NORTH MONO BASIN WATERSHED/LANDSCAPE ANALYSIS

USDA Forest Service
Region 5
Inyo National Forest
2001

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North Mono Basin Watershed/Landscape Analysis Executive Summary

The North Mono Basin Watershed/Landscape Analysis was conducted during 2001 as part of the process outlined in the *Sierra Nevada Forest Plan Amendment*, "…to maintain or restore ecological sustainability to provide a sustainable flow of uses, values, products and services from these lands" (USDA Forest Service, 2001). The process used in this analysis is based on the *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis* (Version 2.2), which employs six research steps:

- Characterization of the watershed
- Identification of issues and key questions
- Description of current conditions
- Description of reference conditions
- Synthesis of interpretation and information
- Recommendations

The format follows that used by the *Upper South Platte Watershed Landscape Assessment* (1999). Opportunities and Recommendations (Step 6) are driven by key issues; no attempt has been made to address every factor relevant to the watershed/landscape.

The identification of issues and key questions (Step 2) is focused on impacts to the Mill Creek ecosystem as the result of human uses. Primary among these uses are water impoundment and diversion for power generation and irrigation and management of fire and fuels. Other issues include erosion and water quality, riparian and wetland habitat, fisheries and fish habitat condition, and wildlife.

The Current Conditions section documents the current range, distribution and condition of elements of the ecosystem relevant to the issues and key question. The Reference Conditions section develops a description of natural, pre-European settlement, conditions and processes for later comparison with current conditions over the period that the system has evolved, and with key management plan objectives. The purpose of Step 5, Synthesis and Interpretation of Information, is to compare the current and reference conditions to specific ecosystem elements and explain significant differences, similarities, or trends, and their causes.

Step 6, Recommendations, recognizes that there are opportunities to make significant contributions to the Mill Creek and Wilson Creek ecosystems while guaranteeing protection of the water rights of all parties. A key opportunity would provide more efficient water use through an improved water transport system that would replace the Mill Creek Return Ditch with a pipeline capable of carrying a larger flow of water more efficiently and replacement of the Thompson Main Ditch with a pipeline. This infrastructure would provide more water for Mill Creek and stream flows that would mimic, to the extent possible, natural processes. A more natural flow regime will enhance riparian growth and stabilize streambanks on both creeks, re-establish degraded habitat in the Mill Creek bottomlands, and provide major benefits to waterfowl, fish, and other wetland wildlife species. Consideration is given to the idea of improving water efficiency by making use of the Lundy Powerhouse tailrace or the Mill Creek Return Ditch for Mono County's fish rearing operation.

Another important opportunity is the re-consideration of the FERC 4e minimum flow requirements based on current understanding of the ecosystems involved, and resolution of the question of the 4e conditions and their possible infringement on the pre-1914 court decreed water rights belonging to the City of Los Angeles, Mono County, BLM and others.

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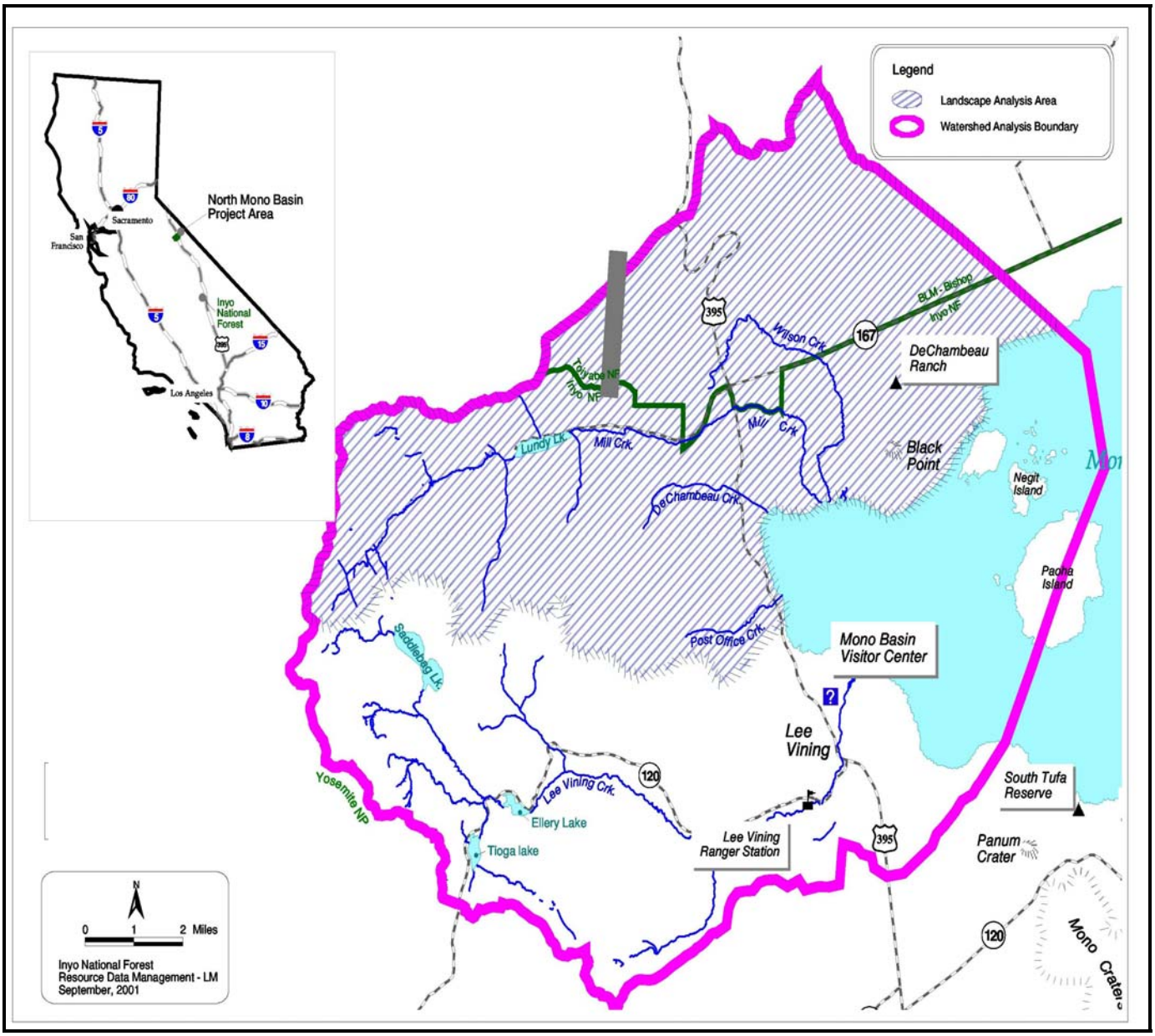

Figure 1. Vicinity map of the North Mono Basin Watershed/Landscape Analysis

NORTH MONO BASIN WATERSHED/LANDSCAPE ANALYSIS

INTRODUCTION

The North Mono Basin Watershed/Landscape Analysis was conducted during 2001. The intent of this analysis was to gain a more comprehensive understanding of the conditions, processes, and interactions within the watershed/landscape, and to assess the extent of human impact on these processes. Although it is, in reality, a landscape analysis, the Federal Guide for Watershed Analysis, Ecosystem Analysis at the Watershed Scale, Version 2.2 (Regional Ecosystem Center 1995), was followed to provide a framework for research. Further, the format of results/findings follows that used by the Upper South Platte Watershed Landscape Assessment (Foster-Wheeler Environmental Corporation 1999) to optimize the document's utility.

The landscape analysis area evaluated in this report is the HUC 5 (Hydrologic Unit Code 5) North Basin watershed (refer to Figure 1, page viii). This area was selected on the basis of certain biological and physical issues, management goals, the reduction of scientific complexity, and to facilitate a better understanding of the region. This project derived information directly from specialists in their respective scientific fields, while also drawing from previous studies and reports. Input was also sought from the local Paiute community, state and local government agencies, and the general public. This participation was used to help identify issues and opportunities, as well as current and historical uses of the watershed. Supplemental literature used in the analysis includes the California Department of Fish and Game's investigations on instream flow and habitat development for Mill Creek and Wilson Creek (1996 and 1998), and *The Mono Basin Ecosystem*, the National Academy of Science's study on the effects of changing lake level on Mono Lake (1996). Also referenced were the Sierra Nevada Framework, Inyo National Forest Land and Resource Management Plan (USDA Forest Service 1988), and the Mono Basin National Forest Scenic Area Management Plan (USDA Forest Service 1989). Integrated into the document as appendices are a hydrologic condition assessment, a roads analysis, wildlife survey data, and a riparian vegetation analysis for the North Mono Basin.

The Federal Guide for Watershed Analysis outlines a series of six research steps that are summarized in Table 1. The document will begin with steps 1 and 2 to provide background information on the North Mono Basin and to identify issues that are critical to the analysis. Steps 3, 4, and 5 will be addressed beneath each respective issue section identified in Step 2. The document will conclude with opportunities and recommendations (step 6) for resolving the pertinent watershed issues brought forth in this analysis and will suggest desired conditions as potential goals to be met.

Table 1. Six Steps of Analysis according to Ecosystem Analysis at the Watershed Scale (Regional Ecosystem Office 1995)

Step No.	Theme	Description
Step 1	Characterization of the Watershed	Provides a general overview of the analysis area, including locational attributes and physical, biological, and anthropogenic processes that may be acting in/on the landscape. Also supplies background information on management and regulatory constraints.
Step 2	Identification of Issues and Key Questions	Focuses the analysis on ecosystem elements most relevant to landscape management questions and objectives, values, and/or resource conditions. Provides the framework for subsequent steps of analysis.
Step 3	Current Conditions	Gives description of current physical, biological, and human aspects of relevant ecosystem elements/issues.
Step 4	Reference Conditions	Provides description of "natural" conditions in accordance with each issue (*note: for this analysis, natural is defined as the condition of the land prior to European colonization*). Is used as a measuring tool to determine changes that have taken place over the course of history.
Step 5	Synthesis and Interpretation of Information	Compares and contrasts current and reference conditions of specific ecosystem elements. Explains significant differences, similarities, or trends and their causes. Presents desired ecosystem conditions to set future management goals.
Step 6	Opportunities and Recommendations	Suggests management opportunities to meet a comprehensive resolution of ecosystem issues identified in analysis. Is responsive to natural watershed processes and human uses.

The federal guide defines the scope and priority of analyses as those that reflect the important management and resource issues in the watershed (Regional Ecosystem Office 1995). Further, the guide defines "*issues*" as triggering events that prompted the agency to initiate the research. This analysis is not a decision-making process; rather, it is issue-driven and serves as a stage-setting process. The results of the watershed analysis establish the context for subsequent decision-making processes, including planning, project development, and regulatory compliance. This is a framework to guide landscape management that: 1) uses landscape assessments to determine existing and reference conditions while developing recommendations and opportunities to improve existing conditions; 2) incorporates assessment results into resource management planning; and 3) fosters collaboration with all landowners in the watershed. *No attempt has been made to address every factor relevant to the watershed*. Other important factors within the watershed, but not considered of critical nature with respect to this analysis (i.e., utility corridors, inactive mines, other permitted land uses, etc.) are not addressed at this time. Consequently, this analysis is highly focused on those issues recognized as having the greatest current effect on the landscape.

STEP 1. CHARACTERIZATION OF THE WATERSHED

The North Mono Basin Watershed Analysis area is located on the eastern slope of the Sierra Nevada in the northwest corner of the Inyo National Forest in California, as shown in Figure 1 (page viii). The analysis area covers 49,188 acres (76 square miles) including 38 miles of perennial streams, 64 miles of intermittent streams and 12 miles of ephemeral streams. The major subwatersheds can be characterized as the lands draining into (from southwest to northeast) Post Office Creek, DeChambeau Creek, Mill Creek, Wilson Creek, and Rattlesnake Gulch as well as the unchanneled lands between these creeks that drain directly into Mono Lake. The topographic divide between Wilson Creek and Rancheria Gulch is considered the northeastern boundary of the study area. Subwatersheds within the analysis area include: Upper Lundy Canyon (9,158 acres), Lower Lundy Canyon (4,999 acres), DeChambeau Creek (8,046 acres), No Name (4,642 acres) which includes the area known as Mattly Ranch, Upper Rancheria Gulch (5,363 acres), the lower half of Lower Rancheria Gulch (approx. 1,484 acres), and No Name (18,291 acres) which includes Black Point. Lands within the analysis area are under the jurisdiction of the USDA Forest Service, the Bureau of Land Management, Mono County, the City of Los Angeles Department of Water and Power, Southern California Edison, and private landholders.

The western boundary of the North Mono Basin watershed is the crest of the Sierra Nevada mountain range with peak elevations in excess of 12,000 feet. This Sierra Nevada geologic province is characterized by steep, rugged mountains and stream or glacier cut canyons. The province is separated from Mono Basin by two major faults, and at least three periods of glaciation have created a transition between otherwise distinct rock types of the Sierra and Mono Basin zones.

The rocks of the Sierra Nevada were formed over a 500 million year sequence of sedimentary deposition, folding, erosion, igneous intrusion, uplift, and additional folding. The broadly arched mountain range resulting from these processes was largely covered by volcanic material during the Miocene and Pliocene periods. Three to four million years ago, the Sierra front began breaking apart, and the land east of the faults dropped in elevation with respect to the westernmost portion. Glacial action and erosion of the uplifted land deposited thousands of feet of sediment on the basin floor. The Mono Basin contains many volcanic features that are geologically young, and the basin is presently considered to be an active volcanic area.

The stream environment of Mill Creek reflects prolonged periods of erosion and deposition, which were prompted by extensive faulting, glacial activity, and fluctuations of Mono Lake over the past 20,000 years. Modern-day Wilson Creek is a very recent (in the last 60 to 120 years) human-induced erosional feature. Figure 2 below illustrates the present day features of Mill and Wilson Creeks from an aerial view of Mono Lake.

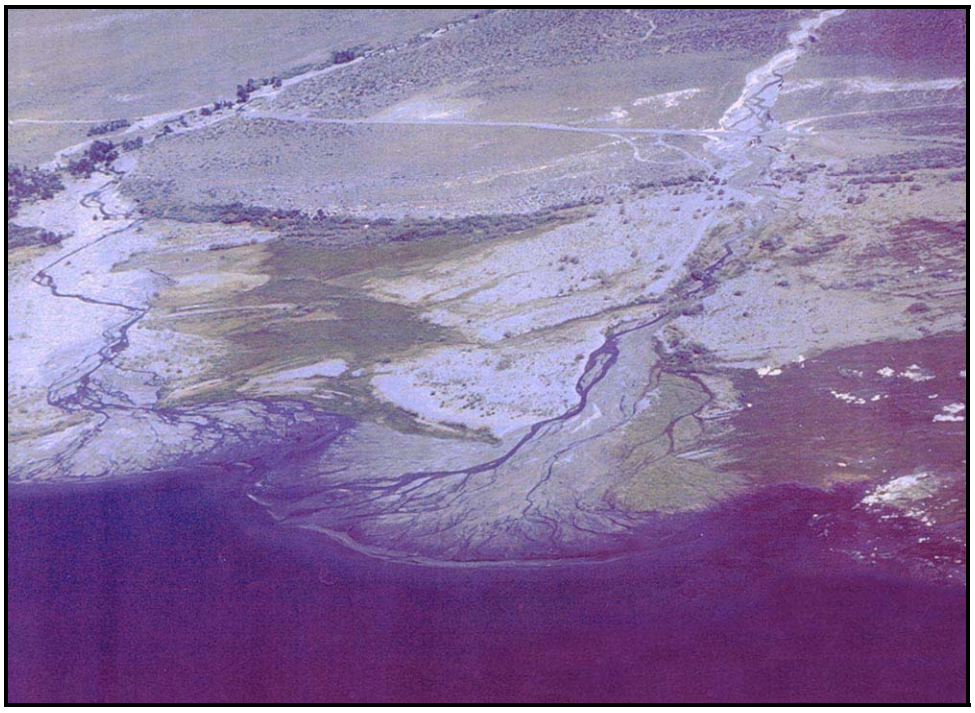

Figure 2. Mill and Wilson Creek delta at Mono Lake.

Upper portions of the watershed above Lundy Reservoir receive, on average, 30 to 40 inches of precipitation annually, primarily in the form of snow. The basin floor averages 10 to 15 inches annually as it lies within the rainshadow of the Sierra Nevada. Average surface water evaporation is about 45 inches and, during the growing season, evapotranspiration is about 24 inches. The temperature regime is continental, characterized by warm summers and cold winters, with mean daily summertime temperatures 60-70°F and mean daily wintertime temperatures dropping below freezing (32°F). Temperature fluctuations within the basin range from 90°F in the summer to -10°F in the winter. Snowmelt provides the majority of the runoff although intense rain events can provide short-term peak flow events. Two thirds of the runoff occurs in the peak snowmelt months of May through the middle of June (see Appendix B for reference).

In 1911, the Southern Sierra Power Company, a predecessor to Southern California Edison (SCE), completed construction of the Lundy Project, a hydroelectric power plant on Mill Creek. Currently, SCE operates the plant and manages the surface elevation of Lundy Lake for purposes of power generation and meeting court decreed water rights as flows exit the tailrace of the power plant. Figure 3 below is an aerial photograph of Lundy Canyon and Lake.

Figure 3. Aerial view of Lundy Lake/Canyon.

Water Issues with Mono Lake have been prominent since the early 1940's when the Los Angeles Department of Water and Power (DWP) completed an aqueduct that carried water from the Mono Basin over 350 miles to Los Angeles. The aqueduct diverted water from four of the six streams that fed into Mono Lake, causing a tremendous water imbalance, as the lake decreased in size and its salinity doubled. Since the creation of the aqueduct, efforts involving the courts have been taken to restore Mono Lake's water level to an elevation of 6,392 feet for ecological, geological, cultural, and air quality improvement purposes (Mono Basin Scenic Area Visitor Center 2001).

In contrast to recent issues with water management, fire has historically been a fundamental disturbance to the analysis area long before human civilization. Prior to the twentieth century, the primary cause of fire was lightning. Lightning ignitions are more prevalent at higher elevations on the west side of the analysis area. Though often coincident with summer thunderstorms, these higher elevation fires were typically not large. Lower elevation portions of the analysis area, however, while touched less frequently by lightning ignitions, have the potential to burn more extensively. In addition to these naturally occurring fires, Native Americans also utilized fire to manage their resources in many plant communities. Acts of fire suppression likely began with the onset of forest management in 1910-1920, when the region became part of the National Forest System (Ford 2001).

The North Mono Basin is the ancestral home to the Mono Lake Paiute Indians and has been occupied continuously for the last 10,000 years. Some members of the tribe continue to make use of the area for traditional gathering practices and value it as their ancestral land.

With the discovery of gold and silver in the 1860s, the population in the Mono Basin and surrounding areas increased dramatically and towns emerged in Lundy Canyon and Rattlesnake Gulch. Many of these villages were located on Copper Mountain and upper Lundy Canyon within the analysis area; Bodie, Dogtown, and Aurora were significant population centers outside but near

the study area boundaries during the last half of the nineteenth century. During that period, farms and ranches expanded in the region to supply the needs of these gold-mining communities. As the gold and silver reserves were depleted, however, mining towns and ranches alike were abandoned and eventually fell to ruin.

Today, two state highways, highways 395 and 167, cross the North Mono Basin. Highway 395 is the main north-south travel corridor in the Eastern Sierra and 167 connects 395 to the Nevada state line (heading east to Hawthorne). The region remains rural, as there is only one population center (Mono City, a community of approximately one hundred residents near the junction of highways 395 and 167), a small resort, and a few private residences in Lundy Canyon and along the shore of Mono Lake. Beyond the immediate landscape analysis area has been an increase in Mono County's tourist/recreation-based economy, chiefly in the communities of Lee Vining, June Lake, and Mammoth Lakes. These communities serve as centers for hiking, mountain biking, fishing, camping, skiing, etc. These uses coincided with designation of the Mono Basin National Forest Scenic Area and the Mono Lake Tufa State Reserve, and proximity to Yosemite National Park and Bodie State Historic Park, have imposed a shared recreational impact on the analysis area.

The majority of the lands within the analysis area fall within the Mono Basin National Forest Scenic Area. Existing management direction of Forest Service lands within the North Mono Basin Watershed Analysis area is contained within three documents, the Mono Basin National Forest Scenic Area Management Plan, 1989 (SAMP), the Land and Resource Management Plan, Inyo National Forest, 1988 (LMP), and the Sierra Nevada Framework (2001b).

The SAMP gives strong guidance in the management of the Scenic Area to protect the geologic, cultural, scenic and other natural resources while allowing recreational, scientific, and additional activities consistent with this goal. The LMP provides direction on lands that fall outside the boundaries of the SAMP and includes a portion of the Hoover Wilderness and a portion of Lundy Canyon.

The emphasis of management on wilderness lands is to provide opportunities for solitude, challenge, and conventional recreation while protecting these wild lands and their values of natural ecological integrity and appearance. Portions of Lundy Canyon are managed as a concentrated recreation area, which provides for a broad range of facilities and opportunities that accommodate a limited number of people safely, conveniently, and with little resource damage. These facilities include a trailhead for the Hoover Wilderness that accommodates moderate use by day hikers and light use by backpackers, campgrounds for moderate to extensive use during the summer season, and a private resort that caters to fishermen and campers.

For the purpose of this analysis, the North Mono Basin was divided into the two coverage areas of Mill and Wilson Creeks; identification of issues and key questions address each creek separately but under the same subject heading (i.e., erosion and water quality, habitat composition, etc.). Mill and Wilson Creeks were further separated into reaches based on channel morphology and common physical and biological attributes. In essence, such organization better facilitates understanding of the goals and objectives of this document. Such stratification of reaches is outlined below and is shown graphically in Figure 4 (page 7)**.**

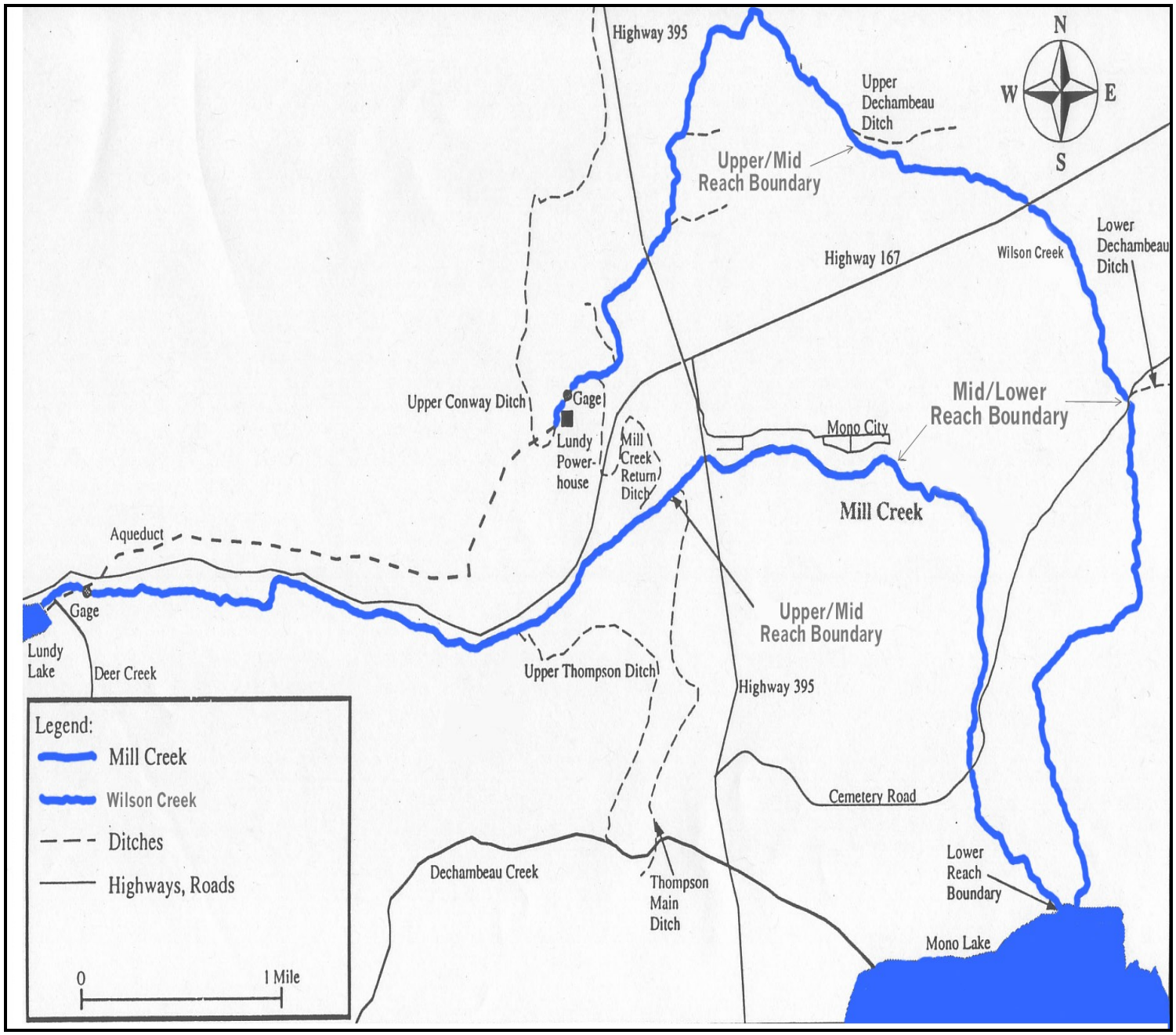

Figure 4. Stratification of the reaches of Mill Creek and Wilson Creek

Mill Creek was divided into three reaches. The upper reach extends approximately 3.25 miles from Lundy Dam downstream to the Mill Creek Return Ditch; the middle reach extends approximately 1.5 miles from the Mill Creek Return Ditch downstream to the east end of Mono City; the lower reach, also referred to as the "bottomlands" extends approximately 2.2 miles from the east end of Mono City to Mono Lake. Figure 4 shows the stratification of reaches in Both Mill and Wilson Creeks. Figure 5 illustrates present conditions in the lower reach of Mill Creek.

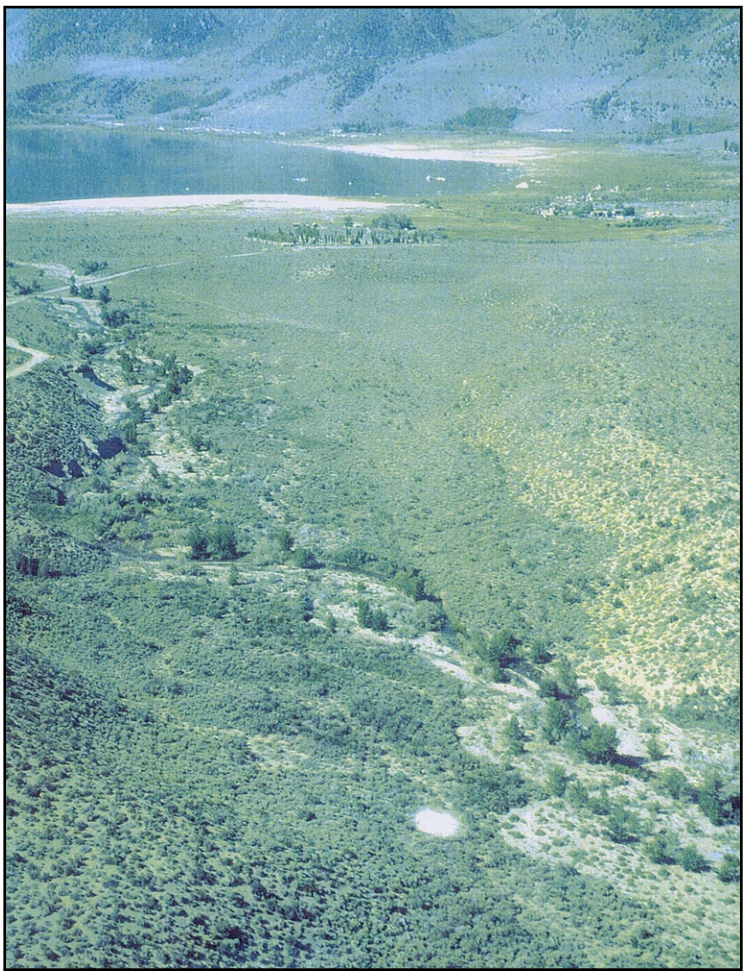

Figure 5. Mill Creek upstream of Cemetery Road (looking south/southeast).

Wilson Creek was also divided into three reaches. The upper reach begins at the return ditch diversion and extends downstream approximately 4 miles to the Upper DeChambeau Ditch (just below the Conway Ranch property boundary); the middle reach extends approximately 2.25 miles from the Upper DeChambeau Ditch downstream to Cemetery Road; the present lower reach extends approximately 2.25 miles from Cemetery Road to Mono Lake. Refer to the following figures for images of upper (Figure 6) and lower (Figure 7) Wilson Creek.

Figure 6. Upper Wilson Creek (above Cemetery Road).

Figure 7. Lower Wilson Creek.

STEP 2. IDENTIFICATION OF ISSUES AND KEY QUESTIONS

The intent of identifying issues and key questions for this analysis is to place emphasis on the elements most relevant to management questions, values, and current resource conditions within the landscape. The Federal Guide for Watershed Analysis (Regional Ecosystem Center 1995) suggests the examination of seven ecological components when conducting such research (*i.e., erosion processes, hydrology, vegetation, stream channel, water quality, species and habitats, and human uses*). Issues discussed in this document encompass all seven topics, but are consolidated and ordered in such a way that clearly reflects the pertinent issues of the North Mono Basin. Subsequently, this analysis is focused on six separate, but equally important facets of the watershed. Further, each issue is discussed from the standpoint of past and present trends and addresses questions that guide the analysis toward future management direction.

Issues to be assessed include the availability and management of water in the North Mono Basin, as well as recommendations for the current water supply. In addition to manipulation of aquatic resources through impoundment and diversion, is human utilization of the terrestrial environment. As such, a principal use of the basin and throughout the Inyo National Forest is that of recreation, fire suppression, and road networks for transportation. Thus, maintaining forestland for recreational use and travel while sustaining a well-preserved environment is a significant goal of managers. Also to be evaluated in this report are the status of erosion and water quality, methods to safeguard existing populations of fish and wildlife, and means to ensure the effectiveness of existing riparian and wetland habitats for these species. Thus, the six key issues featured below will serve as the basis for this analysis, and key questions correlated with each heading are addressed in respective sections of this report.

Issues to be addressed in the North Mono Basin Watershed/Landscape Analysis:

Issue A: Human Use of the Aquatic Environment (Water Impoundment, Diversion, Power Generation, and Stream Condition)
Issue B: Human Use of the Terrestrial Environment (Roads, Recreation, Fire/Fuels)
Issue C: Erosion and Water Quality
Issue D: Riparian and Wetland Habitat
Issue E: Fisheries and Fish Habitat Condition
Issue F: Wildlife (Terrestrial and Avian)

ISSUE A. HUMAN USE OF THE AQUATIC ENVIRONMENT
(Water Impoundment, Diversion, Power Generation, and Stream Condition)

Issue

Water impoundment and diversion practices are mechanisms that transform the environment; such engineering modifies stream morphology, quantity of flow, and corresponding aquatic and riparian habitat. This treatment of the water supply may subsequently change the condition and quality of streams. Human structural use of the aquatic environment in the North Mono Basin is prominent; impoundment and diversion practices (partly for hydropower generation) have been occurring for over a hundred years. As a result, Mill and Wilson Creeks have been heavily altered by human controlled flows. This analysis of hydrologic components of the landscape will examine the level of impact that these practices have had on the aquatic environment and on water rights holders in the Basin.

The North Mono Lake Basin serves as valuable habitat and rearing grounds for aquatic species. A desirable objective in the Basin is the ability to enhance fish production for economic gain, maintain current populations for ecosystem function, and to support recreational fishing opportunities in the Eastern Sierra. Questions of interest are linked to feasibility of fish production goals, relationships between production and water flow in the Basin, and maintaining good condition of current fish populations. The intention is to sustain suitable habitat for current species and to support the fish rearing operation, while complying with Forest and Scenic Area management goals and objectives.

Background

Currently and historically, some water diverted from Mill Creek has been used for two purposes: (1) the irrigation of pastureland for livestock grazing, and (2) the generation of hydroelectric power. These events and activities have progressively changed the flow regimes of both Mill and Wilson Creeks.

Mill Creek historically followed natural hydrologic patterns before the construction of a hydroelectric dam at Lundy Lake. This construction has altered flow patterns by reducing flows and, most importantly, eliminating a proper functioning riparian system in the lower reach. Since little to no release has occurred directly from the dam, the natural hydrograph for the entire creek has been changed. Today, roughly 70% of Mill Creek's flow is sent through the penstock, approximately three miles, to the Lundy power plant; remaining water flows into Mill Creek when capacity of the reservoir and power plant is exceeded in wetter years. Once through the power plant and into the tailrace, the bulk of the water is directed, not back into Mill Creek but into the present-day Wilson Creek and the Conway-DeChambeau ditch system. Consequently, power generation and irrigation practices of past and present have reduced the flows in Mill Creek.

Alternatively, Wilson Creek, historically an ephemeral drainage, has experienced a significant increase in flows to where it is a perennial channel. However, the flows in Wilson Creek fluctuate greatly depending on the needs and discharge from the hydropower plant.

Key Questions

Step 3. Current Conditions

A-1. What are the existing conditions of the processes, both natural and human influenced, within the watershed?

A-2. What are the current runoff conditions and storage capacity of Mill Creek?

A-3. How do diversions from Mill Creek affect the course, volume, and duration of flow in Wilson Creek?

A-4. What are the different management goals and uses for the irrigated meadows?

A-5. What is the current status of water rights to landowners in the Mono Lake Basin?

A-6. Where are the primary opportunities for rearing fish with existing and new facilities?

Step 4. Reference Conditions

A-7. What are the historical conditions of physical, biological, and human ecosystem elements with respect to the aquatic environment in the North Mono Basin? What are the expected runoff and streamflow characteristics of unimpaired flows?

Step 5. Synthesis and Interpretation of Information

A-8. How have the presence of impoundments and diversions impacted the aquatic environment? How might these influence future management direction?

Step 3. Current Conditions

A-1. What are the existing conditions of the processes, both natural and human influenced, within the watershed?

Mill Creek

Due to diversion from Lundy Lake to the powerhouse, there is reduced flow in Mill Creek immediately from Lundy dam to Mono Lake. Water initially diverted from Lundy reservoir for power generation is returned to Mill Creek on occasion via the Mill Creek Return Ditch to provide seasonal irrigation. Lundy dam originally included Deer Creek as well as Mill Creek, but between 1956 and 1968, Deer Creek shifted eastward on its alluvial fan. Its waters now enter Mill Creek below the dam (Stine 1995).

A gain (or "accretion") of 3 to 10 cfs presently occurs in Mill Creek between Lundy Lake and the mouth of Lundy Canyon at Highway 395 (California Department of Fish and Game 1996). This gain is due to seepage from the Reservoir, inflow from Deer Creek and other localized runoff, and channel accretion. More recent measurements, after several years of above normal runoff suggest that the gain can be up to 16 cfs in wetter years. This gain can be augmented by spills, or releases from the Farmer's Gate, when the capacity of Lundy Reservoir is exceeded. Downstream of the Thompson Main Ditch, near Highway 395, Mill Creek generally loses water (except for short periods of localized runoff contribution) due to percolation into the coarse stream deposits. Flow measurements between Highway 395 and Mono Lake have shown losses averaging 4 cfs with a range of –5.2 cfs to +7 cfs (USDA Forest Service 1999). Mill Creek continues to lose water

mainly by infiltration all the way down to Mono Lake. In drier periods, nearly all of Mill Creek's surface gain from accretion is lost by the time it enters Mono Lake. In wetter periods, surface flow (varying from 2 cfs to 100 or more cfs when Lundy Reservoir spills) reaches Mono Lake.

The channel through the Pleistocene sediments, below Highway 395, appears to have had sufficient water during the past century to maintain a channel and some of its riparian vegetation. However, the massive reduction in flows in the lower channel from Mono City to Mono Lake produced notable changes in vegetation and channel form (Stine 1995). Only dead snags remain of a formerly lush riparian woodland, and the multiple channels of the bottomlands have been superseded by a single channel (Stine 1991). The last mile of the stream has undergone further changes since the 1940s, when Mono Lake began to fall in response to the exports of other tributaries to the lake. This drop in lake level (totaling 45 feet by 1982) forced Mill Creek to cut into its exterior delta, creating two elongate trenches up to 10 feet deep, below Cemetery Road (refer to Figure 11, page 22). By 1955, most of this lowermost reach had been transformed into a straight, wide wash with little to no channel definition (Stine 1995). See Appendix B, Hydrologic Condition Assessment, for more information regarding the current conditions in the North Mono Basin.

Wilson Creek

Although essentially an artificially maintained diversion, Wilson Creek has acquired properties of a natural stream and is paralleled by riparian vegetation. Wilson Creek begins at the return ditch diversion, below the Lundy Powerplant at an elevation of 7,050', and extends a distance of approximately 8.5 miles to Mono Lake. The present normal practice of Southern California Edison (SCE), which is based on the limited capacity of the return ditch and the requirement to supply needs of water rights holders, is to route most of the powerhouse discharge flow to Wilson Creek (Harrison 1997). The natural channel of Wilson Creek has been enlarged by the high spring and summer flows from the power plant. The slope of Wilson Creek is less than 3% over most of the channel length, although there are steep areas just below the tailrace and below culverts. Wilson Creek averaged 2' deep and 13' wide in the summer of 1990 (California Department of Fish and Game 1998). Substrates include gravel, sands, fines, volcanic outcrops, and cobble (refer to Figure 7, page 9). Because of the permeable nature of the material forming the channel of Wilson Creek, water tends to infiltrate into the bed and banks except where the local water table is close to the surface because of seepage or irrigation. Flow in the stream is generally lost through the permeable soils at a rate of 1.1 cfs per mile (California Department of Fish and Game 1998). Below the diversions below Conway Ranch, in May 1987 (a drought year), surface flow ceased within one mile of Mono Lake (Triad Engineering 1988). See Appendix B, Hydrologic Condition Assessment, for more information regarding the current conditions in the North Mono Basin.

Very infrequent and brief peak flows a hundred cfs can occur from the Wilson Creek watershed above Conway Ranch during intense rainfall events, rain on snow events, and heavy snowmelt periods. Some of that flow is diminished before it reaches the Wilson Creek stream channel.

The flow in Wilson Creek is also subject to fluctuations on a daily, seasonal, and annual basis because of the powerhouse operations. For example, mean annual Wilson Creek flows from the powerhouse have varied from 8 to 33.6 cfs (Triad Engineering 1988). Although power plant operations often maintain fairly constant outflows to Wilson Creek, flows can occasionally be increased or decreased 10 cfs to 20 cfs, which may represent a 200% or more increase or a 50% decrease on a mean daily basis.

The typical pattern of discharge in Wilson Creek is 5-10 cfs from October through March, increasing flows April through May, and with an annual maximum near 60 cfs in June or July. These high flows account for as much as 70% of the total annual flow in a six-week period. Flows decline through August, September and October. Irrigation diversions from Wilson Creek from the Bell and Bowl ditches typically amount to approximately 7 cfs.

Some other characteristics of streamflow in Wilson Creek were described in the environmental studies for the Conway Ranch Estates proposal conducted in the 1980's. This report noted a daily discharge from the Lundy powerhouse that averaged 24 cfs and ranged from 0 to 70 cfs. Annual streamflow averages in Wilson Creek for dry and wet years were 10 cfs in 1976 and 1990, and 41 cfs in 1982, respectively. Also the median discharge was 8 cfs in dry years, 14 cfs in normal years, and 24 cfs in wet years (Beak Consultants 1990).

From 1961 through the end of 1967, the power plant was out of service and irrigation season flows for the Wilson system were diverted directly from Mill Creek. During that time no flow was diverted from Mill Creek to Wilson Creek during the winter months. Short, largely unused, stretches of the old ditches from Mill Creek to Wilson Creek are occasionally put into use when the power plant is temporarily taken out of service, but they are in poor shape, are inefficient transporters of water, and are of unknown or questionable ownership status.

DeChambeau Creek

DeChambeau Creek collects runoff from the northeast slopes of Mount Warren and a small portion of lake terraces before entering Mono Lake below County Park. The USGS-mapped channel begins at about 9,520' and extends for about 2.5 miles. Year-round flow maintained by springs is recorded at the DeChambeau Creek gaging station located above the irrigation diversions.

A-2. What are the current runoff conditions and storage capacity of Mill Creek?

Most runoff is generated in spring and early summer from melt of the seasonal snow cover. The runoff of Mill Creek, above the dam, is captured and regulated by Lundy Reservoir, a natural lake enlarged by completion of the dam in 1911. Relatively little subsurface storage capacity exists in the thin layer of unconsolidated materials in the headwater areas, yet there does appear to be some capacity below Lundy Dam. Therefore, the volume and timing of runoff depend on the quantity of water stored as snow and the timing of its melt. Approximately 81% of the annual runoff of Mill Creek has been attributed to snowmelt, occurring from April through September, and the remaining 19% of the annual streamflow occurs as base flow from October through March (Perrault 1995). Although the annual hydrograph (daily volume of streamflow plotted against day

of the water year [October to September]) has roughly the same shape each year, the volumes of snowmelt runoff can be quite different from year to year.

A-3. How do diversions from Mill Creek affect the course, volume, and duration of flow in Wilson Creek?

The advent of diversions from Mill Creek in the 1870s, for irrigation, began to artificially extend the course, volume, and duration of flow in Wilson Creek. The amount that could be diverted increased to 70 cfs when the Lundy power plant was built in the early 20th century. Currently, the course of Wilson Creek begins at the tailrace of the Lundy powerhouse and runs northeast for approximately two miles through a channel cut by increased flows. At this point, it enters the natural channel of Wilson Creek above Conway Ranch estates. After following this course for approximately four miles, the course divides at Cemetery Road; a portion of the water follows the natural Wilson Creek wash to the DeChambeau Ranch, while the majority of the water flows southward through a channelized arroyo that skirts the west flank of Black Point. The proportional division of flow varies seasonally with most of the flow during low flow months being directed to DeChambeau Ranch and the DeChambeau/County Ponds complex for irrigation and habitat maintenance.

Figure 8. DeChambeau Ranch

Prior to 1930, all of the water followed the historic channel of Wilson Creek to DeChambeau Ranch. In approximately 1930, the Wilson Creek channel was altered to protect the lands at the DeChambeau Ranch from the seasonally high flows through the powerhouse (Norm DeChambeau). The stream channel was split at the county road crossing, sending the greatest flows of water south, through the Wilson Creek Arroyo, to reach Mono Lake between the Black Point Marsh and the mouth of Mill Creek.

A-4. What are the different management goals and uses for the irrigated meadows?

There is currently an agreement between Mono County and the F.I.M. Corporation to graze 2,000 sheep on the Conway Ranch between June 1st and November 1st of each year. Until 1999, there was a grazing lease from the Los Angeles Department of Water and Power on Thompson Ranch. A study using a reference year of 1996 (under that lease) indicated a grazing period for the meadow of early May to mid-July, and late August to mid-October. During these periods, there were 1,400 ewes with lambs (50% with twin lambs, 50 % with single lambs). Grazing allotments on Forest Service lands within the analysis area were eliminated over time, based on direction from the Mono Basin National Forest Scenic Area Management Plan.

Management of pastures and irrigated meadows on Thompson Ranch and the DeChambeau Ranch is carried out with seasonal irrigation at a rate of approximately 2 acre feet per acre per season for maintenance of grasses and trees at those historic sites.

Figure 9. Thompson Ranch

A-5. What is the current status of water rights to landowners in the Mono Lake Basin?

Early rights to appropriate water from streams in the North Mono Basin were established as farmers and ranchers constructed the first diversion ditches to redirect water onto their private lands. A court decision in 1901 formalized some of these rights and extinguished many previous claims, but the principal adjudication of water rights to Mill Creek was a judgment and decree by the Mono County Court on November 30, 1914. Mono County water rights were formalized by purchase agreement of Conway Ranch.

LADWP, Mono County, the U.S. Forest Service, BLM, and Simis hold current Mill Creek water rights. These water rights account for the complete 70 cfs effluent from the Lundy power plant (refer to Table 2, below). LADWP and Mono County hold highest priority rights to the largest quantity of water. A portion of the LADWP right has historically been satisfied by water directly taken from Mill Creek at the upper and lower Thompson ditches. The remainder of the DWP right, like all of the Mono County and Forest Service rights, has been supplied by water that has first passed through the Lundy powerhouse. While the lands to the northeast of Mill Creek have water rights totaling 31.6 cfs (Mono County = 16 cfs; BLM = 2 cfs; USFS = 12.6 cfs; DWP = 1 cfs), far more water than this has typically been diverted toward those lands during much of the irrigation season. This excess water has ended up in Wilson Creek, rather than being returned to Mill Creek. Please refer to Table 3 (page 18) and Table 4 (page 19), for further information regarding flows and water right needs.

Table 2. A current list of water rights compiled by Don Mooney, consulting attorney for Mono County, is shown below (quantity and cumulative figures are in cubic foot/second):

Priority Right	Right Holder	Quantity of Right	Cumulative DWP	Cumulative Conway (Mono Co.)	Cumulative Total
1st	LADWP	1	1	0	1
2nd	Mono Co.	2	1	2	3
3rd	BLM	2	1	2	5
4th	Mono Co.	8	1	10	13
5th	LADWP	9.2	10.2	10	22.2
6th	Simis	1.8	10.2	10	24
7th	LADWP	14	24.2	10	38
8th	Mono Co.	5	24.2	15	43
9th	USFS	12.6	24.2	15	55.6
10th	LADWP	18	42.2	15	73.6
11th	Mono Co.	1	42.2	16	74.6

Table 3. Average water availability to water rights holders based on Lundy Powerhouse tailrace releases (note: water year types are based on 1968 – 1991 averages – flows in cfs)

Dry Year													
	Lundy tailrace	LADWP	Mono Co.	BLM	Mono Co.	LADWP	Simis	LADWP	Mono Co.	USFS	LADWP	Mono Co.	LADWP and USFS water available for transfer
January	5	1	2	2	0	0	0	0	0	0	0	0	1
February	4	1	2	1	0	0	0	0	0	0	0	0	1
March	10	1	2	2	5	0	0	0	0	0	0	0	1
April	10	1	2	2	5	0	0	0	0	0	0	0	1
May	19	1	2	2	8	6	0	0	0	0	0	0	7
June	30	1	2	2	8	9.2	1.8	6	0	0	0	0	16.2
July	19	1	2	2	8	6	0	0	0	0	0	0	7
August	15	1	2	2	8	2	0	0	0	0	0	0	3
September	10	1	2	2	5	0	0	0	0	0	0	0	1
October	8	1	2	2	3	0	0	0	0	0	0	0	1
November	7	1	2	2	2	0	0	0	0	0	0	0	1
December	6	1	2	2	1	0	0	0	0	0	0	0	1
Water Right		1	2	2	8	9.2	1.8	14	5	12.6	18	1	
Cumulative Rights		1	3	5	13	22.2	24	38	43	55.6	73.6	74.6	

Normal Year													
	Lundy tailrace	LADWP	Mono Co.	BLM	Mono Co.	LADWP	Simis	LADWP	Mono Co.	USFS	LADWP	Mono Co.	LADWP and USFS water available for transfer
January	10	1	2	2	5	0	0	0	0	0	0	0	1
February	11	1	2	2	6	0	0	0	0	0	0	0	1
March	12	1	2	2	7	0	0	0	0	0	0	0	1
April	18	1	2	2	8	5	0	0	0	0	0	0	6
May	41	1	2	2	8	9.2	1.8	14	3	0	0	0	24.2
June	58	1	2	2	8	9.2	1.8	14	5	12.6	2.4	0	39.2
July	52	1	2	2	8	9.2	1.8	14	5	9	0	0	33.2
August	32	1	2	2	8	9.2	1.8	8	0	0	0	0	18.2
September	18	1	2	2	8	5	0	0	0	0	0	0	6
October	10	1	2	2	5	0	0	0	0	0	0	0	1
November	9	1	2	2	4	0	0	0	0	0	0	0	1
December	9	1	2	2	4	0	0	0	0	0	0	0	1
Water Right		1	2	2	8	9.2	1.8	14	5	12.6	18	1	
Cumulative Rights		1	3	5	13	22.2	24	38	43	55.6	73.6	74.6	

Wet Year													
	Lundy tailrace	LADWP	Mono Co.	BLM	Mono Co.	LADWP	Simis	LADWP	Mono Co.	USFS	LADWP	Mono Co.	LADWP and USFS water available for transfer
January	11	1	2	2	6	0	0	0	0	0	0	0	1
February	11	1	2	2	6	0	0	0	0	0	0	0	1
March	12	1	2	2	7	0	0	0	0	0	0	0	1
April	29	1	2	2	8	9.2	1.8	5	0	0	0	0	15.2
May	53	1	2	2	8	9.2	1.8	14	5	10	0	0	34.2
June	63	1	2	2	8	9.2	1.8	14	5	12.6	7.4	0	44.2
July	62	1	2	2	8	9.2	1.8	14	5	12.6	6.4	0	43.2
August	61	1	2	2	8	9.2	1.8	14	5	12.6	5.4	0	42.2
September	47	1	2	2	8	9.2	1.8	14	5	3	0	0	27.2
October	29	1	2	2	8	9.2	1.8	5	0	0	0	0	15.2
November	19	1	2	2	8	6	0	0	0	0	0	0	7
December	17	1	2	2	8	4	0	0	0	0	0	0	5
Water Right		1	2	2	8	9.2	1.8	14	5	12.6	18	1	
Cumulative Rights		1	3	5	13	22.2	24	38	43	55.6	73.6	74.6	

Table 4. Flows in the Lundy Powerhouse tailrace vs. water needs (note: water year types are based on 1968 – 1991 averages – flows in cfs)

Dry year

	Lundy tailrace (cfs)	Mono Co. fish rearing	Mono Co. irrigation	LADWP irrigation	USFS irrigation	USFS ponds, etc.	Total Water needs (CFS)	Water available for transfer (cfs)
April	10	8	0	0	0	0	8	2
May	19	8	2	0.5	0	0	10.5	8.5
June	30	8	2	0.5	0	0	10.5	19.5
July	19	8	2	0.5	0	0	10.5	8.5
August	15	8	2	0.5	0	0	10.5	4.5
September	10	8	2	0	0	0	10	0
October	8	3	0	0	0	0	3	5
November	7	3	0	0	0	0	3	4
December	6	3	0	0	0	0	3	3
January	5	3	0	0	0	0	3	2
February	4	3	0	0	0	0	3	1
March	10	3	0	0	0	0	3	7

Normal year

	Lundy tailrace (cfs)	Mono Co. fish rearing	Mono Co. irrigation	LADWP irrigation	USFS irrigation	USFS ponds, etc.	Total Water needs (CFS)	Water available for transfer (cfs)
April	18	8	0	0	0	0	8	10
May	41	8	2	0.5	0	0	10.5	30.5
June	58	8	2	0.5	0	0	10.5	47.5
July	52	8	2	0.5	0	0	10.5	41.5
August	32	8	2	0.5	0	0	10.5	21.5
September	18	8	2	0	0	0	10	8
October	10	3	0	0	0	0	3	7
November	9	3	0	0	0	0	3	6
December	9	3	0	0	0	0	3	6
January	10	3	0	0	0	0	3	7
February	11	3	0	0	0	0	3	8
March	12	3	0	0	0	0	3	9

Wet year

	Lundy tailrace (cfs)	Mono Co. fish rearing	Mono Co. irrigation	LADWP irrigation	USFS irrigation	USFS ponds, etc.	Total Water needs (CFS)	Water available for transfer (cfs)
April	29	8	0	0	0	0	8	21
May	53	8	2	0.5	0	0	10.5	42.5
June	63	8	2	0.5	0	0	10.5	52.5
July	62	8	2	0.5	0	0	10.5	51.5
August	61	8	2	0.5	0	0	10.5	50.5
September	47	8	2	0	0	0	10	37
October	29	3	0	0	0	0	3	26
November	19	3	0	0	0	0	3	16
December	17	3	0	0	0	0	3	14
January	11	3	0	0	0	0	3	8
February	11	3	0	0	0	0	3	8
March	12	3	0	0	0	0	3	9

Mono County fish rearing 4,000 AF @ 3cfs Oct. through March and 8 cfs April through September

Conway Ranch ~ 150 acre 600 AF - 4 AF/acre/irrigation season

Thompson Ranch ~68 acres 136 AF - 2 acre feet/acre/irrigation season - water transport by pipeline (no transport loss)

DeChambeau Ranch ~ 5 acres irrigation based upon flow-through water available from Conway Ranch
DeChambeau Meadow, Ponds and County Ponds ~30 acres - maintenance based on flow-through water from Conway Ranch

Water availability - average flows in the Lundy Powerhouse tailrace during the irrigation period (April through August):

Dry years - 6,696 AF
Normal years ~11,959
Wet years ~15,945

A-6. Where are the primary opportunities for rearing fish with existing and new facilities?

Currently, Mono County has entered into an agreement with the Eastern Sierra Trout Foundation to manage and operate a fish-rearing facility on Conway Ranch (Figure 10, below). The Foundation is entitled to priority usage of Mono County's water right to rear trout of a variety of species, noting that this water use will be substantially non-consumptive. It is estimated that the current levels of fish-rearing at the Mono County facility will require a water flow of 2 to 3 cfs during the winter months, but that a flow of approximately 5 cfs is required to eliminate the freezing problems associated with the transport of water. If there is an expansion of the fish-rearing program as described in the MOU between the Sierra Trout Foundation and Mono County, those water needs would increase.

It has been suggested that the possibility exists to make use of the Lundy Power Plant tailrace or the Mill Creek Return Ditch for the rearing of fish.

Figure 10. Conway Ranch

Step 4. Reference Conditions

A-7. What are the historical conditions of physical, biological, and human ecosystem elements with respect to the aquatic environment in the North Mono Basin? What are the expected runoff and streamflow characteristics of unimpaired flows?

Mill Creek

Mill Creek historically flowed approximately 13 miles through glacier-carved Lundy Canyon, a series of moraines, and across an expanse of ancestral lake terraces before entering Mono Lake

(elevation 6,380'). The stream flowed for roughly 9.25 miles (~49,000') in a deep canyon composed of crystalline rocks that contained Lundy Lake (natural outlet elevation 7,766'), a natural water body dammed by recessional moraines of the Tioga glacial advance nearly 20,000 years ago. Most of the area contributing water to Mill Creek above the mouth of Lundy Canyon (7,200' and 3.25 miles downstream of Lundy dam) is rugged, steep terrain with little vegetation except along the watercourses. Downstream of the canyon, Mill Creek flowed east for 3.45 miles (18,200') through a narrowly incised lake delta over a bed of alternating coarse-alluvial and fine lacustrine sediments (Stine 1995). This delta was formed during the late Pleistocene when ancestral Lake Russell filled the Mono Basin to an elevation of about 7,060'. Aerial photos and field observations indicate that this reach of Mill Creek was characterized over most of its length by a single channel lined with a narrow band of riparian vegetation (i.e., willows, cottonwoods, aspen, Jeffrey pine, etc.) (Stine 1995). At an elevation of about 6,630', the eastward-trending channel of Mill Creek begins to curve to the south. From this point, the stream enters a zone of coarse, permeable sediments deposited over the past 10,000 years. This final reach is currently about 2.15 miles (11,200') long and becomes progressively wider as it approaches Mono Lake (Stine 1995). From a point near the present crossing of County Road, Mill Creek extended its channel into Mono Lake by building a delta composed of the sediments it transported out of its headwaters. Upstream of this point, an "interior delta" was built by the stream backfilling into Mill Creek canyon for a distance of about 7,800' (Stine 1995). Under natural conditions, this interior delta was characterized by several channels, which distributed the flow across the valley bottom. Riparian vegetation was present along the narrow distributaries, and on the interfluve that separated them, as suggested by dead snags that remain today (Stine 1995).

The upper portion of the drainage extends to the Sierra Nevada crest at a maximum elevation of approximately 12,242 feet (North Peak). Precipitation is primarily snow deposited near the Sierra Nevada crest. Dry air descending the eastern slope produces a rain shadow effect resulting in little precipitation at the lower elevations of the Mill Creek basin.

Under natural conditions, streamflow in Mill Creek would typically reach a maximum between late May and early July and then decline to base flow levels, which persist through the winter until the following snowmelt season. Average monthly unimpaired natural flow at Lundy Lake in June is about 89 cfs, and base flow tends to be approximately 11 cfs (Perrault 1995; California Department of Fish and Game 1996). Using data for runoff years (April-March) 1968 to 1991 supplied by Southern California Edison, the California Department of Fish and Game (1996) estimated that unimpaired *daily* streamflow in Mill Creek ranged from 0 to 267 cfs and averaged 29 cfs. This study also estimated average *annual* unimpaired streamflow at Lundy Lake ranged from 12 to 56 cfs (8,700 AF to 40,000 AF).

Estimates of annual unimpaired runoff in Mill Creek at a point immediately downstream of Lundy Lake for 1941 to 1990 averaged 21,200 acre-feet (AF) [29 cfs] (Perrault 1995). These estimates were derived from flow through Lundy powerhouse (SCE gauges 365 and 366), flow in Mill Creek below Lundy Reservoir (SCE gage 355) and storage change in Lundy reservoir. The average depends on the time period considered; Lee (1969) estimated an average flow in Mill Creek of 17,100 AF (23 cfs) and Vorster (1985) calculated an average for 1941-1983 of 21,669 AF (30 cfs). This volume is equivalent to 22.7" depth of water spread uniformly over the drainage area of 11,604 acres (Vorster 1985). Comparable figures for other creeks in the area are 22" for Rush Creek and 26.5" for Lee Vining Creek; Dechambeau Creek averages 7.6" (945 AF) from its drainage area of 1,511 ac (Vorster 1985).

Figure 11. Mill Creek below Cemetery Road

Wilson Creek

In its natural condition, Wilson Creek was an ephemeral drainage course that drained the area of Rattlesnake Gulch, Bacon Gulch, and the area bounded by Copper Mountain on the west and Conway Summit on the north. During years of abnormally high snowmelt, streamflow could have amounted to approximately 10 cfs, but even in the wettest years flow usually ceased by early July (Stine 1995). While the upper reach of Wilson Creek is discontinuous, early maps of the area show a continuous channel to the north of Black Point where it entered Mono Lake. The channel is cut into lacustrine sediments and is incised in the mid-reach, between Highway 167 and Cemetery Road, where the gradient is more than 2%; the final three miles that flows near DeChambeau Ranch to Mono Lake, where the gradient is ~ 1%, however, shows little incision.

Prior to diversions, the natural drainage area of Wilson Creek above the southeast corner of Conway Ranch was about 14 square miles (Triad Engineering 1987) and included the area north and east of Copper Mountain and south of Conway Summit. Because much of this area has a southern exposure, snow on these slopes melts throughout the winter between storms. Therefore, spring snowmelt comes from a relatively shallow snowpack and would not be expected to produce dramatic snowmelt runoff in spring melt periods. Wilson Creek was not mentioned in the reports of either VonSchmidt (1856) or Russell (1889). Considering the detail of these reports, the lack of a description of Wilson Creek suggests that this creek was not particularly noticeable in the 19th century. Geomorphologists have hypothesized that the upper and lower Wilson Creek were not connected as surface channels prior to diversion and that water seeping out of the upper channel flowed as groundwater for several hundred feet before converging downslope and forming the lower channel. An area of high groundwater likely existed in the area around where the creek flows through Conway Ranch today.

Black Point Marsh

In 1857, A.W. Von Schmitt mapped a sizable spring rill at the Black Point marsh; spring induced tufa towers contain wood that has been carbon dated to ~ 900 ybp. The Inyo National Forest map, dated 1917, clearly shows the natural Wilson Creek stream channel to enter Mono Lake to the north and east of Black Point with no stream channel shown in the vicinity of the current Wilson Creek Arroyo. Early aerial photos from 1942 show a road from Mill Creek to DeChambeau Ranch across the area now cut by the Wilson Creek Arroyo (Ford 2001).

Step 5. Synthesis and Interpretation of Information

A-8. How have the presence of impoundments and diversions impacted the aquatic environment? How might these influence future management direction?

Mill Creek

As a result of impoundment and diversion practices, the Mill Creek bottomlands are characterized by a single flow channel that is deeply incised and has lost a major portion of its vegetation. Had the water flow of Mill Creek remained consistent without disturbance, stream stabilization would likely have occurred through the growth of riparian vegetation. In addition, multiple, braided channels might occur and woody debris would provide pooling of stream water. The bottomlands would have been a seasonally wet complex of riparian forests, thickets, wet meadows, ponds, and sinuous channels. Finally, relatively high groundwater levels would have been maintained through this reach area.

Future management direction may include a restoration of a more natural flow regime that would lead to regeneration of a healthier aquatic and riparian ecosystem.

Wilson Creek

Wilson Creek has been altered from an ephemeral stream with a maximum flow during years of high spring runoff of 10 cfs to a perennial stream with flows varying from 5 cfs in the fall and winter to 70 cfs in the spring and summer. Wilson Creek can be characterized as a single flow channel supporting a narrow riparian corridor consisting primarily of willow shrubs and a low productivity aquatic environment. The Wilson Creek delta is choked with willows growing on sediment transported from the Wilson Creek Arroyo. A hypopycnal layer is present at the mouth of Wilson Creek.

Future management direction may include a reallocation of Mill Creek water that would reduce and stabilize Wilson Creek flows allowing for stabilization of stream banks and maintenance of the riparian corridor and a more natural aquatic environment.

Water Impoundments and Diversion Infrastructure

Lundy Lake and diversion structures related to power generation are currently maintained by Southern California Edison. Transport and irrigation ditches are generally in fair to poor condition with some ditches (i.e. Lower and Upper Conway Ditch, Upper Thompson Ditch) no longer usable. Transport losses in unlined ditches that continue to be used reduce the water available for both Mill and Wilson creeks. However, pipelines in the area of the DeChambeau Ranch and Ponds complex area have replaced several inefficient transport ditches. Future management direction may suggest to further improve these facilities, as it is not likely that utilization of water for hydroelectric power generation will cease.

ISSUE B. HUMAN USE OF THE TERRESTRIAL ENVIRONMENT
(Roads, Recreation, Fire/Fuels)

Issue

Roads, recreation, and fire suppression are human induced disturbances that have the potential to modify a landscape. The advent of road networks, refer to Figure 12 (below) to an area may not only bring increased human influence to a region, but may also result in fragmented habitats, soil loss, and increased wind and water erosion. Likewise, alpine/subalpine recreational opportunities attract a great number of individuals to roads, trails, ski resorts, etc. often escalating the degree of human disturbance. Fire suppression is a recognized cause of altering the natural age structure of vegetation and impacting fuel load. The shared impact of all of these activities is the modification of natural disturbance processes that dominated ecosystems prior to European settlement in the late nineteenth century. This analysis examines the impacts of these activities with regard to the North Mono Basin.

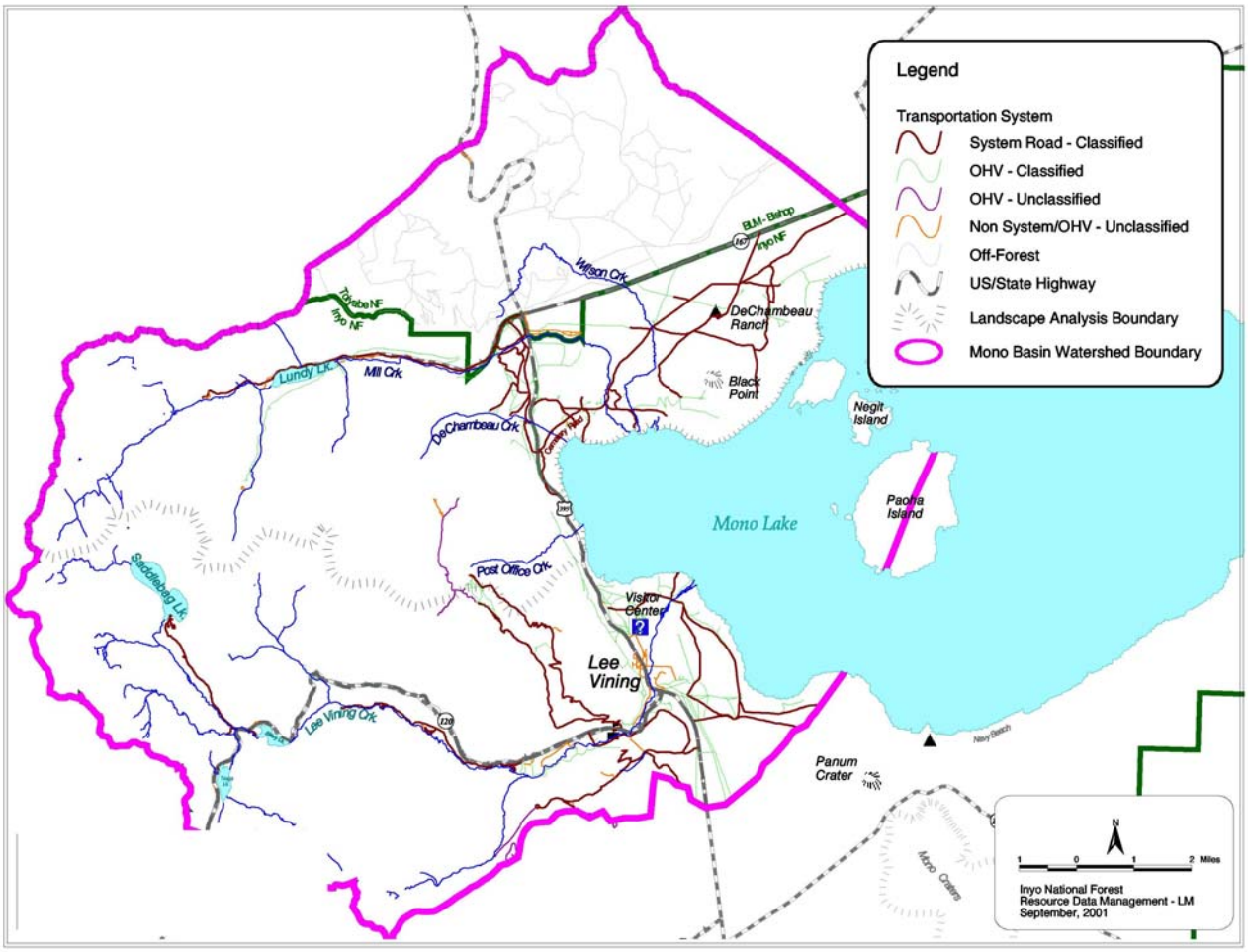

Figure 12. Transportation system by type of road

Background

When compared to more populace areas, paved roads are of very low density in the North Mono Basin analysis area and support light to moderate traffic throughout the year. Less traveled dirt roads have largely been developed arbitrarily as a result of providing access for a variety of occupational and leisure activities (i.e., mining, ranching, sightseeing, etc.)

Recreation is a substantial resource in the Eastern Sierra including the analysis area, which supports activities such as fishing, hiking, camping, photography, and cross-country skiing. The progressive introduction of new users to the Eastern Sierra for recreational purposes in the twentieth century prompted the Inyo National Forest and other land management agencies to construct new campgrounds/facilities for accommodations. Unfortunately, many of those facilities were positioned in drainages or were otherwise too close to water. This building practice continued unabated through the 1960's; as a result, many accommodations were outdated and poorly placed for management objectives. As part of the FERC re-licensing, SCE has closed campsites that were too close to water and have renovated the campgrounds.

Beginning in the early 1900's, there was a significant effort to suppress all lightning and human induced wildland fires. Many years of this practice in the analysis area has caused the bitterbrush/sagebrush complex to become primarily one seral stage, which is characterized by old age and decadence. In the subalpine and alpine environment, suppression activities have resulted in encroachment of conifers into areas that were previously meadows.

Key Questions

Step 3. Current Conditions

B-1. What are the existing conditions of the processes related to recreation and roads within the watershed?

B-2. What are the existing ecological conditions of the landscape with respect to fuels and fire suppression practices?

Step 4. Reference Conditions

B-3. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

Step 5. Synthesis and Interpretation of Information

B-4. What are the overall impacts of road networks, recreation, and fire suppression in the North Mono Basin analysis area?

Step 3. Current Conditions

B-1. What are the existing conditions of the processes related to recreation and roads within the watershed?

Recreation is currently a substantial resource in the North Mono Basin. The analysis area supports activities including fishing, hunting, hiking, camping, sightseeing, photography, bird watching and cross-country skiing. Lundy Canyon is noted for stunning wildflowers in the early summer and for distinctive fall colors, and many recreationists visit the area for these annual displays. In 1989, the Lundy Lake area received 3,780 recreation visitor days (RVD) (1 RVD = 12 hours of recreation use) of day use and 3,450 RVDs of overnight use, as recorded by Mono County.

The only developed campgrounds within the analysis area are located along the upper reach of Mill Creek. There are 52 campsites, on SCE land, managed by Mono County. There is an informal parking area adjacent to Lundy Dam. This parking area serves day-use fisherman and is an informal trailhead for hikers to Lake Canyon. The US Forest Service maintains trailhead parking above Lundy Lake for day use and Hoover Wilderness visitors. In addition, a privately operated resort at the west end of Lundy Reservoir provides camping, cabins, boat rentals, a small store and a concrete boat launch recently built by SCE.

There are about 15 miles of paved roads, 39 miles of Forest Service system roads, and 102 miles of non-system roads within the analysis area. The most heavily traveled roads, Cemetery and Lundy Canyon roads, are the maintenance responsibility of Mono County. The rate of new road construction within the North Mono Basin is slow, as road densities have changed little in the past fifty years. For dirt roads within the North Mono Basin, the level of routine maintenance is not being met, leading to some degradation of road systems and a slight increase in wind erosion. Refer to Appendix D, North Mono Basin Roads Analysis, for more information regarding road networks in the basin.

B-2. What are the existing ecological conditions of the landscape with respect to fuels and fire suppression practices?

The mid-elevations of Lundy Canyon are dominated by whitebark pine and mountain mahogany; this vegetation type produces high intensity fire behavior but has a very low frequency. Aspens and sagebrush dominate the lower elevations within the canyon. Fire behavior associated with aspens is generally low intensity with low frequency while the sagebrush produces high intensity fire behavior with low frequency. Prevalent plant communities on Warren Bench, which includes the headwaters of Post Office Creek and DeChambeau Creek, are whitebark and lodgepole pine and big sagebrush. Fire behavior associated with this vegetation type is high intensity with low frequency. Jeffery pines are found on south facing draws and hillsides, frequently with an understory of mountain mahogany, and fire intensity for this type is normally low to moderate with a low frequency. The sagebrush-bitterbrush-rabbitbrush complex covers over 50 percent of the acreage of the Mono Basin, and has a fire intensity that is moderate to high with a low frequency. Stream channels within the basin are characterized by riparian vegetation including Jeffery pines, black cottonwoods and willows. The fire intensity and frequency for the riparian vegetation is generally low except in decadent old stands of willows, which could produce high-intensity fire behavior.

Step 4. Reference Conditions

B-3. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

There are no reference conditions to note for recreation and roads in the analysis area since both rely on human civilization and advancement. Therefore, reference condition broadly refers to the state of the land before pre-European settlement. In addition, there was no historic data available for fire.

Step 5. Synthesis and Interpretation of Information

B-4. What are the overall impacts of road networks, recreation, and fire suppression in the North Mono Basin analysis area?

An increase in residents, and the discovery of the Mono Basin's desirable recreational opportunities have brought about a permanent increase in population and moderate to heavy recreational use in the Mono Basin. To accommodate these increases in population new roads were built and fire suppression became the standard.

The paved roads in the basin support light to heavy vehicle use, and with little to no apparent traffic problems or issues. However, some road degradation is occurring due to inadequate maintenance. The basin continues to support a moderate recreation base for tourists, although camping accommodations have historically been built in drainages and too close to water sources.

Man's practice of fire suppression has significantly altered the vegetation structure and composition in the analysis area. However, it is expected that little will change with regard to fire suppression until a comprehensive program for prescribed burning is implemented.

ISSUE C. EROSION AND WATER QUALITY

Issue

Erosion and water quality are both issues to be considered in the North Mono Basin, since sediment load and transport help to determine water quality, stream bank stability, stream morphology, and existent riparian vegetation. Water quality is desirable to be high to support fish and wildlife populations, human use, and the pristine natural environment.

Background

Mill and Wilson Creeks in the landscape analysis area demonstrate moderate erosive properties and varying stream morphologies. Bank erosion was once high due to the prevalence of livestock grazing in the basin, since the anchoring riparian vegetation was limited or nonexistent. The region consequently succumbed to extensive erosion during high runoff events.

Mill Creek is incised into lake delta sediments and becomes progressively wider as it approaches Mono Lake. Roads and other human activities have added little to erosion for Mill Creek overall, yet the creation of the Lundy Dam project has reduced the typical sediment transport between the upper and lower portions of the creek. In addition, substantial erosion of Mill Creek banks in the lowest reach occurred during the 1982-83 runoff season, when culverts under Cemetery Road failed and the road was washed out, allowing the stream to form two channels. Mill Creek has since been confined to one of its historic channels by a road culvert (see Stream Crossing map, Figure 15, page 34).

Wilson Creek changed dramatically with the addition of water diverted from Mill Creek. Increased flows from the diversion transformed the creek and rendered it capable of carrying more water. It currently follows a deeply incised channel that splits into the historic stream channel and the Wilson Creek Arroyo (refer to Figure 13, page 31 and Figure 14, page 33), which has recently received most of the water. The upper reaches, above Highway 167, generally have high water quality with normal sediment transport; the lowest reach, the “Arroyo reach”, continues to carry large sediment loads into the Black Point marsh during high flows.

Figure 13. Wilson Creek Arroyo

Key Questions

Step 3. Current Conditions
C-1. What are the existing erosive conditions of each reach of Mill and Wilson Creeks and how does this effect riparian vegetation?
C-2. How have livestock grazing and the presence of roadways influenced erosion in the North Mono Basin?
C-3. What is the current water quality of the North Mono Basin?

Step 4. Reference Conditions
C-4. What are the historical soil erosion conditions of the analysis area prior to human induced disturbances?
C-5. What were the reference conditions of water quality in the analysis area?

Step 5. Synthesis and Interpretation of Information
C-6. Are current erosive conditions and water quality consistent with what would naturally occur without human disturbance in each creek?

Step 3. Current conditions

C-1. What are the existing erosive conditions of each reach of Mill and Wilson Creeks and how does this effect riparian vegetation?

Mill Creek

Mill Creek is incised into lake delta sediments as a result of the artificial lowering of Mono Lake, and becomes progressively wider as it approaches the lake. Riparian vegetation has stabilized the

channel from Lundy Dam to Highway 395, eliminating any extensive erosion except during extreme runoff events. Although having improved slowly since the removal of grazing, the reaches of Mill Creek from Highway 395 to Mono Lake have yet to be fully stabilized by riparian vegetation due to inadequate flows. They are therefore subject to extensive erosion during high runoff events. While roads and other human activities have added little to erosion problems on Mill Creek, the Lundy Dam project has reduced normal sediment transport flows between the upper and lower portions of the creek.

No bank erosion was identified in the region defined as the upper reach, Lundy Dam to the Thompson Main Ditch. Eroding banks were present along 16% of the lower stream reaches, Thompson Main Ditch downstream to Mono Lake, but were generally small, localized and more common in the lowest reach.

Hydrologic and riparian conditions differ between the upper, middle and lower reaches and contribute to differences in erosion between the two areas. The lowest reach is subject to greater flow fluctuations in spring and summer due to upstream diversion during the irrigation season and loosely consolidated banks exhibit lower channel stability. Reduced flows in the lowest reach contribute to a less developed riparian zone, further aggravating bank instability (California Department of Fish and Game 1996).

Wilson Creek

Wilson Creek changed dramatically with the addition of the water diverted from Mill Creek. Beyond the Lundy powerhouse tailrace, a new channel connects with the headwater channel of Wilson Creek coming from Copper Mountain. The great increase over natural flow eroded the channel into a new form capable of transmitting considerably more water than it carried in pre-diversion times. No eroding banks were recorded in the upper reach. Eroding banks were present in 25% of the habitat units in the middle reach and 67% of the habitat units of the lower reach (California Department of Fish and Game 1998). Flow fluctuations from power plant operations may contribute to erosion of exposed banks.

Wilson Creek follows a deeply incised channel from Conway Ranch to the Cemetery Road crossing. At this point, the channel splits with a portion of the flow following the historic stream channel toward DeChambeau Ranch, which currently has a shallow gradient but is susceptible to erosion and incision under very high flows. The lower reach that receives the majority of the water during high flow events has cut a channel, the Wilson Creek Arroyo, through highly erodable lacustrine and volcanic sediments. Figure 13 (page 31) and Figure 14 (page 33) illustrates the deeply incised channel known as the Wilson Creek Arroyo. Since the 1960s, roughly half of Black Point Marsh has been buried by alluvial sediments from the arroyo. These sediments appear to be too coarse to support a marsh ecosystem; instead, shrubs are colonizing the alluvium.

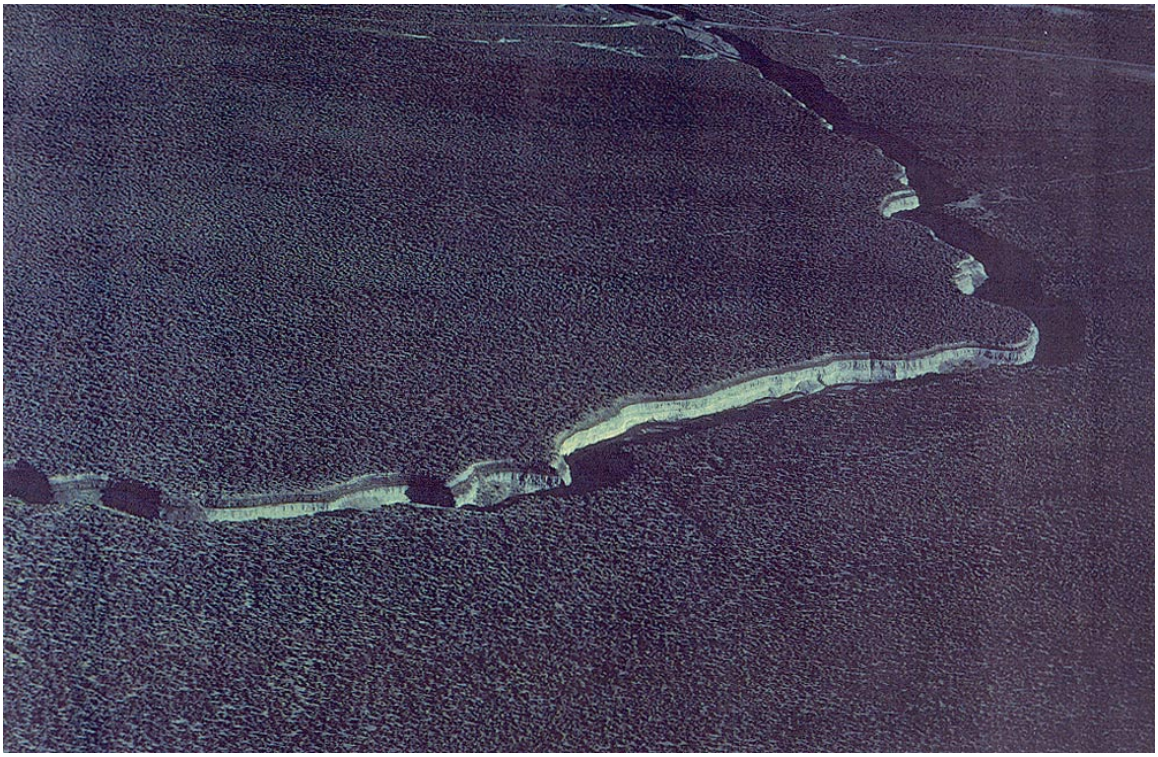

Figure 14. Wilson Creek Arroyo (aerial photo)

C-2. How have livestock grazing and the presence of roadways influenced erosion in the North Mono Basin?

Riparian vegetation has been slowly restored since the removal of grazing, stabilizing Mill Creek from Lundy Dam to Highway 395. However, reaches of Mill Creek from Highway 395 to Mono Lake have yet to be fully stabilized due to insufficient flows. In addition, substantial erosion of Mill Creek banks occurred near its mouth when culverts under Cemetery Road failed during the high runoff season in 1982-83. The road was washed out and the creek broadened into two wide channels as it entered Mono Lake. When the road was repaired, the Mill Creek channel was confined to one of its historic channels by a road culvert (California Department of Fish and Game 1996). Vegetation is responding to increased water and removal of grazing over the past ten years.

Due to past grazing practices, livestock-induced bank erosion is apparent along the Wilson Creek channel, below Conway Ranch. Both Mill and Wilson Creeks remain subject to erosion in extreme runoff events.

C-3. What is the current water quality of the North Mono Basin?

The Lahontan Basin Plan of 1975 characterized the waters of the region as generally excellent in quality, with total dissolved solid (TDS) levels of less than 50 parts per million (ppm) in surface water and less than 100 ppm in groundwater. Surface water is ionically dominated by calcium

carbonate and classified as soft. Heavy metal concentrations are below detectable limits or are only present in trace amounts. There is little to no turbidity, and dissolved oxygen is at or near saturation. Coliform bacteria are below detectable limits in groundwater; surface waters were not analyzed for bacteria (Beak Consultants Inc. 1990; Triad Engineering 1987). In addition, independent sampling by Lee (1969) in several Mono Basin streams including Mill and Wilson Creeks found that the waters were of the calcium bicarbonate type and had TDS ranging from 31 to 81 parts per million (ppm).

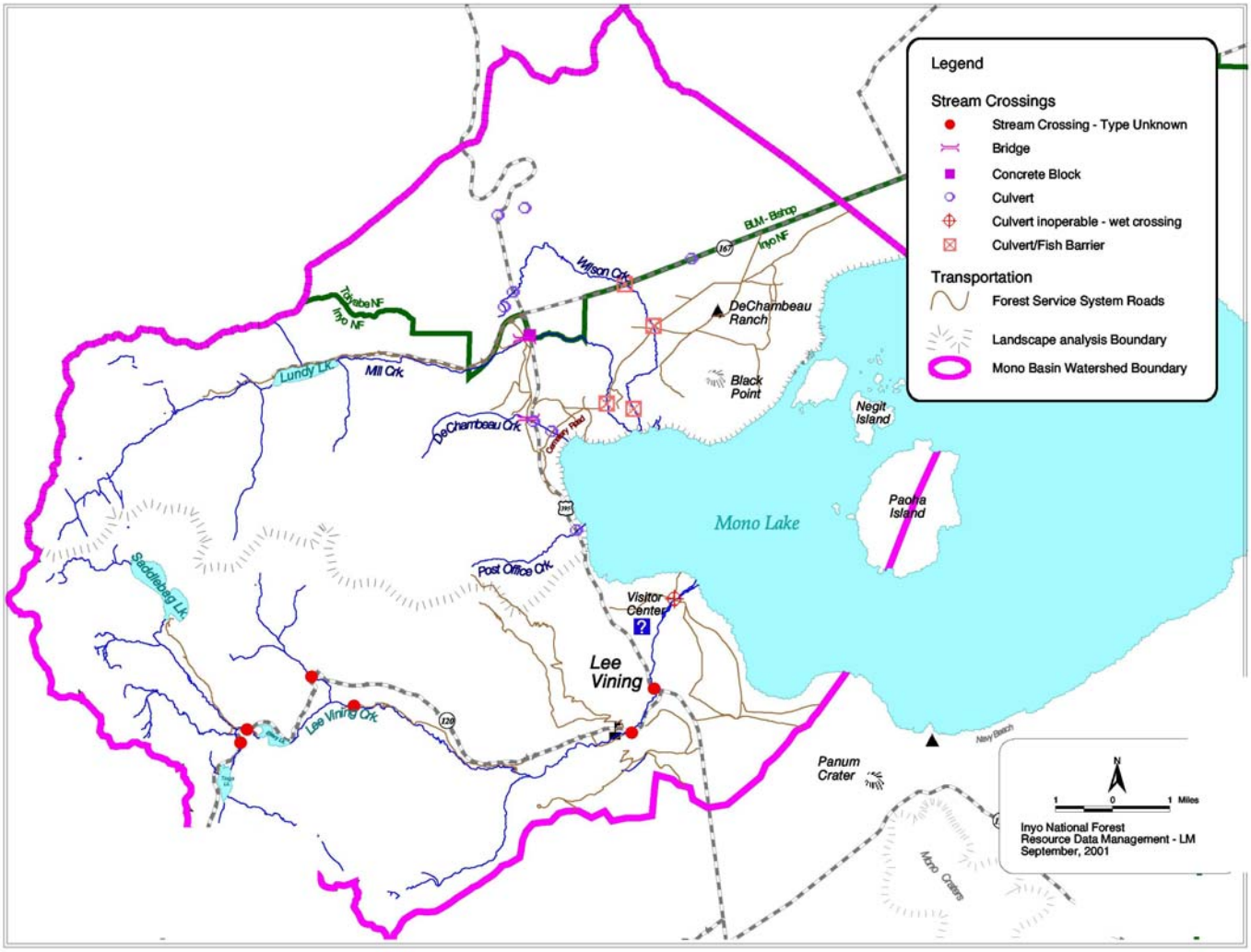

Figure 15. Stream crossings

Step 4. Reference Conditions

C-4. What are the historical soil erosion conditions of the analysis area prior to human induced disturbances?

Erosion within the montane regions of the analysis area (including Mill and Wilson Creeks) is consistent with glacier and stream-cut canyons in an area of exposed bedrock. While significant

runoff events and avalanches may generate significant short-term erosion, erosion and deposition rates are generally low.

Soils found within the lower elevations of the analysis area are typical of those found on lakeshore terraces and alluvial fans. The parent material consists of mixed alluvium influenced by volcanic ash. These soils are deep, have moderate permeability and are well to poorly drained. On shallow slopes, these soils show little tendency for water erosion but, on steeper slopes or with high flows, are easily eroded by water and are subject to severe erosion by wind.

C-5. What were the reference conditions of water quality in the analysis area?

There is no prior documentation of reference conditions preceding human settlement for water quality on Mill or Wilson Creeks. However, since there are currently no significant problems associated with waterborne chemical agents in the streams, let it be assumed that the historical state of water quality would have been similar prior to colonization. It is probable that high runoff events would have initiated the transport of a greater than normal sediment load, but would have been considered part of natural processes rather than impacted by humans.

Step 5. Synthesis and Interpretation of Information

C-6. Are current erosive conditions and water quality consistent with what would naturally occur without human disturbance in each creek?

Mill Creek

Current conditions of erosion are relatively consistent with what would naturally occur for Mill Creek, with the exception of reformed banks as a result of the Cemetery Road collapse in the 1980s and slowed sediment transport due to the Lundy Dam Project. Currently there is no apparent bank erosion present in the upper reach of Mill Creek, above Thompson Main Ditch; however, eroding banks are present in the lower reaches (Thompson Main Ditch to Mono Lake) due to fluctuating flows, but are generally small and localized. Stream banks in Mill Creek are anticipated to remain stable in the upper reach, but need sediment deposition to produce bank stability in the lower reaches.

Presently, water quality for Mill Creek is characterized as excellent, similar to what it would have occurred if reference conditions still remained. However, it should be noted that turbidity is periodically high with extreme runoff events.

Wilson Creek

Likewise, current conditions of erosion are moderately consistent with what would naturally occur for Wilson Creek, with the exception of altered banks from past grazing practices and water

diversion from Mill Creek. There are presently no eroding banks in the upper reach of Wilson Creek (power plant to the lower boundary of Conway Ranch); however, eroding banks are present in the mid-reach due to past grazing practices and in the lower reach in the "arroyo" area. Stream banks in Wilson Creek will likely maintain stable except during high runoff events.

Water quality for Wilson Creek is also presently excellent, as in Mill Creek. However, in contrast to Mill Creek, water quality in Wilson Creek would have been low due to sediment transport during the short runoff season in reference conditions. Wilson, like Mill, is periodically turbid during extreme runoff events, yet exhibits an overall high quality of water in the present day. Therefore, the issue of water quality in Mill and Wilson Creeks in the North Mono Basin is not of great concern for this analysis.

ISSUE D. HABITAT COMPOSITION (UPLAND, WETLAND, AND RIPARIAN)

Issue

Structure, composition, and distribution of vegetation over the landscape may have been altered/impacted by human disturbance since the settlement of man in the nineteenth century. Water use is of concern for upland, wetland, and riparian habitat in the North Mono Basin primarily due to its need to support critical fish and wildlife species, and its role in maintaining good water quality, bank stability, and complex stream morphology.

Background

Fire suppression, heavy grazing, the introduction of exotic species to the region, and the subsequent flow of humans to the surrounding area based on increased mining interest have impacted vegetation patterns of the North Mono Basin. Pinyon pine and big sagebrush dominate the mid-elevations while aspens occur on hillsides fed by springs and seeps. The sagebrush-bitterbrush-rabbitbrush complex covers a large portion of the North Mono Basin. Each of these species occurs in nearly monotypic stands as well as in association with one another. The blend of species found at any given site is determined by fire history, soil type, and soil depth. Mill Creek demonstrates a well-developed riparian community in its upper reach, gradually declining to little or no riparian vegetation in its lowest reach. Wilson Creek sustains a narrow riparian corridor in its upper extent, and lower portions support many water loving species. Wetland regions are chiefly made up of wet meadows to the north and south of Wilson Creek.

Key Questions

Step 3. Current Conditions

D-1. What are the existing conditions of upland vegetation within the watershed?

D-2. What is the relationship between riparian/wetland condition and flows in the different reaches of the two creeks?

D-3. What riparian habitat exists along existing irrigation ditches?

D-4. What are the source and current status of off-stream wetlands that exist in the vicinity of DeChambeau Ranch and Conway Ranch?

Step 4. Reference Conditions

D-5. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

Step 5. Synthesis and Interpretation of Information

D-6. What are the differences between current and reference conditions for upland, wetland, and riparian habitat in the North Mono Basin? If changes are present, what significance do they appear to have on the ecosystem?

Step 3. Current Conditions

D-1. What are the existing conditions of upland vegetation within the watershed?

The vegetation of Lundy Canyon above Lundy Reservoir is dominated by lodgepole pine (*Pinus contorta spp. murrayana),* curl-leaf mountain mahogany (*Cercocarpus ledifolius),* aspen (*Populus tremuloides),* and sagebrush (*Artemisia tridentata)* communities, as well as rocky areas with very little vegetation cover consisting of alpine herbs. Limber pine (*Pinus flexilis*), western white pine (*Pinus monticola),* and whitebark pine (*Pinus albicaulis)* are also present in the upper elevations. The prevalent plant communities on Warren Bench, which includes the headwaters of Post Office Creek and DeChambeau Creek, are singleleaf pinyon pine (*Pinus monophylla)* and sagebrush, with smaller areas of mountain mahogany, lodgepole pine, and montane chaparral. Communities dominated by big sagebrush, bitterbrush (*Purshia tridentata),* and/or rabbitbrush (*Chrysothamnus nauseous, C. viscidiflorus)* currently occupy over 50 percent of the acreage of the Mono Basin and are currently in a decadent state and lack diversity due to fire suppression practices.

D-2. What is the relationship between riparian/wetland condition and flows in the different reaches of the two creeks?

Mill Creek

In his study of riparian vegetation of Eastern Sierra streams (1982), Taylor notes that the upper reach, Mill Creek above Upper Thompson Ditch, supports a well-developed aspen-dominated riparian community, while the mid-reach, between Highway 395 and the bottom of Mono City, supports declining stands of black cottonwood (*Populus balsamifera ssp. trichocarpa*) and Jeffrey pine (*Pinus jeffreyi).* Further downstream, the riparian vegetation continues to decline, in terms of total cover and diversity. At the time of his study, Taylor described the lowest reach on DWP land as nearly devoid of riparian species with the exception of a few stunted clumps of narrowleaf willow (*Salix exigua*). This observation is further supported by Stine, who notes that only a small amount of vegetation had colonized the existing channels in this reach (1991). Recent observations show continuing limited recolonization. Annual flows and removal of grazing since the mid-1980's have increased the water availablilty and have allowed for re-establishment of some riparian vegetation in parts of lower Mill Creek. Much of the system of multiple channels is dry due to the interference with the natural flow regime and the single existing channel remains wide and ill-defined along most of its length. Braiding is evident in some places but there is no indication of a return to a system of narrow distributary channels. The lowest reach appears to have been dewatered routinely between the 1890s and 1920, resulting in the loss of riparian woodland on the delta . Photos show that most of the riparian stand in the lower reaches had already been lost by 1929. Non-native species, such as wooly mullein (*Verbascum thapsus*) and sweet clover (*melilotus sp*.), sporadically occupy the Mill Creek floodplain.

Wilson Creek

Distribution of vegetation on the Conway Ranch is associated with the location of natural seeps and the long history of irrigation for grazing on the property. Much of the Conway Ranch property has been flood irrigated for at least 100 years, resulting in the presence of hydrophytic (water-loving) vegetation in some irrigated portions. Natural wetland portions, representing

approximately 47 acres of this property, consist of several areas of wet meadow located both north and south of Wilson Creek and a narrow fringe of narrowleaf willow paralleling Wilson Creek (Schmit 2001).

D-3. What riparian habitat exists along existing irrigation ditches?

DeChambeau Ditch and the Bell and Bowl diversions on Conway Ranch currently support a relatively continuous narrow riparian corridor of primarily narrowleaf willow . Thompson Main Ditch supports little riparian vegetation due to the short duration of its sporadic use and routine removal. There is low structural or species diversity on these ditches. The existing vegetation has been maintained in part by historical and ongoing diversions from Mill Creek. Some non-native species may be present along these ditches.

D-4. What are the source and current status of off-stream wetlands that exist in the vicinity of DeChambeau Ranch and Conway Ranch?

The implementation of the DeChambeau Ponds/County Ponds restoration project has been underway since the early 1990s with reconstruction of the hot water artesian well and pipeline, restoration of DeChambeau Pond #2 and #3, construction of the 4th and 5th DeChambeau ponds, reconstruction of the East County Pond and installation of nearly 3 miles of pipeline to minimize transport losses (refer to Figures 16 and 17, page 40). To date, the project consists of 10 acres of irrigated pastureland, 5 acres of wetland and 18 acres of marsh and pond habitat. While the Forest Service has a 12.6 cfs Mill Creek water right, it is a junior right and is fulfilled only during the peak runoff season when the power plant is at or near capacity. Fall and winter flows have been dependent upon flow-through water from Conway Ranch.

Locally high groundwater levels have created small seasonal wetlands on Conway Ranch and Thompson Ranch Meadow which are enhanced by irrigation based upon Mill Creek water rights held by Mono County and LADWP.

Figure 16. DeChambeau Ponds

Figure 17. County Ponds

Step 4. Reference Conditions

D-5. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

Upland Vegetation

Though limited information is available, significant human caused changes are not likely to have affected the upland vegetation, especially in the higher elevations. If left untouched by human existence, the upper elevations of Lundy Canyon are expected to have been dominated by lodgepole pine and mountain mahogany, while lower elevations in the canyon with aspens and sagebrush. The prevalent plant communities on Warren Bench were pinyon pine and big sagebrush, while Jeffrey pines were found on south-facing draws and hillsides, frequently with an understory of mountain mahogany. At lower elevations, reference conditions in shrub communities likely contained a higher percentage of early and mid-seral stages resulting from the natural fire regime in these communities.

Mill Creek

Mill Creek is the third largest stream in the Mono Basin with a wide, continuous riparian corridor characterized by Jeffrey pines and quaking aspen in the upper reaches and a dense, multi-storied, cottonwood dominated stand in the lower reaches. The Mill Creek bottomland near Mono Lake was a seasonally wet complex of riparian forests, thickets, wet meadows, ponds and sinuous channels. The uniqueness of the bottomlands lay in the arrangement of the plant species in mosaics of woodlands, scrub, and meadows all intertwined in close proximity to open water. The shrub vegetation in the delta was comprised of narrowleaf (*Salix exigua*) and Pacific willows (*Salix lucida ssp. lasiandra*), creek dogwood (*Cornus sericea*) and interior rose (*Rosa woodsii var. ultramontana*) while, upstream of the delta, Pacific willow and creek dogwood dominated.

Wilson Creek

Pre-diversion conditions on Wilson Creek were typical of other ephemeral desert creeks such as Bridgeport Creek. The reach near the headwaters and in the vicinity of springs would have supported the growth of willow shrubs; the lower reaches would have flowed through sagebrush, rabbitbrush, and bitterbrush along a channel lacking significant riparian vegetation.

Step 5. Synthesis and Interpretation of Information

D-6. What are the differences between current and reference conditions for upland, wetland, and riparian habitat in the North Mono Basin? If changes are present, what significance do they appear to have on the ecosystem?

Upland Vegetation

Differences in upland vegetation between current and reference conditions may occur due to human disturbance at lower elevations. However, these differences do not appear to be significant, as most of the species existing in the past are still present today, though possibly varying in abundance and/or distribution.

Wetland/Riparian Habitat

Mill Creek

Currently, the upper reach supports a well-developed aspen dominated riparian community, while the mid-reach, between Hwy. 395 and the lower boundary of Mono City, supports declining stands of black cottonwood and Jeffrey pines. Similarly, the bottomlands support a narrow riparian corridor that declines as the creek approaches Mono Lake. If left undisturbed, Mill Creek would likely have had a continuous multi-storied canopy of riparian vegetation that would have included Jeffrey pine, aspen, cottonwood and willow rather than current notable differences in each reach of the Creek.

Wilson Creek

At present, Wilson Creek supports a narrow band of riparian vegetation, primarily narrow-leafed willow throughout the extent of its course. If reference conditions still existed, Wilson Creek is expected to have had narrow-leaf willows growing in the vicinity of springs, but would not have supported significant riparian vegetation for the remainder of its course.

ISSUE E. FISHERIES AND FISH HABITAT CONDITION

Issue

Maintenance of indefinitely self-perpetuating populations of trout in both Mill and Wilson creeks is related not only to instream flows, but to cover, reproductive habitat, water temperature, water quality, food availability, etc. Based on the available water, it may not be possible to maintain optimal fish habitat conditions in both creeks.

Background

While there are no native finned fishes in streams tributary to the Mono Basin there are, as a result of continual species introduction that began in the late nineteenth century, Rainbow (*Oncorhynchus mykiss*), brown (*Salmo trutta*), and eastern brook trout (*Salvelinus fontinalis*) in Mill Creek. The Wilson Creek fish population is comprised almost exclusively of introduced brown trout.

Key Questions

Step 3. Current Conditions

E-1. What are the existing conditions of the processes, both natural and human influenced, within the watershed?

E-2. What is the seasonal relationship between flow and fish habitat, and between flow and fish populations in Mill and Wilson creeks?

Step 4. Reference Conditions

E-3. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

Step 5. Synthesis and Interpretation of Information

E-4. What flows are needed to maintain a recreational fishery in the different reaches of the two creeks and how is this different than the agency recommendations?

Step 3. Current Conditions

E-1. What are the existing conditions of the processes, both natural and human influenced, within the watershed?

Mill Creek

The California Department of Fish and Game stocks rainbow trout in both Lundy Lake and Mill Creek below Lundy Lake. There is a self-propagating population of brown trout between Deer

Creek and the Mill Creek Return Ditch, and both brown trout and rainbow trout may be taken as far downstream as Cemetery Road.

Wilson Creek

The Wilson Creek fish community is almost exclusively comprised of brown trout (Beak Consultants, Inc. 1986). Fish densities range from 103 to 370 fish per acre (17 to 52 pounds per acre by weight), and most fish rarely exceed 8" in length. Subsequently, the fish population of Wilson Creek is not optimal for angling. Small size of fish and low fish biomass suggest that Wilson Creek is a stream of low productivity, which is likely due to the cold water temperature, fluctuating water flow, relatively few nutrients, and limited riparian vegetation. It is also probable that the stream suffers from low primary productivity as well as a high sediment load from streambeds and banks altered by livestock (Triad Engineering 1988).

Also worth noting is that there is little to no shade in the lower reach of Wilson Creek, below Highway 167. Lack of shade may allow surface water temperatures to rise, which may indirectly influence temperature fluctuations throughout the entirety of the reach. The reach also lacks undercut banks and streamside grasses, shrubs, and trees, providing little cover for aquatic species that reside in the creek (California Department of Fish and Game 1998). Consequently, water temperature, streamflow level and stability, and the extent of cover provided by riparian vegetation on Wilson Creek are the critical limiting factors of successful fisheries (Beak Consultants, Inc. 1990).

E-2. What is the seasonal relationship between flow and fish habitat, and between flow and fish populations in Mill and Wilson creeks?

Fish and Game recommendations for Wilson Creek to maintain a recreational brown trout fishery in the middle reach, from the lower Conway Ranch boundary to Cemetery Road, at 80, 90 and 100% of the maximum estimated adult brown trout populations are 34, 43 and 50 cfs. For the lower reach, Cemetery Road to Mono Lake, at the same percentages, the recommended discharges are 50, 55 and 60cfs. However, since middle reach flows usually are much less than 34 cfs, and only reach 14 cfs during dry years, recommended flows would never be met in order to maintain a brown trout fishery. Lower reach flows are predicted never to reach 50 cfs during a dry or normal year. (California Department of Fish and Game 1998).

The Mill Creek Stream Evaluation Report 96-1 from California Department of Fish and Game (1996) calculates minimum flows required to support a viable brown trout fishery within Mill Creek. These figures are shown below in cubic feet per second (cfs) and are classified by time of year and type of runoff condition.

Runoff year type	April	May to September	October	November to March
Dry	15	16	15	13
Normal	17	20	17	15
Wet	23	27	23	22

These values include 3 cfs needed downstream of Thompson Main Ditch to compensate for infiltration and evaporation losses.

Step 4. Reference Conditions

E-3. What are the historical conditions of physical, biological, and human ecosystem elements that will enable us to understand fundamental changes in current conditions due to natural or human-induced disturbances?

No finned fish existed in the streams to the Mono Basin when European settlers arrived. However, there is fossil evidence to indicate that prehistoric fish populations at one time existed in the Mono Basin. A diverse macroinvertebrate fauna currently occurs within Mill and Wilson Creeks. However, data supports the notion that this fauna was not present in Wilson Creek prior to inundating the channel with water from the Mill Creek diversions. Mill Creek may have had larger populations of these insects due to the absence of fish in the stream, which prey on them, and because there were higher and more consistent flows of water throughout the channel to support greater numbers of macroinvertebrate species.

Step 5. Synthesis and Interpretation of Information

E-4. What flows are needed to maintain a recreational fishery in the different reaches of the two creeks and how is this different than the agency recommendations?

Both Mill Creek and Wilson Creek support a fishery of primarily brown trout, however the productivity is low. Flows in both creeks that do not mimic natural processes interfere with optimum stream conditions that would support fish populations at all life cycles and throughout the year.

The California Department of Fish and Game's goals for brown trout in Mono Lake tributaries is "…to make these fish available to the angling public as part of the natural ecosystem" (Wong 1993) and to provide 80, 90, or 100% of maximum brown trout habitat area (i.e., WUA) for all life stages during dry, normal, and wet runoff years, respectively. Flows required for 80, 90, or 100% WUA on Wilson Creek were estimated to range from 34 to 60 cfs while instream flows, measured just below the Mill Creek Return Ditch range from 17 to 27 cfs for Mill Creek (DFG 1998).

The conclusion reached in DFG's *Instream Flow and Habitat Development Investigations for Wilson Creek* (Draft -1998) is that there is insufficient water available from Mill Creek to provide for a self-perpetuating brown trout fishery on both Mill Creek and Wilson Creek. DFG did not consider the possibility of maintaining a recreational fishery that would not include the full lengths of both creeks (i.e., a fishery only through Conway Ranch on Wilson Creek). It may be necessary to consider flows that would provide less than the optimal WUA for one or both creeks. The feasibility of this will require further investigation.

ISSUE F. WILDLIFE (TERRESTRIAL AND AVIAN)

Issue

It has been nearly 150 years since European settlement in the Mono Basin. Impacts through development of lands and water resources, first for agricultural and mining purposes, and later for residential and recreational uses have altered wildlife habitats throughout the basin. Of the several wildlife species that use these habitats for foraging, nesting, or cover, some are threatened or endangered or are of special concern. These species include the willow flycatcher (*Empidonax traillii*), peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), yellow warbler (*Dendronica petechia*), mountain beaver (*Aplodontia rufa*), and Inyo shrew (*Sorex tenellus*), and sage grouse (*Centrocercus urophasianus)* (USDA Forest Service 1989, California Department of Fish and Game 1990). This issue is set forth to examine the degree of landscape change since European settlement, and to place emphasis on use of riparian habitats.

Background

By the early 1870's lands in the Mono Basin were being homesteaded. These pioneers built homes, fenced their property and dug water ditches for irrigation and domestic uses. They raised vegetables, grain crops, cows, and sheep (Conway Ranch EIR, Appendix G 1989). These uses, new to the Mono Basin, altered natural habitats by clearing native vegetation, changing water uses and fragmenting habitats with fences and roads.

Key Questions

Step 3. Current Conditions

F-1. What is the wildlife use of the existing aquatic/riparian and terrestrial habitats in the Mill-Wilson watershed?

F-2. What is the current status of waterfowl management in the North Mono Basin?

Step 4. Reference Conditions

F-3. What is the wildlife use of the historic (reference) existing aquatic/riparian and terrestrial habitats in the Mill-Wilson watershed?

F-4. What are the differences, if any, between past and present species use of the terrestrial and riparian environment in the North Mono Basin?

Step 3. Current Conditions

F-1. What is the wildlife use of the existing aquatic/riparian and terrestrial habitats in the Mill-Wilson watershed?

Wildlife surveys suggest that riparian willow scrub habitats throughout the Mono Basin provide high-quality nesting, escape, feeding, and resting cover for a large diversity of resident and migrant birds and other wildlife; only cottonwood-willow forests supported more species. See Appendices F and G for wildlife survey data from the analysis area. However, riparian habitats vary greatly in their overall condition and attractiveness to wildlife. Width and continuity increase their wildlife value, while human disturbance decreases it. Riparian habitats that are narrow and fragmented (i.e., Mill Creek bottomlands and Wilson Creek below Hwy. 167) do not appear to offer a high-quality movement corridor, especially for species with low dispersal capabilities such as most small mammals and reptiles. Willow scrub habitats near the mouth of Mill and Wilson Creeks supported less than one-third of the wildlife species that were observed in similar willow scrub habitats on tributary streams such as Lee Vining and Rush Creeks (18 species compared to 64 species, respectively). The relatively low wildlife diversity of lakeshore willow scrub habitats could be related to their isolation from riparian forests that are present along the tributary streams. The saturated soils associated with lakeshore willow scrub habitats also make them unsuitable for ground-dwelling species such as most small mammals and reptiles (Beedy 1997).

Mule deer (*Odocoileus hemionus*) are the most prominent big game species of the Eastern Sierra Nevada. The analysis area lies within a broad area of transitional range used by the Mono Lake mule deer herd during its seasonal migrations. The herd, estimated at approximately 3,000 animals, winters in western Nevada and summers at high elevations on both the eastern and western slopes of the Sierra Nevada; a small number of these deer summer, fawn, and winter in the North Mono Basin area.

Pronghorn (*Antilocapra americana*) were abundant in the Mono Basin prior to the 1880s; however, pressures of hunting, livestock-induced range degradation, and increased settlement resulted in their removal from the basin. Several reintroductions of pronghorn have since reestablished a herd that winters in Nevada and summers primarily in the Bodie Hills, although a small number summers along the north shore of Mono Lake. Sightings have been made at DeChambeau Ranch and Conway Ranch. Table F-1 outlines current known habitat parameters (listed by species) occupied by pertinent species in the Mono Basin.

The peregrine falcon and bald eagle, both federally listed as endangered in California, are occasionally sighted within the Mono Basin. It is currently unknown if there are any other listed species in the area due to lack of current survey data. Small numbers of bald eagles are periodically sighted along the west and northwest shore of Mono Lake and DeChambeau Ranch as they winter near DeChambeau ponds. While not common, peregrine falcon sightings occur irregularly on the

Table 5. Amount of Known Wildlife Habitat Occupied by Species in the North Mono Basin

Type of Habitat (species)	Amount of Habitat
Goshawk	195 acres
Willow flycatcher	195 acres
Meso-Carnivore	1,763 acres
Mule deer use areas	
High use	17,683.63 acres
Average use	16,933.63 acres
Little/No use	613.51 acres
Bighorn Sheep	5,827.10 acres

Habitat expanses determined for the Sierra Nevada Framework and by the California Department of Fish and Game)

northwest shore of Mono Lake and at the DeChambeau Ponds.

The willow flycatcher, formerly a common nester in riparian willow thickets throughout California, is no longer found as a breeder in most of its former range, surviving only in the Sierra Nevada and along several major river systems. Willow flycatchers are rare summer residents in the Mono Basin (Gaines 1988).

Sage grouse (*Centrocercus urophasianus*) are found throughout the Mono Basin. Suitable habitat consists of large expanses of sagebrush range with an interspersion of small meadows. Overgrazing of meadows and sagebrush range, over-hunting of the grouse, and human disturbance at leks have contributed to a depletion of habitat and abundance. Regular sightings near Thompson Ranch and on Conway Ranch indicate that the analysis area is used for summer and winter range.

Other Special Interest Species

Among the special interest species known to occur within the analysis area include the Apache silverspot butterfly, large satyr butterfly, and Mono checkerspot butterfly, which occupy the wet meadow systems. Some of these species have critical needs for specific vegetation types for successful breeding within the riparian areas.

Yosemite toad (*Bufo canorus*) and mountain yellow-legged frog (*Rana muscosa*) sightings have been identified in the upper reaches of drainages within the landscape analysis area. Little is known of their habitat ranges in the Mono Basin, as suitable habitat for frogs and toads has not yet been surveyed.

Known riparian species within the 172 acres of riparian habitat include: Nuttall's cottontail (*Sylvilagus nuttallii*), montane vole (*Microtus montanus*), red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), waterfowl, northern goshawk (*Accipiter gentilis*), osprey and red-tailed hawk (*Buteo jamicensus*), Sierra Nevada mountain beaver, mink (*Mustela vison*), willow flycatcher, Yosemite toad, and mountain yellow-legged frog. To date, there have

Figure 18. Riparian vegetation along lower Wilson Creek.

been no specific surveys for sensitive species within the analysis area. Figure 18 (page 48) shows a representation of riparian vegetation along Wilson Creek below Highway 167.

F-2. What is the current status of waterfowl management in the North Mono Basin?

The Mono Lake Basin Water Right Decision 1631 was adopted by the State Water Resources Control Board (SWRCB). The decision amended Water Rights Licenses 10191 and 10192, held by the City of Los Angeles, to meet the public trust needs of the Mono Basin environment and comply with Fish and Game Code sections 5937 and 5946. The Decision required LADWP to prepare a waterfowl habitat restoration plan. This plan included recommendations by selected waterfowl scientists that are pertinent to the analysis area. These recommendations included: increase of the water surface elevation of Mono Lake to 6,392 feet; rewatering Mill Creek; and developing and implementing the DeChambeau Ponds/County Ponds/Black Point restoration project (see Figures 16 & 17, page 40). In overall importance to waterfowl, the scientists considered the restoration of riparian and deltaic wetland habitats on Mill Creek second only to raising the lake level. This proposed program would have established a year-round instream flow in Mill Creek to develop habitat and to benefit waterfowl during the annual peak waterfowl migration period. It would also have established an instream flow release that would have approximated the natural (unimpaired) hydrology of Mill Creek to the extent possible. This proposed program considered Mill Creek's complex physical dynamics. It suggested that instream flows should be spread among lower Mill Creek distributaries to stimulate greater riparian growth and encourage backwater habitat.

Step 4. Reference Conditions

F-3. What is the wildlife use of the historic (reference) aquatic/riparian and terrestrial habitats in the Mill-Wilson watershed?

Prior to settlement by Europeans, the small Native American population had a modest impact on wildlife species that inhabited the area. Natural water flows would have provided a more complex stream morphology and corresponding riparian habitat along all reaches of Mill Creek with the ability to sustain a larger diversity of avian and other riparian dependent species. Native vegetation patterns would have prevailed unaffected by livestock grazing and agricultural uses. Populations of wildlife species such as bighorn sheep, mule deer, pronghorn and sage grouse would have fluctuated due to natural changes affecting habitat and forage, and predator-prey relationships that included hunting pressure from the Native Americans.

Step 5. Synthesis and Interpretation of Information

F-4. What are the differences, if any, between past and present species use of the terrestrial and riparian environment in the North Mono Basin?

A number of species that maintained sustainable populations in the Mono Basin in the past are now listed as sensitive. These species include the peregrine falcon, bighorn sheep, sage grouse,

and willow flycatcher. Direct habitat loss or disturbance to breeding grounds is the primary reason for the listing of these animals as threatened or endangered.

While the upper reaches of both Mill and Wilson creeks provide continuous riparian vegetation that is beneficial to a diverse resident and migrant population of birds and other wildlife, the narrow, fragmented riparian vegetation in the lower reaches of both creeks provide little benefit to avian and terrestrial species of wildlife. On Mill Creek, natural flows would have provided a variety of stream morphology and a complete riparian canopy resulting in a diverse invertebrate and avian population. A hypopycnal layer at the mouth of Mill Creek would have provided more waterfowl habitat if reference conditions remained today.

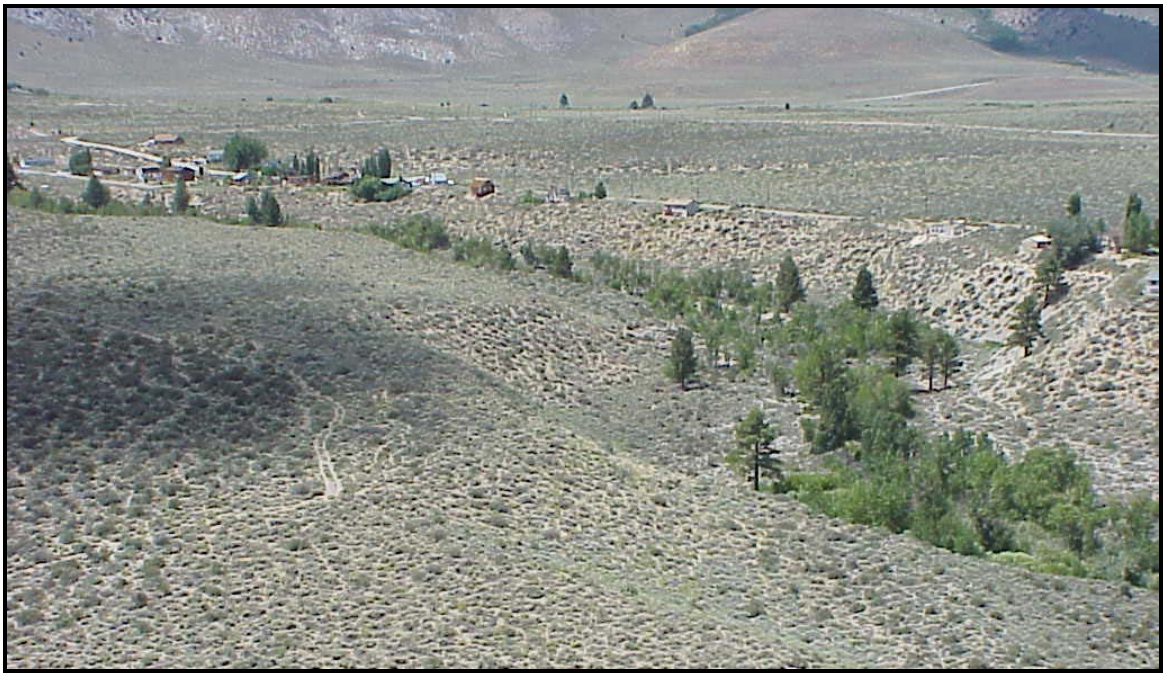

Figure 19. Riparian vegetation along the mid-reach of Mill Creek

Wildlife values associated with continuous, tall, cottonwood-willow forests along restored reaches of mid- and lower Mill Creek are superior to those presently associated with the narrow, and discontinuous stands of willow scrub vegetation on Wilson Creek (refer to Figure 19, above). A Jones & Stokes Associates 1991 survey of birds, mammals, reptiles, and amphibians in riparian and wetland habitats indicated that multistoried, cottonwood-willow habitats supported more wildlife species (68) than any other riparian or wetland habitat type in the Mono Basin. This habitat is important to wildlife because it offers a tall canopy and a dense shrub and herbaceous understory that meets the habitat requirements of a high diversity of riparian wildlife species. Long-distance migrant birds depend on riparian habitats as they travel through the arid Great Basin. In comparison, Wilson Creek lacks tall trees in all but the reach above Highway 395; it is fragmented and it does not offer a suitable movement corridor for wildlife, especially for species with low dispersal capabilities such as most small mammals and reptiles.

STEP 6. OPPORTUNITIES AND RECOMMENDATIONS

The intent of this section is to bring the results of previous steps to conclusion by focusing on management opportunities that are responsive to watershed processes and those issues pertinent to the North Mono Basin. In doing so, step six presents possible management direction needed to meet desired future conditions of the watershed/landscape. This step also identifies data gaps of the information provided and limitations of the analysis.

Which of the changes in ecosystem condition and function require management direction? What opportunities exist to implement management action and how will those actions be assessed in terms of overall watershed goals?

Analysis of the North Mono Basin indicates that there have been significant changes in ecosystem condition and function of the Mill-Wilson landscape. These changes primarily result from water management activities and other human uses. For some of the landowners, regulatory agencies, and members of the public, these changes are not reflective of a Desired Future Condition (DFC), whether that condition is the enhancement of Mill Creek or a broader utilization of Conway Ranch water rights. The DFC for the different landscape elements is open to varying interpretation, but ultimately must reflect the values of the public, the management goals of the landowners, and the legal mandates of the regulatory agencies.

Since much of the land, water rights, and opportunities considered in this analysis are outside the jurisdiction of the US Forest Service, this document does not propose a single desired future condition and recommendations to accommodate all parties. However, this section highlights the most significant management goals for the US Forest Service. It also presents recommendations and opportunities for other parties to meet their goals. These goals are based on the following principles:

- **Restoration of reference conditions to Mill Creek (in compliance with current and future constraints of Lundy Reservoir and SCE operations)**
- **Maintenance Thompson and Conway/Mattly meadows**
- **Maintenance of aquatic/riparian habitat in and along Wilson Creek**
- **Ability to retain the opportunity to divert water from Mill and Wilson Creeks for existing and potential human uses**

These goals/principles are largely reliant on water availability and management. FERC requirements will essentially determine whether these goals can be achieved at all, or to what extent. This section is structured in a manner that presents the issue, identifies a desired future condition and opportunities for moving toward those conditions, and data gaps that currently exist in the analysis that currently stand between reaching those goals.

Issue A: Human Use of the Aquatic Environment (Water Impoundment, Diversion, Power Generation, and Stream Condition)

Vegetation

***Mill Creek, from Lundy Dam to Mono Lake, on National Forest System lands*:**

Goals:
Continue maintenance of the upper reach, from Lundy Dam to the return ditch, in its existing good condition. Depending on whether any releases occur from the reservoir, this reach may exhibit a small increase in the width and improvement of its riparian condition. The mid-reach, from the return ditch to the lower boundary of Mono City once again consists of a wide continuous riparian corridor characterized by Jeffrey pines and quaking aspen. A continuous riparian corridor with a dense, multi-storied cottonwood-willow forest characterizes the lower reach, the lower boundary of Mono City to Mono Lake. Total cover is high, averaging 75-90%. Willow shrubs and other riparian shrub species, such as creek dogwood, occupy the understory, providing additional structure. For woody species, a variety of age and size classes exist. Herbaceous cover varies, but consists of a diverse assemblage of native forb and graminoid species. Bryophytes occupy the streambank in places. Flows are spread across the valley bottom, in multiple channels and relatively high groundwater levels are maintained through the fall and winter. Non-native plant species are absent. Terrestrial and avian wildlife make use of the cover and forage. A range of high-quality recreational experiences are available including near-stream campsites with vehicle access to semi-primitive explorations with a high degree of solitude.

Opportunities:

- Spring and summer high flows and fall and winter baseflows through the upgrade of the Mill Creek return ditch (or construction of a pipeline)
- Store wet-year water (1,000 to 1,500 AF) – release in fall and winter
- Develop restoration plan for bottomlands
- Continue quality recreation opportunities in Lundy Canyon
- Replace culverts at Cemetery Road
- Restore and maintain fish habitat
- Improve quantitative understanding of gains and losses on Mill and Wilson creeks with a coordinated measurement program among landowners, management agencies, and interested publics (USFS, BLM, Mono County, SCE, DFG, PMBP, MLC)
- Develop annual water budget – prioritize uses for water in dry years
- Land acquisition – SCE (Lundy)
- Provide fish screens for diversion points such as Thompson Main Ditch

Data Gaps:

- Analysis of existing riparian monitoring data and determination of effect of 4 and 7 cfs release on riparian corridor

Dechambeau, and upper Mill (above Lundy Reservoir) Creeks:

Goals:
Riparian conditions on these stream reaches continue to be largely unaffected by management activities, particularly water conveyance. The aspen series is the most common vegetation series encountered. Jeffrey pine, black cottonwood, lodgepole pine, and occasional red fir or white fir may occur. Total cover is high. Willow shrubs and other riparian shrub species, such as creek dogwood, occupy the understory, providing additional structure. For woody species, a variety of age and size classes exist. Herbaceous cover varies, but consists of a diverse assemblage of native forb and graminoid species. Bryophytes occupy the streambank in places. Bighorn sheep populations benefit from prescribed burning and a more natural fire regime that provides forage and habitat improvement.

Opportunities:

- Maintain existing natural processes

Wilson Creek from the Lundy Powerplant tailrace to the DeChambeau Ditch diversion point, and from the diversion point to DeChambeau Ranch:

Goals:
These reaches support a narrow corridor of riparian vegetation, though the riparian width, species richness and structural diversity do not equal that of Mill Creek. Tree species are largely absent. Narrowleaf willow is the primary shrub species, and dominates most or all of the riparian corridor. Canopy cover is moderate to high, ranging from 50-85%, though not as continuous as that provided by the communities found on Mill Creek. Herbaceous cover varies, and consists of a variety of native forb and graminoid species. Riparian vegetation does not extend across the entire width of the floodplain. A recreational fishery is maintained at least to the lower Conway Ranch boundary.

Opportunities:

- Maintain adequate flows to provide for a recreational fishery through Conway Ranch without harming the fishery on Mill Creek
- Maintain the riparian corridor from Cemetery Road to DeChambeau Ranch
- Control exotic plant species

Data Gaps:

- Develop predictive model for riparian vegetation recruitment and monitoring on Wilson Creek for different flow regimes

Wilson Creek, below Cemetery Road (the "arroyo" branch):

Goals:
Flows are not sufficient to support riparian vegetation. Over time the vertical banks of the "arroyo" slough into the channel softening the contours. Upland species, such as big sagebrush, bitterbrush, rabbitbrush, and native perennial grasses become established, helping to stabilize erosion-prone surfaces. Non-native plant species are absent.

Opportunities:
- Reduce flows
- Dry up Wilson Creek arroyo
- Control exotic plant species

Conway Ranch

Goals:
Mono County and the Trust for Public Land entered into an agreement at the time of purchase which identifies the goals and desired future condition of the ranch: "The Parties intend that the Property be used for any or all of the following uses: historical and cultural preservation, fish-rearing facilities, open space preservation (including deer migration habitat and scenic highway preservation), wetlands mitigation banking, waterfowl habitat maintenance and enhancement, and/or other compatible uses. Mono County continues to play a key role in the management of the North Mono Basin through implementation of its mission for Conway Ranch.

Opportunities:
- Consider fish rearing in the tailrace year-round
- Consider cutthroat trout rearing
- Construct a pipeline to provide irrigation water to Mattly Ranch
- Strive to improve efficiency in transport to be able to irrigate with 2 acre feet/acre/year
- Improve Virginia Creek delivery system to water north half of Mattly
- Manage water to provide for flow through sufficient to irrigate DeChambeau
- Develop and provide for interpretation on Conway Ranch
- Continue restoration/stabilization of the Conway Ranch buildings

Thompson Ranch

Goals:
Although currently under the ownership of the City of Los Angeles, Thompson ranch may be acquired by either the USFS or Mono County through lease, trade or sale. Forest Service acquisition would exclude the cemetery, park and private residences. The desired future condition of Thompson Meadow, if acquired by the USFS, would be to maintain the historic cultural value of its pastures and trees through irrigation while maintaining the DeChambeau Creek riparian corridor and the stands of willow and black cottonwood. The management emphasis would be to

preserve the integrity of a high quality wildlife habitat, while maintaining the historic and cultural nature of the irrigated pasturelands.

Opportunities:

- If necessary grade the meadow to eliminate high (dry) spots to provide for more efficient irrigation
- Construct a pipeline from Mill Creek to Thompson meadow to eliminate transport losses
- Irrigate with no more than 2 ac-ft/acre/year
- Consider all management alternatives [i.e. grazing/4-H, wildlife (birds)]
- Encourage birdwatching
- Mono County acquires park, cemetery, private residences

DeChambeau Ranch

Goals:
The buildings of the ranch are maintained in a state of arrested decay to provide an example of an early 20th century ranch. The ranch compound (approximately 5 acres) is irrigated to retain some of the historic values of the land and provide fire protection.

Opportunities:

- Plant trees to replace the ones that are dying of old age
- Develop an irrigation plan to maximize the use of water on the ranch
- Complete stabilization of the DeChambeau Ranch buildings
- Rebuild the chicken house and blacksmith shop destroyed in the fire

Issue B: Human Use of the Terrestrial Environment (Roads, Recreation, Fire/Fuels)

Roads

Goals:
Roads are maintained in a condition suitable for use by the appropriate vehicle while minimizing erosion from wind and water. The impacts of road crossings on streams and fish movement is minimized. Unnecessary roads are closed and obliterated. Future road building is minimal.

Opportunities:

- Meet the required level of maintenance on all roads
- Examine the possibility of reestablishing the natural flow channels on Mill Creek at Cemetery Road
- Obliterate portions of old Hwy 395

Recreation

Goals:
There continues to be a diversity of resource-based recreation opportunities that are accessible to all segments of the public and emphasizes the quality of the recreational experience. Recreation

facilities include sites such as the Lundy store, developed campgrounds along Mill Creek, interpretive sites such as Black Point and the Mono Lake County Park, while offering dispersed camping throughout undeveloped areas in the North Mono Basin. Popular recreation sites are protected from overuse by comprehensive management. Recreation opportunities include hunting, fishing, hiking, photography, birding, cross-country skiing and snowmobiling.

Opportunities:

- Close and rehabilitate the campsites along Mill Creek between the return ditch and Highway 395
- Increase public understanding and appreciation of the human and natural resources, both past and present, through interpretive/educational programs and facilities
- Encourage comprehensive recreation planning that fosters a unified, regional approach and de-emphasizes divisions by state, county or other jurisdictional boundaries, while recognizing particular needs of such jurisdiction

Heritage Resources

Goals:
Gain a complete understanding of the historic and prehistoric cultures that have inhabited the Mono Basin. Protect and interpret the cultural history of the Mono Basin. Heritage Resources inventories on Forest Service and BLM administered lands are completed, with emphasis on known historic sites at the Log Cabin, May Lundy, Summit, Gorilla, Godchaux mines, including additional recording of the historic landscapes in Lundy Canyon and at Monoville, the oldest historic mining area in the Mono Basin.

Historic and prehistoric activity areas or heritage sites that are currently being impacted by contemporary activities are identified. Forest Service specialists and other agencies work to minimize these impacts, and prepare mitigation data recovery plans for these sites when avoidance measures are unworkable.

A paleobotanical research program in the Mono Basin is begun produceing important baseline data for managers and scientists to monitor the scope of vegetative changes in the Mono Basin during the Holocene and serve as a tool to track the rapid vegetation changes that have taken place in the basin since the beginning of the historic era. It serves as a contextual tool for prehistoric research in the basin, especially when incorporated into the extensive archaeological, climatological and geological background studies within the Mono Basin.

Opportunities:

- Initiate a more vigorous site evaluation program in keeping with Regional directives; such a program would pay dividends by allowing Heritage specialists to focus their efforts upon those sites that are truly significant, both culturally and because of their research values. Those sites that are found to be not eligible for listing on the National Register of Historic Places could then be dropped from further management activities.
- Record the historic remains of historic ranch sites such as the Felicina and Gardella Ranches and possibly seek funding opportunities for additional restoration work at Dechambeau Ranch, including the reconstruction of the blacksmith's shop at the ranch which was recently destroyed by fire.

- Opportunities exist to enlist the aide of the local Mono Basin Historical Society and the Native American Community in the development of site monitoring and cultural-interpretative programs throughout the Mono Basin as many of the sites located in the Basin are unique to this area and represent the earliest historic contacts between Euro-Americans and the Basin's Native American community, and the development of the historic themes of mining, farming, grazing, logging, transportation, and hydroelectric power. Such a program would assist in educating the public about the Mono Basin's unique history and underscore the fact that Heritage Resources are a non-renewable resource and are a part of everyone's heritage, and that their theft or defacement is everyone's loss.

Fire and Fuels

Goals:
Fire operates as a process throughout the landscape to provide nutrient cycling, fuels reduction and vegetation disturbance. The urban interface areas are protected from high intensity fires and the surrounding landscape is protected from fire that might originate in the areas of concentrated use. Prescribed fire is an accepted tool to bring vegetative patterns into line with desired future conditions which would include multiple age classes, structural diversity, etc.

Opportunities:
- Reintroduce fire as a process throughout the analysis area
- Use the suppression strategies of control, contain, and confine for all fires
- Reduce the risk of high intensity fires within the area
- Treat areas around developments to reduce the threat of fire
- Use prescribed fire as a tool to manage vegetation and wildlife habitat
- Develop a wildlife burn plan for DeChambeau Ranch (every 3 years?)
- Develop a prescribed fire plan

Issue C: Erosion and Water Quality

Goals:
Streamflow is managed in both Mill and Wilson creeks to mimic, to the extent possible, natural processes that will enhance riparian growth, benefit stream bank stability and allow natural sediment transport and deposition. Roads are maintained to minimize erosion from wind and water runoff. Water quality is high to support fish and wildlife populations.

Opportunities:
- Avoid instream structures when considering restoration; stream systems repair themselves quickly with a little help
- Consider riparian plantings to accelerate natural restoration processes
- Consider soil erosion potential when planning restoration
- Improve road maintenance to minimize erosion
- Document responses to disturbances associated with restoration projects

Data Gaps:

- What sediment sources are available for regeneration of the Mill Creek bottomlands that would enhance soil deposition for vegetative growth and bank building?

Issue D: Habitat Composition (Upland, Wetland, Riparian)

Species and Habitat Composition

Goals:

Rewatering Mill Creek below the Lundy Powerhouse Return Ditch helps to maintain the dense stands of riparian habitat that currently exist along the upper reaches of the creek (e.g., above the Highway 395 crossing). A continuous stand of mature cottonwood-willow riparian forest offers important resting, foraging, and nesting cover for a variety of neotropical migrant birds and other wildlife as well as maintaining suitable stream water temperatures. Snags in mature riparian forests provide for cavity-nesting species and important perching sites for raptors.

Restoration of the Mill Creek bottomland environment provides major benefits to waterfowl and other wetland-dependent wildlife, particularly in the fall and in drought years when other wetland areas around the lakeshore may be dry.

Restoration of a natural hydrograph maintains a hypopycnal rias (lake flooded creek mouths) along the two primary channels of the Mill Creek delta that create a protected, high quality fresh water waterfowl habitat area of approximately 14 acres. Deeper waters (e.g., > 10 feet) of the hypopycnal rias attract diving ducks such as redheads, ruddy ducks, lesser scaup, ring-necked ducks, and buffleheads, in addition to puddle ducks like mallards, northern shovelers, gadwalls, and American widgeon that frequent both deep and shallow waters. In addition to these species, northern pintails, green-winged teal, and cinnamon teal would probably frequent shallower portions of these rias.

Since it is spring-fed, the valuable marsh habitat at the mouth of Wilson Creek continues to offer important habitat for migratory shorebirds and ducks even if the flows down Wilson Creek cease. Sedimentation and degradation of the high-quality marsh habitat at the mouth of Wilson Creek is eliminated.

Opportunities:

- Prescribed burn and/or brush trimming for upland habitat enhancement
- Close roads not needed for primary transportation needs
- Develop off-site water sources for any livestock grazing ongoing near riparian areas
- Apply water distribution analysis on wet, average and dry year limiting factors to best benefit a wide diversity of species
- Develop wetlands at the mouth of Bridgeport Creek
- Develop a management plan for existing ‘man-made’ meadow systems including providing for an efficient transport and distribution of irrigation water from Mill Creek
- Construct a series of scrapes in the upper DeChambeau meadow

- Enlarge DeChambeau pond #3

Data Gaps:
- Full vegetation inventory-'ground truthed' and provided as a GIS layer for habitat analysis
- Wildlife Inventories for all federal listed and sensitive species within the analysis area
- Need to include data from existing song bird surveys being conducted by PRBO
- Habitat analysis by limiting factors for each species of concern
- Critical habitat identification
- Nesting/brooding habitat
- Core fledging area
- Monitoring data of vegetation condition trends within all riparian and upland areas including areas that have been removed from livestock grazing and/or dewatered
- Description of desired condition for fishery and fish habitat for Mill and Wilson creeks

Issue E: Fisheries and Fish habitat Condition

Goals:
There is high quality fisheries habitat in Mill Creek to Cemetery Road and Wilson Creek to the lower boundary of Conway Ranch to provide a recreational sport fishing opportunity. Stream conditions met the needs of fish populations that are well proportioned and free of disease. Macroinvertebrate fauna is abundant, diverse, and characteristic of a cool, clear, headwater stream enabling the sustainable production of a high biomass of trout and multiple life stages of brown trout are present in all reaches.

Opportunities:
- Provide minimum flow from sand trap
- Re-evaluate minimum flow requirement recommendation for FERC
- Protect and enhance good quality fisheries habitat
- Increase instream large woody debris
- Improve site conditions which promote growth of cottonwoods to provide a continuing source of lwd. and continuous riparian cover to provide shade along creeks

Data Gaps:
- None identified

Issue F: Wildlife (Terrestrial and Avian)

Goals:

Willow scrub and cottonwood-willow forests are enhanced along the watercourses to provide continuity and increase the overall condition and attractiveness to wildlife. Characteristic species of the upper forest canopy include insectivorous species such as flycatchers, vireos, and warblers that forage and nest there. Snags in mature riparian forests provide for cavity-nesting species such as woodpeckers, bluebirds, and some owls and important perching sites for raptors such as prairie falcons (Falco mexicanus), and rough-legged hawks (Buteo lagopus). Decadent sagebrush-bitterbrush scrub is managed through prescribed fire to enhance habitat for sage grouse and other sagebrush dependent species. Streamside vegetation provides unified movement corridors for large mammals such as mule deer (Odocoileus hemionus) and bobcats (Lynx rufus), in addition to smaller mammals, reptiles and birds. In spring and summer depressions in distributary channels surrounded by emergent and riparian vegetation are excellent nesting habitat for mallards, gadwalls, and cinnamon teal; wood ducks (Aix sponsa) may nest in cavities in cottonwood trees near ponded water.

Opportunities:

- Continue to monitor waterfowl use
- Evaluate additional waterfowl needs
- Provide for most efficient use of water in waterfowl/shorebird use areas
- Expansion of the current herd of pronghorn

Data Gaps:

- What conditions have caused the pronghorn to abandon the North Mono Basin area

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