-River Lakes and Ponds	• No adaptive management actions are required.	• NA
Delta Habitat Area	• In March 2009, after one full year of continuous flow recording, 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 • 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 • 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	• Yes • Yes • No
Land/Grazing Management	• Recommend that all livestock grazing plans be reviewed and updated so they are compatible with the LORP Monitoring, Adaptive Management and Reporting Plan. • 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.	• Yes • Yes

Rapid Assessment Survey	• Consistent reporting – Use 2008 report format with management areas were grouped together. • The Perennial pepperweed (*Lepidium latifolium*) site (or sites) appear(s) to have spread. All sites should be treated multiple times to prevent further expansion. Aggressive efforts to control this weed should be taken. • Recommend that the extent of *bassia* infestation be examined in detail following the 2009 RAS before adaptive management actions are considered. • 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 correlated with native vegetation recruitment. • Feeding/supplement areas are not permitted within the riparian and floodplain areas, but still occurring. • Use of categorical data for tamarisk results (i.e. 1-5 trees, 5–10 trees etc.) would alleviate issues with field recording differences, and allow better understanding of extent of Tamarisk. • 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 • Recommendation that the Inyo County Saltcedar Control program pile new slash in appropriate areas where LADWP can burn or otherwise dispose of them • Consider chipping of green tamarisk as a control technique • Perform or verify removal and proper disposal of several large appliances dumped into the floodplain as recommended in 2007 RAS	• Yes • Yes • Yes • Yes • No • Yes • No • Yes • Yes • No

Summary of 2009 Adaptive Management Recommendations

Management Area	Recommendation and/or Action to be Taken	Recommendation followed or Action Taken?
Riverine-Riparian Area	• Perform the river modeling when field surveys are completed. • Re-map landforms, including channel landform, to improve accuracy of monitoring seasonal habitat flow events. Re-mapping of landforms can be performed in conjunction with the flow modeling recommendation using current aerial photos and survey data. • During next year's seasonal habitat flow all plots need to be field measured with GPS tracking at high flows to verify mapping and flooded extent. • Timing the release of the seasonal habitat flow is important and should be decided by the Scientific Team as described in the LORP Monitoring, Adaptive Management and Reporting Plan. • There is no need to continue to monitor and report on river gains and losses. This can be done at any point in the future if needed. • The weed control program should use the data provided to it by other monitoring efforts, specifically the RAS. Future reports should include the utilization of these tools and an explanation of what adaptive management recommendations were considered or implemented. • Tamarisk brush piles should be chipped rather than burned in the future.	• Yes • No • Yes • Yes • No • Yes • No
Blackrock Waterfowl Management Area	• Perform analysis of Thibaut Ponds habitat area. In the event monitoring and analysis show that more than 50% of the open water habitat has disappeared, it is recommended that Thibaut Ponds be slated for a controlled burn in the following winter. • Perform the avian census in the Drew and Waggoner units in the next two years to see if the initial response of habitat indicator species peaks in the first year and then declines, or if usage remains high.	• In progress • Yes
Delta Habitat Area	• Until it can be shown that the current pulse flow plan cannot achieve all of the MOU goals, the adaptive management recommendation is to not make any modifications or changes to the current plan.	• Yes
Off-River Lakes and Ponds	• No adaptive management actions are required.	• NA

Rapid Assessment Survey	• Curlycup gumweed could become a larger problem in the future. Ensure that all field personnel are well trained in identifying this plant, as well as all other previously identified exotic weeds. • The cut fence at river mile 28 and exclosure fencing should be repaired to ensure that grazing management plans are followed. • A more robust program to control pepperweed needs to be implemented immediately. • As resources are available, those roads identified in the RAS with the most severe impacts should be blocked.	• Yes • Yes • Yes • No
Land/Grazing Management	• Testing bassia control with cattle trampling will be a multi-year effort using RAS, vegetation mapping and annual on-site evaluation to determine its effectiveness beginning in the next grazing season in the White Meadow Riparian Pasture. • The 4 miles of the east side of the Lone Pine leases need at least one, preferably more, range transects.	• No • Yes
Other	• The LORP Data Warehouse needs to be established and populated with data as soon as possible. This will allow access to data by all MOU parties and will be a useful device for managing information without the need to include large amounts of data in the annual reports.	• In progress

Summary of 2010 Adaptive Management Recommendations

Management Area	Recommendation and/or Action to be Taken	Recommendation followed or Action Taken?
Riverine-Riparian Area	• Conduct river modeling and flow analysis and provide recommendations.	• In progress
	• LADWP develop a feasibility analysis addressing alternatives to improve the flow measuring capability of the Lower Owens River Intake Control Structure.	• No
	• LADWP, ICWD and the MOU Consultants participate in a mapping conference to identify a repeatable methodology for the landscape mapping and determine how to account for error when comparing multiple years of data.	• No
	• Normalize the flooding extent and inundation data for the seasonal habitat flow before extrapolating to the reach and river-wide. Perform the vegetation inundation analysis.	• No
	• Re-map the landforms of the LORP to more accurately monitor seasonal habitat flow events and flooded extent.	• No
	• Conduct review by the scientific team of GIS data, summarized data, map outputs and reporting for seasonal habitat flow and flooded extent.	• Yes
	• Decrease seasonal habitat flow duration so the available water can be used to increase the peak flow on all years when the average annual flow is predicted to be from 60 to 99 percent of normal.	• In-process
	• Discontinue River Flow Loss and Gain Report.	• No
	• Conduct fisheries creel census only during spring on the years designated in the MAMP. Eliminate the fall census.	• Yes
	• Discontinue fish habitat surveys until warranted in the future.	• Yes
	• Follow the water quality recommendation in the MAMP and LRWQCB order and discontinue further water quality monitoring.	• Yes
	• Spot check dissolved oxygen levels and water temperatures regularly during the 2011 seasonal habitat flow and during periods of high ambient temperature.	• Yes
	• Modify Avian Census Surveys to be conducted during more appropriate time period for species.	• Yes

Blackrock Waterfowl Management Area	• Continue draining and drying Winterton Unit to prepare for burning. • LADWP complete an analysis of reasonable alternatives to determine if there is a more feasible method to regain and maintain 28 acres of surface water over the life of the project in Thibaut. • Conduct avian observations and suitable habitat surveys only on active units, and at least on the first and second year that each unit is active.	• Yes • In progress • Yes
Off-River Lakes and Ponds	• No adaptive management recommendations are required.	• NA
Delta Habitat Area	• LADWP continue to manage the base and pulse flows released to the DHA as they have in the past.	• Yes
Rapid Assessment Survey	• LADWP, ICWD and MOU Consultants meet to re-examine the present RAS methodology, analysis and reporting procedures and to bring the survey design back to the original intention and purview of the RAS. • Exotic Weeds: leave bassia in place, do not burn or mow it, and let natural processes continue. • Fencing: conduct minimal repairs and complete upgrades. • Recreation: remove fire rings and block certain non-designated ORV use. • Roads: continue to restrict access as in previous years. Prioritize roads entering the riparian area and accessing the floodplain. • Woody Recruitment: RAS is not a comprehensive survey to monitor woody recruitment. If managers desire more systematic information on woody recruitment, then another method should be employed. Belt transects may provide needed recruitment information	• No • Yes • Yes • No • No • No
Land/Grazing Management	• Develop a “Rangeland Vegetation Management Plan” for the LORP to plan for and implement future rangeland burning prescriptions and needs. • Continue belt transect monitoring until the abundance of woody riparian plants eliminates the need for this monitoring. • Collect range trend transect data from all LORP exclosures. • Continue to implement the riparian forage utilization standard (40% limit) for the White Meadow Riparian Pasture.	• No • Yes • Yes • Yes

Salt Cedar and Weed Control	• Conduct a meeting between the MOU Consultants, LADWP and County representatives, and the salt cedar program director to establish goals and direction for each season prior to commencing activities. • Attenuate all future salt cedar cutting, spreading, or piling until all existing slash and piles are eliminated or addressed. • Continue with the weed program and explore additional funding venues to improve effectiveness.	• No • No • In-process

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11.0 PUBLIC COMMENTS

11.1 LORP Annual Report Public Meeting

The LORP 2011 Draft Annual Report public meeting was held on Tuesday, December 20, 2011, at the LADWP Bishop office. The following table lists those in attendance.

In Attendance:		Jim Campbell
Gene Coufal		Kim Stringfellow
Clarence Martin		Nathan Reade
Brian Tillemans (BT)		Brad Henderson
Dave Martin (DM)		Eddie Trimmer
Mark Hill (MH)		Mike Gervais
Bill Platts (BP)		Eileen Burger
Mark Bagley (MB)		Earl Wilson (EW)
Larry Freilich (LF)		Matt Hays
		Janice Aten
		By Phone
		Peter Vorster (PV)

11.2 Minutes Taken at the Public Meeting

LADWP Staff Overview of Monitoring Efforts Conducted this Year and Related Comments

DM: Fourth year monitoring, overview of the report sections, including summary of each section.

Ecosystem Sciences Staff Overview of Adaptive Management Recommendations

MH, BP: Power Point presentation on Adaptive Management recommendations from Ecosystem Sciences (ES). MH, BP present Adaptive Management recommendations, primary functions, goals are being met, focus on improving flows, management to sustain through time. No final decisions just recommendations, adaptive management. This year we will a conduct a detailed review.

Power Point provides summary of the four LORP areas, Riverine-Riparian Area, Delta Habitat Area, Blackrock Waterfowl Management Area, and Off-River Lakes and Ponds. Off-River Lakes and Ponds no concerns, are fine. Riverine-Riparian Area, need to revise model, 1993 first flow studies, need to discuss present models used, set parameters as the river has changed. New consultant to determine model changes, hope to be done mid-March. Cannot eliminate tules and shouldn't as they provide habitat for aquatic invertebrate and fish. Will look at higher flows, "lift", to improve water quality, habitat.

BP: Seasonal Habitat Flow (SHF) is set by the EIR and Court, need to look at the restrictions to establish ways to improve the flows. Consider the water-year, this determines flows. Concerned that we are not getting 200 cfs when we can, drought years take a hit. Seeding flow, needed each year, putting pressure on fishery. Two Culverts area eats up oxygen – look at the effects and stress to aquatic invertebrate and fish. 2010 – fish stressed, last years recommendations that SHF be no later June 15, look at mechanisms to increase water quality. 200 ppm is release water below Intake release flow, late fall early winter. Remove organic matter that is decomposed throughout the winter, slow process for peak flow to reach lower part of river. 125-175 cfs to remove matter at this time to improve water quality in SHF. Augmentation – serious look- 5 foot lift on upper end as peak goes down depth goes down. But getting the inundation, looking at ways to achieve this, but have to wait and determine the type of water-year.

PV: Augmentation, are you looking at the potential, does the duration need to be addressed, is it sufficient for the key areas, willow complex or you looking to increase.

BP: Look at magnitude, you can read more detail in the report.
PV: Currently flattens out, what target do you have in mind?
BP: Have to look at the lifetime of the peak, look at duration. Some of the floodplains have a high soil moisture and duration doesn't mean a lot where the sides are steep. The lift in the river is more important than duration. Want to see an increase in the inundated acreage.
PV: What will be the process once the model comes out? Will there be an open process for gaming ideas?
BP: We are doing this now.
PV: Maybe Mark Bagley can follow-up on this, sounds like the opportunity will present itself.

MH: Bassia smothers, not an intended species, looking to control and eliminate it. Burning and mowing has not been successful.
Beaver, non-native species, keep population in check.
BP: Beaver don't do well on tule, young willow provide food source and allows population to increase. Old trees beyond Two Culverts are important to maintain. Don't want a repeat of the Gorge. Recommendation is for more emphasis on keeping beaver numbers down.
MH: Delta Habitat Area flows are not doing as well as they could to improve this area.
BP: Looking close for last 4 years, 1 flow every three months. Delta needs water during hot months. Recommend increased flows for this area. Delta looks good but there is value in improving it.

MH: RAS Look at noxious weeds, woody. Saltcedar – successful. Weed –Inyo County address both, need modification.

Belt transect – woody riparian data – need to expand methodologies. Make it wider and only count woody growth.

Range Trend – set up 5 yr intervals, more beneficial every 3 years (more often)
BWMA – switched cells from Wag to Winterton, 500 acres is the goal this year. Difficult to count all birds great abundance – every bird we wanted is accounted for. Need-can't drawdown at same time. Track number of birds to amount of water increased. Thibaut problem according to MOU, agreement for Thibaut. Best stands of cottonwoods mowed, mistake.

Other LORP needs, protocols followed, define reasons to change these. Database, organized and categorized, specific data, building warehouse of data, accessible, where it will be housed?

Annual report, time problem with collecting data, write report, not enough time for good feedback. Recommend we move report schedule, give more time to all. If we change flows will require change to MOU and should look at future changes.

Adaptive management follow through, should look at past recommendations, as we change remap landforms, more discrete mapping, always difficult, and understand how mapping is done.

Need to establish baseline corridor habitat, look at burning plan, establish database warehouse.

DM: Open for questions.

MB: DM mentioned woody recruitment, is all the data on this from the RAS? Where is the herbaceous data?
DM: Greenline and RAS, looking at widening the Belt.
DM: There won't be herbaceous data.
BP: The herbaceous data is doing good. Woody recruitment is what's important, again we would like to have the Belt widened to establish a better idea of woody recruitment and replacement.
MB: Concur with this, critical. Seems like we should have clarification between small and large woody. Which as what benefits?
MH: That is done in the RAS.
MB: Are we getting good woody recruitment in tree species?
MH, BP: Don't know, need to widen Belt.

LF: 50 different locations, RAS is not designed to pick up woody recruitment.
MB: Belt transects, maybe 1 or 2 times per year.

DM: Twice, spring when cows enter and fall, after grazing.

MB: Issue of Adaptive Management need to adjust and create models, doesn't make any sense. Whitehorse study needs to be redone.
MB: I understand that you don't know how much?
MH: Good elevation model, solid data, most important below Island. Question is how much water, maybe an empirical study.

MB: only 5 areas, encourage improving Delta, Bill mentioned, instead of release Delta pulse flows, are we looking at the same amount?
BP: In the cool season, river is gaming area, caution might work
4 flows are working – remarkable. Delta is in good shape.

MB: Main response – beneficial to water quality
BP: concerned with potential of a big fish kill, fish we like, are not good at surviving heavy organic matter.
Look at ways to remove stress.

MB: with new model can you determine what a winter flow would actually do? Lose it in the peak.
BP: worried about moving water, recommend moving organic matter during winter.

MB: What will be effective amount of water, maybe need to do an empirical study.
BP: Models can lead to wrong answer.

MB: Is this a recommendation or a pilot study, you have the idea, now how to determine the amount?
BP: Not losing any water, we are looking at when and where it is released.

MB: Pulse flow targeted to Delta, won't you lose it in oxbows?
BP: Talking about a different item. We want higher flows at that time.

MB: I'm confused, want to take Delta flows? March and April for early migrants
BP: Delta flows is still released, Pumpback will be the same.

MB: Water is neutral, how neutral? Is there a way to measure this material?
BP: Then measure the water quality during the SHF

MB: Do you want the effects of SHF to be complete by June 15?
BP: No, start flow by June 15.

EW: Have you considered a mechanical method of increasing oxygen?
BP: Takes a lot of effort, can't do this in 95 to 100 degree weather.
EW: Obstructions, turbulents could do it.
BP: Be careful when situation could result in a super saturation in the winter.

MB: Chap 2, Table 3, wrong label?
DM: Yes
MB: 500 acres goal not met?
DM: Yes, over 500, holding flows constant, how rapid wetting would occur.

MB: Chap 10, you say "habitat has developed and continues to develop." Has it increased, YBC?
MH: Yes, habitat has increased as we continue to grow – YBC
DM: CWHR-analysis was conducted, can't conduct this unless you have mapping.

MB: wanted to know where "increase" was noted.
DM: In the 2010 annual report.

MB: Beaver, recall Ecosystem's target number of beaver per mile.
BP: Used study in Idaho where so many miles of young willow for number of beavers to survive. Study is not valid for the LORP.

MB: what is the target # of beavers to maintain?
Don't know, you can't say if you don't know how many exist. RAS shows increase in beaver activity with loss in veg.
LF: Beaver are moving through system.
BP: We know #'s are increasing.

MB: Will they go after seedlings, how much recruitment is being effected by beaver? How do you know?
DM: When we conduct "Belt" monitoring, note teethmarks.
MH: Sent trappers out one year noted how many trapped, sent out next year again noted numbers

MB: Is this only data on effects of beaver "Belt" monitoring?
LF, DM: RAS also provides some
BP: Tremendous willow recruitment, you will find increase in beaver

MB: What is your recommendation?
MH: LADWP suspended trapping program, we recommended we reinstate trapping program

MB: 89 river miles – saltcedar is this overall or one side
LF: Monitoring was done on both sides

MB: Is the recommendations for BWMA Avian Survey completed by Debbie House?
MH: Yes

11.3 Public and MOU Parties Comments

The public and the MOU Parties were provided the opportunity to offer comments on the draft report at the meeting and to submit written comments to the Bishop LADWP office by Friday, January 6, 2011. No comments were received.

12.0 GLOSSARY

BLM – U.S. Department of Interior, Bureau of Land Management

BOD – Biological Oxygen Demand

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

COD – Oxygen Demand

County – Inyo County

CWHR - California Wildlife Habitat Relationship System

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

ES - Ecosystem Sciences

EIR – Environmental Impact Report

ET – Evaporation transpiration

LAA – Los Angeles Aqueduct

LADWP – Los Angeles Department of Water and Power

LORP – Lower Owens River Project

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.

RAS – Rapid Assessment Survey

SIP – State Implementation Plan *June 2004 Los Angeles Dept of Water & Power and the U.S. Environmental Protection Agency* 17-3 *Lower Owens River Project Final EIR/EIS*

SLC – California State Lands Commission

WHA – Whitehorse Associates