6.0 HCP Monitoring and Adaptive Management

Purpose

The purposes of this HCP Monitoring and Adaptive Management program are 1) to ensure compliance with the Plan; 2) to assess the status of Covered Species, natural communities/habitats, and ecosystem processes within certain habitat types; and 3) to evaluate the effects of management actions such that the Conservation Strategy described in Section 5, including the Biological Goals and Objectives of the Plan are achieved.

6.1 HCP Monitoring

Under the USFWS's Five-Point Policy, HCP monitoring includes compliance monitoring and effectiveness monitoring. Compliance monitoring (or implementation monitoring) tracks the status of Plan implementation and documents that all requirements of the Plan are being met. Compliance monitoring verifies that the permittee is carrying out the terms of the HCP and the ITP. Effectiveness monitoring assesses the biological success of the Conservation Strategy in achieving the Biological Goals and Objectives of this Plan. Specifically, it evaluates the implementation and success of the conservation strategy described in Section 5.

LADWP conducts land and water management monitoring as part of their land management practices. Examples of land management monitoring activities that LADWP conducts include fisheries monitoring (e.g., trout surveys), vegetation surveys (e.g., rare plant monitoring), bird surveys, forage utilization surveys, vegetation mapping, monitoring to avoid disturbance to historic and prehistoric resources, monitoring for compliance with best management practices, water quality, etc. Land and water management monitoring differs from compliance monitoring and may differ or overlap with effectiveness monitoring of the HCP. Examples of LADWP's land management monitoring activities are in Sections 2.2.2, 2.2.5, 2.2.6, 2.2.8, 2.2.9, and 2.2.11. Some land and water management monitoring activities may result in incidental take of Covered Species.

6.2 Regulatory Context

By regulation, an HCP must incorporate monitoring of conservation measures and the response of Covered Species to these measures (50 CFR 17.22[b][1][iii] and 50 CFR 222.22[b][5][iii]) to determine the effectiveness of the measures. An Adaptive Management (see Section 6.3) strategy is a recommended component of HCPs with data gaps that would substantively affect how the Covered Species is/are managed and monitored in the future (65 FR 35251).

The HCP Monitoring and Adaptive Management program described in this section is intended to fulfill HCP requirements to monitor Covered Species' habitats and their response to management activities, and adjust management activities as necessary. This program will continually implement HCP Monitoring and Adaptive Management based on guidelines provided by the USGS Biological Resources Division and USFWS for designing monitoring programs in an adaptive management context for multiple species conservation plans (Atkinson et al. 2004).

6.3 Adaptive Management

The USFWS's Five-Point Policy (65 FR 35241–35257) describes Adaptive Management as an integrated method for addressing uncertainty in natural resource management, and states that management must be linked to measurable biological goals and monitoring. A decision-making

process promoting flexible management so that actions can be adjusted as uncertainties become better understood or as conditions change to improve resource management. Monitoring the outcomes of management is the foundation of an adaptive approach, and thoughtful monitoring can both advance scientific understanding and modify management actions iteratively (Williams et al. 2009).

As part of this HCP, Adaptive Management is necessary because of the degree of uncertainty and natural variability associated with ecosystems and communities and their responses to management and permit duration (i.e., it is difficult to predict the future several years from now). Based on the best scientific information currently available, LADWP expects that the Plan's Conservation Actions will effectively implement the Conservation Strategy described in Section 5. However, there are varying degrees of uncertainty associated with the management techniques and conditions within and outside the Plan Area. In addition, the status of Covered Species and habitat may change in unexpected ways during Plan implementation. It is possible that additional and different Conservation Actions not identified in the Plan will be identified in the future and prove to be more effective in implementing the Conservation Strategy described in Section 5 than those currently implemented. Results of monitoring may also indicate that some Conservation Actions are less effective than anticipated. To address these uncertainties, an adaptive approach will be used to inform LADWP and USFWS; thus, the monitoring program will be designed to support this adaptive approach.

Integrating Adaptive Management and HCP monitoring is critical to the successful implementation of the Conservation Strategy. HCP monitoring is the foundation of an adaptive approach, and Adaptive Management actions are developed, in part, from the results of HCP monitoring. In this Plan, the two components are integrated into a single program. The HCP Monitoring and Adaptive Management program will inform LADWP managers of the status of Covered Species, natural communities, and essential ecological processes such that management actions will be revised when necessary to meet the Biological Goals of the Plan (see Figure 6-1).

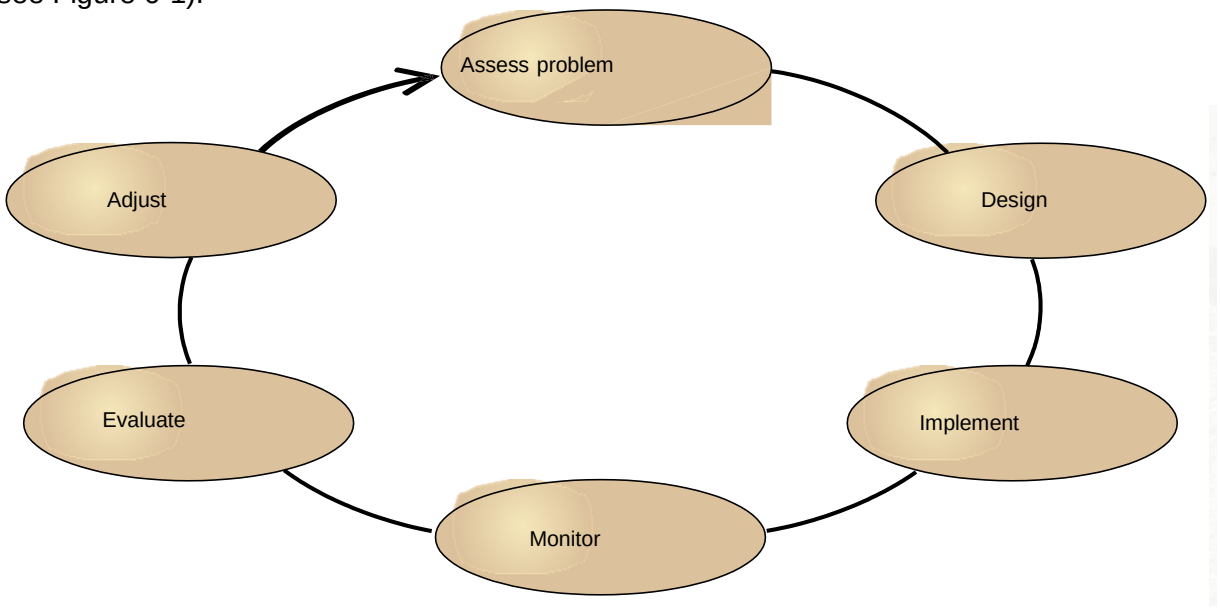

Figure 6-1. Diagram of adaptive management process.

In summary, the HCP Monitoring and Adaptive Management program 1) monitors the effects of implemented Conservation Actions to achieve the Biological Goals and Objectives of the Plan, 2) evaluates and determines whether the Biological Goals and Objectives are being met, and 3) adjusts or modifies these Actions if they are not achieving the desired Biological Goals and Objectives (see Figure 6-1). The following paragraphs contain an overview of the HCP Monitoring and Adaptive Management program and HCP Monitoring and Adaptive Management actions, in addition to data and reporting requirements.

Monitoring efforts in the Plan focus on flow, habitat, vegetation, and grazing. The monitoring program will provide data on habitat and vegetation of riparian and aquatic areas important to the riparian obligate bird species and fish species and upland areas important to the GRSG. Management within the Plan Area targets adaptive Conservation Actions aimed at the habitat level. Managers must have reliable and quantifiable information on habitat changes to inform adaptive land and flow management. It is cost prohibitive to monitor the entire Plan Area; therefore, HCP monitoring will focus on priority areas such as riparian, irrigated pastures, and Covered Species habitats and use efficient tools such as remote imagery.

Most Adaptive Management measures will occur when Conservation Actions do not produce the desired outcome or when Covered Species /natural community trends decrease. In these cases, new or modified Conservation Actions will be implemented, to try to improve the outcome for Covered Species and communities. Such Conservation Actions include but are not limited to the following:

- Alter the timing, location, intensity or type of grazing;
- Reduce, increase or otherwise change the management of prescribed burning;
- Change the flow regime released from reservoirs into target streams (e.g., timing, frequency, magnitude of flow levels or events);
- Re-evaluate and, if necessary, alter avoidance and minimization measures;
- Prioritize or de-emphasize one aspect of noxious weed control such as targeted pesticide use.

6.4 Biological Monitoring and Adaptive Management Program Scope

The scope of the monitoring and adaptive management program is limited by the assurances provided by the USFWS to LADWP and described in Section 7. These assurances include the commitment by the USFWS that if unforeseen circumstances arise (as defined in Chapter 7), LADWP will not be required to provide additional land, water, or financial compensation beyond the obligations of the HCP.

The monitoring program is designed to be flexible. Because the Plan seeks to balance the requirements of management with the need to learn more about the ecological system through monitoring, the amount of funding allocated to monitoring can vary during the permit term. Funding can be shifted within the Plan to respond to the changing needs of the Monitoring and Adaptive Management Program. The scope of the Monitoring and Adaptive Management Program for LADWP's HCP is further defined below.

Because the Conservation Strategy (Section 5) identified goals at three levels (landscape, habitat, and species), monitoring issues, approaches and/or tools are identified that will provide information on the effectiveness of achieving these goals.

6.5 Landscape Level Monitoring

Landscape-level monitoring is directed at geographically large areas. Landscape-level monitoring addresses the following issues relevant to the Plan.

- The amount of land cover types in the Plan Area and their relationship to each other (e.g., succession or conversion from one community type to another, transitions zones between communities).
- The status and trends in the amount and quality of land cover types, natural communities/habitats, and other landscape features.
- The integrity and quality of landscape linkages and their potential role as dispersal and movement routes and corridors to preserve or maintain connectivity throughout the Plan Area and adjacent areas.
- The delineation of watersheds and maintenance of the general hydrologic function of those watersheds in the Plan Area.
- The location, distribution, and range of invasive species in the Plan Area.
- The frequency, intensity, and geographic scope of disturbance events such as fires and floods.

The purpose of monitoring changes in the Plan Area and arrangement of land cover types within the Plan Area is to track long-term, landscape-level changes and, by inference, changes to the habitats and natural communities contained within them. Long-term changes can indicate local, regional, or global problems such as unanticipated impacts of Covered Activities, influence of invasive species, and effects of climate change. Monitoring long-term changes will also track the contribution of the HCP toward maintaining or improving the extent, distribution, and continuity of natural land cover types (e.g., vegetation communities, habitats). Changes in land cover type will result from management actions (e.g., create or restore functional pond, spring, and wetland habitats; see Section 5). If landscape-level changes differ from the Biological Goals and Objectives, LADWP will attempt to identify reasons for the differences and address them through the Adaptive Management program, as appropriate.

6.5.1 Landscape Monitoring Issues

Reduction of Available Habitat and Fragmentation

The reduction of available habitat and fragmentation at a landscape level are among the principle causes of species decline. Therefore, protecting and maintaining natural and semi-natural landscapes and natural communities/habitats are objectives of this Plan. In general, monitoring available habitats and linkages can take several forms. These include:

- mapping vegetation and land use using remote imagery to determine changes in amount and arrangement of habitats during the Permit Term,
- tracking changes in linkages that contain landcover features representative of important types in the range of Covered Species in the Plan Area (e.g., woodland riparian habitat for YBCU, SWWF, and LBVI; sagebrush habitat for GRSG),
- using motion-activated cameras to document the presence/use of habitats and linkages by Covered Species.
- monitoring water flows to determine location, timing, and connectivity of aquatic habitats

Invasive Species

A landscape goal of the Plan is to protect and maintain natural and semi-natural landscapes. This includes monitoring and removing undesirable species. This monitoring program will track the success of eradication and minimization efforts for invasive species. Types of monitoring on invasive species management may include status and trend monitoring surveys. Depending on the resource issue and the level of the monitoring effort, this monitoring might occur at varying frequencies. For example, site-specific monitoring of nonnative plant species might be conducted annually, while a watershed-wide monitoring might only occur every 5–10 years.

6.5.2 Landscape Monitoring Tools

Tools that LADWP will use to monitor landscape issues include water flow monitoring, remote imagery including vegetation mapping and assessment, livestock monitoring (including fencing), irrigated pasture condition monitoring, outdoor recreation monitoring, and weed monitoring. Descriptions of these tools are in Section 6.8.

6.6 Community Level Monitoring

Community-level monitoring is designed to detect changes in the composition and function of natural communities, invasive species, and other important habitat factors for Covered Species. LADWP will conduct monitoring to assess natural community function. Natural community–level monitoring focuses on local resources and threats to communities and habitats as well as the response of each natural community to management actions (especially restoration and enhancement). Natural community monitoring includes, but is not limited to, the following issues relevant to the Plan.

- The extent and quality of natural communities and the relationships between their constituent elements.
- Natural community function including the ability of these communities to withstand natural and anthropogenic stressors and threats.
- The effectiveness of the conservation measures in enhancing, creating, or restoring natural communities and their associated features (e.g., ponds, riparian woodland) and the ability of these areas to provide their intended ecological functions and values.

6.6.1 Community Monitoring Issues

Hydrologic Function and Stream Flow

Hydrologic function can be broadly defined as the flow of water through a landscape and the processes controlled or influenced by those flows. Hydrologic functions are driven by precipitation. These functions include infiltration, runoff, groundwater recharge, and the quality and quantity of water within channel networks and other water bodies. Aquatic ecosystems—including streams, rivers, ponds, and wetlands—are structured by hydrological processes operating at multiple levels. Thus, hydrologic function is closely linked to surface flow of water that helps determine the presence of aquatic (e.g., river, stream, pond, etc.), wetland (e.g., wet meadow), and riparian (e.g., riparian forest/scrub) habitats.

In the Plan, a community goal is to improve the quality of natural waterways and the hydrologic and geomorphic processes that support them to maintain functional aquatic and riparian communities. To do this the Plan has committed to maintaining and, where feasible, improving

hydrologic function within the Plan Area. Types of actions to monitor changes in hydrologic processes include data collection using automated telemetered flow gauging stations or manually by the aqueduct and reservoir keepers (A&RS) or hydrographers at gauging stations. Flow monitoring is conducted on all waterways (see Section 2). Flow monitoring enables flow management that promotes water distribution to maintain and enhance existing and potential aquatic and riparian habitats for Covered Species.

Altered Wildfire Frequency

Monitoring will record the frequency, intensity, and location of wildfire (human and natural caused) events. These results will be compared to historic incidence of fire in an attempt to foster natural fire cycles where fire is a useful management tool or the habitat is adapted to fire.

Livestock Grazing

Much of the flora of the Plan Area evolved under the influence of wildlife species that grazed or browsed on shrubs. Grazing by livestock in certain native communities, however, may need to be reduced to maintain or enhance these communities. Accordingly, the response of native plant populations to grazing regimes in rangelands will be monitored. Further, the response of nonnative vegetation will also be monitored. These activities will be supplemented with evaluation of other natural community metrics such as grazing utilization and range trend.

Altered Stream Flow

The flow regime is a function of watershed-level patterns of precipitation and runoff, which are strongly influenced by vegetation cover, underlying geology, and land use. For example, impervious surfaces can lead to a “flashier” runoff regime—higher peak flows and lower base flows—by reducing the amount of precipitation that infiltrates the ground. Thus, more precipitation rapidly reaches the channel network and less infiltrates into shallow groundwater to support base flows during periods of low or no precipitation. Changes in flow regime strongly affect the quality of habitat for Covered Species within the aquatic and riparian land cover types and influence the structure and composition of riverine and riparian natural communities. Because of their importance, base flows will be monitored throughout the year in the Plan Area.

Impacts from Recreation

Outdoor recreation activities in the Plan Area include various forms of outdoor activities (e.g., hunting, fish, hiking, bird watching, OHV use, etc.). Although there are a variety of outdoor activities that occur on LADWP land, the one element they have in common is access (e.g., roads). Recreation in the Plan Area will be monitored to determine if uses are having adverse effects on habitats. Monitoring will also be designed to help inform if and when seasonal or other restrictions on recreational uses will be imposed in sensitive areas.

Changes in Vegetation Community Types

Human activities and/or climate change may alter vegetation communities. An example of a change in vegetation communities for which LADWP monitors is change in sagebrush vegetation communities. LADWP will evaluate and monitor woodland encroachment into areas known to currently or previously support Greater Sage-Grouse, based on available data (telemetry or other). LADWP will also ensure that the native understory species in

sage-grouse habitat remain healthy and viable to remain competitive against cheatgrass and other nonnative species.

6.6.2 Community Monitoring Tools

Tools that LADWP will use to monitor community issues include water flow monitoring, remote imagery including vegetation and road mapping and assessment, avian habitat quality mapping, livestock monitoring (including fencing), irrigated pasture condition monitoring, and outdoor recreation monitoring. Descriptions of these tools are in Section 6.8.

6.7 Species Level Monitoring

Species-level monitoring measures the effects of management actions on Covered Species and tracks the abundance, distribution, and other variables of Covered Species in the Plan Area.

6.7.1 Species Monitoring Issues

LADWP will conduct monitoring to assess the status of Covered Species and to determine the extent to which the Biological Goals and Objectives for Covered Species are being met. Because this Plan covers a large area, it is a habitat-based conservation plan, Covered Species monitoring will focus on monitoring changes in the amount and configuration of their habitats using species models to address the following issues relevant to the Plan.

- The response of Covered Species to implementation of the Plan's Conservation Actions and Adaptive Management.
- Status and trends of Covered Species in the Plan Area.

6.7.2 Species Monitoring Tools

Species monitoring will provide data for use by LADWP as well as the USFWS, California Department of Fish and Wildlife, universities, and wildlife conservation organizations to assess the overall status of Covered Species populations, to identify Covered Species conservation needs, and to direct future conservation efforts. This information may also be used to redirect Plan Conservation Actions in future years to improve conditions in the Plan Area for declining Covered Species. Any redirection of Plan funds in response to monitoring must be carried out in accordance with the terms and conditions of the ITP, including the No Surprises assurances.

LADWP will use various tools to monitor Covered Species including direct monitoring of Covered Species and applying species habitat models.

Direct Monitoring of Covered Species Implementing this tool requires using appropriate methods to sample the species' population to obtain an accurate population estimate. When repeated, the results can be compared and yield a population trend. This approach requires considerable investment of resources and time, but when possible to implement, is a standard approach for monitoring species abundance and trend. Variations of direct monitoring of Covered Species may be implemented to yield data on population trend.

Species-Habitat Models - Species-habitat models document the best current understanding of the biological and physical parameters that influence each Covered Species and, in this way, are species-specific conceptual models. Species-habitat models were developed for most

Covered Species using GIS to hypothesize a relationship between land cover type and other habitat associations and the distribution of Covered Species.

These models served as the basis for estimating the impacts of Covered Activities and achieving Biological Goals and Objectives. Information from species surveys will further refine these models such that they can be used to help predict distribution and occupancy and to assess population trends. LADWP plans to continue its existing monitoring program for covered bird species in representative locations to help refine/update the species-habitat models and provide information on species' occurrence and numbers. For example, LADWP monitors for Yellow-Billed Cuckoo occurrence at Baker and Hogback creeks annually.

6.8 Monitoring Tools or Approaches and Adaptive Management Approaches

The monitoring tools or approaches are summaries of monitoring efforts described in the following documents: Mono Basin Stream Restoration Plan (LADWP 1998), Mono Basin Waterfowl Habitat Restoration Plan (LADWP 1998), Owens Valley Land Management Plan (LADWP 2010), and Lower Owens River Project Monitoring and Adaptive Management Plan (Ecosystem Sciences 2008). Annual results of these monitoring efforts are reported in the Mono Basin Annual Report, Owens Valley Annual Report (including all City land management monitoring), and the LORP Annual Report. Land management monitoring in Long Valley, which is not covered in these reports, will be included in the HCP report.

6.8.1 Monitoring Water Flows

LADWP will track changes in flow in waterways to ensure compliance with Biological Goals and Objectives. Flow monitoring is done through automated telemetered flow gauging stations or manually by the aqueduct and reservoir keepers (A&RS) or hydrographers at gauging stations. Flow monitoring is conducted on all waterways (Section 2). Flow monitoring enables flow management that promotes water distribution to maintain and enhance existing and potential habitat for Covered Species.

6.8.2 Remote Imagery including Vegetation Mapping and Assessment

LADWP will track changes in natural and semi-natural landscapes and vegetation communities every five to ten years to ensure compliance. Monitoring and analysis of the Plan Area may be staggered to create a manageable workload. LADWP's Annual Report will include the monitoring results and analyses conducted for the locations that year and compare it to the previous vegetation mapping. Once every 10 years or sooner LADWP will submit a summary report that assesses vegetation, community, and landscape changes across the entire Plan Area.

Habitat monitoring relies upon Vegetation Mapping from remote imagery to quantify major habitat changes and early detection of problem areas at a natural community and landscape scale. Vegetation Mapping from remote imagery is ground-truthed and revised as necessary to improve accuracy. Accuracy assessment will be reported in the Annual Reports. The purpose of Vegetation Mapping is to provide managers with a landscape and natural community scale measurement of the Plan Area. New imagery is gathered approximately every five years. In regions where vegetation change is expected (e.g. LORP), vegetation is re-mapped approximately every five years.

Mapping within the Plan Area will be similar to the methods used in the LORP effort (LADWP 2010). Mapping methods change with aerial imagery quality, software updates, and

advancements in technique. In general, the resolution of the final mapping products continues to increase with time. This mapping is part of an already established long-term monitoring program dating back to the mid-1980s; therefore, future methods will be designed to be comparable to those utilized before and during 2010.

6.8.3 Avian Habitat Quality Mapping

This HCP is habitat-based; therefore, habitat mapping is the foundation of the monitoring program for the four avian Covered Species. Avian habitat quality within the Plan Area is identified by applying a species-specific model to the Vegetation Mapping products described above. This produces a quantifiable measure of habitat quantity and quality for each Covered Bird Species (see Section 3). This mapping will be performed periodically on approximately 5-year intervals. Range trend transects (see below) will be used to further monitor upland and riparian habitat. LADWP has baseline information for avian species from applying this tool.

6.8.4 Livestock Monitoring (including fencing)

These monitoring activities include Range Trend, Irrigated Pasture Condition Monitoring, and Utilization Monitoring described below as well as any other activities necessary for livestock management in the Plan Area (e.g., fences, stock water).

Range Trend

Range trend monitoring uses quantitative sampling techniques to assess the trend in key indices of range condition. Range trend monitoring will provide data to evaluate the response of habitat with respect to grazing management practices and climate. Range trend monitoring occurs on each grazing lease. The number of transects per grazing lease varies from 7-49 depending on the lease size (Total transects ~700). Aerial imagery was used to locate transects in uniform habitat types so that an entire transect is within one vegetation type. Transects are typically 100 meters. Range trend monitoring is conducted annually in one third of the transects within each lease. Three range trend components are documented on each transect Nested Frequency Sampling, Line Intercept Sampling, and Photo Documentation.

Nested Frequency Sampling

Nested frequency sampling uses the methods described in the Interagency Technical Reference Sampling Vegetation Attributes (BLM 1996b) to provide an index to the abundance of each plant species. This method is highly repeatable and appropriate for use in grass, forb or shrub communities. Nested frequency values are less responsive to annual weather variations than some other types of vegetation indices.

Nested frequency sampling uses three different quadrat frame sizes (0.25 m^2, 0.5 m^2 and 1.0m^2). Each quadrat frame is further divided into five sub-quadrats, such that five different sized quadrats are “nested” in the frame. The sub-quadrats are assigned a number of 1-5, with the smallest sub-quadrat assigned number 1. The nested frequency value is recorded for each plant species and ranges from 1-5 depending on the smallest sub-quadrat in which the plant was rooted. Plant species with value 1 are not very frequent and plant species with value 5 are quite frequent.

The specific quadrat frame size used for a transect is a function of the vegetative community being sampled and thus the spacing of plants. In more xeric sites where plants are spaced farther apart, the 1.0 m^2 frame is used, while a smaller-sized frame is used in grass-dominated sites where plant spacing is closer. Ideally, nested frequency values for target species should

fall between 20 percent and 80 percent in order to be able to detect trends over time. Because it is difficult to have one plot size that will be appropriate for all species (i.e., produce frequency values between 20 and 80 percent), the use of a nested frequency frame allows the sampling of plots of five different sizes simultaneously. This allows for the selection of an appropriately sized plot for long-term monitoring. The same frame size is used each year that sampling is conducted.

Nested frequency sampling is done every 3 meters for a total of 34 samples per transect. The first sample is at 0 meters and the last sample at 99 meters. The frame is placed flat on the ground with the bottom edge of the frame perpendicular to the tape and sub-quadrat 1 next to the tape at the sampling location.

Line Intercept Sampling

Line Intercept Sampling provides a quantitative measure of vegetation cover and composition. The observer stands directly over the tape and records the intercept of live cover and plant species to the nearest 5-cm for the entire length of the transect. Gaps in the canopy of more than 5-cm and dead areas of a shrub are not counted as live cover.

Photo documentation

To document overall vegetation conditions, general view photos are taken at each sampling transect and close-up photos are taken to document general soil and ground substrate condition. The purpose of the photos is to provide a visual reference of conditions encountered in the field. General view photos are taken from both ends of the transect. Close-up photos are taken at 0m, 51m and 99m.

Transect Locations

Range trend monitoring transect locations were selected through a stratified-random process. The principal vegetation communities selected for monitoring included alkali meadow, rush sedge meadow, and transitional alkali shrub - alkali meadow communities. These communities were selected for monitoring because they experience higher use by livestock annually.

The majority of the transects are located in the Owens River corridor. Some transects along the river are in habitats that are not currently grass-dominated, but these areas are expected to develop grass-dominated vegetation due to changes in land management practices (e.g. rewatering of Lower Owens River).

The starting point and orientation of each 100-meter transect was randomly selected within the LADWP GIS system using ArcView GIS and digital aerial photos from 2000. Slight adjustments were made in the field as necessary to avoid roads, ditches or other drastic changes in vegetation composition. The starting and ending locations for each transect are marked with white-tipped green fence posts. The fence posts were placed three meters away from the actual start and end point of each transect, respectively, in the event that livestock concentration around the post resulted in excessive vegetation disturbance.

Data Analysis for Range Trend

Data compilation will proceed as follows:

> Nested Frequency: The frequency values for each nested plot in the frequency frame will be tallied and the percent frequency of each species in

each will be determined by dividing the number of occurrences in each subquadrat by the number of samples.

Cover estimates: For each transect, the average cover of each species will be calculated.

Line intercept: For each transect, the percent cover for each species will be determined by totaling the intercept measurements and converting the value to percent cover for the transect.

Statistical tests appropriate to data type will be applied to all components of the monitoring program. Data will be analyzed for each individual monitoring component as well as from a multivariate approach. Trend will be evaluated in terms of changes to cover, composition, and frequency of forage species, invasive or other undesirable species, and shrub species as well as cover of bare ground. Soil type, utilization history, site constraints, and comparisons to grazing exclosure sites, grazing history, land management history, water management activities, and past and current disturbances will all be considered during the evaluation of trend.

Adaptive Management for Range Trend

Grazing management changes may include, but are not limited to, changes in livestock numbers, changes in the duration of use of a particular area or field, changes to timing of use, utilization rates, distribution within the pasture, or class of livestock. If necessary, additional fencing may be installed to improve the distribution of livestock.

If range trend data indicate a downward trend at a site, or a failure to move in the direction of identified management goals (e.g., establishment and persistence of preferred habitat of SWWF) (see LADWP 2005 Conservation Strategy for the Southwestern Willow Flycatcher). LADWP staff will evaluate the available data including individual transect results and implement appropriate land management changes.

.6.8.5 Irrigated Pasture Condition Monitoring

Irrigated pastures are a form of irrigated agriculture and are classified as any portion of the lease where the lessee receives up to 5-acre feet of water per acre per growing season. LADWP staff and the lessees will jointly determine irrigated pasture condition using the Natural Resource Conservation Service (NRCS) Pasture Condition Scoring system (Cosgrove et al. 2001). The NRCS Pasture Condition Scoring system evaluates pasture health and the effectiveness of management to optimize plant and livestock productivity and minimize detrimental effects to soil and water resources.

Methods

Field crews walk throughout the entire irrigated pasture. Generally, the boundary of a pasture is walked first, and then the interior of the pasture is crisscrossed. This allows the field crew to evaluate the entire pasture and all factors that contribute to the pasture condition score, including the condition and location of irrigation structures, and the condition and distribution of the livestock. Topics that are scored include:

- Percent desirable plants
- Plant cover
- Plant residue
- Plant diversity

- Plant vigor
- Severity of use
- Uniformity of use
- Livestock concentration area
- Presence of erosion
- Soil compaction

Data Analysis

Pasture condition scoring involves the visual evaluation of 10 indicators, each having five environmental conditions. Each indicator is rated separately and the scores are combined to get an overall score for the pasture. The overall score for a pasture is divided by the total possible score to give a percent rating.

Adaptive Management for Irrigated Pasture Condition

Irrigated pastures within the lease that score 80 to 90 percent will be considered in good condition and will be evaluated bi-annually. These areas will not be subject to any changes in grazing management. Irrigated pastures scoring less than 80 percent will be evaluated annually, and will receive needed changes in management prescriptions to improve pasture conditions. Pastures scoring greater than 90 percent are in excellent condition and will be evaluated every 5 years.

Adaptive management measures may include, but are not limited to, changes in forage utilization, water management, fertilizer application, seeding, livestock numbers, season, or duration of use. Necessary changes will be determined by LADWP in consultation with the lessees. If rare plants occur on irrigated pastures, forage utilization criteria and duration and timing of grazing may be modified, as needed, to protect these species, in addition to pasture condition scoring. Where poor pasture conditions exist, individual ranch lessees will be consulted to determine what factors are contributing to those conditions, and what actions can be implemented to ensure future pasture management is consistent with Plan goals. These actions would be implemented.

Utilization Monitoring

Utilization is the percentage of the current year herbage production or biomass 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. The grazing period or season is defined as the temporal period when livestock first enter a pasture until they are removed from that pasture. Most riparian and upland areas in the southern portion of the Plan Area are currently grazed from fall to late spring (dormant season). In the northern portion of the Plan Area at higher elevations, grazing typically occurs from late spring to fall (growing season).

Methods

If pastures are grazed during the growing season, a small cage (that excludes livestock) will be placed in the pasture and utilization will be calculated by comparing the available biomass within the cage to outside of the cage. Cages are moved annually.

The following methods all apply to areas that are grazed during the dormant season. Utilization will be monitored using the height-weight method, which is based on the allometric relationship between the height of a plant and the distribution of biomass within the plant. This method

estimates the amount of biomass removed from an area based on knowledge of the average height of ungrazed plants of a particular species and the average height of the grazed plants of that same species. Determining the percent of biomass removed based on the average height of grazed plants requires the use of a height-weight relationship curve and a best-fit regression equation. LADWP developed height-weight relationship curves for native forage species in the Owens Valley using locally collected plants.

Utilization monitoring will focus on the use of graminoids (grass and grass-like species), which are the main forage base for livestock. The plant species monitored in each area will depend on the occurrence or abundance of each species along each transect. The forage species typically encountered include alkali sacaton (*Sporobolus airoides*), inland saltgrass (*Distichlis spicata*), and creeping wild rye (*Leymus triticoides*).

Ungrazed plant heights

In most cases, ungrazed plant height data will be obtained after the peak of the growing season and before the start of the grazing season. Ungrazed heights will be collected at the permanent utilization transect locations scattered throughout all livestock grazing leases.

Grazed plant heights

Grazing utilization data are collected by walking along transects, stopping every 6-8 steps, and recording the heights of plants that are closest to the toe of the data collector's shoe. Plants unavailable to grazing animals (i.e., plants growing in the center of a shrub or beyond the reach of an animal) are not sampled. Height data on all forage species at each measuring point are collected. If there are no forage species to sample at a particular stopping point no data are collected.

If the plant has not been grazed, a measurement of the tallest part of the plant is taken. If an inflorescence is present, the measurement is to the tip of the inflorescence. If no inflorescence is present, or if the flowering parts are below the height of the tallest leaves, the measurement is taken after the leaves are pulled up along the vertical axis of the plant so that the length of the leaves are measured.

If a plant has been evenly grazed, the height of the grazed plant is measured. If a plant has been unevenly grazed, the average height of the remaining biomass is measured, taking into consideration the distribution of biomass within grass plants (i.e., in most species, the bulk of the biomass is distributed near the base of the plant).

Utilization Calculation

Utilization for each species along each transect is calculated using species-specific height weight algorithms. These algorithms calculate the percent of biomass removed as a function of the percent of height that has been removed.

The reference height used to determine the percent of height that has been removed from the current year growth will be the average ungrazed height values obtained prior to grazing each season. The percent of biomass removed will be calculated for each sample. Ungrazed samples are assigned a percent use of zero regardless of the height of the plant. Utilization along each transect is weighted by the species composition along the transect.

Adaptive Management for Utilization

Utilization standards are not a management goal, but a management tool. For example, the current utilization standard of 40 percent use of herbaceous vegetation in riparian areas does not mean the goal is to have livestock remove 40 percent of the biomass, but net utilization must not exceed 40 percent. Maximum annual average herbaceous livestock grazing utilization allowed in upland areas is 65 percent if grazing occurs only during the plant dormancy period. Maximum average herbaceous forage utilization allowed in upland areas is 50 percent if livestock grazing occurs during the active plant-growing period. However, if no livestock grazing occurs during the active plant-growing period or the field is not used for a minimum of 60 continuous days during the latter part of this "active stage" to allow seed set, allowable forage utilization can be increased from 50 to 65 percent.

Grazing management changes, if necessary, may include but are not limited to changes in livestock numbers, changing the duration of use of a particular area or field, and changes to timing of use or class of livestock. If necessary, additional fencing may improve the distribution of livestock. If issues of overuse occur, individual ranch lessees will be consulted to determine why the overuse occurred and what actions can be implemented to ensure future use is consistent with allowable use. These actions would be implemented. If overuse continues, LADWP may implement additional actions including a reduction in the maximum allowable use to achieve conservation strategy and land management goals.

When LADWP staff opportunistically observes fences in disarray, they will either repair the fence or inform the lessee of the situation.

6.8.6 Outdoor Recreation Management Monitoring (including fencing)

LADWP conducts periodic patrols in areas that are known to have high use by outdoor recreationists. During these patrols, LADWP personnel look for issues with fencing, road closures, creation of new roads, camping and campfires, dumping, weeds, vandalism, etc. Additionally, permanent photopoints have been established at known high impact sites where management has been implemented to evaluate improvements. For example, along the south side of Chalk Bluffs Road between Pleasant Valley Reservoir and Five Bridges Road, LADWP documented high use by vehicles and people. In response, LADWP constructed a fence with walk throughs and created designated parking areas along this portion of the Owens River, and has since documented an increase in riparian habitat quality and continues to monitor this site. Further, LADWP personnel also look for adverse effects associated with outdoor recreation while they are conducting their normal duties. After identification, corrections are implemented as soon as possible. If illegal activities (camping, dumping, artifact gathering, etc.) are observed LADWP will contact law enforcement.

6.8.7 Weed Management Monitoring

Monitoring for weeds is conducted as a component of LADWP's other monitoring activities. Additionally, operations and maintenance personnel receive annual training on weed identification and reporting procedures.

LADWP has an extensive weed monitoring and treatment program. In implementing this program, LADWP identifies, documents, treats, and monitors nonnative weeds within the Plan Area and has staff certified in the treatment of noxious weeds. LADWP conducts annual surveys for weeds typically from March through October to document the location and extent of

weed occurrence. For example, to identify the presence of weeds, LADWP conducts surveys along much of the Owens River, around seeps and springs, and after water spreading. In addition, LADWP has trained their staff to identify weed occurrences while conducting operations and maintenance activities, and conducts outreach programs to educate lessees and the public on identification and reporting of noxious weeds. In addition, LADWP has trained their staff working in areas occupied by Covered Species about the biology of Covered Species, their habitat requirements, and avoidance and minimization measures that they will need to implement. LADWP removes weedy species using the appropriate method for the ecological sensitivity of the site. For example, when weedy species are located near a special status plant species, a backpack sprayer would be used instead of a truck-mounted sprayer because of ecological sensitivity. LADWP monitors weed management activities to determine their effectiveness by conducting surveys for at least five years to ensure that eradication has been successful. Further, LADWP provides funding to and coordinates with the Inyo County Saltcedar Control Program.

By implementing these weed management activities, LADWP intends to limit the establishment and spread of undesirable plant species in the Plan Area thereby maintaining or improving existing habitat for covered riparian obligate species.

6.8.8 Monitoring of Habitat Enhancement and Habitat Creation Activities

The Yellow Billed Cuckoo Habitat Enhancement Plans at Baker Creek and Hogback Creek in Inyo County (LADWP 2005) include monitoring and performance criteria to determine the success in achieving the Plan's goal of improving habitat suitability for the cuckoo at these sites. LADWP would periodically monitor for vegetation, occurrence of yellow-billed cuckoos, observation of bird use, and range and pasture conditions for grazing. Vegetation monitoring will include the review and comparison of aerial photographs from each site at five-year intervals, supplemented with onsite collection of vegetation cover and composition data. Occurrence of cuckoos will be monitored by conducting surveys using standard protocols for yellow-billed cuckoos. These surveys will also include point counts for all bird species observed on the sites. Range and pasture conditions will be monitored using utilization cages and permanent transects. Range monitoring, vegetation monitoring, and cuckoo occurrence monitoring would occur annually at each site.

Following monitoring, adaptive management recommendations will be made for vegetation management or grazing practices to help achieve the goals of the Yellow-Billed Habitat Enhancement Plans.

6.9 Reporting Requirements

LADWP agrees to meet annually or more frequently if necessary and agreed upon, with USFWS to review progress in implementing the HCP and to review needs for project modifications due to any changes in circumstances. LADWP will submit its annual written report July 1 for the previous calendar year and water year (October to September). Annual Reports will include monitoring results. Annual Reports will identify Adaptive Management Recommendations if biological goals and objectives are not being met, based on a summary and synthesis of monitoring data.

LADWP will also coordinate and share monitoring and other information with other regional restoration and management programs. A well-coordinated monitoring program design will

enable LADWP and others to measure and evaluate change in resources and threats in to species and communities across the Plan area, and within the ecoregion.