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DRAFT

Environmental Impact Statement

for the

Truckee Meadows Flood Control Project

Nevada

General Reevaluation Report

Volume II – Appendixes

prepared by

U.S. Army Corps of Engineers
Sacramento District

May 2013

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APPENDIXES

APPENDIX A

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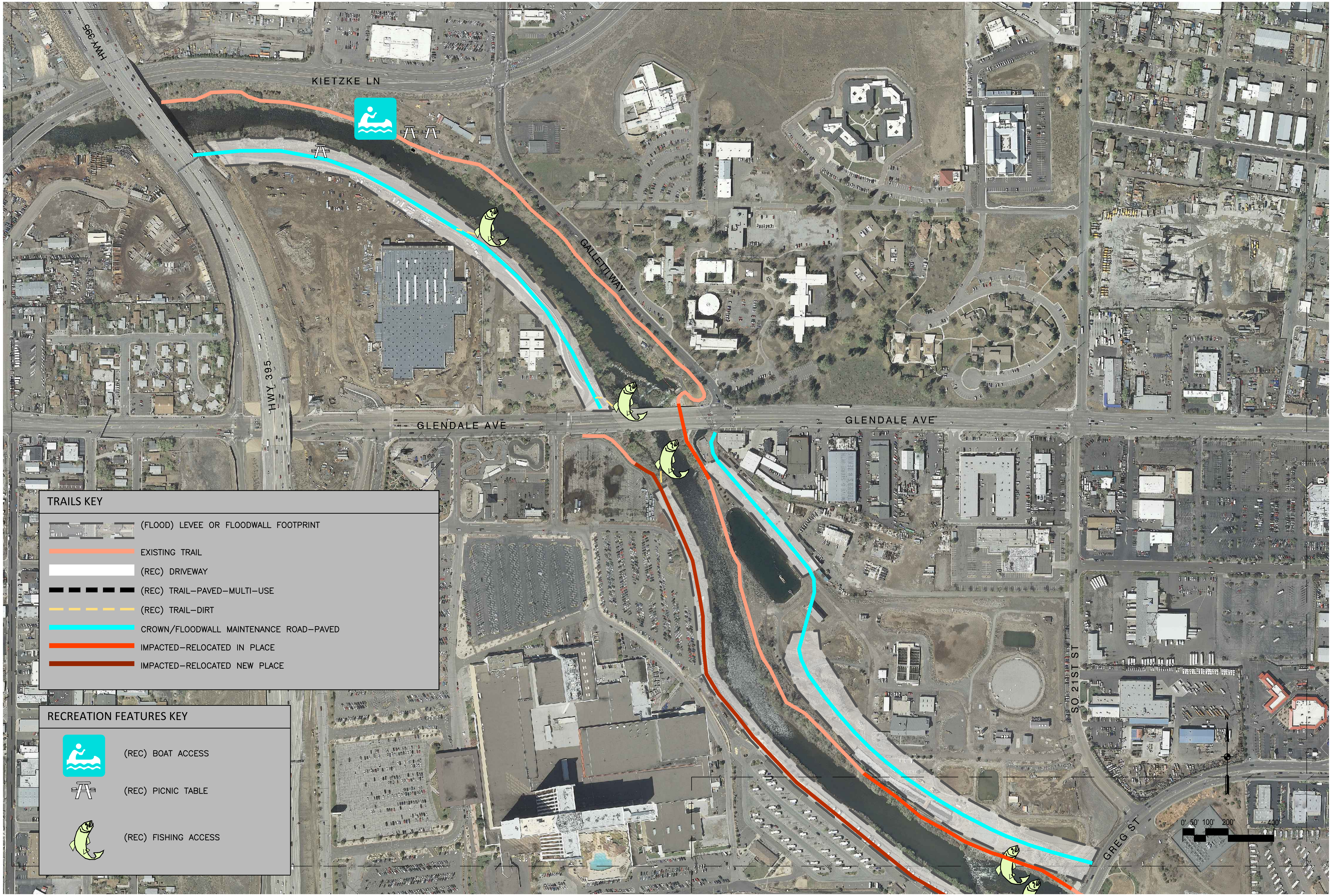
RECREATION PLAN



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WASHOE & STOREY COUNTIES NEVADA
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FLOOD CONTROL PROJECT
ALTERNATIVE 3 FLOOD PLAIN TERRACE PLAN

RECREATION PLAN
ALTERNATIVE C
TRUCKEE MEADOWS

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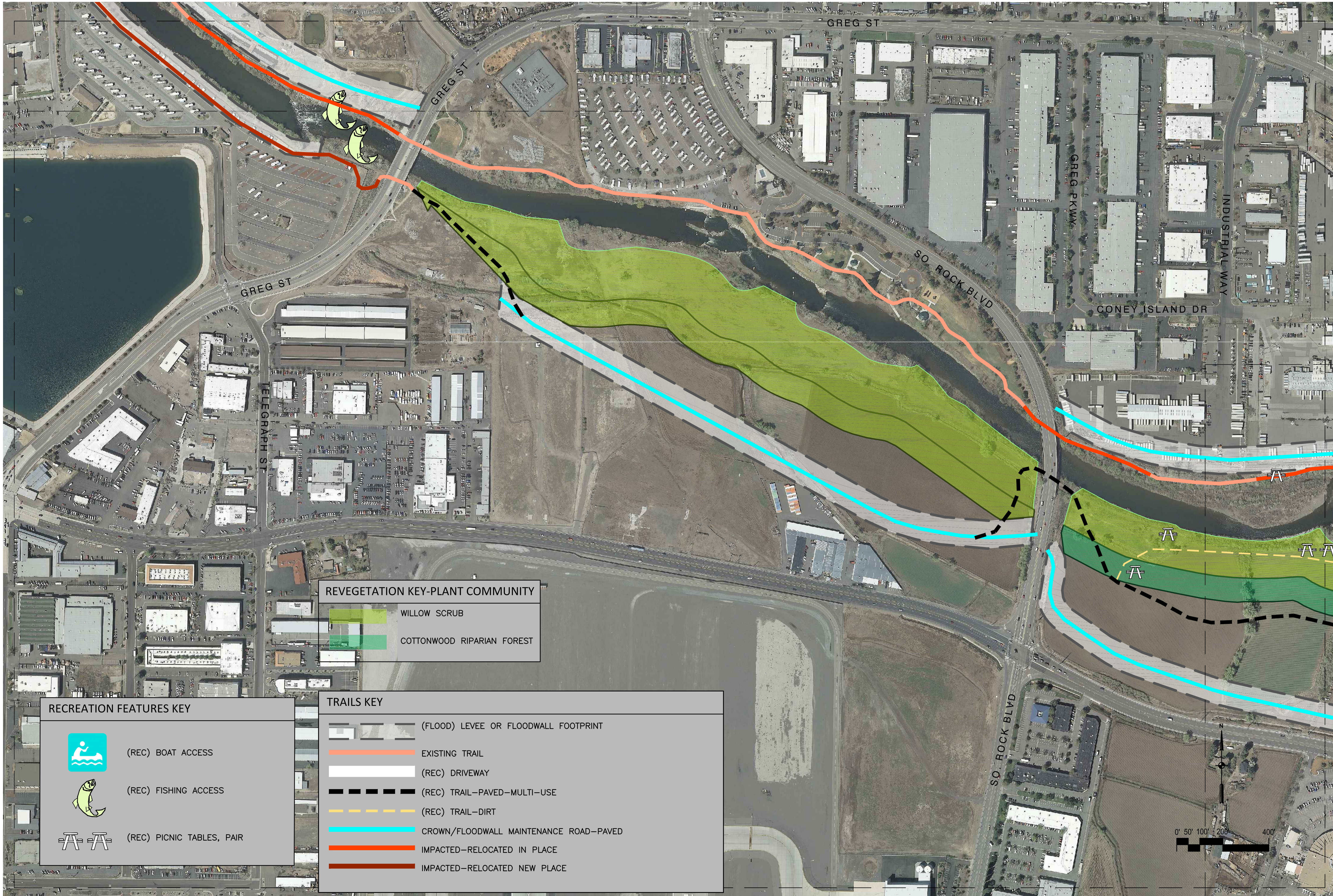

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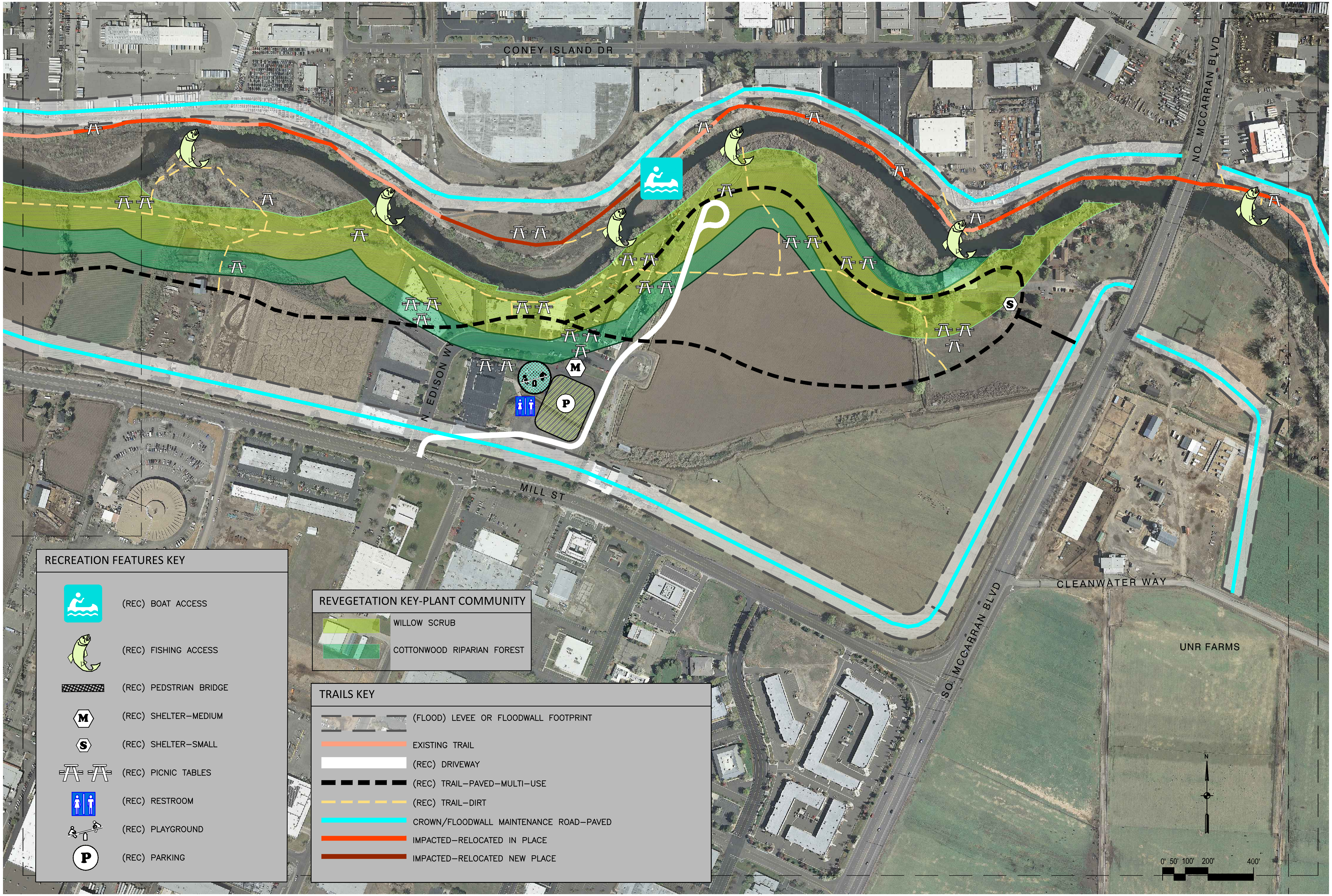

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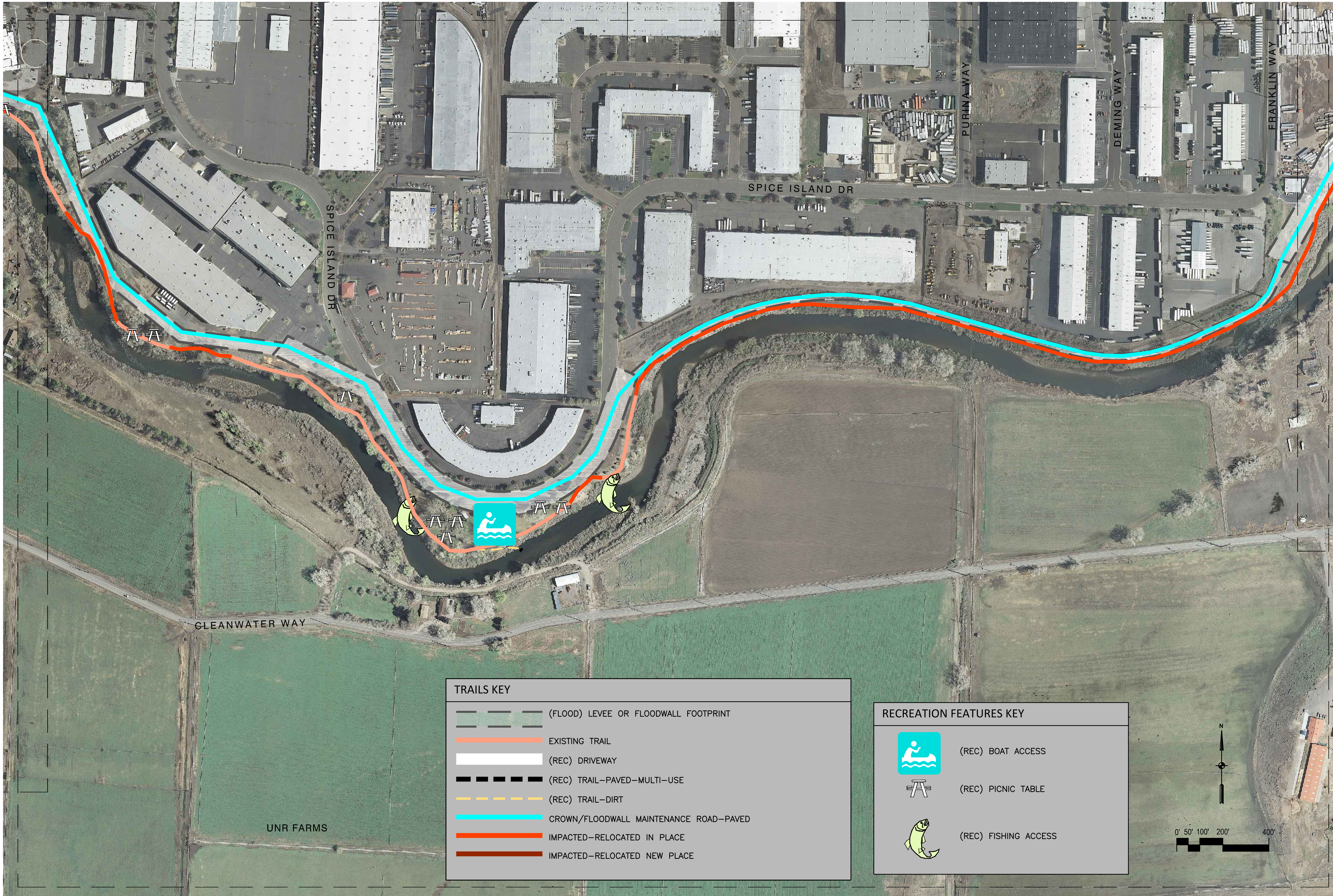

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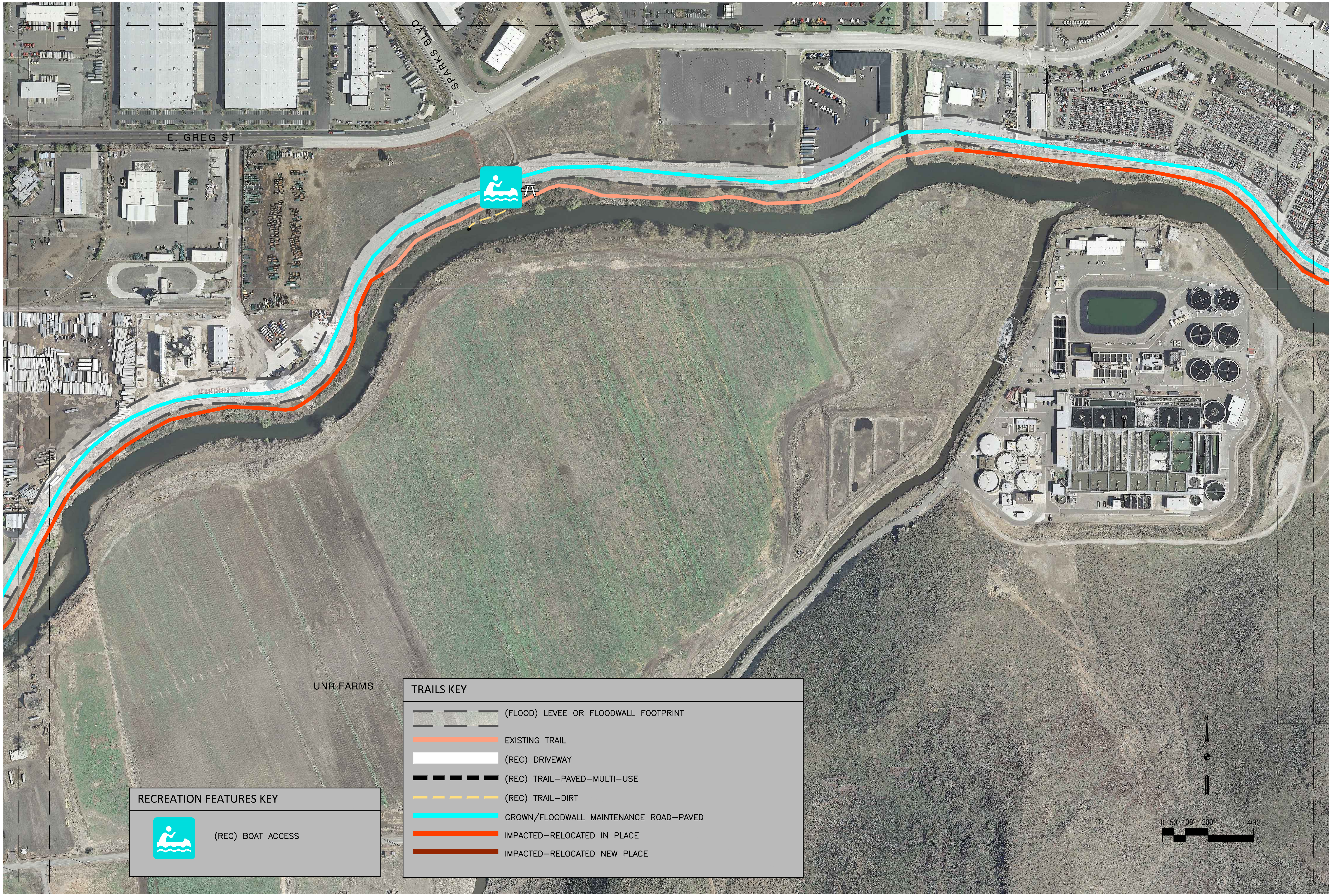

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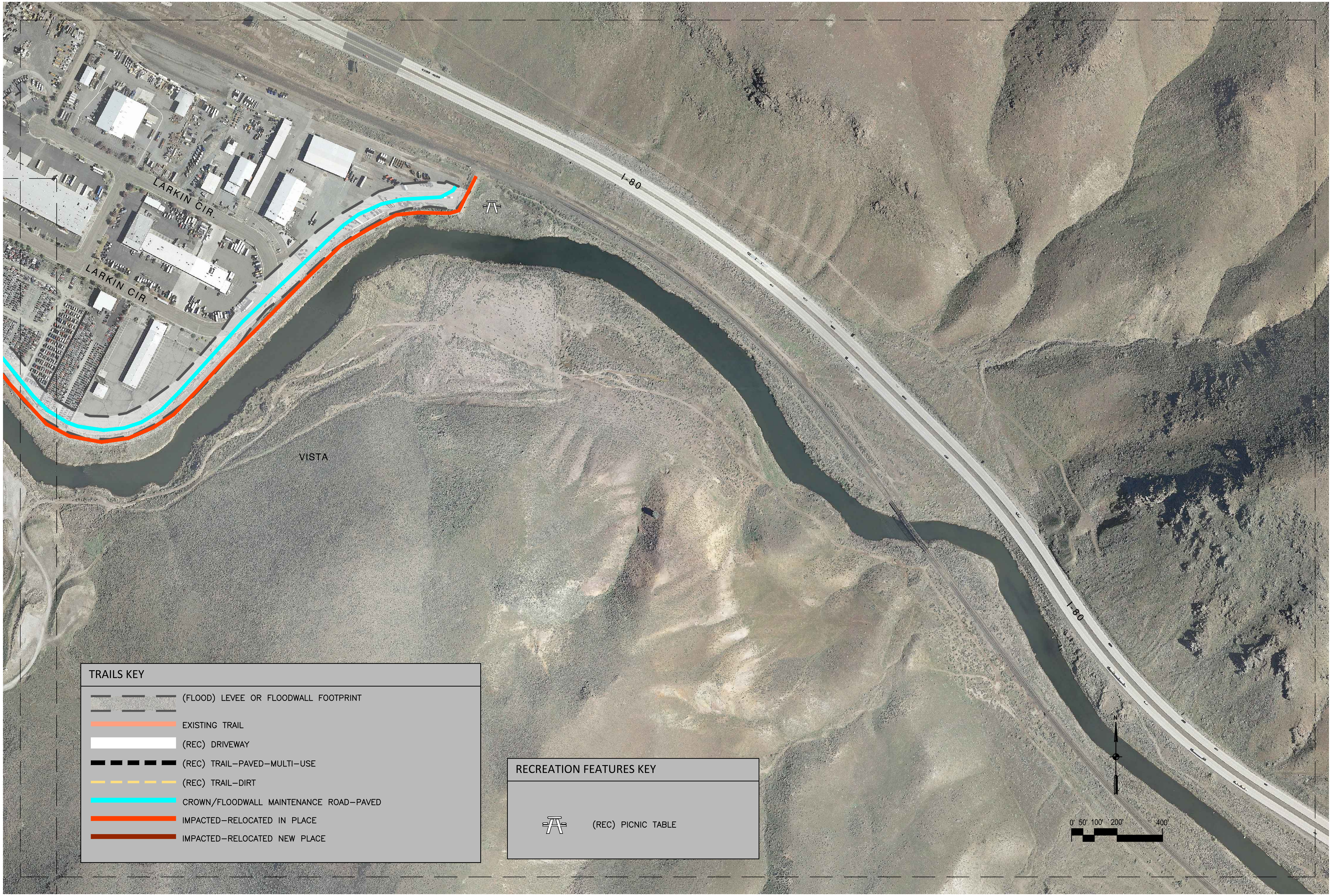

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TRUCKEE MEADOWS

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APPENDIX B

DRAFT

FISH AND WILDLIFE

COORDINATION ACT REPORT

United States Department of the Interior

Pacific Southwest Region
FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

February 9, 2012
File No. 2012-CPA-0051

Alicia Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Dear Ms. Kirchner:

Subject: Preliminary Draft Fish and Wildlife Coordination Act Report for the Truckee Meadows Flood Control Project, Nevada.

Enclosed is our preliminary draft Fish and Wildlife Coordination Act Report (CAR) for the U.S. Army Corps of Engineers' (Corps) proposed Truckee Meadows Flood Control Project (TMFCP), Washoe and Storey Counties, Nevada. This report has been prepared under the authority of, and in accordance with, the provisions of section 2(b) of the FWCA (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*). This report describes fish and wildlife resources in the project area, and provides preliminary impact analyses for project features. We have also recommended mitigation measures to avoid or offset adverse effects, and enhancement measures for these resources.

Our analysis is based on site visits, literature review, scientific investigations, discussion with experts, planning information provided by the Corps, and previous analyses and reports prepared by the U.S. Fish and Wildlife Service (Service). As we were completing this draft CAR, we were informed by the Corps that Alternative 3 did not meet acceptable standards for Federal interest projects. We understand that the Corps is currently reassessing project alternatives in order to identify an alternative that will meet these standards. We are therefore releasing this preliminary draft CAR at your agency's request, to assist you in your continued evaluation of alternatives for the TMFCP.
Any revisions to the project alternatives will require additional revisions to this draft CAR. A final, signed CAR will be provided once a final set of project alternatives has been selected, and section 7 consultation pursuant to the Endangered Species Act has been completed.

We appreciate the opportunity to provide our input to your planning process for this investigation. Any questions or comments regarding this report or requests for additional copies should be directed to Michael Cotter of my staff at 775.861.6300.

Sincerely,

Edward D. Koch
State Supervisor

Enclosure

- - - For Inter-Agency Review Purposes only
- not to be distributed - - -

FISH AND WILDLIFE COORDINATION ACT REPORT

FOR THE

TRUCKEE MEADOWS FLOOD CONTROL PROJECT

WASHOE AND STOREY COUNTIES, NEVADA

PRELIMINARY DRAFT

PREPARED FOR:
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

PREPARED BY:

Michael Cotter, Fish Biologist, Author
Edward D. Koch, State Supervisor
Division of Ecological Services
Reno, Nevada

U.S. Fish and Wildlife Service
Pacific Southwest Region

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EXECUTIVE SUMMARY

The Reno/Sparks metropolitan center has been historically inundated by Truckee River floodwaters during periods of high runoff or rain-on-snow events in the Sierra Nevada range due west of the population center. Major flood events in the Truckee River basin have been recorded in 1862, 1875, 1890, 1904, 1907, 1928, 1937, 1943, 1950, 1955, 1963, 1986, and 1997. In 1954, Congress directed the U.S. Army Corps of Engineers (Corps) to develop and implement methods to reduce the impacts of flooding within the basin. The Corps began channel modifications to increase flood capacity in the late 1970's and began a feasibility study for a flood control project throughout the basin in 1986. Due to rising costs of real estate, the project was deferred in 1996.

On January 1, 1997 heavy rainfall fell from a warm storm system on the Sierra Nevada snowpack. Truckee River flows swelled, and spilled over the river's banks in the Truckee Meadows area. Approximately $700 million in damage was recorded with floodwaters impacting six Nevada counties. The Reno-Tahoe International Airport was shut down for several days and some flooded downtown businesses were shut down for several weeks.

Following the 1997 flood, momentum for a substantial flood control project was reinvigorated. The Corps produced a reconnaissance report that indicated a flood control project was feasible and the cost-benefit ratio would now exceed one. Congress granted the authority for the Corps to pursue a substantial flood control project developed in conjunction with local governments and relevant federal agencies.

This is a draft Fish and Wildlife Coordination Act Report (CAR) by the U.S. Fish and Wildlife Service (Service) on the Truckee Meadows Flood Control Project (TMFCP), Washoe and Storey Counties, Nevada. Throughout the life of the project, a variety of alternatives have been proposed, analyzed and discussed. There were two action alternatives proposed at the time of this writing, including: Alternative 3 – Floodplain Terracing, and Alternative 4 – Locally Preferred Plan. As the Service was completing this draft CAR, the Corps determined that Alternative 3 did not meet their standards for Federal interest projects. The Corps is currently reassessing Alternative 3 configurations, to identify an alternative that can achieve these standards.

This draft CAR describes both action alternatives in their current configuration, and their anticipated impacts to fish and wildlife resources associated with proposed flood control development in the Cities of Reno and Sparks, Nevada, and to the Pyramid Lake Indian Reservation (Figure 1). The Corps has indicated that the configuration of Alternative 3 will be altered; however Alternative 4 will remain unchanged. Because of the programmatic scope of the TMFCP and a consequent lack of detailed descriptions for components of the alternatives, our findings and recommendations should be considered as subject to revision until a preferred program is identified and Alternative 3 project details become available.

The Service recommends that Alternative 4 be selected as the Corp's preferred plan. As discussed throughout this draft report, the Service believes this alternative provides the highest level of ecological restoration with a greater probability of long-term success, maximum level of passage for all life history stages of native fish, and provides the residents of Washoe and Storey Counties with the maximum level of catastrophic flood protection. This draft report will be finalized when a final project alternative has been selected, and formal consultation pursuant to section 7 of the Endangered Species Act has been completed.

1.0 INTRODUCTION

This report is to be used by the Sacramento District of the Corps in preparation of a draft Environmental Impact Statement (EIS) for the General Reevaluation Study. This report constitutes the report of the Secretary of the Interior as required by section 2(b) of the Fish and Wildlife Coordination Act (FWCA), Public Law (P.L.) 85-624 section 2(b), and is in keeping with the spirit and intent of the National Environmental Policy Act (NEPA), P.L. 91-190. The Service's primary objective under the FWCA is to ensure that approved project plans include necessary means and measures to guarantee conservation of fish and wildlife resources.

The Reno/Sparks metropolitan area has been flooded frequently in the past by the Truckee River and associated tributaries during periods of high runoff (Figure 1). Currently, it is estimated that the level of protection (*i.e.*, flows below which are contained) in downtown Reno is for a 1 in 50 year event, which corresponds to flows of 14,000 cubic ft per second (cfs). In the greater Truckee Meadows area (Figure 2), it is far less, corresponding to a 1 in 10 year event or 6,000 cfs. The Corps was directed by Congress and requested by local governments to investigate and propose flood protection measures along the Truckee River beginning in 1954.

The initial investigation by the Corps for the Truckee Meadows Flood Control Project (TMFCP) was authorized under a resolution adopted February 7, 1964, by the Senate Committee on Public Works under the Flood Control Act of 1954. The resolution directed an investigation of water resource problems in the Truckee Meadows, which authorized interim channel improvements on the Truckee River and tributaries for flood control. Channel modifications at several points along the river were constructed and, in 1978, the Corps began preparation of a feasibility study for a flood control project in the Reno/Sparks metropolitan area.

The Corps completed the feasibility study in 1986 and the TMFCP was authorized under the Water Resources Development Act of 1988 (WRDA; P.L. 100-676) and the Conference Report (House Resolution 1905) to the Energy and Water Development Appropriations Act of 1996. However, the project was deferred during the preconstruction engineering and design (PED) phase as a result of changes in real estate costs which made the project economically infeasible. Projects to be considered for funding by the Corps require a benefit-to-cost ratio of at least one, meaning that the financial benefits of a project outweigh the costs to build and construct the project. At that time, the Truckee River project benefit-to-cost ratio fell below one.

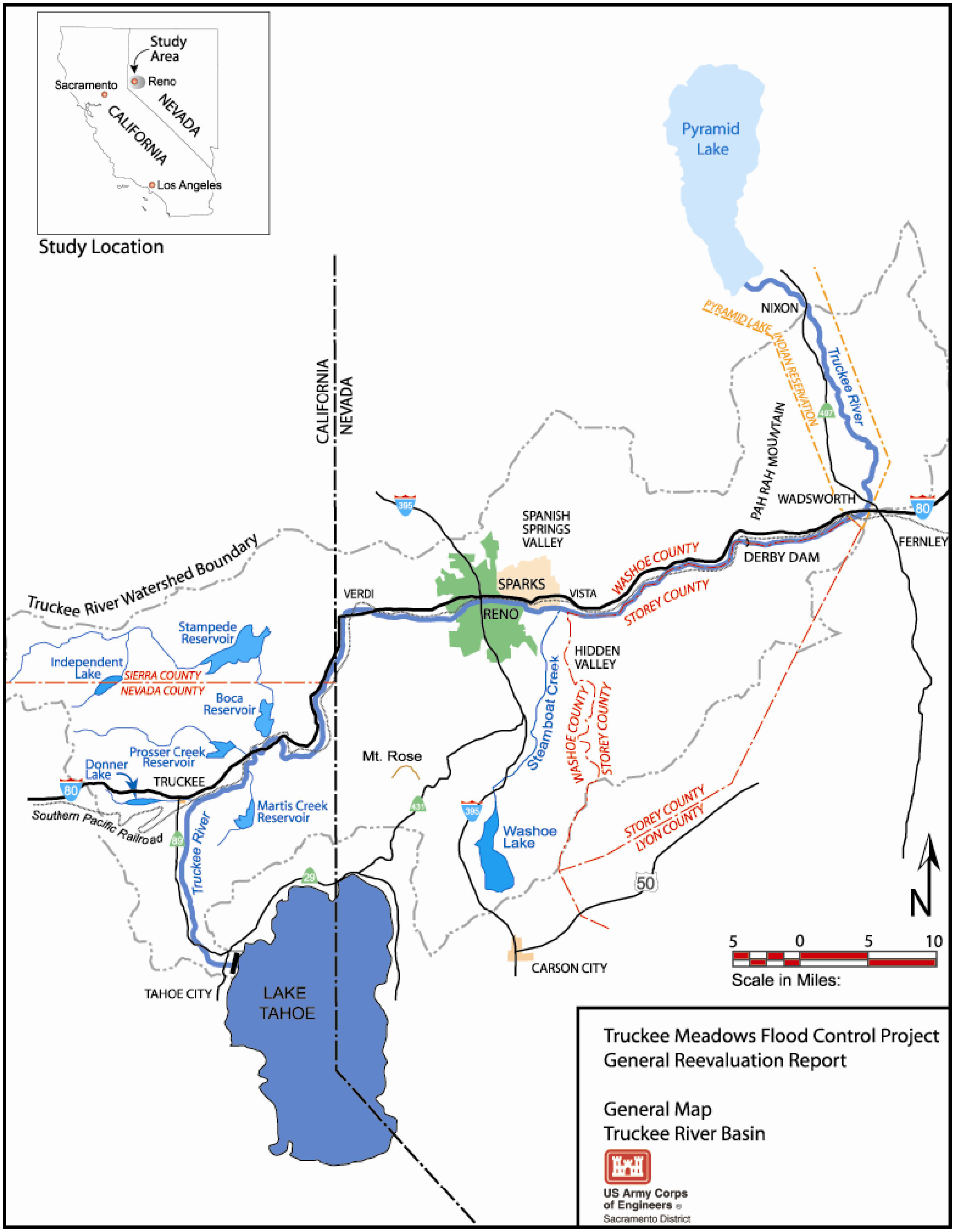

Figure 1. General and Project vicinity map, Truckee River Basin.

In 1996, the local communities requested that flooding problems in the Truckee Meadows be reevaluated, and a decision was made to expand the study area downstream of the Truckee Meadows and to consider ecosystem restoration as part of the purposes of the project. On January 1, 1997, six counties in northern Nevada, including Washoe County and the Truckee Meadows area, experienced a massive flood event that caused over $1 billion in damages regionally and $700 million locally. Following the flood, a Corps reconnaissance report was completed which determined that a project was feasible and that the benefit-to-cost ratio would now likely exceed one. Congress then directed the Corps to prepare a General Reevaluation Report (GRR). The GRR (Corps 2011) and accompanying EIS (Appendix A) considers additional flood protection at and downstream of Reno/Sparks, Nevada, through levee/channel improvements, local impoundments, and operation of existing reservoirs in the watershed. The GRR and EIS also consider the potential for restoration along the Truckee River through the Truckee Meadows and downstream to Pyramid Lake. The reevaluation study addressed in this draft Coordination Act Report (CAR) is limited to three alternatives that are considered in the Corps' GRR and EIS reports.

Throughout the life of the project, numerous alternatives have been proposed and removed from consideration. At the time of this draft, alternatives under consideration include the: (1) No Action Alternative, (2) Alternative 3 Floodplain Terracing, and (3) Alternative 4 Locally Preferred Plan (LPP). Both action alternatives include Flood Risk Management (FRM), Ecosystem Restoration (ER), and recreational improvement components, along four distinct reaches[1] of the Truckee River between Reno and Pyramid Lake (Figure 2):

Verdi Reach (River Mile[2] 85 to 68), extending from Fleish Diversion Dam downstream to the Downtown Reno area, approximately 2,500 ft upstream of Booth Street Bridge.

Downtown Reno Reach (River Mile 68 to 65), extending approximately 2,500 ft upstream of the Booth Street Bridge in Reno's central business district downstream to Highway 395;

Truckee Meadows Reach (River Mile 65 to 58.5), extending from Highway 395 downstream to the Vista gage, south along Steamboat Creek to Huffaker Hills and south along Boynton Slough to the Reno-Tahoe International Airport and north along the North Truckee Drain into Sparks north of Interstate 80, and;

Lower Truckee River Reach (River Mile 58.5 to 0), extending from Vista narrows to the river's terminus at Pyramid lake.

[1] These reaches were delineated by the Corps for planning purposes.
[2] As measured from the mouth of the Truckee River upstream.

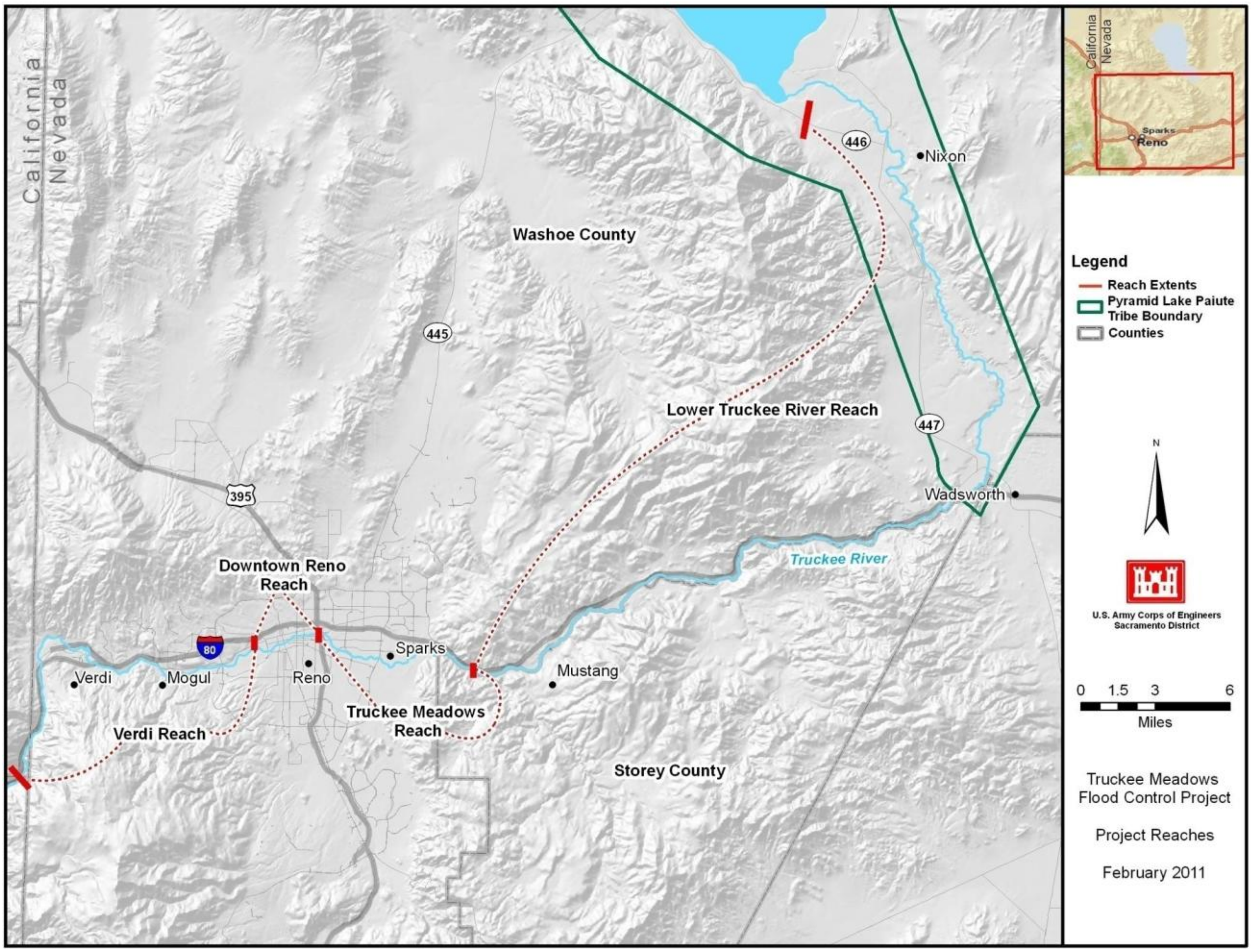

Figure 2. Flood Project Reach delineations.

For both action alternatives, FRM would involve levees and floodwalls in the Downtown Reno Reach and the Truckee Meadows Reach; and ER would involve fluvial and geomorphic restoration in the Lower Truckee River Reach. Both alternatives also include fish passage enhancement (as a part of ER) in the Verdi and Lower Truckee River Reaches. The action alternatives propose set-back levees, benching/terracing, bridge replacement or expansion, floodproofing, internal drainage features, remediation for under-seepage, road relocation, and detention basins as a part of FRM. Both action alternatives would reduce the probability of a flood occurrence in the Reno/Sparks area, and increase the amount of native vegetation cover types along restoration segments. In addition, both action alternatives would allow for some of the river's natural functions to occur, such as deposition and erosion along the banks.

The goals of the Service in this study are to: (1) Evaluate the impact of the proposed project on fish and wildlife and their habitats throughout the planning area; (2) recommend methods of mitigating losses of these resources; and (3) recommend methods of enhancing fish and wildlife habitats where feasible. This document identifies aspects of the project with potential impacts to federally-listed species, but does not satisfy the Corp's responsibilities to ensure that the project complies with the Endangered Species Act of 1973, as amended (ESA). A detailed analysis of the impact the project will have on the endangered cui-ui (*Chasmistes cujus*) and threatened Lahontan cutthroat trout

(*Oncorhynchus clarkii henshawi*) (LCT) will be addressed in the Corps' Biological Assessment (BA) as part of the section 7 consultation process pursuant to the ESA. The Service anticipates that the Corps will initiate formal consultation after issuance of the draft EIS. This draft CAR will be finalized upon completion of formal section 7 consultation.

The Service's findings are based on project descriptions and data provided by the Corps through January 2011, as described in the following documents:

- Lower Truckee River Final Geomorphic Assessment and Final Preliminary Design (Otis Bay Ecological Consultants 2004);
- Ecosystem Restoration Alternatives Design Paper for the Truckee Meadows Flood Damage Reduction and Ecosystem Restoration Project (Montgomery Watson Harza 2002); and
- Habitat Evaluation Procedure and Aquatic Habitat Evaluation for the Truckee Meadows and Lower Truckee River Restoration Reaches (Corps of Engineers 2007).

Our appraisal of resources is also based on the final EIS for the Truckee River Operations Agreement (TROA; U.S. Department of the Interior and State of California 2008), literature reviews, field investigations and surveys, best professional judgment of Service biologists, and a projection of future conditions using current land-use information. Our analyses will not remain valid if the TMFCP, the resource base, or anticipated future conditions change significantly.

This report identifies fish and wildlife resources within the project area, and impacts of the proposed TMFCP on these resources. It provides recommendations to protect existing fish and wildlife resources and to minimize resource losses caused by the project construction. To assess project impacts on terrestrial and aquatic resources within the project area, we identified resource categories characterized by their value to fish and wildlife. We compare existing to future conditions to determine the extent of overall loss/gain of habitat value. Consistent with our mitigation policy (46 FR 15, January 23, 1981), habitat values are compared pre and post project implementation (Section 7.0).

Throughout the remainder of this document, we will utilize common names for organisms referenced through this document, except those with legal status. Scientific names of these organisms, including their common name equivalent, are available in Appendices D (plants), E (fish, amphibians, reptiles), F (birds) of this document.

2.0 DESCRIPTION OF THE STUDY AREA

This section provides background information on the study area, emphasizing its hydrology and current management of flows in the Truckee River system. It also discusses the effects of historical development on the study area's natural resources as well as future activities for the project area that are currently in the planning and implementation stages, and which could affect the Service's assumptions and/or analysis of the TMFCP. A more detailed description of the area's biological resources is provided in Section 5.0.

2.1 BACKGROUND

The Truckee River basin is a closed system within the Great Basin, encompassing 3,060 square miles (mi) of California and Nevada (U.S. Department of the Interior 1998). Streams in the Great Basin are generated from snowpack in high mountain ranges and terminate in sink areas that may contain lakes, wetlands, or playas. The crest of the Sierra Nevada mountain range forms the western boundary of the Truckee River basin, with elevations ranging between 5,000 and approximately 10,500 ft (ft) above mean sea level. The California portion of the study area is approximately 760 square mi and contains Lake Tahoe and the El Dorado, Toiyabe, and Tahoe National Forests in portions of El Dorado, Nevada, Placer, and Sierra Counties. Population centers in this portion of the project area are Truckee, South Lake Tahoe, and Tahoe City. The Nevada portion of the basin encompasses approximately 2,000 square mi and contains portions of the Toiyabe and Tahoe National Forests, the Pyramid Lake Paiute Tribe (PLPT) Reservation in Washoe, Storey, and Lyon Counties. Population centers in Nevada are Reno, Sparks and Wadsworth.

The Upper Truckee River begins in the California Sierra Nevada Mountains from which it enters the southern end of Lake Tahoe (Figure 1). Over 60 other creeks and streams also flow directly into Lake Tahoe. The 114-mi mainstem Truckee River originates at the outlet of Lake Tahoe at Tahoe City and terminates at Pyramid Lake on the PLPT Reservation, in Nevada. The elevation of the river decreases 2,300 ft over this distance for an average slope of 20 ft/mi. The river flows through Quaternary glacial deposits and Miocene volcanic rock (basalt, andesite, and breccia) for the first 30 mi. From 25 to 43 mi downstream, the river travels through a canyon with walls composed of volcanic rock. Sediments in this Reach are composed of unconsolidated gravel, sand, and silt (alluvium). From 44 to 75 mi downstream, the river continues to flow through alluvium. Further downstream, quaternary lacrustrine sediments become more prevalent (Green and Fritsen 2006).

The outflow of Lake Tahoe is controlled by the Lake Tahoe Dam (site of the natural outlet), built in 1870. The natural outlet is at elevation 6,223 ft and the small dam is operated, to the extent practicable, to prevent lake elevation from exceeding 6,229.1 ft (U.S. Department of the Interior 2004). The drainage area upstream of the dam is 506 square mi, of which Lake Tahoe encompasses 192 square mi. The dam creates 744,600 acre-ft of useable storage between these elevations to store and release project water for Floriston Rates (described below).

From Lake Tahoe, the Truckee River flows north and east for about 40 mi, through Truckee and enters Nevada near Farad, California (Figure 1). The main tributaries in this area include Donner, Martis, and Prosser Creeks and the Little Truckee River, all of which are regulated by dams. A concrete dam at the outlet of Donner Lake creates a usable reservoir of 9,500 acre-ft for use by NV Energy and the Truckee-Carson Irrigation District. Martis Creek is regulated by a dam approximately 2 mi from its confluence with the Truckee River, resulting in a reservoir with a capacity of 20,400 acre-ft (Martis Creek Reservoir). Prosser Creek Reservoir is located about 1.5 mi upstream of the confluence of Prosser Creek with the Truckee River, and has a capacity of 29,800 acre-ft. Independence Lake is located on Independence Creek, where an earth-fill dam controls the top 28 ft of the lake above the natural outlet. This provides a usable reservoir of 17,500 acre-ft. Stampede Reservoir is located on the Little Truckee River about 8 mi upstream of its confluence with the Truckee River and 3 mi upstream of Boca Reservoir. It has a storage capacity of 226,500 acre-ft. Boca Reservoir is also located on the Little Truckee River, near its confluence with the Truckee River, and has a capacity of 41,100 acre-ft. In general, these reservoirs store Truckee River surface water in the spring, and release it in the summer and early fall. Reservoir storage, along with natural runoff, determine water supply available to Nevada (U.S. Department of the Interior 2004).

Operation of these reservoirs regulates much of the flow in the Truckee River basin in most years. These reservoirs together can store about 1 million acre-ft of water. A number of court decrees, agreements, and regulations govern day-to-day operations of these reservoirs, which are administered by the Federal Water Master for the Orr Ditch and Alpine Courts. The reservoirs are operated to capture runoff as available while maintaining Floriston Rates, in the Truckee River, measured at the Farad gage near the California-Nevada State line. Floriston Rates provide water to serve hydroelectric generation, municipal and industrial use in Truckee Meadows, flow, and agricultural water rights (U.S. Department of the Interior 2008). In general, each reservoir currently has authorization to serve specific uses.

Downstream from Farad, California, principal tributaries of the Truckee River include Dog, Hunter, Steamboat and Long Valley Creeks. In Nevada, Steamboat Creek, with a watershed of 130 square-mi, is the major tributary of the Truckee River (Figure 1). This creek originates at the outlet of Washoe Lake to the south, and enters the Truckee River adjacent to the Truckee Meadows Water Reclamation Facility (TMWRF) within the City of Sparks. The TMWRF discharges approximately 81 acre-ft/day of treated effluent to the creek (Green and Fritsen 2006), and is the largest point source for surface water returns to the river (U.S. Department of the Interior 2004). Tributaries to Steamboat Creek include Galena, Evans, Thomas, and White Creeks. The 600 square-mi drainage area downstream from the Truckee Meadows to Pyramid Lake provides only minimal contributions to the Truckee River water supply. The most significant tributary is Long Canyon Creek, which flows into the Truckee River near the town of Lockwood.

The Reno-Sparks metropolitan area (located in Washoe County) is the principal population center through which the Truckee River flows. This area is a high desert valley (4,400 ft elevation) bounded on the west by the Carson Range of the Sierra Nevada, on the east by the Virginia Range, and on the north and south by low hills. There are existing floodwalls along the river through the Downtown Reno Reach until about Lake Street. Land use is primarily residential, municipal and industrial with some agriculture, whereas land use in downstream areas is primarily agricultural with the exception of PLPT Reservation. The PLPT reservation surrounds Pyramid Lake and the lower Truckee River and includes the communities of Sutcliffe, Nixon, and Wadsworth.

On the east side of Sparks (near Vista Boulevard), the river enters the Truckee River Canyon. Further downstream, the river reaches Derby Diversion Dam where river flows up to 1,000 cfs are diverted into the Truckee Canal. This water is supplied out of the basin to Lahontan Reservoir to supplement the Carson River water supply in accordance with the 1997 Operating Criteria and Procedures (OCAP) for the Newlands Project. The average annual Truckee Canal discharge is estimated to be 161,500 acre-ft (U.S. Department of the Interior 2004). Twenty mi downstream, the Truckee River enters the Pyramid Lake Indian Reservation and turns north at Wadsworth (Figure 1). The river flows for another 17 mi to Numana Dam, the diversion dam for irrigation on the reservation. About 8 mi downstream from Numana Dam is Marble Bluff Dam, which is designed to reduce erosion along the lower Truckee River. At the dam, a fish lock, constructed in 1998, and the Pyramid Lake Fishway aid the upstream migration of Pyramid Lake fishes that rely upon river spawning and rearing habitat.

2.1.1 HYDROLOGY

The Sierra Nevada greatly influences the climate in Nevada. Precipitation falls almost exclusively as snow from November to April (85 percent of annual precipitation). Most Truckee River runoff results from snow that accumulates on the eastern slope of the Sierra Nevada in the winter and melts in late spring and early summer. Hydrologic regimes within the Truckee River depend on snowpack in the Sierra Nevada range just west of downtown Reno. The lowest annual precipitation recorded in Truckee, California was 16.04 inches (1976); highest annual precipitation was 54.62 inches (1996). The average annual precipitation is about 30.4 inches. Total snowfall for Truckee averages 204.4 inches per year.

There are several primary patterns that characterize the hydrologic regime of the Truckee River: (1) high intensity, short duration peaks that occur episodically during winter months; (2) moderate magnitude, long duration snowmelt peaks that occur from April to June; (3) a period of declining, moderate flow following spring runoff; and, (4) a period of low (base) flow that occurs from August to March. The average annual discharge in the Truckee River at Vista from 1899 to 1996 was 584,000 acre-ft (U.S. Geological Survey 1996). Some of this is composed of surface water return flow from irrigation and M&I uses. It is not uncommon for some sections of the river to become completely dewatered during low-flow periods.

Cycles of flood and drought in the Truckee River are recorded by stream gages installed in the early 1900's (Table 1). Drought periods occurred in 1912, 1929-1934, and 1987-1994 (Otis Bay Ecological Consultants 2004). The two most severe droughts on record occurred from 1928 through 1935 (average annual discharge at Farad of 303,240 acre-ft) and from 1987 through 1994 (average annual discharge at Farad of 286,350 acre-ft). The lowest recorded flow at Farad was 37 cfs in September 1933. Significant flood events usually occur between the months of November and March and are driven by intense rain or rain-on-snow events (Otis Bay Ecological Consultants 2004). Major flood events occurred in 1907, 1909, 1928, 1937, 1950, 1955, 1963, 1983, 1986, and 1997. The "high water year" in the Truckee River basin is 1983, when Truckee River annual discharge recorded at the Farad gaging station was 1,769,000 acre-ft (Horton 1995). The effect of existing reservoir storage facilities in the upper part of the basin on flood magnitude is not clear. Analysis of the historical flood records at the Farad gage indicate there is no difference in the magnitude of flooding before and after 1962, despite the construction of Prosser Creek (1962), Stampede (1970), and Martis Creek (1971) Dams. However, the combination of effects of channelization activities and the lowering of Vista Reef east of Sparks in the late 1970's have significantly increased flood magnitude in the river's downstream reaches.

Table 1. Historical Truckee River annual discharge (acre-ft per year).

Location	Period of Record	Minimum	Average	Maximum
Truckee River at Tahoe City, CA	1909-2000	109	170,500	832,700
Donner Creek at Donner Lake, CA	1929-2000	5,580	26,330	60,300
Martis Cr near Truckee, CA	1959-2000	4,990	19,700	53,930
Prosser Cr downstream from Prosser Dam, CA	1943-2000	17,690	64,000	154,900
Little Truckee River downstream from Boca Dam, CA	1939-2000	40,250	135,000	340,200
Truckee River at Farad, CA	1909-2000	133,500	561,800	1,769,000
Truckee River at Reno, NV	1907-2000	76,700	509,400	1,701,000
Steamboat Cr at Steamboat, NV	1962-2000	1,390	15,550	83,000
Truckee River at Vista, NV	1900-2000	114,600	603,800	2,017,000
Truckee River downstream from Derby Dam	1918-2000	4,450	304,000	1,760,000
Truckee River near Nixon, NV	1958-2000	17,500	425,100	1,889,000

Note: Data based on Table 3.1 in TROA EIS (U.S. Department of the Interior and State of California 2008).

The estimated average non-damaging channel capacity through the Downtown Reno Reach is approximately 14,000 cfs. Overtopping of the existing floodwalls begins at approximately 15,000 cfs, or about the 50-year event. At approximately 35,500 cfs (200-year event) the river accesses a small breakout channel located on the south bank between Lake and East 2nd Streets. This breakout channel returns to the river corridor downstream of North Wells Avenue.

The estimated average non-damaging channel capacity through the Truckee Meadows Reach is approximately 10,000 cfs. Minor flooding of parks and roadways adjacent to the river begins at between 6,000 and 9,000 cfs. Flooding that impacts adjacent warehouses and other structures begins between 10,000 and 12,000 cfs, or about the 20-to 25-year event (Corps 2004). The flooding in this area is characterized by ponding caused by hydraulic backwater effects from Steamboat Creek at its confluence with the Truckee River. The floodplain is wide and expansive because a natural reef in the Truckee River channel near Vista retards the flow of the river, creating a bottleneck. The current floodplains in this Reach cover a large area and include the Reno-Tahoe International Airport, a significant portion of Sparks, the University of Nevada-Reno (UNR) farm lands, and the Truckee Meadows sink area.

The construction and operation of the Derby Dam has significantly disrupted the hydrology of the lower Truckee River (Figure 1). This is a large trans-basin diversion constructed in 1905 that transfers a significant portion of flow into the Truckee Canal, which supplies Lahontan Reservoir (in the Carson River basin). After diversion began, water elevations in Pyramid Lake and nearby Lake Winnemucca began to decline. By 1939, Winnemucca Lake (previously habitat for cui-ui and the site of a Service National Wildlife Refuge) was completely dry. Pyramid Lake reached its lowest level (3,783 ft) in 1967, some 80 ft below its overflow elevation into Winnemucca Lake. On average, it remains some 60 ft below historic natural highs.

2.1.2 Hydro-Geomorphology

The Truckee River channel has experienced significant changes in response to anthropogenic disturbance since the early 1900's. In general, degradation of important riparian and aquatic habitats has resulted from road and railroad construction, cattle grazing, farming, and other factors. The lower

Truckee River, in particular, has undergone alterations such as straightening, widening, and incision (Gregory, 1982; Harvey *et al.* 1981; Water Engineering Technology, Inc. 1991). Specifically, the Corps began major flood control work on the Truckee River in 1959, completing most of the work by 1963 under the authority of the Flood Control Act of 1954 (State of Nevada 1997). The Truckee River and Tributaries Project was initiated by the Corps to provide flood protection for the Cities of Reno and Sparks. The Corps modified the Truckee River by constructing low levees and making channel modifications between the Truckee Meadows and Pyramid Lake. The straightening led to channel downcutting of roughly 3 ft and depression of the groundwater table. Historically, the river in this area was narrow, deep, and had meandering channels lined with cottonwood and willow forests. Management and distribution of water within the basin has contributed to the alteration of the river's geomorphology by influencing erosion, deposition rates and river discharge. The lowered groundwater depth has disconnected the river from the riparian habitat and surrounding floodplains. Without access to groundwater, regeneration of native riparian vegetation has been significantly impaired for decades, and invasive species have begun to dominate the riparian communities along the river's edge. These changes, in turn, have diminished natural ecosystem structure, function, and processes of the Truckee River and associated riparian habitat and caused a decrease in fish and wildlife diversity. Management and distribution of water within the basin has also contributed to the alteration of the river's geomorphology by influencing erosion and deposition rates and river discharge.

The majority of the lower Truckee River appears to have stabilized over the past 20 to30 years (Miller *et al.* 1994), and has been characterized as a braided and meandering channel (Harvey *et al.* 1981). The river's multiple channels are considered anastomosing (anabranching) where multiple channels are separated by large islands that were excised from the floodplain.

The vertical stability of the Truckee River is partially enhanced by the development of stream-bed armor composed of particles deposited under the current hydrologic regime (Miller *et al.* 1994). Under the current hydrologic regime of the Truckee River, much of the sediment load cannot be transported and stream-bed armoring may be limiting the potential for future incision along some portions of the river (Miller *et al.* 1994). There is speculation that headward movement of knickpoints would have the ability to destroy stream-bed armor, allowing incision to occur, but at a potentially slower pace. The incised and straightened Truckee River channel increased the sediment transport rate because all the streamflow is held within the banks, which causes the channel slope and flow depth to increase and results in higher in-channel shear stress (Otis Bay Ecological Consultants 2004).

Since the 1970's, many actions have been implemented in an attempt to ameliorate the ecological decline of the lower Truckee River, including: the purchase and dedication of water rights to improve instream flows, changes to reservoir operations to create flow conditions that support cottonwood tree recruitment and cui-ui spawning, the removal of key barriers to fish passage, and the purchase and subsequent protection of key sections of the Truckee River floodplain.

2.1.3 Diversions and Fish Passage

Construction of dams and water diversions has severely affected the movement of aquatic species throughout the Truckee River system. In particular, these structures act as complete or partial barriers to the upstream migration of the federally-listed LCT and the cui-ui to their historical spawning and rearing habitats. All life stages of these fish may be entrained in diversion canals, impinged on screens, or delayed in migration. As a result, these native fish species are often forced to use sub-optimal habitats, reducing productivity and annual survivorship.

More than 30 dams exist in the mainstem Truckee River and a number of others exist in associated tributaries. The largest is Marble Bluff, just above the river's terminus in Pyramid Lake. It was built to control headcutting caused by dewatering related to a cross-basin diversion to the Carson River Newlands Project (i.e, the Truckee Canal). As part of a feasibility study, the Corps targeted 18 diversions for potential improvements as part of the TMFCP (Conyngham *et al.* 2007) (Table 2). The Corps' Engineer Research and Development Center (ERDC) was tasked to determine fish passage problems at each barrier, propose improvement measures, combine measures into potential alternatives, and develop a model to quantify environmental benefits of preferred alternatives. The ERDC developed a model for assessing the environmental benefits of fish passage measures with input from a working group of resource experts from the PLPT, Service, TMFCP, BOR, NDOW, U.S. Bureau of Indian Affairs (BIA), U.S. Geological Survey (USGS), and Truckee Meadows Water Authority (TMWA).

For the Truckee River basin, eight native fish species were selected for evaluating passage benefits. Both upstream and downstream fish passage were assessed for the identified species at all 18 structures. Environmental benefits were assessed by combining qualitative and quantitative measures of passage efficiency, species characteristics, and habitat range.

Table 2. Truckee River barriers identified for potential re-engineering to improve fish passage.

Barrier Name	Function	Ownership
Fleish Diversion	Hydropower	NV Energy/ TMWA
Washoe/Highland Diversion	Municipal/ Irrigation	TMWA
Derby Dam	Irrigation	BOR
Numana Dam	Irrigation	BIA/PLPT
Marble Bluff Diversion Dam	Grade Control	BOR/Service
Steamboat Ditch	Irrigation/ Municipal	TMWRF
Verdi Diversion	Hydropower	TMWA
Chalk Bluff	Municipal	TMWA
Last Chance	Irrigation	Private
Lake Ditch	Irrigation/ Municipal	Private
South Side Ditch	Inactive	Private
Orr Ditch	Irrigation	Private
Idlewild Ponds	Recreation	Reno
Cochran Ditch	Municipal	Private
Tracy Power Plant	Cooling Water	NV Energy
Herman Ditch	Irrigation	PLPT
Fellnagle Diversion	Irrigation	PLPT
S-S Diversion	Irrigation	PLPT

Source: Modified from Table 4 in Conyngham *et al.* 2007.

The changes in benefit values were then used to determine the most cost-effective designs to improve fish passage on the river. Based on this analysis, the upstream and downstream modifications from the barriers shown above were identified as the most cost-effective level of fish passage improvement for inclusion in the flood control project. Detailed descriptions and engineer designs of each fish passage improvement are included in Appendix C, Fish Passage plates. A brief description of the current condition of these barriers follows. A description of the proposed modifications to each structure, intended to improve fish passage, is provided along with a description of the project alternatives in Section 6 of this document.

Fleish Diversion. Fleish Diversion is operated by the TMWA for hydropower production. It diverts 350 - 360 cfs year round. Two 12-ft radial gates control the diversion. To allow for upstream passage of fish around the dam, a perennial bypass channel would be constructed on the west bank of the river carrying an average discharge of 50 cfs. A gated control structure would be constructed at the head of the bypass to minimize the chance of channel capture and to control the flow. Higher gradient reaches in the bypass would require weir features of 2-ft stone, with footers, in an upstream pointing chevron with defined low flow passage.

Steamboat Ditch Diversion. This diversion owned by Steamboat Canal and Irrigation Co. is located on a tributary of the Truckee River, in Steamboat Creek, but still diverts approximately 50 cfs.

Verdi Diversion. The Verdi diversion is also managed by TMWA and supplies a hydropower facility. The design discharge is 483 cfs. Flow into the diversion ditch is controlled by two tainter gates.

Washoe/Highland Diversion. TMWA manages Washoe Dam, which feeds both the Mogul Powerhouse hydropower station (350 cfs diversion October through February and 436 cfs diversion March through September; this water is returned to the river after turbine passage) and the Highland Diversion, which supplies irrigation demand (120-day continuous rate of 7 cfs) and the main supply for the Chalk Bluff municipal water treatment plant (about 80-90 cfs from April through December).

Chalk Bluff Diversion. The Chalk Bluff Diversion and pumping station is owned by TMWA. It features a Denil fish ladder and screened diversion and is controlled by a weir 120 ft long and about 3 ft high. The diversion has the capacity of 83 million gallons per day.

Herman Ditch Diversion. The Herman Ditch has a water right for a 120-day continuous rate of 10.65 cfs. The structure is mainly composed of large boulders. Current flow paths in this location are creating significant right bank erosion and mid-channel deposition. This diversion has a historically high failure rate during winter and spring flows.

Fellnagle Diversion. This is a small irrigation diversion near Wadsworth that is owned by the Fellnagle Dtich Company.

S-S Ranch Diversion. The purpose of the S-S Ranch Diversion is for irrigation at a 120-day continuous rate of 1.8 cfs for agricultural land owned by PLPT. The diverted water runs through an earthen canal for approximately 2 mi.

Marble Bluff Dam. This facility was created in 1975 to reduce further erosion of the lower Truckee River. It consists of four components; the dam itself, fish lock/elevator, a delta bypass, and a fish handling facility. The facility is owned and operated in partnership by the PLPT and the BOR.

2.2 FUTURE ACTIVITIES

A number of activities affecting the Truckee River independent of the proposed TMFCP, yet included in the Corps plans and designs, are anticipated to occur in the near future (*i.e.*, the next 10 - 20 years). These are identified here for purposes of establishing baseline condition and identifying a future condition for a No Action alternative.

<u>Truckee River Action (TRAction) Projects</u>
TRAction projects are components of the proposed project that have been identified as fast track projects. Various FRM components have been identified in studies, but are expected to be implemented in advance of Congressional authorization of the TMFCP by the local sponsors of the project.

North Truckee Drain Realignment. The City of Sparks is proposing to realign the North Truckee Drain, which will divert water to the Truckee River below the Vista Reefs. The realignment would relocate the confluence of the drain with the Truckee River approximately 4,500 ft downstream from its existing outlet. This realignment requires the construction of new conveyance facilities, including concrete-lined channel and box culverts. The channel would be placed in a buried box culvert for a length of approximately 5,000 ft upstream of its new confluence with the Truckee River and the containment feature along the remainder of the channel will be floodwalls. A concrete exit channel will be constructed for about 500 ft upstream of the mouth of the channel. The purpose of the channel re-alignment is to relocate the North Truckee Drain to downstream of the constricted existing channel area, nearer to the mouth of Steamboat Creek and the existing Truckee Meadows Water Reclamation Facility (TMWRF) plant. The North Truckee Drain project is in the final feasibility and design phases. The Service has recently received a request to initiate consultation pursuant to Section 7 of the ESA.

<u>Truckee River Operating Agreement (TROA)</u>
Future management of the storage of Truckee River flows in Federal reservoirs is proposed as part of the TROA. TROA's primary purpose is to implement section 205(a) of P.L. 101-618, which directs the Secretary of the Interior to negotiate an agreement with California and Nevada to increase the operational flexibility and efficiency of seven reservoirs in the Lake Tahoe and Truckee River basins. TROA would provide additional water storage in existing reservoirs for future M&I demands during periods of drought conditions in the Truckee Meadows, and enhance spawning flows in the lower Truckee River for the benefit of Pyramid Lake fishes. In addition, it would satisfy all applicable dam safety and flood control requirements and ensure that water is stored in and released from Truckee River reservoirs to satisfy the exercise of Orr Ditch and Truckee River General Electric Decree water rights and minimize the Secretary's costs associated with operating and maintaining Stampede Reservoir. It would also increase recreational opportunities in the Federal reservoirs, improve streamflows and fish habitat throughout the Truckee River basin, and improve water quality in the Truckee River.

TROA would supersede all requirements of any agreements concerning the operation of those reservoirs, subject to the terms of the Truckee River Agreement and Tahoe-Prosser Exchange Agreement, and would become the sole operating agreement for all reservoirs. Implementing TROA would trigger certain provisions of P.L. 101-618 to also become effective, including the

California-Nevada Interstate Allocation (section 204 of P.L. 101-618) of waters of Lake Tahoe and Truckee River basins. In January 2008, a final EIS for TROA was issued, and is the basis for the biological resources description in this CAR (U.S. Department of the Interior 2008).

Improvements to Existing Diversions

Derby Diversion Dam. The BOR is proposing to install fish screens for its diversion channel, which will re-direct fish back into the Truckee River.

S-S Ranch Diversion Dam. The S-S Ranch, owned and operated by the PLPT, is proposing to rebuild their diversion dam within the Reservation in the lower Truckee River. The existing diversion sustained extensive damage during flood flows in January 2006. The proposed structure is designed to create head, but will allow fish passage.

3.0 FISH AND WILDLIFE CONCERNS AND PLANNING OBJECTIVES

The Service has identified numerous fish and wildlife resources that could be adversely impacted by the proposed TMFCP. In general, anticipated impacts from the proposed project include:

- permanent displacement of highly-valued riparian habitat types, including existing cottonwood and willow stands;
- loss of complex river geometry (*e.g.*, gravel bars, riffles) in favor of flow conveyance;
- entrainment or stranding of fish by structural features immediately after flood events;
- mobilization of contaminants (*e.g.*, mercury, arsenic, and boron) from Steamboat Creek and hazardous materials from other areas;
- loss of desirable channel features (*e.g.*, large woody debris, gravel and cobble substrates);
- degraded water quality associated with in-channel construction activities like dredging;
- direct disturbance to fish and wildlife from construction activities;
- spread of invasive species (*e.g.*, tall whitetop) from construction activities;
- extensive use of rip-rap and other “hardened” features over bio-engineering techniques;
- construction-related disturbance during sensitive periods (*e.g.*, avian nesting season);
- disturbance from temporary roads and staging areas;
- improper storage of excess spoil material;

- contamination from spills and an inadequate countermeasure plan;
- lack of long-term management plans for highly-valued habitat areas;
- high failure rate of new plantings and seedlings;
- creation of habitats favoring non-native species; and
- flow of contaminants from stormwater runoff.

Consistent with our Mitigation Policy (46 FR 15, January 23, 1981), the Service's planning objective for the TMFCP is to identify measures to conserve in-kind the habitat values associated with the riparian and aquatic areas of the Truckee River throughout the project's footprint and areas beyond.

4.0 EVALUATION METHODOLOGY

The evaluation methodology used by the Service is based on a comparison of existing to future conditions in terms of surface area (acres) that considers the value to wildlife and fish. Existing cover types are delineated based on a vegetative and water surface mapping units identified by Lichvar and Ericsson (2005). Using this delineation, the Service assigned a habitat value rating (high, moderate, and low) to each these existing cover types based on the Lichvar and Ericsson (2005) criteria. The Service's basis for evaluating project effects across alternatives considers the overall net increase/decrease in surface area based on habitat value.

5.0 EXISTING BIOLOGICAL RESOURCES

Riparian habitats, because of their moisture gradients, their dynamic response to river processes, and their long complex interfaces between both upland and aquatic habitats, are among the most diverse and biologically productive ecosystems (Naimann *et al.* 1993). This is particularly true in arid areas such as the Western United States. An investigation on the Inyo National Forest in California, for example, found that riparian areas comprised less than 0.4 percent of the land area but were essential habitat for about 75 percent of local wildlife species (Kondolf *et al.* 1987). The geomorphology of the Truckee River strongly influences the biological communities associated with it. Currently, the system is expressed as multiple channels, where many of these channels are separated by large islands that are excised from the floodplain (Otis Bay Ecological Consultants, 2004).

The following discussion of existing biological resources emphasizes the geographic scope of the project area, which primarily consists of the Truckee River and the associated riparian zone.

5.1 SURFACE COVER TYPES

As a part of a planning-level delineation of existing surface cover types for the proposed project, the Corps' ERDC of the Cold Regions Research and Engineering Laboratory (ERDC-CRREL) identified 51 map units within the project footprint (Lichvar and Ericsson, 2005). The Service grouped these units into seven major surface cover types: (1) open water/pond/riverine (OWPR), (2) emergent wetland/marsh (EWM), (3) native riparian forest (NRF), (4) upland native herbaceous / shrub / grasslands (UNHSG); (5) willow / mixed willow shrub (WMWS); (6) upland non-native herbaceous (UNNH), and (7) disturbed / bare (DB) (Table 3). Under the alternative with the largest potential footprint (*i.e.*, Alternative 4), the proposed project would span approximately 2,637 acres.

Table 3. Major surface cover types based on existing map units within the footprint of the proposed project.

	Habitat Value[b]	**Acreages by Reach**			
Major Cover Type[a]		**Verdi**	**Downtown Reno**	**Truckee Meadows**	**Lower Truckee River**
Emergent Wetland/Marsh	High	0.3	0.1	8.8	25.2
Open Water/Pond/Riverine	High	1.8	15.0	12.8	361.6
Native Riparian Forest	High	1.4	11.3	20.0	83.6
Upland Native Herbaceous	Moderat	0.4	0.3	16.8	192.7
Willow/Mixed Willow	Moderat	2.3	7.2	43.9	56.9
Disturbed/Bare	Low	2.8	44.6	195.5	321.9
Upland Non-native	Low	0.0	5.3	94.8	404.6
TOTAL:		**9.0**	**83.8**	**392.6**	**1446.5**

[a] as delineated by Lichvar and Ericcson 2005.
[b] The Service assigned a habitat value to major cover type that considered vegetation maturity, nativeness, and surface water.

The Service assigned each major cover type to a habitat value of high, moderate, or low, based on a general understanding of essential components needed to support healthy wildlife and fish populations in the Truckee River system. This considered, among other things, the vegetation nativeness (exotic versus native) and stage of development (immature versus mature) and presence of surface water. EWM, OWPR, and NRF are considered to be of high value; UNHSG and WMWS to be of moderate value, and DB and UNNH to be of low value.

5.2 AQUATIC RESOURCES

5.2.1 WATER QUALITY

Aquatic resources within the Project area are affected by water quality which, in turn, is largely driven by flow. Other factors influencing aquatic life include stream gradient, water depth, water temperature, organic and inorganic nutrients, and salinity, substrate type, cover, seasonal variability, aquatic plant and invertebrate abundance, and the presence of other species that are food sources, competitors, or predators. All of these factors interact, and species respond differently to any given set of environmental conditions at different stages of their life cycles.

Primary water quality concerns in the Truckee River are reduced flows and elevated nutrients, which can drive warmer water temperatures and low dissolved oxygen (DO) concentrations. In warm weather, water temperatures gradually increase downstream, especially in low gradient areas where velocities are slow. Warm weather and low flows can result in increased water temperatures. These factors allow algae to attach to the river bottom and accumulate, thereby increasing amounts of organic matter, which results in low DO concentrations as it decays (U.S. Department of the Interior and State of California 2008). The combined effects of these impacts are detrimental to fish populations and increase Total-Dissolved-Solids (TDS) levels discharged into Pyramid Lake.

Seasonally excessive high flows, associated with high storm runoff, may scour the river channel, altering the substrate for invertebrates and spawning fish, and removing vegetation. With very low flows, habitat area is reduced, water temperature may increase beyond the tolerance of many species, DO concentrations may decline, and organisms may become stranded in isolated pools. Stranding may result in death from oxygen depletion, high water temperature, or increased predation by birds and other predators that can easily reach the trapped invertebrates or fish. However, indigenous species evolved with and adapted to the highly variable streamflows of the unregulated river system.

The State of Nevada has established water quality standards (NAC 445A.070 – 445A.225) for waterbodies by (1) designating beneficial uses of the water and (2) setting criteria necessary to protect the beneficial uses. The beneficial uses for the Truckee River within the project area (Idlewild Park to Wadsworth) include propagation of wildlife and aquatic life, irrigation, watering of livestock, recreation, industrial supply, and municipal or domestic supply. Aquatic species of concern have been identified as mountain whitefish, rainbow trout, brown trout, cui-ui and LCT. The lower portion of Steamboat Creek and all of Lagomarsino Creek are designated as Class D waters where the beneficial uses include aquatic life, propagation of wildlife, irrigation, watering of livestock, industrial supply, and recreation not involving contact with the water.

The State of Nevada has established site-specific standards for the Truckee River in the project area at the following locations: Idlewild (NAC 445A.185), East McCarran (NAC 445A.186), Lockwood (NAC 445A.187), Derby Dam (NAC 445A.188), Wadsworth (NAC 445A.189) and the Truckee River at Pyramid Lake (NAC 445A.190). Parameters include temperature, pH, DO, chlorides, phosphates, nitrogen, ammonia, TDS, turbidity, color, alkalinity, fecal coliform (*Escherichia coli*) suspended solids, sulfates, sodium, and Biochemical Oxygen Demand (BOD). For lower Steamboat and Lagomarsino Creeks, parameters include floating solids, sewage, toxic materials, pH, and DO.

In Nevada, the Truckee River is 303(d)-listed for total phosphorus, total nitrogen, TDS and turbidity. The lower river appears to transition from a high to low nitrogen:phosphorus ratio (Green and Fritsen 2006). The Nevada Department of Environmental Protection (NDEP) incorporated Total Maximum Daily Loads (TMDLs) in the National Pollutant Discharge Elimination System (NPDES) permit for the TMWRF in 1994. Since 1994, TMWRF has not been able to consistently meet the waste load allocation for total nitrogen due to treatment problems, such as snails consuming nitrifying bacteria populations, which resulted in high total nitrogen concentrations in the final effluent. As a result of continued noncompliance with the permit limit for total nitrogen, NDEP issued a Finding of Alleged Violation and Order to TMWRF on November 14, 1997.

Downstream of Wadsworth, the PLPT has adopted a Water Quality Control Plan (WQCP) since 2001 to protect, preserve and enhance the biological, chemical, and physical integrity of waters within the exterior borders of the Reservation (http://plpt.nsn.us/environmental/water.htm). The WQCP addresses issues such as beneficial uses, antidegradation, water quality criteria, and implementation plans in accordance with the Tribe's Water Quality Ordinance. On January 30, 2007, the PLPT received Treatment As State Status pursuant to Sections 303 and 401 of the Federal Clean Water Act by the EPA for Program Authority to conduct Water Quality Standards and 401 Certification within the exterior boundaries of the PLPT. Revisions to the 2001 WQCP have been prepared by the PLPT based on comments and recommendations by EPA. The WQCP will be reviewed and approved by the Tribal Council and then by the EPA before revisions are in effect.

5.2.2 AQUATIC VEGETATION

Algae are the basis of the food chain and are grazed by zooplankton. Excessive nutrients downstream of TMWRF (Truckee Meadows and Lower Truckee River Reaches) help stimulate algal growth in the Truckee River. Eight phyla of algae exist in the Truckee River basin containing 12 classes, 32 orders, 57 families, and 512 known species (Lawrence and Seiler 2002). Temperature, availability of nutrients, and other aquatic parameters such as turbidity, and concentrations of organic and inorganic compounds are important elements that can influence composition and abundance of algae in the Truckee River. In general, water temperature and nutrient concentrations increase with decreased streamflow.

Periphyton is the dominant group of algae that occurs in the Truckee River. Periphyton is a complex matrix of algae and heterotrophic microbes attached to submerged substrata that is found in almost all aquatic ecosystems. It serves as an important food source for invertebrates and some fish, and it can be an important absorber of contaminants. Periphyton is also an important indicator of water quality; responses of this community to pollutants can be measured at a variety of time scales representing physiological to community-level changes. Excessive periphyton growth is known to impair ecosystem health. However, there is not sufficient information available on abundance of periphyton combined with flows over long periods in the Truckee River to determine its exact impact to fish or other aquatic species.

Phytoplankton are suspended microscopic organisms found in the water column and are capable of photosynthesis. The presence of certain species can be based upon several chemical or physical factors such as light, temperature, pH and nutrient concentrations. Rapid growth rates in phytoplankton sometimes result in surface "blooms" in which one or more species actually form a visible mat in or on top of the water. Phytoplankton data have been used to document the extent of biological response to nutrient enrichment.

Aquatic macrophytes provide habitat for young fish and aquatic animals, stabilize river bottoms, provide food for waterfowl, and can help protect water quality. However, uncontrolled growths of exotic or non-native species may cause problems including loss of one or more uses of the water body.

5.2.3 AQUATIC INVERTEBRATES

Aquatic invertebrates cycle organic matter, feed on aquatic plants and micro-organisms, serve as both predators and prey to other macroinvertebrates and are an important food source for fish. Larval forms are important to the diet of birds, particularly waterfowl and shorebirds. Adult macroinvertebrates with aquatic larval forms, such as dragonflies and damselflies, are prey for vertebrates found along shorelines or in riparian areas. Eight phyla of aquatic invertebrates exist in the Truckee and Carson River basins containing at least nine classes, 19 orders, and 55 families (O'Connell *et al.* 1962; Jones and Stokes 1973; Cooper 1983; Koch and Hainline 1976; Pacific Environmental Laboratories 1979; McLaren 1977; McLaren 1978; Brown and Caldwell 1979; Lawrence and Seiler 2002; TMWRF data). Dominant invertebrate groups found in the Truckee River system are shown in Table 4.

Table 4. Common aquatic invertebrate taxa found in identified reaches in the Truckee Meadows Flood Control Project. (D. Higgins, U.S. Fish and Wildlife Service, unpublished data)

REACH: **TAXON:**	**1**	**2**	**3**
Diptera (True Flies)	X	X	X
Coleoptera (Beetles)	X	X	X
Ephemeroptera (Mayflies)	X	X	
Plecoptera (Stoneflies)	X	X	
Trichoptera (Caddisflies)	X	X	X
Odonata (Dragonflies)			X
Gastropoda (Snails)	X		X
Bivalvia (Clams)			
Amphipoda (Freshwater shrimp)			
Decapoda (Crayfish)	X		X
Oligochaeta (Aquatic earthworms)	X	X	X
Turbellaria (Free-living flatworms)			
Chelicerata (water mites)	X	X	X

The macroinvertebrate community in the Truckee River is much more dynamic than most vertebrate populations. Species numbers and composition may vary from place to place depending on numerous factors. It is difficult to determine acres of habitat for these organisms because of the dynamic nature of the system and the variety of factors that affect species distributions. Invertebrates can accommodate the natural rise and fall of variable streamflows by moving up with the water and outside the stream banks, by burrowing into the substrate, or by taking refuge in debris along stream banks. They return to the stream channel as the water recedes. Elevated flows in the spring during normal to wet seasons perform the function of flushing sediment from the stream system, which, in turn, increases pore spaces within the stream-bottom substrate and provides surface area for invertebrates to inhabit. However, decreased flows and increased temperatures by the summer period can lead to algal blooms, subsequent stream embeddedness, and decreased DO which reduces the diversity and abundance of macroinvertebrates down-gradient in the system, especially below the Reno/Sparks urban area. As a result, shifts in macroinvertebrate assemblages toward more tolerant taxa are seen in the two lowermost reaches of the Truckee River.

The middle portion of the Truckee River (Downtown Reno and Truckee Meadows Reach) is dominated by Trichoptera, Diptera, Ephemeroptera, and Oligochaeta taxa that are tolerant of moderate or highly degraded water quality conditions. Reach 3 is dominated by a few highly tolerant taxa within Ephemeroptera, Diptera, and Trichoptera. Highly tolerant bivalves and flatworms are also common (Higgins 2008).

5.2.4 FISH

Within the Project area, the Truckee River supports a variety of native and non-native fish species that vary in relative abundance across reaches (Table 5). Native species include cui-ui, LCT, Mountain whitefish, Lahontan redside shiner, Lahontan tui chub , speckled dace, Tahoe sucker, Paiute sculpin, and mountain sucker. In general, these species are spring-time spawners that require clean, cool water and gravel-type substrates.

Beginning in the late 1800s, many non-native fish species were introduced into the Truckee River basin with the establishment of the office of the Nevada Fish Commissioner (Sigler and Sigler 1987). Non-native species present in the project area include rainbow trout , cut-bows, brown trout, brook trout, tiger trout, goldfish , carp, golden shiner, largemouth bass, smallmouth bass, green sunfish, black crappie, mosquitofish, channel catfish, brown bullhead, and fathead minnow. Rainbow and brown trout have been the two most successful species in the Verdi Reach and upstream tributaries, although they have been supplemented with annual plantings of hatchery-reared individuals in certain areas to improve recreational fishing (NDOW 1992). Introduced trout are reported to adversely affect the distribution and abundance of native aquatic species in the Sierra Nevada (Knapp 1994). Rainbow trout, as a close relative to LCT, spawns at the same time and habitats as LCT, with which it can hybridize (Truckee River Implementation Team[3] (TRIT) 2003).

The fish species native to the Truckee River have adapted since the last Ice Age to the highly variable streamflows of the river system prior to its being regulated by humans. Following construction of upstream dams and reservoirs and channelization of portions of the Truckee River, fish have had to cope with regulated streamflow patterns that differ in volume and duration from natural streamflows. These changes and the secondary effects they have caused, (*e.g.*, higher water temperatures), along with the lowering of the water elevation of Pyramid Lake, have contributed to the reduction in populations of many native fish. Fish may become stranded or experience increase potential for predation and exposure to high temperatures or anoxia (U.S. DOI 2007).

Most fish spawn during the spring, when high flows are present and conditions are suitable for spawning needs (*i.e.*, cool water temperatures, connectivity among tributaries, good water quality, and high DO concentrations). In the Truckee River, spawning and fry rearing habitat is degraded, and many of the complex pool habitats critical to juvenile survival have been lost. Available habitat for spawning and rearing of salmonid adults is especially restricted during severe drought. Fall spawning also occurs for mountain whitefish, brook trout and brown trout. These species typically spawn from September through December, their progeny emerging from the gravel in early spring.

[3] Composed of representatives from U.S. Fish and Wildlife Service, U.S. Geological Survey , U.S. Forest Service, Bureau of Indian Affairs, Bureau of Reclamation, California Department of Fish and Game, Pyramid Lake Paiute Tribe, Trout Unlimited, Otis Bay Consultants, and the University of Nevada Reno.

Table 5. Relative abundance of native and non-native fish by Reach within the Truckee Meadows Flood Control Project.

REACH: SPECIES:	Lake Tahoe to Verdi Reach	Truckee Meadows Reach	Lower Truckee River Reach
Native species:			
Lahontan cutthroat trout	U-P	U-P	U-P
Mountain whitefish	C	C	U
Paiute sculpin		C	None
Lahontan redside shiner	C	C	C
Speckled dace	C	C	C
Lahontan tui chub	C	None	U
Tahoe sucker	C	C	C
Mountain sucker	U	C	C
Cui-ui	None	None	U-S
Non-native species:			
Rainbow trout	C-R	C-R	C
Brown trout	C-R	C-R	C-R
Brook trout	U	U	None
Tiger trout	U-P	U-P	None
Goldfish	None	None	U
Carp	None	U	C
Golden shiner	None	None	U
Largemouth bass	None	U	U
Smallmouth bass	U	U	U
Green sunfish	None	U	U
Black crappie	None	U	U
Mosquitofish	None	None	C
Channel catfish	None	None	U
Brown bullhead	None	U	U
Fathead minnow	None	U	C

Source: Modified from U.S. Department of the Interior and State of California (2008)
[a] Occurrence classification: C = Common; U = Uncommon; P = Planted (non-reproducing); R=Planted for recreational fishing only.

5.3 TERRESTRIAL, RIPARIAN, AND SEMI-AQUATIC RESOURCES

5.3.1 TERRESTRIAL VEGETATION

Historically, the Truckee River channel was well connected to its floodplain, resulting in banks and wetland areas that supported abundant willow and cottonwood growth. The dominant riparian tree species existed as structurally complex, multi-canopy forests throughout much of the river corridor (Otis Bay Ecological Consultants 2004). In the last century, riparian and upland vegetation has been severely altered as a result of human activities and natural disturbances including agricultural and urban development, timber harvest, fire, landslides, cattle grazing, industrial development, and human-made dams and diversions (Caicco 1998). As a result, the overall quality of the riparian and shrub habitats has declined with undesirable weedy species invading a large portion of the floodplain (Otis Bay Ecological Consultants 2004). This has been detrimental to natural riverine ecosystem functions. However, in the last decade, some improvements have been observed as a result of the implementation of prescribed ecosystem flows (Rood *et al.* 2003).

As the river reaches the western edge of Reno, the associated riparian area transitions from montane forest to shrubland. This broad transition zone marks a shift in flora between the Mediterranean climate of California and the interior continental climate of the Great Basin (Manley *et al.* 2000). The obvious shift from forest to shrubland is paralleled by a more subtle change in the structure and composition of riparian vegetation along the Truckee River. The montane riparian forest typified by black cottonwood and pine with an alder-willow understory merges gradually to the Great Basin riparian forest of Fremont's cottonwood and willow shrub, or stands of shrubby willow, and lacking trees (Caicco 1998).

In the lower Truckee River, many of the upland plants that occur are drought tolerant due to the dry climatic conditions. In addition, many plants are tolerant of alkaline and saline soil conditions. Plants with higher moisture requirements are generally found in soils adjacent to the river channel or soils with a higher ground water table. Plants requiring high moisture include rushes, sedges, willows, and cottonwoods. Buffaloberry typically occurs as a codominant of willow and cottonwood communities. Typical upland plants that are tolerant of semi-arid, saline, and alkaline soils include greasewood, sagebrush, bitterbrush, ephedra, rabbitbrush, four-wing saltbush, shadscale, and various native grasses (Otis Bay Ecological Consultants 2004).

5.3.1.1 Riparian Vegetation

In general, three types of riparian vegetation occur within the study area: transmontane freshwater marsh, palustrine scrub-shrub wetlands, and palustrine forested wetlands.

Transmontane freshwater marsh includes areas typically dominated by dense perennial, emergent vegetation. Common plant species include slender-beak sedge, water sedge, and beaked sedge. The restricted distribution of emergent vegetation and the prevalence of plant species that require a high water table indicate the habitat cannot tolerate extended periods of drought.

Transmontane freshwater marsh habit is restricted to small areas and narrow bands of streambank vegetation downstream from Verdi and to a few low-lying areas away from the active stream channel where it may persist due to irrigation runoff or seasonal ponding. Although no data exist to document the original area and extent of emergent wetlands found along the Truckee River, the Corps (1992) estimated that 450 acres of palustrine emergent wetlands occurred historically within 164 ft of the river downstream from Sparks. Based on Service (1995a) mapping, 31 acres occurred downstream from Sparks in the early 1990's, primarily upstream of the Tracy plant and upstream of Derby Diversion Dam. Other larger examples are found downstream from Dead Ox Wash. Common plant species include cattail, hardstem bulrush, Olney's bulrush, common reed, slender-beak sedge, soft rush, least spikerush, and aquatic species, such as common waterweed and pondweed. The introduced noxious weed, tall whitetop, is also common in these wetlands. Whitetop (*Lepidium latifolium*)is a federally-listed noxious weed that forms large monoculture colonies that dominate fields and wetlands. Streamflows of 400 to 600 cfs are usually sufficient to inundate the areas where the marshes are found, and inundation occurs annually (Service 1993).

Palustrine scrub-shrub wetlands are dominated by shrubs or young trees less than 20 ft tall (Cowardin *et al.* 1979). The most common type is the Modoc-Great Basin riparian scrub which is a generally dense, deciduous thicket found downstream from Verdi along riverbanks, irrigation ditches, and on stable gravel bars (Service 1993; Caicco 1998). Where willows are dominant, coyote willow is the most abundant, although yellow and shining willows are also common. Downstream from Sparks, riparian scrub habitat is often dominated by Fremont cottonwood saplings. Whether dominated by willow or cottonwood, younger stands often have dense herbaceous understories; older, denser shrub stands usually lack an herbaceous understory. The most common herbaceous species are white sweet-clover, white clover, tall whitetop, and slender-beak sedge. Of these, all but the latter are introduced species.

Many lower terraces and toe slopes adjacent to the river channel and on gravel bars within the active channel along the lower Truckee River are dominated by cottonwood saplings. Scour during high flows in 1986 and 1997 produced mineral surfaces that enabled abundant cottonwood seed germination in subsequent springs. Flows provided for cui-ui spawning had the added benefit of enabling the establishment of the seedlings (Rood *et al.* 2003). When the Service mapped and collected field data in the early 1990's, most cottonwoods that resulted from the 1986 flood were less than 10 ft high. Such young cottonwoods are initially susceptible to loss during subsequent high flows, but become less so after they have become established. Some unknown proportion of these cottonwood saplings are now 20-30 ft high (Rood *et al.* 2003). Although these habitats now exceed the 20 ft threshold that distinguishes palustrine scrub-shrub from palustrine forest, their dense, thicket-like structure is distinctly different from more mature cottonwood forests.

Willow-dominated communities appear to be restricted to areas inundated annually, while lower terraces dominated by cottonwood saplings are inundated approximately once every 1 to 5 years, with corresponding streamflows between 100 to 6,900 cfs between Reno and Nixon (Service 1993). Occasional scouring flows (greater than 10,000 cfs) are important to remove excessive vegetation and maintain the vigor and diversity of this habitat. Such flows occur about once every 10 years (Service 1993).

Palustrine forested wetlands are dominated by woody vegetation at least 20 ft tall (Cowardin *et al* 1979). Within the lower elevations along the Truckee River, the most common of this wetland type is the Modoc-Great Basin cottonwood-willow riparian forest (Caicco 1998). Fremont cottonwood is the sole dominant tree species in this deciduous forest. Coyote willow is present in the understory in some areas. More commonly, upland shrubs, including big sagebrush and rabbitbrush, are understory dominants. The prevalence of upland shrubs likely reflects a lowered groundwater table. There is little herbaceous understory, but extensive patches of the nonnative tall whitetop are common. An exceptional example, with a grass understory dominated by slender wheatgrass, occurs in Oxbow Nature Study Park in Reno. More typical examples occur sporadically downstream from Sparks. Mature cottonwood trees, estimated to be up to 140 years old (Service 1993), are scattered infrequently on upper terraces now less subject to inundation.

Additional vegetation types occur in association with surface water. Gravel bars occur primarily on the inner bends of the river. Many are under water during higher flows, but as streamflows decline in the summer and fall months, they are colonized by a diverse variety of plant species. Over successive years, this can result in healthy stands of mixed willows. Plant cover is generally low (less than 30 percent), but more bars may become vegetated when streamflows remain low over longer periods of time, as during drought. Common herbaceous species are slender-beak sedge, common monkey-flower, and hairy willow-herb. Tamarisk or salt cedar is found lower down in the Truckee River associated with streambanks.

5.3.1.2 Upland Vegetation

To a lesser extent, upland vegetation may be considered part of the project area. Three upland shrub communities are found on higher elevation areas along the river. These are sagebrush steppe, desert saltbush scrub, and desert greasewood scrub. Upstream of Wadsworth, sagebrush communities are predominant. They are dominated by big sagebrush with an understory dominated by the exotic annual grass, cheatgrass. Desert scrub communities are generally found on the more xeric sites downstream of Wadsworth and are dominated by shadscale, four-wing saltbush, and black greasewood, although big sagebrush also occurs. Cheatgrass is a dominant understory herbaceous plant in these areas, as well. Other herbaceous plants that are common here are tansy mustard, Rocky Mountain bee plant, and Russian thistle.

Extensive areas along Steamboat Creek and downstream from the Reno/Sparks metropolitan area are dominated by the noxious weed tall-whitetop. It is very persistent and is an extremely effective competitor of desired native vegetation. Research indicated that it did not occur in the Truckee River in 1971, but by 1992, occupied about 12,000 acres along the lower Truckee River (Donaldson and Johnson 1999). Tall whitetop seeds and roots from eroded banks may travel long distances in rivers and irrigation ditches to invade new areas. During construction and landscaping projects, tall whitetop may spread though contaminated soils. They may be transported to other areas via mobile equipment (*e.g.,* vehicles) or livestock. It can also invade areas where contaminated straw is used for erosion-control projects. Tall whitetop control in newly planted areas (in conjunction with restoration activities) along the Truckee River will be imperative.

Other problematic weedy species include musk thistle, common ragweed, Canada thistle, bull thistle, poison hemlock , prickly lettuce, low whitetop, purple loosestrife, Russian thistle, Russian knapweed, yellow starthistle, cocklebur, and tamarisk (Otis Bay Ecological Consultants 2004).

5.3.2 Amphibians and Reptiles

Riparian areas provide habitat for amphibians and reptiles, but little is known about their habitat needs (Reynolds *et al.* 1993; Jennings 1996). Open water, cool temperatures, and moist soils and microclimates make riparian areas especially important for amphibians (Brode and Bury 1984; Jennings 1996). Approximately 30 amphibian and reptilian species are known or are likely to occur in the various riparian habitats throughout the Truckee River system (Schlesinger and Romsos 2000). Ten are obligate riparian species (those found exclusively along watercourses); the others are facultative species (those that use riparian areas but are not totally dependent on them). Surveys counducted in 2001 identified 9 common species in the project area (Otis Bay Ecological Consultants 2004) (Table 6).

Within the Lower Truckee River Reach, the section between Derby Diversion Dam and Pyramid Lake contains the highest observed species diversity of amphibians in the Truckee River system. This is due to the combined effects of sufficient breeding and adult habitat, including ponds for egg and larvae development and a diversity of aquatic and emergent vegetation for cover (Panik 1992; Panik and Barrett 1994; Ammon 2002b). Bullfrogs, Pacific treefrogs, and western toads are found in this Reach. Northern leopard frogs, described by Linsdale (1940) as “the commonest and most widespread kind of frog in the state,” were recorded at only one field site in 1992 in a shallow spring-fed pond and along the river near Dead Ox Wash (Panik 1992). Three locations with northern leopard frogs were identified on the PLPT Reservation in 2001 (Ammon 2002b). Western toads also appear to be limited to a few areas; however, the large numbers of tadpoles and juvenile toads present at these sites during the spring suggest a large population of adult toads. A few Northwestern pond turtles inhabit the Truckee River downstream from Vista, including a pair in a pond on the McCarran Ranch. The species inhabits rivers, tributaries, ponds, lakes, marshes, oxbows, and other seasonal and permanent wetlands (Ammon 2002b). Introduced species, such as American bullfrog, are the primary predators on juvenile turtles.

In wet years, high flow may inundate areas away from the main river channel and provide temporary breeding ponds for amphibians if the water persists during egg and larvae development. In average years, portions of the Truckee River have few areas suitable for amphibian breeding or egg and larvae development (Panik 1992). In dry years, although breeding ponds may be prevalent, they may become desiccated before larvae complete development in late spring or summer. Palustrine emergent wetlands and pond-like areas provide the majority of amphibian breeding habitat along the Truckee River.

Table 6. Amphibian and reptile species observed during 2001 surveys in the Lower Truckee River Reach (Vista to Pyramid Lake).

Common Species Name	Scientific Species Name	Areas of Occurrence
Western pond turtle	*Clemmys marmorata*	McCarran Ranch (plus unconfirmed sightings in two other locations)
California kingsnake	*Lampropeltis getulus californiae*	McCarran Ranch
Great Basin spadefoot toad	*Spea intermontana*	Dead Ox area
Northern leopard frog	*Rana pipiens*	Near Wadsworth, Dead Ox area
Pacific tree frog	*Pseudacris (Hyla) regilla*	McCarran Ranch
Western toad	*Bufo boreas*	McCarran Ranch, Derby Dam area, Wadsworth area,
Great Basin gopher snake	*Pituophis catenifer*	McCarran Ranch, several other locations scattered along the entire Reach
Western garter snake	*Thamnophis elegans*	McCarran Ranch, Numana Dam, Wadsworth
American bullfrog	*Rana catesbeiana*	Most wetlands along entire Reach; appears absent at Dead Ox wash

Source: Table XII-1 in Otis Bay Ecological Consultants 2004.

Seventeen additional species are thought to occur in the riparian scrub community. Western garter snake, western fence lizard, and western aquatic garter snake are the most common. The abundant invertebrate population associated with the riparian scrub plant community provides an important food source for these animals. The riparian forest provides habitat for many of the species mentioned previously

5.3.3 Birds

Birds show a greater preference for the specific types of riparian habitats along the Truckee River than do most other types of wildlife. Among the riparian types, the highest number of bird species are found in scrub-shrub (93 species), mature Fremont cottonwood forest (57 species), and pole-sapling Fremont cottonwood (48 species) (Lynn *et al.* 1998). Although most species use a variety of habitats, some generalizations can be made regarding the use of emergent, scrub-shrub, and forested riparian habitats by individual species based on how often they are observed in these habitats (Lynn *et al.* 1998).

Emergent wetlands, although limited along the Truckee River and tributaries, are highly productive ecosystems that provide food, cover, and nesting sites for many species of wildlife. Areas of tall emergent vegetation, such as cattails and bulrushes, provide habitat for birds such as yellow-headed, red-winged and Brewer's blackbirds and song sparrows. Some bird species, such as marsh wren are restricted to tall emergent wetlands. Along the Truckee River, most of the emergent wetlands are less than 1 acre in size and occur in reaches downstream from Sparks. As a result, emergent wetlands in the Truckee River system provide limited habitat for the bird species, as well as limited foraging areas for swallows and other insectivorous birds.

Many populations of emergent wetland bird species have declined historically along the Truckee River. American bittern, common yellowthroat, sora, northern harrier, marsh wren, and savannah sparrow were common along the lower river in the late 1800's (Ridgway 1877), but were not observed in the early 1970's (Klebenow and Oakleaf 1984). During surveys in 1992 and 1993, marsh wren, savannah sparrow, and common yellowthroat were rarely observed; American bittern, sora, and northern harrier were not observed at all (Lynn *et al.* 1998). By 2001, however, marsh wren and common yellowthroat were common; savannah sparrow, while once again present, remained rare (Ammon 2002a). Virginia rail were also present historically, but have not been observed since the late 1800's. Neither American bittern nor sora have returned.

The palustrine scrub-shrub habitat is especially important for neotropical migratory birds. Species most frequently observed included American robin, black-billed magpie, Bewick's wren, brown-headed cowbird, Brewer's and red-winged blackbirds, song sparrow, warbling vireo, and yellow warbler (Lynn *et al.* 1998). A historical pattern of decline is seen in birds associated with scrub-shrub habitats along the lower Truckee River. Black-chinned hummingbird, song sparrow, willow flycatcher, and yellow warbler were all abundant in the late 1800's, while yellow-breasted chat and rufous hummingbird were common and yellow-billed cuckoo rare (Ridgway 1877). By the early 1970's, none of these species was observed along the lower Truckee River (Klebenow and Oakleaf, 1984). By the early 1990s, all of these species except for yellow-billed cuckoo were once again reported, although all but the song sparrow and yellow warbler were quite rare (Lynn *et al.* 1998). By 2001, black-chinned hummingbird and yellow-breasted chat were reported as common (Ammon 2002a). Yellow-billed cuckoo and rufous hummingbird have not been observed since 1868 and the early 1970's, respectively.

Fremont cottonwood riparian forest supports the second highest diversity of bird species along the Truckee River. The most common birds in the riparian forest are American robin, black-billed magpie, brown-headed cowbird, European starling, house wren, northern oriole, and red-winged blackbird. There also appears to have been a historical decline in species that prefer cottonwood forests, particularly warbling vireo, Swainson's hawk, long-eared owl, western tanager, western bluebird, and western wood pewee. Most of these species were reported as abundant or common in 1868 (Ridgway 1877), but were rare or not observed in the early 1970s (Klebenow and Oakleaf 1984). By the early 1990's, warbling vireo, Swainson's hawk, and western tanager were observed along the lower Truckee River, but remained relatively rare; western bluebird was not observed (Lynn *et al.* 1998). More recent surveys have found western wood pewee and warbling vireo to be common; western tanager was common during surveys in 1998, but not observed in 2001 (Ammon 2002a). Long-eared owl has not been reported from the lower Truckee River since 1868 when it was recorded as common. Along the lower Truckee

River, nearly 40 percent of the 4,399 bird observations were in Fremont cottonwoods (Lynn *et al.* 1998). Willows were used about 15 percent of the time and were the only other plant species used more than 10 percent of the time. Plant use was distributed more evenly and across more species along the upper Truckee River: willow, 21 percent; lodgepole pine, 15 percent; Jeffrey pine, 14 percent; snowberry, 11 percent; and black cottonwood, 11 percent.

The total number of bird species reported from the lower Truckee River was 107 in 1868 (Ridgway 1877) and 65 in the early 1970's, a decline of 40 percent. Surveys during the early 1990's reported a total of 87 species and, 10 years later, 95 bird species were observed, 89 percent of that reported in 1868 (Ammon 2002a). While many of the recent additions are either introduced species or species associated with human settlement or agricultural landscapes that were not present in 1868 (Ammon 2002a), more than 30 species have either increased in abundance or have reappeared after having been extirpated. Over half of these are associated either with emergent or scrub-shrub wetlands, habitat types that have increased along with other forms of early successional riparian vegetation as a result of supplemental streamflows implemented in the 1980's designed to restore riparian vegetation (Rood *et al.* 2003).

Below some threshold width, riparian habitats begin to lose species (Stauffer and Best 1980 *IN* Dobkin and Wilcox 1986). In 1938, the riparian corridor width along the Truckee River ranged from 1,200 to 2,000 ft (Jones and Stokes 1990). Today, in its widest sections, the current riparian corridor is approximately 500 ft wide, but the average stand width is approximately 125 ft. The area of a riparian forest patch has also been shown to be important for some bird species. For example, in California, the yellow-billed cuckoo requires riparian areas larger than 12 acres and 66 ft wide to provide nesting habitat (Laymon and Halterman 1989). Today, the largest stand of riparian forest along the Truckee River is 13.5 acres; only about 7 percent of the stands are 5 acres or greater, and 50 percent are less than 1 acre. This may explain, in part, why yellow-billed cuckoo has not recolonized the lower Truckee River.

The small, narrow patches of riparian forest along the Truckee River, may also make it easier for brown-headed cowbirds to locate and lay their eggs in the nests of other birds (obligate brood parasitism). Brown-headed cowbird brood parasitism has the potential to greatly reduce populations of the host species (Mayfield 1977). The abundance of cowbirds has increased sharply in the past 100 years, and they are now common throughout the study area (Ridgway 1877; Lynn *et al.* 1998). Ten songbird species observed along the lower Truckee River in 1992 and 1993 are frequent or common cowbird hosts (Ehrlich *et al.* 1988; Lynn *et al.* 1998). Three of these; willow flycatcher, chipping sparrow, and rufous-sided towhee appear to have declined in abundance or disappeared along the river since 1868.

Certain species require large-diameter trees for nesting and/or roosting. Along the Truckee River, sapsuckers, downy woodpeckers, and northern flickers require large cottonwoods in which they excavate their own nest cavity (primary cavity nesters). These species are important because their nest sites are subsequently used by secondary cavity nesters (occupy cavities excavated by another species). Along the lower Truckee River, native secondary cavity nesters include American kestrel, common merganser, house wren, tree swallow, violet-green swallow, and wood duck. Throughout the Truckee River Basin, two introduced secondary cavity nesting species (house sparrow and European starling), which compete with native cavity nesters for nest sites, are also common. Although many of the native cavity nesters remain common today, their numbers are likely lower than they were historically. More importantly, the continuing loss of older cottonwood trees and the absence of cottonwoods in middle size classes (Rood *et al.* 2003) means that species that require large-diameter trees face a habitat bottleneck within the foreseeable future.

5.3.4 MAMMALS

Wetland mammals known or expected to occur along the river and tributaries include muskrat, mink, water shrew, beaver, and river otter. Other mammals, including shrews, insectivorous bats, raccoons, and skunks, may forage on the abundant invertebrates associated with emergent wetlands. Historically, river otters occurred throughout the Truckee River system; however, they are currently believed to be present only along the Truckee River near Wadsworth. Deer also use scrub-shrub wetlands along the Truckee River for cover, forage, and fawning. The Loyalton-Truckee mule deer herd winters along the Sierran front north and south of Reno and summers in higher elevation areas throughout the study area. A number of small, scattered resident mule deer herds also occur from Reno to Pyramid Lake.

The cottonwood forest along the lower and middle Truckee River provides habitat for mammals that otherwise would not be expected to occur at this elevation, including the mountain cottontail, western harvest mouse, long-tailed vole, western jumping mouse, bushytailed woodrat, porcupine, raccoon, long-tailed weasel, and skunk. Cavities in cottonwood snags (dead trees) serve as den or resting sites for mammals, such as bats, spotted skunks, raccoons, martens, and weasels. Rodents, rabbits, foxes, raccoons, weasels, skunks, and otters use downed logs as hiding, feeding, and/or nesting areas. In the lower elevations of the study area, riparian forests along the Truckee River are the only sites that provide snag and log habitats. The riparian zone also provides an avenue for wildlife moving from one habitat or geographic area to another and for seasonal movements between high- and low-elevation areas.

Four species of bats are associated with riparian habitat in the Truckee River: pallid bat, pale Townsend's big-eared bat, western red bat, and the fringed myotis. Pallid bat feeds almost entirely on prey captured on the ground, but it may on occasion roost in tree cavities such as cottonwoods. Pale Townsend's bat may forage in riparian areas. The Western red bat roosts only in tree foliage and is closely associated with lowland riparian forest in arid areas. Fringed myotis, considered imperiled in Nevada, is typically a woodland species at middle elevations in the mountains, but may also be found in more arid environments.

5.4 FEDERALLY-LISTED SPECIES

The following is a discussion of federally-listed threatened and endangered species that may occur at or near the project area, with an emphasis on the Truckee River basin. The Service supplied a species list (File No. 2011-SL-0215) in September 2011 for this project. Endangered species are defined as those species in danger of extinction throughout all or a significant portion of their range. Threatened species are defined as those species likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

5.4.1 Cui-ui

The endangered cui-ui (*Chasmistes cujus*) *is* a large, omnivorous lakesucker species found only in Pyramid Lake and the lower Truckee River in Nevada (Service 1992). At the turn of the century, the cui-ui also inhabited Winnemucca Lake, which was contiguous with Pyramid Lake. However, upstream storage and the Truckee River water diversions for municipal, industrial and agricultural uses (particularly for the Newlands Project) increased so much after the beginning of the 20th century that the reduced inflow to Pyramid and Winnemucca Lakes caused a dramatic decline in the cui-ui population. The long-term average annual discharge to diversions was roughly half of the Truckee River flows from the early-to-mid-1900's (Rood *et al.* 2003). During many years, the entire Truckee River was diverted during critical spawning migrations of cui-ui and during summer months, which contributed to a loss of riparian forest in the lower river.

Historically, cui-ui may have spawned in the lower 40 mi of the Truckee River; though, the formation of a delta at the mouth of the Truckee River and the reduced Pyramid Lake elevations resulting from flow reductions have been impediments to cui-ui upstream passage (Corps 1995). The rapid decline in the lake elevation reduced the stabilizing effect Pyramid Lake had on the lower river channel, inducing a massive, migrating head-cut. This destabilized important spawning habitat and mobilized tons of sediment that added to the newly-formed delta at Pyramid Lake. The Truckee River then flowed in shallow, braided, silty channels that impeded fish passage (Rood *et al.* 2003). In addition, the reduced flows caused Winnemucca Lake to evaporate by 1939 and by 1967 Pyramid Lake was nearly 80 ft lower than in 1900. Poorly designed dams and other in-river structures constructed in the last century have further limited the ability of cui-ui to access spawning areas in the lowermost 12 mi of the river. As a consequence, the Department of Interior classified the species as endangered on March 11, 1967 (32 *FR* 4001). However, conditions have significantly improved in the last decade as described below.

5.4.1.1 Life History

Cui-ui are obligate stream spawners that spawn in the lower Truckee River, but spend most of their life in Pyramid Lake (Scoppettone *et al.* 1986). They are long-lived species (45 years or more), able to take advantage of the occasional high water years to reproduce (Scoppettone and Rissler 2000). Spawning runs generally begin in April or May, depending on the timing of runoff, river access, water turbidity, and water temperature. Cui-ui passage above Marble Bluff Dam occurs through two routes: (1) up the Truckee River and over Marble Bluff Dam; or (2) up the fishway channel that bypasses the dam (Pyramid Lake Fishway). Fish passage to the Truckee River from Pyramid Lake is problematic when lake levels drop below elevation 3,812 ft and a delta is exposed. Even after successful passage, most spawning activity in the river is confined to the reach between Marble Bluff Dam and Numana Dam. When spawning runs upstream of Marble Bluff Dam exceed 200,000 adults, fish ladders are opened at Numana Dam. Some also spawn in the Truckee River downstream from Marble Bluff Dam. While most spawners spend only a few days in the river, some may remain up to 16 days. Spawning runs may continue for 4 to 8 weeks, but most fish migrate during a 1- to 2-week period.

Cui-ui spawn in groups of one to several individuals of each sex. Females broadcast eggs over predominately gravel substrate in water at depths of 0.8 - 4.0 ft and velocities of 1 - 2 ft per second. Individual spawning is completed over a 3- to 7-day period (Scoppettone *et al.* 1986) and adults remain in the river between 4 and 17 days. After returning to the lake, spawners do not enter the river again that year (Scoppettone *et al.* 1986).

Females produce large, but variable numbers of small eggs, ranging between 25,000 and 200,000 eggs per individual (Scoppettone and Rissler 2000). Fertilized eggs hatch in 1 - 2 weeks, depending on water temperature; optimum range is 58 - 63 degrees Fahrenheit (°F). Larvae have a greater tolerance than eggs to elevated temperature. After the eggs hatch, yolk-sac larvae remain in the gravel 5 - 10 days before emerging. Upon emergence, most larvae are swept passively downstream to the lake, although a few may find refuge in the river's backwaters for a month or two.

Both sexes of adolescent cui-ui grow at similar rates until sexual maturity (between 6 and 12 years of age). While both sexes have been documented to live 40 years or more, female cui-ui generally live longer and grow faster than males after sexual maturity is reached (Scoppettone *et al.* 1986). The current age-class structure is believed to include 10 reproductive year-classes and a total of 16 year-classes (Scoppettone and Rissler 2007).

Adult cui-ui are primarily omnivorous and feed mostly on zooplankton (cladocerans and copepods) and, to a lesser extent, chironomid larvae and ostracods (Scoppettone *et al.* 1986). Adult feeding is most active at night and during prespawning aggregation. The larvae feed primarily on chironomid larvae, zooplankton and phytoplankton. Cui-ui larvae are rather selective in their feeding, purposely taking individual organisms from the water column. Cui-ui larvae do not undergo the more bottom-oriented mouth shift like other catostomids and so continue to feed selectively. Zooplankton comprises roughly 90 percent of the food items found in juvenile cui-ui, but other items include diatoms, filamentous algae, and blue-green algae (Scoppettone *et al.* 1986).

5.4.1.2 Management

The objective of the Service, which has the lead responsibility for cui-ui management, is to enhance prospects for cui-ui survival and recovery by providing as many opportunities for cui-ui to reproduce as available water resources will allow. To do so, Truckee River discharge into Pyramid Lake must be sufficient to: (1) attract and initiate the spawning run; (2) maintain spawning, incubation, and rearing habitat in the river; and (3) provide for outmigration of adults and larvae (Buchanan 1987). In general, the greater the spring discharge, the greater the numbers of cui-ui that enter the river and the higher the survival rate of their larvae (Buchanan and Strekal 1988).

Recent improvements for cui-ui spawning are evidenced by spawning runs (Table 7) and are attributed to wet years and flow management during drought years that support spawning under less flow; and, reduced diversion to the Newlands Project over the last two decades. In addition, cooperative management efforts among the Service, BOR, and the PLPT have led to significant improvements in the operations of the Marble Bluff Dam and Fish Facility (MBFF) and Stampede Reservoir. The MBFF was constructed in 1975 under the authority of the Washoe Project Act (1954). The MBFF provides grade control on the river and impounds water for cui-ui and LCT migrations, and is located about 3 mi upstream from Pyramid Lake. Releases from

Stampede Reservoir, located 90 mi upstream from Pyramid Lake, are used to supplement streamflows in the lower river to maximize the occurrence of suitable river stages and lake conditions for spawning. Managed streamflows also enable collection of cui-ui eggs for hatchery incubation. Reservoir management facilitates the implementation of natural flow regime for riparian habitat that is beneficial to the species (Rood *et al.* 2003). As a result, the adult cui-ui population has increased significantly from the time the species was listed, with numbers ranging from 500,000 to 2 million fish since 1991 (Figure 3).

Estimates for cui-ui larvae production have also been varied, ranging from 67 to 940 million from 1994 to 2010. Larval survival rate, ranging from 1.2 to 10.7 percent, is likely a factor of densities of cui-ui spawning in limited spawning habitat below Numana Dam, limited access above Numana Dam, and high flow events during egg deposition and incubation.

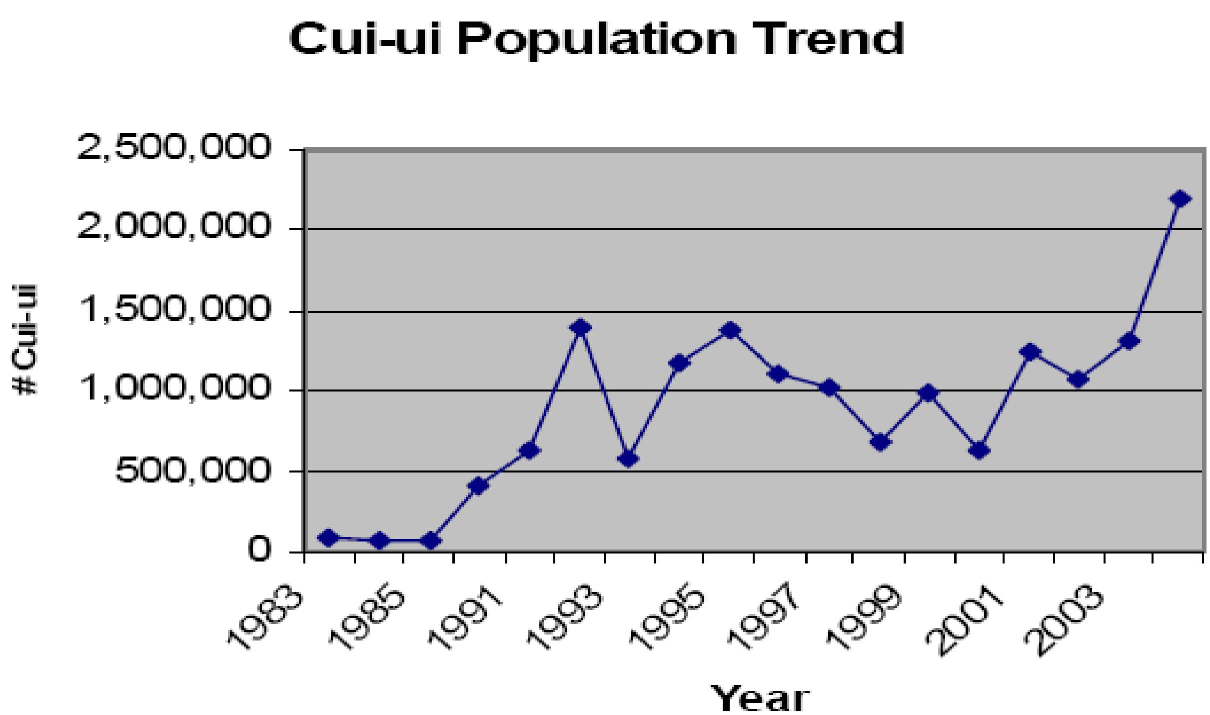

Figure 3. Population trend of adult cui-ui between 1983 and 2004; there are no data for the years 1986 to 1989 (source: USGS unpublished data).

5.4.1.3 Recovery Plan

A cui-ui recovery plan was approved in 1978 and subsequently revised several times, with the most recent revision completed in 1992 (Service 1978; 1983; 1992). The latest revision predicates recovery on conserving the cui-ui's ecosystem and sets out four broad categories of conservation measures to improve and protect cui-ui spawning, incubation, and rearing habitat: (1) increase volume and improve timing of inflow to Pyramid Lake; (2) rehabilitate the lower Truckee River; (3) achieve water quality standards; and (4) improve fish passage in the lower Truckee River.

Table 7. Summary of cui-ui population data by year, including spawning run size through the Marble Bluff Fish Facility (MBFF).

Year	Total Adults	Eggs Produced	Larval Survival (percent)	Total Larvae	Spawners at MBFF
1994	1,170,928	1,713,347,000	8.68	188,270,500	66,345
1995	1,377,980	2,864,324,000	18.73	587,265,700	112,685
1996	1,101,561	6,427,346,000	8.91	616,686,200	171,668
1997	1,012,478	11,841,970,000	8.91	1,068,694,000	306,976
1998	687,386	15,762,210,000	0.72	148,369,800	495,000
1999	980,738	22,208,280,000	1.36	319,462,400	583,972
2000	626,674	7,882,080,000	2.32	170,630,400	182,734
2001	1,240,108	-	-	-	6
2002	1,072,885	1,545,572,000	3.91	60,432,900	38,719
2003	1,317,404	5,956,758,000	2.06	122,795,600	159,800
2004	2,189,298	6,315,294	0.00	-	169
2005	1,292,556	41,729,950,000	0.42	176,178,500	1,331,000
2006	-	34,670,790,000	0.44	152,459,900	953,193
2007	-	-	-	-	62,312
2008	-	-	-	-	105,136
2009	-	-	-	-	8,073
2010	-	-	-	-	416,507

According to the recovery plan's objectives, cui-ui may be considered for reclassification to threatened ("downlisting") when it is demonstrated that the species has an 85 percent change of persisting for 200 years, and the number of adult cui-ui and year classes of juveniles have been stable or increasing for the previous 15 years. The plan indicates this may be achieved by increasing Pyramid Lake's average annual inflow by 45,000 acre-ft or the equivalent benefit. The plan also states that removing the species from the endangered species list ("delisting") requires, among other objectives, increasing the average annual inflow into Pyramid Lake by an additional 65,000 acre-ft, or equivalent benefits over that required for reclassification (a total of 110,000 acre-ft).

Cui-ui may be reclassified or recovered by implementing a variety of conservation measures. These measures include the acquisition of water, as well as other conservation measures that would provide benefits to cui-ui equivalent to acquiring additional water. Other conservation measures include: (1) securing and maintaining cui-ui habitat in the lower Truckee River and Pyramid Lake; (2) operating reservoir and fish passage facilities to promote spawning; and (3) protecting the population from catastrophic events.

5.4.2 Lahontan Cutthroat Trout

The threatened LCT (*Oncorhynchus clarkii henshawi*) is an inland subspecies of cutthroat trout endemic to the Lahontan basin of northern Nevada, eastern California, and southern Oregon. In the Truckee River basin, LCT historically occupied about 360 mi of suitable stream habitat and 284,000 acres of lake habitat (Gerstung 1986). The largest populations of LCT occurred in Pyramid Lake and Lake Tahoe, where the fish were a major food source, along with the cui-ui, for local tribes. LCT populations in Pyramid and Winnemucca Lakes migrated more than 100 mi up the Truckee River through Lake Tahoe to headwaters in its tributaries to spawn (Sumner 1940; LaRivers 1962). Two distinct Pyramid Lake LCT spawning migrations once occurred—spring run “Tommies” and fall run “redfish” (LaRivers 1962). Populations also occurred in Fallen Leaf, Cascade, Donner, and Independence Lakes (Gerstung 1986).

Beginning in the 1860’s with European settlement, rapid degradation of LCT habitats was occurring as a result of pollution (primarily from logging), dams, and commercial marketing. Logging contributed significant quantities of sawdust, wood-chips, industrial waste, and untreated sewage waste - all of which were dumped into the Truckee River. Dams regulated flows in the river to drive logs to sawmills, supply irrigation water for agriculture, and generate power, which disrupted fish migration. Commercial harvest of LCT from Pyramid Lake and the Truckee River also impacted the population, with an estimated 100,000 to 200,000 pounds removed annually between 1873 and 1922 (Townley 1980).

By 1939, the native Lake Tahoe LCT population was extirpated as a result of damage to spawning tributaries. By 1944, the original Pyramid Lake LCT population was extirpated after losing access to its Truckee River spawning grounds due to Derby Diversion Dam and other factors (*e.g.*, pollution, commercial harvest, and exotic fish introductions). Since then, hatchery stocking has developed Pyramid Lake into a popular LCT sport fishery (Coleman and Johnson 1988).

As a result of population declines, LCT was listed by the Service as endangered in 1970 (35 *FR* 13520) and later reclassified as threatened in 1975 under a special rule intended to facilitate management for conservation purposes, including state-regulated angling (40 *FR* 29864). Today, it is estimated that less than 0.3 percent of historical lake habitat and about 2.2 percent of stream habitat in the Truckee River basin are occupied by LCT. The only remaining indigenous population resides in Independence Lake and the main inlet tributary Independence Creek (Peacock *et al.* 1999). LCT within the Truckee River basin are included in the Western Lahontan Basin Geographic Management Unit (GMU), one of three recognized GMUs recognized for LCT (Service 2009). Within the Truckee River basin, there are currently 7 small headwater tributaries that support self-sustaining river populations. In total, within these tributaries, only 8 miles of occupied habitat consists of self sustaining river populations (Service 2009). These populations are found in Independence Creek, Pole Creek, Upper Truckee River, Bronco Creek, and Hill Creek. There are lake populations in Pyramid and Independence Lakes. Only Independence Lake has a naturally reproducing population that has never been extirpated -- Pyramid Lake has a hatchery-maintained population. Current threats in the Truckee River include displacement/hybridization with exotic species, pollution, poor water quality, diversions, and development.

A number of population surveys for LCT have been completed. NDOW has been the primary agency collecting data on the Truckee River in Nevada, conducting annual population sampling utilizing electrofishing techniques since 1971. Annual population monitoring by NDOW consists of performing a single-pass electrofishing method at established locations. This method is not sufficient to produce viable population estimates, however it does assess trends in catch per unit effort data, and the presence or absence of species and age classes.

In 1995, a cooperative 5-year effort was initiated between the Service, PLPT, and NDOW to study LCT supplementation in each of five Truckee River zones: (1) Wadsworth to Pyramid Lake, (2) Derby Dam to Wadsworth Bridge, (3) East McCarran Bridge to Derby Dam, (4) Mayberry Bridge to East McCarran Bridge, and (5) Nevada/California State line to Mayberry Bridge (NDOW 2001). A follow-up creel census each year was used to determine catch rates. Results over the 5-year period indicated that the catch consisted of 23 percent LCT compared to 64 percent rainbow trout and 12 percent brown trout (NDOW 2001).

NDOW's annual assessments have consisted primarily of electrofishing surveys, and in 2001, creel census data was used to supplement the presence-absence data from Truckee River surveys (NDOW 2001 to 2009). In addition, the Desert Research Institute (DRI) has collected baseline hydrologic and biological data near the McCarran Ranch (Lower Truckee River Reach) in 2003 and 2004. In general, these surveys indicate that rainbow trout and brown trout make up the majority of the salmonid fishery in the Lower Truckee River. However, without the precision of population metric data, any trend in these populations is speculative.

5.4.2.1 Life History

LCT in the Truckee River basin express resident, fluvial and adfluvial life histories. Resident LCT generally spend all major life stages (spawning, egg incubation, juvenile rearing, and adult rearing) in suitable stream habitat, usually in protected headwater areas. Fluvial LCT may spend most of their adult life stages in the mainstem Truckee River, but migrate to smaller tributaries to spawn, which is also the site of egg incubation and juvenile rearing. Adfluvial LCT, found in Pyramid and Independence Lakes, spawn in the tributaries where egg incubation and juvenile rearing also occur, but spend most of their adult life stage in lentic systems.

Optimal river habitat for LCT is characterized by clear, cold water (less than 72 °F), pools in close proximity to cover and velocity breaks, well vegetated, stable stream banks, 50 percent or more of cover, and relatively silt-free rocky substrates in riffle-run areas (Service 1994). Fluvial LCT generally prefer rocky areas, riffles, deep pools, and habitats near overhanging logs, shrubs, or banks (Sigler and Sigler 1987). LCT in the lower Truckee River are likely to avoid this Reach as temperatures increase and flows decrease during summer and early fall (July to October).

Adfluvial LCT found in Pyramid Lake are obligate stream spawners that attempt to access the lower Truckee River (via the MBFF) or an artificial spawning channel (used for hatchery purposes) at Sutcliffe, Nevada operated by the PLPT. Access to these areas from Pyramid Lake may be problematic as it is obstructed by a number of dams and diversion structures (TRIT 2003). Spawning usually occurs from April to July, depending on flow, elevation, and water temperatures and is primarily restricted to higher elevation tributaries in California (*i.e.*, upstream of Verdi, Nevada). Water temperature is one of the most important factors affecting LCT spawning success in the lower Truckee River. Prespawning LCT can tolerate a maximum temperature of 56 °F while migrating upstream; higher temperatures will kill developing eggs. The upper river and associated tributaries provide the cool water temperatures, clean water, and silt-free substrates needed for spawning and rearing. The optimum temperatures for egg incubation are 50 - 56 °F. Fry prefer temperatures of 55 - 60 °F. Adults prefer temperatures of 55 - 68 °F, but can tolerate brief periods of temperatures up to 78 °F (U.S. DOI and State of California 2008). The most important LCT spawning habitat was historically upstream of Verdi, Nevada. Unlike the cui-ui, LCT must spawn every year to maintain populations. Current spawning locations of LCT within the Truckee River Basin are not known with any certainty or genetic integrity. Adult LCT are passed through the MBFF into the Truckee River, however, their destination and spawning success are unknown.

Female LCT mature at 3 - 4 years of age, and males at 2 - 3 years of age. Adult post-spawning mortality is 60 – 70 percent for females, and 85 – 90 percent for males (Cowan 1982). Lake-dwelling populations exhibit a fecundity of 600 - 8,000 eggs per female, believed to be correlated with length, weight, and age (Sigler *et al.* 1983). Spawning behavior of LCT is similar to other stream-spawning trout. They pair up, display courtship, lay eggs in redds dug by females, and chase intruders away from the nest. LCT generally spawn in riffle areas over gravel substrate.

LCT eggs generally hatch in 4 - 6 weeks, depending on water temperature, and fry emerge 13 - 23 days later. Fry movement is density-dependent and correlated with fall and winter freshets. Some fluvial-adapted fish remain for 1 - 2 years in nursery streams before emigrating in the spring.

Stream resident LCT are opportunistic feeders, with forage consisting of drift organisms (*e.g.*, terrestrial and aquatic insects). Smaller lake-dwelling LCT feed largely on insects and zooplankton, and larger LCT forage on fish.

5.4.2.2 Management

Currently, spawning opportunities and rearing for LCT in the lower Truckee River are difficult due to seasonally high water temperatures, unsuitable spawning habitat, high sediment loads, and diversion of water before LCT eggs can hatch. Cooperative efforts are ongoing to enhance the lower Truckee River system and improve riparian and riverine habitat. This includes the implementation of a more natural flow regime in support of riparian forests (Rood *et al.* 2003) and active restoration in various segments of the Lower Truckee River (*e.g.*, McCarran Ranch, Mustang Ranch).

In 2003, the Truckee River Recovery Implementation Team (TRIT) developed a short-term action plan for LCT in the Truckee River basin which focuses on gathering information about habitat requirements and implementing demonstration projects and research (TRIT 2003). The action plan identifies tasks intended to eliminate or minimize threats that impact LCT in the Truckee River, and through continued implementation of this process, ensure the long-term persistence of the species. Major issues to LCT persistence include: (1) reduction and alteration of stream flow and discharge; (2) alteration of stream channels and morphology; (3) degradation of water quality; (4) reduction of Pyramid Lake elevation and concentration of chemical components; and (5) introductions of non-native fish species.

A large component of species management in the Truckee River involves hatchery supplementation. In Nevada, LCT are stocked in the Truckee River by the Service and NDOW, in cooperation with the

PLPT. Since the loss of the original Pyramid Lake population of LCT, the Pyramid Lake fishery has been maintained by a hatchery stocking program currently operated by the PLPT Fishery Program and the Service. In Pyramid Lake, the contemporary LCT strain, derived from four strains (Heenan, Walker, Summit and Independence Lakes; Coleman and Johnson 1988), is maintained by hatcheries operated by the PLPT. This strain has developed into a sport fishery in Pyramid Lake that is an important source of revenue for the PLPT. These fish are imprinted to the hatchery rather than to the Truckee River, which means spawning fish are more likely to return to an artificial spawning channel created at Sutcliffe, Nevada (on the west side of Pyramid Lake). The population does not naturally reproduce. These fish are also used as the source for NDOW's hatchery, which also stocks LCT in various locations on the river, and has done so with increased frequency over the years. This has been done concurrent with the State's de-emphasis upon the use of sterile (triploid) rainbow trout in its stocking efforts.

While the Service believes the strain used by the PLPT and NDOW is important as a source of revenue, recovery efforts intended to produce naturally reproducing populations throughout the Truckee River involve the use of wild stocks believed to have originated from the Truckee River. Recent genetic work using microsatellite DNA analysis confirmed that transplanted LCT populations found in Bettridge and Morrison Creeks in the Pilot Peak mountains along the Utah-Nevada border (deemed the "Pilot Peak" strain) are related to museum specimens which originated from the Truckee River basin (Peacock 2003). This Pilot Peak strain is the focus of production at the Service's Lahontan National Fish Hatchery, which raises this broodstock and has made this strain available for stocking or supplementary LCT recovery efforts. In the last few years, LCT stocking (Pilot Peak strain) has increased within the project area.

5.4.2.3 Recovery Plan

A recovery plan was issued for LCT in 1995 (Service 1995). The plan identified five conditions contributing to the decline and affecting the potential recovery in the Truckee River: (1) reduction and alteration of streamflow and discharge; (2) alteration of stream channels and morphology; (3) degradation of water quality; (4) reduction of Pyramid Lake elevation; and (5) introduction of non-native fish species.

The recovery plan recommends several actions regarding Pyramid Lake and the Truckee River: (1) developing an ecosystem plan for the Truckee River basin to determine long-range options relating to water and other uses in the basin; (2) evaluating LCT lacutrine population viability; and (3) evaluating possible remnant "Pyramid Lake strain" LCT in other waters for transplanting.

According to the recovery plan's objectives, LCT may be considered for delisting when management is implemented to sustain identified numbers of self-sustaining viable population. Habitat should be secured to ensure the benefits of management to allow LCT a 95 percent chance of persisting for 100 years or more. Viable populations are considered to be ones that have been established for 5 or more years and have 3 or more age classes of self-sustaining LCT as determined through monitoring. The Truckee River basin targets this objective for existing populations in 7-fluvial and 2-lacustrine systems. In addition, LCT reintroduction should be conducted to establish a minimum of 6-additional populations.

6.0 DESCRIPTION OF THE PROJECT ALTERNATIVES

A No-Action Alternative (future conditions without the project) and two action alternatives are being evaluated for the TMFCP:

- No Action Alternative (Future Without Project)
- Alternative 3 – Floodplain Terracing
- Alternative 4 – Locally Preferred Plan

The Service refers to the alternatives as they are described by the Corps, which no longer uses sequential numbering for alternatives that have been dropped from consideration. Alternatives were formulated based on Corps' criteria and policy; coordination with other Federal, State, and local agencies; and local concerns regarding effects on existing environmental and cultural resources in the area. The action alternatives vary in the configuration of the different project components. Primary differences between the two alternatives were for the design of Flood Risk Management (FRM) features.

The primary purpose of the TMFCP is to investigate options for the reduction of flood damage currently experienced in the Truckee Meadows and areas downstream. Objectives of FRM include:

- Reduce the potential for loss of life from flooding in the study area.
- Reduce flood damages in the Reno/Sparks metropolitan area from overbank flows of the Truckee River and its tributaries to the fullest extent consistent with Federal participation and community financial capabilities.
- Remove the Reno/Sparks metropolitan area from the National Flood Insurance Program base floodplain by reducing the flood risk to no greater than 1 in 100 chance of flooding in any given year (non-Federal sponsor's objective).

Performance of the existing FRM features along the Downtown Reno Reach varies dramatically, with bridge heights playing a significant role in obstructing high river flows and influencing the extent of flooding. The Truckee River emerges from the more channelized downtown Reno area into the broad plain historically known as the Truckee Meadows. It is this area that receives the greatest inundation of flood flows. The meadows area attenuates large flood volumes from the Truckee River. The flooding in this area is characterized by ponding caused by hydraulic backwater effects from Steamboat Creek at its confluence with the Truckee River and from the impacts of the Vista Reefs further downstream. The action alternatives, Alternative 3—Floodplain Terracing and Alternative 4—Locally Preferred Plan, currently being pursued to address flood risk management issues in the Reno/Sparks area, are discussed further below.

6.1 NO ACTION ALTERNATIVE

In the **No Action Alternative**, no Federal action would be taken to alleviate flooding, ecosystem, or recreation problems or needs in the study area. This alternative serves as the baseline against which the environmental effects of the action alternatives are evaluated. Existing levees and floodwalls would remain to prevent flooding in Reach 1 up to the 1 in 50 year event, and in Reach 2 up to the 1 in 10 year event. Performance of the existing Floodplain Risk Management (FRM) features within

Reach 1 would continue to vary dramatically, with bridge heights playing a significant role in obstructing high river flows and influencing the extent of flooding. No Ecosystem Restoration (ER) would be implemented in the Truckee Meadows or Lower Truckee River Reaches.

A No Action Alternative assumes the following as the baseline condition:

<u>Flood Risk and Management (FRM)</u>

- The Reno Flood Warning System will continue to provide Reno and Sparks with advanced warning of flood events.

- Reno, Sparks, and the Truckee Meadows area will remain at risk from flooding and flood damages due to flow constrictions and inadequate channel capacity.

- A regional water management plan will remain in place that addresses groundwater and surface water quality, water supply, flood and water drainage management, and other plan requirements.

- Redevelopment of the downtown Reno area will continue; new development will include flood proofing from the Federal Emergency Management Agency 100-year event.

- Truckee Meadows will develop in areas outside the floodplain. Development closer to the Truckee River will continue to be abated by local ordinances.

<u>Environmental Conditions</u>

- Bird diversity and abundance will decline due to loss of suitable marsh and riparian habitats.

- Reservoir storage requirements and instream flow requirements will remain the same. Truckee River system operations will remain basically the same since conflicting environmental, social, and economic factors will continue to make storage and instream flow changes increasingly more difficult.

- Specific actions identified in the recovery plans for LCT and cui-ui, designed to benefit these two federally-listed fish species, will continue.

- In accordance with TROA, Washoe County will ensure that 6,700 acre-ft of water is dedicated to instream use.

<u>Recreational Facilities and Opportunities</u>

- The City of Reno will continue implementation of the Truckee River Recreation Plan (Resource Concepts, Inc. *et al.* 2001).

6.2 ALTERNATIVE 3 – FLOODPLAIN TERRACING

Alternative 3 - Floodplain Terracing proposes the replacement or removal of four downtown bridges presenting the greatest obstructions to flow. Elimination of these obstructions would significantly reduce backwater flood damages to a 1 in 75 year chance of occurrence in the Truckee Meadows Reach. ER features are also proposed for the Truckee Meadows and Lower Truckee River Reaches.

6.2.1 Verdi Reach

6.2.1.1 Flood Risk Management Features

There are no flood risk management or recreation features proposed for the Verdi Reach.

6.2.1.2 Ecosystem Restoration Features

Ecosystem restoration features in this Reach consist of fish passage improvements, discussed below.

6.2.1.2.1 Fish Passage Enhancements

Fleish Diversion. Due to the high capacity of the Fleish Diversion, fish screening is needed. The current diversion geometry enables sweeping flows for an initial trash rack, optimizing debris handling. A flat plate screen would be constructed in the diversion canal approximately 700 ft downstream from the radial gates. In addition, a separate bypass channel would be constructed to divert any fish in front of the screen back to the river. A power line from TMWA's hydropower plant to the screen would be constructed for screen maintenance and operation requirements.

Steamboat Ditch Diversion. To improve upstream fish passage at the Steamboat Ditch Diversion, more boulders and rock would be added downstream. This would create high passage efficiency for diverse fish species and ages with minimal operation and maintenance costs. The boulders would be placed with a slope of approximately 1 ft on 20 ft. The addition of the boulder field to the structure would run approximately 200 ft downstream of the weir crest. The boulders used for this addition would be approximately 3 ft in diameter and be spaced no more than 6 ft apart.

Verdi Diversion. A perennial bypass channel with a control structure and headgate would be constructed on the west bank of the channel. Because it would enter the channel in a riffle-run complex (largely drowning out attraction flows), a low head guidance weir of 2.5-ft-diameter boulders in the main channel may be needed.

A fish screen would be constructed at the head of the diversion, upstream of the head gates with the screen parallel to river flow. The screen configuration would be an inclined flat bar screen, approximately 160 ft long. An automated air-burst screen cleaning system would be installed on the downstream side of the bars to help keep the screen free of debris and help prevent ice problems in the winter. With sufficient bar screen strength the need for a trash rack in front is not expected. Most debris would be swept along parallel to the screen face. This screen configuration would require removal of the existing remnants of the concrete structure at the point of diversion. The forebay area between the fish screen and the head gates would be enlarged.

Washoe/Highland Diversion. The proposed upstream fish passage improvement would be a perennial bypass channel carrying an average discharge of 50 cfs around the dam along the north/left bank of the river. A control structure of rock or concrete would be constructed at the head of the bypass in order to minimize the chance of channel capture. Higher gradient reaches in the bypass would require weir features of 2-ft stone, with footers, in an upstream pointing chevron with defined low flow passage.

For downstream fish passage improvement, an inclined flat bar fish screen would be installed on the river side of the diversion intake. Because there is a high steep embankment in this location, the fish screen will have to sit some distance away from the bank, with room for a conveyance channel between the screens and the bank to carry the screened water to the existing diversion. The proposed conveyance channel width increases from upstream to downstream to handle the increasing discharge without undue increases in velocity or head requirements. The steep embankment will require stabilization features, such as a concrete wall or rock.

An automated air-burst screen cleaning system would be installed on the downstream side of the screen bars. This will help keep the screen free of debris, and help prevent ice problems in the winter. This screen configuration will require demolition of existing concrete structures near the culvert inlet, but most of the existing concrete structure at the right abutment of the diversion dam would be left intact. At the upstream end of the screen structure, rock would be placed to make a smooth transition back to the existing river bank and to provide additional bank protection.

Chalk Bluff Diversion. Although the fish ladder has been in place for at least 10 years, relatively high velocities under some flow conditions were observed at the downstream inlet to the fish ladder which could restrict access to the ladder and confuse migrating fish. The project proposes evaluation of upstream and downstream passage efficiency of the current structure through direct observation, videography, or telemetry. Recommendations, if any, would then be developed for modifications to the existing structure to improve fish passage efficiency.

6.2.2 Downtown Reno Reach

6.2.2.1 Flood Risk Management Features

Under Alternative 3 - Floodplain Terracing, the Sierra Street Bridge and Virginia Street Bridge would be replaced. In addition, the Lake Street Bridge and the lower Wells Avenue Bridge, currently a pedestrian walkway, would be removed and not replaced. A new pedestrian walkway would be constructed at Lake Street as a mitigation feature.

The replacement of Sierra Street Bridge and Virginia Street Bridge would require permanently closing several roadways, as well as constructing several features, because of the elevated roadway approaches necessary to connect to the new higher bridge decks. Since these road closures would have no discernable impact to fish and wildlife resources, they are not discussed further (See Appendix A for further details).

6.2.2.2 Ecosystem Restoration Features

There are no proposed ER features for this reach.

6.2.2.3 Recreation Features

Upon successful completion of bridge construction and reconstruction, existing recreation facilities would be reestablished. Since these actions would have no discernable impact to fish and wildlife resources, they are not discussed further.

6.2.3 Truckee Meadows Reach

6.2.3.2 Flood Risk Management Features

For Alternative 3 - Floodplain Terracing, FRM features would primarily consist of levees, floodwalls, and floodplain terracing that would reduce damaging flood events to a 1 in 75 year chance of occurrence in the Truckee Meadows Reach. The site layout of FRM features was generally based on availability of land area to construct levee or floodwalls. Floodwalls were placed where features requiring greater land area, levees, would drastically impact adjacent structures or developed area. Most floodwalls are on-bank type. The average height of the floodwall or levee structure ranges from 6 to 10 ft. Levees and floodwalls along the north bank of the Truckee River are generally set back approximately 25 ft from the stream bank. No floodwalls are included in features along the south bank of the Truckee River. Levees along the south bank were set back as far as practical to provide additional flood flow capacity.

Floodwalls along the drain would be sized to hold flood volumes equaling the backwater flows from the river, as well as coincidental flows from the tributaries. In order to maximize the existing flood storage capacity at UNR Farms for the 1 in 75 year chance event, a levee would be constructed at the north end of the UNR Farms Experiment Station near East McCarran Boulevard.

Excavation of floodplain terraces would improve the conveyance capacity of the river and provide an opportunity to reestablish riparian communities along the Truckee River. This alternative would include intermittent terracing along the south bank from Greg Street downstream to the second railroad bridge, and along the north bank from Vista downstream to the second railroad bridge. The lower terrace will be excavated to an elevation that would allow flooding in a 1 in 5 year chance occurrence. In the Vista Narrows region, floodplain terracing would excavate to an elevation that would be overtopped in a 1 in 20 year event.

To prevent scouring and flanking of bridges, bank protection would be installed along approximately 500 lineal ft of the Truckee River upstream and downstream of the existing Greg Street, Rock Boulevard, and East McCarran Boulevard Bridges. Bioengineered protection sites are proposed in areas where predicted velocity and shear stress are low enough for this construction to be sustained. In general, bioengineered bank stability structures would consist of vegetated coir mats with rip-rap toe structures to minimize bank failure. In locations where predicted velocities are too high, standard bank stability structures composed of rock rip-rap would be constructed. Throughout the Truckee Meadows Reach, approximately 12,846 linear ft of bank scour protection will be installed. Of this, approximately 1,190 linear ft will consist of bioengineered bank protection. Construction of FRM features along the alignment in the Downtown Reno Reach would also affect a number of existing buildings, requiring them to be modified or removed as part of the project. These buildings are located along both banks of the Truckee River. Interior flood and under-seepage controls would also be installed.

Interior drainage management systems would be constructed as part of the project to maintain the area's existing stormwater runoff drainage capacity. Interior drainage management measures typically include pumping stations and gravity drain lines with flap gates through levees/floodwalls. Alternative 3 would require 3 pump stations in the Truckee Meadows Reach.

6.2.3.3 Ecosystem Restoration (ER) Features

Geomorphic and riparian restoration features in this Reach were designed to be implemented within the footprint of the FRM features proposed for each alternative. In general, restoration in the Truckee Meadows Reach focused on: (1) streambank protection, (2) riparian forest, (3) exotic species, and (4) geomorphic function.

Barren areas of rip-rap and other artificial bank stabilizing materials would be removed and treated with bioengineered bank protection. Removal of rip-rap and replacement with bioengineered structures would be applied to approximately 3,000 ft of bank with 2.04 acres of rip-rap removed.

To take advantage of terracing for flood protection, two levels of terraces will be shaped from Greg Street to Steamboat Creek. This proposal would reconnect the floodplain to the river in order to create additional riparian habitat. After the banks have been shaped and terraced, they would be planted with native riparian species. In total, approximately 153 acres of riparian forest habitat would be created.

Riparian forests would be planted in areas where none currently exist, but where vacant lands are available. This would include along the north bank of the river between the Glendale and Greg Street Bridges. Levee setbacks on the north bank in limited areas would allow planting of trees approximately 20 - 50 ft wide. In other areas, existing forest could be enhanced and extended with the planting of additional native species. Approximately 47 acres would be planted.

Invasive exotic plant species (*e.g.* tall whitetop) within the riparian areas would be removed to allow planting of cottonwoods, willows, and other native riparian species. Follow-up treatments using manual or chemical methods would be applied to prevent re-invasion. Interplanting would also take the place of exotic removal in a few locations. Approximately 50 acres of invasive vegetation would be removed.

Grading would be done along steep slopes in Fisherman's Park to create a suitable surface for riparian restoration. There is a large area (approximately 100 acres) on the south side of the river that could be available for geomorphic restoration, upon reconnection to the floodplain. Potential restoration features would include excavation of one or more high flow channels through the area lying between the river and Steamboat Creek in conjunction with riparian forest restoration. Approximately 12 acres of geomorphic restoration would be accomplished under this alternative.

6.2.3.3 Recreation Features

Recreation components and facilities are proposed for the Truckee Meadows Reach. Since these actions would have no discernable impact to fish and wildlife resources, they are not discussed further.

6.2.4 LOWER TRUCKEE REACH

6.2.4.1 Hydraulic Mitigation (HM) Features

Alternative 3 - Floodplain Terracing includes HM features in the Lower Truckee River Reach. These features were included because of the increase in flows above existing conditions that would be sent downstream as a result of the FRM features proposed in Downtown Reno and Truckee Meadows

Reaches. At the design flow event (1 in 75 year chance of occurrence), Alternative 3 would induce an additional 2,400 cfs of flow above existing conditions in the Truckee River downstream of Vista. These additional flows could potentially increase flooding of residences in Lockwood/Rainbow Bend and Wadsworth, as well as increase inundation of agricultural lands in various locations downstream of Vista. Additional flows could also increase scour at the Painted Rock Bridge. Mitigation features proposed for these hydraulic effects include bed, bank, and pier scour protection, and the replacement of Painted Rock Bridge.

The Lower Truckee River Reach has approximately 10,968 linear ft of bioengineered bank stabilization proposed. Approximately 46,377 linear ft of traditional engineered stabilization practices such as stone rip-rap or gabion structures would be constructed where water velocities are too strong or bank instability is too severe.

Painted Rock Bridge would be replaced with a two-lane concrete girder bridge structure aligned immediately upstream of the existing bridge. The new bridge would be designed to handle anticipated debris loading from river flows and would be constructed at an elevation sufficient to pass with-project design flows.

6.2.4.2 Ecosystem Restoration Features

6.2.4.2.1 Geomorphic and Riparian Restoration

Alternative 3 consists of geomorphic and riparian restoration at 10 segments within the riparian corridor and associated uplands. The proposed level of restoration would be low, medium or high, depending on existing conditions.

All levels of restoration would require the purchase of land or easements to protect the riverine corridor. The primary difference between the levels is the extent of active restoration of vegetation and channel modification.

For **low-level restoration** segments, the primary intent is to prepare the existing channel to allow natural fluvial processes to restore aquatic and riparian habitat types. Rip-rap removal and bank sloping would be the primary mechanical restoration techniques. River flows would remain in the existing entrenched channel, and in some cases, riffles would be constructed to reduce channel entrenchment. With low-level restoration, the revegetation plan would be limited to areas along the existing channel or existing wetlands. This level would only initiate the recovery of a complex riparian forest and would not result in a complex riparian forest in the near future.

For **medium-level restoration** segments, the primary intent is to reconnect the river to the floodplain and restore channel pattern and sinuosity. With this level, the existing channel would be used to the extent possible; however, when the desired floodplain connection and sinuosity cannot be achieved in the existing channel, then new channel construction would be included. Sinuosity levels are usually toward the low end of the pre-channelization range. Channel bed features such as point bars, lateral bars, and diagonal bars would be included, but most of these would be placed in the existing channel.

The creation of wetlands would be part of medium-level restoration; however, the new wetland area would not be extensive. Wetland construction would only create emergent wet areas sufficient to maintain frog, toad, and turtle populations, but would not create a mosaic of interspersed riparian wetlands. Riparian forest restoration would be completed at a moderate level and would mainly focus on near-channel areas and wetland areas.

Revegetation features would include planting new and reconstructed streambanks, planting newly excavated emergent and wet meadow wetlands, and planting patches of riparian and upland plant communities within the river corridor and existing agricultural lands. Medium-level vegetation restoration would allow for substantial recovery of the bird, bat, and small mammal populations.

For **high-level restoration** segments, the primary intent is also to reconnect the river to the floodplain and restore channel pattern and sinuosity. However, this level would reconstruct a new river channel, with the bed elevation higher than the existing entrenched channel. This work would include excavating and connecting numerous backwater and oxbow areas to the new river channel. High-level restoration typically includes a channel sinuosity toward the higher end of the pre-channelization range. Channel bed features such as point bars, lateral bars, and diagonal bars would be included to create the new river channel.

The floodplain reconnection and new channel sinuosity would result in hydrologic conditions necessary to develop a complex mosaic of riparian and upland plant communities throughout the entire floodplain area. High-level restoration would also create a mosaic of emergent wetlands interspersed in the riparian forest, and the active reestablishment of a complex patch mosaic of riparian vegetation.

After construction is complete, extensive revegetation would consist of seeding, sapling plantings, bare-root plantings, seedling plantings, and cuttings. Revegetation features would include planting streambanks of the newly constructed meandering channels, planting large expansive patches of various riparian and upland plant communities throughout the entire floodplain, planting newly excavated emergent and wet meadow wetlands, and creating large amounts of sagebrush shrub lands in existing agricultural lands.

6.2.4.2.2 Fish Passage Enhancements

Herman Ditch Diversion. This diversion alternative would replace the existing weir with two new lower-head weirs and repair the wide blow-out area at the right abutment of the existing weir. The new weirs would be keyed into the bed and banks, and built with large enough rock to be stable. The banks would be armored upstream and downstream of the new weirs and for a short distance upstream of the headgate.

Fellnagle Diversion. Removal of the upper section of the existing rock diversion structure and installation of a smaller secondary structure approximately 220 ft downstream to reduce the loss in water pressure is proposed for the Fellnagle irrigation diversion. The structure would be keyed into both banks of the river and the river bed.

S-S Ranch Diversion. The installation of an irrigation pump to replace the existing diversion, according to the action alternative proposal. The pump would be located 1.7 mi downstream from the existing diversion structure and closer to the irrigated fields. This would allow the removal of the upstream diversion. Installation of a pump would require screening of the intake. Typical intake screens would be installed in a vertical or tee configuration.

Marble Bluff Dam. Construction of a new bypass channel is proposed at Marble Bluff Dam to increase the duration and magnitude of fish passage by creating a perennial, meandering channel offering various hydraulic habitats and movement slots for fishes of all life stages. Target conveyance capacities would be 100 cfs during the cui-ui and LCT runs, and 50 cfs during other periods. The new bypass channel entrance would be closer to the base of the dam and offer upstream fish passage during average or high lake levels for longer durations than currently offered by the fish lock. Tying the new bypass channel into the river at a meander would maximize the likelihood of a blend of good attraction flow characteristics, sediment routing at the terminus, and acceptable stability. A geomorphic trends analysis of the reach below the dam, which has shown significant physical adjustment since Marble Bluff Dam was constructed, would be needed during preconstruction engineering design (PED) phase. If further adjustment is expected, two or more training structures could add stability. The bypass channel would need sufficient velocities to clear it of wind-blown debris, and any riverine sediments that settle out. The upstream terminus of the bypass channel would enter the existing fishway near the bridge that crosses the existing channel. By connecting the two fish channels at this point, the existing infrastructure at Marble Bluff Dam could still be used for fish passage and monitoring.

Where the bypass channel has a steep slope (2 percent), four boulders with an average diameter of 2 ft would be inset to the depth of the graded stone. The boulders would be approximately 18 inches apart in this section. Depending on the length of the 2 percent slope area, the boulder clusters would be spaced at approximately 20-ft intervals in an upstream v-shaped orientation. Where the channel slope decreases, clusters of three boulders would be placed in the channel at a spacing of six channel widths. The three-boulder clusters would be 18-inch stone and have the same spacing, inset, and orientation requirements. The terminus for the proposed bypass channel would enter the river downstream of the dam, but before the delta area where the river enters Pyramid Lake.

During conditions when lake levels are below 3,800 ft in elevation, many of the lake fish, including cui-ui, are incapable of swimming past the delta to the base of the dam and the current fish lock that lifts the fish above the dam. A 3-mi-long fishway that bypasses the river delta and connects directly to the lake was constructed in the 1970’s to provide a path for fish movement from the lake to above the dam during low lake level conditions. However, deposition of littoral sands on the entry ladder has proven to be a significant issue. Cui-ui were also shown to be incapable of passing the fishway ladders as designed and only partially successful even after ladders were modified. The existing concrete weir and orifice style fish ladders that are on a 10 percent grade would be replaced with rock ladders on a 1.2 percent slope with boulder array style drops. The rock ladders would be designed to accommodate a 50 cfs flow. In addition, the fishway channel that links the fish ladders would be reconstructed. Channel reconstruction would entail reconfiguring the channel to its original geometry and slope and lining it with a thick, lime-treated clay to prevent seepage.

6.2.4.3 Recreation Features

Recreation features compatible with the ecosystem restoration features are proposed for the Lockwood, Mustang Ranch, Tracy Power Plant, Railroad Cut, and Wadsworth restoration segments. Since these actions would have no discernable impact to fish and wildlife resources, they are not discussed further.

6.3 ALTERNATIVE 4 – LOCALLY PREFERRED PLAN

Alternative 4 - Locally Preferred Plan would include all of the features of Alternative 3 - Floodplain Terracing plus features in the Downtown Reno and Truckee Meadows Reaches to reduce damaging flood events to a 1 in 100 year chance of occurrence in Reach 1 and a 1 in 117 year chance of occurrence in Reach 2. These features are summarized by Reach below.

6.4.1 VERDI REACH

The fish passage improvement measures at the Fleish, Steamboat, Verdi, Washoe/Highland, and Chalk Bluff diversions are the same as described for Alternative 3. There are no FRM or recreation features proposed for the Verdi Reach.

6.4.2 DOWNTOWN RENO REACH

6.4.2.1 Flood Risk Management Features

As described for Alternative 3, performance of the existing FRM features along the Downtown Reno Reach varies dramatically, with bridge heights playing a significant role in obstructing high river flows and influencing the extent of flooding.

Alternative 4 proposes the replacement or removal of five downtown Reno bridges presenting the greatest obstructions to flow. In addition, Alternative 4 would include construction of floodwalls and levees, flood-proofing, bed, bank, and pier scour protection, interior drainage management features, and temporary closures structures. These features as well as the change in 100-year floodplain area as a result of these features are shown in Appendix A (Plate 2) and described further below.

The bridge replacement or removal work for Alternative 4 would be the same as discussed for Alternative 3 except that Center Street and Lake Street Bridges would also be replaced with new bridges. Each of the four new bridges would be a single-span bridge over the Truckee River.

Floodwalls would be constructed primarily on the north side of the river from West Second Street to Arlington Avenue. Additional floodwalls on the north bank would be tied in to the new bridges from Sierra Street to Lake Street, and for a short stretch on the downstream side of the Kuenzli Street Bridge. Smaller floodwall segments would be constructed on the south bank of the river upstream of Booth Street, and between Center Street and Lake Street. A levee is proposed for a short stretch from Museum Drive to Second Street on the south bank. On-bank floodwalls would be constructed in locations where there is sufficient open space available for the floodwall structure, and its associated seepage remediation and maintenance access requirements. In-channel floodwalls would be constructed where structures or topography do not allow sufficient space to construct floodwalls along the banks.

The existing river banks are susceptible to significant erosion and bank instability at several locations along the Downtown Reno Reach. Alternative 4 would install bank protection along these segments. Where water velocities allow, the bank protection would be installed using bioengineering techniques. Where water velocities are too strong or bank instability is too severe, traditional engineering practices such as stone rip-rap or gabion structures would be constructed. A total of 24,244 linear ft of bed, bank, and pier scour protection is proposed in the Downtown Reno Reach. Results from ongoing sedimentation and stability evaluations would determine more specifically where and what type of bank protection would be required.

To manage interior drainage in the Downtown Reno Reach, Alternative 4 would include seven pump stations on the north bank and three pump stations on the south bank of the Truckee River. These pump stations could also accept flows from seepage facilities and/or overland flows that can no longer fall into the Truckee River due to proposed improvements.

Under-seepage remediation features similar to what was described in the Truckee Meadows Reach in the previous alternatives would be required for the floodwalls constructed in the Downtown Reno Reach for Alternative 4.

The construction of floodwalls and replacement of Sierra Street Bridge, Virginia Street Bridge Center Street Bridge, and Lake Street Bridge would require permanently closing several roadways, similar to Alternative 3.

6.4.2.2 Ecosystem Restoration (ER) Features

There are no proposed ER features for this reach.

6.4.2 Truckee Meadows Reach

6.4.2.1 Flood Risk Management Features

The FRM features for Alternative 4 would be similar to what was discussed for Alternative 3. However, the flood protection for Alternative 3 provided protection of up to a 1 in 75 year chance flood. To accommodate the 1 in 117 year chance flood protection that Alternative 4 proposes, average levee and floodwall heights would be increased. In addition, Alternative 4 would include work on the East McCarran Boulevard and Rock Boulevard Bridges, a McCarran Boulevard bypass channel, floodproofing at the Hidden Valley and East Side subdivisions, a ring levee around the UNR Farms Main Experiment Station, and realignment of the North Truckee Drain.

The East McCarran Boulevard and Rock Boulevard Bridges would be lengthened to provide greater conveyance capacity for flood flows and to benefit species movement by connecting with proposed ecosystem restoration terracing. Each bridge would be extended approximately 250 ft to the south.

To increase the flow capacity under the lengthened East McCarran Boulevard Bridge, a new bypass channel would be constructed beginning approximately 6,000 ft upstream of East McCarran Boulevard, passing underneath the lengthened bridge, and tying back into the Truckee River.

In order to accommodate the 117-year floodplain and maximize the existing flood storage capacity provided by the UNR Farms agricultural fields without constructing a detention basin, a ring levee would be constructed around the UNR Farms Main Experiment Station facilities near East McCarran Boulevard. This would remove buildings due east of East McCarran Boulevard and south of the river from the design flow event floodplain. Construction of the ring levee and floodplain terracing, discussed below, in the UNR Farms area would require that a section of Clean Water Way be relocated for approximately 5,000 ft along the southern edge of the ring levee and south of its current alignment. Construction of flood damage reduction features along the alignment in the Truckee Meadows Reach would affect several existing buildings, possibly requiring them to be modified or removed as part of the project.

6.4.2.2 Ecosystem Restoration (ER) Features

The ER features for Alternative 4 would be the same as discussed for Alternative 3, however the intensity of the restoration would be increased to a High Level. The main difference between High and Maximum is approximately 27 more acres of riparian habitat establishment in the Maximum option. Restoration features proposed in relation to Alternative 4 flood risk management features are shown in Appendix B (Plate Eco-101).

6.4.2.3 Recreation Features

Recreation features proposed for Alternative 4-Locally Preferred Plan, would consist of the same features as described in section 6.2.2.2.

6.4.3 LOWER TRUCKEE RIVER REACH

6.4.3.1 Hydraulic Mitigation (HM) Features

At the design flow event (1 in 117 year chance of occurrence), Alternative 4 would induce additional flows above existing conditions in the Lower Truckee River Reach. The HM features for Alternative 4 would be the same as discussed for Alternative 1, with the addition of 3,000 ft of floodplain terracing and floodwall construction proposed at Rainbow Bend and Wadsworth.

The greater reduction in flood risk afforded by Alternative 4 in the Truckee Meadows Reach above Alternative 3 also creates higher potential for increased water velocities and shear stress downstream. This exposes more areas of the river channel to greater scour potential. As a result, Alternative 4 proposes approximately 15,032 linear ft of bioengineered bank stabilization and approximately 68,298 linear ft of traditional engineered stabilization in the Lower Truckee River Reach. As with Alternative 3 scour protection, ongoing sediment transport and stability evaluations would determine more specifically where and what type of bank protection would be required.

6.4.3.2 Ecosystem Restoration (ER) Features

The ER features for the Lower Truckee Reach in Alternative 4 would be identical to those discussed for Alternative 3, with the exception of the HM features discussed above (Section 6.4.3.1).

7.0 MITIGATION PLANS

7.1 THE FISH AND WILDLIFE SERVICE MITIGATION POLICY

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy (46 FR 15, January 23, 1981). The policy establishes guidance for Service personnel on mitigating adverse impacts of land and water developments on fish, wildlife, and their habitats, and uses thereof. It also helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The Service's goal is conservation, protection, and enhancement of fish and wildlife and their habitats. The intent of the policy is to ensure protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources. The Mitigation Policy does not apply to endangered or threatened species, which are covered under the ESA and associated regulations. The policy also does not apply to Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities or Service recommendations related to enhancement of fish and wildlife resources.

The Mitigation Policy establishes four distinct Resource Categories which are used to indicate mitigation goals consistent with the values of the fish and wildlife resource in question (Table 8). The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. Mitigation planning goals range from "no loss of existing habitat value" (*i.e.*, Resource Category 1) to"minimize loss of habitat value" (*i.e.*, Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value". To achieve this goal, any unavoidable losses would need to be replaced in-kind. "In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

Table 8. U.S. Fish and Wildlife Service resource categories, habitat values, and mitigation goals.

Resource Category	Habitat Value	Mitigation Goal
1	High value for evaluation species and is unique and irreplaceable on an national basis or in the ecoregion section	No loss of existing habitat value
2	High quality for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section	No net loss of in-kind habitat value
3	High to medium value for evaluation species	No net loss of habitat value while minimizing loss of in-kind habitat value
4	Medium to low value for evaluation species.	Minimize loss of habitat value

During an impact assessment, the Service applies the Mitigation Policy by identifying each specific habitat type or cover type that may be impacted by the proposed project. Evaluation species which use each habitat or cover type are then selected for resource category analysis. The selection of evaluation species can be based on several rationale, including species: (1) known to be sensitive to specific land and water use actions, (2) playing a key role in nutrient cycling or energy flow, (3) using a common environmental resource, or (4) associated with important resource problems (*e.g.*, migratory birds) as designated by the Director or Regional Directors of the Service. In applying the Mitigation Policy to the proposed project, evaluation species which use each cover-type were selected for Resource Category determination.

In addition to the mitigation goals based on habitat values as defined according to Resource Categories in the Mitigation Policy, the Service's Region 8 (which includes Nevada) has a mitigation goal for wetlands of no net loss of acreages, while seeking a net overall gain in the quality and quantity of wetlands through restoration, development, and enhancement. This policy applies, but is not limited to, Service involvement in federal projects, permits and licenses, NEPA processes, area-wide planning, and technical assistance. Furthermore, the Service believes that wetlands compensation, which is the creation of wetlands to offset losses, should only be deemed acceptable when losses are determined to be unavoidable and compensation is known or believed to be technically feasible. Restoration of former or degraded wetlands is the preferred form of compensatory mitigation, followed by wetlands creation. However, in accordance with the Regional wetlands policy, either of these methods must result in no net loss of wetland acreage.

In recommending mitigation for adverse impacts to fish and wildlife, the Service uses the same sequential mitigation steps recommended in the President's Council on Environmental Quality in the National Environmental Policy Act regulations (40 CFR Part 1508.20 [a-e]). These mitigation steps (in order of preference) are: (1) avoidance of impact; (2) minimization of impact; (3) rectification of impact; (4) reducing or eliminating the impact over time; and (5) compensating for the impact.

7.2 DESIGNATION OF RESOURCE CATEGORIES WITHIN THE PROJECT AREA

Using the vegetation / surface water map units identified in the 2005 ERDC study (Lichvar and Ericsson 2005), the Service identified 7 major surface cover types within the footprint of the project as discussed earlier (Section 6). We then assigned a resource category to each of the major surface types based on identified criteria that considered identified evaluation species (Table 9). In addition to habitat value for evaluation species, the Service considered vegetation nativeness in assigning resource category. The Service placed greater emphasis on native species; therefore, exotic plant species, such as tall whitetop, were assigned to less-valued categories when compared to native species. In general, all open water (Waters of the United States; WOUS) and closely-associated native vegetation community types were assigned to the highest-valued category found in the system (*i.e.*, Resource Category 2). This is supported by the contention that riparian areas in close proximity to surface water often support greater wildlife diversity and biomass. Also these areas serve as highly-functional corridors that enhance connectivity and preserve biodiversity at the landscape scale (Damschen *et al.* 2006). In the case of a cover type involving wetlands[4] for which the Service's regional policy applies (*i.e.*, Open Water/Pond/Riverine and Emergent Wetlands), we added a resource category of "2-WET" to distinguish it from those non-wetland cover types of resource category "2".

[4] Cowardin et al. (1979) defines wetlands in a riverine system as including "…all wetlands and deepwater habitats contained within a channel, [except] wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. . ." The river channel is also defined as "…an open conduit either naturally or atrifically created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water." (Langbein and Iseri 1960:5 *in* Cowardin et al. 1979).

Table 9. Major surface cover type, evaluation species, and assigned resource category.

Major Surface Cover Type	Evaluation Species	Resource Category
NRF	Northern oriole, hairy woodpecker, spotted towhee	2
WMWS	Yellow warbler, spotted towhee, American kestrel	2
EWM	Mink, marsh wren	2-WET
OWPR	Mink, marsh wren	2-WET
UNHSG	Yellow warbler, American kestrel	3
UNNH	Yellow warbler, American kestrel	4
DB	American kestrel	4

Based on these criteria, the appropriate Resource Category and associated mitigation planning goal were then determined. A general description of major surface types and their assigned resource categories follows.

The **NRF** (Native Riparian Forest) surface cover type consisted of native mature riparian forests (cottonwood, willow, maple, and alder). Evaluation species selected for the riparian woodlands that would be impacted are northern oriole, hairy woodpecker, and spotted towhee. These species were selected to represent cavity nesters and insectivores and also because the Service has responsibilities to protect and manage species that use this habitat type under the Migratory Bird Treaty Act (MBTA). Migratory songbirds also play multiple roles in riparian ecology, as predators, prey, and as seed dispersal agents. Cottonwood forests provide important nesting, resting, and foraging areas for these species and other wildlife. The Fremont cottonwood forest cover type, both young and mature stands, supports the greatest diversity and abundance of wildlife species of all habitats along the Truckee River. These areas also support rich and complex insect communities. Riparian habitats are linearly structured which provides extensive edge. Native riparian woodland cover-types are of generally high value to the evaluation species, and are overall, extremely scarce (less than 2 percent remaining from pre-development conditions). Therefore, the Service finds that any riparian woodland cover-type that would be impacted by the proposed project should be placed in **Resource Category 2,** with an associated mitigation planning goal of "no net loss of in-kind habitat value".

The **WMWS** (Willow Mixed Willow Scrub) surface cover type consisted of willow/mixed willow scrub. Evaluation species selected for this type that would be impacted are yellow warbler, spotted towhee, and American kestrel, representing small insectivorous passerine birds and ground-foraging and nesting granivorous organisms. To a lesser extent, mink and marsh wren were also considered. This type of scrub habitat provides vegetative structure, close proximity to forage, and suitable nesting areas. It provides breeding sites, shelter and feeding opportunities for a wide variety of wildlife species. Therefore, the Service finds that any willow and mixed willow scrub cover-type that would be impacted by the proposed project should be placed in **Resource Category 2,** with an associated mitigation planning goal of "no net loss of in-kind habitat value".

The **EWM** (Emergent Wetland Marsh) surface cover type consisted of seasonally flooded areas dominated by non-woody vegetation, including cattails, rushes, and sedges. Evaluation species selected for this type that would be impacted are mink and marsh wren. This type of wetland habitat provides vegetative structure in close proximity to forage areas. The marsh wren is a passerine species which nests and feeds in emergent wetlands, and could therefore be present in any occurrences of this cover type. It is also a migratory bird for which the Service has management responsibility under the MBTA. Therefore, the Service finds that any emergent wetland and marsh cover-type that would be impacted by the proposed project should be placed in **Resource Category 2-WET,** with an associated mitigation planning goal of "no net loss of in-kind habitat value". In addition, the Service's regional goal of "no net loss of wetland acreage or habitat values, whichever is greater" would apply to this habitat type.

The **OWPR** (Open Water Pond Riverine) surface cover type consisted of wetted areas of the active floodplain and terraced areas that meet the Corps' criteria for a wetland or WOUS all of the time. Evaluation species selected for this type that would be impacted are mink and marsh wren. This type of wetted habitat provides important food sources for these species. Therefore, the Service finds that any open water/pond/riverine cover-type that would be impacted by the proposed project should be placed in **Resource Category 2-WET,** with an associated mitigation planning goal of "no net loss of in-kind habitat value". In addition, the Service's regional goal of "no net loss of wetland acreage or habitat values, whichever is greater" would apply to this habitat type.

The **UNHSG** (Upland Native Herbaceous Shrub Grass) surface cover type consisted of upland areas and terraces where native herbaceous shrubs and grasslands are prevalent. Evaluation species selected for this type that would be impacted are yellow warbler and American kestrel. These species were chosen because raptors, as predators, play a key role in community ecology of the study area, and songbirds have important human nonconsumptive benefits (*e.g.,* birdwatching). This type of upland habitat provides important cover and transitional zone for these species as well as foraging habitat for breeding raptors. Grasslands provide a valuable understory as well. The value of these habitats are often enhanced by their continuity with other adjacent habitats, such as wooded areas, cliffs, and ponds, which provide nest and shelter sites. Therefore, the Service finds that any upland native herbaceous/shrub/grassland cover-type that would be impacted by the proposed project should be placed in **Resource Category 3,** with an associated mitigation planning goal of "no net loss of habitat value while minimizing loss of in-kind habitat value".

The **UNNH** (Upland Non Native Herbaceous) surface cover type consisted of upland and terraced areas where non-native herbaceous species are prevalent. Evaluation species selected for this type that would be impacted are yellow warbler and American kestrel. Upland areas potentially impacted by the project vary in their relative values to the evaluation species, depending on the plant species composition, juxtaposition, and magnitude and frequency of flooding. In general, the Service finds these areas to be of limited value to most wildlife. Therefore, the Service finds that any upland non-native herbaceous cover-type that would be impacted by the proposed project should be placed in **Resource Category 4,** with an associated mitigation planning goal of "minimize loss of habitat value".

Table 10. Net acreages post project implementation by resource category under Alternatives 3 and 4 by Reach.

Resource Category	Reach		ALT 3	ALT 4
2-WET	Verdi		-2.1	-2.1
(EWM,OWPR)	Downtown		-0.90	-15.20
	Meadows		-16.20	-16.10
	Lower		77.75	131.9
	Total		**58.55**	**98.50**
2	Verdi		-1.4	-1.4
(NRF)	Downtown		-0.10	-11.20
	Meadows		78.20	45.80
	Lower		290.60	256.40
	Total		**367.30**	**289.60**
3	Verdi		-2.7	-2.7
(WMWS,UNHSG)	Downtown		-0.10	-7.40
	Meadows		86.20	68.90
	Lower		-29.30	-32.20
	Total		**54.10**	**26.60**
4	Verdi		-2.8	-2.8
(DB,UNNSG)	Downtown		0.80	44.80
	Meadows		-331.00	-278.60
	Lower		-571.40	-586.10
	Total		**-904.40**	**-822.70**

The **DB** (Disturbed Bare) surface cover type consisted of the areas that are disturbed or barren of vegetation. The evaluation species selected for this type that would be impacted is American kestrel as it is somewhat reliant on bare ground. DB areas potentially impacted by the project vary in their relative values to the evaluation species, depending on the plant species composition, juxtaposition, and magnitude and frequency of flooding. In general, the Service finds these areas to be of limited value to most wildlife. Therefore, the Service finds that any disturbed/bare surface cover-type that would be impacted by the proposed project should be placed in **Resource Category 4,** with an associated mitigation planning goal of "minimize loss of habitat value".

7.3 SUMMARY OF CHANGES IN RESOURCE CATEGORY ACREAGES

Using the 7 major surface cover types identified earlier, the Service has categorized potentially-impacted acreages for each Resource Category by alternative (Table 10). Resource category disturbance appears very similar in comparison of the two project alternatives post implementation. The major discrepancies involve the additional disturbed acres of the highly-valued 2-WET category with Alternative 4 (98.50 acres), in comparison to Alternative 3 (58.55 acres). These differences are due to: (1) the larger project footprint involved with the additional FRM component construction; and (2) the added 42 years of flood risk prevention afforded from Alternative 4 (1 in 117 year event), in comparison to Alternative 3 (1 in 75 year event). Both alternatives provide substantial riparian plantings (Category 2-High value), with 367.30 acres for Alternative 3, and 289.60 acres for Alternative 4. In conjunction, both alternatives involve the removal of large parcels of low-value DB habitat units (a reduction of 904.40 acres and 822.70 acres, respectively).

8.0 PROJECT IMPACTS

Through its FWCA responsibilities, the Service is required to assess the relative environmental impacts of the alternatives, advise on the mitigability of these impacts, and make detailed recommendations on ways to avoid, minimize, or compensate for these impacts. In doing so, it follows established national and regional policies. In defining federal goals for the conservation and enhancement of the fish and wildlife resources of the Nation, the Service is also guided by the principles of conservation biology, ecosystem management, the Council on Environmental Quality's analysis (CEQ 1993), court decisions regarding public trust responsibilities, broad and specific legislation, other national direction (*e.g.*, the Executive Order on Recreational Fisheries dated June 8, 1995), and local consensus-building efforts such as the Community Coalition lead by the Washoe County Water Resources Planning Division.

This section discusses the potential project impacts on aquatic and terrestrial resources for the identified alternatives. It is generally outside the scope of this report to address cumulative effects resulting from future non-project activities reasonably likely to occur — these will be addressed as a part of the cumulative effects analysis in the NEPA process.

8.1 NO ACTION ALTERNATIVE

The No-Action Alternative serves as the basis against which the proposed action alternatives will be evaluated to determine effectiveness and to identify effects that would result from them. Future conditions are those expected to occur over the next 50 years (the life span of any action alternative).

Under the No-Action alternative, the Corps would not implement the TMFCP. No FRM features would be constructed to contain flows in and the Downtown and Truckee Meadows reaches in excess of current conditions. The risk of damage due to extreme flood events would remain, and erosive damages and degraded water quality would continue to occur. In addition, no restoration components would be implemented. Riparian and geomorphic restoration involving active re-contouring of the river, wetland construction, and plantings within riparian areas would not occur. Re-engineering of up to 9 diversion dams on the river to enhance fish passage also would not happen. No additional recreational facilities would be built.

In general, we predict future conditions within the project area would involve a continued state of degraded conditions or a gradual decline in fish and wildlife habitat values. More specifically, conditions would include:

- riverbed and groundwater elevations that do not rise above present levels and contribute to the disconnection between river and floodplain;
- a river that continues to widen and shallow, thus leading to thermal loading;
- continued river instability leading to streambank erosion and incision;

- limited shaded riparian areas and instream cover;
- diminished instream microhabitat diversity and velocity regimes;
- continued water quality problems and violation of standards;
- continued spread of upland invasive weeds;
- continued problems with fish passage; and
- agricultural, invasive weed, and other disturbed areas would not be converted to habitats of higher value to wildlife.

Exceptions to some of these trends would be expected as a part of continued implementation of the prescribed Truckee River ecosystem flow regimes and new implementation of TROA. However, this effect would be difficult to quantify and is not considered part of this analysis.

8.1.1 Surface Cover Types by Reach

Existing surface cover types for the entire footprint of the proposed project was discussed earlier in Section 6.1. In terms of future conditions by river Reach, we assume there to be little change from existing conditions for purposes of comparing with- and without-Project alternatives.

8.1.1.1 Verdi Reach

In the Verdi Reach, the dominant major cover type would continue to be Disturbed Bare followed by Willow Mixed Willow Shrub habitats.

8.1.1.2 Downtown Reno Reach

In the Downtown Reno Reach, the dominant major cover type would continue to be Disturbed Bare (approximately 50 percent dominance) followed by Native Riparian Forest (17 percent).

8.1.1.3 Truckee Meadows Reach

In the Truckee Meadows Reach, the dominant major cover type would continue to be the low value Disturbed Bare and Upland Non Native Herbaceous habitats.

8.1.1.4 Lower Truckee River Reach

In the lower Truckee River Reach, the dominant major cover types would continue to be Distubed-Bare and Upland Non Native Herbaceous, followed by Open Water Pond Riverine and Upland Native Herbaceous Shrub Grass. Less abundant cover types would include Native Riparian Forest, Willow Mixed Willow Shrub, and Emergent Wetland Marsh habitat types.

8.1.2 Aquatic Resources

Under the no action alternative, water quality critical to aquatic biota, would remain the same. Since no additional FRM features would be constructed, there would be a continued potential for contaminants to enter the river during high flow events (*i.e.*, in excess of 6,000 cfs). This is particularly the case in the Downtown Reno Reach, which has a large number of industrial areas adjacent to the river. Moreover, no geomorphic and riparian restoration would occur in the lower

Truckee River. Continual degradation in aquatic habitat would be reflected in higher water temperatures, degraded water quality, lack of cover, limited depth/velocity diversity, minimal allochthonous input, substrate embeddedness, sediment-dominated substrates (*i.e.*, fines), and limited microhabitat diversity (*e.g.*, pool-riffle complexes).

8.1.2.1 Aquatic Vegetation

Trends for aquatic vegetation are expected to remain the same as compared to current conditions in all reaches. Concerns would remain for the Truckee River, especially for the Lower Truckee River Reach, where warm temperatures and low flows promote algal blooms. These conditions allow the algae that attach to the river bottom to accumulate, increasing organic matter. Decay of organic matter, such as dead algae, would continue to result in low concentrations of DO.

8.1.2.2 Aquatic Invertebrates

Trends for aquatic invertebrate communities are expected to remain about the same compared to current conditions in all reaches. In the Truckee Meadows and Lower Truckee River Reaches for which we have data, benthic macroinvertebrate (BMI) would continue to be dominated by taxa that are tolerant to moderate or highly degraded water quality and habitat conditions. This would result in a domination by highly tolerant BMI taxa such as chironomids (midgeflies), oligochaetes (worms), and hirudineas (leeches).

8.1.2.3 Fish

Under the No Action Alternative, no ER would be implemented. Fish habitat and water quality would continue to be degraded, and fish communities are expected to remain about the same. In the Lower Truckee River Reach, warmwater non-native fish taxa such as brown trout, centrarchids (sunfishes, bass), bullhead, and carp would likely still dominate. To a lesser extent, the Downtown Reno and Truckee Meadows Reaches would also have non-native fish. Native fishes would continue to compete with non-natives for limited space. Varying degrees of fish passage barriers would remain in place throughout all three reaches, disrupting the life history cycles of migratory fishes. Fluvial and adfluvial salmonid fishes would be particularly vulnerable since these rely on access to variable habitats for their life history requirements.

8.1.3 Semi-Aquatic, Riparian, and Terrestrial Resources

The continued loss of wetlands and cottonwood forest would reduce the diversity and numbers of associated wildlife species. Populations and diversity of birds and mammal species dependent on riparian habitats will continue to decrease, while those dependent on disturbed areas (*e.g.*, dominated by invasive plants) will increase. Amphibians dependant on wetlands such as turtles and frogs would also continue to decline.

8.1.3.1 Terrestrial Vegetation

Within targeted segments of the Lower Truckee Reach and, to a lesser extent, the Truckee Meadows Reach, cottonwood and willow stands with understory shrubs in riparian areas would continue to diminish due to the lower water table, contributing to the disconnection between the river and floodplain, and erosive processes to river banks and islands. Prolonged periods where the riparian vegetation is not provided with water would not support seed germination and seedling growth. Recruitment and maintenance of these stands will not occur without the periodic flooding flows in a connected system. Other areas would likely become infested with invasive plants such as tall whitetop and sweet clover in the absence of active plantings. Diversity in plant communities would remain low.

8.1.3.2 Amphibians and Reptiles

Wetland areas in the Lower Truckee River Reach would continue to limited and disconnected from the river. The surrounding terrestrial vegetation will continue to be degraded. Therefore, population of amphibians and reptiles, like northern leopard frogs, will continue to fluctuate with an overall declining trend. An exception to this trend is expected at the Lockwood, Mustang, and 102 Ranch segments where active restoration of wetlands has been completed. In these areas, amphibians and reptile populations are expected to increase in abundance and diversity.

8.1.3.3 Birds

The continued reduction in riparian plant communities would affect birds that depend on this for completing their life cycles. Bird populations would become fragmented as large blocks of riparian forest do the same. Critical resting and feeding sites for birds passing through the Great Basin during the fall and spring migrations would continue to degrade. Species which would decrease in numbers are those that prefer tree species such as cottonwood and willow for perching, foraging and/or nesting as these species would likely decline over time.

8.1.3.4 Mammals

Similar to bird populations, the continued reduction in riparian plant communities would adversely affect mammals which depend on this type of habitat. Mammal populations will continue to become fragmented as large blocks of riparian forest are lost.

8.1.4 Federally-Listed Species

8.1.4.1 Cui-ui

Degraded water quality would continue to exceed the standards for dissolved oxygen, temperature, and other parameters at various times throughout the year. As a result, indirect adverse effects on cui-ui would continue.

Fish passage enhancement would not be implemented on most of the existing barriers. Therefore, cui-ui migrating up from Pyramid Lake would continue to rely on operation of the MBFF during spawning runs in the spring (March – June). The continued existence of other partial barriers in the lower Truckee River would impede upstream passage of cui-ui, limited spawning habitat to only the strongest individuals. Unmodified diversions would continue to cause entrainment of cui-ui adult and larvae.

8.1.4.2 Lahontan cutthroat trout (LCT)

Degraded water quality would continue to exist. Indirect and direct adverse effects on LCT would continue. Moreover, such conditions would continue to benefit non-native fishes that compete with and displace LCT.

LCT from Pyramid Lake would also continue to rely on operating of the MBFF for passage during spawning runs in the spring. Upstream fish passage at any other time would not be possible. Habitat conditions in the Lower Truckee River Reach would continue to be degraded and water temperatures in late summer would preclude LCT use. Therefore, LCT would continue to use this part of the Truckee River as a seasonal corridor, but with limited access to available spawning habitat which is also limited. Diversions would continue to entrain LCT.

8.2 FUTURE WITH THE PROJECT

In assessing effects across action alternatives, a number of similar impacts are expected. All action alternatives would incur temporary adverse effects on existing vegetation and wildlife in the project area due to disturbances associated with construction. The use of heavy equipment would create noise, soil compaction, plant, potential for contaminant leaks (*e.g.*, diesel fuel). Equipment parking and staging, disposal sites and equipment access would inflict temporary disturbance. Construction activities are expected to last upwards of five to seven years. However, most temporary adverse effects would not be expected to last beyond three years after the onset of construction because of the implementation of avoidance measures and Best Management Practices proposed by the Corps. This would include the use of general erosion control measures that include biotechnical applications such as sediment logs and willow wattles, erosion control blankets, hydromulch, and certified weed-free straw mulch.

FRM – In the Downtown Reno Reach, FRM features would prevent urban areas from being inundated during major flood events between 6,000 cfs (1-in-10 year event) and 20,700 cfs (1-in-100 year event). In the Truckee Meadows Reach, FRM features would prevent urban areas from being inundated during flood events between 14,000 cfs and 23,000 cfs (1-in-117 year event). More water would be directed to downstream portions of the river (Lower Truckee River Reach) which are dominated by rural or natural areas. However, the potential damages due to the increase in erosive forces would be attenuated by the restoration features proposed along those segments of the Lower Truckee River Reach.

ER- Channel construction would create a channel that is narrower than existing conditions in the Lower Truckee River Reach. This work would require large excavators with six-wheel drive articulating dump trucks to remove surface materials to an average depth of 5 - 6 ft. To protect water quality, construction crews would place excavated material on one side of the existing channel while they train river flows to the other side. Temporary soil storage in the existing channel should occur in low-risk months to minimize risk of erosion from flood flows.

After the new channel has been excavated, restoration crews would place processed bed material (gravels, cobbles, and boulders) in designated sites to armor the channel bed. The same type and location of armoring that occurs in natural, undisturbed rivers would be employed to construct important features such as diagonal bars, riffles, and point bars. Such features would facilitate the rapid creation of diverse hydraulic habitat types. After completing the new channel, river flows would be diverted into the new section and the abandoned channel would be filled with excavated, stockpiled material. As the soil material is distributed in the abandoned channel, it would be formed into wetland, backwater, and forewater habitat types. Additional wetland types would be constructed in the floodplains at a water table elevation capable of supporting the associated vegetation and permanent surface water year-round. Many of these would be shaped into an oxbow pattern similar to an oxbow pond habitat type.

In some areas (about 15 sites) of the Lower Truckee River, rip-rap and other hardened bank features are required to protect human property and infrastructure. This would keep the river channel from migrating and overtopping during flood flows, thus, interfering with some of the river's natural geomorphic functions. The addition of rip rap and other hardened structures would displace natural riparian vegetation and river-generated gravel bars that are valuable to fish and wildlife. However, the additional bank structures would lessen erosion that contributes sediments to the river that adversely affect some aquatic habitat types.

After construction has been completed, vegetation crews would initiate extensive re-vegetation work. Each area to be re-vegetated would be assigned a prescription of plant species according to supportive abiotic conditions such as ground water level, soil texture, proximity to the river, soil organic content, and soil salinity. Collectively, these prescriptions would be designed to create a mosaic of diverse riparian habitat types. Re-vegetation activities would consist of seeding, sapling plantings, bare-root plantings, seedling plantings, and cuttings.

8.2.1 Alternative 3- Floodplain Terracing

Across all reaches under Alternative 3, the major surface cover types that potentially would be negatively affected by the proposed project consists of disturbed/bare areas (30.7 percent), UNNH (27.0 percent), OWPR (19.7 percent) and UNHSG (27.2 percent). Surface types least likely to be affected include EWM (1.6 percent), WMWS (6.5 percent), and NRF (4.1 percent) (Table 11).

8.2.1.1 Changes to Major Cover Types

Due to the tremendous size and magnitude of the TMFCP, and its large project footprint under Alternative 3 (1638.3 acres), we can expect major changes to the current cover types. In general, the vast proportion of altered habitat types would provide a net benefit to the Truckee River hydrologic system function. On the contrary, some high-value habitats would undoubtedly be lost with a project of this scope. Specifically, a total of 120.0 acres of high-value OWPR would be permanently lost (Table 10). This loss is expressed almost exclusively in the Lower Truckee Reach. The primary loss of this habitat is a product of the restoration of geomorphic function in this highly degraded Reach. Transforming the current river from its shallow, wide and straightened channel into a natural sinuous, deeper and narrower channel would eliminate open-water from a spatial data perspective. However, the Service believes this would provide an overall net benefit to the biological and cultural resources of the Truckee River.

Table 11. Alternative 3- change in cover type acreage for all project components throughout the project lifetime.

FWS Classification	Resource Category	Pre-project acres	Post-Project acres	Increase/ decrease
Emergent Wetland/Marsh (EWM)	2-WET	28.1	284.4	**256.3**
Open Water/Pond/ Riverine (OWPR)	2-WET	360.2	240.2	**-120.0**
Native Riparian Forest (NRF)	2	75.6	442.9	**367.3**
Willow/Mixed Willow Scrub (WMWS)	3	121.4	319.4	**198.0**
Upland Native Herbaceous/Shrub/ Grasslands (UNHSG)	3	147.0	3.1	**-143.9**
Upland Non-native Herbaceous (UNNH)	4	400.3	0.0	**-400.3**
Disturbed/Bare (DB)	4	505.7	348.3	**-157.4**
Total		1638.3	1638.3	0.0

8.2.1.1.1 Verdi Reach

FRM/Recreation Components: There are no FRM or Recreation components proposed for the Verdi Reach.

ER components: A total of 2.1 acres of the high value 2-wet category (OWPR and EWM) would be lost in the Verdi Reach (Table 12). A total of 1.4 acres of NRF and 2.3 acres of WMWS would also be lost. However, there would be a net biological benefit as native Truckee River fish would now have provisions for upstream and downstream passage in these locations (Table 12).

Table 12. Alternative 3-acres of habitat cover types affected for the Verdi Reach.

Fish Passage Improvement Features	Habitat Cover Types Effected - Acreage						
	Emergent Wetland/ Marsh (EWM)	Upland Native Herbaceous/ Shrub/ Grasslands (UNHSG)	Upland Non-native Herbaceous (UNNH)	Disturbed/ Bare (DB)	Native Riparian Forest (NRF)	Willow/ Mixed Willow Scrub (WMWS)	Open Water/ Pond/ Riverine (OWPR)
Fish Bypass Channels	0.3	0.2	0	2.5	1.2	1.9	0.6
Fish Screens	0	0.2	0	0.3	0.2	0.4	0.8
Dam Wier Modification	0	0	0	0	0	0	0.4
Total	**0.3**	**0.4**	**0**	**2.8**	**1.4**	**2.3**	**1.8**

8.2.1.1.2 Downtown Reno Reach

Table 13. Alternative 3- FRM and Recreation post construction vegetation type acreage disturbance for the Downtown Reno Reach.

Flood Risk Management Features	Habitat Cover Types Effected - Acreage						
	Emergent Wetland/ Marsh (EWM)	Upland Native Herbaceous/ Shrub/ (UNHSG)	Upland Non-native Herbaceous (UNNH)	Disturbed/ Bare (DB)	Native Riparian Forest (NRF)	Willow/ Mixed Willow Scrub (WMWS)	Open Water / Pond / Riverine (OWPR)
Bridge Replacements; Bridge Removals; Pedestrian Bridges	0	0	0	0.8	0.1	0.1	0.9

FRM/Recreation Components: At the beginning of project implementation and continuing until the end of the project's lifespan, all existing major cover types in the Downtown Reno Reach would be converted into DB as a part of FRM, a net gain of 1.17 acres of low-value habitat (Table 13). The high-value habitat, OWPR, and NRF would experience net losses of 0.90, and 0.10 acres. The moderate-value habitat WMWS would lose 0.10 acres, respectively. No ER is proposed for this Reach to help offset these losses.

8.2.1.1.3 Truckee Meadows Reach

FRM/Recreation Components. At the beginning of project implementation and continuing until the end of the project's lifespan under Alternative 3, FRM components in the Truckee Meadows Reach would result in a net loss of highly-valued habitats as follows: 0.2 acres of EWM, and 11.5 acres of OWPR (Table 14). Of moderate-value habitat, the cover types UNHSG and WMWS would realize a net loss of 14.8 acres and 12.2 acres, respectively. All of the identified affected acreages would be converted into flood control structures and pedestrian thoroughfares, and thus would be classified as the low-valued DB cover type, a net gain of 91.7 acres.

ER Components: Under Alternative 3, ER components in the Truckee Meadows Reach would result in a net loss of 4.6 acres of the highly-valued EWM, 47.9 acres of the moderately valued UNNH, and 145.1 acres of the low value DB (Table 14). However, this alternative would result in a net gain of 84.3 acres of the highly-valued NRF, 1.3 acres of the moderately-valued UNHSG, and 0.1 acres of the high-valued OWPR. These gains would come from the conversion of low value habitats DB, and UNNHG into NRF and UNHSG.

Table 14. FRM, ER, and Recreation change in vegetation types for the Truckee Meadows Reach under Alternative 3.

USFWS Cover Type	Pre-Construction Habitat Cover Acreages			Post-Construction Habitat Cover Acreages			Post-Construction Change in Habitat Cover Acreages
	Restoration Area	FRM/ Recreation Area	Total	Restoration Area	FRM/ Recreation Area	Total	
Emergent Wetland/Marsh (EWM)	4.6	0.2	4.8	0	0	0	**-4.8**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	1.8	14.8	16.6	3.1	0	3.1	**-13.5**
Upland Non-native Herbaceous (UNNH)	47.9	46.9	94.8	0	0	0	**-94.8**
Disturbed/Bare (DB)	145.1	91.1	236.2	0	0	0	**-236.2**
Native Riparian Forest (NRF)	14.4	6.1	20.5	98.7	0	98.7	**78.2**
Willow/Mixed Willow Scrub (WMWS)	33.7	12.2	45.9	145.6	0	145.6	**99.7**
Open Water / Pond / Riverine (OWPR)	2.4	11.5	13.9	2.5	0	2.5	**-11.4**
Bank Scour Protection - Rip-rap	0	0	0	0	28.9	28.9	**28.9**
Bank Scour Protection - Bioengineered	0	0	0	0	3.2	3.2	**3.2**
Bridge Scour Protection	0	0	0	0	2.7	2.7	**2.7**
Cleanwater Way	0	0	0	0	2.8	2.8	**2.8**
In Channel Floodwall	0	0	0	0	6.5	6.5	**6.5**
Levee	0	0	0	0	70.5	70.5	**70.5**
North Truckee Drain	0	0	0	0	2.1	2.1	**2.1**
On-Bank Floodwall	0	0	0	0	5.5	5.5	**5.5**
Pedestrian Bridges	0	0	0	0	0.2	0.2	**0.1**
Pioneer Ditch	0	0	0	0	6.1	6.1	**6.1**
Recreation	0	0	0	0	26	26	**26**
Terracing	0	0	0	0	28.3	28.3	**28.3**
Total	249.9	182.8	432.7	249.9	182.8	432.7	**0**

Table 15. Summary of cover type impacts for the Truckee Meadows Reach for Alternative 3.

USFWS Cover Type	Pre-Construction Vegetation Cover – Total	Post-Construction Vegetation Total	Change
Emergent Wetland/Marsh (EWM)	4.8	0	**-4.8**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	16.6	3.1	**-13.5**
Upland Non-native Herbaceous (UNNH)	94.8	0	**-94.8**
Disturbed/Bare (DB)	236.2	0	**-236.2**
Native Riparian Forest (NRF)	20.5	98.7	**78.2**
Willow/Mixed Willow Scrub (WMWS)	45.9	145.6	**99.7**
Open Water / Pond / Riverine (OWPR)	13.9	2.5	**-11.4**
Total	**432.7**	**432.7**	

A summary of the impacts from all project components to cover types for Alternative 3 in the Truckee Meadows Reach is shown in Table 15. For highly-valued cover types EWM and OWPR, project implementation would result in a net loss of 16.2 acres. The NRF cover type would realize a net gain of 78.2 acres following post maturation of planted forest. For the moderately-valued cover types, proposed restoration would include a net gain of 99.7 acres of WMWS, and a net loss of 13.5 acres of UNHSG, respectively. For low-valued cover types DB and UNNH, project implementation would result in a net a net loss of 331 acres following restoration maturation (Table 15).

8.2.1.1.4 Lower Truckee River Reach

<u>FRM Components:</u> At the beginning of project implementation and continuing until the end of the project's lifespan under Alternative 3, FRM components in the Lower Truckee Reach would result in a net loss of highly-valued habitats as follows: 1.7 acres of EWM, 10.1 acres of NRF, and 37.4 acres of OWPR. Of the moderately valued habitats, a net loss of 17.5 acres of WMWS, and 20.5 acres of UNHSG would be realized immediately post construction. All of these features would be converted into flood control or bank scour protection, and thus classified as DB (Table 15).

Table 16. Summary of FRM, ER, and Recreation impacts to cover type acres for the Lower Truckee Reach for Alternative 3.

Service Cover Type	Pre-Construction Vegetation Cover – Total	Post-Construction Vegetation Cover – Total	Change (in acres)
Emergent Wetland/Marsh (EWM)	23	284.4	**261.4**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	130	445.7	**315.7**
Upland Non-native Herbaceous (UNNH)	305.5	0.0	**-305.5**
Disturbed/Bare (DB)	265.9	121.6	**-144.4**
Native Riparian Forest (NRF)	53.6	344.2	**290.6**
Willow/Mixed Willow Scrub (WMWS)	73.1	173.8	**100.7**
Open Water / Pond / Riverine (OWPR)	343.6	237.7	**-105.9**
Total	1194.7	1194.7	

A summary of the impacts from all project components to cover types for Alternative 3 in the Lower Truckee Reach is shown in Table 16. For highly-valued cover types EWM and OWPR, project implementation would result in a net gain of 155.5 acres. The NRF cover type would realize a net gain of 290.6 acres following post maturation of planted forest. For the moderately-valued cover types, proposed restoration would include a net gain of 100.7 acres of WMWS, and 315.7 acres of UNHSG, respectively. For low-valued cover types DB and UNNH, project implementation would result in a net a net loss of 449.9 acres following restoration maturation (Table 16).

ER Components: Under Alternative 3, ER components in the Lower Truckee Reach would result in a net loss of 103.7 acres of the highly-valued OWPR. (Table 16). However, this alternative would result in a net gain of 35.2 acres of the high-value EWM, 289.8 acres of the highly-valued NRF, and 280.2 acres of the moderately-valued UNHSG. These gains would come from the conversion of low value habitats DB, and UNNHG into NRF, EWM and UNHSG. The loss of OWPR in this Reach is primarily due to the realignment of the channel from its current state as a wide, shallow and straight into a sinuous, deep and defined bank system.

Table 17. FRM, ER, and Recreation change in vegetation types for the Lower Truckee Reach under Alternative 3.

USFWS Cover Type	Pre-Construction Habitat Cover Acreages				Post-Construction Habitat Cover Acreages				Post-Construction Change in Habitat Cover Acreages
	Restoration Area	Fish Passage Area	FRM Area	Total	Restoration Area	Fish Passage Area	FRM Area	Total	
Emergent Wetland/Marsh (EWM)	21.3	0	1.7	23	284.4	0	0	284.4	**261.4**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	100.3	9.2	20.5	130	0	0	0	0	**-130**
Upland Non-native Herbaceous (UNNH)	287.8	2.3	15.3	305.5	0	0	0	0	**-305.5**
Disturbed/Bare (DB)	229.3	17.5	19.1	265.9	0	0	0	0	**-265.9**
Native Riparian Forest (NRF)	42.6	0.9	10.1	53.6	344.2	0	0	344.2	**290.6**
Willow/Mixed Willow Scrub (WMWS)	54.5	1.1	17.5	73.1	173.8	0	0	173.8	**100.7**
Open Water / Pond / Riverine (OWPR)	304.2	2	37.4	343.6	237.7	0	0	237.7	**-105.9**
Bridge Scour Protection	0	0	0	0	0	0	2.2	2.2	**2.2**
Painted Rock Bridge Replacement	0	0	0	0	0	0	0.3	0.3	**0.3**
Bank Scour Protection - Rip-rap	0	0	0	0	0	0	98.3	98.3	**98.3**
Bank Scour Protection – Bioengineered	0	0	0	0	0	0	20.8	20.8	**20.8**
Fish Bypass Channel (Marble Bluff)	0	0	0	0	0	12	0	12	**12**
Existing Fishway Retrofit (Marble Bluff Dam)	0	0	0	0	0	17.5	0	17.5	**17.5**
Low-head pump with screened intake (S-S Ranch)	0	0	0	0	0	0.2	0	0.2	**0.2**
Dam Wier Modification (Hermann, Fellnagle)	0	0	0	0	0	3.3	0	3.3	**3.3**
Total	**1040.1**	**33**	**121.6**	**1194.7**	**1040.1**	**33**	**121.6**	**1194.7**	

8.2.3.2 Aquatic Resources

Over the short-term (5-10 years post construction), riparian areas where there is a temporary or a net loss of streamside vegetation canopy would experience increases to water temperature, which in turn can affect the biotic characteristics of the river. Reductions in vegetation density would bring about a greater change in available shade, which increases solar radiation, and increases water temperature.

Degradation of runoff water quality due to non-point source pollutants could emanate from the project area during construction activities that would cumulatively affect water quality to the Truckee River. Site grading during construction would expose soils to rain, erosion and transport to the Truckee River by runoff, and could also result in increased turbidity in the Truckee River and Steamboat Creek. Other potential sources of water quality degradation that could occur during construction include accidental spills of fuel or chemicals.

Excavation along Steamboat Creek, if needed, would likely mobilize contaminants like mercury, arsenic, and boron. However, without additional details, it is difficult to predict the extent of this effect to aquatic biota.

Over the long-term, ER implementation primarily in the lower Truckee River Reach would result in changes in the channel morphology and promote bank vegetation, which would significantly reduce channel width and increase channel depth. Over the long term, a narrower, deeper shaded channel would decrease water temperatures. The increased connectivity between the river and the floodplain (and associated wetlands) would improve water quality by removing fine sediments and nutrients.

8.2.3.2.1 Aquatic Vegetation

Short term adverse effects to aquatic vegetation are expected due to mechanical disturbance that increases fine sediment input and degraded water quality.

Long-term beneficial effects to aquatic vegetation are expected as a result of restoration. Increased shading, a deeper, narrower river channel, and connectivity to the floodplain would significantly improve water quality and favor desirable aquatic vegetation.

8.2.3.2.2 Aquatic Invertebrates

The removal of streamside vegetation could impact important invertebrate production areas (*e.g.*, overhanging willows), which would be temporarily lost. Nutrient inflow, in the form of detritus and woody debris, could also decrease. However, biotechnical bank stabilization methods would allow for habitat attributes to be recovered by replanting near shore woody vegetation. This vegetation would provide instream and overhanging cover, introduce roots and other woody material into the river system, and assist in varying the near shore water velocities and depths.

Adverse effects to aquatic invertebrates are also expected due to channel disturbance. Excavation and fill would be required as a part of FRM and ER construction, which would increase fine sediment input that impact aquatic invertebrate assemblages. Degraded water quality would also contribute to this impact.

Long-term benefits to aquatic invertebrates are expected with restoration. Improved water quality (including cooler temperatures) would favor healthy assemblages.

8.2.3.2.3 Fish

Some short-term adverse effects would be associated with the construction phase of this project, which would result in injuries and/or mortalities to fish. Heavy equipment operating in and around the river would damage habitat and inflict direct harm to fish. As most of the work involving the river would occur during low flows (*i.e.*, after July 1), the greatest potential for direct effects would be for the fall-spawning fish (*i.e.*, brown trout and mountain whitefish). Deposition of suspended material from upstream construction activities would cover spawning grounds of these species as well as reduce benthic macroinvertebrate (a food source for fish) species diversity and abundance. Also, there may be direct disturbance to and dewatering of spawning areas. Continued disturbance from noise, lights, and motion may be enough to cause fish to abandon spawning.

Over the long-term, however, the restoration component would greatly improve habitat, water quality, and temperatures that would benefit native fishes in the Project area. As the restoration project would involve the addition of shaded areas through riparian improvements, these would result in lower water temperatures. The levees, floodwalls, and detention basins to be constructed along the Truckee River and Steamboat Creek could act as barriers to fish, stranding them after flood waters recede. However, this is not considered to be a significant impact because fish could only be stranded after events greater than the designed-for flood capacity. Currently, fish can become stranded in various reaches during less than the 100-year event. Thus the Preferred Alternative would reduce the frequency of stranded and trapped fish.

8.2.3.3 Semi-Aquatic, Riparian, and Terrestrial Resources

Along the Truckee River, construction of the project would incur temporary losses to riparian forestand riparian scrub-shrub. This loss would temporarily adversely affect the many birds, small mammals, reptiles, and amphibians which use these existing riparian corridors. Most wildlife species inhabiting the riparian corridor would be lost or displaced during construction. The loss of large trees would temporarily eliminate nesting and roosting habitat for several bird species. However, this loss would occur incrementally in construction phases, and not all at once. We anticipate losses to large mature trees to be low to non-existent and riparian plantings would be included during the phased construction.

8.2.3.3.1 Terrestrial Vegetation

Short-term adverse impacts to terrestrial vegetation are expected due to construction of FRM, ER, and recreation components. Although measures would be incorporated to protect existing vegetation, it is expected that terrestrial vegetation would be impacted from construction activities involving land clearing to install these features.

Over the long term, FRM that sends more flows downstream and ER that results in connectivity between the river and floodplain would benefit the abundance, distribution, and condition of riparian vegetation (Kattelmann and Embury, 1996). During periods of higher flow, portions of the floodplain may be inundated, revitalizing riparian vegetation in those areas. High flow can also remove vegetation and create the mineral surfaces that some riparian plants need for seed germination. Cottonwood stands especially would benefit from this connectivity as they depend on the presence of an exposed, moist mineral surface when seeds are viable, usually a 3-week period from early May to early July (Fenner *et al.* 1985). Additional conditions necessary for successful seedling establishment are: (1) peak streamflows to create germination sites, (2) receding streamflows during seed dispersal, (3) gradually declining streamflows after seedling establishment, and (4) adequate late summer and fall streamflows. Extremely high flow, such as occurs during large storm events, may scour the stream channel of established vegetation. In addition, these areas would experience increased soil moisture, added nutrients and organic matter, and recruitment of plant material for natural revegetation.

Long-term passive restoration of riparian vegetation in the Truckee Meadows and Lower Truckee River reaches would proceed at different rates depending on vegetation type and water availability. Upland vegetation would develop more slowly compared to emergent wetlands, which usually only take a few years to develop. Cottonwoods and willow trees in the upper canopy forest Reach maturity in 10 to 15 years, but would continue to develop in canopy for over 50 years.

There would also be significant revegetation with the goal to enhance plant species and structural diversity through expansion of the six most common vegetation community types: (1) riparian forest, (2) riparian shrublands, (3) scrub-shrub emergent wetlands, (4) wet meadow, (5) transitional wet meadow, and (6) sagebrush shrublands. Proper implementation of site-specific re-vegetation designs would result in the establishment of large patches of riparian, wetland, and upland plant communities comprised of commonly occurring Truckee River Great Basin plant associations. Re-vegetation of the riparian corridor and associated uplands is designed to improve wildlife habitat by preserving and enhancing existing plant communities and by creating new habitat. To reduce re-vegetation costs and hasten the re-vegetation process existing plant communities would be preserved to the maximum extent possible.

8.2.3.3.2 Amphibians and Reptiles

ER would increase wetland habitat and diversity, which would benefit amphibians and reptiles. By mechanically elevating the river bed, connection with the floodplain would be re-established, thus providing flows during high flow events that support wetland areas. Additionally, the active creation of wetlands would provide additional habitat for amphibians and reptiles.

8.2.3.3.3 Birds

Loss in riparian cover-type would result in a temporary adverse effect on birds.
During equipment disturbance, many birds would be displaced to adjacent areas. The loss of large trees would temporarily eliminate nesting and roosting habitat for several bird species. However, this cover-type would be created with the proposed project and, over time, would replace habitat that would be lost. ER would increase riparian and wetland habitat and diversity, thus benefiting riparian and wetland songbird communities.

8.2.3.3.4 Mammals

Short-term impacts due to FRM and ER construction have the propensity to displace mammals within the area. However, the proposed project would incur long-term benefits for mammals by providing an overall net gain in habitat units.

8.2.3.4 Listed Species

The project could affect water surface elevation and the quality, quantity, timing and duration of flow of the Truckee River and several of its tributaries. These changes could affect the life histories, habitat, and potential for recovery of listed species. ER would create a channel morphology and shaded areas to reduce temperatures that are more favorable to spawning and survival of both cui-ui and LCT.

With the project, cottonwoods and willows acreages would be added, which are habitat types associated with cui-ui and LCT. The effects of the project could result in direct, indirect, and cumulative impacts to listed species. Direct impacts could include harassment; displacement; mortality, which could occur during construction of dikes and floodwalls, creation of flood terraces and floodplain habitat; and loss of habitat. Indirect impacts could include changes in hydrology due to placement of bank stabilization structures and construction of a detention basin; and release of toxins that have been bound in sediments for years during construction with heavy equipment (especially along Steamboat Creek). Cumulative impacts include diversions of water that may entrain adult or larval fish; and point and non-point source chemical contaminant discharges.

A number of conservation recommendations are provided in Chapters 9 these should be implemented and followed by the Corps.

8.2.3.4.1 Cui-ui

The increase in riparian vegetation among segments in the lower Truckee River would create shaded areas that would help maintain cooler water temperatures and reduce evaporative process which would benefit cui-ui in the long-term. Due to the timing of construction (*e.g.* July-September), it is anticipated that cui-ui would not be present within the watershed.

8.2.3.4.2 Lahontan cutthroat trout

The increase in riparian vegetation among segments in the lower Truckee River would create shaded areas that would help maintain cooler water temperatures and reduce evaporative process which would benefit LCT. The vegetation would also increase input from allochthonous sources (*e.g.*, large woody debris, leaf litter), which provides cover and forage for benthic macroinvertebrates, an LCT food source.

Table 18. Alternative 4- change in cover type acreage for all project components throughout the project lifetime.

Service Classification	Resource Category	Pre-project acres	Post-Project acres	Increase/ decrease in acres
Emergent Wetland/Marsh (EWM)	2-WET	28.9	283.8	**254.9**
Open Water / Pond / Riverine (OWPR)	2-WET	396.6	240.2	**-156.4**
Native Riparian Forest (NRF)	2	116.8	406.4	**289.6**
Willow/Mixed Willow Scrub (WMWS)	3	113.3	300.4	**187.1**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	3	162.8	2.3	**-160.5**
Upland Non-native Herbaceous (UNNH)	4	410.1	0.0	**-410.1**
Disturbed/Bare (DB)	4	507.3	502.7	**-4.6**
Total		1735.8	1735.8	

8.2.2 Alternative 4- LPP Plan

Across all reaches under Alternative 4, the major surface cover types that would be most affected by the proposed project consist of UNNH (23.6 percent), OWPR (22.8 percent) and UNHSG (9.38 percent). Surface types least likely to be affected include EWM (1.70 percent), WMWS (6.53 percent), and NRF (5.9 percent) (Table 18).

8.2.2.1 Changes to Major Cover Types

The changes to major cover types for Alternative 4 would be similar to those of Alternative 3. Again, the primary destruction of high-value habitats (*e.g.* OWPR) would involve the hydrologic and geomorphic restoration of the degraded Lower Truckee River Reach. The major disparity between the two alternatives involves the differences in NRF post-construction. In comparison to Alternative 4, Alternative 3 would involve the planting of additional NRF acreage (291.5 and 368.7) post construction. On the surface this appears that Alternative 3 may provide a larger net benefit for the system biologically, and culturally. However, due to the difficulty in establishing successful and sustainable riparian restoration in arid climates (Goodwin *et al.* 1997; Hawkins *et al.* 199; Kershner 1997), and the likelihood of riparian failure without mature (>25 years) vegetation from previous Truckee River studies (Rood *et al.* 2003), the Service believes that Alternative 4 would provide the largest net benefit. In addition to a proposed restoration plan with a higher likelihood of sustainability, Alternative 4 provides increased flood protection (1 in 117 year event compared to a 1 in 75 year event) to the residents of Washoe and Storey Counties.

8.2.2.1.1 Verdi Reach

Changes to major cover types would be identical to that described for Alternative 3.

8.2.2.1.2 Downtown Reach

FRM/Recreation Components: At the beginning of project implementation and continuing until the end of the project's lifespan, all existing major cover types in the Downtown Reno Reach would be converted into FRM features (Table 19). The Service delineates these construction components as DB. In total, a net gain of 44.7 acres of the low-value DB habitat (Table 19). The high-value habitat, OWPR, and NRF would experience net losses of 15.1, and 11.2 acres. The moderate-value habitats UNHSG and WMWS would lose 0.1 and 7.3 acres, respectively. No ER is proposed for this Reach to help offset these losses

Table 19. Alternative 4- FRM and Recreation pre and post construction vegetation type acreage changes for the Downtown Reach.

	Habitat Cover Types Effected - Acreage						
Flood Risk Management Features	**Emergent Wetland/ Marsh (EWM)**	**Upland Native Herbaceous/ Shrub/ Grasslands (UNHSG)**	**Upland Non-native Herbaceous (UNNH)**	**Disturbed/ Bare (DB)**	**Native Riparian Forest (NRF)**	**Willow/ Mixed Willow Scrub (WMWS)**	**Open Water/ Pond/ Riverine (OWPR)**
In-Channel Floodwall	0.1	0	0.1	4.8	1.6	1.5	0.8
Bridge Scour Protection	0	0	0.1	1.2	0.3	0.4	2.1
Bridge Replacement (Sierra, Virginia, Center, Lake)	0	0	0.1	1.8	0.1	0.1	1
Bridge Removal (lower Wells)	0	0	0	0	0.1	0	0.2
Bank Scour Protection	0	0.1	2.2	3.9	8.4	5	10.9
Pedestrian Bridge	0	0	0	0.1	0.1	0	0.1
On-Bank Floodwall	0	0	0.1	5.2	0.2	0.1	0
Levee	0	0	2.6	27.7	0.4	0.2	0
Total	**0.1**	**0.1**	**5.2**	**44.7**	**11.2**	**7.3**	**15.1**

8.2.2.1.3 Truckee Meadows Reach

FRM/Recreation Components: At the beginning of project implementation and continuing until the end of the project's lifespan under Alternative 3, FRM components in the Truckee Meadows Reach would result in a net loss of highly-valued habitats as follows: 4.6 acres of EWM, and 11.5 acres of OWPR, and a net gain of 45.8 acres of NRF (Table 20). Of moderate-value habitat, the cover types UNHSG would realize a net loss of 14.2 acres and WMWS would increase by 83.1 acres, respectively. All of the identified affected acreages would be converted into flood control structures, and thus would be classified as the low-valued DB cover type, a net gain of 180.0 acres.

Table 20. FRM, ER, and Recreation change in vegetation types for the Truckee Meadows Reach under Alternative 4. (all values reported in acres)

USFWS Cover Type	Pre-Construction Habitat Cover Acreages			Post-Construction Habitat Cover Acreages			Post-Construction Change in Habitat Cover Acreages
	Restoration Area	FRM Area	Total	Restoration Area	FRM Area	Total	
Emergent Wetland/Marsh (EWM)	0	4.6	4.6	0	0	0	**-4.6**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	1.3	15.2	16.5	2.3	0	2.3	**-14.2**
Upland Non-native Herbaceous (UNNH)	45.9	49.2	95.1	0	0	0	**-95.1**
Disturbed/Bare (DB)	103.6	79.9	183.5	0	0	0	**-183.5**
Native Riparian Forest (NRF)	12.2	7.1	19.3	65.1	0	65.1	**45.8**
Willow/Mixed Willow Scrub (WMWS)	31.3	12.3	43.6	126.7	0	126.7	**83.1**
Open Water / Pond / Riverine (OWPR)	2.3	11.7	14	2.5	0	2.5	**-11.5**
Bank Scour Protection - Rip-rap	0	0	0	0	29.3	29.3	**29.3**
Bank Scour Protection - Bioengineered	0	0	0	0	3.2	3.2	**3.2**
Bridge Scour Protection	0	0	0	0	4.1	4.1	**4.1**
Cleanwater Way	0	0	0	0	4	4	**4**
In Channel Floodwall	0	0	0	0	2.6	2.6	**2.6**
Levee	0	0	0	0	43.9	43.9	**43.9**
North Truckee Drain	0	0	0	0	3.2	3.2	**3.2**
On-Bank Floodwall	0	0	0	0	3.3	3.3	**3.3**
Pedestrian Bridges	0	0	0	0	0	0	**0**
Pioneer Ditch	0	0	0	0	6.1	6.1	**6.1**
Recreation	0	0	0	0	26	26	**26**
Terracing	0	0	0	0	54.3	54.3	**54.3**
Total	**196.6**	**180**	**376.6**	**196.6**	**180**	**376.6**	**0**

ER Components: Under Alternative 4, ER components in the Truckee Meadows Reach would result in a net loss of 45.9 acres of the low valued UNNH, and 103.6 acres of the low value DB.

(Table 19). However, this alternative would result in a net gain of 45.8 acres of the highly-valued NRF, 83.1 acres of the highly-valued WMWS, 1.0 acres of the moderately valued UNHSG, and 0.2 acres of the high-valued OWPR (Table 20). These gains in vegetation cover types would result from the conversion of low value habitats DB, and UNNHG into NRF, WMWS and UNHSG.

For highly-valued cover types EWM and OWPR, project implementation would result in a net loss of 16.1 acres. The NRF cover type would realize a net gain of 45.8 acres following post maturation of planted forest. For the moderately-valued cover types, proposed restoration would include a net gain of 83.1 acres of WMWS, and a net gain of 14.2 acres of UNHSG, respectively. For low-valued cover types DB and UNNH, project implementation would result in a net a net loss of 278.6 acres following restoration maturation (Table 21).

Table 21. Summary of cover type impacts for the Truckee Meadows Reach for Alternative 4 (all values reported in acres).

USFWS Cover Type	Pre-Construction Vegetation Total	Post-Construction Vegetation Total	Change (in acres)
Emergent Wetland/Marsh (EWM)	4.6	0	**-4.6**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	16.5	2.3	**-14.2**
Upland Non-native Herbaceous (UNNH)	95.1	0	**-95.1**
Disturbed/Bare (DB)	183.5	0	**-183.5**
Native Riparian Forest (NRF)	19.3	65.1	**45.8**
Willow/Mixed Willow Scrub (WMWS)	43.6	126.7	**83.1**
Open Water / Pond / Riverine (OWPR)	14	2.5	**-11.5**
Total	376.6	376.6	

8.2.2.1.3 Lower Truckee River

FRM Components: In the Lower Truckee Reach, Alternative 4 would incur changes to major cover types similar to that of Alternative 3. At the beginning of project implementation and continuing until the end of the project's lifespan under Alternative 4, FRM components in the Lower Truckee Reach would result in a net loss of highly-valued habitats as follows: 2.6 acres of EWM, 18.6 acres of NRF, and 60.2 acres of OWPR. Of the moderately valued habitats, a net loss of 28.3 acres of WMWS, and 28.1 acres of UNHSG would be realized immediately post construction. All of these features would be converted into flood control or bank scour protection, and thus classified as DB (Table 22).

Table 22. FRM, ER, and Recreation change in vegetation types for the Lower Truckee Reach under Alternative 4. (all values reported in acres)

Service Cover Type	Pre-Construction Habitat Cover Acreages				Post-Construction Habitat Cover Acreages				Post-Construction Change in Habitat Cover Acreages
	Restoration Area	Fish Passage Area	FRM Area	Total	Restoration Area	Fish Passage Area	FRM Area	Total	
Emergent Wetland/Marsh (EWM)	21.3	0	2.6	23.9	283.8	0	0	283.8	**259.9**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	117.7	0	28.1	145.8	0	0	0	0	**-145.8**
Upland Non-native Herbaceous (UNNH)	284.3	2.3	23.2	309.8	0	0	0	0	**-309.8**
Disturbed/Bare (DB)	213.7	27.2	35.4	276.3	0	0	0	0	**-276.3**
Native Riparian Forest (NRF)	65.4	0.9	18.6	84.9	341.3	0	0	341.3	**256.4**
Willow/Mixed Willow Scrub (WMWS)	30.6	1.2	28.3	60.1	173.7	0	0	173.7	**113.6**
Open Water / Pond / Riverine (OWPR)	303.5	2	60.2	365.7	237.7	0	0	237.7	**-128**
Bank Scour Protection - Rip-rap	0	0	0	0	0	0	146.2	146.2	**146.2**
Bank Scour Protection - Bioengineered	0	0	0	0	0	0	36.5	36.5	**36.5**
Bridge Scour Protection	0	0	0	0	0	0	5.8	5.8	**5.8**
Rainbow Bend Hydraulic Mitigation	0	0	0	0	0	0	6.8	6.8	**6.8**
Wadsworth floodwall	0	0	0	0	0	0	0.8	0.8	**0.8**
Painted Rock Bridge Replacement	0	0	0	0	0	0	0.3	0.3	**0.3**
Fish Bypass Channel (Marble Bluff)	0	0	0	0	0	12	0	12	**12**
Existing Fishway Retrofit (Marble Bluff Dam)	0	0	0	0	0	17.5	0	17.5	**17.5**
Low-head pump with screened intake (S-S Ranch)	0	0	0	0	0	0.2	0	0.2	**0.2**
Dam Wier Modification + fish screen (Hermann, Fellnagle)	0	0	0	0	0	3.9	0	3.9	**3.9**
Total	**1036.5**	**33.6**	**196.4**	**1266.5**	**1036.5**	**33.6**	**196.4**	**1266.5**	

ER Components: Under Alternative 4, ER components in the Lower Truckee Reach would result in a net loss of 65.8 acres of the highly-valued OWPR, and 117.7 of the moderately valued UNHSG (Table 22). However, this alternative would result in a net gain of 259.9 acres of the high-value EWM, 275.9 acres of the highly-valued NRF, and 284.3 acres of the moderately-valued UNHSG. These gains would come from the conversion of low value habitats DB, and UNNHG into NRF, EWM and UNHSG. The loss of OWPR in this Reach is primarily due to the realignment of the channel from its current state as a wide, shallow and straight into a sinuous, deep and defined bank system (Table 22).

A summary of the impacts from all project components to cover types for Alternative 4 in the Lower Truckee Reach is shown in Table 23. For highly-valued cover types EWM and OWPR, project implementation would result in a net loss of 90.2 acres. The NRF cover type would realize a net gain of 256.4 acres following post maturation of planted forest. For the moderately-valued cover types, proposed restoration would include a net gain of 113.6 acres of WMWS, and a net loss of 145.8 acres of UNHSG, respectively. For low-valued cover types DB and UNNH, project implementation would result in a net a net loss of 586.1 acres following restoration maturation.

Table 23. Summary of FRM, ER, and Recreation impacts to cover type acres for the Lower Truckee Reach for Alternative 4.

Service Cover Type	Pre-Construction Vegetation Total	Post-Construction Vegetation Total	Change (in acres)
Emergent Wetland/Marsh (EWM)	23.9	283.8	**259.9**
Upland Native Herbaceous / Shrub / Grasslands (UNHSG)	145.8	0	**-145.8**
Upland Non-native Herbaceous (UNNH)	309.8	0	**-309.8**
Disturbed/Bare (DB)	276.3	0	**-276.3**
Native Riparian Forest (NRF)	84.9	341.3	**256.4**
Willow/Mixed Willow Scrub (WMWS)	60.1	173.7	**113.6**
Open Water / Pond / Riverine (OWPR)	365.7	237.7	**-128.0**
Total	1266.5	1266.5	

8.2.4.2 Aquatic Resources

Alternative 4 would have many similar effects to aquatic resources as Alternative 1, discussed in 8.2.3.2. An added biological impact from Alternative 4 includes the additional fish passage measures implemented in the Lower Truckee River Reach not present in Alternative 3. These impacts are addressed in detail below.

8.2.4.2.1 Aquatic Vegetation

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to aquatic vegetation as Alternative 3, discussed in 8.2.3.2.1

8.2.4.2.2 Aquatic Invertebrates

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to aquatic invertebrates as Alternative 3, discussed in 8.2.3.2.2

8.2.4.2.3 Fish

Due to the similarities of the proposed projects, Alternative 4 would have many similar effects to fish as Alternative 3, discussed in 8.2.3.2.3

8.2.4.3 Semi-Aquatic, Riparian, and Terrestrial Resources

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to Semi-Aquatic, Riparian and Terrestrial Resources as Alternative 3, discussed in 8.2.3.2.

8.2.4.3.1 Terrestrial Vegetation

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to terrestrial vegetation as Alternative 3, discussed in 8.2.3.3.1

8.2.4.3.2 Amphibians and Reptiles

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to amphibians and reptiles as Alternative 3, discussed in 8.2.3.3.2.

8.2.4.3.3 Birds

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to birds as Alternative 3, discussed in 8.2.3.3.3

8.2.4.3.4 Mammals

Due to the similarities of the proposed projects, Alternative 4 would share short-term and long term effects to mammals as Alternative 3, discussed in 8.2.3.3.4

8.2.4.4 Listed Species

Due to the similarities of the proposed projects, Alternative 4 would share many short-term and long term effects to listed species as Alternative 3, discussed in 8.2.3.3.4. An added benefit to Alternative 4 would be the installation of fish screens at two diversion locations, Hermann and Fellnagle. Recovery Plans for both cui-ui (Service 1992), and LCT (Service 1995) identify successful passage of all life stages through Truckee River diversions and dam structures as conservation measures needed to sustain these native species. Currently, both of these irrigation diversions remain unscreened, with no return to the Truckee River. That is, any fish that enters the diversion has no method to return to the river, except swimming back upstream. Due to their limited swimming proficiency, this is impossible for larval cui-ui, and young-of-the-year LCT.

8.2.4.4.1 Cui-ui

Due to the similarities of the proposed projects, Alternative 4 would share similar effects to aquatic resources as Alternative 3, discussed in 8.2.3.4.1. An additional benefit of Alternative 4 over Alternative 3 is the additional fish passage improvements at diversions located on the Lower Truckee Reach. These fish passage and cui-ui conservation measures would prevent entrainment of larval and adult cui-ui that navigate into this diversion.

8.2.4.4.2 Lahontan cutthroat trout

Due to the similarities of the proposed projects, Alternative 4 would share similar effects to LCT as Alternative 3, discussed in 8.2.3.4.2. An additional benefit of Alternative 4 includes the additional fish passage improvements at Hermann and Fellnagle diversions on the Lower Truckee Reach. The modifications of these diversion structures would prevent entrainment of juvenile and adult cui-ui that navigate into the diversion structures.

8.3 SUMMARY OF IMPACTS

Implementation of the action alternatives would have short-term adverse effects, but long-term beneficial effects on the natural lotic processes and biological resources of the Truckee River. Plant roots help stabilize the soil, and stems and leaves of emergent vegetation move with the current, decreasing flow velocity and reducing the scour effects of water. Vegetation also traps sediment from the watershed, preventing it from settling spawning sites, fish eggs and fry, and insect larvae. Emergent vegetation provides cover as well as a substrate for organisms and eggs. Shade provided by overhanging vegetation helps maintain cool water temperatures important for many fish species. Encroachment of vegetation into the channel may help create a narrower, deeper channel, also improving conditions for fish (U.S. Department of the Interior and State of California 2008).

Organic material from riparian vegetation provides organic carbon for the aquatic ecosystem. Trees and shrubs provide habitat for terrestrial insects (a food source for many wildlife species), cover, and nesting sites for birds and mammals. Riparian zones and associated aquatic and terrestrial vegetation are critical for breeding birds. Riparian zones also serve as corridors for migrating and dispersing animals.

The Service believes that the least damaging alternative from an environmental, human health and safety, and social and community development perspective is Alternative 4 (Locally-Preferred Plan). Although restoration components remain identical across all action alternatives for the Lower Truckee River Reach, the primary differences between the two action alternatives reside in the step benching of the banks (described in detail in Section 6.4.3.1), and increased riparian plantings in the Truckee Meadows and Lower Truckee River Reaches. In addition, flood reduction capabilities for Alternative 3 are reduced from a 117 year event, to a 75 year flood event. Thus, there would be a greater propensity to flood reaches downstream of the Downtown Reno Reach.

The benching proposed in the Truckee Meadows and Lower Truckee River Reaches would allow greater connectivity between the river, floodplain and riparian vegetation. Although this connectivity is a natural cycle that has the potential to improve riparian recruitment, the Service agrees that the benefit of increased planted riparian forests is far outweighed by the reduction of flood protection of 42 years to the residents of Washoe and Storey County, Nevada. Although the Service is supportive of riparian restoration, we are also concerned the newly planted riparian forests described in Alternative 3 have a high potential to fail, based on the amount of time needed for riparian stands to mature, survive an extreme water event, and the limited time the planting sites would be effectively monitored and re-planted (Klotz 1997; Rood *et al.* 2003).

Upon further analysis, Alternative 4—Locally Preferred Plan would offer substantially greater benefits to fish and wildlife resources over Alternative 3—Floodplain Terracing. This is particularly evident in the Lower Truckee River Reach with the additional Hydraulic Mitigation features and fish passage improvements at the Fellnagle and Hermann Diversions. Improvements to Truckee River diversions for successful upstream and downstream passage of all life stages of fish are identified as conservation measures in the 5-Year Review for LCT (Service 2009), and the Short Term Action Plan for LCT in the Truckee River Basin (TRIT 2003). In conclusion, Alternative 4—Locally-Preferred Plan would provide additional benefits not immediately evident in disturbance, HEP or restoration acreage analyses, including: (1) an additional 42 year flood event protection for residents of Washoe and Storey Counties; (2) a restoration plan with a higher chance to succeed and sustain outside of the required monitoring period; and (3) an additional long-term benefit of increased conservation of both federally-listed and native fishes within the Truckee River basin.

9.0 RECOMMENDATIONS

9.1 GENERAL RECOMMENDATIONS

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy (46 FR 15; January 23, 1981). Recommendations are based on the current project information provided by the Corps. These recommendations are to assist the Corps during the project's planning process to ensure that adverse impacts to existing wildlife resources are avoided or minimized. The following are our recommendations for enhancement of habitat associated with the Project:

1. The alternative with the most beneficial effects to riparian, aquatic, and wetland habitats and which avoids unmitigable impacts in the Truckee River should be selected. As evidenced by results from the Service's analysis, the most beneficial configuration is Alternative 4, the Locally Preferred Plan.

2. The LCT TRIT has finalized a Short-Term Action Plan (Action Plan) for the species (Service 2003). This Action Plan identifies priority areas with current or potential opportunities to support LCT or important habitats that would sustain various life history stages. It also specifies tasks to be implemented to help ensure long-term persistence of the species. All aspects of the Project should be reviewed for consistency with this Action Plan.

3. Consideration should be given to the implementation of TROA and the ecosystem-based six-flow regime recommendations and how this would affect restoration efforts.

4. In the absence of TROA implementation, design project features should be designed such that flow regimes match the prescribed ecosystem flow regimes as described in the TRIT without sacrificing flood protection (Service 2003).

9.2 SPECIFIC RECOMMENDATIONS

1. Construction activities immediately in and adjacent to the river channel should be done during low flows (*i.e.*, between July 1 and September 30) while maintaining downstream water flow. De-watering associated with construction should not occur during the spring season to avoid migration periods of native fish (especially federally-listed fish species). Personnel and equipment should be on-hand to conduct fish rescues if needed, placing fish outside areas of construction. Fish salvage operations would be coordinated with the Service and NDOW at least 24 hours prior to implementation.

2. Work activities outside the river channel should also be scheduled to minimize adverse impacts to wildlife resources. Construction should occur after nesting and rearing of young birds have been completed. To ensure impacts to nests or young do not occur, surveys should be conducted prior to construction to determine whether any birds are nesting in the area.

3. Implement BMPs for minimizing the spread of noxious weeds.

4. In areas dominated by the invasive, non-native species tall-whitetop, all plant materials removed during construction should be left on-site in a location that would not allow plant material to enter waterways. To avoid spreading weeds, all machinery and vehicles that leave the site should be washed on site to remove attached seeds and roots.

5. If hay/straw bales are used for sediment control, they should be certified weed-free to reduce establishment/reestablishment of invasive weeds.

6. Avoid impacts to woody vegetation at and adjacent to the construction staging areas. In the event any woody vegetation is inadvertently destroyed in the staging areas, it should be

replaced on-site at a ratio of 5:1 (*i.e.*, five plants replaced for each one destroyed). Watering and monitoring of replanting success would be necessary until replanted areas are established.

7. Erosion control and maintenance measures should be implemented on a site-specific basis. Pertinent materials should be certified weed-free. Hydromulch should be secured with an organic tackifier.

8. Minimize impacts to the grassland/herbaceous cover-type by reseeding all areas with native grasses and forbs, including construction staging and disposal areas.

9. Excess spoil materials should be properly stored. Measures should be implemented to ensure that spoil material does not enter the Truckee River, Steamboat Creek, or adjacent wetlands.

10. A spill prevention and containment countermeasure plan that addresses all potential mechanisms of contamination should be developed. Suitable containment materials should be on-hand in the event of a spill. All discarded material and any accidental spills should be removed and disposed of at approved sites.

11. An onsite, specified contractor certified in the federally approved Occupational Safety and Health Administration (OSHA) under 29 CDF, and the Resource Conservation and Recovery Act (RCRA) Guidelines under 40 CFR, should observe excavated materials at all times during excavation and grading of sites which may contain hazardous waste. Observation practices should serve to ensure that in the event hazardous waste is unexpectedly encountered, it is recognized as hazardous waste and handled properly. If additional contaminants are encountered during construction, the Corps should notify the non-Federal sponsors immediately and construction should be halted.

12. Minimize instream time and the number of stream crossings for heavy equipment. Stream crossings should be perpendicular to the stream and in designated areas using gently-sloping and stable banks.

13. Equipment and vehicles operated within the floodway shall be checked and maintained daily to prevent leaks of fuels, lubricants, and other fluids to the river.

14. Temporary roads should be constructed to the minimal number, width, and total length consistent with construction activities. Minimize roads in sensitive areas (*e.g.*, riparian). Water bars and other erosional controls should be installed for permanent roads or trails.

15. Assemble a technical advisory team, composed of a qualified fishery biologist, riparian ecologist, and geomorphologist to provide technical oversight during construction for restoration. Team members should be available to inspect work onsite.

16. For any and all Federal lands allocated or designated primarily for fish and wildlife management associated with the project, develop General Plans (GPs) jointly with the Service and NDOW in accordance with section 3 of the Coordination Act (Public Law 732, 79th Congress, approved August 14, 1966, 60 Stat. 1080). GPs are to be prepared for the purpose

of designating the type of use as between the national migratory bird management program of the Department of the Interior and the wildlife programs of the State of Nevada and therein to define the lands and waters to be administered by each.

17. Continue coordination efforts with the Service, NDOW and the PLPT throughout the preconstruction engineering and design phase with emphasis on features directly affecting fish and wildlife resources.

18. Implement measures for monitoring and associated adaptive management to verify the performance of mitigation, construction BMPs, and other conservation features. Lessons learned from the earlier phases of construction should be applied to later phases.

19. Prior to construction, participate in meetings of the Truckee River Operating Forum dealing with projected river flows and incorporate into construction plans.

9.2.1 FLOOD RISK MANAGEMENT

1. As a part of in-channel work, remove structures that impede fish passage (upstream and downstream) and sediment transport and replace with structures that correct these problems (see Appendix C). In addition, any modifications to structures that control diverted flows should be outfitted with gages to measure amount of flow. This should not be limited to within restoration segments as there are a number of other problematic areas as identified in the Short-Term Action Plan (TRIT 2003). Other stakeholders with an interest in this issue (*e.g.*, Water master, Service and Tribe[5]) should be coordinated with prior to final design and construction.

2. Water diversions from the Truckee River may be a source of fish entrainment. Along major diversions, site preparation for fish screens is recommended as an efficiency measure for federal spending. Within the project area, Idlewild, Wingfield, Cochran Ditch, North Truckee Drain, and Sission Ditch, are potential entrainment sources. The intake structures for some of these ditches may be modified by the proposed project. Fish screens, or provisions to accept fish screens, should be installed at these diversions which are likely to have long-term use.

3. Minimize the use of hard structures such as floodwalls where possible as these require in-channel work and restrict river movement. If space permits, use set-back levees to allow establishment of a greenway. Naturalized features should also be emphasized that promote flood damage reduction while restoring riverine functions.

4. On-bank or setback floodwalls should be favored over in-channel floodwalls in the Truckee River as the latter requires extensive work in close contact with the water.

5. Maximize infiltration through bioretention techniques that consider soils and vegetation that are proficient in trapping stormwater pollutants and take advantage of microbial processes that help transform and trap pollutants. This will benefit the project by reducing stormwater

[5] Pyramid Lake Fisheries is currently assessing options for a re-design of Proctor and Pierson Diversion Dams as well as exclusionary devices for diversions.

volume and peak runoff rate, recharging groundwater which helps replenish wetlands, creeks and rivers, augmenting base flows in streams, and settling and filtering of pollutants as they move through the system's vegetation and surficial soils (Livingston 2000). Bioretention areas should also be configured to prevent groundwater contamination.

6. Establish an institutional framework that assures that all BMPs are: (1) properly designed, (2) reviewed and approved, (3) inspected during and after construction, and (4) operated and maintained.

7. Slackwater areas that are temporarily flooded (*e.g.*, detention basins) during high flow events should be designed to minimize fish entrainment and stranding. Water conveyance should be equipped with evasive devices (*e.g.*, screens) specific to adult-sized fish or smaller. Flooded areas where fish entrainment is unavoidable should be designed with a rampdown rate no greater than 3 inches per hour to allow volitional escape of fish back to the river and associated tributaries. Access to these areas should be granted to biologists and enforcement personnel of the NDOW and, Service, and their representatives to facilitate monitoring of fish stranding, fish salvage operations, and minimize poaching.

8. Water surface relations should be developed between established USGS gage stations and detention basins that will allow biologists to monitor rampdown via the internet. Outlet structure detention basins should also consider the settling of fine sediments and infiltration and removal of various contaminants (*e.g.*, stormwater runoff) as a means of improving water quality.

9. For Steamboat Creek, avoid excavations with the historic floodplain to avoid mobilizing contaminants (*i.e.*, mercury, boron, and arsenic).

10. Excavation within the stream channel should be limited. If all the excavated material is not relocated to another portion of the project area, it should be completely removed from the floodplain so it does not reenter the river during the next high flow event. These materials should also be located on previously disturbed upland areas.

11. For levees/rip-rap, a slope of 3:1 or 4:1 should be constructed where space is available to provide better bank stability. Instead of rip-rap, consider the use of stream barbs and vortex weirs in appropriate sections of the channel to control stream flow direction.

9.2.2 Ecosystem Restoration

1. Implement all fish passage improvements identified in Alternative 4, Locally Preferred Plan, including:

   a. fish bypass and screen at Fleisch Diversion;
   b. Steamboat Diversion improvement;
   c. fish bypass and screen at Verdi Diversion;
   d. fish bypass and screen at Washoe/Highland Diversion;
   e. fish ladder and efficiency testing at Chalk Bluff intake;
   f. replacement of irrigation structure at S-S Ranch;

g. upstream fish passage improvement and screening at Fellnagle and Hermann Ditches; and
h. the retrofit of existing fishway and new bypass channel at Marble Bluff Dam as described in Appendix D.

2. Compensate for unavoidable impacts and loss of high value habitat as described in Alternative 4—Locally Preferred Plan, including:

   Truckee Meadows Reach

   a. restore natural streambank functions by removal of 2.04 acres of existing rip-rap and shape newly exposed banks;
   b. connect 3.11 acres of existing riparian habitat and interplant 6.45 acres in existing habitat:
   c. restore function of created low and high bench with 79.96 acres and 79.27 acres, respectively, of planted vegetation (= 153.23 acres);
   d. complete 8.64 acres of major geomorphic restoration;
   e. complete 2.97 acres of minor geomorphic restoration;
   f. remove 34.59 acres of non-native invasive plant species;
   g. plant 41.75 acres of new riparian forests;

3. Develop a detailed and comprehensive monitoring plan for ER to demonstrate level of success in meeting project objectives and include a biological component for fish and wildlife. The plan shall provide, but not be limited to, specific performance standards, monitoring methods and requirements, and contingency measures for habitat to be restored and managed. Conduct pre-project surveys for selected species which will facilitate a comparison of pre- and post construction activities to help demonstrate level of success. As part of surveys, include all federally-listed species and species of concern that may occur in the project area.

4. Develop and implement a 20-year vegetation monitoring program as a part of the project. Monitoring the riparian restoration effort should focus on recording tree survival rates, the quantification of improved habitat values for wildlife (primarily bird species) by measuring percent tree and shrub cover, average height of overstory trees, canopy layering, and total woody riparian vegetation, and developing recommendations for alternative methods of riparian restoration should initial efforts fail.

5. Monitoring of revegetated sites should be conducted by a qualified restoration ecologist and in collaboration with our Service botanist. Monitoring should continue annually for a minimum of 5 growing seasons to allow the vegetation to establish. Remediation plans shall be prepared and implemented in the event of a planting failure. Results of monitoring should be detailed in reports to be issued at 5-year intervals. At least one of the reports should have recommendations for future restoration projects on systems like the Truckee River and include construction BMPs.

6. In cooperation with the local non-Federal sponsors, develop a maintenance plan and a remedial action plan for ER to address contingencies in the event of failure.

7. Update and implement the Comprehensive Wildlife Sensitive Weed Control Plan (Otis Bay Consulting 2006). Removal and control of noxious weeds will provide wildlife enhancement features for the project. Manual removal measures are recommended in sensitive areas near waterways and wetlands. If chemicals are used in these areas, a wick applicator and a water labeled formula of 2,4-D should be used for infested areas located within 30 ft of the Truckee River and associated wetlands. Chemical uses in other areas should be applied according to the manufacturer's specifications by state-approved weed control experts.

8. Minimize impacts to the upland/agricultural cover-type by reseeding all disturbed uplands with native grasses and forbs, including construction and staging areas.

9. Coordinate with the PLPT on restoration projects in subreaches on the reservation, as there are currently efforts to restore Proctor and Pierson Diversion Dams (re-engineered to allow fish passage) and associated riparian habitats.

10. Maximize efforts to salvage trees and shrubs in the local area, transplanting to designated sites in accordance with the Restoration Plan.

11. Where opportunities exist, remove existing rip-rap and other hard materials and replace with bioengineered stabilization structures.

9.3 RECOMMENDATIONS FOR FEDERALLY-LISTED FISHES

The Service anticipates that the TMFCP will require formal consultation pursuant to section 7 of the ESA, and that this consultation will be programmatic in nature. Once a preferred alternative is selected and design for project features are finalized, the Corps should request initiation of section 7 consultation with the Service. To assist the Corps in satisfying their ESA obligations, we offer the following recommendations that should be addressed in any materials accompanying a request to initiate consultation. Until a final alternative is selected, these recommendations are preliminary and are provided for planning purposes.

1. As described above, the Corps should implement Ecosystem Restoration components, as described in Section 9.2.2 (above).

2. The Corps should implement the least environmentally damaging alternative for the proposed project to minimize adverse effects to federally-listed species, specifically cui-ui and LCT.

3. The Corps should design detention basins to capture fine sediments and contaminants before entering the Truckee River (*i.e.*, infiltration component). Using a permanent semi-wetland vegetation zone in the capture area whenever appropriate and to provide additional wildlife habitat.

4. Where opportunities exist, construct a defined low-flow river channel with the appropriate configuration (*i.e.*, depths and widths) in support of fish passage, habitat, and water quality but which also retains the river's connectivity with the floodplain.

5. Where applicable, the Corps and local non-Federal project sponsors should use biotechnical bank stabilization methods on an aggressive, adaptive management basis. Experienced consultants and designers should be used to develop biotechnical designs on a location-specific basis.

6. Place processed rock material within the riverbed to create a series of alternating pool and riffle complexes at various locations. The rock specifications would mimic the particle size distribution expected in a naturally functioning Truckee River. Excavation of channel meanders would reestablish the natural dynamic equilibrium of the river channel by reconstructing the channel into a meandering stream that generally follows the historic course of the channel, and could include sandbars and gravel bars. The river channel should also have a defined low-flow channel.

7. Coordinate with the Service, NDOW and the PLPT to incorporate access sites for purposes of stocking and monitoring fish populations in the Truckee River.

8. To enhance salmonid habitat, clean gravels and woody debris should be strategically placed in portions of the river shown to be lacking adequate levels of these components.

10.0 SUMMARY AND SERVICE POSITION

The Truckee Meadows Flood Control Project would improve flood protection and control throughout the Truckee River system through the construction of new floodwalls and raised levees, expanded bank/scour protection, and strategic shaping of channel morphology.

The project has two action alternatives, each providing a different level of flood protection. The primary difference between these alternatives lies in the height of the floodwalls, the terracing of the river channel through the Downtown Reno and Truckee Meadows Reaches, and the intensity of flood protection for residents through the Reno/Sparks area downstream to Pyramid Lake. The Service strongly recommends that Alternative 4 be selected as the Corp's preferred plan. As discussed previously, the Service believes this alternative provides the highest level of restoration with a greater probability of long-term success, maximum level of passage for all life history stages of native listed fish, and provides the residents of Washoe and Storey Counties with the maximum level of catastrophic flood protection.

Approximately 1735.8 acres (Table 18) of habitat would be affected by Alternative 4—Locally Preferred Plan resulting in temporary and permanent impacts to fish and wildlife resources. A Habitat Evaluation Study was conducted in 2007 for the Truckee Meadows and Lower Truckee River Reaches (Corps 2007). In conjunction, vegetation/surface water map units identified in the 2005 ERDC-CRREL study (Lichvar and Ericsson 2005) were utilized to identify a net loss of 156.4 acres of the high valued resource category, Open Water/Pond/Riverine (Resource Category 2-WET). The Service's Region 8 (which includes Nevada) has a mitigation goal for resource category 2-WET, of no net loss of acreage, while seeking a net overall gain in the quality and quantity of wetlands through restoration, development, and enhancement. The Service has recommended a 2:1 ratio of mitigation for loss of these high ecological value habitats. This mitigation is currently incorporated into

Alternative 4, and will be implemented throughout the Truckee Meadows, and Lower Truckee River Reaches as described in Section 9.2.2. The Service is in full support of the current ecosystem restoration components of the proposed plan identified in Alternative 4. Benefits of the proposed plan, as defined by acres of habitat restored, are summarized in Tables 15-23.

Due to comments from the public review process of the Draft EIS, the Corps may modify work proposed for the Truckee Meadows Flood Control Project. The Service will evaluate any proposed modification to the project when specific information has been developed. This draft CAR will be finalized when a final project alternative has been selected, and formal consultation pursuant to section 7 of the Endangered Species Act has been completed.

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Appendix A. Environmental Impact Statement, AFB Read Ahead Document. Prepared by U.S. Army Corps of Engineers, Sacramento District. (Electronic copy included with enclosed CD)

Appendix B. Truckee Meadows Flood Control Project Fish Passage Plans. Prepared for the Corps Draft EIS. (Electronic copy included with enclosed CD)

Appendix C. COE Feasibility Level Fish Bypass Design at Marble Bluff Dam. Prepared by Bureau of Reclamation. (Electronic copy included with enclosed CD)

Appendix D. Vascular Plant Species Associated with the Truckee River.

COMMON NAME	SCIENTIFIC NAME
TREES	
Fremont cottonwood	*Populus fremontii*
Chinese elm	*Ulmus parvifolia*
SHRUBS	
Big sagebrush	*Artemisia tridentata*
Shadscale	*Atriplex confertifolia*
Four-wing saltbush	*Atriplex canescens*
Black greasewood	*Sarcobatus vermiculatus*
Silver buffaloberry	*Sheperdia argentea*
Antelope bitterbrush	*Purshia tridentata*
Interior rose	*Rosa woodsii* var. *ultramontana*
Narrow-leaved willow	*Salix exigua*
Goodings willow	*Salix goodingii*
Shining willow	*Salix lucida* spp. *lasiandra*
Yellow willow	*Salix lutea*
Dusky willow	*Salix melanopsis*
Tamarisk	*Tamarix* sp.
Russian olive	*Eleaganus angustifolia*
Mountain alder	*Alnus incana tenuifolia*
XX	*Chrysothamnus nauseosus*
XX	*Chrysothamnus viscidiflorus*
XX	*Gutierrezia sarothrae*
XX	*Prunus andersonii*
GRASSES AND GRAMINOIDS	
Slender wheatgrass	*Elymus trachycaulus*
Slender-beak sedge	*Carex athrostachya*
Beaked sedge	*Carex utriculata*
Cheatgrass	*Bromus tectorum*
Annual beard grass	*Polypogon monspeliensis*
Kentucky bluegrass	*Poa pratensis*
Soft rush	*Juncus effuses*
Least spikerush	*Eleocharis acicularis*
Olney’s bulrush	*Scirpus americanus*

COMMON NAME	SCIENTIFIC NAME
Baltic rush	*Juncus balticus*
	Phalaris arundinacea
	Carex douglasii
	Carex lenticularis
	Juncus effuses
	Hordeum brachyantherum
	Distichlis spicata
	Leymus cinereus
HERBS	
Broadleaved peppergrass	*Lepidium latifolium*
White sweet-clover	*Melilotus alba*
White clover	*Trifolium repens*
Common monkey-flower	*Mimulus guttatus*
Hairy willow-herb	*Epilobium ciliatum*
Tansy mustard	*Descurainia pinnata*
Rocky Mountain bee plant	*Cleome serrulata*
Russian thistle	*Salsola kali*
White-top	*Cardaria pubescens*
Common horsetail	*Equisetum arvense*
Water hemlock	*Cicuta douglasii*
Rough cocklebur	*Xanthium strumarium*
	Artemisia dracunculus
	Conringia orientalis
	Plantago lanceolata
	Artemisia ludoviciana
Curly dock	*Rumex crispus*
	Rumex sp.

Appendix E. Fish, Amphibian, and Reptile Species Associated with the Truckee River.

Common Name	***Scientific Name***
FISH	
Native	
Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*
Mountain whitefish	*Prosopium williamsoni*
Piute sculpin	*Cottus beldingi*
Lahontan redside shiner	*Richardsonius egregius*
Speckled dace	*Rhinichthys osculus*
Lahontan tui chub	*Gila bicolor*
Tahoe sucker	*Catostomus tahoensis*
Mountain sucker	*Catostomus platyrhynchus*
Cui-ui	*Chasmistes cujus*
Non-native	
Rainbow trout	*Onchorhynchus mykiss*
Brown trout	*Salmo trutta*
Goldfish	*Carassius auratus*
Carp	*Cyprinus carpio*
Golden shiner	*Notemigonus chrysoleucas*
Largemouth bass	*Micropterus salmoides*
Green sunfish	*Lepomis cyanellus*
Black crappie	*Pomoxis nigromaculatus*
Mosquitofish	*Gambusia affinis*
Channel catfish	*Ictalurus punctatus*
Brown bullhead	*Ameiurus nebulosus*
Fathead minnow	*Pimephales promelas*
AMPHIBIANS	
Bullfrog	*Rana catesbeiana*
Pacific treefrog	*Hyla regilla*
Western toad	*Bufo boreas*
Great Basin spadefoot toad	*Spea intermontana*
Northern leopard frog	*Rana pipiens*
REPTILES	
Northwestern pond turtle	*Clemmys marmorata marmorata*
Western aquatic garter snake	
Western terrestrial garter snake	
Western fence lizard	*Sceloporus occidentalis*
Side-blotched lizard	*Uta stansburiana*
Long-nosed leopard lizard??	*Gambelia wislizenii*

Desert spiny lizard??	*Sceloporus magister*
Northern sagebrush lizard	*Sceloporus graciosus graciosus*
Western skink	*Eumeces skiltonianus*
Western whiptail lizard	*Cnemidophorus tigris*
Rubber boa	*Charina bottae*
Racer	*Coluber constrictor*
Coachwhip	*Masticophis flagellum*
Striped whipsnake	*Masticophis taeniatus*
Gopher snake	*Pituophis catenifer*
Common kingsnake	*Lampropeltis getula*
Common garter snake	*Thamnophis sirtalis*
Ground snake	*Sonora semiannulata*
Western rattlesnake	*Crotalus viridis*

Appendix F. Bird Species Associated with the Truckee River.

Common Name	***Scientific Name***
LOONS	
Pacific Loon	*Gavia pacifica*
Common Loon	*Gavia immer*
GREBES	
Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Eared Grebe	*Podiceps nigricollis*
Western Grebe	*Aechmophorus occidentalis*
Clark♣s Grebe	*Aechmophorus clarkii*
PELECANIFORMES	
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
WADING BIRDS	
American Bittern	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Snowy Egret	*Egretta thula*
Green Heron	*Butorides striatus*
Black-crowned Night Heron	*Nycticorax nycticorax*
White-faced ibis	*Plegadis chihi*
NEW WORLD VULTURES	
Turkey Vulture	*Cathartes aura*
GEESE, SWANS, AND DUCKS	
Greater White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Ross Goose	*Chen rossii*
Canada Goose	*Branta canadensis*
Tundra Swan	*Cygnus columbianus*
Wood Duck	*Aix sponsa*
Gadwall	*Anas strepera*
American Widgeon	*Anas americana*

Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Surf Scoter	*Melanitta perspicillata*
Bufflehead	*Bucephala albeola*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
DIURNAL RAPTORS	
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Red-shouldered Hawk	*Buteo lineatus*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*
UPLAND GAME BIRDS	
Chukar	*Alectoris chukar*
Ring-necked Pheasant	*Phasianus colchicus*
Blue Grouse	*Dendragapus obscurus*
Mountain Quail	*Oreortyx pictus*
California Quail	*Callipepla californica*
GRUIFORMES	

Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Black-bellied Plover	*Pluvialis squatarola*
Snowy Plover	*Charadrius alexandrinus*
Semipalamated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitis macularia*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Sanderling	*Calidris alba*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
Dunlin	*Calidris alpina*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*
Bonaparte's Gull	*Larus philadelphia*
Heermann's Gull	*Larus heermanni*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Caspian Tern	*Sterna caspia*
Forster's Tern	*Sterna forsteri*
Black Tern	*Chlidonias niger*
PIGEONS AND DOVES	
Rock Dove	*Columba livia*
Band-tailed Pigeon	*Columba fasciata*
Mourning Dove	*Zenaida macroura*
OWLS	
Barn Owl	*Tyto alba*
Flammulated Owl	*Otus flammeolus*

Western Screech-Owl	*Otus kennicottii*
Great-horned Owl	*Bubo virginianus*
Northern Pygmy-Owl	*Glaucidium gnoma*
Burrowing Owl	*Athene cunicularia*
California Spotted Owl	*Strix occidentalis*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
GOATSUCKERS AND SWIFTS	
Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*
Black Swift	*Cypseloides niger*
Vaux’s Swift	*Chaetura vauxi*
White-throated Swift	*Aeronautes saxatalis*
HUMMINGBIRDS	
Black-chinned Hummingbird	*Archilochus alexandri*
Anna’s Hummingbird	*Calypte anna*
Calliope Hummingbird	*Stellula calliope*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*Selasphorus rufus*
KINGFISHERS	
Belted Kingfisher	*Ceryle alcyon*
WOODPECKERS	
Lewis Woodpecker	*Melanerpes lewis*
Acorn Woodpecker	*Melanerpes formicivorus*
Williamson’s Sapsucker	*Sphyrapicus thyroideus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
White-headed Woodpecker	*Picoides albolarvatus*
Black-backed Woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
TYRANT FLYCATCHERS	
Olive-sided Flycatcher	*Contopus cooperi*
Western Wood-Peewee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax traillii*
Hammond’s Flycatcher	*Empidonax hammondii*
Gray Flycatcher	*Empidonax wrightii*
Dusky Flycatcher	*Empidonax oberholseri*

Pacific-slope Flycatcher	*Empidonax difficilis*
Black Phoebe	*Sayornis nigricans*
Say's Phoebe	*Sayornis saya*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Western Kingbird	*Tyrannus verticalis*
SHRIKES	
Loggerhead Shrike	*Lanius ludovicianus*
Northern Shrike	*Lanius excubitor*
VIREOS	
Plumbeous Vireo	*Vireo plumbeus*
Cassins' Vireo	*Vireo cassinii*
Hutton's Vireo	*Vireo huttoni*
Warbling Vireo	*Vireo gilvus*
JAYS, CROWS, AND THEIR ALLIES	
Steller's Jay	*Cyanocitta stelleri*
Western Scrub-Jay	*Aphelocoma californica*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
LARKS	
Horned Lark	*Eremophila alpestris*
SWALLOWS	
Purple Martin	*Progne subis*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
CHICKADEES AND THEIR ALLIES	
Mountain Chickadee	*Parus gambeli*
Juniper Titmouse	*Baeolophus ridgwayi*
Bushtit	*Psaltriparus minimus*
NUTHATCHES AND CREEPERS	
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*

Pygmy Nuthatch	*Sitta pygmaea*
Brown Creeper	*Certhia Americana*
WRENS	
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Marsh Wren	*Cistothorus palustris*
OLD WORLD WARBLERS, THRUSHES, AND THEIR ALLIES	
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Western Bluebird	*Sialia mexicana*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
MIMIDS	
Northern Mockingbird	*Mimus polyglottus*
Sage Thrasher	*Oreoscoptes montanus*
STARLINGS	
European Starling	*Sturnus vulgaris*
PIPITS	
American Pipit	*Anthus rubescens*
WAXWINGS	
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*Bombycilla cedrorum*
WOOD-WARBLERS	
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Virginia's Warbler	*Vermivora virginiae*
Northern Parula	*Parula americana*
Yellow Warbler	*Dendroica petechia*

Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Gray Warbler	*Dendroica nigrescens*
Townsend's Warbler	*Dendroica townsendi*
Hermit Warbler	*Dendroica occidentalis*
Blackpoll Warbler	*Dendroica striata*
American Redstart	*Setophaga ruticilla*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
Yellow-breasted Chat	*Icteria virens*
TANAGERS, CARDINALS, AND THEIR ALLIES	
Western Tanager	*Piranga ludoviciana*
Green-tailed Towhee	*Pipilo chlorurus*
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Brewer's Sparrow	*Spizella breweri*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Black-throated Sparrow	*Amphispiza bilineata*
Sage Sparrow	*Amphispiza belli*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Rose-breasted Grosbeak	*Pheucticus tibialis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Passerina caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*Passerina cyanea*
ICTERIDS	
Red-winged Blackbird	*Agelaius phoeniceus*
Tricolored Blackbird	*Agelaius tricolor*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*

Bullock's Oriole	*Icterus bullockii*
FINCHES AND OLD WORLD SPARROWS	
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carpodacus mexicanus*
Red Crossbill	*Loxia curvirostra*
Pine Siskin	*Carduelis pinus*
Lesser Goldfinch	*Carduelis psaltria*
American goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*

Appendix G. Mammal Species Associated with the Truckee River.

Common Name	Scientific Name
INSECTIVORES	
Vagrant shrew	*Sorex vagrans*
Preble's shrew	*Sorex preblei*
Merriam's shrew	*Sorex merriami*
Trowbridge's shrew	*Sorex trowbridgii*
Montane shrew	*Sorex monticolus*
Water shrew	*Sorex palustris*
Broad-footed mole	*Scapanus latimanus*
BATS	
Little brown myotis	*Myotis lucifugus*
Yuma myotis	*Myotis yumanensis*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
California myotis	*Myotis californicus*
Western small-footed myotis	*Myotis ciliolabrum*
Silver-haired bat	*Lasionycteris noctivagans*
Western pipestrelle	*Pipistrellus hesperus*
Big brown bat	*Eptesicus fuscus*
Western red bat	*Lasiurus blossevillii*
Hoary bat	*Lasiurus cinereus*
Spotted bat	*Euderma maculatum*
Townsend's big-eared bat	*Plecotus townsendii*
Pallid bat	*Antrozous pallidus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
LAGOMORPHA	
White-tailed hare	*Lepus townsendii*
Sierra nevada snowshoe hard	*Lepus americanus tahoensis*
Black-tailed jackrabbit	*Lepus californicus*
Mountain cottontail	*Sylvilagus nuttallii*
Pygmy rabbit	*Brachylagus idahoensis*
RODENTIA	
Mountain beaver	*Aplodontia rufa*
sierra Nevada mountain beaver	*Aplodontia rufa californica*
Yellow-bellied marmot	*Marmota flaviventris*
Townsend's ground squirrel	*Spermophilus townsendii*
Belding's ground squirrel	*Spermophilus beldingi*

California ground squirrel	*Spermophilus beecheyi*
White-tailed antelope ground squirrel	*Ammospermophilus lecucurus*
Golden-mantled ground squirrel	*Spermophilus lateralis*
Least chipmunk	*Tamias minimus*
Yellow-pine chipmunk	*Tamias amoenus*
Lodgepole chipmunk	*Tamias speciosus*
Townsend’s chipmunk	*Tamias townsendii*
Long-eared chipmunk	*Tamias quadrimaculatus*
Western gray squirrel	*Sciurus griseus*
Douglas’squirrel	*Tamiasciurus douglasii*
Northern flying squirrel	*Glaucomys sabrinus*
Botta’s pocket gopher	*Thomomys bottae*
Northern pocket gopher	*Thomomys talpoides*
Mountain pocket gopher	*Thomomys monticola*
Little pocket mouse	*Perognathus longimembris*
Great Basin pocket mouse	*Perognathus parvus*
Long-tailed pocket mouse	*Chaetodipus formosus*
Merriam’s kangaroo rat	*Dipodomys merriami*
Panamint kangaroo rat	*Dipodomys panamintinus*
Ord’s kangaroo rat	*Dipodomys ordii*
Chisel-toothed kangaroo rat	*Dipodomys microps*
Dark kangaroo mouse	*Microdipodops megacephalus*
American beaver	*Castor canadensis*
Western harvest mouse	*Reithrodontomys megalotis*
Canyon mouse	*Peromyscus crinitus*
Deer mouse	*Peromyscus maniculatus*
Brush mouse	*Peromyscus boylii*
Pinon mouse	*Peromyscus truei*
Northern grasshopper mouse	*Onychomys leucogaster*
Bushy-tailed woodrat	*Neotoma cinerea*
Desert woodrat	*Neotoma lepida*
Heather vole	*Phenacomys intermedius*
Montane vole	*Microtus montanus*
Long-tailed vole	*Microtus longicaudus*
Sagebrush vole	*Lemmiscus curtatus*
Common muskrat	*Ondatra zibethicus*
Norway rat	*Rattus norvegicus*
House mouse	*Mus musculus*
Western jumping mouse	*Zapus princeps*
Common porcupine	*Erethizon dorsatum*
CARNIVORA	
Coyote	*Canis latrans*
Sierra Nevada red fox	*Vulpes vulpes necator*
Kit fox	*Vulpes velox*

Common gray fox	*Urocyon cinereoargenteus*
Black bear	*Ursus americanus*
Common raccoon	*Procyon lotor*
American marten	*Martes americana*
Fisher	*Martes pennanti*
Ermine	*Mustela erminea*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
California wolverine	*Gulo gulo luteus*
American badger	*Taxidea taxus*
Western spotted skunk	*Spilogale gracilis*
Stripped skunk	*Mephitis mephitis*
Northern river otter	*Lutra canadensis*
Mountain lion	*Felis concolor*
Bobcat	*Lynx rufus*
PERISSODACTYLA	
Feral horse	*Equus caballus*
EVEN-TOED HOOFED MAMMALS	
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*

Appendix I. Species List for the Truckee River Flood Control Project.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89502
Ph: (775) 861-6300 ~ Fax: (775) 861-6301

May 10, 2011
File No. 2011-SL-0215

Ms. Alicia Kirchner
U.S. Army Engineer District
Sacramento Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Dear Ms. Kirchner:

Subject: Updated Species List for the Truckee River Flood Control Project General Reevaluation Study, Washoe and Storey Counties, Nevada

This responds to your request received April 8, 2011, requesting an updated species list for the proposed Truckee River Flood Control Project General Reevaluation Study in Washoe and Storey Counties, Nevada. We have previously provided species lists on October 10, 2002 (File No. 03-SP-015), November 8, 2004 (File No. 05-SP-031), and March 28, 2006 (File No. 1-5-06-SP-111). The project area includes the Truckee River and adjacent flood plain area from the California/Nevada State Line, Washoe County, through the Truckee Canyon in Storey County, and to Pyramid Lake Paiute Tribal lands at Pyramid Lake. The project area also includes the entire Truckee Meadows north and south of the river, encompassing major tributaries such as Steamboat Creek, the North Truckee Drain, and Long Valley Creek. The following federally-listed and candidate species may occur in the project area:

- Cui-ui (*Chasmistes cujus*), endangered;
- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*), threatened;
- Greater sage-grouse (*Centrocercus urophasianus*), candidate;
- Yellow-billed cuckoo (*Coccyzus americanus*), candidate.

This list fulfills the requirement of the Fish and Wildlife Service to provide information on listed species pursuant to section 7 (c) of the Endangered Species ESA of 1973 (ESA), as amended, for projects that are authorized, funded, or carried out by a Federal agency. Candidate species receive no legal protection under the ESA, but could be proposed for listing in the near future. Consideration of these species during project planning may assist species conservation efforts and may prevent the need for future listing Actions.

Your proposed project is located within a potential and existing metapopulation for Lahontan cutthroat trout (LCT), and as such, the area is necessary for the species' recovery. The LCT Truckee River Recovery Implementation Team (TRIT) has finalized a *Short-Term Action Plan* for the species in the Truckee River basin (http://www.fws.gov/nevada/protected_species/fish/documents/lct/final_trit.pdf). This *Short-Term Action Plan* (2003) identifies priority areas with current or potential opportunities to support LCT or important habitats that would sustain various life history stages. Under the ESA, completed projects should not preclude future recovery and survival of this species. We recommend that projects be reviewed for all direct and indirect impacts that they may have on riparian and aquatic habitats as they relate to LCT, and that you consult with the Service accordingly under section 7 of the ESA.

Greater sage-grouse are known to occur within and/or near the project area; therefore, we recommend that you analyze potential impacts from this project on the species to ensure that the proposed action does not exacerbate further decline of the species. On March 23, 2010, the Service's 12-month status review finding for the species was published in the Federal Register (75 FR 13910). We determined that the greater sage-grouse warrant the protection of the ESA but that listing the species at this time is precluded by the need to address higher priority species first. The greater sage-grouse has been placed on the candidate list for future action, meaning the species does not receive statutory protection under the ESA, and States will continue to be responsible for managing the species. The Western States Sage and Columbian Sharp-tailed Grouse Technical Committee, under direction of the Western Association of Fish and Wildlife Agencies, has developed and published guidelines to manage and protect greater sage-grouse and their habitats in the Wildlife Society Bulletin (Connelly *et al.* 2000). We ask that you consider incorporating these guidelines (http://www.ndow.org/wild/conservation/sg/resources/guidelines.pdf) into the proposed project. On a more local level, the Sage Grouse Conservation Plan for Nevada and Portions of Eastern California was completed in June 2004. The Plan is available online at: http://www.ndow/org/wild/conservation/sg/plan/SGPlan063004.pdf. We encourage you to adopt all appropriate management guidance from this Plan as you analyze and implement your proposed action and to engage your local State and Federal wildlife biologists early in the project planning process.

The Nevada Fish and Wildlife Office no longer provides species of concern lists. Most of these species for which we have concern are also on the Animal and Plant At-Risk Tracking List for Nevada (At-Risk list) maintained by the State of Nevada's Natural Heritage Program (Heritage). Instead of maintaining our own list, we adopted Heritage's At-Risk list and are partnering with them to provide distribution data and information on the conservation needs for at-risk species to agencies or project proponents. As you may know, the mission of Heritage is to continually evaluate the conservation priorities of native plants, animals, and their habitats, particularly those most vulnerable to extinction or in serious decline. In addition, in order to avoid future conflicts, we ask that you consider these at-risk species early in your project planning and explore management alternatives that provide for their long-term conservation.

For a list of at-risk species by county, visit Heritage's website (http://heritage.nv.gov). For a specific list of at-risk species that may occur in the project area, you can obtain a data request form from the website (http://heritage.nv.gov/forms.htm) or by contacting the Administrator of Heritage at 901 South Stewart Street, Suite 5002, Carson City, Nevada 89701-5245, (775) 684-2900. Please indicate on the form that your request is being obtained as part of your coordination with the Service under the ESA. During your project analysis, if you obtain new information or data for any Nevada sensitive species, we request that you provide the information to Heritage at the above address.

Furthermore, certain species of fish and wildlife are classified as protected by the State of Nevada (http://www.leg.state.nv.us/NAC/NAC-503.html). You must first obtain the appropriate license, permit, or written authorization from the Nevada Department of Wildlife to take, or possess any parts of protected wildlife species. Please visit http://www.ndow.org or contact the Nevada Department of Wildlife at (775) 688-1500.

On September 30, 2010, the Service published the 12-month finding for the pygmy rabbit in the Federal Register (75 FR 60516) announcing that the species did not warrant protection under the ACT. We request that you submit any new information concerning threats to the species or its habitat to the Nevada Fish and Wildlife Office. This information will help us monitor the pygmy rabbit and encourage its conservation.

If bald eagles (*Haliaeetus leucocephalus*) and/or golden eagles (*Aquila chrysaetos*) occur in the project area or within 10 miles of the proposed project area boundary, we recommend you analyze project impacts to the affected individuals, their habitats, and regional populations. While the bald eagle has been removed from the Federal list of threatened and endangered species (August 8, 2007; 72 FR 37346), it remains classified as endangered by the States of Nevada and California. Further, the bald eagle along with the golden eagle continues to be protected under the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended (16 U.S.C. 668-668d) and the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703 *et seq.*). Both the BGEPA and the MBTA prohibit take as defined as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, disturb, or otherwise harm eagles, their nests, or their eggs. Under the BGEPA, "disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle, 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. On September 11, 2009 (74 FR 46836), the Service set in place rules establishing two new permit types: 1) take of bald and golden eagles that is associated with, but not the purpose of, the Activity; and 2) purposeful take of eagle nests that pose a threat to human or eagle safety. We recommend you coordinate with State and Federal wildlife officials early in the planning process to ensure compliance with State and Federal regulations and to develop a survey protocol to evaluate the potential risk and the likelihood of take of eagles. If take is reasonably anticipated to occur, we recommend you develop an Avian Protection Plan (APP) in coordination with State wildlife agencies and the Service. An APP is intended to avoid, minimize, or mitigate impActs to these species.

Because wetlands, springs, or streams are present within the project area, we ask that you be aware of potential impacts project Activities may have on these habitats. Discharge of fill material into wetlands or waters of the United States is regulated by the U.S. Army Corps of Engineers (ACOE) pursuant to section 404 of the Clean Water ESA of 1972, as amended. We recommend you contact the ACOE's Regulatory Section [300 Booth Street, Room 3060, Reno, Nevada 89509, (775) 784-5304] regarding the possible need for a permit.

Based on the Service's conservation responsibilities and management authority for migratory birds under MBTA, as amended, we are concerned about potential impacts the proposed project may have on migratory birds in the area. Given these concerns, we recommend that any land clearing or other surface disturbance associated with proposed Actions within the project area be timed to avoid potential destruction of bird nests or young, or birds that breed in the area. Such destruction may be in violation of the MBTA. Under the MBTA, nests with eggs or young of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If nests are located, or if other evidence of nesting (i.e., mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

Please reference File No. 2011-SL-0215 in future correspondence concerning this species list. If you have any questions or require additional information, please contact me or Michael Cotter at (775) 861-6300.

Sincerely,

Marcy Haworth
for Jenny A. Ericson
Acting State Supervisor

APPENDIX C

CLEAN WATER ACT SECTION 404(B)(1) ANALYSIS

TRUCKEE MEADOWS FLOOD CONTROL PROJECT
WASHOE COUNTY
NEVADA

Section 404(b)(1) Evaluation

I. Introduction

This evaluation of compliance with the Clean Water Act, 40 CFR Part 230 - Section 404 (b)(1) Guidelines (Guidelines) relies on the detailed information in the environmental impact statement (EIS) to which it is attached and is not intended to be a "stand alone" document.

The purpose of these Guidelines is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material.

Fundamental to these Guidelines is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.

The procedures for documenting compliance with the Guidelines include the following:

- Examining practicable alternatives to the proposed discharge that might have fewer adverse environmental impacts, including not discharging into a water of the U.S. or discharging into an alternative aquatic site.
- Evaluating the potential short- and long-term effects, including cumulative effects, of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment.
- Identifying appropriate and practicable measures to mitigate the unavoidable adverse environmental impacts of the proposed discharge.
- Making and documenting the Findings of Compliance required by §230.12 of the Guidelines.

Alternative 3-Floodplain Terrace Plan (1:50 AEP) will be evaluated for compliance. Alternative 3 is the least environmentally damaging practicable alternative (LEDPA).

II. Project Description

a. Location

The project area is located in Nevada along the Truckee River in Washoe County. The project area encompasses just over 202 acres of land and extends 6 river miles along the river from Highway 395 to the eastern end of the Sparks industrial area.

b. Authority

The initial Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada, investigation was authorized under a resolution adopted February 7, 1964, by the Senate Committee on Public Works. The resolution directed an investigation of water resource problems in the Truckee Meadows, Reno-Sparks metropolitan area, under the Flood Control Act of 1954, which authorized interim channel improvement on the Truckee River and tributaries, California and Nevada, for flood control.

The Truckee Meadows investigation resulted in a project authorized under WRDA 1988. In addition, authority for this general reevaluation comes from the Conference Report (House Resolution 1905) to the Energy and Water Development Appropriations Act of 1996, which directed the Secretary of the Army to initiate a General Reevaluation Report (GRR) for the Truckee Meadows Flood Control Project.

c. Purpose and Need

The proposed project would be designed to reduce flood risks and increase recreational opportunities in the project area while avoiding or minimizing any adverse effects on environmental and cultural resources. The primary purpose is to reduce flood damage to the Truckee Meadows area. The secondary purpose is the enhancement of recreational opportunities along the Truckee River within the Truckee Meadows.

The project is needed to ensure public safety, reduce structural and economic damages, and increase recreational opportunities in the project area.

d. General Description of Alternative 3—Floodplain Terrace Plan (1:50 AEP)

Alternative 3—Floodplain Terrace Plan (1:50 AEP) proposes flood risk management and recreation features in the project area. The alternative would reduce the risk of flooding in the Truckee Meadows reach to a 1 in 50 (2 percent) chance event; and increase recreational opportunities in the Truckee Meadows. A general description of Alternative 3 features follows. A more detailed description can be found in section 4.2 of the Draft EIS.

Flood Risk Management Features

- Construct 9,650 linear feet of on-bank (6,500 feet) and in-channel (3,150 feet) floodwalls and 31,000 linear feet of levees along the north and south banks of the Truckee River. This would also include a gravel levee maintenance road/ recreational trail.
- Excavate 1.7 miles of new floodplain terraces along south bank of Truckee River from Greg St. to East McCarran Boulevard.
- Place 3,200 feet of North Truckee Drain in twin 11-ft. x 10-ft. concrete box culverts south of I-80, including 200-feet extension to Peoples' Drain.
- Cap two junction structures of Peoples' Drain.
- Remediate under-seepage with seepage berms, drainage blankets, impervious berms, and relief wells.
- Manage interior drainage with 14-cfs pumping station upstream of Glendale Boulevard, gravity drain at UNR Farms Facility levee, and new flap or vertical sluice gates at all existing storm drains.
- Construct 1,700 linear feet of bioengineered bank scour protection and 11,100 linear feet of rock riprap bank scour protection.
- Install bridge abutment and pier scour protection at 4 bridges.

- Revegetate 60 acres along 1.7 miles of new floodplain terraces with riparian vegetation on the south bank of Truckee River from Greg St. to East McCarran Boulevard.
- Relocate approximately 14,100 feet of existing recreational trails along segments of the current trail alignment.

Recreation Features

- Construct 4 Canoe/kayak launch points at Fisherman's Park, Glendale Park, Cottonwood Park, and the trail access at the end of Sparks Boulevard;
- Install 50 new picnic tables on the north and south sides of the river, including 36 within the recreation focus area of the proposed plan between Rock Boulevard and McCarran Boulevard;
- Construct 13 fishing access locations on the north and south sides of the river, from Highway 395 to Cottonwood Park;
- Construct 18,600 linear feet of new paved (9,700 feet) and unpaved (8,900 feet) recreation trail;
- Construct a community park at the current location of the Excel Building on Mill Street, which would include a parking lot, playground, public restroom, medium-sized picnic shelter, and access to new recreation trails;
- Install a small-sized picnic shelter at the current Sagewinds property

e. Project Alternatives

Section 230.10 of the Guidelines dictates that, except as provided under §404(b)(2), "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have significant adverse environmental considerations." While the NEPA process, through the EIS, extensively examines alternatives and discloses all of their environmental impacts, the 404(b) (1) Evaluation focuses on the impacts of alternatives to the aquatic ecosystem. The Guidelines require choosing for implementation the practicable alternative that has the least damage to the aquatic ecosystem, assuming that this alternative has no significant adverse environmental impacts to other components of the environment, such as endangered species that occupy upland habitat. A "practicable alternative" is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes."

As summarized in Section 3.3 of the Draft EIS, an extensive array of flood risk management measures were taken into consideration while formulating alternatives that could meet the project's flood risk management objectives. Table 3-1 of the Draft EIS presents the list of measures considered.

When considering alternatives to placing dredge or fill material into a water of the U.S., the use of non-structural measures would warrant high consideration. To the extent possible, non-structural measures were incorporated into alternatives when not cost prohibitive and/or not functionally effective in reducing flood risk for the area. However, given the extent of the flooding problem in the Truckee Meadows area, non-structural measures alone would not be a practicable alternative to consider for achieving the project flood risk management objectives.

In this case, combinations of non-structural and structural measures were deemed necessary to formulate alternatives that would achieve a reduction in the risk of flooding. Structural flood risk measures that would have the lowest potential of placement of fill material into a water of the U.S. would be measures set back from the river channel such as setback levees, features off-stream from the river such as off-stream detention basins, or reoperation of existing flood risk management features such as at existing upstream reservoirs. Setback levees and off-stream detention basins were included in alternatives considered further; however, reoperation of existing upstream reservoirs was not considered further. Except for Tahoe Dam, the other six existing upstream reservoirs in the system (Prosser, Martis, Boca, Stampede, Donner, and Independence) are located on tributaries to the Truckee River, not on the main stem. But the bulk of the flooding in the Truckee Meadows is driven mainly by the unregulated runoff from the Sierra Nevada Mountains, particularly between Lake Tahoe and the Reno gage. Therefore, reoperation of the existing reservoirs would have limited effect on the reduction of flood risk.

In related terms, the possibility of constructing new upstream storage was also considered; however, the substantial cost of constructing a facility large enough to acceptably meet the flood risk reduction objectives, as well as the potential for significant environmental effects, including placement of fill material into the river, led the team to dismiss new upstream storage as an option.

The remaining structural measures left for consideration generally involved increasing channel flow capacity either by widening, deepening or establishing a bypass, or by removing constrictions to flow, such as raising, replacing, or removing bridges. Channel deepening was not considered further because of its high potential to significantly affect channel hydraulics and morphology, in addition to the high cost and environmental impacts of maintaining channel depths. Given the incised nature of the existing channel in the Truckee Meadows reach resulting from past channel straightening and deepening activities, channel widening, or floodplain terracing, was included in alternatives as a measure to increase channel flow capacity as well as a measure to reconnect the river to its historic floodplain. Bridge raising/replacement/removal was also brought forward and was not considered a substantial contributor to placement of fill into a water of the U.S. because the footprints of the project bridge piers and abutments would be generally the same as the existing bridges.

As discussed in section 3.4 of the Draft EIS, development of alternatives involved combining the retained measures into a range of plans that would meet the objectives of the study, while avoiding or minimizing significant adverse effects on social, environmental, or cultural resources.

In the Downtown Reno reach, there were no flood risk management alternatives determined to be cost-effective and maximize net benefits; therefore, an alternative meeting National Economic Development (NED) criteria was not identified for the reach.

The remaining alternatives focused on reducing flood risk in the Truckee Meadows reach and varied from including primarily on-channel floodwalls and levees (Alternative 1) to floodwalls, levees, and detention basins (Alternative 2) to setback levees and floodwalls combined with floodplain terracing (Alternative 3). Under the Corps' planning process, the plan demonstrating the greatest gain in net benefits (flood damages prevented) when compared to plan costs moves forward for increased level of analysis and optimization to arrive at NED plan. The NED plan is used for purposes of identifying the Federal Government's cost-sharing parameters for the project.

The Alternative 3 designs outperformed all of the other alternatives, so Alternative 3 was brought forward for more detailed analysis and optimization (see section 3.4.1 in the Draft EIS for the list of alternatives that were evaluated). Recent changes in real estate values in the project area, as well as refinements to the hydraulic and economic models being used, have prolonged the optimization process. However, current efforts have identified Alternative 3—Floodplain Terrace Plan (1 in 50 AEP), as the NED. Therefore, Alternative 3—Floodplain Terrace Plan (1:50 AEP) has been moved forward as the tentatively selected plan.

NEPA requires that an EIS consider a range of reasonable alternatives that could accomplish the project's purpose and need, as well as a no action alternative for comparison. Reasonable alternatives are those that may be feasibly carried out based on technical, environmental, economic, and other factors such as local support and legal adequacy. Alternatives determined to be infeasible do not need to be considered in an EIS, but the reasons why they were not considered need to be explained. As discussed in Section 3.5.4 of the Draft EIS, Alternatives 1 was considered to be infeasible because of significant environmental effects, land availability issues, substantial public opposition, and lack of partner support for this alternative. Specific to placement of dredge or fill material, Alternative 1 would impact more acres of jurisdictional waters than the other alternatives because of its dependence on more linear footage of floodwalls and levees to contain flood events and the proximity of the floodwalls and levees to the existing channel.

As indicated in Appendix G of the Corps Planning Guidance Notebook (ER 1105-2-100), a comparison of the recommended plan to the authorized plan is called for when changes to a Congressionally-authorized plan are being proposed. This includes an evaluation of environmental effects. Given the time that has elapsed since completion of the authorized plan's EIS (1985) and changes that have occurred in the project area since then, a detailed analysis of Alternative 2-Detention Plan (1 in 100 AEP), the alternative most similar to the authorized plan, is included in this EIS in order to establish relevant environmental effects for comparison to the recommended plan. However, this plan was not selected because of its high cost relative to flood reduction benefits realized.

Following identification of the flood risk management plans, a recreation plan was formulated that would incorporate recreation features into the proposed flood risk management footprint. Corps recreation authority is limited to cost share participation of specified passive recreation activities and amenities.

f. General Description of Dredged or Fill Material

A total of 28.8 acres of wetlands and waters of the U.S. would be filled as a result of the project features. The location of flood risk management features in the Truckee Meadows reach was based on reducing the linear feet of floodwalls and levees while still providing developed areas with flood protection. To accomplish this, levee and floodwall alignments were set back from the river as much as possible and floodplain terraces were proposed to increase channel capacity within the Truckee Meadows reach. Where structures or topography do not allow sufficient space to place floodwalls along the banks, in-channel floodwalls would be constructed.

Currently, it is estimated that Alternative 3—Floodplain Terracing would require approximately 1,700 linear feet of bioengineered bank scour protection and 11,100 linear feet of rock rip-rap bank scour protection in the Truckee Meadows Reach. Riprap scour protection for banks and bridge piers would call for placement of rock riprap in 7.1 acres of the river channel. Bioengineered bank scour protection would also entail the placement of riprap along the toe of the bank; however, bank stabilization methods such as coir matting, brush mattresses, willow pole cuttings, and other bioengineered stabilization methods would be employed on the majority of these scour protection sites. Bioengineered scour protection would place fill in 1.2 acres of the river channel. Ongoing sedimentation and stability evaluations, in conjunction with development of construction design-level hydraulic models following project authorization, would refine where and what type of scour protection would be required.

Fill from in-channel floodwalls would be concrete from local batch sources and would require placement in 1.7 acres of the river channel.

Fill for on-bank floodwalls and levees would come from excavation work being done for the project, particularly floodplain terrace excavation, or local sources, in addition to concrete from local batch suppliers. This would result in the placement of 6.6 acres of fill in the Pioneer Ditch.

Two levels of floodplain terraces would be excavated and shaped. While these features would not entail placement of fill in jurisdictional waters, they would require relocation of portions of the Pioneer Ditch, some of which presents wetland characteristics. In addition, there are 2 farmed wetlands located within active farmland that would be removed as a result of floodplain terrace excavation. Floodplain terrace excavation would affect 10.2 acres of jurisdictional wetlands. However, this work would reconnect the floodplain to the river, creating an additional 62.3 acres of riparian habitat, of which 40 acres would be exposed to seasonal inundation during winter and spring peak flows with annual occurrence frequency of less than 1:2. Non-native plant species would be removed and areas planted with native riparian species

The North Truckee Drain, downstream of Interstate 80 and the railroad, would be placed in two buried box culverts, 11 feet wide by 10 feet high, for a length of approximately 3,200 lineal feet. The reinforced concrete box culverts would include maintenance access and be installed along the existing drainage channel alignment. At the transition of the existing North Truckee Drain crossing under the railroad, a 20-foot-wide by 10-foot-high reinforced concrete box culvert would be installed. Placement of the lower portion of the drain into concrete culverts would represent placement of 1.7 acres of fill in the North Truckee Drain.

Proposed fishing (220 square feet of rock/gravel per site) and kayak access (500 square feet of rock/gravel per site) recreation features represent approximately 0.1 acre of rock and gravel fill in the margins of the river channel.

g. Description of the Proposed Discharge Site(s)

In order to identify waters of the U. S. at a planning level, a delineation of aquatic resources was performed within the project area between June and September 2005 (Lichvar and Ericsson 2005). A planning level delineation is defined here as the identification of areas that meet the jurisdictional requirements under CWA Section 404 at a watershed scale. Although the delineation is highly accurate at the planning level, it is not specific to any one site. Thus, a planning-level wetland delineation does not replace the need for a jurisdictional wetland delineation. However, the level of accuracy is sufficient to carry out a landscape level analysis of effects to waters of the U. S. following the USEPA 404(b)(1) Guidelines. Because the proposed project would be constructed in phases due to its size and geographical extent, a field delineation of jurisdictional waters within each phase would be carried out prior to construction to refine this 404(b)(1) analysis.

The modification of standard delineation sampling protocols and the development of wetland ratings for Section 404 regulatory purposes for the riparian vegetation map units allowed for a watershed scale delineation. The sampling protocols outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) were modified for use at the watershed scale. To delineate at this scale, fluvial geomorphic surfaces were mapped in the riparian zones representing several different flood return intervals, which were later interpreted for frequency requirements under Section 404, as represented in Figure 1.

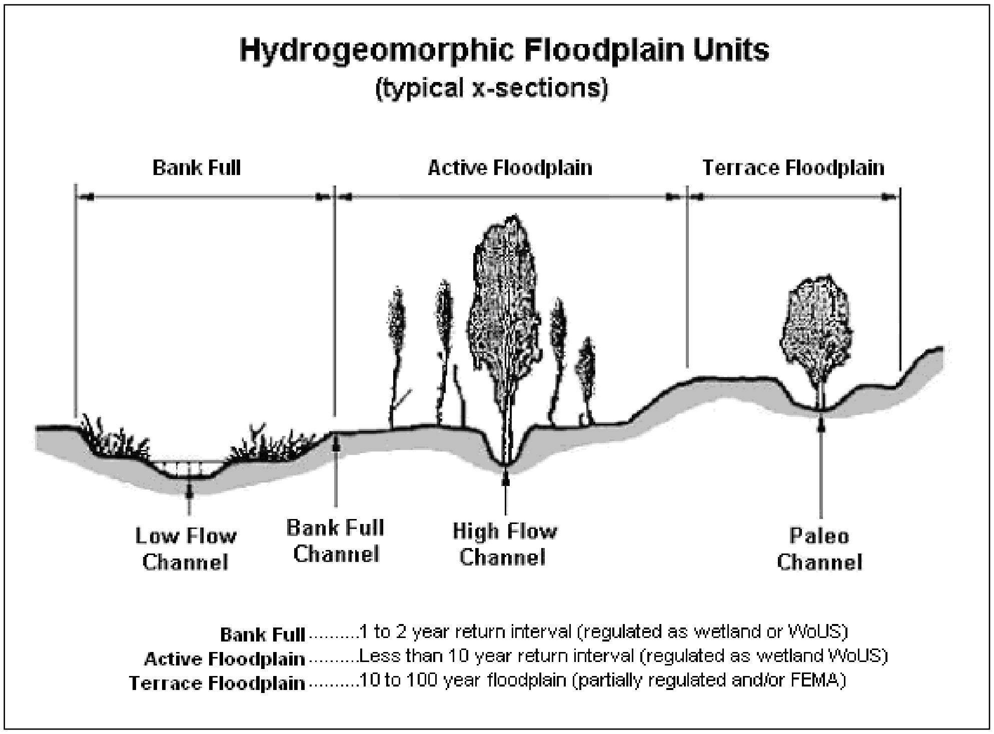

Figure 1. Hydrogeomorphic Floodplain Units.

Individual vegetation units were sampled to develop a characterization of the indicators for both wetlands and other waters of the United States. Wetland decisions were determined by combining the field data for wetland criteria for each separate vegetation map unit with the distribution patterns of vegetation units within the geomorphic surfaces. By combining the wetland indicators with flood frequency information obtained from the geomorphic surface map, jurisdictional decisions were made regarding waters of the United States, including wetlands across the entire study area.

The vegetation units in the riparian areas were then rated for their probability of meeting the criteria as either wetland or non-wetland waters of the United States. These ratings resolved the issue that some vegetation units had repeatable characteristics that always meet the criteria of a Water of the United States, including wetlands, and others were so ecologically diverse that they were able to occur in various landscape positions. By combining field sampling and observations with distribution patterns analyzed within the GIS database, probabilities ratings intended for regulatory purposes were developed to accommodate all variations. As shown in Table 1, six categories of wetland ratings were assigned to each of the riparian vegetation units with ratings ranging from always regulated to upland or not regulated.

Table 1. Regulatory probability ratings assigned to riparian vegetation types

Rating	Description
1	Types meet the criteria for a wetland or WoUS 100% of the time
2	Types meet the criteria for a wetland or WoUS 67-98% of the time
3	Types meet the criteria for a wetland or WoUS 33-66% of the time.
4	Types meet the criteria for a wetland or WoUS 2-32% of the time (primarily uplands)
5	Types meet the criteria for a wetland or WoUS <2% of the time (primarily uplands)
6	Unregulated upland
Source: Lichvar, Robert and Michael Ericsson. 2005. *Delineation of Aquatic Resources Using Vegetation Communities and Fluvial Surfaces Within Selected Reaches of the Truckee River, Washoe and Storey Counties, Nevada.*	

The effects to waters of the U.S. with ratings of between 1 and 3 by permanent dredged or fill material for Alternative 3 is summarized in Table 2 below.

Table 2. Acres of Jurisdictional Waters Effected by Permanent Dredged or Fill Material

Flood Risk Management and Recreation Features	Acres
Bank Scour Protection - Riprap	5.4
Bank Scour Protection - Bioengineered	1.2
Bridge Scour Protection	1.7
On bank Floodwall	0.1
In channel Floodwall	1.7
Levees	6.5
Floodplain Terrace	10.2
North Truckee Drain	1.7
Recreation	0.1
Total	**28.6**

The general vegetation of the Truckee River and Truckee Meadows between Reno, NV and Vista, NV is one of an arid big sagebrush and a riparian corridor following the Truckee River. The hillsides and slopes that are adjacent to the river are dominated by a Great Basin flora mixed with several arid southwestern desert species. Big sagebrush (*Artemisia tridentata*) and wheatgrasses (*Agropyron spp.*) cover most of the slopes. Many introduced grass species have invaded most of these sites as well as most dry areas in the region. Some of these species include cheat grass (*Bromus tectorum*) and lolium (*Lolium perenne*).

Following along the Truckee River is a highly modified riparian corridor. Large and old stands of Fremont cottonwood (*Populus fremontii*) and willows (*Salix spp.*) are found on old abandoned floodplain terraces. In the more active flood plain channels are young stands of willows (*Salix spp.*) and herbaceous wetland species. Some of the common wetland species include tule (*Scirpus acutus*), cattails (*Typha latifolia*), rushes (*Juncus spp.*) and sedges (*Carex spp.*). In addition to the natural flora is a common weedy component that dominates much of the floodplain. The white top mustard (*Lepidium latifolium*) is so aggressive in many locations that it is the single dominant or even the only species found at a site.

Development on the north side of the Truckee River has encroached into the majority of the historic floodplain in the Truckee Meadows area, leaving a narrow band of the highly modified riparian corridor described above. The North Truckee Drain is a drainage canal that returns irrigation waters from the north Truckee Meadows area back to the river along with stormwater runoff from the City of Sparks. The North Truckee Drain south of Interstate 80 is an unlined canal that supports patches of common wetland species identified above.

While development has not encroached as aggressively onto the historic floodplains south of the river, much of the area is actively farmed, reducing the presence of riparian habitat to a narrow corridor along the river. The agricultural areas are irrigated via canals that carry water diverted from the river at the Pioneer Ditch diversion dam. The irrigation system contains a mix of lined and unlined canals, some of which support patches of the common wetland species identified above.

h. Description of Disposal Method

Dump trucks, dozers, graders, excavators, backhoe, and rollers would be used to construct the levees and floodwalls, excavate the floodplain terraces, and place rock for scour protection along the bank of the Truckee River.

III. Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

The elevation of the Truckee River is approximately 4,300 feet in Reno declining to 3,800 feet at Pyramid Lake with a generally low to flat, 0 percent to 2 percent slope. The primary soil forming environments of the lower watershed include floodplains and low terraces, alluvial fans, low elevation foothills, and high elevation uplands. In general, soils present within the lower watershed formed on moderately sloping surfaces. A wide range of parent material present within the lower watershed includes volcanic rock, alluvial fans composed of assorted volcanic rock, floodplains composed of coarse-grained to fine-grained material, and aeolian sands deposited on high terraces.

In a river channel with a well-connected floodplain, flowing water is spread across the floodplain surface during periods of high flow. The result is that water depths in the channel are decreased (compared to an incised channel) and the shear stresses present within the channel are also decreased, thus reducing overall bed load sediment transport rates. The incised and straightened nature of the Truckee River channel however, has the effect of increasing the sediment transport rate because all of the stream flow is held within the banks, which causes the channel slope and flow depth to increase and results in higher in-channel shear stresses.

(2) Sediment Type

All soils in the Truckee River Basin are predominantly loamy to sandy with intermixed gravels and boulders. Soils in the study area are typically classified as aridisols, ultisols, and entisols. Aridisols are dry, alkaline mineral soils with light-colored surface horizons that contain limited organic material. Aridisols typically have calcium carbonate, gypsum, and other salts accumulated on its subsurface. They usually occur in the lower watershed, where there is less precipitation. In general, along the Lower Truckee River watershed, older, more stable alluvium present along the Truckee River corridor was deposited during the Pleistocene. The floodplain materials are primarily clayey silt, silt, and silty sand with interstitial lenses of either peat or clay-rich sediments

(3) Dredged/Fill Material Movement

Because of the risk of high flows washing the excavated material away, temporary soil storage near the existing channel would only occur in low-risk months of July thru September when the river flows are low. The rock revetment specifications for scour protection range from 12-18 inches in diameter and will prevent excessive sediment transport and incision of the river channel. Best management practices would be incorporated in the construction of flood risk management features in the river channel to minimize the amount of fill movement.

(4) Physical Effects on Benthos (burial, changes in sediment type, etc.)

The construction of floodwalls and levees, the creation of floodplain terraces, and placement of rock for scour protection on the banks of the Truckee River could temporarily affect portions of the river bottom and wetland benthos. Construction activities may increase turbidity, stimulate algal growth, and cause aquatic organisms to leave the area or increase their difficulty in finding food. However, the construction of the new floodplain terraces would create additional habitat for aquatic invertebrates. The effects of these terracing activities would increase the amount of surface water and would increase the habitat for benthic organisms providing long term benefits.

(5) <u>Other Effects</u>

Project construction could result in accidental spills of fuel or other toxic materials associated with the operation of construction equipment (e.g., gasoline, oils, lubricants, and solvents). Hazardous substances that enter the river channel could have temporary adverse effects on water quality and aquatic organisms. Best management practices would be implemented to reduce the potential of accidental spills due to construction activities.

(6) <u>Actions Taken to Minimize Impacts</u>

The Corps and their contractors would implement erosion control measures throughout the construction period to minimize erosion and sediment input into the river. All construction within the existing river would occur during low flows. In-channel construction would be done in dry conditions with the use of cofferdams and the temporary diversion of river flows through pipes or a temporary diversion canal. During construction, disturbance outside of the project area would be kept to a minimum.

Construction would be conducted in accordance with site-specific construction plans that minimize the potential for increased sediment inputs to the river. Spoils and stockpile sites would be stabilized to minimize erosion and sediment from entering the river. Erosion control measures would be implemented as appropriate to prevent sediment from entering the river or other watercourses to the extent feasible, including the use of silt fencing or fiber rolls to trap sediment and erosion control blankets to protect channel banks. The removal of vegetation would be minimized and any areas disturbed by construction would be seeded or planted with the appropriate trees, shrubs, grasses, and emergent vegetation.

The Corps and their contractors would prepare a spill prevention and response plan that regulated the use of hazardous and toxic material, such as petroleum-based fuels and lubricants for construction equipment. Construction equipment would be stored in dedicated on-site staging areas and would be maintained in proper operating condition to prevent leaks of petroleum products.

The revegetation effort proposed in the Truckee Meadows reach will include opportunistic plantings associated with flood risk management measures, particularly floodplain terracing. The plantings that will be installed are in line with best management practices that address erosion, storm water runoff, outcompete with the potential spread of non-native invasive plants, and provide visual quality.

b. Water Circulation. Fluctuation and Salinity Determinations

(1) <u>Water</u>

The proposed fill activities would not permanently affect salinity, chemistry, clarity, color, odor, dissolved oxygen level, nutrients, or eutrophication. There may be some short-term effects such as change in color when floodwalls and levees are being constructed, the excavation of the floodplain terraces, and placement of rock for scour protection. The release of sediment during these construction activities would cause a change in the color of the water and an increase in nutrients. The nutrient level and color would return to normal after construction activity has ended.

(2) Current Patterns and Circulation

During in-channel construction the flow patterns would be diverted temporarily around the work area. Cofferdams upstream and downstream of the work area would be installed and used to divert river flows through a pipe or temporary bypass channel. Following completion of construction, cofferdams would be removed and river flows returned to the natural channel.

(3) Normal Water Level Fluctuations

The main source of water for the lower Truckee River originates in Lake Tahoe. The normal water level is lowest during the late summer and early fall months. Water levels would fluctuate during storm events, snowmelt, or changes in discharge from Lake Tahoe. Project construction would be scheduled during this low-flow period and would not affect the water level during construction.

(4) Salinity Gradients

TDS concentrations in the Truckee River increase downstream and are a concern because Pyramid Lake is a terminal saline lake. Both temperature and salinity affect density stratification of the water layers of Pyramid Lake. Long periods of stratification lead to oxygen-deficient bottom waters, which stress cold water organisms. Flood risk management measures in and along the Truckee River would not affect the salinity gradient of the freshwater river or to the more saline Pyramid Lake.

(5) Actions That Will Be Taken to Minimize Impacts

The majority of construction activities, including floodwall and levee construction, floodplain terrace development, and scour protection would be performed simultaneously, where possible, to reduce the duration of disturbance. Excavation of the new floodplain terraces would include the stockpile of fill material and the installation of silt fences.

All construction within the existing river and floodplain would occur during low flows. Best management practices would be used to prevent sediment and erosion from entering the Truckee River during the construction.

Equipment would be stored in designated onsite staging areas away from the river. The staging area would be leveled and surrounded by a small berm to prevent runoff from entering the river. Refueling operations would be done at least 100 feet from any waterway. All refueling equipment would be equipped with an automatic shut-off nozzle to contain drips and keep from topping off the tanks. Equipment would be washed before entering the work site to prevent spread of noxious plants into the work site. Equipment would also be washed and checked for any leaks before conducting work in the waterway. Waste fluids would be collected and recycled or disposed of according to local ordinances at an offsite location. Any cleaning activities would be done without soaps, solvents, degreasers, or other chemical products. All wash water would be stored in a sump for evaporation or infiltration into underlying soils.

All stockpiles would be located 100 feet away from all drainage courses and would be managed to prevent stormwater runoff from entering the water. Soils excavated from development of the floodplain terraces and long-term staging of soil material (longer than one week) will be placed away from the stream, vegetated, and surrounded by a berm perimeter to control runoff and erosion. Temporary covers would be used on stockpiles as soon as practicable but no later than 14 days after stockpiles are created. Sediment and erosion controls would be used to prevent material from entering the water until plants have stabilized the soils. All areas disturbed by construction activities would be seeded or planted with trees, shrubs, and emergent vegetation. Monitoring of water quality upstream and downstream of the construction site would occur as directed by the Nevada Department of Environmental Protection.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

Construction activities throughout the project area may contribute temporary increases in the suspended particulate and turbidity levels. Suspended particulates and turbidity levels would be expected to return to preconstruction levels upon completion of the project.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column

Flood risk management construction activities causing a temporary increase in turbidity could temporarily inhibit light penetration, dissolved oxygen, and the aesthetics in the vicinity of disposal sites. No long-term or permanent affects would be expected to occur.

Project construction could result in accidental spills of fuel or other toxic materials associated with the operation of construction equipment (e.g., gasoline, oils, lubricants, solvents). Hazardous substances that enter the river channel could have temporary adverse effects on water quality and aquatic organisms.

(3) Effects on Biota

The project may temporarily affect photosynthesis, suspension feeders, and sight feeders in the areas of construction activity. However, the effects would be short-term with no expected long-term or permanent consequences.

(4) Actions taken to Minimize Impacts

Sediment control BMPs are intended to intercept and slow flows to allow sediments to settle and be contained before entering a waterbody, and include gravel filter berms, silt fences, sediment barriers (e.g. sandbags), fiber rolls, sediment basins, check dams, turbidity curtains, and dewatering operations. Erosion control BMPs are applied directly to disturbed soils to reduce erosion by wind, rain, and runoff, and include geotextiles, revegetation, and mulching. Active construction area BMPs control erosion and sediment through practices that include:

- All soils are stabilized within 14 days of completed work.
- Construction equipment is limited to the actual area being disturbed and vehicles may not travel in areas to be left in their natural state.
- Short-term staging of soil material is surrounded by a silt fence, fiber rolls, or other perimeter.
- Long-term staging of soil material (longer than one week) would be placed away from the stream, vegetated, and surrounded by a berm perimeter to control runoff and erosion.
- Existing vegetation is left in place to the maximum extent possible.
- The contractor would have a designated area for vehicle and equipment maintenance that is self-contained to protect groundwater, surface water, and soils from contamination.
- Dewatering water is discharged into a meadow a sufficient distance from the stream to assure no direct discharge back to the stream.

- Suitable stream crossings are constructed and/or existing and appropriate access is utilized to avoid damage to the streambanks and bed.
- Construction traffic is restricted to predetermined routes.
- Traffic during wet weather or within the wet zone is minimized.

Perimeter controls and monitoring - control erosion and sediment through the use of: silt fences, straw bales, graded berms, and native filter zones with planned restoration to control the perimeter around the active construction area; continuous turbidity monitoring to assess BMP performance; and immediate reporting of failing or ineffective BMPs.

d. Contaminant Determinations

The project study area was evaluated to determine the potential for encountering hazardous materials and wastes in areas that would be disturbed during construction (see Section 5.2.2 of the EIS). Buried materials found during construction will be evaluated and disposed of in accordance with local, state and federal regulations. Fill material needed for the project would either come from excess excavation in the project areas or from a local source that has been tested and is free from contaminants.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

The project would temporarily affect plankton in those areas of in-water work. However, the effect would be short-term and mitigated to less than significant using best management practices. Development of the floodplain terraces would create new and enhance existing aquatic habitat providing long-term benefits to plankton.

(2) Effects on Benthos

The project would temporarily affect benthos in those areas of in-water work. However, the effect would be short-term and mitigated to less than significant using best management practices. Development of the floodplain terraces would create new and enhance existing aquatic habitat providing long-term benefits to benthos.

(3) Effects on Nekton

The project would temporarily affect nekton in those areas of in-water work. However, the effect would be short-term and mitigated to less than significant using best management practices. Development of the floodplain terraces would create new and enhance existing aquatic habitat providing long-term benefits to nekton.

(4) Effects on Aquatic Food Web

The project would temporarily affect the aquatic food web in those areas of in-water work. Increase in turbidity during construction would cause aquatic wildlife to leave the area or have a harder time finding food. However, the effect would be short-term and mitigated to less than significant using best management practices. Development of the floodplain terraces would enhance existing aquatic habitats providing long-term benefits to the aquatic food web.

(5) Effects on Special Aquatic Sites

Two levels of floodplain terraces would be excavated and shaped. While these features would not entail placement of fill in jurisdictional waters, they would require relocation of portions of the Pioneer Ditch, some of which presents wetland characteristics. In addition, there are 2 farmed wetlands located within active farmland that would be removed as a result of floodplain terrace excavation. Floodplain terrace excavation would affect 10.2 acres of jurisdictional wetlands. However, this work would reconnect the floodplain to the river, creating an additional 62.3 acres of riparian habitat, of which 40 acres would be exposed to seasonal inundation during winter and spring peak flows with annual occurrence frequency of less than 1:2. Non-native plant species would be removed and areas planted with native riparian species

The North Truckee Drain, downstream of Interstate 80 and the railroad, would be placed in two buried box culverts, 11 feet wide by 10 feet high, for a length of approximately 3,200 lineal feet. The reinforced concrete box culverts would include maintenance access and be installed along the existing drainage channel alignment. At the transition of the existing North Truckee Drain crossing under the railroad, a 20-foot-wide by 10-foot-high reinforced concrete box culvert would be installed. Placement of the lower portion of the drain into concrete culverts would represent placement of 1.7 acres of fill in the North Truckee Drain.

(6) Threatened and Endangered Species

Effects to special status species are addressed more fully in the EIS (Section 5.7).

The project will not affect the Federally-listed endangered Carson wandering skipper (*Pseudocopaeodes eunus obscures*), a small butterfly whose range is restricted to four extant populations occurring within a small geographic range extending from south of Carson City, Nevada, through Washoe County, to southeastern Lassen County, California.

The Federally-listed endangered cui-ui (*Chasmistes cujus*) is a large, robust lakesucker found only in Pyramid Lake, Nevada. The current range of the cui-ui is restricted to Pyramid Lake and the lower Truckee River downstream of Derby Dam, approximately 15 miles downstream of the project area. Potential indirect effects to cui-ui could result from changes to the water quality of the Truckee River. According to the USFWS recovery plan for the cui-ui, increased temperatures and sediment loading and decreased dissolved oxygen within the Truckee River have adversely affected cui-ui spawning and nursery areas. Short-term increases in sediment load could result from project construction activities. However, implementation of stormwater and in-channel construction BMP's discussed in Section 5.4 Water Quality would reduce the short-term effects to may affect, not likely to adversely affect the cui-ui population. Short-term loss of riparian shading as a result of in-channel floodwall and bank scour protection construction could result in a slight increase in water temperatures. However, implementation of environmentally sustainable designs and bioengineering measures in flood risk management features would result in negligible long-term changes to water temperature, including potential beneficial reductions in temperatures resulting from revegetation of floodplain terraces with native riparian habitat. Overall, the project is not likely to adversely affect the cui-ui population.

The Federally-listed threatened Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) is a subspecies of cutthroat trout native to the Lahontan basin of northern Nevada, eastern California and southern Oregon. The Lahontan cutthroat trout was extirpated from the Truckee River and all but a few of its tributaries. Subsequently, the trout has been re-introduced to the upper Truckee River and a number of tributaries to the Truckee River. Today, there are no extant fluvial Lahontan cutthroat trout populations native to the Truckee River watershed. Out-of-basin fish believed to have originated from the Truckee River basin have been planted throughout the Truckee River watershed by California Department of Fish and Wildlife, Nevada Division of Wildlife, U.S. Fish and Wildlife Service, and the Pyramid Lake

Paiute Tribe (USFWS, 1995) and as part of the recreational fishery in Nevada (Western Native Trout Initiative, 2007). Currently, spawning opportunities and permanent rearing habitat for the trout in the lower Truckee River do not exist due to seasonally high water temperatures, unsuitable spawning habitat, and diversion of water before the trout eggs can hatch and fish migrate back to Pyramid Lake. Derby Dam also prevents spawning migrations upstream of Derby Dam.

However, stocking of Lahontan cutthroat trout near the project area allows for the possible presence of individual fish within the project reach. In order to minimize the short-term, construction-related adverse effects to potential trout present in the project area, in-channel construction would take place during low-flow conditions and at the time of year that fish migrations are least likely, July 1 to September 30. In addition, river flows would be diverted around in-channel construction areas using cofferdams and pipes or temporary diversion channels. Finally, the Corps would coordinate in-channel construction work with those agencies and organizations that stock the trout to minimize the potential for this species to be present. With these measures and other BMPs in place, the project is not likely to adversely affect the Lahontan cutthroat trout.

The creation of additional foraging, resting, nesting and rearing habitat would benefit the special status species. The project would have long-term benefits to the threatened and endangered species that occupy the river and the surrounding riparian habitats through the reconnection of historic floodplains through floodplain terrace excavation and revegetation. Increased river shading from project riparian plantings would also provide a benefit to the threatened and endangered fish species by slightly reducing water temperatures, compensating for the short-term loss of near-shore riparian habitat as a result of in-channel project features.

(7) Other Wildlife

The project area provides habitat for a variety of wildlife species. Areas disturbed during construction would be revegetated with native plant species to the extent practicable and consistent with Corps levee safety requirements. Wildlife habitat will be further improved by creating edge environments associated with open areas, particularly on the 1.7 miles of floodplain terraces to be excavated. Wildlife habitat for common and sensitive wildlife species would be increased and enhanced within the floodplain terraces on a long-term basis. One important benefit would be to riparian-obligate bird species due to increases in cottonwood/willow communities.

(8) Actions to Minimize Impacts

This project is likely to have adverse short-term effects that would be minimized by maintaining buffers around sensitive habitats and conducting construction activities outside of sensitive time frames for special status species fish and migratory birds and bats. Additionally, the implementation of a storm water pollution prevention plan (SWPPP) and associated BMP's would adequately avoid, minimize, and mitigate adverse effects to special status species. Excavation of and revegetation of floodplain terraces would establish 62.2 acres of cottonwood and willow riparian habitat, of which 40 acres would be exposed to seasonal inundation during winter and spring peak flows with a greater than 50 percent annual occurrence frequency.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

Not applicable.

(2) Determination of Compliance with Applicable Water Quality Standards

No water quality standards would be violated. There would be some minor, short-term increases in sedimentation and turbidity. These effects would be minimized by constructing during late summer or during the period of low flow. Monitoring of turbidity levels above and below in-channel construction locations would be carried out on a daily basis to ensure turbidity thresholds are not exceeded. If exceedence thresholds are being approached, actions would be taken to reduce turbidity levels, such as slowing down or halting in-channel construction until turbidity levels have been lowered to an acceptable condition.

(3) Potential Effects on Human Use Characteristic

There is a municipal water supply intake at the Glendale diversion dam in the Truckee Meadows reach. There is not expected to be any in-water work immediately upstream from the intake that would increase turbidity or effect water quality. Any flood damage reduction or restoration work in the project area would be mitigated to less than significant through the application of the appropriate best management practices.

Recreational activities would be temporarily affected during construction of flood damage reduction activities. River access, fishing and kayaking opportunities would be limited along the river where construction is taking place. Upon completion of the project, fishing and water related recreation would return to normal and there would be an increase in trails and river access.

Aesthetics would be affected during construction with the presence of heavy equipment along the river. These effects would be temporary and the restoration of the river and riparian corridor would have long-term beneficial affects.

There are numerous city parks along the Truckee River in the Truckee Meadows reach that would experience temporary effects due to construction. Temporary closures or limited access may occur during construction. The parks are not expected to have long-term adverse effects.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

With implementation of avoidance and minimization measures, this project will not significantly contribute to adverse cumulative effects on the aquatic ecosystem of the Truckee River.

h. Determination of Secondary Effects on the Aquatic Ecosystem

No significant secondary effects to the aquatic ecosystem are anticipated from project construction. There would be some minor, short-term construction effects. Best management practices would be implemented to minimize these effects.

IV. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

a. Adaptation of the Section 404(b)(l) Guidelines to this Evaluation

No significant adaptations of the guidelines were made relative to this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site

Flood damage reduction measures would be mitigated to less than significant. Alternatives 3 is considered to have the least adverse effects on the aquatic ecosystem due to fewer flood risk management features and an increase in riparian habitat in the Truckee Meadows reach that would expand the riparian corridor through terracing and setback levees. See Chapter 3 in the EIS for a more detailed discussion of alternatives considered.

c. Compliance with Applicable State Water Quality Standards

State water quality standards would not be violated. Water quality would bes ampled throughout construction and best management practices would be applied to meet State standards.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 Of the Clean Water Act

The proposed action would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

e. Compliance with Endangered Species Act of 1973

The proposed fill may affect, but not likely to adversely affect any endangered or threatened species or their critical habitat.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection. Research and Sanctuaries Act of 1972

Not applicable.

g. Evaluation of Extent of Degradation of the Waters of the United States

The activity would not cause or contribute to significant degradation of waters of the United States, including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity, productivity, and stability; and recreational, aesthetic, and economic values. The proposed fill activities would have minor, short-term adverse effects on sedimentation and turbidity. This project should have some long-term beneficial effect on sedimentation and turbidity.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

Appropriate and practical steps would be taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem. Prior to flood risk management construction, it must be determined that the Truckee River is experiencing its period of lowest flow minimizing the adverse effects of the discharge on the aquatic ecosystem.

i. On the Basis of the Guidelines the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material is as follows

On the basis of the guidelines, the proposed project is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effect on the aquatic ecosystem.

APPENDIX D

HEP ASSUMPTIONS AND OUTPUTS

TRUCKEE MEADOWS REACH NET AAHUs
22-Mar-13

Alternative		Without Project	With Project	
				Net AAHUs
Alt 2	AAHU	80.64	2.59	-78.05
Alt 3	AAHU	76.85	156.74	79.89

Truckee Meadows HEP Mitigation - Alternative 2 Sum

	Future w/o Project								Future w/ Project			
Evaluation Species/Cover Type	HSI	Acreage	HU	AAHU	Restoration Measure	Target Year	# of years		HSI	Acreage	HU	AAHU
Yellow Warbler/ forest	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.38	0.00	0.00	0.00
	0.38	6.30	7.18	0.14	Create New Riparian	1 to 3	3		0.10	0.00	0.00	0.00
	0.38	6.30	7.18	0.14		4 to 6	3		0.37	0.00	0.00	0.00
	0.38	6.30	9.58	0.19		7 to 10	4		0.49	0.00	0.00	0.00
	0.38	6.30	23.94	0.48		11 to 20	10		0.58	0.00	0.00	0.00
	0.38	6.30	23.94	0.48		21 to 30	10		0.49	0.00	0.00	0.00
	0.38	6.30	47.88	0.96		31 to 50	20		0.49	0.00	0.00	0.00
			119.70	2.39				Subtotals			0.00	0.00
					Interplanted areas	1 to 3	3		0.38	0.00	0.00	0.00
						4 to 6	3		0.54	0.00	0.00	0.00
						7 to 10	4		0.62	0.00	0.00	0.00
						11 to 20	10		0.55	0.00	0.00	0.00
						21 to 30	10		0.38	0.00	0.00	0.00
						31 to 50	20		0.38	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.38	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Whitetop Control / create riparian	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
Yellow Warbler/ shrub	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.87	0.00	0.00	0.00
	0.87	22.60	58.99	1.18	Create New Riparian	1 to 3	3		0.25	0.00	0.00	0.00
	0.87	22.60	58.99	1.18		4 to 6	3		0.62	0.00	0.00	0.00
	0.87	22.60	78.65	1.57		7 to 10	4		0.74	0.00	0.00	0.00
	0.87	22.60	196.62	3.93		11 to 20	10		0.89	0.00	0.00	0.00
	0.87	22.60	196.62	3.93		21 to 30	10		0.97	0.00	0.00	0.00
	0.87	22.60	393.24	7.86		31 to 50	20		0.97	0.00	0.00	0.00
			983.10	19.66				Subtotals			0.00	0.00
					Hydroseed Benches	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Interplanted areas	1 to 50	50		0.87	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.87	0.00	0.00	0.00
								Subtotals			0.00	0.00
Northern Oriole/ forest	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.77	0.00	0.00	0.00
	0.77	6.30	14.48	0.29	Create New Riparian	1 to 3	3		0.00	0.00	0.00	0.00
	0.77	6.30	14.48	0.29		4 to 6	3		0.00	0.00	0.00	0.00
	0.77	6.30	19.30	0.39		7 to 10	4		0.58	0.00	0.00	0.00
	0.77	6.30	48.26	0.97		11 to 20	10		0.74	0.00	0.00	0.00
	0.77	6.30	48.26	0.97		21 to 30	10		0.78	0.00	0.00	0.00
	0.77	6.30	96.52	1.93		31 to 50	20		0.75	0.00	0.00	0.00
			241.29	4.83				Subtotals			0.00	0.00
					Interplanted areas	1 to 3	3		0.77	0.00	0.00	0.00
						4 to 6	3		0.77	0.00	0.00	0.00
						7 to 10	4		0.77	0.00	0.00	0.00
						11 to 20	10		0.75	0.00	0.00	0.00
						21 to 30	10		0.75	0.00	0.00	0.00
						31 to 50	20		0.75	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.77	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Whitetop Control/ create riparian	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
Northern Oriole/ shrub	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.79	0.00	0.00	0.00
	0.79	22.60	53.83	1.08	Create New Riparian	1 to 3	3		0.00	0.00	0.00	0.00
	0.79	22.60	53.83	1.08		4 to 6	3		0.20	0.00	0.00	0.00
	0.79	22.60	71.78	1.44		7 to 10	4		0.38	0.00	0.00	0.00
	0.79	22.60	179.44	3.59		11 to 20	10		0.54	0.00	0.00	0.00
	0.79	22.60	179.44	3.59		21 to 30	10		0.58	0.00	0.00	0.00
	0.79	22.60	358.89	7.18		31 to 50	20		0.58	0.00	0.00	0.00
			897.22	17.94				Subtotals			0.00	0.00
					Hydroseed Benches	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Interplanted Areas	1 to 50	50		0.79	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.79	0.00	0.00	0.00
								Subtotals			0.00	0.00
American kestrel/multiple cover types	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.90	28.90	78.03	1.56	All Measures	1 to 3	3		0.89	0.00	0.00	0.00
	0.90	28.90	78.03	1.56		4 to 6	3		0.89	0.00	0.00	0.00
	0.90	28.90	104.04	2.08		7 to 10	4		0.89	0.00	0.00	0.00
	0.90	28.90	260.10	5.20		11 to 20	10		0.89	0.00	0.00	0.00
	0.90	28.90	260.10	5.20		21 to 30	10		0.88	0.00	0.00	0.00
	0.90	28.90	520.20	10.40		31 to 50	20		1.00	0.00	0.00	0.00
			1300.50	26.01				Subtotals			0.00	0.00
Mink/emergent wetland	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.30	14.00	12.60	0.25		1 to 3	3	All Measures	0.30	3.70	3.33	0.07
	0.30	14.00	12.60	0.25		4 to 6	3		0.30	3.70	3.33	0.07
	0.30	14.00	16.80	0.34		7 to 10	4		0.30	3.70	4.44	0.09
	0.30	14.00	42.00	0.84		11 to 20	10		0.30	3.70	11.10	0.22
	0.30	14.00	42.00	0.84		21 to 30	10		0.30	3.70	11.10	0.22
	0.30	14.00	84.00	1.68		31 to 50	20		0.30	3.70	22.20	0.44
			210.00	4.20				Subtotals			55.50	1.11
Marsh wren/emergent wetland	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.40	14.00	16.80	0.34		1 to 3	3	All Measures	0.40	3.70	4.44	0.09
	0.40	14.00	16.80	0.34		4 to 6	3		0.40	3.70	4.44	0.09
	0.40	14.00	22.40	0.45		7 to 10	4		0.40	3.70	5.92	0.12
	0.40	14.00	56.00	1.12		11 to 20	10		0.40	3.70	14.80	0.30
	0.40	14.00	56.00	1.12		21 to 30	10		0.40	3.70	14.80	0.30
	0.40	14.00	112.00	2.24		31 to 50	20		0.40	3.70	29.60	0.59
			280.00	5.60				Subtotals			74.00	1.48
			3541.81	80.64				Total for all species			0.00	2.59

Truckee Meadows HEP Mitigation - Alternative 3 Sum

	Future w/o Project								Future w/ Project			
Evaluation Species/Cover Type	**HSI**	**Acreage**	**HU**	**AAHU**	**Restoration Measure**	**Target Year**	**# of years**		**HSI**	**Acreage**	**HU**	**AAHU**
Yellow Warbler/ forest	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.38	0.00	0.00	0.00
	0.38	10.00	11.40	0.23	Create New Riparian	1 to 3	3		0.10	6.20	6.98	0.14
	0.38	10.00	11.40	0.23		4 to 6	3		0.37	12.40	16.00	0.32
	0.38	10.00	15.20	0.30		7 to 10	4		0.49	12.40	26.54	0.53
	0.38	10.00	38.00	0.76		11 to 20	10		0.58	12.40	66.34	1.33
	0.38	10.00	38.00	0.76		21 to 30	10		0.49	12.40	60.76	1.22
	0.38	10.00	76.00	1.52		31 to 50	20		0.49	12.40	121.52	2.43
			190.00	3.80				Subtotals			298.13	5.96
					Interplanted areas	1 to 3	3		0.38	0.00	0.00	0.00
						4 to 6	3		0.54	0.00	0.00	0.00
						7 to 10	4		0.62	0.00	0.00	0.00
						11 to 20	10		0.55	0.00	0.00	0.00
						21 to 30	10		0.38	0.00	0.00	0.00
						31 to 50	20		0.38	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.38	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Whitetop Control / create riparian	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
Yellow Warbler/ shrub	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.87	0.00	0.00	0.00
	0.87	20.00	52.20	1.04	Create New Riparian	1 to 3	3		0.25	24.95	51.15	1.02
	0.87	20.00	52.20	1.04		4 to 6	3		0.62	49.90	101.80	2.04
	0.87	20.00	69.60	1.39		7 to 10	4		0.74	49.90	162.67	3.25
	0.87	20.00	174.00	3.48		11 to 20	10		0.89	49.90	464.07	9.28
	0.87	20.00	174.00	3.48		21 to 30	10		0.97	49.90	484.03	9.68
	0.87	20.00	348.00	6.96		31 to 50	20		0.97	49.90	968.06	19.36
			870.00	17.40				Subtotals			2231.78	44.64
					Hydroseed Benches	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Interplanted areas	1 to 50	50		0.87	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.87	0.00	0.00	0.00
								Subtotals			0.00	0.00
Northern Oriole/ forest	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.77	0.00	0.00	0.00
	0.77	10.00	22.98	0.46	Create New Riparian	1 to 3	3		0.00	6.20	0.00	0.00
	0.77	10.00	22.98	0.46		4 to 6	3		0.00	12.40	10.79	0.22
	0.77	10.00	30.64	0.61		7 to 10	4		0.58	12.40	32.74	0.65
	0.77	10.00	76.60	1.53		11 to 20	10		0.74	12.40	94.24	1.88
	0.77	10.00	76.60	1.53		21 to 30	10		0.78	12.40	94.86	1.90
	0.77	10.00	153.20	3.06		31 to 50	20		0.75	12.40	186.00	3.72
			383.00	7.66				Subtotals			418.62	8.37
					Interplanted areas	1 to 3	3		0.77	0.00	0.00	0.00
						4 to 6	3		0.77	0.00	0.00	0.00
						7 to 10	4		0.77	0.00	0.00	0.00
						11 to 20	10		0.75	0.00	0.00	0.00
						21 to 30	10		0.75	0.00	0.00	0.00
						31 to 50	20		0.75	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.77	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Whitetop Control/ create riparian	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
Northern Oriole/ shrub	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.79	20.00	790.00	15.80
	0.79	20.00	47.64	0.95	Create New Riparian	1 to 3	3		0.00	24.95	12.48	0.25
	0.79	20.00	47.64	0.95		4 to 6	3		0.20	49.90	43.41	0.87
	0.79	20.00	63.52	1.27		7 to 10	4		0.38	49.90	91.82	1.84
	0.79	20.00	158.80	3.18		11 to 20	10		0.54	49.90	279.44	5.59
	0.79	20.00	158.80	3.18		21 to 30	10		0.58	49.90	289.42	5.79
	0.79	20.00	317.60	6.35		31 to 50	20		0.58	49.90	578.84	11.58
			794.00	15.88				Subtotals			1295.40	25.91
					Hydroseed Benches	1 to 3	3		0.00	0.00	0.00	0.00
						4 to 6	3		0.00	0.00	0.00	0.00
						7 to 10	4		0.00	0.00	0.00	0.00
						11 to 20	10		0.00	0.00	0.00	0.00
						21 to 30	10		0.00	0.00	0.00	0.00
						31 to 50	20		0.00	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Interplanted Areas	1 to 50	50		0.79	0.00	0.00	0.00
								Subtotals			0.00	0.00
					Exotics Removal	1 to 50	50		0.79	0.00	0.00	0.00
								Subtotals			0.00	0.00
American kestrel/multiple cover types	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.90	30.00	81.00	1.62		1 to 3	3	All Measures	0.75	62.30	161.20	3.22
	0.90	30.00	81.00	1.62		4 to 6	3		0.98	62.30	181.95	3.64
	0.90	30.00	108.00	2.16		7 to 10	4		0.97	62.30	238.24	4.76
	0.90	30.00	270.00	5.40		11 to 20	10		0.94	62.30	558.21	11.16
	0.90	30.00	270.00	5.40		21 to 30	10		0.85	62.30	518.65	10.37
	0.90	30.00	540.00	10.80		31 to 50	20		0.82	62.30	1015.49	20.31
			1350.00	27.00				Subtotals			2673.73	53.47
Mink/emergent wetland	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.30	7.30	6.57	0.13		1 to 3	3	All Measures	0.30	3.70	3.33	0.07
	0.30	7.30	6.57	0.13		4 to 6	3		0.30	3.70	3.33	0.07
	0.30	7.30	8.76	0.18		7 to 10	4		0.30	3.70	4.44	0.09
	0.30	7.30	21.90	0.44		11 to 20	10		0.30	3.70	11.10	0.22
	0.30	7.30	21.90	0.44		21 to 30	10		0.30	3.70	11.10	0.22
	0.30	7.30	43.80	0.88		31 to 50	20		0.30	3.70	22.20	0.44
			109.50	2.19				Subtotals			55.50	1.11
Marsh wren/emergent wetland	0.00	0.00	0.00	0.00	Unaffected Study Area	1 to 50	50		0.00	0.00	0.00	0.00
	0.40	7.30	8.76	0.18		1 to 3	3	All Measures	0.40	3.70	4.44	0.09
	0.40	7.30	8.76	0.18		4 to 6	3		0.40	3.70	4.44	0.09
	0.40	7.30	11.68	0.23		7 to 10	4		0.40	3.70	5.92	0.12
	0.40	7.30	29.20	0.58		11 to 20	10		0.40	3.70	14.80	0.30
	0.40	7.30	29.20	0.58		21 to 30	10		0.40	3.70	14.80	0.30
	0.40	7.30	58.40	1.17		31 to 50	20		0.40	3.70	29.60	0.59
			146.00	2.92				Subtotals			74.00	1.48
			3842.50	76.85				Total for all species			7707.66	156.74

Truckee River Flood Control Project

Habitat Evaluation Procedure and Aquatic Habitat Evaluation for the Truckee Meadows and Lower Truckee River Restoration Reaches

March 2007

US Army Corps of Engineers ®
Sacramento District

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Truckee River Flood Control Project

Habitat Evaluation Procedure
and Aquatic Habitat Evaluation
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1.0 Introduction

1.1 Background

The Reno/Sparks metropolitan area in Nevada has been flooded frequently in the past by the Truckee River. The Truckee Meadows area also is subject to severe flooding during periods of high runoff from the Truckee River and its primary tributary, Steamboat Creek. The U.S. Army Corps of Engineers (Corps) was directed by Congress and requested by local governments to investigate and propose flood protection measures along the Truckee River beginning in 1954. Channel modifications at several points along the river were constructed and in 1978 the Corps began preparation of a feasibility study for a flood control project in the Reno/Sparks Metropolitan (Truckee Meadows) area. The Corps completed the feasibility study in 1986 and the Truckee Meadows Flood Control Project was authorized under the Water Resources Development Act (WRDA) of 1988 (Public Law 100-676). However, the project was deferred during the preconstruction engineering and design (PED) phase when changes in real estate costs made the project economically infeasible.

In 1996, the local communities requested that flooding problems in Truckee Meadows be reevaluated, and the decision was also made to expand the study area beyond Truckee Meadows and consider ecosystem restoration as a project purpose. Congress then directed the Corps to prepare a general reevaluation report that will consider additional flood protection at and below Reno, Nevada, through levee/channel improvements, local impoundments, and potential reoperation of existing reservoirs in the watershed. The report is also to consider the potential for environmental restoration along the Truckee River and tributaries in the Reno-Sparks area.

1.2 Objectives and Constraints of the Restoration Plan

The Corps works to conceive active restoration initiatives in the context of broader watershed or regional water resource management programs and objectives. With this in mind, segments were evaluated by those criteria that will rank a river segment according to its potential to derive benefits from active restoration. The criteria that were used are: (1) floodplain expansion potential; (2) riparian forest expansion potential; (3) mechanical aquatic habitat recovery; (4) mechanical floodplain reconnection potential; and (5) constructed or existing landscape features.

Proposed restoration measures were developed for two major reaches along the Truckee River: the Truckee Meadows reach (from Highway 395 to Vista); and Lower Truckee River reach (Vista to Wadsworth). Restoration measures proposed for the Truckee Meadows reach were designed to be compatible with potential flood damage reduction (FDR) measures being evaluated for this reach. Evaluation of the Lower Truckee River reach identified 11 segments in the reach with good potential for restoration.

In addition to the need for compatibility with proposed FDR measures in the Truckee Meadows reach, separate habitat evaluations were prepared for the two reaches because the Truckee Meadows reach is far more urbanized than the Lower Truckee River reach.

1.2.1 Truckee Meadows Reach

The overall objective of restoration within the Truckee Meadows reach is to promote a living river concept by preserving and enhancing fish and wildlife habitat, water quality, and natural geomorphic characteristics of the river while obtaining the project's flood damage reduction objective.

Particular objectives to support the living river concept are:

- Maximize future restoration opportunities.
- Create wetlands and floodplain riparian terraces to maximize riverine fish and wildlife habitat.
- Weave terraces/overflow channels through the greenbelt corridor.
- Re-establish a more natural river floodplain.
- Improve water quality through development of wetlands.
- Arrest erosion of banks and berms at sites along the Truckee River.
- Allow migration of terrestrial and aquatic species, especially the passage of fish.
- Modify near stream land use, instream structures, and flood control activities to reduce disturbance of riparian corridor.
- Set aside the low floodplain as open space.
- Fill gaps in riparian forest caused by flow modifications.
- Improve the value of existing habitats of fair and good quality.
- Set levees and floodwalls back from the river channel and associated habitat and vegetation.

The following is a list of environmental constraints identified by the Corps:

- Ensure that project operation and maintenance are environmentally sensitive.
- Maintain water table necessary to sustain vegetation.
- Preserve existing vegetation.
- Utilize bio-technical and habitat-friendly riverbank treatments.
- Preserve archeological resources.

- Ensure no net loss of aquatic or riparian habitat.

- Ensure that the project design, construction, and operation does not increase waterborne concentrations of nutrients, turbidity, toxic pollutants, or total dissolved solids; discharge of untreated urban runoff; potential for hazardous material to enter the river; and river temperatures.

- Ensure that the project design, construction, and operation does not decrease the amount of dissolved oxygen.

- Avoid or mitigate impacts downstream from the project area. Avoid increasing downstream flood flows and water surface elevations; inducing or exacerbating erosion; impacting (adversely) Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*), cui-ui (*Chasmistes cujus*) and their habitats; and damaging other aquatic or riparian habitat.

1.2.2 Lower Truckee River Reach

Project objectives for the Lower Truckee River reach are as follows:

- Develop a restoration plan that is based on fluvial and ecosystem processes.

- Rehabilitate riparian habitat, including willow thickets, cottonwood galleries, and wetlands.

- Increase biological productivity and diversity, with special emphasis on target species.

- Restore and improve hydraulic habitats for aquatic species including native and nonnative fishes.

- Create a mosaic of wetland and aquatic habitats.

- Improve water quality by creating a riparian buffer and forest that will up take nutrients and reduce river water temperature with shade.

- Compensate (partially) for increased flood magnitude resulting from upstream flood control projects with increased sinuosity and increased roughness from vegetation.

1.3 RESTORATION PLAN FEATURES

1.3.1 Truckee Meadows Reach

Habitat restoration design in the Truckee Meadows reach included three alternatives and four levels of restoration (maximum, high, medium, and low) within each alternative. Several land treatments may be implemented to varying degrees depending on the alternative and restoration option selected. The three major land treatments and specific actions are as follows:

1. Hydroseed grasses on benches created along the river bank

2. Improve habitat values of existing riparian forest

   - Interplant into small openings within existing riparian forest
   - Remove exotic trees and shrubs and plant native species
   - Create new riparian habitat
   - Remove riprap and plant woody species
   - Create new riparian stands
   - Create planting benches and plant woody species
   - Develop cottonwood/willow along created open channels
   - Bioengineer river banks with planting benches for cottonwood and willow

3. Control whitetop and plant cottonwood and willow

Future habitat conditions and values were analyzed for each of the four restoration options within each FDR alternative, for a total of 12 separate analyses. Tables 1.1, 1.2, and 1.3 broadly summarize which treatments would be applied under the four levels of restoration and three alternatives. A more detailed description of the proposed ecosystem restoration alternatives for the Truckee Meadows reach is included in the Ecosystem Restoration Alternatives Design Paper, Truckee Meadows Flood Damage Reduction and Ecosystem Restoration Project, Reno/Sparks, Nevada (Corps 2002).

The following is a brief description of components of the low, medium, high, and maximum restoration options.

Low - Minimal level of effort above completely passive restoration; protect existing, prevent encroachment on floodplain areas, allow vegetation to grow by cessation of maintenance practices that require vegetation to be removed.

Medium - Same as previous plus connect existing stands of native vegetation by planting new vegetation in between closely located stands of existing vegetation. Augment selected areas of existing vegetation by interplanting. Restore floodplain connectivity in areas most easily reconnected.

High - Same as medium restoration plus restore floodplain connectivity to a portion of the area within the FDR footprint, plant new riparian vegetation wherever conditions can support it. Remove whitetop and replace with native riparian vegetation.

Maximum - Same as high restoration plus restore floodplain connectivity to the entire area within the FDR footprint, plant new riparian vegetation in the entire area within the FDR footprint. Remove whitetop and replace with native riparian vegetation.

Table 1.1: Truckee Meadows Alternative 1 Restoration Treatments by Option

Description	low	med	high	max
remove rip rap completely, replace with bioengineered bank protection			X	X
excavate to bring ground surface closer to water table, Revegetate			X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated			X	X
revegetate areas currently with no native riparian vegetation			X	X
control whitetop, replace with native vegetation			X	X
remove exotics from existing vegetation	X			
partially remove rip rap and replant	X			
mitigation-vegetate new bank formed by flood control levee work.	X	X	X	X
revegetate areas currently with no native riparian vegetation, requires excavation to move ground surface closer to water table.				X
revegetate areas between existing stands of native vegetation at density of around 680 plants per acre		X	X	X
remove or breach existing levees to connect areas with floodplain		X	X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated		X		
remove exotics from existing vegetation		X	X	X

Table 1.2: Truckee Meadows Alternative 2 Restoration Treatments by Option

Description	low	med	high	max
remove rip rap completely, replace with bioengineered bank protection			X	X
excavate to bring ground surface closer to water table, revegetate			X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated			X	X
revegetate areas currently with no native riparian vegetation			X	X
control whitetip, replace with native vegetation			X	X
remove exotics from existing vegetation	X			
partially remove rip rap and replant	X			
mitigation-vegetate new bank formed by flood control levee work.	X	X	X	X
revegetate areas currently with no native riparian vegetation, requires excavation to move ground surface closer to water table.				X
revegetate areas between existing stands of native vegetation at density of around 680 plants per acre		X	X	X
remove or breach existing levees to connect areas with floodplain		X	X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated		X		
remove exotics from existing vegetation		X	X	X

Table 1.3: Truckee Meadows Alternative 3 Restoration Treatments by Option

Description	low	med	high	max
remove rip rap completely, replace with bioengineered bank protection			X	X
excavate to bring ground surface closer to water table, revegetate			X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated			X	X
revegetate areas currently with no native riparian vegetation			X	X
control whitetip, replace with native vegetation			X	X
remove exotics from existing vegetation	X			
partially remove rip rap and replant	X			
mitigation-vegetate new bank formed by flood control levee work.	X	X	X	X
Seed excaveted benches with an appropriate native grass and woody plant mixture	X			
revegetate areas currently with no native riparian vegetation, requires excavation to move ground surface closer to water table.				X
revegetate areas between existing stands of native vegetation at density of around 680 plants per acre		X	X	X
remove or breach existing levees to connect areas with floodplain		X	X	X
plant cottonwoods in existing riparian vegetation, 15 per acre estimated		X		
plant bench with riparian plants at 870 plants per acre		X	X	X
plant bench with riparian plants at 680 plants per acre		X	X	X
remove exotics from existing vegetation		X	X	X

1.3.2 Lower Truckee River Reach

Restoration along the Lower Truckee River reach would consist of restoring vegetation communities with common plant associations presently existing within the riparian corridor and associated uplands in addition to varying degrees of channel modification. The five vegetation community types to be restored are: 1) riparian forest, 2) riparian shrublands, 3) scrub-shrub emergent wetlands, 4) wet meadow, and 5) transitional wet meadow. In general, three levels of design alternatives were proposed for each segment within the lower Truckee River corridor. The degree of revegetation implemented within each of the 11 project segments was dependent upon the chosen alternative for that particular segment. The following is a brief description of the land treatments involved for each design alternative level:

Low - Slope banks (minor effort in comparison to medium alternative); Build existing mid-channel gravel bars to raise the channel bed, river stage, and groundwater level; Enhance plantings along existing stream banks.

Medium - Construct a limited amount of meandering channels and bank sloping; Build existing mid-channel gravel bars; Excavate new backwater and wetland areas; Plant new and reconstructed stream banks; Plant newly excavated emergent and wet meadow wetlands; Plant patches of riparian and upland plant communities within the river corridor and existing agricultural lands.

High - Construct many new meandering channels; Reconnect the floodplain; Excavate numerous backwater and oxbow areas; Plant stream banks of the newly constructed meandering channels; Plant expansive patches of various riparian and upland plant communities throughout the entire floodplain; Plant newly excavated emergent and wet meadow wetlands.

A more detailed description of the proposed ecosystem restoration alternatives for the Lower Truckee River reach is included in the Lower Truckee River Final Geomorphic Assessment and Final Preliminary Design (Vista to Pyramid Lake)(Corps 2004). Future habitat conditions were analyzed for the 3 restoration alternatives for each of the 11 project segments, for a total of 33 separate analyses.

2.0 Description of the Study Area

The Truckee River originates at Lake Tahoe and flows northward to the California-Nevada state line. The river then turns eastward at Verdi and descends towards Reno/Sparks. Between Lake Tahoe and the Reno/Sparks metropolitan area, the river flows through steep, confined areas with a narrow floodplain and limited riparian vegetation (USFWS 1993). Near Reno, the river enters Truckee Meadows, a low, broad, flat area where the river historically meandered and has a broader floodplain than in upstream areas. The river continues to flow eastward through the Vista narrows towards Wadsworth. At Wadsworth, the river turns northwards to its terminus in Pyramid Lake.

2.1 HABITAT EVALUATION PROCEDURE STUDY AREA REACHES

2.1.1 Truckee Meadows Reach

The study area includes riparian cover types along the Truckee River between Interstate 395 in Reno and the crossing of Interstate 80 in Sparks below the confluence with Steamboat Creek. The study area also includes pasturelands that are part of the University of Nevada—Reno (UNR) Main Station Field Lab (UNR Farms).

2.1.2 Lower Truckee River

The study area extends along the Truckee River between Vista and Wadsworth Nevada. It includes wetland and riparian cover types and portions of the floodplain occupied by whitetop. The cover types are all located on the current or former floodplain of the Truckee River.

The Habitat Evaluation Procedure (HEP) team considered whether, for purposes of HEP sampling, the Lower Truckee River reach needed to be divided into two distinct reaches. Team members noted that while there were subtle differences in species composition within a given cover type along the nearly 50 river miles of the reach, differences were not substantial enough to warrant splitting the reach into two reaches. Therefore, the lower Truckee River was treated as a single reach for the analysis of current conditions. The Lower Truckee River HEP analysis included all lands within the Lower Truckee River reach mapped as cottonwood, willow, emergent wetland, or whitetop.

2.2 LAND USE

2.2.1 Truckee Meadows

In Truckee Meadows, much of the Truckee River flows through the cities of Reno and Sparks, an urban setting with parks and green belts located along portions of its banks. The lowest portion of the river in the meadows flows through a more rural setting with a diversity of land uses including light industrial, rural and suburban residential and urban recreation on the north bank. UNR Farms occupies much of the south bank in the lower reaches. UNR Farms consists of mostly pastureland; although, a few buildings are present. There are also weedy fields (dominated by whitetop) along the lowest part of the meadows.

2.2.2 Lower Truckee River

Three primary land uses dominate the Lower Truckee River reach: rural residential and light industrial, wetland/riparian, and agriculture. Rural residential and light industrial developments occur on a very small portion of the project area. Livestock often excessively graze wetland and riparian communities. In addition, large areas are devoted to agriculture, a portion of which are dominated by whitetop. Adjacent uplands support desert shrub/steppe communities. Uplands were not included in the HEP analysis.

2.3 VEGETATION OF THE HABITAT EVALUATION PROCEDURE STUDY AREA

2.3.1 Truckee Meadows

The Truckee Meadows area was historically covered with extensive riparian forest and herbaceous wetlands. However, the riparian zone was always rather narrow. Although the meadows supported riparian vegetation dominated by cottonwoods (*Populus spp*.), willows (*Salix spp.)*, and alders (*Alnus sp*.), the majority of the riparian vegetation was lost as a result of urban and agricultural development, livestock grazing, flood control, and water resources development. Riparian vegetation is now generally limited to a thin, fragmented band of cottonwoods and willows along the river's edge. The few large patches and continuous bands of riparian vegetation that do exist are very narrow.

The vegetative clearing required by flood control, water supply, and hydropower projects directly reduced the amount of riparian vegetation in the meadows. These projects indirectly reduced the amount of riparian vegetation by altering the river's hydrology. Much of the streamside vegetation was eliminated during the 1960s, when the Truckee River was widened and straightened in the meadows to increase channel capacity for flood management. Levees and bank protection now confine the river in most locations in the meadows, separating it from its floodplain.

<u>Sub-reach 1: Highway 395 to Greg Street Bridge.</u>

A riparian zone, ranging from10 to 30 feet, stretches along most of the southern bank of sub-reach 1. Much of the south bank is riprapped; however, willows and wild rose (*Rosa spp*.)

provide abundant bank cover. There is only one area of completely barren bank on the south side of the river in sub-reach 1.

On the north bank, there is considerably more open land adjacent to the river, but the riparian zone is still confined to the immediate area of the channel. The riverbank is partially riprapped, and there is more barren bank.

There are patches of residual riparian forest and individual cottonwood trees throughout this reach on both sides of the river. However, many exotic trees are present, which sometimes dominate the streamside forest. Cottonwood and willow regeneration is also common, especially above, and just below, the Glendale Bridge, where the floodplain widens and mid-channel bars are present. The main exotic wood species is elm (*Ulmus spp*.), which is present throughout the reach. Other exotics include blackberry (*Rubus spp.)* and tree of heaven (*Ailanthus altissima*). There are no large contiguous patches of exotic vegetation; rather, the entire sub-reach has exotics scattered throughout the riparian zone.

Sub-reach 2: Greg Street Bridge to McCarran Boulevard Bridge

The southern bank of the Truckee River between Greg Street and Rock Boulevard is entirely vacant land, some of which is currently being used as a dumpsite. Bank cover is nearly continuous willow. There are residual patches and scattered mature cottonwoods present on the southern side of the river. There is also continuous riparian vegetation along the Pioneer Ditch on the south side of the river.

There is vacant land and park land immediately downstream from Greg Street, with continuous bank cover of willow and a streamside gallery of residual cottonwoods on the north side of the river. A trailer park is located further downstream. The bank is riprapped and is partly to fully vegetated with willows, but the width of the willow community is narrow (<20 feet). The trailer park was landscaped with honey locust and other exotics that migrated into the riparian zone. Between the trailer park and Rock Boulevard is a linear park that has residual cottonwoods in groves and has individual trees with an understory of turf. The park was extensively planted with exotics, including giant sequoia (*Sequoiadendron giganteum*).

The area between Rock and McCarran generally has the highest quality riparian habitat in the entire study area. There are two relatively large riparian patches on point bars on the south side of the river. These consist of dense willow shrub cover on the lower parts of the bars and a canopy of large cottonwoods at the backs of the bars. Exotic trees are also present. Development on the south side of the river is relatively limited.

The north side of the sub-reach between Rock Boulevard and McCarran Boulevard is nearly completely developed, but individual cottonwoods and a few cottonwood patches are present. A point bar exists about midway through this sub-reach, which is bisected by the levee-trail leaving a relatively large residual patch of large cottonwoods on the landward side of the levee. Dead cottonwoods and stumps in the upstream part of this area indicate that at one time, it was a larger patch. There is also a park on the north side of the river with residual cottonwoods. An incursion of tree-of-heaven established itself in the riparian zone near McCarran Boulevard. Otherwise, as in sub-reach 1, exotics in the riparian zone mainly consist of scattered individual planted or volunteer landscape trees (oaks [*Quercus spp*.], sycamore [*Platanus occidentalis*], ash [*Fraxinus spp*.], elm, Russian olive [*Elaeagnus angustifolia*], and giant sequoia).

Sub-reaches 3 and 4: McCarran Boulevard Bridge to Interstate 80

The south side of the river in this reach is undeveloped and traverses land used for agriculture by the University of Nevada. There are some residual patches and galleries of riparian forest in the upstream area, but trees become rare with distance downstream. Some large cottonwood trees are being undermined by bank erosion. Bank conditions on the south bank deteriorate with distance downstream, and there are frequent gaps in riparian cover. Whitetop is dominant from the Steamboat Creek confluence to the end of the reach. The stream is incised, bank erosion is common, and generally, riparian bank vegetation is limited or comprised of exotics.

The north side of this reach is almost entirely developed by industry, with the exception of a vacant parcel upstream of the North Truckee Drain. Bank conditions on the north side vary. Some patches of residual riparian forest are on the north side of the river mainly on the landward side of the levee-foot path. Otherwise, residual riparian trees are relatively uncommon on the north side of the river in this reach. Cottonwood regeneration is abundant on many of the bars and islands just downstream of McCarran Boulevard Bridge.

The extent of exotic vegetation increases with distance downstream. Whitetop was first noted in this reach about one half mile downstream from McCarran Boulevard. Whitetop dominates the willow community upstream of the North Truckee Drain and the adjacent terrace near Steamboat Creek. Whitetop also dominates the bank cover on the north bank for most of the distance between Steamboat Creek and Interstate 80.

2.3.2 Lower Truckee River

Downstream of Vista the Truckee River flows through confined canyons. Historically, the project reach of the Truckee River supported riparian vegetation dominated by cottonwoods, willows, and alders. Much of the riparian vegetation has since been lost due to agricultural development, livestock grazing, flood control, and water resource development.

Much of the channel is deeply incised, which limits the extent and type of wetland and riparian communities present and severely restricts natural establishment and recruitment of new riparian vegetation. Salt tamarisk becomes more common towards Wadsworth. The segments just upstream of Wadsworth are often limited to thin, fragmented bands of cottonwoods and willows along the river's edge. The few large patches and continuous bands of riparian vegetation that do exist are very narrow.

2.4 FLOOD CONTROL ALTERNATIVES

2.4.1 Truckee Meadows

Within the Truckee Meadows project reach there are three fundamental flood damage reduction alternatives that are being analyzed:

Alternative 1: Levees and Floodwalls

Under Alternative 1, flood damage reduction in the Truckee Meadows area would primarily be provided through the construction of levees and floodwalls. Alternative 1 does not include any detention facilities or channel benching.

Alternative 2: Levees, Floodwalls, and Detention Basins

Alternative 2 would accomplish flood damage reduction in the Truckee Meadows area by capturing peak flows in detention facilities and by containing flows with levees and floodwalls. Alternative 2 would not require channel benching. Under Alternative 2, floodwater detention facilities would prevent the increase of downstream flows.

Alternative 3: Channel Benching (Community Coalition) Alternative

Under Alternative 3, flood damage reduction in the Truckee Meadows area would be achieved by enlarging the flow area of the existing channel. This would be accomplished through benching and by capturing peak flows in detention facilities. As a result of the channel benching, Alternative 3 would provide the lowest water surface elevations in most areas relative to the other alternatives.

2.4.2 Lower Truckee River

The FDR alternatives in the Truckee Meadows reach may induce up to an additional 3,000 cubic feet per second of flows downstream of Vista. Effects of these additional flows include potential increase of flooding of residences in Rainbow Bend and Wadsworth and a potential increase of inundation of agricultural lands in various locations downstream of Vista. A preliminary takings analysis did not positively identify any takings. However, mitigation for these hydraulic effects is currently being evaluated. Mitigation measures under study include additional detention basins, floodwalls, levees, and ecosystem restoration.

2.5 AFFECTED AREA

2.5.1 Truckee Meadows

The FDR and habitat restoration and enhancement features of the Truckee River project would affect Fremont cottonwood and willow/alder riparian communities. The third habitat type effected would be pasture land, primarily on the UNR Farms property.

Table 2.1 identifies the acreage of UNR Farms that would be lost to FDR structures for each alternative. Flood control features under Alternatives 1 and 2 would use 60.54 acres and 647.74 acres of the UNR Farm, respectively, for levees and a detention basin. The lands used for the detention basin under Alternative 2 would remain as pasture for the duration of the analysis period (50 years).

A master land use plan was prepared for UNR Farms in 1999 (Codega 1999). Don Kennedy of UNR Farms indicated during discussions with the Corps that UNR Farms pasturelands would not be developed for the next 25 years. Therefore, developments that would convert pastureland to other land uses such as a research park, business park, or commercial use would only begin after 25 years have passed. For the HEP study, the assumption was made that commercial development of portions of the UNR Farm would begin in Target Year (TY) 26 and would occur at an even rate over the remainder of the 50-year analysis period.

Codega (1999) further indicated that at least 166 acres of the UNR farm would be required to conduct university research after TY50. Therefore, the HEP analysis assumed that at least 166 acres of pastureland would remain at TY50 unless flood control features that would be maintained as pastureland exceeded 166 acres, in which case the larger area was evaluated.

Table 2.2 presents existing habitat acreages within the restoration area for each alternative as well as acreage changes anticipated during the life of the project from FDR structures and projected land use changes on UNR Farms property. The acreage changes to these cover types as a result of restoration are presented in Table 2.3 through Table 2.5 for the three alternatives, respectively.

Table 2.1: Acres of UNR Farm to be Used for Flood Damage Reduction Structures

Reach Description	Total Structure Length (feet)	Average Width of Levee Footprint (feet)	Impact Area (acres)
Alternative 1			
West Levee	9,093	290	60.54
Total			**60.54**
Alternative 2			
West Levee	8,569	296	58.23
North Levee	6,667	303	46.38
East/South Levee	9,596	105	23.13
Detention Basin			520
Total			**647.74**
Alternative 3	0	0	0
Total			**0**

Table 2.2: Current and Future Habitat Acres in the Truckee Meadows Study Area—Without Project and Flood Damage Reduction Acres

Target Year/Future Action	Alternative 1			Alternative 2			Alternative 3		
	Willow	Cottonwood	Pasture	Willow	Cottonwood	Pasture	Willow	Cottonwood	Pasture
TY0 (Existing Conditions) Acres	63.45	55.8	1025	63.45	55.8	1025	63.45	55.8	1025
Flood Control Impacts—Permanent Acres Lost	-4.66	-2.74	-15.66	-13.33	-9.78	-20.55	-5.04	-3.21	-29.94
UNR Farms Conversion—Acres Lost	0	0	-714.92	0	0	-710.03	0	0	-701.32
TY50 Acres	58.79	53.06	294.42	50.12	46.02	294.42	58.41	52.59	293.74

Table 2.3: Alternative 1 Habitat Restoration and Enhancement Acres at TY50

Restoration Option	Restoration Treatment				
	Create Riparian (acres)	Remove Exotics (acres)	Interplant (acres)	Whitetop Removal (acres)	Seed Benches (acres)
Low	5.18	49.99	0	0	0
Medium	17.21	43.16	7.26	0	0
High	93.73	43.16	7.23	2.79	0
Maximum	163.37	43.16	7.23	2.79	0

Table 2.4: Alternative 2 Habitat Restoration and Enhancement Acres at TY50

Restoration Option	Restoration Treatment				
	Create Riparian (acres)	Remove Exotics (acres)	Interplant (acres)	Whitetop Removal (acres)	Seed Benches (acres)
Low	5.18	48.03	0	0	0
Medium	13.39	43.76	7.33	0	0
High	79.22	43.76	7.30	2.79	0
Maximum	140.68	43.76	7.30	2.79	0

Table 2.5: Alternative 3 Habitat Restoration and Enhancement Acres at TY50

Restoration Option	Restoration Treatment				
	Create Riparian (acres)	Remove Exotics (acres)	Interplant (acres)	Whitetop Removal (acres)	Seed Benches (acres)
Low	4.98	39.65	0	0	146.15
Medium	163.41	34.59	6.48	0	0
High	187.65	34.59	6.45	2.79	0
Maximum	214.77	34.59	6.45	2.79	0

None of the restoration alternatives proposed the interplanting of existing marsh or ponds or the construction of new ponds.

2.5.2 Lower Truckee River

All constructed emergent wetland would be in the form of marsh habitat since marshes provide substantially higher quality habitat for more HEP evaluation species.

Although the Truckee River Restoration Plan included the creation of new, and enhancement of existing, upland scrub to sagebrush shrubland, the Corps decided to exclude sagebrush shrubland from the future analysis for the kestrel. Although included in the 2004 restoration plans, it is unlikely that sagebrush shrublands would be created especially if it is replacing existing upland shrubland.

Table 2.6 presents both with and without project vegetation acreages for each of the restoration project segments.

Table 2.6: Vegetation Acreages for the Lower Truckee River Reach Restoration Segments

Segment	Low		Medium		High	
	Existing Acreage	Acreage Created	Existing Acreage	Acreage Created	Existing Acreage	Acreage Created
7	14.16	0.00	14.86	6.17	13.59	9.09
9	39.13	0.22	35.35	25.98	37.46	61.97
12	13.10	0.83	13.20	4.89	12.18	12.28
13	38.50	0.00	34.76	31.27	27.15	31.24
14	65.76	0.40	63.58	43.93	41.79	52.15
15	56.85	2.52	56.53	7.64	56.85	
17	14.86	0.03	15.01	0.30	14.60	10.78
18	26.94	0.91	25.62	6.80	24.13	14.00
19	32.29	4.70	32.19	6.80	32.29	
20	85.89	3.70	80.51	16.82	77.14	20.06
21	57.06	14.44	53.38	22.34	54.74	29.76
Total Acres	444.55	27.77	425.00	172.94	391.93	241.34
Total Restored/Created Acres	472.32		597.94		633.27	

3.0 Habitat Evaluation Procedure

The following discussion of the HEP process describes the approach that was used to assess wildlife habitat values for the both the Truckee Meadows reach and the Lower Truckee River reach. The HEP was modified from the Service HEP course manual and workbook (Service 1980; Stiehl 1993).

The HEP was developed to rate the quality and quantity of habitat to quantify the impacts of changes made through land and water development projects or revised management actions. The HEP can also be used to document baseline habitat conditions to gauge changes in habitat quality and quantity resulting from future habitat modification. The HEP has many different uses, including project planning; impact assessment; mitigation and compensation planning, design, and assessment; habitat restoration; and habitat management. This is accomplished by providing information for two types of comparisons in terms of wildlife habitat: 1) the relative value of different areas at the same point in time and 2) the relative value of the same area at future points in time, given alternative future scenarios.

The HEP methodology utilizes a team of biologists that designs the HEP study, determines resource goals, selects evaluation species, develops and assesses HEP study assumptions, and evaluates habitat conditions based on selected species models. Each species model uses measurable physical and biological variables (i.e. percent canopy cover and height of herbaceous vegetation) that characterize important habitat features or life requisites (i.e. reproduction and winter habitat) for a particular species.

The value of an area to a given wildlife species is a product of the area's size multiplied by the quality of the area for the species. Mathematically, this is stated as the following equation:

Habitat Value Units = Habitat Quantity x Habitat Quality

In HEP, the quantity measurement of the formula is any unit of area (i.e., acres, hectares, square miles, or sections). The quality measurement of the formula is expressed as the habitat suitability index value (the HSI value). HSI is calculated from the suitability index (SI) values for each of the evaluation species in each pertinent cover type. An SI value is calculated from field data for each HSI model variable. SI values vary from 0 to 1.0, with 0 representing no habitat value and 1.0 representing optimum habitat value for the particular habitat parameter. HSI values, which also vary from 0 to 1.0, are calculated from the SI values using a formula unique to each evaluation species model. HSI indicates how suitable the habitat is for the particular species when compared to optimum habitat. The product of these two measures, which is comparable to "habitat value units" in the formula above, is expressed as a Habitat Unit or HU. In HEP, the measure of habitat units becomes:

$$\text{Cumulative HU's} = (T_1 - T_2)\,[(A_1H_1 + A_2H_2)/3 + (A_2H_1 + A_1H_2)/6]$$

Where: T_1 = first target year of time interval

T_2 = last target year of time interval
A_1 = area of available habitat at beginning of time interval
A_2 = area of available habitat at end of time interval
H_1 = HSI at beginning of time interval
H_2 = HSI at end of time interval
3 and 6 = constants derived from integration of HSI x Area for the interval between any two target years

Potential project impacts, in terms of HUs, may be estimated at several points in the future. This process is called the futures analysis, and each future year for which an analysis is conducted is called a target year. The futures analysis projects habitat conditions at various points over the life of the project and is used to estimate the potential total impact of the project over its life. HUs are typically summed for each year of the evaluation period (the life of the project) and then averaged on an annual basis to determine the average annual change in habitat units for different future scenarios. This averaged change in HUs is called Average Annual Habitat Units (AAHUs).

In order to accomplish these tasks, a HEP study is typically divided into several basic activities, including the following:

- Determine the applicability of HEP, including assumptions.
- Determine restoration plan wildlife habitat goals.
- Select evaluation species.
- Conduct pre-field activities.
- Collect field data.
- Calculate SI and HSI for current conditions.
- Determine future actions and estimate variable changes due to flood control, restoration, enhancement, and unrelated development of the UNR farm.
- Calculate HUs for future conditions with and without the project.

3.1 HABITAT EVALUATION PROCEDURE TEAM

The HEP Team assembled for this evaluation consisted of Veronica Petrovsky, Biologist, Corps; Mary Jo Elpers, Biologist, USFWS; Dan Mosley, Fisheries Biologist, Pyramid Lake Paiute Tribe; Kim Tisdale, Biologist, Nevada Division of Wildlife; and Chuck Blair, Wildlife Biologist, CH2MHill.

3.2 APPLICATION OF THE HABITAT EVALUATION PROCEDURE METHOD

The purpose of the wildlife habitat suitability analysis was to determine the future habitat values along the Truckee River for selected wildlife species following implementation of the flood control and restoration projects. Changes in future habitat conditions were estimated by quantifying HSI values at several points in time over the projected life span or planning horizon of the project. Target Years were selected to correspond with years where habitat conditions were reasonably defined.

Target Year 0 (TY0), represented current conditions. Target Year 1 (TY1), represented the first year of the project, when habitat conditions were expected to deviate from baseline conditions as a result of a proposed action. The ending Target Year was defined by the life of the project. The analysis period for this project ends was TY50. Interim target years were selected to correspond with other significant biological events such as the development of new emergent wetlands and maturation of riparian communities.

3.3 Comparing Future Conditions With and Without the Projects

Evaluation species' HSI values and habitat acreages were required for all TY ranges. Habitat area and value were measured for the study area during TY0 and represented the baseline condition (existing condition and construction years one and two). A basic assumption of the HEP process is that habitat area, condition, and assessed values do not change substantially between TY0 and TY1, even though several years may elapse between these two periods.

Impact assessments and projections of net changes in habitat value were determined by annualizing habitat conditions, impacts, and changes resulting from restoration over the life of a project by comparing HUs from 1) Future-With-Project for all alternatives and 2) Future-Without-Project for all alternatives. Average annual changes in habitat value were calculated using AAHUs over the life of the project. The net change in HUs and AAHUs was calculated by comparing HUs and AAHUs for the Future-Without-Project to the flood control and restoration alternatives and options for the Future-With-Project conditions.

3.4 HEP Assumptions

3.4.1 General HEP Assumptions for Both Truckee Meadows and the Lower Truckee River

- HEP was a suitable methodology for quantifying direct impacts to wildlife habitats.

- Quality and quantity of wildlife habitat could be numerically described using indices derived from HSI models and the associated HUs.

- The HEP assessment was directly applicable only to the selected evaluation species.

- HSI models were conceptual models and may not have measured all ecological factors that affect the quality of a given habitat type for the evaluation species.

- The HSI value for the evaluation species was a measure of habitat quality that was assumed to be linearly related to carrying capacity of some other response measure for the evaluation species.

- The HEP team could predict future habitat conditions with reasonable accuracy. This was accomplished either by finding and assessing sites that reflected the desired or expected future conditions or through available literature and professional judgment.

3.4.2 Truckee Meadows

- Willow height and other similar measurable variables for willows planted along the riverbanks or on the low benches adjacent to the river had a single rate of change, regardless of specific treatment

- All of restoration would be successful.

- Wetland and riparian communities that would not be affected by the project and that were outside of the UNR farm would remain relatively stable over the 50-year analysis period.

- Commercial development of portions of the UNR Farm would begin in TY26 and would occur at an even rate over the remainder of the 50-year analysis period.

3.4.3 Lower Truckee River

- Livestock grazing would be permanently eliminated from all wetland, riparian, and upland areas or parcels included in the restoration plan.

- Livestock grazing would continue as at present on all parcels that are not part of the restoration project.

- The restoration project would be implemented over a period of 3 to 5 years; therefore, some restored areas would start to accrue habitat value and HUs before others. For this study, the assumption was made that all of the activity during the first 2 years of the 3- to 5-year implementation would be construction-related and that little, if any, planting would occur. Thus, no new habitat would be developed during these first 2 years. Planting would begin in the third year of the 3- to 5-year period, and continue for 2 more years.

- TY1 of the HEP reanalysis would be the first year in which restoration planting would occur. This assumption was based on the fact that HEP analyses of future conditions typically begins when the first substantial changes in habitat area or value occur. For valid comparisons among options, all of the analyses need to begin and end in the same year and need to evaluate the same number of years

- Some plantings would have a 1- or 2-year head start on others since restoration planting would occur over a 3-year period. The following approach was used for this study.

  - The average number of acres of a given type of restoration was determined. For example, if there would be 30 total acres of a particular restoration action after 3 years, the assumption was made that 10 acres would be planted each year and an average of 20 acres of restored habitat would be present during these 3 years [(10+20+30)/3=20]. The SI and HSI values were determined for the cover types that would be present at the end of the second growing season based on the assumption that planting is done in the spring of each of these 3 years or during the previous fall. These HSI values were used to calculate HUs for the implementation period by multiplying the TY2 HSI values by the 20-acre average area to get the average HUs for each of the three implementation years.

  - Essentially no differences would be apparent after TY3. Beginning in TY4, the entire area (30 acres) was used to calculate HUs using a single average HSI value for the next period of analysis (TY4–6) and this one data set would be carried through the 50-year project life.

- A single HSI value per species cover type was determined for each model species for the entire project reach (from Vista to Wadsworth). The assumption was made that HSI value provided for each cover type was representative of the cover types present within the 11 project segments.

- HSI values were the same for high, medium, and low options (with the exception of the kestrel model).

- Acreages for the emergent wetland cover type were calculated differently for the marsh wren habitat model and the mink habitat model. Marsh wren habitat consisted of only marsh cover type. Mink habitat included the marsh cover type plus pond cover type. The assumption was made that the entire area covered by marsh was vegetated and that the entire area covered by ponds were completely void of vegetation.

- Interplanted acreages were presented as the alternative cover type acreage. For example, if 5 out of 10 acres of existing cottonwood were interplanted with mixed willow under the low alternative, the cover type acreage used was 5 acres of interplanted mixed willow (not cottonwood).

- Mixed willow and cottonwood interplanted acreages reflected areas where the alternatives overlapped existing cottonwood or willow only (i.e. existing disturbed areas, whitetop, agriculture, pond, marsh, or gravel bars overlapped with the alternatives were not included in the interplanted acreages for cottonwood or willow).

- Adjacent segment polygons originally created did not always have common boundaries. In other words, some neighboring segment polygons were separated spatially – leaving "gaps." If a portion of the low, medium, or high alternative fell into a "gap" between adjacent polygons, the cover type acreages included in that portion of the alternative were excluded from the HEP analysis.

3.5 HEP EVALUATION SPECIES CRITERIA

The core criteria for the selection of evaluation species for both the Truckee Meadows HEP and the Lower Truckee HEP were the same:

- The species had a relatively high probability of occurring in the study area.

- The species (as measured through change in HSI model values) was likely be impacted, either positively or negatively, by the restoration project.

- Sufficient data was available to assign, with a reasonable degree of confidence, a relationship between the HSI model, habitat quality, and some measure of a species response (i.e., biomass, density, reproductive success, etc.). Species with established, field validated HSI models were preferred but not required.

- The baseline habitat conditions at the study site were indicative of the habitat conditions for the evaluation species.

- Each evaluation species utilized the habitat type(s) they were selected to represent.

- The species occupied an ecological niche that represented significant environmental values in the study area.

- The species had the potential to respond to management activities in the potential restoration areas.

- The species was native to the area.

- The HSI model variables included specific habitat components that were important to the selected species.

- Species that were highly selective of certain cover types were preferred as their HSI model would most likely respond to change in habitat quality.

- Species that were habitat generalists were excluded because their HSI models were not very sensitive to changes in specific habitat components.

3.6 HEP Evaluation Species Selection

3.6.1 Truckee Meadows

The following is a discussion of the HEP evaluation species selected for the Truckee Meadows analysis. Species used to evaluate habitat quality of cottonwood and willow cover types included the northern oriole and yellow warbler for both cottonwood and willow and the American kestrel for a combined analysis of willow, cottonwood, and UNR Farm pastureland. No emergent wetland species were assessed because the restoration plan did not include development of emergent wetlands and none would be impacted by the flood control or restoration project. Table 3.1 below details the HSI model variables included in the meadows HEP for each evaluation species. A discussion of the species selection process for each cover type follows. Modified species habitat quality index models used for the HEP evaluations can be found in Appendix A.

Table 3.1: Evaluation Species, Cover Types and Model Variables Used in the 1999 – 2001 Truckee Meadows HEP Analysis

Evaluation Species	Cover Type	HSI Model Variables
Yellow warbler	Cottonwood/willow	Percent deciduous shrub canopy cover
		Average height deciduous shrub canopy
		Deciduous shrub canopy, hydrophytic
Northern oriole	Cottonwood/willow	Average height deciduous tree canopy
		Percent deciduous tree canopy cover
		Stand width
American kestrel	Cottonwood/willow/ pasture	Percent bare ground
		Percent herbaceous cover < = 12 inches tall
		Percent shrub cover < = 16.5 feet
		Number perch sites
		Vegetative structure
		Number of nest sites/acre
		Distance to nest
		Distance to food

Fremont Cottonwood and Willow/Alder Cover Types and Evaluation Species

The Truckee Meadows HEP study used the same species evaluated in the HEP study conducted by the Service along the entire Truckee River in 1993. Review of the Service cover type maps indicated that Fremont cottonwood associations and willow/alder were the two cover types that constituted the cottonwood and willow communities, which were the focus of this study. HEP evaluation species for these cover types included the yellow warbler, northern oriole, and American kestrel. These species were used in the original HEP study and the models were not modified for the meadows HEP.

Each species model was built upon a number of measurable variables (e.g., percent canopy cover) that characterized important features of the habitat or life requisites for the species. Evaluation species models used for these 3 species include 14 unique habitat variables; 11 of which were measured in the field, and 3 of which were measured from aerial photographs or calculated from field data values.

Special Considerations for American Kestrel

Several special considerations were used to analyze the future habitat value for American kestrel in both the meadows and lower Truckee HEPs. The multi-cover type kestrel model required the simultaneous evaluation of the three cover types that provided both food and reproduction value. Numerous variables outside of the model affected each of these cover types for the future analysis. The absolute and relative areas of each cover type, as well as the habitat quality of each of these cover types, affected the overall HSI values for the kestrel. The absolute and relative areas and habitat value of each of these cover types varied annually and by alternative and restoration option. Each TY range for each restoration alternative and option required analysis of a discrete combination of area by cover type, relative area, SI values for each cover type corresponding with its stage of development, life requisite SI values based on these variables, and an overall weighted HSI value for the three cover types.

Calculation of Sample Means for Kestrel SI Variables

The density of several habitat features was estimated for the willow and cottonwood cover types. These variables included the following:

- Number of perches per acre with two or more per acre optimal (willow and cottonwood cover types)
- Number of suitable nest sites available per acre with one or more per acre optimal (willow and cottonwood cover types)
- Number of snags per acre with two or more per acre optimal (cottonwood cover type)

The HEP team counted these habitat features within a 1-acre belt centered on the sampling transects at each sample location. Since the HEP team decided against splitting up the study area into segments, a single representative HSI value was required for each evaluation species in each respective cover. Typically, this type of calculation would use the average number of perches, nest sites, and snags per acre at all sample locations for a given cover type to calculate the respective SI and HSI values for the study area.

However, as noted above, the number of each of the above features per acre required for the optimal SI value for each individual sample location is only one or two. The actual number of these features counted per acre at many of the individual sample locations greatly exceeded the optimal levels. Some willow locations had as many as 9 perches and 6 suitable nest sites per acre, and some cottonwood locations had 23 perches and 33 suitable nest sites per acre. The HSI models were designed so that once the optimal habitat value was achieved, additional variables (i.e. perches, nest sites, or snags) did not enhance habitat value. In other words, the SI value could not exceed 1.0.

When the optimal number of nest sites per sample location was exceeded, the optimal number rather than the higher, counted number of suitable nest sites per location was used to calculate means and SI values. A value of 1 was entered into the calculations for the location with 10 nest sites and a value of 0 was used entered for locations with no nest sites. Therefore, exceeding the optimal habitat value at one location did not add value to the habitat at another independent sampling location and did not affect the SI values at the other locations.

The three cover types used to assess kestrel habitat value in the Truckee Meadows reach were willow/alder, Fremont cottonwood, and UNR farm pastureland. The area and quality of these three cover types would change following the implementation of the flood control and restoration projects. The variables that would change by year and cover type are discussed below.

Changes in Existing and Restored Cottonwood and Willow Areas

Several different actions would affect the area of cottonwood and willow within the study area. First, the area of existing willow and cottonwood would decrease during TY 1–3 due to the flood control project alternatives. The area of enhanced willow and cottonwood would increase in years TY1, TY2, and TY3 as enhancement is implemented. Finally, the area of restored willow and cottonwood would increase annually during years TY1, TY2, and TY3. Changes resulting from enhancement and restoration would vary by both alternative and restoration option.

Changes in HSI and HU for Cottonwood and Willow

SI and HSI values of restored and enhanced willow and cottonwood change annually throughout the project depending on the particular treatment. HUs for restored areas change annually and by alternative and restoration option because of the different types and amounts of restoration between the alternatives and restoration options. Changes in absolute and relative area of cottonwood, willow, and pastureland affect SI values, and hence the HSI, HU, and AAHU calculations.

Calculation of Weighted Mean SI Values for the American Kestrel

As noted above, implementation of the flood control and restoration projects would result in a large number of independent changes in SI variables. Each of the alternative/restoration option combinations included several treatments of willow and/or cottonwood that would result in independent changes in cover type area and habitat value. In addition to these changes, some areas of existing willow and cottonwood would be unaffected by the project and would not change in the future.

In theory, each individual future patch of willow and cottonwood that differed from another patch because of a different restoration treatment would be matched with a nearby portion of the pastureland in each time frame of the analysis to conduct the kestrel multi-cover type analysis. However, this would result in an unworkable number of independently varying HSI values and cover type acreages for each treatment within each analysis time frame. Therefore, weighted mean SI values for all treatments for each cover type for each analysis period were calculated, with the treatment areas and existing cover type areas providing the weighting. This allowed the calculation of a single weighted mean HSI value for all of the cottonwood treatments plus the existing cottonwood habitat for each target year period. The same approach was used for willow treatments and existing willow habitat. This approach yielded an interim SI value for reproduction and another for nesting for the cottonwood and willow cover types. This permitted calculation of a single HSI value for all cottonwood areas and one for all willow areas to be assessed with the appropriate acres of pasture for each target year period. Using weighted mean HSI values in this manner is a standard approach in HEP multi-cover type analyses when there are multiple patches of habitat with SI and HSI values starting at different levels and changing at different rates.

3.6.2 Lower Truckee River

Table 3.2 below details the HSI model variables included in the Lower Truckee River HEP for each evaluation species. A discussion of the species selection process for each cover type follows.

Fremont Cottonwood Cover Type and Evaluation Species

There was a fair amount of overlap in the variables for the potential cottonwood evaluation species. The chickadee model included several of the same variables as the oriole and woodpecker. Age class would have been represented by dbh in the woodpecker model. The oriole model was useful in that it also considered stand width, with the wider riparian zones than would be developed following restoration rated as much better habitat than the present narrow ones. As discussed earlier, the kestrel model provided a measure of pasture land values on the floodplains that would be restored and would permit consideration of the degraded habitat value of whitetop infested floodplains. The kestrel could also be used to evaluate cottonwood, willow, and emergent wetland areas at the same time.

Evaluation species selected for the cottonwood cover type included the northern oriole, hairy woodpecker, and American kestrel. The oriole and kestrel models were used to assess this cover type in the earlier HEP studies. One of the kestrel model variables was modified for this study as described later.

Each species model was built upon a number of measurable variables (i.e., percent canopy cover) that characterized important features of the habitat or life requisites for the species. Evaluation species models used for these 3 species include 17 unique habitat variables; all but one of which were measured in the field.

Willow and Willow/Alder Cover Type and Evaluation Species

The yellow warbler model covered three of the habitat features expected to change and was recommended for use in the Lower Truckee HEP analysis. The towhee model addressed four of the habitat features, including two that would be quite important as restoration sites matured and was also recommended. The song sparrow model assessed two of the same variables as the yellow warbler plus a variable that assessed habitat value based on distance to water. Because the model variable distances were so great, this variable would have been meaningless for areas adjacent to the Truckee River (all sites would have had optimum value for this variable). Since the song sparrow model would not have provided additional information, the model was not recommended. As noted above, the kestrel evaluated cottonwood, willow, and emergent wetland areas at the same time and was also recommended.

Table 3.2: Evaluation Species, Cover Types and Model Variables Used in the 2004 Lower Truckee River HEP Analysis

Evaluation Species	Cover Type	HSI Model Variables
Hairy Woodpecker	Cottonwood	Percent canopy of pines
		Mean dbh of overstory trees
		Percent deciduous tree canopy
		Number of snags greater than 25 cm
Northern oriole	Cottonwood	Average height deciduous tree canopy
		Percent deciduous tree canopy cover
		Stand width
American kestrel	Cottonwood	Percent deciduous shrub canopy
		Percent herb canopy less than 12 inches
		Percent herb canopy (all heights)
		Native/exotic herb dominance
		Percent leaf litter cover
		Number of perch sites per acre
		Vegetative structure
		Number of nest sites per acre
		Distance to nest
		Distance to food
		Percent bare ground
Yellow warbler	Willow	Average shrub height
		Percent deciduous shrub canopy
		Percent native deciduous shrub canopy
		Native/exotic woody
		Percent of shrub canopy that is hydrophytic shrubs (A)
Spotted Towhee	Willow	Average shrub height
		Percent deciduous tree canopy
		Percent deciduous shrub canopy
		Lateral screening (shrub density)
		Percent leaf litter cover
		Thickness of leaf litter and humus

Evaluation Species	Cover Type	HSI Model Variables
American kestrel	Willow	Percent deciduous shrub canopy
		Percent herb canopy less than 12 inches
		Percent herb canopy (all heights)
		Native/exotic herb dominance
		Percent leaf litter cover
		Vegetative structure
		Number of nest sites per acre
		Distance to nest
		Distance to food
		Percent bare ground
Mink	Emergent wetland	Percent of year with surface water
		Percent tree/shrub canopy cover within 100 meters (328 feet) of water or wetland edge
		Percent canopy cover of emergent herbaceous vegetation
Marsh Wren	Emergent wetland	Percent canopy cover of emergent herbaceous vegetation
		Percent canopy cover of woody vegetation in wetland
		Mean water depth
		Growth form of emergent hydrophytes
American kestrel	Emergent wetland	Percent herbaceous cover less than 12 inches
		Vegetative structure
		Distance to nest

Evaluation species selected for the willow and willow/alder cover type included the yellow warbler, spotted towhee, and American kestrel. The warbler, oriole, and kestrel models were used to assess this cover type in the earlier HEP studies. The spotted towhee model was used in the Truckee Meadows reach study to evaluate a riparian transition community. Evaluation models selected for the willow and willow/alder cover types included 18 unique habitat variables; all but one of which were measured in the field.

Emergent Wetland Cover Type and Evaluation Species

There was quite a bit of overlap between the variables for the four potential evaluation species for emergent wetland in the Lower Truckee River reach. Based on past experience, the mink was probably a better model than the muskrat model for the Lower Truckee River HEP. The leopard frog model included more water related variables than the marsh wren, and the HEP team was very interested in the leopard frog model. However, the leopard frog model was not validated by the Service or another reliable source. Therefore, the mink and marsh wren were selected. The mink HSI model was used in the previous Truckee River HEP studies for the emergent wetland cover type. The mink and marsh wren models assessed six unique measures of emergent wetland conditions.

American Kestrel Cover Types

The three cover types used to assess kestrel habitat value in the Lower Truckee River HEP were cottonwood, willow, and emergent wetland. The area and quality of these three cover types would change following the implementation of the flood control and restoration components of the project.

3.7 SAMPLING PROTOCOLS AND PROJECTED COVER TYPE AREA

3.7.1 Truckee Meadows

The field data collected in 1999 for the Truckee Meadows reach were used as the starting point (TY0) for all estimates of current and future habitat values. The projected total area of each of the cover types that would be developed under each alternative and restoration option was determined from the 2002 habitat restoration design paper (Corps). The following outlines the sampling protocols utilized in the Truckee Meadows HEP.

Fremont Cottonwood and Willow/Alder Sampling

Habitat variables for each of the evaluation species were grouped by the two major cover types (Fremont cottonwood and willow) appropriate for application of the models. Sample locations within each cover type were selected randomly after cover type polygons were roughly stratified by size. This ensured that the sampling results were representative and statistically valid and covered both large and smaller polygons. Methods used to generate sample locations varied depending on the variable measured and the physical constraints of the study area. Sample locations for habitat variables measured offsite by use of data sources such as aerial photographs were randomly located by use of a dot grid. Dot grids were arbitrarily positioned over each site, and a random numbers table used to generate an X and Y coordinate, corresponding to a particular dot location. From this location habitat variables such as size (area) of polygon and stand width were measured. Polygon size measures were provided by the Corps for all cottonwood/willow polygons.

Field locations were randomly located by a similar approach using dot grids or artificial axes from which random coordinates can be determined. Each randomly selected location served as a point of origin for the establishment of line and/or belt transects. The direction of each transect from the origin corresponded to a randomly selected compass bearing (zero degrees to 360 degrees). If selected bearings resulted in transects extending beyond the cover type, another bearing was chosen. The rule to change transect direction was as follows: 90 degrees to the left, 90 degrees to the right, 45 degrees left behind, 45 degrees right behind, 45 degrees left forward, and 45 degrees right forward. Given the linear nature of most riparian habitats, most transects ran roughly parallel to the river. Efforts were made to include all moisture gradients within the samples.

Sample locations were identified by an alphanumeric code specific to each site, transect and sample location. Fremont cottonwood sites had a designation FC and were numbered sequentially as FC01, FC02, etc. Similarly, willow or willow/alder cover type sites were numbered WA01, WA02, etc.

Transects and sample locations were numbered consecutively so that the first and second sample location on the first willow transect were identified as follows: WA01-01-01, WA01-01-02.

Riparian Transition Zone Sampling

The HEP team searched several locations along the Truckee River in an attempt to locate plant communities similar to those of the proposed riparian transition zone. Numerous areas supporting a cottonwood overstory and shrub understory were located. However, none of these appeared to provide a good model for what the transition community was expected to look like. Generally, existing riparian communities have very low shrub species diversity. Therefore, predicting future HSI values for the riparian transition zone used a combination of field data and projections based on the restoration plan, literature, and professional judgment. Some data, collected from existing riparian areas, was used to predict expected habitat values of mature riparian transition zone communities that would develop several years after the restoration plan is implemented. Three of the riparian cover type sites used during the 1999 sampling appear to have enough shrub cover to provide useful data for some of the variables.

3.7.2 Lower Truckee River

The selection of sample locations within each cover type was based largely on site accessibility. Access to many private lands was restricted by land owners. Physical accessibility was a factor on some lands on the Pyramid Lake Indian Reservation. Lack of roads, steep canyons, and the inability to cross the Truckee River except at a few locations also restricted access. Sample sizes were larger than typically required to minimize variance around sample means, which would offset, to an unknown degree, any bias resulting from the lack of a random approach to selecting sample sites.

Fremont Cottonwood and Willow/Alder Sampling

Habitat variables for each of the evaluation species were grouped by the two major cover types (cottonwood and willow) appropriate for application of the models. Habitat variables such as size (area) of polygons, total cover type area, and stand width were measured by the Corps using GIS. Sample locations were identified by an alphanumeric code specific to each site, transect and sample location. Cottonwood sites had a designation C and were numbered sequentially as C01, C02, etc. Similarly, willow or willow/alder cover type sites were numbered W01, W02, etc.

Emergent Wetland Sampling

An initial review of the land cover maps indicated that the only emergent wetlands in the study area reach of the Truckee River that were large enough for sampling occurred on the Pyramid Lake Paiute Tribe reservation below the outfall of the Numana fish hatchery and possible near Derby Dam. The Numana wetlands are supported by a constant supply of water from the hatchery. Emergent wetlands that would be developed as part of the habitat restoration plan would likely be supported by natural hydrologic conditions that involve declining water levels as the growing season progresses. Therefore, field data collected at the Numana hatchery wetlands may provide some insights regarding future wetland conditions if similar hydrologic conditions are created. However, these wetlands were not considered to represent natural conditions and the data from this site was not included in the analysis of current conditions. The small emergent wetlands near Derby Dam have been altered and substantially reduced in size by recent construction at the dam and were not suitable for sampling.

During sampling of cottonwood and willow cover types on the McCarran Ranch the HEP team discovered a relatively small emergent wetland located in an old river meander channel. This wetland was not mapped on the cover type maps. While small, it was the only emergent wetland available that had a natural river-controlled hydrology, as would be the case with wetlands developed as part of the restoration plan. Therefore, this area was intensively sampled for the emergent wetland evaluation species' variables.

3.8 ANALYSIS OF FUTURE CONDITIONS

3.8.1 Restoration Plan Goals, Objectives, and Details

The restoration plans included goals and objectives as well as detailed information about each of the cover types to be developed. Information either provided by or estimated from the restoration plans and its authors and used in the HEP analysis included planting designs; planting density; plant species and numbers to be used; groundwater and surface water depths; irrigation plans; expected future area of each cover type; impacts to or losses of existing wetland and riparian habitat to accommodate restoration actions; weed control actions and expected success; and performance goals such as expected canopy cover of shrub and tree strata in the future.

3.8.2 Truckee Meadows

The HEP method was used to evaluate and compare the effects of future changes on wildlife habitat value for selected wildlife species. Two of the major parts of the HEP process involve assessing current habitat values for evaluation species followed by estimating habitat values at future points in time based on expected changes in the amount or quality of wildlife habitat for different future scenarios. Changes in quantity or quality of wildlife habitat were predicted from existing field data, literature, and professional experience.

The entire Truckee Meadows study area was used for analysis of all future scenarios, regardless of the changes that may or may not occur. This is a standard approach used in HEP so that there is a common basis for comparison of future changes with and without the project. As discussed in section 2.5, Affected Area, the area of land that would be occupied by different cover types, affected by flood control, restoration, or enhancement activities, or changed to different land uses also varied for each of the restoration alternatives and options.

All of the existing pasturelands of the UNR farm area were included in the SI and HSI analyses of all future scenarios for the American kestrel. This was done because the kestrel model required the concurrent analysis of the combined foraging and nesting habitat value of pasture and riparian cover types located near each other. However, to more accurately capture the results of the proposed restoration plans, it was deemed more appropriate to include only those acreages of pasture and riparian cover types included within the active restoration footprints, primarily located from 500 feet to 1,000 feet from the river channel.

3.8.3 Lower Truckee River

Three approaches were used to determine expected future habitat conditions and value:

- Field measurements (as both a starting point for future change and, in a few cases, an end point for future habitat conditions).
- Literature and professional judgment (including past Truckee River HEP studies).
- Specific Truckee River restoration goals, objectives, and design elements.

<u>Use of Field Measurements to Predict Future Conditions</u>

Field measurements were used to predict expected future conditions, where the current habitat condition reasonably represented the HEP team's expectation of the future condition. For example, the percent cover of leaf litter and the depth of litter and humus, SI variables from the spotted towhee model, were measured in existing mixed willow communities. If future mixed willow communities at restoration sites were expected to be similar to current mixed willow communities for these variables, they were used to project future conditions at some future point after willows have been established for a period of time. Current tree and shrub heights for existing mature cottonwood and willow stands were used to estimate these variables after a period of years at restoration sites. Newly planted willows and cottonwoods would progress from a height of a few feet at planting to mature heights over a period of years that would vary depending on the community and hydrologic conditions estimated in the restoration plans.

Literature and Professional Judgment

Plant growth rates and ultimate plant size information was available in the literature for a few species. Additionally, HEP team members' experience and judgment with plant growth rates and sizes provided additional information. Growth rates and expected future conditions used in the previous Truckee River HEP studies were also used when appropriate. Projected plant growth rates used for the HEP futures analysis considered information from the restoration plans such as depth to seasonal ground water, the duration of planned irrigation, and the estimated success of weed control measures.

Exclusion of Sagebrush Shrublands in Kestrel Habitat Analysis

Although the 2004 restoration designs included the creation of new and enhancement of existing upland scrub to sagebrush shrubland, the Corps decided to exclude sagebrush shrubland from the future analysis for the kestrel. Although included in the 2004 restoration designs, it is unlikely that sagebrush shrublands would be created especially if it is replacing existing upland shrubland.

Exclusion of Whitetop in Kestrel Habitat Analysis

Contrary to the HEP team's initial assumption, whitetop provided no foraging or nesting habitat for the kestrel. Thus, the inclusion of whitetop acreages in the Lower Truckee HEP would have distorted the results of the HEP analysis. It was decided that whitetop would be excluded from the HEP analysis of the Lower Truckee River (CH2MHILL 2004c). This decision was made because inclusion of whitetop acreages in the kestrel model caused a false interpretation of the results for existing habitat under both the no action alternative and the future with project conditions under each of the three restoration options.

The SI values for the kestrel model were derived for the total area being evaluated (the combination of all 3 cover types). The lowest nesting or foraging SI value became the overall habitat SI value, which was multiplied by the total acres to equal the HUs.

Inclusion of whitetop in the kestrel multi-cover type model created two problems. The first problem was that it contributed acreages to the analysis that provided no habitat value for the kestrel. The whitetop acreages artificially inflated the HUs and AAHUs.

The second problem arose because of how the SI value for nesting habitat was calculated in the model. The model correctly assumed that only a small portion of cover types needed to be present to provide suitable nesting habitat (10 to 30 percent of the total area was optimal). Since the birds can fly and cover a lot of ground, a lot of foraging area was available to the kestrel with just a few nest sites. When applied to the model, the value of the nesting habitat steadily reduced as the percent of the total area that provided nesting habitat increased beyond 30 percent. Even though whitetop did not contribute anything in the way of kestrel nesting habitat value, the presence of 341 acres of whitetop under the no action alternative caused the model to falsely generate an inflated SI value for reproduction habitat.

The same is true under the action alternatives for each of the restoration options. However, for lands not affected by restoration under the restoration options, the amount of whitetop considered in the analyses is much less (69 acres) with respect to the no action alternative. The smaller area of whitetop increased the percent of the total area that was suitable for nesting, which resulted in lower SI and HSI values for each future option compared to the no action alternative. In other words, not only was less area included in the analysis (69 acres as compared to 341 acres), the HSI values under the restoration options were artificially lower than the no action alternative. These factors combined to substantially, and incorrectly, reduce HUs and AAHUs for the restoration options as compared to no action alternative.

4.0 Aquatic Habitat Evaluation

The Lower Truckee River Final Geomorphic Assessment and Final Preliminary Design (Vista to Pyramid Lake) (Corps 2004) (Lower Truckee River restoration plan) described, in detail, the restoration alternatives for each of the project segments along the Lower Truckee River. The aquatic habitat evaluation (AHE) for the Lower Truckee River was conducted using data presented in the Lower Truckee restoration plan.

The AHE was based upon the Service-approved Draft McCarran Ranch Ecosystem Restoration, Vicinity of Reno/Sparks, Washoe and Storey Counties, Nevada, Section 1135, Habitat Evaluation Procedure and Aquatic Habitat Evaluation (Corps 2004). The modified U.S. Environmental Protection Agency Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, Second Edition utilized in the Ecosystem Restoration - North Fork, Gunnison River Delta County, CO (2003) report also served as a guideline for the Lower Truckee AHE.

4.1 HEP Components Adapted in the Aquatic Habitat Evaluation

Similar to HEP, the AHE was developed to rate the quality and quantity of aquatic habitat in order to quantify changes resulting from this restoration project. The AHE was based on 3 variables of the river channel: pool to pool spacing to channel width ratio (V_1); channel sinuosity (V_2); and pool:riffle:run acreage ratios (V_3).

V1, Pool to Pool Spacing to Channel Width Ratio: The Lower Truckee River restoration plan provided pool to pool spacing to channel width data for each of the project segments. The median spacing in natural alluvial river channels is between 5 to 7 times the channel width (i.e., the ratio of pool to pool spacing to channel bankfull width should be between 5 and 7). Moreover, significant departures from 5 to 7 times the channel width was indicative of a disturbed channel and an improperly functioning river segment. The Corps subsequently used known data points to create an SI chart. SI values were then used to calculate HSI values per segment.

V2, Channel Sinuosity: The Lower Truckee restoration plan provided sinuosity data for each of the project segments. Sinuosity is a measure of the river channel meander and is measured by dividing the distance along the centerline of the channel by the straight-line distance, starting and ending at the same points. A straight channel has a sinuosity of 1 to 1.15. However a well-developed meander pattern has a sinuosity of 1.5 to 2.2.

An SI curve was created based upon the information provided by both the Lower Truckee restoration plan along with the 2003 Gunnison Report. SI values were then used to calculate HSI values per segment.

V3, Pool/Riffle/Run Ratios: The Lower Truckee restoration plan provided acreages of pools, riffles, and runs for each project segment. An acreage ratio (pool:riffle:run) was created for each segment under both with and without project conditions. Each of the 3 components of the ratio was then summed. That sum was then used to create an SI table for V_3. For example, without project conditions for segment 14 (102 Ranch) were as follows: 2.86 acres of pools, 14.37 acres of riffle, and 8.77 acres of run. The reduced ratio for pools:riffles:runs in segment 14 is 1:5:3. The ratio components were then summed (1+5+3 = 9).

The area of aquatic riverine habitat types (i.e., pools, riffles, and runs) is usually balanced to some degree in undisturbed, properly functioning alluvial river systems. The assumption was made that a ratio sum of 3 (1+1+1 = 3) equated to the highest suitability index value of 1. Based on the pool, riffle, run acreages provided in the Lower Truckee design plan, the assumption was made that a pool, riffle, run ratio sum of 50 equated to the worst suitability index (0). SI values were calculated for each design level (high, medium, low alternatives) and used to derive HSI values.

4.2 AHE ASSUMPTIONS

- Changes in the project area's aquatic habitat would in general have the same effects on all aquatic species in the river.

- There is a direct mathematical relationship between changes in the selected physical characteristics and the quality of the aquatic habitat. That is, as the number of selected physical characteristics increases, the quality of the aquatic habitat also increases.

- V_3, Pool, Riffle, Run Acreage Ratios - Pool, riffle, run acreages were converted into ratios (i.e. Segment 7 – 0/7.0/9.0). The ideal balance of pool, riffle, run complexes in any given segment would be a 1:1:1 ratio. In order to simplify the task of creating an SI curve for this variable, each of the pool, riffle, run ratio components were added (i.e. Segment 7 = 0 + 7.0 + 9.0 = 16.0). A score of 3 would correspond to a perfectly balanced segment (i.e. 1.0/1.0/1.0 = 3.0). As a result, best professional judgment was used to build an SI curve on the assumption that a ratio sum of 3.0 would correlate to an SI value of 1. Any deviation from 3.0 would result in a reduced SI value. Best professional judgment based upon data in the Lower Truckee restoration plan was used to make the assumption that a pool, riffle, run ratio sum of 50 had an SI value of 0.

- HSI equation – Best professional judgment was used to determine that an additive HSI equation would be most appropriate for the lower Truckee aquatic evaluation. Similar to the Service-approved aquatic habitat evaluation for McCarran Ranch (Corps, 2003), the decision was made to weight the pool/riffle/run acreage rating by squaring SIV_3 in the HSI equation because of its direct reflection on a stream's equilibrium and species diversity.

  The HSI equation used was as follows:

  $$HSI = [SIV_1 + SIV_2 + (SIV_3)^2]/3$$

5.0 Results

Calculations that generated the Habitat Suitablity Index (HSI) values for species cover types are included in Appendix B for the Truckee Meadows HEP and in Appendix C for the Lower Truckee River HEP. The AHE model developed for the Lower Truckee River reach and AHE calculations are presented in Appendix D.

5.1 TRUCKEE MEADOWS HEP RESULTS

The results of the Truckee Meadows HEP analysis are presented in Table 5.1 in terms of the total number of AAHUs for the future without the project and the number of net AAHUs increase anticipated above future without project with implementation of the three alternatives for the future with project conditions. Net AAHUs reflect the difference between the future with project total AAHUs and future without project totals. Figure 5.1 compares net AAHUs between alternatives and restoration options.

Results shown for each alternative are a summation of the results calculated for each of the three reaches for both the oriole and warbler models and the results of the kestrel model analysis for the alternative. Future AAHUs are attributed to unaffected lands (lands not affected by flood control, restoration, or UNR farm conversion), and changes due to habitat restoration activities.

The meadows HEP study summary results indicated significant differences in both the change in total AAHU between the alternatives with the project and between those alternatives and the future conditions without the project. However, it should be noted that for the low level alternatives, the kestrel model results are the cause of the most significant net change in AAHUs. These gains were largely attributed to the increase in the area of forested and willow riparian areas that would be created under each alternative. These gains would occur because restoration lands would change from having no current value for the respective evaluation species to having substantial value after a period of years.

5.2 LOWER TRUCKEE RIVER HEP RESULTS

The results of the Lower Truckee River HEP analysis are also presented in terms of the net AAHUs for the future project conditions (Table 5.2). The net AAHUs were calculated by subtracting the existing AAHUs from their corresponding with project AAHUs. A negative net AAHU indicated a decrease in habitat quality as a result of a restoration alternative. Results shown for each alternative are a summation of the results calculated for all of the evaluation species (yellow warbler, spotted towhee, hairy woodpecker, northern oriole, mink, marsh wren, and American kestrel).

According to the data in Table 5.2, the high alternative yielded the largest net gain of AAHUs for all segments, with the exception of segments 15 and 19. High alternatives were not proposed for segments 15 and 19. The medium alternative resulted in significantly larger net AAHUs compared to the low alternative for segment 15. However, the low alternative yielded net AAHUs 0.47 larger than the medium alternative for segment 19.

Table 5.1: Truckee Meadows Reach Restoration HEP Output

Without Project Total AAHUs	Alternative	Restoration Option							
		Low		Medium		High		Max	
		Total AAHUs	Net AAHUs	Total AAHUs	Net AAHUs	Total AAHUs	Net AAHUs	Total AAHUs	Net AAHUs
276.85	Alt 1	288.44	11.58	333.69	56.84	594.36	317.51	831.87	555.02
	Alt 2	267.66	-9.19	329.21	52.36	554.51	277.66	707.97	431.12
	Alt 3	460.00	183.14	804.96	528.10	876.17	599.32	949.30	672.44

Figure 5-1: Comparison of Truckee Meadows HEP Net Outputs by Alternative and Restoration Option

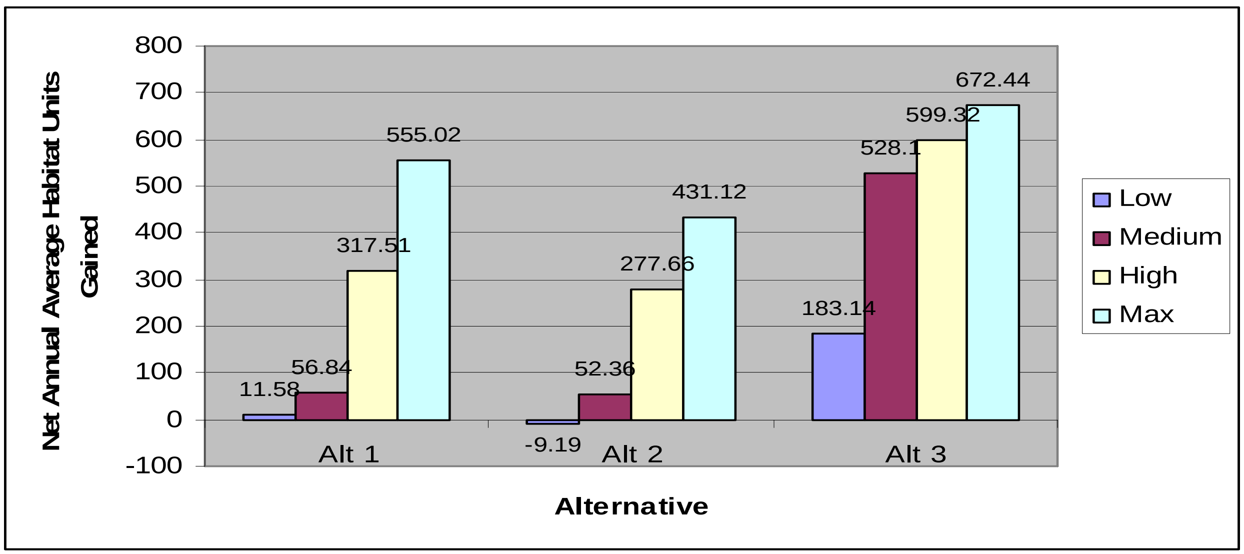


Table 5.2: Lower Truckee River Reach Restoration HEP Output

Segment	Without Project Total AAHUs	Option					
		Low		Medium		High	
		Total AAHUs	Net AAHUs	Total AAHUs	Net AAHUs	Total AAHUs	Net AAHUs
Seg 7 (Lockwood)	20.08	19.06	-1.02	30.37	10.28	35.72	15.64
Seg 9 (Mustang)	63.00	65.16	2.16	98.64	35.64	172.94	109.94
Seg 12 (Granite Pit)	4.28	5.34	1.07	11.22	6.94	24.84	20.56
Seg 13 (Tracy)	18.15	18.19	0.04	64.23	46.08	69.71	51.56
Seg 14 (102 Ranch)	84.07	87.02	2.96	151.87	67.81	168.96	84.89
Seg 15 (Eagle Picher)	69.91	76.69	6.79	96.55	26.65		
Seg 17 (Ferretto Ranch)	24.16	23.40	-0.76	32.05	7.89	42.94	18.78
Seg 18 (Railroad Cut)	32.99	35.78	2.78	42.38	9.39	57.17	24.18
Seg 19 (I-80 Rest Stop)	53.22	64.37	11.14	63.65	10.43		
Seg 20 (Above I-80 Bridge)	146.80	157.51	10.71	167.48	20.68	175.91	29.10
Seg 21 (Wadsworth)	96.14	119.23	23.09	125.42	29.28	146.97	50.83

Analysis of the kestrel data indicated that the greatest number of project segments would experience a net increase in AAHUs under the high alternative. The segments with the most increase in AAHUs were identical to that noted in the marsh wren analysis.

5.3 LOWER TRUCKEE RIVER REACH AQUATIC HABITAT EVALUATION RESULTS

The results of the Lower Truckee River Aquatic Habitat Evaluation are shown on Table 5.3. Results are presented in net AAHUs gained/lost for each project segment under the with- and without-project conditions.

Table 5.3: Lower Truckee River Reach Restoration Aquatic Habitat Evaluation Output

Segment	Without Project Annual Average Habitat Units (AAHUs)	Low Restoration		Medium Restoration		High Restoration	
		With Project AAHUs	Net AAHUs	With Project AAHUs	Net AAHUs	With Project AAHUs	Net AAHUs
Seg 7 (Lockwood)	3.70	6.69	2.99	11.06	7.36	12.05	8.35
Seg 9 (Mustang)	7.28	7.28	0.00	20.90	13.62	24.61	17.33
Seg 12 (Granite Pit)	1.44	1.39	-0.05	1.39	-0.05	1.39	-0.05
Seg 13 (Tracy)	7.68	7.68	0.00	20.63	12.95	23.30	15.62
Seg 14 (102 Ranch)	22.45	22.45	0.00	11.26	-11.19	18.94	-3.51
Seg 15 (Eagle Picher)	11.20	11.20	0.00	35.45	24.25	11.20	0.00
Seg 17 (Ferretto Ranch)	3.08	3.08	0.00	9.23	6.15	12.67	9.59
Seg 18 (Railroad Cut)	7.31	7.31	0.00	18.31	11.00	28.27	20.96
Seg 19 (I-80 Rest Stop)	5.84	5.84	0.00	15.17	9.33	5.84	0.00
Seg 20 (Above I-80 Bridge)	1.36	22.37	21.01	18.13	16.77	17.40	16.04
Seg 21 (Wadsworth)	6.32	8.50	2.18	16.43	10.11	19.05	12.73

5.4 LOWER TRUCKEE HEP AND AHE RESULTS COMBINED

Table 5.4 combines net AAHUs from both the HEP and the Aquatic Habitat Evaluation for the Lower Truckee River for each segment.

Table 5.4: Lower Truckee River Reach Restoration Net AAHUs—Combined HEP and AHE Results

Segment	Without Project Total Combined AAHUs (terrestrial plus aquatic)	With Project Net AAHUs (increase/decrease from without-project conditions)		
		Low Restoration	Medium Restoration	High Restoration
Seg 7 (Lockwood)	23.78	1.97	17.64	23.99
Seg 9 (Mustang)	70.28	2.16	49.26	127.27
Seg 12 (Granite Pit)	5.72	1.02	6.89	20.51
Seg 13 (Tracy)	25.83	0.04	59.03	67.18
Seg 14 (102 Ranch)	106.52	2.96	56.62	81.38
Seg 15 (Eagle Picher)	81.11	0.00	50.90	N/A
Seg 17 (Ferretto Ranch)	27.24	-0.76	14.04	28.37
Seg 18 (Railroad Cut)	40.30	2.78	20.39	45.14
Seg 19 (I-80 Rest Stop)	59.06	11.14	19.76	N/A
Seg 20 (Above I-80 Bridge)	148.16	31.72	37.45	45.14
Seg 21 (Wadsworth)	102.46	25.27	46.05	63.56

5.5 WEIGHTING OF LOWER TRUCKEE HABITAT EVALUATION OUTPUTS

Following review of the Draft HEP and AHE report, the Service and the Corps' internal technical review team indicated concern that the results of the Lower Truckee HEP and AHE did not adequately reflect the regional value of habitat in the Lower Truckee River reach, particularly in comparison to results of the Truckee Meadows HEP. The Service's comments are included as Attachment A. As indicated in the Service's letter, the Lower Truckee restoration provides for greater potential to connect riparian corridors, more direct benefits to fisheries habitat, including habitat of the Federally-protected cui-ui and Lahontan cutthroat trout, as well as higher potential for improving water quality currently affected by factors such as water treatment plant discharges, urban run-off, and decreased shading. Finally, the Service suggested that the use of HSI models, while widely used tools for quantifying habitat values, in certain cases may not accurately capture regionally significant factors applicable to regionally-specific habitat values.

Reassessment of the Lower Truckee HEP and AHE revealed that while values for three distinct riparian habitat types (cottonwood, willow, emergent wetland) were strongly represented by HEP species models, aquatic habitat values were only captured by a single evaluation model, the AHE. It was deemed appropriate to weight the outputs of the AHE, to given the importance of aquatic habitat to the overall value of the lower Truckee River reach ecosystem. The AHE output was doubled instead of tripled given the fact that both aquatic and riparian habitat values were captured with the emergent wetland species models. These weighting factors resulted in modified outputs to the Lower Truckee combined HEP/AHE as indicated in Table 5.5.

Figure 5.2 compares the outputs between the Lower Truckee restoration options using the weighted AHE outputs combined with the HEP outputs. Weighting of the AHE outputs caused a general increase in output for the majority of segments for the medium and high restoration options while the low restoration options tended to maintain their original values. This is most likely attributable to the fact that increased acreages of aquatic habitat occur in a higher percentage of the medium and high restoration options.

Figure 5.3 compares the outputs generated for all restoration options in the Truckee Meadows HEP with the cumulative weighted outputs of the low, medium, and high design options in the Lower Truckee habitat evaluations. The chart indicates that the weighted outputs in the Lower Truckee reach are comparable to the range of outputs seen in the Meadows outputs.

The Meadows HEP outputs and the weighted outputs for the Lower Truckee reach HEP-AHE will be utilized in the incremental cost and cost effectiveness analyses, described in the Corps' General Evaluation Report, to help determine the Federal Government's National Environmental Restoration alternative on this project.

Table 5.5: Lower Truckee Reach Restoration Net Weighted AAHUs Gained Above Without Project Conditions—Combined HEP and AHE Results

Segment	Without Project AAHUs	Design Option		
		Low	Medium	High
		Net AAHUs Gained	Net AAHUs Gained	Net AAHUs Gained
7	27.47	4.94	24.59	31.62
9	77.56	2.13	61.17	140.86
12	7.16	1.03	6.76	19.97
13	33.52	0.04	69.83	80.38
14	128.96	2.91	41.90	73.53
15	92.30	6.38	73.91	0.00
17	30.32	-0.77	19.79	37.24
18	47.61	2.69	30.92	65.03
19	64.89	10.43	28.63	0.00
20	149.52	52.43	53.14	59.67
21	108.78	26.86	48.07	74.25

Figure 5-2: Comparison of Lower Truckee Reach Combined HEP-Weighted AHE Outputs by Alternative and Restoration Option

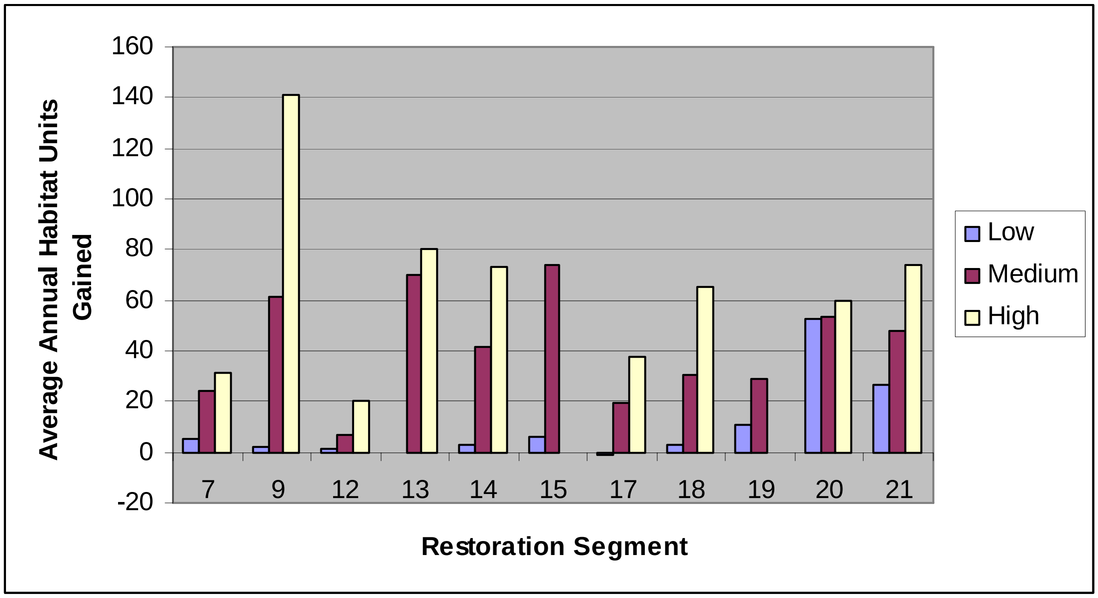
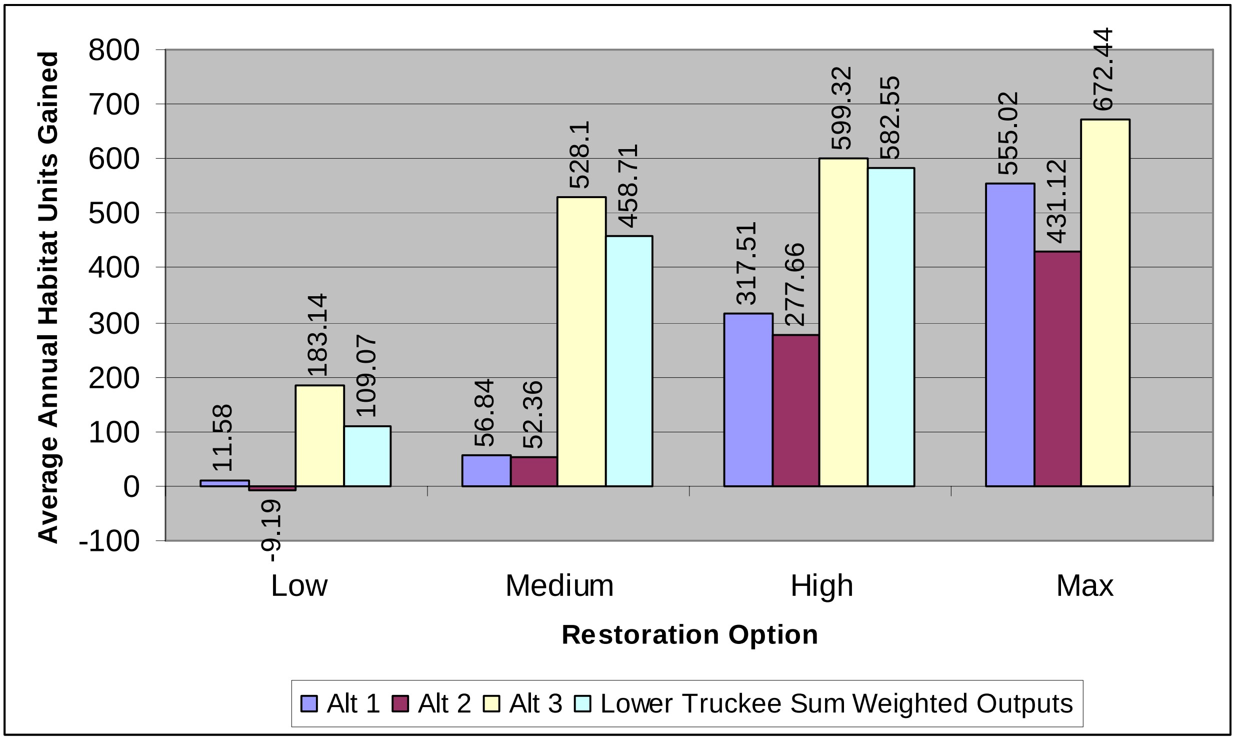


Figure 5-3: Comparison between Meadows HEP Outputs and Lower Truckee Cumulative Weighted Outputs



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ATTACHMENTS

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June 29,2006
File No. COE-03150401 TMFCP

Mr. Daniel Artho
Environmental Manager
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814

Dear Mr. Artho:

Subject: Ecologic Restoration for the Truckee Meadows Flood Control Project

The U.S. Fish and Wildlife Service (Service) supports ecosystem restoration as a part of the U.S. Army Corps of Engineers (Corps) proposed Truckee Meadows Flood Control Project (TMFCP), which is currently planned for the reaches in the Truckee Meadows (the river between U.S. 395 and Vista Boulevard) and lower Truckee River (the river from Vista Boulevard to Pyramid Lake). However, we are concerned that the Corps' analysis of wildlife benefits favoring the Truckee Meadows reach does not adequately consider other factors of particular importance to the lower Truckee River.

The lower Truckee River has experienced significant ecological damages caused by various past actions that include altered flow regimes, reduced flows from water diversions (especially Derby Dam for the Newlands Project), channelization and straightening of the river (especially as part of the Corps' earlier flood control efforts in the 1960s), intensive grazing and agriculture practices within the watershed, mining and industrial activities, and intensive urban development in the Reno/Sparks area. In some cases, flood damage reduction measures may further increase these damages by sending a higher peak in flow downstream. Restoration is needed to address the ecological damage caused by various past actions and will help compensate for the potential increase in erosive forces if caused by the amplified flood peaks.

The Corps helped facilitate a Habitat Evaluation Procedure (HEP) analysis to evaluate wildlife habitat conditions for specified segments in the two reaches using Habitat Suitability Index (HSI) models for selected evaluation species. Restoration impacts were quantified and averaged over the project's lifespan in terms of Average Annualized Habitat Units (AAHUs). In general, preliminary results show AAHUs calculated for the Truckee Meadows reach were one level of magnitude higher than that of the lower Truckee River reach (Corps 2006). As discussed in our November 7,2002 letter (File No. 3-15-14), this may be due to the scale of the HEP maps, which do not accurately represent vegetation types and may underestimate habitat benefits in the lower reach. Also, the contribution of the University of Nevada Reno's (UNR) Agriculture Station to the HSI songbird and kestrel models may inflate AAHUs for the Truckee Meadows reach.

While we do not discount the importance of restoration in the Truckee Meadows reach (consisting of revegetation along the banks and low terraces), we believe the potential for ecological restoration is limited by the surrounding land uses, i.e., industry, agriculture (via the UNR property), and urban development. Thus, a realistic expectation of this potential is for a narrow, riparian corridor that is heavily encroached by these uses and interrupted by the supporting infrastructure. Moreover, much of the revegetation needed in this reach will be stimulated passively upon implementation of a more naturalized flow regime which is currently being implemented. While a dedicated "ecosystem restoration" flow regime will also have obvious benefits to the lower Truckee River reach, it will not be enough to drive the kind of restoration needed, which requires earthwork.

The lower Truckee River reach, in particular, has experienced significant losses in its riparian forests and associated wildlife communities over the past century. From the Service's perspective, results from the HEP analysis appears skewed to favor the Truckee Meadows reach, although greater ecological benefits may be realized in the lower Truckee River reach. Our rationale is based on the following factors, which are supportive of Public Law 101-618:

1. The price of land is much cheaper and there is more space for restoration, therefore, the benefit to cost ratio may be higher.

2. A number of other restoration projects among segments (independent of the TMFCP) have been implemented or are planned in the near future, including McCarran Ranch, Mustang Ranch, 102 Ranch, and Lovelock. Thus, there is greater potential for creating contiguous blocks of habitat or a mosaic of riparian, transitional, wetland, aquatic, and upland habitats that will benefit fish, wildlife, and water quality.

3. More opportunities for restoration will be availed to the Pyramid Lake Paiute Tribe (Tribe), the largest landowner in the lower Truckee River Reach. The Tribe has been on the receiving end of reduced Truckee River flows of degraded water quality ever since construction of the Derby Dam diversion. The river now experiences elevated levels of nutrients (primarily nitrogen), contaminants, and temperatures. Restoration on this reach will help offset some of these impacts by creating healthy riparian buffers in the floodplain.

4. Restoration downstream of the water treatment facility in Sparks will help to meet state and Tribal water quality standards.

5. There are intense, ongoing efforts to recover the federally-listed cui-ui (*Chasmistes cujus*) and Lahontan cutthroat trout (Oncorhynchus *clarki* henshawi) involving the Tribe and various state and federal entities. These species reside in Pyramid Lake and are obligate stream spawners. When conditions are favorable (i.e., adequate springtime flows), these species attempt to migrate up the lower Truckee River to access spawning habitat. Restoration in this area will have direct, long-term benefits to these species.

As discussed in our July 1,2002 letter to the Corps, while we support the use of HEP, we also recognize that over two decades have passed since it was first developed and that many advances in conservation science have occurred over that time. We identify issues above that may not be fully captured in the HSI models. For these reasons, we suggest that the Corps revise the HEP output to provide a more equitable comparison across reaches. This may entail a weighting component integrating the above factors as criteria.

In summary, the Service supports ecosystem restoration for the Truckee River as an integral part of the TMFCP, with emphasis on the lower Truckee River reach, as this has obvious benefits to water quality, fish and wildlife habitat, species recovery, and tribal trust resources. Any analysis projecting the benefits of the project should give adequate consideration to these factors. If you have any questions or require additional information, please contact me or David Potter at (775) 861-6300.

Sincerely,

for Robert D. Williams
Field Supervisor

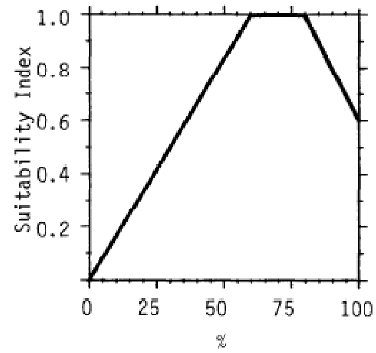
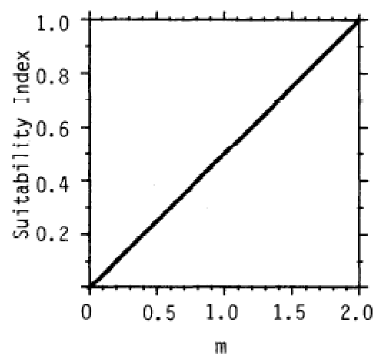
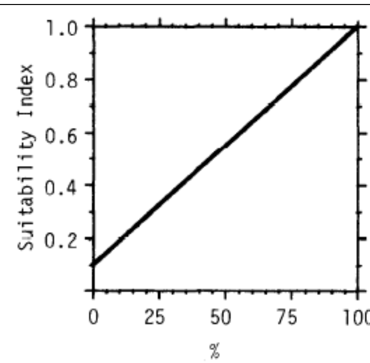
cc:
Fishery Biologist, Nevada Department of Wildlife, Reno, Nevada
(Attn: Kim Tisdale)

APPENDIX A

HSI SPECIES MODELS USED
IN THE
TRUCKEE MEADOWS PROJECT HEPS

Suitability Index Variables and HSI Formulas for Yellow Warbler

HSI and Life Requisite Calculations: **HSI = (SIV1 x SIV2 x SIV3)$^{1/2}$**

SI Variables	SI Variable Charts
V1 % deciduous shrub canopy	
V2 % native deciduous shrub canopy	
V3 % of shrub canopy that is hydrophytic shrubs	

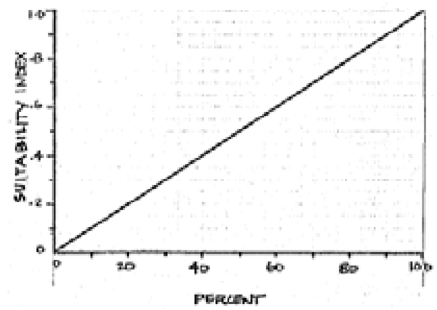
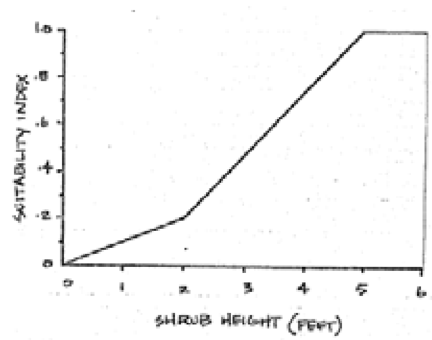
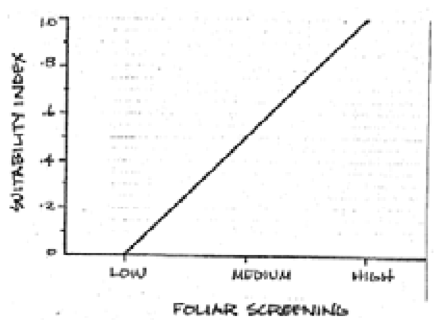
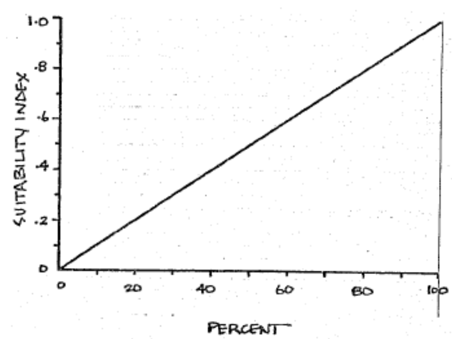
Suitability Index Variables and HSI Formulas for Spotted Towhee

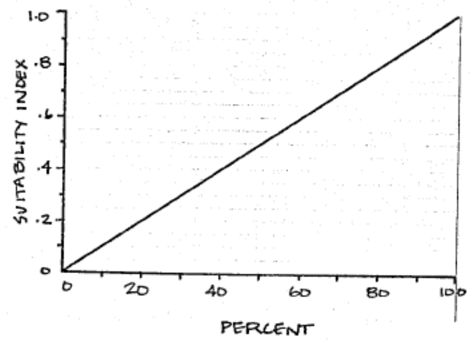
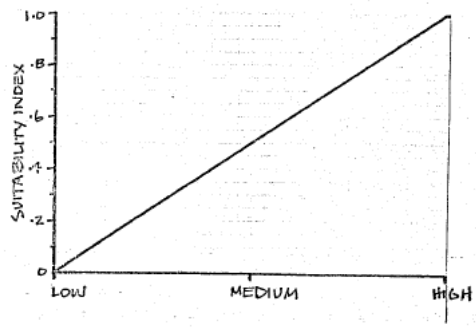
HSI and Life Requisite Calculations:

HSI = the lowest calculated life requisite value

Reproduction life requisite = (SIV1 x SIV2 x SIV3 x SIV4)$^{1/4}$

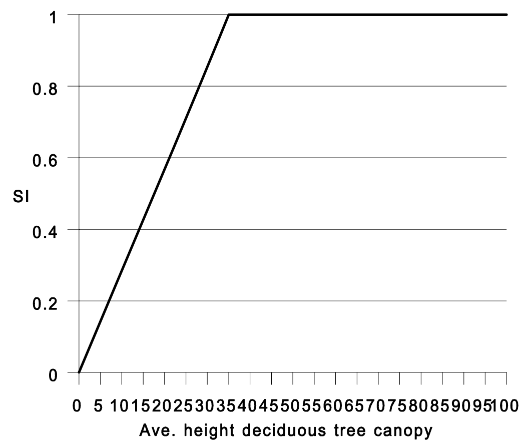
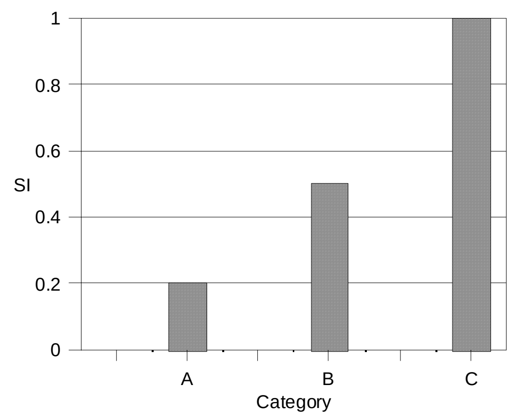
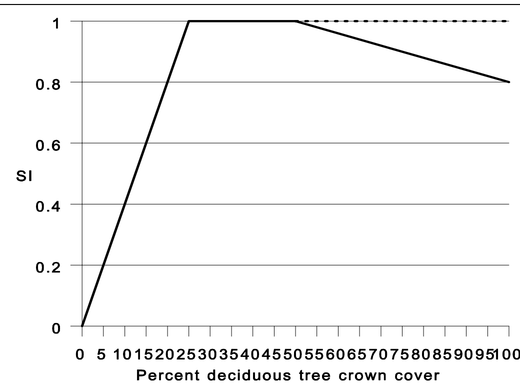
Food life requisite = (SIV5 x SIV6)$^{1/2}$

SI Variables	SI Variable Charts
V1 % native deciduous shrub canopy	
V2 Average shrub height	
V3 Lateral screening (shrub density)	
V4 % deciduous tree canopy	

SI Variables	SI Variable Charts
V5 % leaf litter cover	
V6 Thickness of leaf litter and humus	

Suitability Index Variables and HSI Formulas for Northern Oriole

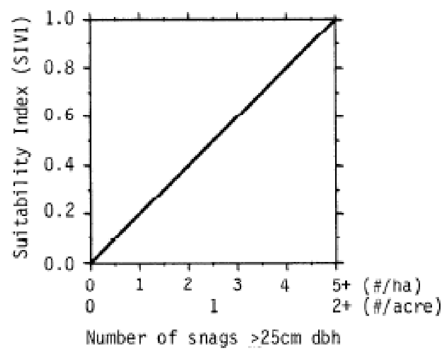
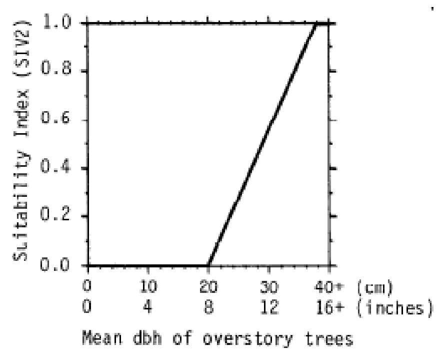
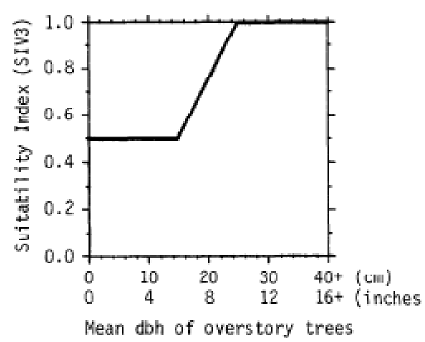
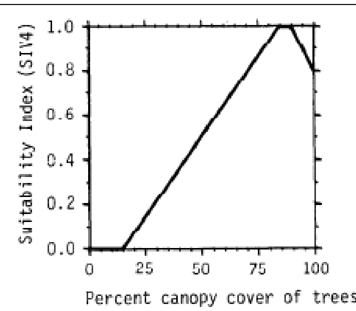
HSI and Life Requisite Calculations: **HSI = (SIV1 x SIV2 x SIV3)$^{1/3}$**

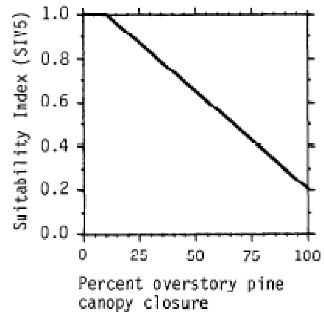
<table>
<tr><th>SI Variables</th><th>SI Variable Charts</th></tr>
<tr><td>V1 Average height of deciduous tree canopy</td><td>
</td></tr>
<tr><td>V2 % deciduous tree canopy</td><td>
</td></tr>
<tr><td>V3 Stand width</td><td>
</td></tr>
</table>

Suitability Index Variables and HSI Formulas for Hairy Woodpecker

HSI and Life Requisite Calculations: **HSI = [SIV1 + (0.75 x SIV2)] x (SIV3 x SIV4 x SIV5)**

(if SIV1 + (0.75 x SIV2) > 0, set = 0 before calculating HSI value)

SI Variables	SI Variable Charts
V1 Number of snags > 25 cm	
V2 Mean dbh of overstory trees	
V3 Mean dbh of overstory trees	
V4 % deciduous tree canopy	

SI Variables	SI Variable Charts
V5 % canopy of pines	

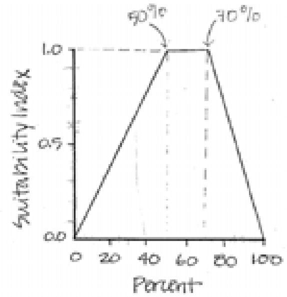
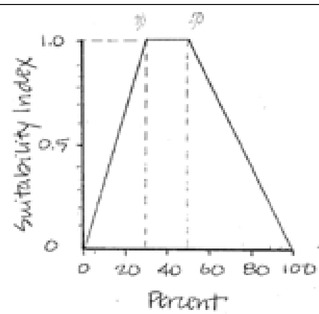
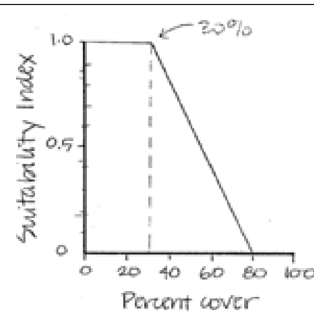
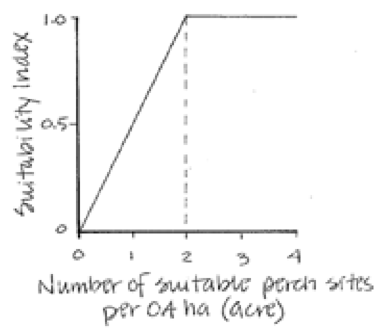
Suitability Index Variables and HSI Formulas for American Kestrel

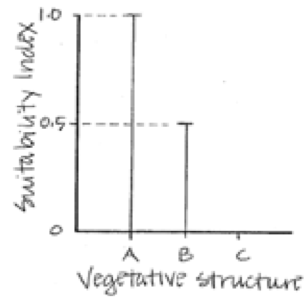
HSI and Life Requisite Calculations:

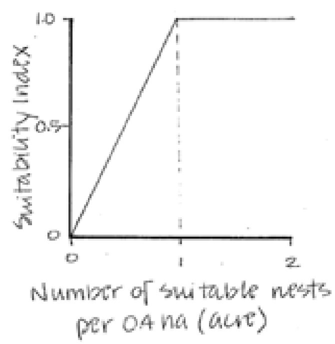
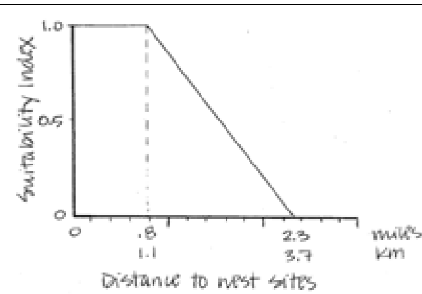
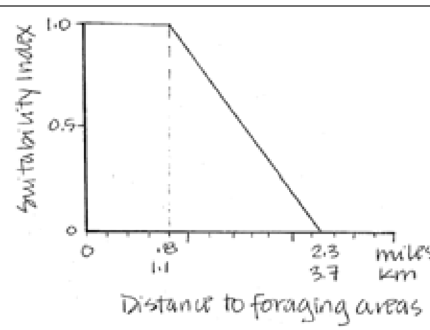
HSI = the lowest calculated life requisite value weighted for the three cover types evaluated as one unit

Food life requisite = $(SIV1 \times SIV2 \times SIV3 \times SIV4)^{1/4}$ x SIV7

Reproduction life requisite = SIV6 x SIV8

<table>
<tr><th>SI Variables</th><th>SI Variable Charts</th></tr>
<tr><td>V1 Percent bare ground</td><td>
</td></tr>
<tr><td>V2 Percent herbaceous cover < = 12” tall</td><td>
</td></tr>
<tr><td>V3 Percent shrub cover < = 16.5’</td><td>
</td></tr>
<tr><td>V4 Number perch sites</td><td>
</td></tr>
</table>

<table>
<tr><th>SI Variables</th><th>SI Variable Charts</th></tr>
<tr><td>V5 Vegetative structure</td><td>

Catagory	Description
A.	Completely open from 1.2 m (4 ft) and below.
B.	Moderately open below 1.2 m (4 ft), with some branching and obstructions.
C.	Slightly open to closed below 1.2 m (4 ft).
</td></tr>
<tr><td>V6 Number of nest sites/acre</td><td>
</td></tr>
<tr><td>V7 Distance to nest</td><td>
</td></tr>
<tr><td>V8 Distance to food</td><td>
</td></tr>
</table>

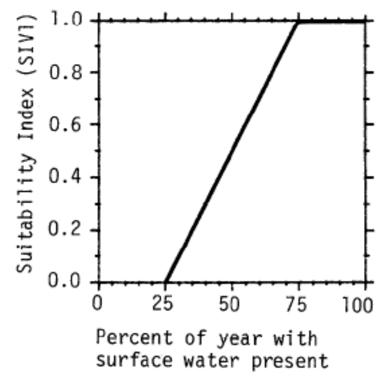
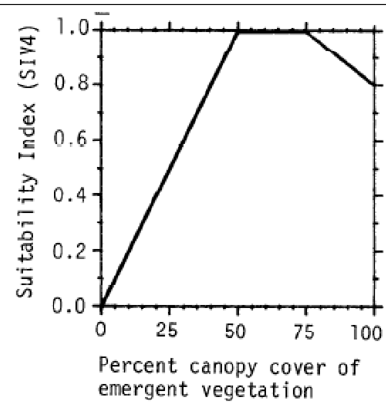
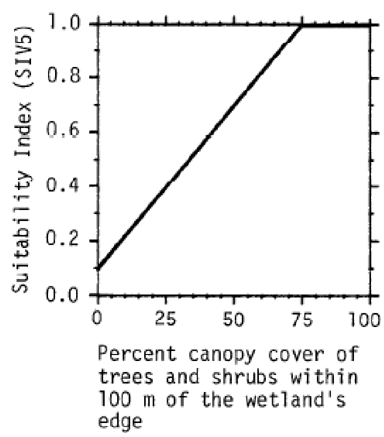
Suitability Index Variables and HSI Formulas for Mink

HSI and Life Requisite Calculations:

HSI = the lowest calculated life requisite value

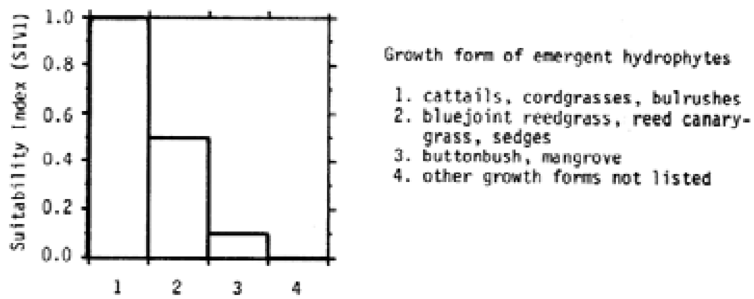
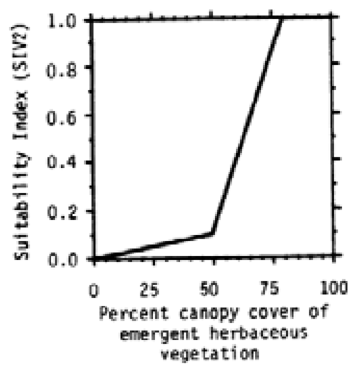
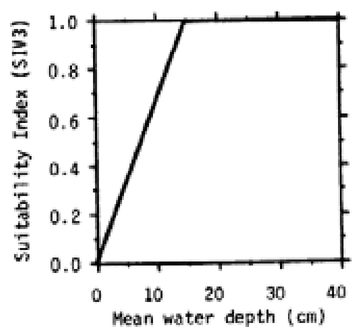
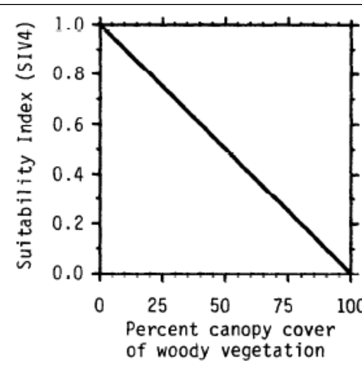
Water life requisite = SIV1

Cover life requisite = (4 SIV4 + SIV5) / 5

SI Variables	SI Variable Charts
V1 % of year with surface water present	
V4 % canopy cover of emergent herbaceous vegetation	
V5 % tree and shrub canopy within 100 m of wetland	

Suitability Index Variables and HSI Formulas for Marsh Wren

HSI and Life Requisite Calculations: $(SIV1 \times SIV2 \times SIV3)^{1/3} \times SIV4$

SI Variables	SI Variable Charts
V1 Growth form of emergent hydrophytes	
V2 Percent canopy cover of emergent herbaceous vegetation	
V3 Mean water depth	
V4 Percent canopy cover of woody vegetation	

APPENDIX E

INFORMATION REGARDING SPECIAL STATUS SPECIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NV 89502
PHONE: (775)861-6300 FAX: (775)861-6301
URL: www.fws.gov/nevada/

Consultation Tracking Number: 08ENVD00-2013-SLI-0164 April 08, 2013
Project Name: Truckee Meadows Flood Control Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project.

To Whom It May Concern:

The attached species list indicates threatened, endangered, proposed, and candidate species and designated or proposed critical habitat that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act of 1973, as amended (ESA, 16 U.S.C. 1531 *et seq*.), for projects that are authorized, funded, or carried out by a Federal agency. Candidate species have no protection under the ESA but are included for consideration because they could be listed prior to the completion of your project. Consideration of these species during project planning may assist species conservation efforts and may prevent the need for future listing actions. For additional information regarding species that may be found in the proposed project area, visit http://www.fws.gov/nevada/es/ipac.html.

The purpose of the ESA is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the ESA and its implementing regulations (50 CFR 402 *et seq*.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Guidelines for preparing a Biological Assessment can be found at: http://www.fws.gov/midwest/endangered/section7/ba_guide.html.

If a Federal action agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species, and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this species list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally listed, proposed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally, as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation, for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the attached list.

The Nevada Fish and Wildlife Office (NFWO) no longer provides species of concern lists. Most of these species for which we have concern are also on the Animal and Plant At-Risk Tracking List for Nevada (At-Risk list) maintained by the State of Nevada’s Natural Heritage Program (Heritage). Instead of maintaining our own list, we adopted Heritage's At-Risk list and are partnering with them to provide distribution data and information on the conservation needs for at-risk species to agencies or project proponents. The mission of Heritage is to continually evaluate the conservation priorities of native plants, animals, and their habitats, particularly those most vulnerable to extinction or in serious decline. In addition, in order to avoid future conflicts, we ask that you consider these at-risk species early in your project planning and explore management alternatives that provide for their long-term conservation.

For a list of at-risk species by county, visit Heritage's website (http://heritage.nv.gov). For a specific list of at-risk species that may occur in the project area, you can obtain a data request form from the website (http://heritage.nv.gov/get_data) or by contacting the Administrator of Heritage at 901 South Stewart Street, Suite 5002, Carson City, Nevada 89701-5245, (775) 684-2900. Please indicate on the form that your request is being obtained as part of your coordination with the Service under the ESA. During your project analysis, if you obtain new information or data for any Nevada sensitive species, we request that you provide the information to Heritage at the above address.

Furthermore, certain species of fish and wildlife are classified as protected by the State of Nevada (http://www.leg.state.nv.us/NAC/NAC-503.html). You must first obtain the appropriate license, permit, or written authorization from the Nevada Department of Wildlife (NDOW) to take, or possess any parts of protected fish and wildlife species. Please visit http://www.ndow.org or contact NDOW in northern Nevada (775) 688-1500, in southern Nevada (702) 486-5127, or in eastern Nevada (775) 777-2300.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq*.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the Service's wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

The Service’s Pacific Southwest Region developed the *Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Wind Energy Facilities* (Interim Guidelines). This document provides energy facility developers with a tool for assessing the risk of potential impacts to wildlife resources and delineates how best to design and operate a bird- and bat-friendly wind facility. These Interim Guidelines are available upon request from the NFWO. The intent of a Bird and Bat Conservation Strategy is to conserve wildlife resources while supporting project developers through: (1) establishing project development in an adaptive management framework; (2) identifying proper siting and project design strategies; (3) designing and implementing pre-construction surveys; (4) implementing appropriate conservation measures for each development phase; (5) designing and implementing appropriate post-construction monitoring strategies; (6) using post-construction studies to better understand the dynamics of mortality reduction (*e.g.*, changes in blade cut-in speed, assessments of blade “feathering” success, and studies on the effects of visual and acoustic deterrents) including efforts tied into Before-After/Control-Impact analysis; and (7) conducting a thorough risk assessment and validation leading to adjustments in management and mitigation actions.

The template and recommendations set forth in the Interim Guidelines were based upon the Avian Powerline Interaction Committee’s Avian Protection Plan template (http://www.aplic.org/) developed for electric utilities and modified accordingly to address the unique concerns of wind energy facilities. These recommendations are also consistent with the Service’s wind energy guidelines. We recommend contacting us as early as possible in the planning process to discuss the need and process for developing a site-specific Bird and Bat Conservation Strategy.

The Service has also developed guidance regarding wind power development in relation to prairie grouse leks (sage-grouse are included in this). This document can be found at: http://www.fws.gov/southwest/es/Oklahoma/documents/te_species/wind%20power/prairie%20gr
.

Migratory Birds are a Service Trust Resource. Based on the Service's conservation responsibilities and management authority for migratory birds under the Migratory Bird Treaty Act of 1918, as amended (MBTA; 16 U.S.C. 703 *et seq*.), we recommend that any land clearing or other surface disturbance associated with proposed actions within the project area be timed to avoid potential destruction of bird nests or young, or birds that breed in the area. Such destruction may be in violation of the MBTA. Under the MBTA, nests with eggs or young of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If nests are located, or if other evidence of nesting (*i.e.*, mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

Guidance for minimizing impacts to migratory birds for projects involving communications towers (*e.g.*, cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

If wetlands, springs, or streams are are known to occur in the project area or are present in the vicinity of the project area, we ask that you be aware of potential impacts project activities may have on these habitats. Discharge of fill material into wetlands or waters of the United States is regulated by the U.S. Army Corps of Engineers (ACOE) pursuant to section 404 of the Clean Water Act of 1972, as amended. We recommend you contact the ACOE’s Regulatory Section regarding the possible need for a permit. For projects located in northern Nevada (Carson City, Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lyon, Mineral, Pershing, Storey, and Washoe Counties) contact the Reno Regulatory Office at 300 Booth Street, Room 3060, Reno, Nevada 89509, (775) 784-5304; in southern Nevada (Clark, Lincoln, Nye, and White Pine Counties) contact the St. George Regulatory Office at 321 North Mall Drive, Suite L-101, St. George, Utah 84790-7314, (435) 986-3979; or in California along the eastern Sierra contact the Sacramento Regulatory Office at 650 Capitol Mall, Suite 5-200, Sacramento, California 95814, (916) 557-5250.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Truckee Meadows Flood Control Project

Official Species List

Provided by:

NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NV 89502
(775) 861-6300
http://www.fws.gov/nevada/

Consultation Tracking Number: 08ENVD00-2013-SLI-0164
Project Type: Stream / Waterbody / Canals / Levees / Dikes
Project Description: Construct levees, floodwalls, floodplain terraces, and scour protection along about 6 miles of the Truckee River from Highway 395 downstream approximately 6 miles to the eastern end of the Sparks industrial area. Also would place approximately 3,000 feet of the North Truckee Drain into twin box culverts.

United States Department of Interior
Fish and Wildlife Service

Project name: Truckee Meadows Flood Control Project

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-119.7860712 39.5315863, -119.7849211 39.5316856, -119.7824148 39.5315275, -119.7814611 39.5313877, -119.7807562 39.530892, -119.7804139 39.5304609, -119.7791895 39.5294645, -119.777709 39.5283292, -119.7771039 39.5274892, -119.774059 39.5237163, -119.7727093 39.5229533, -119.7716954 39.5225883, -119.7708646 39.5221756, -119.7704226 39.5223784, -119.7700063 39.5222054, -119.7694677 39.5221591, -119.7690407 39.5221591, -119.7687596 39.522659, -119.7679871 39.5226904, -119.7668906 39.5226697, -119.7665902 39.522155, -119.765715 39.5215597, -119.7628603 39.5202145, -119.7621522 39.5197725, -119.7615964 39.5189154, -119.761251 39.5187681, -119.7604924 39.5186183, -119.7593713 39.518264, -119.7579658 39.5183203, -119.7558979 39.5185407, -119.7539721 39.5183553, -119.7532704 39.5178868, -119.7525902 39.5177618, -119.7513382 39.5177867, -119.7503629 39.5179431, -119.7495422 39.5183378, -119.7481678

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119.7360197 39.5109639, -119.740598 39.5120747, -119.7434948 39.5122758, -119.7440999 39.5125705, -119.7443778 39.5120921, -119.7449121 39.5119448, -119.7454491 39.5119723, -119.7463922 39.5123638, -119.7489693 39.5133314, -119.7504392 39.513745, -119.7518553 39.5140796, -119.7529304 39.5143734, -119.7575298 39.5152673, -119.7592239 39.5153981, -119.7598806 39.5155328, -119.7608084 39.5158292, -119.761436 39.5161545, -119.7614349 39.5164376, -119.7619263 39.5165038, -119.7624681 39.516512, -119.7637105 39.51694, -119.7654615 39.5172205, -119.7672521 39.5181235, -119.7689045 39.5190865, -119.7710386 39.5195718, -119.7719827 39.5212932, -119.7757593 39.5229484, -119.7777334 39.5249346, -119.77842 39.5272517, -119.7796217 39.5285758, -119.7816816 39.529966, -119.784714 39.5301837, -119.7860712 39.5315863)))

Project Counties: Washoe, NV

Endangered Species Act Species List

Species lists are not entirely based upon the current range of a species but may also take into consideration actions that affect a species that exists in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Please contact the designated FWS office if you have questions.

Carson wandering skipper *(Pseudocopaeodes eunus obscurus)*

Population: U.S.A. (NV, CA)

Listing Status: Endangered

cui-ui *(Chasmistes cujus)*

Population: Entire

Listing Status: Endangered

Greater sage-grouse *(Centrocercus urophasianus)*

Population: entire

Listing Status: Candidate

Lahontan cutthroat trout *(Oncorhynchus clarkii ssp. henshawi)*

Population: Entire

Listing Status: Threatened

Webber Ivesia *(Ivesia webberi)*

Listing Status: Candidate

Table 1 Special-Status Species with the Potential to Occur in the Project area

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Invertebrates					
California floater *Anodonta californiensis*	--/S/--/--	Occurs in shallow areas of clean and clear lakes, ponds, and slow moving rivers with a soft substrate such as mud or sand	Historical distribution included the Pacific Northwest, south to the northern San Joaquin Valley of California. Extirpated from Utah and limited distribution in Arizona	Historical record (1880s) in Truckee River. Truckee River may provide suitable habitat	Yes
Mono checkerspot *Euphydryas editha monoensis*	--/S/--/--	Riparian habitats on the east side of the Sierra Nevada Range. Larval plants include dwarf plantain (*Plantago sp*.) and several other plants in the Scrophulariaceae family	Occurs along the eastern slopes of the Sierra Nevada Mts. and is currently known from only five or six populations	One population occurs within the project area at Reno Metropolitan Conservation Site	Yes
Wong springsnail *Pyrgulopsis wongi*	--/S/--/--	Freshwater lakes, reservoirs, rivers, streams, etc.	Recorded in the Great Basin of California and Nevada in freshwater habitat	Truckee River may provide suitable habitat	Yes
Fish					
Cui-ui *Chasmistes cujus*	LE/-- /P/--	Freshwater lake and inflow	Only population is in Pyramid Lake; spawns in lower Truckee River	Historically, cui-ui spawned in the lower 43 miles of the Truckee River. Currently, most spawners use lower 10-mile reach to Namana Dam	Yes
Lahontan cutthoat trout *Onchorynchus clarki hensshawi*	LT/-- /P/--	Coldwater rivers, streams , and lakes	Occurs in three distinct population segments: western Lahontan basin (Truckee, Carson, and Walker river basins), northwestern Lahontan basin (Quinn river, Black Rock Desert, and Coyote Lake basins), and Humboldt River basin	Original strain of LCT extirpated from Pyramid Lake and the Truckee River. Hatchery LCT now stocked throughout project area. Some self-sustaining populations exist well above Reno on the Truckee River	Yes

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Amphibians					
Mountain yellow-legged frog *Rana muscosa*	C/---/--/--	Montane riparian stream banks, undisturbed ponds and lakes.	Extreme western portion of Nevada. Observed in Independence Creek, Cold Creek, and Little Truckee River on the Sierraville Ranger District, California	Species is believed to be extirpated from Nevada with the presence of trout, and lack of pools and high-quality habitat	No
Northern leopard frog *Rana pipiens*	--/S/--/--	Brackish and freshwater marshes with dense vegetation	Desert lowlands to high mountain meadows	Lower reach of Truckee River from approx. 8.0 to 12.0 miles upstream from Pyramid Lake.	Yes
Reptiles					
Sierra alligator lizard *Elgaria coerulea palmeri*	--/S/P/--	Woodland and forest landscapes, grassland and brush habitat	Found in the Sierra Nevada Mountains, from Plumas County, south to Kern County where it occurs as far south a the Piute Mountains and Breckenridge Mountain	Suitable habitat may be present in project area. Species recorded within 5 miles of project area (NNHP 2007)	Yes
Birds					
Northern goshawk *Accipiter gentilis*	--/S/P/--	Nests and roosts in older stands of red fir, Jeffrey pine, and lodgepole pine forests. Hunts in forests and in forest clearings and meadows	Occurs throughout the majority of the United States, including Nevada	No documented occurrence, or appropriate nesting or foraging habitat in project area	No
Tri-colored blackbird *Agelaius tricolor*	--/S/P/--	Moderate to large areas of dense cattails, tules, or water dependent shrubs associated with emergent wetlands	Range is almost entirely restricted to California	Historical occurrence. No suitable habitat in project area	No

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Golden eagle *Aquila chrysaetos*	--/S/P/--	Occurs primarily in mountainous canyon land, rimrock terrain of open desert and grassland areas	Year-round residents of Nevada and have been documented throughout the State	Absent as breeder. Suitable nesting habitat not present. May occur as a forager	Yes
Short-eared owl *Asio flammeus*	--/S/P/--	Occurs exclusively in open areas, frequenting annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh water emergent marshes.	Majority of North America, with a secure population in the Nevada	Suitable breeding and foraging habitat available in project area	Yes
Western burrowing owl *Athene cunicularia hypugaea*	--/S/P/--	Optimum habitat typified by short vegetation and presence of fresh small mammal burrows. Found on open grasslands, especially prairie, plains, and savanna.	Western North America from Canada to Panama. California, New Mexico, and Arizona are important wintering areas	Closest documented occurrence outside the project area near Marble Bluff Dam. Suitable breeding and foraging habitat available in project area	Yes
Ferruginous hawk *Buteo regalis*	--/S/P/--	Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert	Primarily southwestern and south-central U.S. south to Baja California and central mainland of Mexico; in the U.S., in largest numbers in western Texas, eastern New Mexico, and western Oklahoma	No documented occurrence in project area	No
Swainson's hawk *Buteo swainsoni*	--/S/P/--	In Nevada, resides in agricultural valleys interspersed with cottonwood trees or on river floodplains with cottonwood overstory.	Large breeding range in western and central North America; winters mainly in southern South America	Documented sightings in project area with possible breeding in the Lahontan Valley	Yes
Sage grouse *Centrocercus urophasianus*	--/S/P/--	Sagebrush obligate species with brood rearing support by wet meadows within sagebrush range	Follows the range of sagebrush steppe from eastern California to northern Colorado, western North and South Dakota, northeast to extreme southern Nevada	Shrub community adjacent to project area provides suitable breeding and foraging habitat	Yes

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Vaux's swift *Chaetura vauxi*	--/S/--/--	Prefers late seral stages of coniferous and mixed deciduous/coniferous forests. Forages over lakeshores and streams	Ranges from British Columbia south through Central America. Uncommon transient through Great Basin.	Historical occurrence. Transient sighting along lower Truckee River. No suitable habitat in project area	No
Black tern *Chlidonias niger*	--/S/P/--	Found in fresh emergent wetlands, lakes, ponds, moist grasslands, and agricultural fields.	Inhabits both Eurasia and North America. In Nevada, nests on shallow lakes and wetlands in northern Washoe County. More common on western edge of the Great Basin in northeastern California and Ruby Lakes NWR	No documented occurrence in project area. Freshwater marshes may provide habitat for migrating birds	Yes
Western Yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/--/P/--	Riparian obligate species requiring dense tracts of cottonwood and willow forests	Riparian habitat breeders in California, Arizona, New Mexico southward into northern Mexico. Winters in tropical deciduous and evergreen forests of South America	Historical occurrence in project area. Nearest migrant sightings have occurred along a stretch of the Carson River	No
Yellow warbler *Dendroica petechia*	--/PS/P/--	Optimal nesting habitat in wet areas with dense, moderately tall stands of hydrophytic deciduous shrubs such as willows	Found throughout North and Central America with declining populations especially in California and Arizona.	Found in all reaches of the Truckee River in relatively high numbers (Klebenow and Oakleaf, 1984; Ammon and Chisholm, 1998; Ammon, 2001a).	Yes
Merlin *Falco columbarius*	--/S/P/--	Wintering habitat includes open forests and grasslands	May occur throughout the State as a winter migrant	Historical occurrences. Does not breed in project area. May occur as a winter migrant	Yes
Prairie falcon *Falco mexicanus*	--/S/P/--	Primarily associated with perennial grasslands, savannahs, rangeland, desert scrub areas. Requires ledges on rocky or cliffs for nesting	Ranges above timberline in Sierra Nevada Mts. in late summer. May winter at lower elevation foothills	Suitable breeding habitat not present in project area. May forage in project area	Yes

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Bald eagle *Haliaeetus leucocephalus*	D/S/P/--	Nests and roosts in trees near lakes, reservoirs, and rivers that contain an abundant supply of fish	Widespread distribution in North America with some large numbers of occurrences, particularly in Alaska and British Columbia, but suffered great decline in southern and eastern part of range earlier this century	Rare to uncommon winter visitor to the project area. Nearest documented nest attempts have occurred at Lahontan Reservoir and east shore of Lake Tahoe.	Yes
Western least bittern *Ixobrychus exilis hesperis*	--/S/P/--	Preferred habitat is dense marshland containing cattails and reeds along waterway shorelines	Patchy distribution throughout appropriate habitat in Arizona, California, Nevada, and Oregon	Historical occurrence. No documented sightings in project area during Klebenow and Oakleaf (1984), and Ammon and Chisholm (1998) bird community surveys	No
Loggerhead shrike *Lanius ludovicianus*	--/S/P/--	Open habitats with sparse shrubs and trees, other suitable perches, bare ground and low or sparse herbaceous cover	Found throughout Nevada where suitable breeding and foraging habitat is present	Adjacent shrub communities provide suitable breeding and foraging habitat	Yes
Lewis' woodpecker *Melanerpes lewis*	--/S/P/--	Open or park-like ponderosa pine, burned-over stands of Douglas fir, mixed conifer, pinyon-juniper, riparian and oak woodlands with grassy and bushy understory	Ranges throughout the western United States, southwestern Canada and northwestern Mexico. In Nevada, it is a resident breeder in isolated pockets mainly in northern half of the State	Historical occurrence. Potential habitat exists in the mature black cottonwood forest edge along the Truckee River. No documented sightings in project area during Klebenow and Oakleaf (1984), and Ammon and Chisholm (1998) bird community surveys	Yes
Osprey *Pandion haliaetus*	--/S/P/--	Ocean shorelines, lake margins, and large, open river courses for both nesting and wintering habitat	Osprey are known to breed in the upper Truckee Basin	Does not breed in project area, but may forage along the Truckee River watercourse	Yes

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
White-faced ibis *Plegadis chihi*	--/PS/P/--	Lives near marshes, swamps, ponds, and rivers with nesting colonies hidden in dense reed beds and willow riparian areas	In the West, found in wetlands from Lower Klamath Lake on the Oregon-California border as far south as Baja California. In Nevada, the species breeds at several of the large wetland complexes of the Great Basin	Historical occurrence throughout emergent marshland in project area. More recent occurrence documented along Truckee River near Wadsworth	Yes
Vesper sparrow *Pooecetes gramineus*	--/S/P/--	Found in open habitats, including old fields, sagebrush, grasslands, and cultivated crop fields	In Nevada, vesper sparrows are known to breed from the south-central portion of the State north with most nesting reported in the northernmost counties	Adjacent shrub communities provide suitable breeding and foraging habitat	Yes
Mammals					
Pygmy rabbit *Brachylagus idahoensis*	--/S/P/--	Typically in dense stands of big sagebrush growing in deep loose soils.	Oregon to east-central California, east to western Utah and southwestern Montana; isolated population in east-central Washington	No documented occurrence of pygmy rabbits within project area. Habitat may be available adjacent to the project area where big sagebrush-dominated plains and alluvial fans exist	Yes
Townsend's big-eared bat *Corynorhinus townsendii*	--/S/P/--	Highly associated with caves and mines. Found primarily in rural settings from deserts to mid-elevation mixed coniferous-deciduous forests	Found throughout Nevada from low desert to high mountain habitats. Concentrated in areas offering caves or mines as roosting habitats	Historical occurrence in vicinity of project area (Stillwater NWR, Pyramid Lake area). No recent surveys for this species are known to have been conducted within the project area	Yes
Big brown bat *Eptesicus fuscus*	--/S/--/--	Prefers open areas, water sources, or among trees in fairly open stands to forage. Uses buildings and other human-made structures for roosting	Recorded throughout Nevada	May use highway bridges, large culverts, and buildings for roosting, and may forage along Truckee River	Yes

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Spotted bat *Euderma maculatum*	--/S/P/--	Deserts to high mountains; roosts primarily in crevices in cliffs near water; may forage in riparian areas	Distribution is fairly broad throughout western U.S. but is extremely patchy and highly associated with prominent rock features.	Historical occurrence within the project area in Reno, Washoe County. Recorded elsewhere in the central and northern Nevada	Yes
River otter *Lontra canadensis*	--/S/P/--	Cover provided by thickets, tall wetland plants, hollow logs, stumps, snags, and other cavities	May be found anywhere there is a permanent food supply and easy access to water. Favor streams with low gradient, high meander ratios, and multiple channels	Occurrence recorded in Storey County and the Truckee River provides suitable habitat	Yes
Small-footed myotis *Myotis ciliolabrum*	--/S/--/--	Inhabits a variety of habitats including desert scrub, grasslands, sagebrush steppe, and pinyon-juniper woodlands	Occurs in most of the western U.S. Found throughout Nevada at middle and higher elevations to the south, and valley bottoms in the northern and central portions of the State	Occurrences recorded in the Wadsworth area within the project area.	Yes
Long-eared myotis *Myotis evotis*	--/S/--/--	Preferred habitat is the high mountain coniferous forests but may also be found in semi-arid shrublands, sagebrush, chaparral, and agricultural areas	Widespread distribution in western U.S. Found throughout Nevada, primarily at the higher elevations associated with coniferous forest. More widespread and common in the northern half of the state	No documented occurrence in project area	No
Fringed myotis *Myotis thysanodes*	--/S/--/--	Inhabits mid-elevation grasslands, deserts, and oak and pinon woodlands. Has also been detected in high-elevation spruce-fir forests	Found sparsely scattered through central and southern Nevada from upper elevation Creosote Bush desert to 7,000 ft. in the White Pine Mountains	No documented occurrence in project area	No

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Long-legged myotis *Myotis volans*	--/S/--/--	Primarily a coniferous forest bat, but also may be found in riparian and desert habitats down to 4,000 ft.	Found throughout Nevada but more widespread and common in the northern half. Occurs from mid- to high elevations. Absent from the low desert	No documented occurrence in project area, but suitable roosting and foraging habitat is present in the project area	Yes
Yuma myotis *Myotis yumanensis*	--/S/--/--	Optimal habitat includes open forests and woodlands with abundant water sources near ponds, streams and lakes	Found primarily at low to middle elevations in the southern and western half of Nevada	Occurrences recorded near Reno and on lower Truckee River south of Pyramid Lake within the project area	Yes
Brazilian free-tailed bat *Tadarida brasiliensis*	--/S/P/--	Uses caves, crevices, and buildings for roosting and hibernation. Forages high over surrounding habitats and water.	Recorded throughout Nevada.	May use highway bridges, large culverts, and buildings for roosting, and may forage along Truckee River	Yes
Plants					
Steamboat buckwheat *Eriogonum ovalifolium var. williamsiae*	E/S/CE/E	Endemic to sinter soils derived from the thermal activity of Steamboat Springs	Known only from one population in the Steamboat Springs area in Washoe County, Nevada. This area is approximately 10 miles south of downtown Reno.	No documented occurrence or suitable habitat in project area	No
Sierra Valley ivesia *Ivesia aperta var. aperta*	--/S/--/T	Favors wet meadows and rocky stream edges on the eastern base of the Sierra Nevada Mountains.	Extant occurrences localized around the foothills of Mt. Rose, Hunter Creek, and Peavine Creek in Storey and Washoe Counties, Nevada	No documented occurrence or suitable habitat in project area	No
Webber's ivesia *Ivesia webberi*	C/S/CE/T	Dry barren ground and open patches of volcanic ash in sagebrush scrub at elevations between 1,036 –1,753 meters	Known from less than fifteen extant occurrences in California and Nevada, including Douglas and Washoe Counties in Nevada	No documented occurrence or suitable habitat in project area	No

Common Name *Genus species*	**Status[1] USFWS/BLM/NV/NNPS**	**Habitat**	**Distribution**	**Potential of Occurrence in Project area**	**Proposed for Evaluation in the EIS**
Sand cholla *Opuntia pulchella*	--/--/CY/--	Found in dry regions of Nevada about 4,000 feet in elevation. Dependent on sand dunes or deep sand	Cactus grows almost exclusively in Nevada, but it also occurs in Utah	Documented occurrences east of Wadsworth outside of project area	No
Nevada oryctes *Oryctes nevadensis*	--/S/--/--/W	Requires deep loose sand in stabilized dunes, washes, and valley flats	Known to occur in Churchill, Humboldt, Mineral, Perishing, and Washoe Counties, Nevada.	Documented occurrence in the vicinity of Wadsworth, Washoe County, Nevada	Yes

[1]Key to Status:

-- = No Listing

U.S. Fish and Wildlife Service (USFWS):
LE = USFWS Endangered
LT = USFWS Threatened
PE = USFWS Proposed Endangered
PT = USFWS Proposed Threatened
C = USFWS Candidate
D = Delisted

Nevada Bureau of Land Management (BLM):
S = Nevada Special-status Species – designated Sensitive by State Office
PS = Proposed Nevada Special-status Species – designated Proposed Sensitive by State Office

Nevada State Protected Species (NV):
Fauna:
P = Species protected under NRS 501
Flora:
CE = Critically endangered (NRS) 527.260 - .300)
CY = Protected as a cactus, yucca, or Christmas tree (NRS 527.060 - .120)

Nevada Native Plant Society (NNPS):
E = Endangered
T = Threatened
W = Tracked as watch-list species

APPENDIX F

INFORMATION REGARDING CULTURAL RESOURCES

STATE OF NEVADA
DEPARTMENT OF CULTURAL AFFAIRS
State Historic Preservation Office
100 N. Stewart Street
Carson City, Nevada 89701
(775) 684-3448 • Fax (775) 684-3442
www.nvshpo.org

JIM GIBBONS
Governor

MICHAEL E. FISCHER
Department Director

RONALD M. JAMES
State Historic Preservation Officer

January 7, 2010

Francis C. Piccola
Chief, Planning Division
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento CA 95814-2922

RE: Draft of the "People and Places of Truckee Meadows: An Enthohistory of a Portion of the Truckee Meadows Flood Control Project, Washoe County Nevada".

Dear Francis C. Piccola:

The Nevada State Historic Preservation Office (SHPO) reviewed the subject document. The SHPO does not recommend any changes to the subject document.

Thank you for the opportunity to review the subject document.

If you have any questions concerning this correspondence, please contact me by phone at (775) 684-3443 or by e-mail at Rebecca.Palmer@nevadaculture.org.

Sincerely,

Rebecca L Palmer

Rebecca Lynn Palmer
Review and Compliance Officer, Archaeologist

PROGRAMMATIC AGREEMENT
BETWEEN
THE U.S. ARMY CORPS OF ENGINEERS
AND
THE NEVADA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE
TRUCKEE MEADOWS FLOOD CONTROL PROJECT

WHEREAS, The U. S. Army Corps of Engineers, Sacramento District (Corps), under the authority of House Conference Report (House Resolution 1905) to the Energy and Water Development Act of 1996 (Public Law 104-46), has determined that the Truckee Meadows Flood Control Project (Project) proposed by the Corps may have an effect on properties that are either included in, or are eligible for inclusion in the National Register of Historic Places (NRHP) and has consulted with the Nevada State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA); and

WHEREAS, the Corps has consulted with Washoe County, Storey County, the City of Reno, the City of Sparks, Nevada Department of Transportation, Federal Highway Administration, and the University of Nevada, Reno and has invited them to be concurring parties to this Programmatic Agreement (PA); and

WHEREAS, the Pyramid Lake Paiute Tribe, the Washoe Tribe of Nevada and California, The Reno-Sparks Indian Colony, The Carson Community Council, The Dresslerville Community council, The Stewart Community Council, and the Woodsford Community Council have been contacted and afforded the opportunity to participate in the Section 106 process and will continue to be included throughout the process; and

WHEREAS, the Advisory Council on Historic Preservation (ACHP) was invited to participate in consultation and has declined; and

WHEREAS, this agreement addresses all phases and segments of the project; and

WHEREAS, the definitions set forth in 36 CFR 800.16 are incorporated herein by reference and apply throughout this PA;

NOW, THEREFORE, the Corps and the SHPO agree that the proposed undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on historic properties and to satisfy the Corps' Section 106 responsibilities for all individual aspects of the undertaking.

DEFINITIONS

Signatories are those parties who have the exclusive right to execute, amend or terminate a PA.

Concurring Parties. Concurring means their concurrence indicates that they are in agreement with the terms of the PA.

STIPULATIONS

The Corps shall ensure that the following measures are carried out:

Stipulation I
Identification, Evaluation, and Effects Determination

A. The Corps shall determine and document the Area of Potential Effects (APE) for the undertaking in consultation with SHPO. Future project design may require redefining the APE. The Corps shall consult with SHPO in a timely manner to amend the boundaries of the APE.

B. The Corps shall complete and report the results of all required intensive surveys of the undertaking's APE in a manner consistent with the "Secretary of the Interior's Standards and Guidelines for Identification" (48 FR 44720-23) and take into account the National Park Service's publication, "The Archeological Survey: Methods and Uses" (1978: GPO stock #024-016-00091). This will include areas not previously surveyed and areas where previous surveys are deemed by the Corps, in consultation with the SHPO, to be inadequate. This will also include additional areas that may be affected by changes in the project design, borrow areas, haul roads, staging areas, extra work space, and other ancillary areas related to the undertaking. If identified cultural resources do not need to be evaluated but can be determined eligible based on the results of the survey and prepared contexts and historic documentation, then the Corps may request SHPO concurrence with those determinations at that time. Reports produced as a result of intensive surveys shall be submitted to SHPO for review. SHPO shall have 30 calendar days after receipt to provide comments to the Corps.

C. Survey recordation shall include linear features, isolates, and re-recordation of previously recorded sites as necessary. The survey shall ensure that historical structures and buildings, and historical engineering features are recorded in addition to archeology sites. The types of properties to be recorded shall include, but not be limited to; commercial, residential, and ecclesiastical buildings, roads, trails, bridges, culverts, and agricultural features, including ditches. Recordation of historic structures and buildings shall be prepared using the State Historic Preservation Office, Historic Resources Inventory form, August 2004 revision.

D. Previously recorded sites will be updated using the Nevada IMACS form and encoding form. Isolates will be numbered sequentially, plotted on a map and recorded on a single table within the report. Non-linear sites outside of the APE will be examined in their entirety unless access to land is prohibited. In the event access cannot be gained, the Corps will consult with SHPO regarding appropriate means of evaluating a given site. Linear resources (i.e., railroad, road, trail, ditch, etc.) that appear on GLO plat maps or are known from other archival data to be potentially significant, or which have associated features or dateable artifacts will be recorded on IMACS site forms. Linear resources not mentioned on GLO plat maps or that appear on GLO plat maps but which are not associated with features or dateable artifacts, and so not appear to be significant on the basis of known archival data will be treated as "isolated road segments" and will be recorded in tabular form and collected data will include at a minimum two (2) separate GPS points at both ends of the linear feature within the APE.

E. The Corps shall ensure that Evaluation Plans (EP) prepared for previously unevaluated cultural resources identified within the APE are consistent with the "Secretary of the Interior's Standards and Guidelines for Evaluation" (48 FR 44723-26). Individual EPs will be developed to address different categories of potentially eligible historic properties. A Discovery Evaluation Plan (DEP) and a Construction Monitoring Plan (CMP) shall be developed as components of an EP. An EP shall be used whenever the Corps, in consultation with the SHPO, determines that a cultural resource should be evaluated and use of the EP is essential to determine the boundaries and data potential of the site. Any archaeological testing shall be limited to disturbing no more than 20% of the surface area of the resource and shall be just sufficient to determine a site's eligibility for inclusion in the National Register.

F. The Corps shall submit the EP for concurrent review to the SHPO, and appropriate Native American groups. Reviewers shall have 30 calendar days after receipt to comment on the draft EP. The Corps shall ensure that any comments received within that time period are taken into account and incorporated into the final EP. If the Corps cannot concur with comments made by SHPO and/or tribes, the Corps will resolve the dispute in accordance with Stipulation XII. Failure of the SHPO to comment within the specified time period shall not preclude the Corps from allowing the draft EP to be finalized and implemented in accordance with the terms of this stipulation. The Corps shall ensure that the SHPO is expeditiously provided with copies of the final EP.

G. The Corps in consultation with SHPO shall ensure that determinations of eligibility are made in accordance with the criteria set forth in 36 CFR 60.4 for all properties within the APE, including additional areas that may be affected by changes in the project design, borrow areas, haul roads, staging areas, extra work space, and other ancillary areas related to the undertaking. If the Corps and the SHPO cannot agree on the National Register eligibility of a property, the Corps shall obtain a determination from the Keeper of the National Register in accordance with 36 CFR 63. The determination of the Keeper shall be final for purposes of this PA.

H. The Corps shall ensure that copies of draft evaluation reports are submitted concurrently to the SHPO, other concurring parties for review and comment.

I. Failure by any reviewer to comment within this time period shall not preclude the Corps from allowing draft reports to be finalized. The Corps shall ensure that all reviewers named in this stipulation shall expeditiously receive copies of all final survey and evaluation reports.

J. The Corps shall ensure that historic, architectural, and archaeological work conducted pursuant to this Agreement is carried out by, or under the direct supervision of a person or persons meeting qualifications set forth in the Secretary of the Interior's Professional Qualification Standards (36 CFR 61).

Stipulation II
Determinations of Effect

The Corps shall apply the Criteria of Adverse Effect pursuant to 36 CFR 800.5(a) (1) to all historic properties within the APE that will be affected by the Project. Determinations of effect shall be made in consultation with the SHPO and other interested parties.

Stipulation III
Public and Native American Involvement

A. The Corps will identify and consult with appropriate tribes to identify properties of traditional religious and cultural importance.

B. The Corps shall seek comments from all potentially interested Native American groups in light of the guidance provided in National Register Bulletin 38 in making determinations of eligibility for any Traditional Cultural Properties as these are defined in Bulletin 38. All reviewers shall have 30 calendar days after receipt to provide comments to the Corps. The Corps shall ensure that any comments received during this time period are taken into account and incorporated into the final survey and evaluation reports. Disputes shall be resolved by the Corps in accordance with Stipulation XII.

C. The Corps, in consultation with SHPO, shall evaluate the request of a special interest group to be a concurring party to this agreement following its execution.

Stipulation IV
Treatment of the Virginia Street Bridge

The Virginia Street Bridge (VSB) is an historic property listed in the National Register of Historic Places. Treatment of the VSB shall be consistent with the stipulations contained within the Memorandum of Agreement for The Virginia Street & Center Street Bridges executed on 20 May 1996 between the Federal Highway Administration, The Nevada State Historic Preservation Office Bridge, and the Advisory Council on Historic Preservation (Attachment 1).

Stipulation V
Preparation of Historic Property Treatment Plans

The Corps, in consultation with SHPO shall ensure that a Historical Property Treatment Plan (HPTP) is developed for the mitigation of anticipated effects on historic properties that will result from the Project and any related uses and activities. Further, the Corps, in consultation with SHPO, will ensure the development of location and property specific Data Recovery Plans for each individual permit application of the Project that will be considered as Supplements to the Treatment Plan.

A. Avoidance of adverse effects on historic properties is the preferred treatment approach. The HPTP will discuss and justify the chosen approaches to the treatment of project historic properties and those treatment options considered, but rejected. If preservation of part or all of any historic properties is proposed, the treatment plan will include discussion of the following:

1. Description of the area or portions of the historic properties to be preserved in-place, and an explanation of why those areas or portions of sites were chosen;
2. Explanation of how the historic properties will be preserved in-place, including both legal and physical mechanism for such preservation;
3. A plan for monitoring and assessing the effectiveness of mechanisms to preserve the historic properties; and
4. A plan for minimizing or mitigating future adverse effects on the historic properties if preservation in-place mechanisms prove to be ineffective.

B. When avoidance is not feasible, the Corps in consultation with SHPO shall ensure that its consultant develops an appropriate treatment plan designed to lessen or mitigate project-related effects to historic properties. For properties eligible under criteria (a) through (c) (36 CFR 60.4) mitigation other than data recovery may be considered in the treatment plan (e.g., HABS/HAER recordation, oral history, historic markers, exhibits, interpretive brochures or publications, etc.). Where appropriate, treatment plans shall include provisions (content and number of copies) for a publication for the general public.

C. When data recovery is proposed, the Corps in consultation with SHPO shall ensure that its consultant develops a data recovery plan that is consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation and the ACHP's "Recommended Approach for Consultation on Recovery of Significant Information from Archaeologist Sites" (ACHP May 18, 1999). Components to be included in data recovery plans are found in Appendix 2.

D. Each phrase or segment specific treatment plan tier off of the HPTP prepared for the project, providing specific direction for the conduct of data recovery within any project segment. Components to be included in data recovery plans are found in Appendix 2.

E. The interested public, including Native American tribes will be invited to provide input on the identification, evaluation, and proposed treatment of historic properties. Depending on the specific nature of the undertaking this will be done through letters of notification, public meetings, and site visits.

Stipulation VI

Review of Treatment Plan and Supplemental Treatment Plans

The Corps shall ensure that draft HPTP's and Supplemental Treatment Plans (STP) are submitted concurrently to the SHPO, the Council, and appropriate Native American groups and individuals for review and comment. Reviewers shall have 30 calendar days after receipt of the draft

HPTP to comment to the Corps. The Corps shall ensure that any comments received during this time period are taken into account and incorporated into the final HPTP. The Corps shall make every effort to resolve disputes that may arise from conflicting comments by the consulting parties via telephone conversations. In the event that disputes are not easily remedied, the Corps shall resolve them in accordance with Stipulation XII. Failure to comment within this time period shall not preclude the Corps from allowing the HPTP to be finalized and implemented. The Corps shall ensure that all reviewers are expeditiously provided with copies of the final HPTP.

A. If revisions are needed, any party, including the SHPO, has 30 days to review the revisions. If no comments are received within 30 days, concurrence among the parties will be assumed.

B. Once the reviewing parties determine the HPTP adequate, the Corps shall issue authorization to proceed with the development of STP's. The corps shall ensure that its consultant develops and implements an appropriate treatment plan. A separate 30-day period for all consulting parties shall apply to the review of the STP's. Situations that require development and review of STP's are in Stipulation VII(B-C).

C. Once the reviewing parties determine the STP's adequate, the Corps shall issue authorization to proceed with the implementation of the plans.

D. Final drafts of the HPTP and all subsequent STP's will be provided to SHPO and the Council.

Stipulation VII
Modifications in Construction, Right-of-Way, and Ancillary Areas

A. Identification and Evaluation

1. If rerouting a portion of the proposed right-of-way (ROW) becomes necessary or if activities are proposed in ancillary areas (AA's) (for example, borrow or disposal areas) that have not been previously surveyed for historic properties, the Corps shall ensure that the APE of the proposed reroute or unsurveyed AA is inventoried and that any properties located within those APE's that may be affected by the undertaking are evaluated.
2. Identification and evaluation of such properties will be carried out in the manner specified in Stipulation IA - II, inclusive, except as noted below.

B. Supplemental Treatment Plans

1. Where historic properties within the rerouted ROW or AA's may be affected by the undertaking, the Corps shall ensure that specific STP's are prepared.
2. The STP's shall be prepared in the manner specified in Stipulation V, inclusive, except as noted below.

C. Review of STP's

Review of STP's shall proceed in the manner specified in Stipulation VI.

D. The Corps may authorize construction in any area subject to the provisions of this stipulation after the Corps and the SHPO have consulted and agreed in writing that such construction either will not affect historic properties, or that the area does not contain historic properties.

Stipulation VIII
Notices To Proceed With Construction

Notices to Proceed (NTP) may be issued by the Corps for individual construction segments, defined by the Corps in its construction Specifications, under any of the following conditions:

1. the Corps and SHPO have determined that there are no cultural resources within the APE for a particular construction segment; and

2. the Corps and SHPO have determined that there are no historic properties within the APE for a particular construction segment; or

3. the Corps after consultation with the SHPO and interested persons has implemented an adequate treatment plan for the construction segment, and

    (a) the fieldwork phase of the treatment option has been completed;

    (b) The Corps has accepted a summary of the fieldwork performed and a reporting schedule for that work.

Stipulation IX
Discovery of Unknown Historic Properties

If potentially National Register eligible cultural resources are discovered during construction, ground disturbing activities will cease until the provisions of 36 CFR 800.13(b), Discoveries without prior planning, are met. The Corps will provide the SHPO and the Council an opportunity to review and comment on proposed treatment in accordance with Stipulation V. The Corps will contact the SHPO by facsimile machine, telephone, and/or email within 48 hours of the discovery. The SHPO has 48 hours to respond by facsimile machine, telephone, and/or email following initial contact by the Corps.

Stipulation X
Curation

The Corps shall ensure that all cultural materials and associated records resulting from identification, evaluation, and treatment efforts conducted under this PA are curated in accordance with 36 CFR Part 79, except as specified in Stipulation XI. Archaeological items and materials from privately owned lands to be returned to their owners should be maintained in accordance with 36 CFR 79 until any specified analyses are complete.

Stipulation XI
Native American Consultation and Treatment of Human Remains

A. The Corps in consultation with SHPO will ensure that Native Americans are consulted during, and may participate in, implementation of the terms of this PA. The specific manner in which this Native American involvement will occur will be set forth in the HPTP's.

B. The Corps will ensure that Native American human remains, grave goods, items of cultural patrimony, and sacred objects encountered during the undertaking that are located on state or private land are treated in accordance with the requirements of NRS 383, and on federal land the Native American Graves Protection and Repatriation Act (NAGPRA), and the Archaeological Resources Protection Act (ARPA).

Stipulation XII
Dispute Resolution

A. Should any signatory to this PA object within 30 calendar days to plans provided for review pursuant to this PA or to actions proposed or carried out pursuant to this PA, the Corps shall notify the other signatories to this PA and consult to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the Council. Within 45 days after receipt of all pertinent documentation, the Council shall either:

1. Provide the Corps with recommendations that the Corps shall take into account in reaching the final decision regarding the dispute; or

2. Notify the Corps that it will comment pursuant to 36 CFR 800.7, and proceed to comment. Any Council comment provided in response to such a request shall be taken into account by the Corps in accordance with 36 CFR 800.7 with reference to the subject of the dispute.

B. Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute. The Corps's responsibility to carry out all actions required by this PA that are not subject of the dispute shall remain unchanged.

Stipulation XIII
Amendments, Noncompliance, and Termination

A. If any signatory believes that the terms of this PA cannot be carried out or are not being met, or that an amendment to its terms should be made, that signatory will immediately consult with the other signatories to consider and develop amendments to this PA pursuant to 36 CFR 800.6(c)(7)

B If this PA is not amended as provided for in this stipulation, the Corps, or the SHPO may terminate it. The party terminating the PA will in writing provide all other signatories with an explanation of the reasons for termination in accordance with 800.6(c)(8).

C. If this PA is terminated and the Corps determines that the undertaking authorizing the project will proceed, the Corps shall comply with 36 CFR 800.3-6.

Stipulation XIV
Duration of the PA

A. If the project has not been implemented within ten (10) years of the date of execution of the PA and the PA has not been terminated, the signatories shall consult on a date not less than 90 days prior to the tenth anniversary of this PA to reconsider its terms. Reconsideration may include continuation of the PA as originally executed, amendment, or termination. If the PA is terminated because the undertaking no longer meets the definition of an "undertaking" set forth in 36 CFR 800.16(y), Stipulation ~~XI~~(C) shall apply.
XIII CS

B. This PA will be in effect through the Corps's implementation of the undertaking, and will terminate and have no further force or effect when the Corps, in consultation with the other signatories, determines that the terms of this PA have been fulfilled in a satisfactory manner and/or Corps involvement in the project has ended. The Corps will provide the other signatories with written notice of its determination and of termination of this PA.

Stipulation XV
Effective Date

This PA shall take effect on the date that it has been fully executed by the Corps and the SHPO.

EXECUTION of this PA by the Corps, and the SHPO, its transmittal to the Council, and subsequent implementation of its terms evidence that the Corps has afforded the Council an opportunity to comment on the undertaking and its effects on historic properties, that the Corps has taken into account the effects of the undertaking on historic properties, and that the Corps has satisfied its responsibilities under Section 106 of the National Historic Preservation Act and applicable implementing regulations for all aspects of the undertaking.

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: Ronald N. [signature] DATE: 9 August 2005

Ronald N. Light, Colonel, U.S. Army Corps of Engineers, District Engineer

NEVADA STATE HISTORIC PRESERVATION OFFICE
BY: Alice M. Baldrica, Deputy DATE: 8/23/05
TITLE: State Historic Preservation Officer, Nevada

CONCURRING PARTIES
CARSON COLONY COUNCIL

BY: ______________________________ DATE: ______________

TITLE:

DRESSLERVILLE COMMUNITY COUNCIL

BY: ______________________________ DATE: ______________

TITLE:

PYRAMID LAKE PAIUTE

BY ______________________________ DATE: ______________

TITLE:

WASHOE TRIBE OF NEVADA AND CALIFORNIA

BY ______________________________ DATE: ______________

TITLE:

RENO-SPARKS INDIAN COLONY

BY: ______________________________ DATE: ______________

TITLE:

STEWART COMMUNITY COUNCIL

BY: ______________________________ DATE: ______________

TITLE:

WOODSFORD COMMUNITY COUNCIL

BY: ______________________________ DATE: ______________

TITLE:

CITY OF RENO

BY: Charles McNeely DATE: 8/19/05

TITLE:

CITY OF SPARKS

BY: ______________________________ DATE: ______________

TITLE:

STOREY COUNTY

BY: ______________________________ DATE: ______________

TITLE:

UNIVERSITY OF NEVADA, RENO

BY: ______________________________ DATE: ______________

TITLE:

WASHOE COUNTY

BY: ______________________________ DATE: ______________

TITLE:

WOODSFORD COMMUNITY COUNCIL

BY: ______________________________ DATE: ______________
TITLE:

CITY OF RENO

BY: ______________________________ DATE: ______________

TITLE:

CITY OF SPARKS

BY: ______________________________ DATE: 10/6/2003

TITLE:

STOREY COUNTY

BY: ______________________________ DATE: ______________

TITLE:

UNIVERSITY OF NEVADA, RENO

BY: ______________________________ DATE: ______________

TITLE:

WASHOE COUNTY

BY: ______________________________ DATE: ______________

TITLE:

WOODSFORD COMMUNITY COUNCIL

BY: ______________________________ DATE: ______________
TITLE:

CITY OF RENO

BY: ______________________________ DATE: ______________

TITLE:

CITY OF SPARKS

BY: ______________________________ DATE: ______________

TITLE:

STOREY COUNTY

BY: ______________________________ DATE: ______________

TITLE:

UNIVERSITY OF NEVADA, RENO

BY: ______________________________ DATE: ______________

TITLE:

WASHOE COUNTY

BY: [signature] DATE: 9/16/05

TITLE: County Manager

Appendix 1
Standards and Guidelines for Research Designs

Research designs prepared for this undertaking shall specify, at a minimum:

- The property, or properties, or portions of properties where data recovery is to be carried out;
- Any property, or properties or portions of properties that will be destroyed with data recovery;
- The research questions to be addressed through the data recovery, with an explanation of their relevance and importance;
- The methods to be used, with an explanation of their relevance to the research questions;
- The methods to be used in analysis, data management, and dissemination of data, including a schedule;
- The proposed disposition of recovered materials and records;
- Proposed methods by which the parties to the Programmatic Agreement will be kept informed of the work and afforded the opportunity to participate; and
- A proposed schedule for the submission of progress reports to the Nevada State Historic Preservation Officer.

Appendix 2
Historic Property Treatment Plans (HPTP) shall address:

- The historic properties or portions of historic properties where treatment will be implemented;

- Any historic properties or portions of historic properties that will be destroyed or altered without treatment;

- A research design that will contain the research questions and goals that are applicable to the project area as a whole and that will be addressed through data recovery, along with an explanation of their relevance and importance. These research questions and goals shall reflect the concepts of historic contexts as defined in National Register Bulletin 16. Historic contexts shall be prepared to provide the necessary background information to properly evaluate historical, engineering, and architectural properties;

- The field and analysis methods to be used, with an explanation of their relevance to the research questions;

- The methods to be used in data management and dissemination of data, including a schedule;

- The proposed disposition of recovered materials and records;

- Proposed methods for disseminating results of work to the interested public;

- Proposed methods by which appropriate Native American groups and individuals, local governments, and other interested persons will be kept informed about implementation of the HPTP and afforded an opportunity to comment;

- A proposed schedule for submission of progress reports to the Corps, SHPO, and the Council;

- Methods and procedures for the recovery, analysis, treatment, and disposition of human remains, associated grave goods, and objects of cultural patrimony that reflect any concerns and/or conditions identified as a result of consultations between the Corps and any affected Native American Group (see Stipulation IX);

- The historic properties to be affected in the specified project segment and the nature of those effects;

- The research questions identified in the HPTP that will be appropriate for the specified project segment and that will be addressed through data recovery, along with any explanation of their relevance to the overall research goals as established in the HPTP;

- The specific field work and analytical strategies identified in the HPTP, as well as any other strategies that will be used in the specified project segment;
- A proposed schedule for submission of progress, summary, and other reports to the Corps and;

- Qualifications of consultants employed to undertake the implementation of the STP.

Avoidance of adverse effects on historic properties is the preferred treatment approach. The HPTP will discuss and justify the chosen approaches to the treatment of project historic properties and those treatment options considered, but rejected. If preservation of part or all of any historic properties is proposed, the treatment plan will include discussion of the following:

1. Description of the area or portions of the historic properties to be preserved in-place, and an explanation of why those areas or portions of sites were chosen;
2. Explanation of how the historic properties will be preserved in-place, including both legal and physical mechanism for such preservation;
3. A plan for monitoring and assessing the effectiveness of mechanisms to preserve the historic properties; and
4. A plan for minimizing or mitigating future adverse effects on the historic properties if preservation in-place mechanisms prove to be ineffective.

MEMORANDUM OF AGREEMENT
Virginia Street &
Center Street Bridges
Reno, Nevada

WHEREAS, the Federal Highway Administration (FHWA) has determined that the rehabilitation of the Virginia Street Bridge and the reconstruction of the Center Street Bridge, will have:

No Adverse Effect on the Virginia Street Bridge, a historic property listed on the National Register of Historic Places; and

Adverse Effect on the Center Street Bridge, a historic property eligible to the National Register of Historic Places; and

has consulted with the Nevada State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (Council) pursuant to 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f); and

WHEREAS, the Nevada Department of Transportation (NDOT) and the City of Reno, Nevada, has participated in the consultation and concurred in this Memorandum of Agreement; and

NOW, THEREFORE, FHWA, NDOT, the City of Reno, SHPO, and the Council agree that this undertaking shall be implemented in accordance with the following stipulations. These stipulations will take into account the effects of the undertaking on both the Virginia Street bridge and the Center Street bridge.

Stipulations

The FHWA will ensure that the following measures are carried out and acceptable to the appropriate agency.

1. The FHWA shall ensure that:

a. The Virginia Street bridge be rehabilitated in a manner that preserves the historical and architectural value of the bridge through conformance with the Secretary of Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings."

b. After the Center Street bridge is demolished, it will be replaced with a new bridge designed to be compatible with the surrounding historic properties.

2. The FHWA shall ensure that the "Final Construction Documents" as they become available for each bridge, are provided to the SHPO for a 30 day review period. SHPO will provide written comments to FHWA within that 30 day time period or the FHWA will assume that the SHPO approves the documents. If there is a disagreement that cannot be resolved through meetings or additional documentation, the FHWA shall consult the Advisory Council as per stipulation 6.

3. The FHWA shall ensure that the construction, and any other activities associated with this undertaking, take place and are completed without any visually identifiable changes from the project plans dated March 29, 1996 and project effect documentation dated January 11, 1996, unless:

a. The FHWA, shall ensure that the SHPO be provided with appropriate documentation for review of any changes in the project's design, implementation, etc., including Change Orders, that could result in:

1. Any visible features added or deleted from the bridges.
2. Changes in colors, materials, and textures of any visible portion of the bridge.
3. Changes in the railings, lights, or benches that are visible.
4. Changes in the style or form of the bridges themselves.

b. The FHWA shall ensure that the SHPO has two standard working days, from the receipt of adequate documentation, to review each proposed change. At the end of those two standard working days, the SHPO will provide written comments on the proposed changes. Should there be any disagreement between FHWA and SHPO, staff from both agencies will meet as soon as possible to resolve the difficulty.

4. The FHWA has consulted with the HABS/HAER Coordinator of National Park Service (NPS). The FHWA has provided existing HAER reports to NPS and will provide further documentation as requested by NPS. NPS must accept documentation prior to FHWA commencing the project.

5. The FHWA shall ensure that all work carried out pursuant to this agreement is carried out by or under the direct supervision of a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738-9) as appropriate.

6. Should the Nevada SHPO or the Council object within 30 days to any actions proposed pursuant to this agreement, the FHWA shall consult with the objecting party to resolve the objection. If the FHWA determines that objection cannot be resolved, the FHWA shall forward all documentation relevant to the dispute to the Council. Within 30 days after receipt of all pertinent documentation, the Council will either:

a. provide the FHWA with recommendations, which the FHWA will take into account in reaching a final decision regarding the dispute; or

b. notify the FHWA that it will comment pursuant to 36 CFR § 800.6(b), and proceed to comment. Any Council comment provided in response to such a request will be taken into account by the FHWA in accordance with 36 CFR § 800.6(c)(2) with reference to the subject of the dispute.

If any of the signatories to this agreement believe that the terms of the agreement cannot be carried out, or that an amendment to the terms of the agreement must be made, that signatory shall immediately notify the other signatories and request consultation to amend this agreement. The process of amending the agreement shall be the same as that exercised in creating the original agreement.

Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute; the FHWA's responsibility to carry out all actions under this agreement that are not the subjects of the dispute will remain unchanged.

Execution of this Memorandum of Agreement by the FHWA and the Nevada SHPO, its subsequent acceptance by the Council and implementation of its terms, evidence that FHWA has afforded the Council an opportunity to comment on the Virginia Street and Center Street bridge project and its effects on historic properties, and that FHWA has taken into account the effects of the undertaking on historic properties.

FEDERAL HIGHWAY ADMINISTRATION

By:_______________ Date: 4/18/96
Division Administrator

NEVADA STATE HISTORIC PRESERVATION OFFICE

By: _______________ Deputy Date: 4/12/96
Nevada State Historic Preservation Officer

Concur:

NEVADA DEPARTMENT OF TRANSPORTATION

By:_______________ Date: 4/12/96
for Director

THE CITY OF RENO, NEVADA

By:_______________ Date: 4-24-96

ACCEPTED FOR THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:_______________ Date: 5-20-96

Preserving America's Heritage

March 15, 2005

Richard Perry
US Army Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

REF: *Truckee River Flood Control Plan*

We received your notification and supporting documentation regarding the adverse effects of the referenced project on a property or properties eligible for inclusion in the National Register of Historic Places. Based upon the information you provided, we do not believe that our participation in consultation to resolve adverse effects is needed. However, should circumstances change, please notify us so we can re-evaluate if our participation is required. Pursuant to 36 CFR 800.6(b)(iv), you will need to file the Agreement, and related documentation at the conclusion of the consultation process. The filing of this Agreement with the ACHP is necessary to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions, please contact Margie Nowick at 303/969-5110 or via email at mnowick@achp.gov.

Sincerely,

Nancy Kochan

Nancy Kochan
Office Administrator/Technician
Western Office of Federal
Agency Programs

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Appendix 3

AMENDMENT TO
PROGRAMMATIC AGREEMENT (PA) BETWEEN THE U.S. ARMY CORPS OF ENGINEERS (Corps) AND THE NEVADA STATE HISTORIC PRESERVATION OFFICER (SHPO) REGARDING THE TRUCKEE MEADOWS FLOOD CONTROL PROJECT

WHEREAS, Stipulation XIII of the PA states, "If any signatory believes that the terms of this PA cannot be carried out or are not being met, or that an amendment to its terms should be made, that signatory will immediately consult with the other signatories to consider and develop amendments to this PA pursuant to 36 CFR 800.6(c)(7)".

WHEREAS, the City of Reno (City) has filed their intent to submit a Section 408 application for treatment of the Virginia Street Bridge (VSB) in advance of the Truckee Meadows Flood Control Project. Treatment of the Virginia Street Bridge remains part of the investigation of the Truckee Meadows Flood Control Project. Should treatment be identified as part of the tentatively selected plan, effects to the Virginia Street Bridge and mitigation identified would also be described in the Environmental Impact Statement for the Truckee Meadows Flood Control Project, and

WHEREAS, Stipulation IV - Treatment of the Virginia Street Bridge in the PA states:

The VSB is an historic property listed in the National Register of Historic Places. Treatment of the VSB shall be consistent with the stipulations contained within the Memorandum of Agreement for The Virginia Street & Center Street Bridges executed on 20 May 1996 between the Federal Highway Administration, The Nevada State Historic Preservation Office, and the Advisory Council on Historic Preservation (ACHP) (Attachment 1).

NOW THEREFORE, the Corps and SHPO agree that Stipulation IV of the PA be amended to read as follows:

Stipulation IV(a)
Amended Treatment of the Virginia Street Bridge (VSB)

A. As a result of amended Stipulation 1, of the Amendment to Memorandum of Agreement, Virginia Street & Center Street Bridges, Reno, Nevada executed on 4/29/2010 by the Federal Highway Administration, Stipulation IV of this PA is superseded by this Stipulation IV(a), which effectively replaces Stipulation IV, effective upon execution of this amended to the PA.

B. Responsibility for the disposition of the VSB, a property listed in the National Register of Historic Places in 1980, has been assumed by the City in the attached letters of intent dated December 11, 2009, and February 8, 2010. By assuming the responsibility for all actions regarding treatment of the VSB, the City agrees to obtain a letter of permission pursuant to Section 408 of the River and Harbors Act of 1899, and obtain a Corps permit pursuant to Section 404 of the Clean Water Act. All compliance pursuant to Section 106 of the National Historic Preservation Act of 1966 as amended will be through this PA, and will be concluded prior to implementation of treatment.

C. Insofar as treatment of the VSB may constitute an Adverse Effect pursuant to 36 CFR 800.5, the City shall perform the necessary mitigation measures to resolve those adverse effects. The City shall develop an Historic Properties Treatment Plan (HPTP) that is consistent with the provisions of Stipulation V of this PA. The mitigation measures shall be approved by the Corps and SHPO prior to any action by the City for treatment of the VSB. The interested public, historic preservation organizations, and Indian Tribes will be invited to be consulting parties regarding proposed treatment of the VSB. In some cases, mitigation may be required to be completed prior to any action being implemented by the City.

D. Inasmuch as the City is proposing to incorporate the treatment of the VSB as an integral element of the City of Reno TRAction Visioning Project, treatment of the VSB continues to be an essential component of the Corps' Truckee Meadows Flood Control Project. To this end, the City assumes the responsibilities of implementing an approved HPTP and mitigation measures as specified in D (1-4).

1. Identification of potential consulting parties interested in the treatment of the VSB;

2. Assemble a design review committee of interested consulting parties to include at least one member of City Engineers Office, one member of the SHPO office and others as appropriate. The City and the Corps will consult on the appropriate membership of the design review committee based on regulation 36 CFR 800.2;

a. Identify potential treatments that would be part of an HPTP;

b. Determine design standards for a new bridge in conformance with the Secretary of Interior's Standards and Guidelines for the Treatment of Historic Properties;

c. Should there be a disagreement that cannot be resolved on the design review committee then the disagreement will be resolved per Stipulation XII of this PA.

3. Solicit public comments on the new bridge design using the standards created by the design committee. Comments may be obtained through public workshops, virtual forums or public meetings and will be considered during final design;

4. When the new bridge design has been completed, the City shall present a submittal consisting of the new bridge design and HPTP to the Corps for approval. Upon Corps approval, they will officially transmit to the SHPO for concurrence.

5. Any action proposed by the City with regard to treatment of the VSB shall insure that all hydraulic and hydrological requirements as specified by the Corps at the time of design are met.

E. The Corps will continue to bear responsibility for insuring full compliance with Section 106 of the National Historic Preservation Act.

F. In the event that Truckee Meadows Flood Control Project is authorized (by Congress) before the implementation of treatment of the VSB or its components by the City, the City shall be absolved of all further responsibilities specified in paragraphs B-D of this stipulation.

Stipulation XIV(a)
Duration of the PA

A. If the project has not been implemented within ten (10) years of the date of execution of the ***amended*** PA and the PA has not been terminated, the signatories shall consult on a date not less than 90 days prior to the tenth anniversary of this PA to reconsider its terms. Reconsideration may include continuation of the PA as originally executed, amendment, or termination. If the PA is terminated because the undertaking no longer meets the definition of an "undertaking" set forth in 36 CFR 800.16(y), Stipulation XIII(C) shall apply.

B. This PA will be in effect through the Corps's implementation of the undertaking, and will terminate and have no further force or effect when the Corps, in consultation with the other signatories, determines that the terms of this PA have been fulfilled in a satisfactory manner and/or Corps involvement in the project has ended. The Corps will provide the other signatories with written notice of its determination and of termination of this PA.

Stipulation XV (a)
Amended Effective Date

This amendment shall take effect on the date that it has been fully executed by the Corps and the SHPO.

EXECUTION of this PA by the Corps, and the SHPO, its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the ***amended*** undertaking and its effects on historic properties, that the Corps has taken into account the effects of the undertaking on historic properties, and that the Corps has satisfied its responsibilities under Section 106 of the National Historic Preservation Act and applicable implementing regulations for all aspects of the undertaking.

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: Thomas C. Chapman DATE: 12 Apr '10

Thomas C. Chapman, Colonel, U.S. Army Corps of Engineers, District Engineer

NEVADA STATE HISTORIC PRESERVATION OFFICE

BY: Alice M Baldrica DATE: 4/29/10

TITLE: Deputy SHPO

PUBLIC WORKS DEPARTMENT
1 East 1st Street, 8th Floor
PO Box 1900
Reno, NV 89505

December 11, 2009

CITY OF RENO

Mr. Andre Aldax, Chairman
Carson Truckee Water Conservancy District
295 Holcomb Avenue
Reno, Nevada 89502-0836

RE: City of Reno Virginia Street Bridge Project

Dear Mr. Aldax:

Please let this letter serve as the City of Reno's intent to submit a 408 Permit application for the replacement of the Virginia Street Bridge Project through the Carson Truckee Water Conservancy District (CTWCD) to the U.S. Army Corps of Engineers (USACE).

The Virginia Street Bridge Project is a component of the Truckee River Flood Project; replacement of the existing structure with an improved geometry for flood conveyance is necessary for purposes of flood reduction in downtown Reno. Also, the City is concerned about the structural integrity of the Virginia Street Bridge and the potential closure of the bridge to traffic in the near future. For this reason, the City seeks to advance the replacement of the Virginia Street Bridge according to the USACE's procedures for project advancement prior to federal authorization of the Truckee River Flood Project. The Virginia Street Bridge is a component of a former federal project and is addressed in the 1973 Martis Creek Lake Agreement. The CTWCD is the co-permittee with the USACE for the regulation of encroachments into the designated flood way of the Truckee River. According to USACE procedures for a 408 application, the City will require CTWCD's assistance in approaching the USACE with a 408 Permit application. We recognize that once the Truckee River Flood Project is federally authorized, the 408 process would not be necessary. However, to pursue an advanced project at this time, the 408 process is required to honor the 1973 federal project.

As above, please let this letter serve as the City of Reno's (City's) intent to submit a 408 Permit application for the replacement of the Virginia Street Bridge Project through the Carson Truckee Water Conservancy District (CTWCD) to the U.S. Army Corps of Engineers (USACE). The City will soon select an engineering consultant to lead the design and public outreach for Virginia Street Bridge, and then will pursue preparation of the 408 Permit Application. Please direct future correspondence concerning this matter to Kerri Lanza at same address as above. Ms. Lanza's phone number is (775) 334-2683. The City requests your assistance in providing guidance and processing a 408 compliant application to the USACE. We appreciate your help and look forward to working with you on this project.

Sincerely,

John Flansberg, P.E.
Public Works Director

xc: Naomi Duerr, Truckee River Flood Project
Roger Henderson, USACE
Daniel Artho, USACE
Jerry Fuentes, USACE Matthew Setty, JBR, Consultant to CTWCD

CARSON-TRUCKEE
WATER CONSERVANCY DISTRICT
P.O. Box 2047 PHONE 322-8041
Reno, Nevada 89505-2047 FAX 322-7266

February 8, 2010

Colonel Thomas C. Chapman, District Engineer
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814

Dear Colonel Chapman,

In accordance with the Policy and Procedural Guidance for the Approval of Modification of Alteration of Corps of Engineers Projects, dated October 23, 2006, and on the behalf of the City of Reno, Nevada (City), the Carson Truckee Water Conservancy District (CTWCD) is requesting permission from the U.S. Army Corps of Engineers (Corps) to alter a portion of the Truckee River Flood Control project governed by the 1973 Martis Creek Lake Agreement. The City is requesting this authorization in relation to the reconstruction of the Virginia Street Bridge in downtown Reno. Historically, the CTWCD has complied with the 208 modifications. Due to the various agencies and funding sources involved the CTWCD requests that the Corps process the Virginia Street Bridge project subject to section 408.10 protocols.

Due to scheduling of numerous parties to this project, CTWCD requests that the Corps review and process the flood project modification application concurrently with CTWCD's application review. At this time, Reno has not provided the requisite information to initiate a review. It is anticipated that when the City's design consultants develop the 60% design plans a submittal will be made to both the CTWCD and the Corps.

If the Corps approves this request the CTWCD will consider authorizing the proposed work by way of a revised 408.10 application process. Should the Board approve the project, and upon completion of the project, is formally incorporated within this Truckee River Flood Control Project (Martis Creek Agreement), the CTWCD will accept operation and maintenance of the facility pursuant to existing maintenance practices within the CTWCD jurisdictional reach.

Within 180 days of completion of the project alteration, CTWCD will provide information to the Corps for the purpose of preparing a revised Operation and Maintenance Manual for this portion of the Truckee River.

To best support the ongoing project planning, CTWCD requests the Corps make any preliminary determinations or notifications that may impede the process by April 2010.

If you have any questions, please feel free to contact me at 775-322-8041, or our consultant Matt Setty, JBR Environmental Consultants, Inc., at 775-747-5777.

Sincerely,

Andre Aldax

Andre Aldax,
Board President

APPENDIX G

AIR QUALITY ANALYSIS

Air Quality Technical Report

Truckee Meadows Flood Control Project

Nevada

Prepared for

U.S. Army Corps of Engineers
Sacramento District

US Army Corps
of Engineers ®
Sacramento District

Prepared by CDM (2008)
Updated by HDR Inc. (2011)

April 2011

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CHAPTER 1. INTRODUCTION

This report presents the air quality impact analysis conducted for the Truckee Meadows Flood Control Project alternatives. The report describes the affected existing environment, future no action conditions, regulatory setting, environmental consequences of the alternatives, and potential cumulative effects of the project.

This report was originally prepared in April 2008 by CDM. As a result of revisions to the project and the proposed alternatives, this report was updated by HDR inc. in April 2011.

CHAPTER 2. AFFECTED ENVIRONMENT

This section describes the area studied in the air quality analysis, as well as the regulatory and environmental setting. The regulatory setting is described in terms of the federal requirements. The environmental setting is described in terms of climate and atmospheric conditions, and air pollutant sources and existing concentrations.

2.1 STUDY AREA

This section discusses aspects of air quality that could potentially be affected by the Truckee Meadows Flood Control Project. This section focuses on the existing air quality in Washoe County because Sierra County in California, Storey County and the Pyramid Lake Paiute Tribe Lands in Nevada are classified as attainment for all criteria pollutants. Therefore, although the air quality analysis evaluates the existing conditions and air emissions from project construction activities in the study area, it focuses on Washoe County.

2.2 REGULATORY SETTING

Air quality management and protection responsibilities exist in federal, state, and local levels of government. The primary statute that establishes ambient air quality standards and establishes regulatory authorities to enforce regulations designed to attain those standards is the federal Clean Air Act (CAA).

2.2.1 Air Quality Management at the Federal and State Levels

The federal CAA, as amended in 1990, is currently comprised of six titles:

- Title I – Air Pollution Prevention and Control
- Title II – Emission Standards for Moving Sources
- Title III – General
- Title IV – Acid Deposition Control
- Title V – Permits
- Title VI – Stratospheric Ozone Protection

Titles I and V contain the provisions that typically address construction projects and stationary source emissions. Title I requirements include, among others, requirements (a) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that protect human health with an adequate margin of safety as well as protect public welfare, (b) to limit emissions from new stationary sources, (c) to prevent significant deterioration of air quality in regions with air quality that is already better than the NAAQS, and (d) to develop state implementation plans (SIPs) that establish the steps to be taken to bring areas with air quality that is worse than the NAAQS back into attainment of the NAAQS by mandated attainment dates. As part of Title I, federal agencies cannot engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an approved SIP.

Title V requires that major stationary sources obtain operating permits and pay fees that are based on the quantity of pollutants emitted. Title III of the CAA gives authority to the U.S. Environmental Protection Agency (EPA) to promulgate regulations that implement the CAA requirements.

2.2.2 National Ambient Air Quality Standards

As required by the Federal CAA, the EPA has established and continues to update the NAAQS for specific "criteria" air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), inhalable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead (Pb). The NAAQS for these pollutants are listed in Table 1, and represent the levels of air quality deemed necessary by USEPA, to protect the public health and welfare with an adequate margin of safety. The health effects associated with these pollutants are summarized in Table 2.

Table 1. National Ambient Air Quality Standards

Pollutant	Averaging Period Time	Standard, as parts per million by volume (ppmv)	Standard, as micrograms per cubic meter (μg/m^3)
Ozone (O_3)	8 -hour (1997 standard)s	0.08[a]	157
	8-hour (2008 standard)	0.075[a]	147
Carbon monoxide (CO)	8- hours	9	10,000
	1- hour	35	40,000
Nitrogen dioxide (NO_2)	Annual	0.053	100
Sulfur dioxide (SO_2)	Annual	0.03	80
	24- hours	0.14	365
	3- hours	0.5	1,300
Inhalable particulate matter (PM_{10})	Annual	N/A	50[a]
Particulate matter (PM_{10})	24- hours	N/A	150
Fine particulate matter ($PM_{2.5}$)	Annual	N/A	15
	24- hours	N/A	65 / 35[b]
Lead (Pb)	Rolling 3-month average (2008 standard)	N/A	0.15
	Quarterly	N/A	1.5

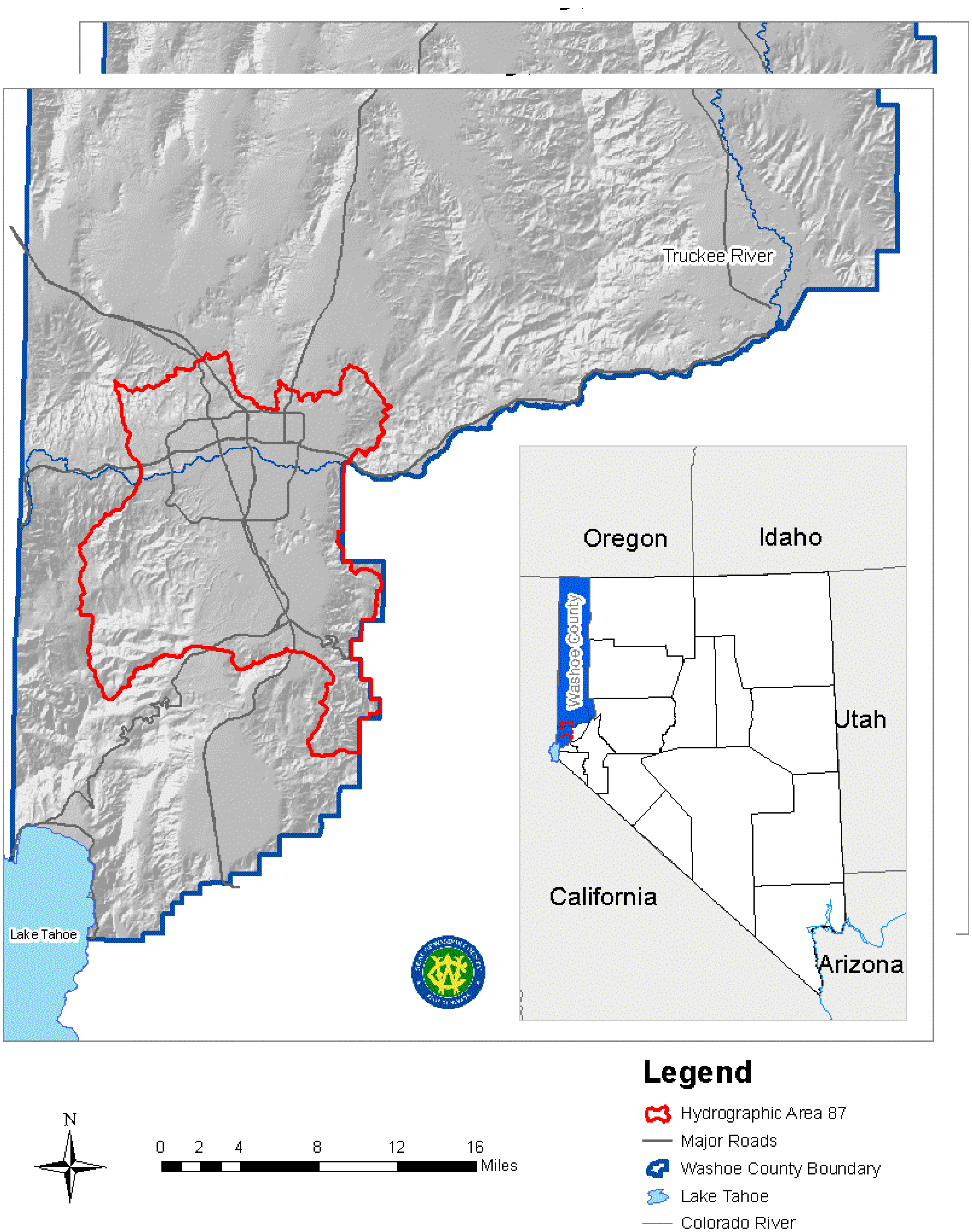
[a] based on a 3-year average of the 4th highest concentration
a. Revoked by USEPA, effective on Dec. 18, 2006.
b. Lower standard (35 μg/m^3) adopted by USEPA, effective on December 18, 2006
Sources: 40 CFR Part 50; and 71 FR 61144.

Table 2. Criteria Pollutant Characteristics, Health Effects and Major Sources

Pollutant	Characteristics	Health Effects	Major Sources
Ozone	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (volatile organic compounds and oxides of nitrogen).	Eye irritation. Respiratory function impairment.	Combustion sources, such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide	Odorless, colorless gas that is highly toxic. Formed by the incomplete combustion of fuels.	Impairment of oxygen transport in the bloodstream. Aggravation of cardiovascular disease. Fatigue, headache, dizziness.	Automobile exhaust, combustion of fuels, and combustion of wood in woodstoves and fireplaces.
Nitrogen Dioxide	Reddish-brown gas formed during combustion.	Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, and fossil-fueled powerplants.
Sulfur Dioxide	Colorless gas with a pungent odor.	Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered powerplants, industrial processes.
PM_{10} and $PM_{2.5}$	Small particles that measure 10 microns or less are termed PM_{10} (fine particles less than 2.5 microns are $PM_{2.5}$). Solid and liquid particles of dust, soot, aerosols, smoke, ash, and pollen and other matter that are small enough to remain suspended in the air for a long period.	Aggravation of chronic disease and heart/lung disease symptoms.	Dust, erosion, incinerators, automobile and aircraft exhaust, and open fires.

Over the past five years, the USEPA has implemented numerous changes to the NAAQS, including the new standards for 8-hour O_3 and $PM_{2.5}$ (24-hour and annual) and a new rolling 3-month average for lead NAAQS, and has revoked the 1-hour O_3 and annual PM_{10} NAAQS. The USEPA also adopted a more stringent 24-hour $PM_{2.5}$ standard, of 35 $\mu g/m^3$ and a more stringent 8-hour O_3 standard of 0.075 ppm.

The Federal CAA requires states to classify air basins (or portions thereof) as either "attainment" or "non-attainment" with respect to criteria air pollutants, based on whether the NAAQS have been achieved, and to prepare air quality plans containing emission reduction strategies for those areas designated as "non-attainment." The portion of Washoe County that is located within Hydrographic Area 87 – Truckee Meadows, shown on Figure 1 is designated as a "serious" non-attainment area for the 24-hour PM_{10}. A summary of the attainment status for all criteria pollutants is presented in Table 3. The remaining areas of Washoe County, all of Storey County, and the Pyramid Lake Paiute Indian lands are classified as attainment for all criteria pollutants.



Truckee River
Lake Tahoe
Oregon
Idaho
Washoe County
Utah
California
Arizona
N
0 2 4 8 12 16
Miles
Legend
Hydrographic Area 87
Major Roads
Washoe County Boundary
Lake Tahoe
Colorado River

Table 3. NAAQS Attainment Status-Hydrographic Area 87 (Truckee Meadows)

Pollutant	Federal Status
O_3	Attainment, Maintenance
PM_{10}	Nonattainment, Serious
$PM_{2.5}$	Attainment
CO	Attainment, Maintenance
NO_2	Attainment
SO_2	Attainment
Pb	Attainment

Source: USEPA 2010.

2.2.3 State Implementation Plans

Counties or regions that are designated as Federal non-attainment areas for one or more criteria air pollutants must prepare a State Implementation Plan (SIP) that demonstrates how the area will achieve attainment of the standards by the Federally mandated deadlines. In addition, those areas that have been redesignated from non-attainment to attainment are required to have a maintenance plan that shows how the area will maintain the standard for up to 10 years. Such areas, referred to as maintenance areas, are often treated similar to nonattainment areas for evaluation and conformity purposes. Because Hydrographic Area 87 – Truckee Meadows is located within Washoe County and is designated serious nonattainment for PM_{10}, Washoe County has to prepare an SIP.

The Truckee Meadows PM_{10} nonattainment area (NAA) was originally designated as a moderate NAA. On February 7, 2001, the Truckee Meadows area was redesignated a serious PM_{10} NAA due to exceedances of the 24-hour NAAQS on January 6, 1999 as well as the annual NAAQS for 1999. On July 13, 2009, the Washoe County Air Quality Management Division (WCAQMD) submitted a redesignation request for PM_{10} to attainment status, and it is awaiting final approval (Washoe County, 2010a).

Washoe County was designated a marginal 1-hour O_3 NAA until June 5, 1998, when the USEPA revoked the 1-hour O_3 NAAQS for this area and reclassified Washoe County as an attainment area (AA). On December 20, 2000, the USEPA reinstated the 1-hour O_3 NAAQS because the proposed 8-hour NAAQS had been challenged in a U.S. Supreme Court case. On June 15, 2004, the USEPA rescinded the 1-hour O_3 standard and the 8-hour standard became effective on June 15, 2005. However, because the Truckee Meadows area had not attained the 1-hour standard when that standard was revoked, a maintenance plan for ozone was required under the implementation rules for the 8-hour O_3 NAAQS. Therefore, Washoe County must still submit an 8-hour maintenance plan for the new 8-hour standard, even though Washoe County is in attainment for the 8-hour standard. Washoe County has not exceeded the 8-hour O_3 NAAQS since the new 8-hour standard took effect in June 2005 (Washoe County, 2010a).

The CO NAA was classified as a moderate (< 12.7 ppm) NAA until 2005. In September 2005, the WCAQMD submitted a redesignation request to attainment/maintenance status for CO. The USEPA approved the redesignation request effective August 4, 2008.

2.2.4 General Conformity

Section 176 (c) of the *Clean Air Act* (42 U.S.C. 7506(c)) requires any entity of the Federal Government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable SIP required under Section 110 (a) of the Federal CAA (42 U.S.C. 7410(a)) before the action is otherwise approved. In this context, conformity means that such Federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each Federal agency must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken. This project is subject to the General Conformity Rule since it is sponsored and supported by a Federal agency.

On November 30, 1993, USEPA promulgated final general conformity regulations at 40 CFR 93 Subpart B for all Federal activities except those covered under transportation conformity. The general conformity regulations apply to a proposed Federal action in a non-attainment or maintenance area if the total of direct and indirect emissions of the relevant criteria pollutants and precursor pollutants caused by the proposed action equal or exceed certain *de minimis* amounts, thus requiring the Federal agency to make a determination of general conformity. The *de minimis* amounts for the region covering Truckee Meadows are presented in Table 4.

Table 4. General Conformity *de minimis* Thresholds

Pollutant	Federal Status	*De minimis* Threshold (TPY[a])
PM_{10}	Nonattainment, Serious	70
CO	Attainment, Maintenance	100
O3 (measured as NOx or VOCs)	Attainment, Maintenance	100

[a] TPY = tons per year
Source: 40 CFR 93.153.

Regardless of the proposed action's emissions relative to the *de minimis* amounts, if this total represents 10 percent or more of the area's total emissions of that pollutant, the action is considered regionally significant and the Federal agency must make a determination of general conformity. By requiring an analysis of direct and indirect emissions, USEPA intended to have only those emissions that are reasonably foreseeable and that the Federal agency can practicably control subject to that agency's continuing program responsibility be addressed.

Direct emissions are those that are caused or initiated by the Federal action, and occur at the same time and place as the Federal action. Indirect emissions are reasonably foreseeable emissions that are further removed from the Federal action in time and/or distance, and can be practicably controlled by the Federal agency on a continuing basis (40 CFR 93.152). A Federal agency can indirectly control emissions by placing conditions on Federal approval or Federal funding. An example would be controlling emissions by limiting the size of a parking facility or by making employee trip reduction requirements (USEPA 1994).

The general conformity regulations incorporate a stepwise process, beginning with an applicability analysis. According to EPA guidance (USEPA 1994), before any approval is given for a proposed action to go forward, the regulating federal agency must apply the applicability requirements found at 40 CFR 93.153(b) to the proposed action and/or determine the regional significance of the proposed action to evaluate whether, on a pollutant-by-pollutant basis, a determination of general conformity is required. The guidance states that the applicability analysis can be (but is not required to be) completed concurrently with any analysis required under NEPA. If the regulating federal agency determines that the general conformity regulations do not apply to the proposed action (meaning the project emissions do not exceed the de minimis thresholds and are not regionally significant), no further analysis or documentation is required. If the general conformity regulations do apply to the proposed action, the regulating federal agency must next conduct a conformity evaluation in accord with the criteria and procedures in the implementing regulations, publish a draft determination of general conformity for public review, and then publish the final determination of general conformity. For a required action to meet the conformity determination emissions criteria, the total of direct and indirect emissions from the action must be in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP (40 CFR 93.158(c)), and in addition must meet other specified requirements, such as:

- For any criteria pollutant, the total of direct and indirect emissions from the action is specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR 93.158(a)(1)); or
- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is determined and documented by the State agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the non-attainment (or maintenance) area, would not exceed the emissions inventory specified in the applicable SIP (40 CFR 93.158(a)(5)(i)(A)); or
- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is determined by the State agency responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the non-attainment (or maintenance) area, would exceed the emissions inventory specified in the applicable SIP and the State Governor or the Governor's designee for SIP actions makes a written commitment to EPA for specific SIP revision measures reducing emissions to not exceed the emissions inventory (40 CFR 93.158(a)(5)(i)(B)); or
- For ozone or nitrogen dioxide, the total of direct and indirect emissions from the action is fully offset within the same non-attainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant (40 CFR 93.158(a)(2)).

2.2.5 Air Quality Management at the Local Level

The Washoe County District Board of Health governs the air quality management, permitting, and compliance in the County. Under the district Regulation 040.030, there are specific requirements on fugitive dust control for construction activities, which were applied in emission calculations as discussed below. Although there is a potential health risk from exposure to diesel particulate matter from diesel-fueled construction equipment, the Washoe County District Board of Health does not require health risk assessments for mobile sources; therefore, one was not completed as part of this analysis.

2.3 PHYSICAL ENVIRONMENT

This description of the physical environment includes a brief discussion of the climate and atmospheric conditions, existing ambient air quality concentrations in the project area, sensitive receptors, and global warming/climate change. Although there is a potential health risk from exposure to diesel particulate matter from diesel-fueled construction equipment, the Washoe County District Board of Health does not require health risk assessments for mobile sources; therefore, one was not completed as part of this analysis.

2.3.1 Climate and Atmospheric Conditions

Washoe County is a growing area located along the eastern slopes of the Sierra Nevada Mountains in western Nevada. The county covers an area of 6,600 square miles in the northwest section of the State bordering California and Oregon. The county seat is the City of Reno, the second largest city in Nevada. Other communities in Washoe County are Sparks and Incline Village, at Lake Tahoe. Washoe County's climate is mild, with low humidity and rainfall, and enjoys the full range the four seasons. The prevailing winds are from northwest to southwest. Washoe County terrain varies from high desert at the 4,000 feet elevation to mountain ranges of 10,500 feet. Large bodies of water, including Pyramid Lake and a portion of Lake Tahoe, are located within Washoe County. The majority of its 290,000 population lives in a 7-mile-wide by 30-mile-long area at the southern end of the county. The annual average mixing height is approximately 300 meters in the morning, and 3,200 meters in the afternoon.

2.3.2 Existing Air Quality Conditions

The existing air quality conditions for a project area are typically the result of meteorological conditions and existing emission sources in an area. As stated previously, the remaining areas of Washoe County, all of Storey County, and the Pyramid Lake Paiute Indian lands are classified as attainment for all criteria pollutants, therefore, emissions inventories for these areas are not discussed below.

Washoe County Emissions Inventories

The WCAQMD has compiled the 2008 emissions inventories for the Truckee Meadows CO/PM_{10} Nonattainment Area (NAA) and for the Washoe County O_3 Attainment Area (AA). These emission inventories are presented in Tables 5 and 6, respectively.

Table 5. 2008 Emissions Inventory for Truckee Meadows CO/PM_{10} NNA

Source Category	2008 Annual Emissions (tons per year)					
	VOC	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**NH_3[a]**
Point Sources	183	681	3,031	12	12	0
Non-Point Sources	7,282	775	3,174	5,995	1,164	2
Non-Road Mobile Sources	2,111	1,474	16,662	136	130	N/D
On-Road Mobile Sources	3,323	4,026	40,057	120	74	283
Total	**12,899**	**6,957**	**62,923**	**6,263**	**1,380**	**285**

[a] NH_3 is ammonia
Source: Washoe County, 2010a.

Table 6. 2008 Emissions Inventory for Washoe County O_3 AA

Source Category	2008 Annual Emissions (tons per year)					
	VOC	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**NH_3[a]**
Point Sources	937	5,542	6,508	302	29	0
Non-Point Sources	9,087	1,065	7,768	11,099	2,181	2
Non-Road Mobile Sources	3,026	3,432	28,224	273	260	N/D
On-Road Mobile Sources	3,957	5,122	48,133	157	100	341
Total	**17,007**	**15,161**	**90,633**	**11,831**	**2,570**	**343**

[a] NH_3 is ammonia
Source: Washoe County, 2010a.

Monitoring Data – Criteria Pollutants Concentrations

Air quality data from the Reno monitoring station from 2007-2009 is summarized in Table 7 and was taken from the *Washoe County, Nevada, Air Quality Trends 2000-2009 Report*, prepared in April 2010 by the Air Quality Management Division of the Washoe County District Health Department (Washoe County 2010b).

Table 7. Summary of Air Pollutant Monitoring Data in Reno, Nevada from 2007-2009

Pollutant	Average Time	2007	2008	2009	NAAQS
CO (ppm)	1-hr (2nd High)	3.5	2.5	2.9	35
	8-hr (2nd High)	2.2	1.6	2.1	9
O_3 (ppm)	8-hr (4th High)	0.071	0.076	0.065	0.075
NO_2 (ppm)	Annual	0.019	0.018	0.017	0.053
PM_{10} (ug/m^3)	24-hr (2nd High)	67	84	72	150
$PM_{2.5}$ (ug/m^3)	24-hr (2nd High)	26.5	61.0	41.2	35
	Annual	8.0	10.2	10.2	15

Source: Washoe County, 2010c.

Sensitive Receptors

Some individuals are considered more sensitive than others to air pollutants. The reasons for greater than average sensitivity include pre-existing health problems, proximity to emissions sources, or the duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the respiratory system.

2.3.3 Global Warming and Climate Change

Northwestern Nevada

Scientists have warned that climate changes due to global warming could dramatically affect the environment. To examine recent temperature patterns in the U.S., the U.S. Public Interest Research Group (U.S. PIRG) compared temperature data for the years 2000-2006 from 255 weather stations located in all 50 states and Washington, D.C., with temperatures averaged over the 30 years spanning 1971-2000. The U.S. PIRG found that temperatures overall were above the 30-year average across the nation (Cassady and Figdor, 2007).

The U.S. PIRG found that Nevada was among the states with the most dramatic increases in average temperatures in the last 30 years, including an average increase in Reno of 3.4 degrees above the average. This was the second highest reading in the nation for the period. U.S. PIRG also found that the average temperature in Reno from June through August of 2006 was almost seven degrees above the 30-year average, the highest increase in the nation.

Such rising temperatures would affect the annual amount of snow in the northern Sierra Nevada. Leading scientists agree that a rise in temperature could result in a 36 percent reduction of Sierra snow in 50 years (Sierra Nevada Alliance, 2005). Since nearly all of the water to northwest Nevada is supplied by the snowmelt from the Sierra Nevada, this area could find itself unable to meet the current and future water demands of its urban population and farmers, especially during the summer months (Sierra Nevada Alliance, 2005).

The Reno, Carson City, and Minden/Gardnerville areas of Nevada all are dependent on Sierra Nevada waters (Timmer, 2003). With respect to the Truckee River, the increase in temperatures and decrease in annual snowmelt imply that water releases from upstream storage reservoirs will have to be extended over a longer period. This change also implies that those river systems without significant main-stream storage facilities (Carson, Walker, and Humboldt Rivers) will be more prone to flooding and early runoff, with the possibility of a shortened irrigation season for agriculture.

In 2006, TMWA partnered with the Desert Research Institute to research the possibility of global warming and climate affecting the Truckee Meadow's water supplies. DRI concluded that relationships between climatic and hydrologic variables were inconclusive at that time due to the high variability of the parameters, and trends could not be detected over the period of record that indicated an effect on the region's water resources or supplies. They also concluded that additional research is needed to continue to refine the current level of understanding of climatic change and to evaluate the latest data for tends (TMWA, 2007).

The U.S. Bureau of Reclamation (USBOR) is currently conducting a comprehensive study to define options for meeting future water demands in the Truckee River Basin. The study will identify potential climate change impacts to the Truckee's hydrology including fish and wildlife, their habitats, hydroelectric power generation, water quality, recreation, and flood control. USBOR is working with the Placer County Water Agency, Tahoe Regional Planning Agency (TRPA), State of California - Department of Water Resources (DWR), State of Nevada - Water Resources Department (NDWR), Truckee Meadows Water Authority (TMWA), City of Fernley, and the Pyramid Lake Paiute Tribe.

2.3.4 Corps Policy

Water resources management agencies at all levels of government, including the Corps, must deal with the consequences of climatic variations as seen in the current records of atmospheric temperatures, sea level rise, and hydrological and meteorological trends.

The Corps does not collect or interpret the basic scientific and physical information – precipitation, evaporation, snow pack, wind speed, soil moisture, or sea level – that explain climate change trends. However, the agency's mission does involve understanding and responding to the extremes of climate variability, including protecting the public from the effects of floods and droughts, and helping to sustain aquatic ecosystems by sustaining ecological streamflows and by restoring aquatic environments (Corps, 2007).

For the Truckee Meadows project, the Corps is addressing climate change by (1) incorporating risk and uncertainty analyses into the planning process and (2) designing the features of the project to allow for projected long-term changes in Sierra Nevada snowmelt. The

Corps is also working closely with other Federal, State, and local agencies to ensure that the project is operated in a more sustainable nature to allow greater flexibility with shifts in climatic trends.

CHAPTER 3. ENVIRONMENTAL CONSEQUENCES AND MITIGATION

The following section provides the significance criteria and thresholds used to determine if project air quality effects are significant, methodology for estimating project emissions, project construction emissions for each alternative, identification of significant impact, if any, and proposed mitigation for such impacts, and general conformity discussion.

3.1 SIGNIFICANCE CRITERIA AND THRESHOLDS

The major thresholds are the General Conformity *de minimis* emission levels for CO, PM_{10}, and the O_3 precursors (NOx and VOC); as well as the NAAQS (NEPA). A project would have a significant adverse air quality impact if it either causes of an exceedance of a standard (for pollutants in attainment) or makes a substantial contribution to an existing exceedance of an air quality standard (for pollutants in non-attainment).

3.1.1 Emission Calculation Methodology

This section describes the methodology used to develop the project emission inventories. Emissions from the construction of various flood control measures are included in this air quality analysis for the following reaches and measures:

- Virginia Street Bridge
- Lake Street Bridge
- Sierra Street Bridge
- Center Street Bridge
- Sierra to Second Street Floodwalls
- Sierra to Booth Street Floodwalls
- Booth to 650 ft Downstream of Keystone Floodwalls, flood proofing, and bed, bank, and pier scour protection
- Downtown to Pyramid Lake bed, bank, and pier scour protection
- Lower Wells Avenue Pedestrian Bridge removal
- US395 to E. Second Street Bank Protection
- North Truckee Drain Realignment
- Cleanwater Way Relocation
- Rock Blvd. Bridge Extension
- McCarran Blvd. Bridge Extension
- Pioneer Ditch Relocation
- Rock Blvd. to US395 Bank Stabilization
- Rock Blvd. to US395 Levees and Floodwalls
- Rock Blvd. to US395 Recreation Trail Replacement
- McCarran Blvd. to Rock Blvd. Recreation Trail Replacement
- Vista to McCarran Blvd. Channel Terracing
- McCarran Blvd. to Rock Blvd. Channel Terracing
- McCarran Blvd. to Rock Blvd. Levee and Floodwall
- McCarran Blvd. Bypass Channel
- Flood proofing Steamboat Creek
- Painted Rock Bridge Replacement
- Lockwood/Rainbow Bend Hydraulic Mitigation
- Lockwood/Rainbow Bend Floodwall
- Wadsworth Floodwall

The construction emissions were estimated for various sources using emission factors and construction schedules, in terms of number of work days, hours and equipment, and haul truck miles traveled. The emission factors for stationary sources were obtained from AP-42 (U.S. EPA 1995) and a study report by Midwest Research Institute (MRI, 1996). The mobile source emission factors were developed from USEPA Non-Road (U.S. EPA, 2005) and Mobile 6 (U.S. EPA, 2003) models. The following construction sources and activities were analyzed for emissions:

- Earth moving, grading (cut/fill) fugitive dust
- On-site construction equipment and haul truck engine emissions (all pollutants)
- Off-site haul truck engine emissions (all pollutants)
- On-site and off-site haul truck fugitive dust emissions for paved and unpaved road travel
- Off-site worker vehicle trips to and from project site, including paved road dust

Fugitive Dust from Earth Cut and Fill

Using the following equation (MRI 1996), uncontrolled fugitive dust emissions were calculated for the primary earth moving activities at each site:

Emissions (tons/day) = [(0.011 tons/acre-month) / 22 days/month]
+ [(0.059/1000)*(cu yds of on-site cut and fill per day)]
+ [(0.22/1000)*(cu yds of off-site cut and fill per day)]

The Washoe County District Board of Health requires that public and private construction activities that generate fugitive dust comply with Regulation 040.030 – Dust Control. This rule will require that a dust control permit by obtained from the district before the start of construction. The permit will describe all control measures to be implemented before, during, and after any dust generating activity. Potential control measures may include but are not limited to:

- Paving.
- Pre-wetting.
- Applying dust suppressants.
- Stabilizing with vegetation, gravel, re-crushed/recycled asphalt or other forms of physical stabilization.
- Limiting, restricting, phasing and/or rerouting motor vehicle access.
- Reducing vehicle speeds and/or number of vehicle trips.
- Limiting use of off-road vehicles on open areas and vacant lots.
- Utilizing work practices and/or structural provisions to prevent wind and water erosion onto paved public roadways.
- Using dust control implements appropriately.
- Installing one or more grizzlies, gravel pads, and/or wash down pads adjacent to the entrance of a paved public roadway to control carry-out and trackout.
- Keeping open-bodied haul trucks in good repair, so that spillage may not occur from beds, sidewalls, and tailgates.
- Covering the cargo beds of haul trucks to minimize wind-blown dust emissions and spillage.

Typical control efficiencies for fugitive dust reduction measures range from 70 to 95 percent (U.S. EPA 1995). Watering for fugitive dust control of PM_{10} has typical control efficiencies of 75 to 95 percent (Cowherd, et al. 1990). Therefore, once the uncontrolled earth moving fugitive dust emissions were determined, the PM_{10} emissions were reduced by 87 percent to account for compliance with Washoe County District Regulation 040.030.

On-Site Construction Equipment Engine Emissions

The emission factors were developed from U.S. EPA NONROAD (U.S. EPA, 2005) model for Washoe County as shown in Table 8.

Table 8. Construction Equipment Engine Exhaust Emission Factors

Non-Road Equipment	VOC (lb/day)	PM_{10} (lb/day)	$PM_{2.5}$ (lb/day)	CO (lb/day)	NOx (lb/day)	SO_2 (lb/day)
Bore/Drill Rigs	0.105	0.092	0.089	0.451	1.295	0.160
Cement & Mortar Mixers	0.015	0.013	0.012	0.066	0.141	0.018
Concrete/Industrial Saws	0.046	0.057	0.055	0.329	0.469	0.081
Cranes	0.179	0.163	0.158	0.702	2.686	0.443
Crawler Tractor/Dozers	0.241	0.283	0.275	1.553	3.602	0.654
Crushing/Proc. Equipment	0.129	0.124	0.120	0.626	1.827	0.289
Dumpers/Tenders	0.045	0.030	0.029	0.181	0.161	0.023
Excavators	0.181	0.220	0.213	1.044	2.442	0.505
Graders	0.193	0.221	0.214	0.975	2.577	0.527
Off-Highway Tractors	0.691	0.745	0.722	4.915	11.046	1.658
Off-highway Trucks	1.057	1.206	1.170	6.811	19.495	3.436
Other Construction Equipment	0.252	0.282	0.274	1.735	3.580	0.533
Pavers	0.118	0.140	0.136	0.700	1.476	0.280
Paving Equipment	0.061	0.069	0.067	0.363	0.690	0.120
Plate Compactors	0.008	0.006	0.006	0.039	0.055	0.008
Rollers	0.089	0.108	0.105	0.578	1.073	0.195
Rough Terrain Forklifts	0.095	0.118	0.114	0.667	1.038	0.182
Rubber Tire Loaders	0.204	0.232	0.225	1.245	2.955	0.496
Scrapers	0.314	0.397	0.385	2.476	5.469	1.001
Signal Boards/Light Plants	0.022	0.017	0.016	0.090	0.174	0.027
Skid Steer Loaders	0.099	0.072	0.070	0.441	0.371	0.055
Surfacing Equipment	0.097	0.107	0.104	0.668	1.173	0.172
Tampers/Rammers	0.005	0.004	0.004	0.024	0.030	0.010
Tractors/Loaders/Backhoes	0.171	0.136	0.132	0.808	0.841	0.125
Trenchers	0.071	0.085	0.083	0.491	0.763	0.129

On-Site and Off-Site Haul Truck Engine Emissions and Road Dust

The haul truck engine emissions were calculated based on MOBILE6.2 (U.S. EPA, 2003) emission factors for heavy duty diesel trucks in Washoe County and estimates of total vehicle miles traveled per day. The emission factors used in this analysis are presented in Table 9. The average speed for on-site hauling was assumed to be 15 mph, and the average speed for off-site hauling was assumed to be 35 mph.

Table 9. Heavy Duty Diesel Truck Emission Factors for Washoe County

Travel Speed (MPH)	Emission Factors (g/VMT)					
	VOC/ROG	CO	NOx	PM_{10} Total [1]	SO_2	$PM_{2.5}$ Total[1]
15	1.554	10.867	9.654	0.2768	0.0132	0.2312
35	0.790	5.168	9.040	0.2768	0.0132	0.2312

[1] PM_{10} and $PM_{2.5}$ totals include engine exhaust, tire wear, and brake wear.

Re-entrained road dust from haul truck travel was estimated for paved and unpaved roads. Paved road dust was estimated using emission factors developed by the Midwest Research Institute (MRI 1996), and unpaved road dust was estimated using emission factors from AP-42 (U.S. EPA 1995). Table 10 presents the paved road emission factors for two road conditions (average and worst case) and three relative roadway traffic conditions (low, average, and high). The traffic conditions include all vehicles traveling on the road, not just project-related traffic. Paved road emissions were calculated using the emission factor under average daily traffic with worst-case road conditions. Table 11 presents the unpaved road emission factors.

Table 10. Paved Road Re-entrained Dust PM_{10} Emission Factors

Road Condition	Daily Trips (ADT)		
	High	Low	Average
	Emission Factors (g/VMT)		
Average conditions	0.37	1.3	0.81
Worst-case conditions	0.64	3.9	2.1

ADT = Average Daily Trips
g/VMT = grams per vehicle mile traveled
Source: MRI 1996.

Table 11. Unpaved Road Re-entrained Dust PM_{10} Emission Factors

	Emission Factors (g/VMT)		
	Silt (%)	PM_{10}	$PM_{2.5}$
Washoe County Rule 040.030	6	3.1	0.31

Source: U.S. EPA 2007b

The construction emission factor for unpaved road dust was calculated using the maximum silt contents specified in Washoe County District Board of Health Rule 040.030.

The one-way trip distance for off-site haul was assumed to be 15 miles, and 0.01 miles for on-site haul because all construction sites are adjacent to the roadways.

Off-Site Worker Vehicle Trips to and from the Project Site

Worker vehicles were assumed to travel on an average 50 miles roundtrip per day for all sites. The number of workers were assumed equal to the total counts of on-site equipment. The average emission factors for diesel trucks from MOBILE6.2 were used in emission calculations for off-site worker trips.

3.2 ENVIRONMENTAL CONSEQUENCES

Construction of the proposed improvements under each alternative would start in 2014 and would continue for five years. Emissions of criteria pollutants would occur during construction activities at the proposed site. Typical construction activities including site grading and hauling will contribute to fugitive dust emissions or on- and off-site diesel exhaust emissions. Although pump stations for interior drainage will be operational sources, they are expected to be electrically-driven and an air quality assessment for these pump stations was not completed.

Construction impacts were estimated following the methodology described above. In cases where emission factors were only provided for PM_{10}, appropriate CARB PM size profiles were used to estimate $PM_{2.5}$ emissions. Emissions summaries by year and by general source categories are included in Attachment 1.

3.2.1 No Action Alternative

Under the No Action Alternative, no Federally funded flood risk management improvements would take place in the study area. Therefore, no emissions of criteria pollutants as a result of the proposed improvements would occur because no related construction activities would take place. Hydrographic Area 87 – Truckee Meadows (Downtown Reno and Truckee Meadows reaches) is designated as serious nonattainment for 24-hour PM_{10}. All other project areas are classified as attainment for all Federal CAA criteria pollutants. Washoe County District Board of Health will continue to manage air quality in the region, implementing emission-reduction requirements set forth by the SIP. Based on a review of the *Washoe County, Nevada, Air Quality 2000-2009 Trends Report* (Washoe County 2010b) existing sources of air pollution would be expected to remain the same in the project area in the near-term future. Therefore, Hydrographic Area 87 would continue in the near-term future to be designated by the USEPA as being in serious non-attainment for PM_{10}.

3.2.2 Alternative 3--Floodplain Terracing

Table 13 below provides a summary of the estimated annual emission rates for VOC, NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$ under Alternative 3. In cases where emission factors were only provided for PM_{10}, appropriate PM size profiles were used to estimate $PM_{2.5}$ emissions. Emissions summaries by year and by general source categories are included in Attachment 1.

Table 13. Alternative 3 Construction Emissions – All Reaches

Alternative-3	VOC	NOx	CO	SO_2	PM_{10}[a]	$PM_{2.5}$[b]
Year	**Annual Emissions in tons/year**					
1	3.05	39.57	20.42	0.63	44.70	29.80
2	3.69	48.55	24.62	1.33	65.40	56.70
3	2.29	34.18	15.56	1.80	32.60	21.10
4	0.64	10.72	4.62	0.25	21.60	12.30
5	0.09	2.22	0.79	0.01	5.20	0.20

a. Total PM_{10} emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Includes 87% reduction on uncontrolled PM_{10} emissions due to compliance with Regulation 040.030.
b. Total $PM_{2.5}$ emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Assumes 16% reduction on uncontrolled $PM_{2.5}$ emissions due to compliance with Regulation 040.030.

3.2.3 Alternative 4--Locally Preferred Plan

Table 14 below provides a summary of the estimated annual emission rates for VOC, NO_x, CO, SO_2, PM_{10}, and $PM_{2.5}$ under Alternative 4. In cases where emission factors were only provided for PM_{10}, appropriate PM size profiles were used to estimate $PM_{2.5}$ emissions. Emissions summaries by year and by general source categories are included in Attachment 1.

Table 14. Alternative 4 Construction Emissions – All Reaches

Alternative-4	VOC	NOx	CO	SO_2	PM_{10}[a]	$PM_{2.5}$[b]
Year	**Annual Emissions in tons/year**					
1	3.07	39.71	20.52	0.64	45.60	31.0
2	3.98	52.04	26.42	1.58	68.50	59.90
3	2.71	39.12	18.24	.2.21	43.60	51.1
4	1.00	18.31	7.46	0.34	31.90	13.70
5	0.36	7.80	2.86	0.07	8.80	1.80

a. Total PM_{10} emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Includes 87% reduction on uncontrolled PM_{10} emissions due to compliance with Regulation 040.030.
b. Total $PM_{2.5}$ emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Assumes 16% reduction on uncontrolled $PM_{2.5}$ emissions due to compliance with Regulation 040.030.

3.2.4 Significance of Peak Emissions by Alternative

Table 15 compares the peak emissions for each pollutant by alternative. Table 15 shows that the amount of construction activity under Alternative 4 causes the peak annual emissions to be higher than Alternative 3. Internal combustion engines in the on-site construction equipment and on-road haul trucks produce the majority of the gaseous pollutant emissions (NOx, VOC, CO, and SO2). Earth moving activities produce the bulk of the PM_{10} emissions and a substantial portion of the $PM_{2.5}$ emissions.

Table 13. Peak Construction Year Emissions for Alternatives 3 and 4

Alternative	VOC	NOx	CO	SO_2	PM_{10}[a]	$PM_{2.5}$[b]

	Annual Emissions in tons/year					
3	3.69 (Year 2)	48.55 (Year 2)	24.62 (Year 2)	1.80 (Year 3)	65.40 (Year 2)	68.50 (Year 2)
4	3.98 (Year 2)	52.04 (Year 2)	26.42 (Year 2)	2.21 (Year 3)	56.70 (Year 2)	59.90 (Year 2)

a. Total PM_{10} emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Includes 87% reduction on uncontrolled PM_{10} emissions due to compliance with Regulation 040.030.
b. Total $PM_{2.5}$ emissions from all sources (exhaust, fugitive dust, paved, and unpaved). Assumes 16% reduction on uncontrolled $PM_{2.5}$ emissions due to compliance with Regulation 040.030.

Comparison of the peak year emissions with the General Conformity de minimis thresholds provided in Table 4 indicates that emissions of all non-attainment or maintenance pollutants (CO, PM_{10}, NOx and VOC) for both alternatives are less than the de minimis thresholds. Of these pollutants, PM_{10} emissions during Year 2 are the highest and approach the de minimis thresholds for PM_{10}. Table 15 shows the peak construction year emissions for both alternatives. Table 15 was created by summing emissions from construction activities in all reaches, even those that are not located within the non-attainment area, such as the sites in Wadsworth and at Painted Rock Bridge located in Storey County, an attainment area. The construction activities in locations outside of the non-attainment area are likely not occurring in the peak construction emissions year (Year 2) for PM_{10}, and the emissions generated would be relatively small (less than 1 tpy of PM_{10}). Therefore, these locations do not effect or substantially increase the peak construction year emissions. Thus, the project construction emissions from the reaches or sections located within the non-attainment area under both alternatives would be less than the General Conformity de minimis thresholds and would have a less-than significant effect on air quality. Therefore, no additional General Conformity evaluation is necessary per 40 CFR 93.153 (c)(1). Compliance with Washoe County District Regulation 040.030 for the control of fugitive dust from construction activities along with obtaining and implementing the requirements set forth in the dust control permit for the project would further reduce PM_{10} and $PM_{2.5}$ construction emissions under each alternative.

3.3 PROPOSED MITIGATION

The project contractors will be required to comply with Washoe County District Regulation 040.030 for the control of fugitive dust from construction projects. A dust control permit will be obtained from the district before the start of construction. The permit will describe all control measures to be implemented before, during, and after any dust generating activity. Potential control measures may include but are not limited to:

- Paving.
- Pre-wetting.
- Applying dust suppressants.
- Stabilizing with vegetation, gravel, re-crushed/recycled asphalt or other forms of physical stabilization.
- Limiting, restricting, phasing and/or rerouting motor vehicle access.
- Reducing vehicle speeds and/or number of vehicle trips.
- Limiting use of off-road vehicles on open areas and vacant lots.

- Utilizing work practices and/or structural provisions to prevent wind and water erosion onto paved public roadways.
- Using dust control implements appropriately.
- Installing one or more grizzlies, gravel pads, and/or wash down pads adjacent to the entrance of a paved public roadway to control carry-out and trackout.
- Keeping open-bodied haul trucks in good repair, so that spillage may not occur from beds, sidewalls, and tailgates.
- Covering the cargo beds of haul trucks to minimize wind-blown dust emissions and spillage.

The on-road and non-road mobile equipment typically used on construction projects are subject to USEPA regulations. No other air quality mitigation measures are proposed at this time.

CHAPTER 4. CUMULATIVE AIR QUALITY IMPACTS

Air quality effects associated with the proposed project would occur primarily during construction, and would be temporary and short-term in nature. However, the proposed project alternatives, as well as the other related cumulative projects described in Table 7.1 of the EIS, have the potential to result in cumulative effects on air quality. It is expected that impacts from the other related cumulative projects would be similar to the proposed project in that air quality effects would primarily result from construction activities. Construction of these projects would increase emissions of criteria pollutants from construction and transport of materials. Individually these projects would be anticipated to provide mitigation for construction emissions. Construction of the proposed project is not anticipated to result in long-term effects on air quality, as operational activities are expected to be similar to existing conditions.

Compliance with Washoe County District Regulation 040.030 for the control of fugitive dust from construction projects would reduce construction related emissions. Project contractors would be required to comply with the specifications listed in the Washoe County District regulations for the control of fugitive dust from construction activities. A dust control permit would also be obtained prior to the start of construction, and would include all control measures to be implemented before, during, and after any dust generating activity. Long-term projected emissions are anticipated to be similar with or without the proposed project. Therefore, the proposed project, in conjunction with reasonably foreseeable future projects, would therefore be anticipated to result in less than significant cumulative air quality effects.

CHAPTER 5. REFERENCES

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ATTACHMENT 1

This attachment was originally prepared in April 2008 by CDM. As a result of revisions to the project and the proposed alternatives, this attachment was updated by HDR inc. in April 2011. The April 2011 emissions summaries by year and by general source categories are included in the following pages. In addition, the April 2008 emissions summaries by year and by general source categories are included in the back of this attachment for reference.

April 2011 Emissions Summaries

Alt 3 Emissions

	Peak Daily (lbs/day)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Year 1	51.96	638.26	340.36	13.65	23.13	5544.07	47.40	751.10	6365.70	20.25	1152.32	8.00	0.00	1180.58
Year 2	51.51	641.73	337.24	18.18	24.01	4041.37	45.70	736.28	4847.35	21.18	839.99	7.72	0.00	868.89
Year 3	29.53	406.19	194.85	23.00	17.55	1884.96	21.94	322.51	2246.96	16.01	391.79	3.70	0.00	411.50
Year 4	24.17	311.55	158.03	11.44	12.59	1992.75	19.95	302.80	2328.09	11.30	414.19	3.37	0.00	428.86
Year5	10.05	128.75	65.49	4.38	5.07	363.38	8.53	126.27	503.25	4.53	75.53	1.44	0.00	81.50

PM 10 Emissions assumed 70% control for Dust Plans

Alt 4 Emissions

	Peak Daily (lbs/day)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Year 1	51.96	638.26	340.36	13.65	23.13	3729.25	47.40	751.10	4550.88	20.25	775.12	8.00	0.00	803.37
Year 2	53.10	663.61	348.15	18.68	24.76	4360.71	47.16	757.01	5189.65	21.85	906.36	7.96	0.00	936.18
Year 3	49.78	659.75	325.34	38.86	28.88	2744.41	36.87	586.18	3396.35	26.32	839.30	6.23	0.00	871.84
Year 4	43.50	552.77	283.28	18.78	21.93	3228.20	36.63	568.11	3854.87	19.59	670.97	6.18	0.00	696.75
Year5	15.65	196.48	101.72	5.84	7.55	1443.44	13.52	215.25	1679.77	6.70	300.02	2.28	0.00	309.00

PM Numbers	PM10 Alt 3	PM10 Alt 4	PM2.5 Alt 3	PM2.5 Alt 4
Year 1	44.7	47.4	27.7	31.0
Year 2	65.5	68.7	52.9	56.1
Year 3	45.4	68.3	35.5	75.4
Year 4	22.3	32.7	12.3	13.7
Year5	5.2	8.9	0.2	1.8

PM10 Control % = 86
PM2 Control % = 16

Alt 3 Emissions

	Annual (tpy)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Year 1	3.00	39.02	20.11	0.62	1.29	149.86	2.90	43.39	197.44	1.11	31.15	0.49	0.00	32.75
Year 2	3.66	48.28	24.45	1.33	1.70	291.58	3.36	50.99	347.62	1.49	60.60	0.57	0.00	62.67
Year 3	2.29	34.18	15.56	1.80	1.35	195.53	1.82	23.14	221.84	1.22	40.50	0.31	0.00	42.02
Year 4	0.64	10.72	4.62	0.25	0.33	68.23	0.62	5.75	74.93	0.30	14.16	0.11	0.00	14.56
Year5	0.09	2.22	0.79	0.01	0.05	0.86	0.12	0.29	1.32	0.04	0.18	0.02	0.00	0.24

PM 10 Emissions assur

Alt 4 Emissions

	Annual (tpy)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Year 1	3.07	39.71	20.52	0.64	1.32	168.76	2.95	44.29	217.32	1.14	35.08	0.50	0.00	36.72
Year 2	3.98	52.04	26.42	1.58	1.88	308.71	3.58	54.90	369.07	1.66	64.16	0.60	0.00	66.43
Year 3	3.52	50.14	23.63	2.86	2.03	276.97	2.74	39.80	321.54	1.84	87.10	0.46	0.00	89.40
Year 4	1.00	18.31	7.46	0.34	0.51	75.34	1.04	7.79	84.69	0.45	15.63	0.18	0.00	16.25
Year5	0.36	7.80	2.86	0.07	0.18	8.97	0.43	1.84	11.42	0.15	1.86	0.07	0.00	2.08

PM Numbers

Year 1
Year 2
Year 3
Year 4
Year5

PM10 Control % =
PM2 Control % =

	Peak Daily (lbs/day)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	5544.067	0.000	0.000	5544.067	0.000	1152.323	0.000	0.000	1152.323
Non-Road Equipment	6.773	76.818	38.111	12.876	6.927	0.000	0.000	0.000	6.927	6.719	0.000	0.000	0.000	6.719
On-Road Haul Truck	42.232	483.262	276.272	0.706	14.797	0.000	43.301	751.100	809.198	12.360	0.000	7.312	0.000	19.671
Worker Trip	2.959	78.185	25.974	0.067	1.402	0.000	4.104	0.000	5.506	1.171	0.000	0.693	0.000	1.864
Total	51.964	638.264	340.356	13.648	23.126	5544.067	47.405	751.100	6365.697	20.250	1152.323	8.004	0.000	1180.577

Total Quantity (cy+ton)

	Annual (tpy)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	149.576	0.000	0.000	149.576	0.000	31.089	0.000	0.000	31.089
Non-Road Equipment	0.275	3.448	1.607	0.575	0.294	0.285	0.000	0.000	0.578	0.285	0.059	0.000	0.000	0.344
On-Road Haul Truck	2.440	27.920	15.961	0.041	0.855	0.000	2.502	43.394	46.750	0.714	0.000	0.422	0.000	1.136
Worker Trip	0.290	7.651	2.542	0.007	0.137	0.000	0.402	0.000	0.539	0.115	0.000	0.068	0.000	0.182
Total	***3.004***	***39.019***	***20.110***	***0.623***	***1.286***	***149.861***	***2.903***	***43.394***	***197.444***	***1.113***	***31.148***	***0.490***	***0.000***	***32.752***

Total Quantity (cy+ton)

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	4041.366	0.000	0.000	4041.366	0.000	839.990	0.000	0.000	839.990
Non-Road Equipment	7.894	102.113	45.845	17.434	8.390	0.000	0.000	0.000	8.390	8.138	0.000	0.000	0.000	8.138
On-Road Haul Truck	40.918	468.229	267.678	0.684	14.337	0.000	41.954	736.281	792.572	11.975	0.000	7.084	0.000	19.059
Worker trip	2.701	71.386	23.715	0.061	1.280	0.000	3.747	0.000	5.027	1.069	0.000	0.633	0.000	1.702
Total	51.513	641.728	337.238	18.179	24.007	4041.366	45.701	736.281	4847.355	21.182	839.990	7.717	0.000	868.889

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	291.040	0.000	0.000	291.040	0.000	60.492	0.000	0.000	60.492
Non-Road Equipment	0.498	7.429	3.049	1.278	0.553	0.536	0.000	0.000	1.089	0.536	0.111	0.000	0.000	0.648
On-Road Haul Truck	2.858	32.708	18.698	0.048	1.001	0.000	2.931	50.989	54.921	0.837	0.000	0.495	0.000	1.331
Worker trip	0.308	8.146	2.706	0.007	0.146	0.000	0.428	0.000	0.574	0.122	0.000	0.072	0.000	0.194
Total	3.665	48.282	24.454	1.333	1.701	291.576	3.358	50.989	347.624	1.495	60.604	0.567	0.000	62.666

Total Quantity (cy+ton)
3,525,763

	lbs/day															t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1884.963	0.000	0.000	1884.963	0.000	391.786	0.000	0.000	391.786	0.000	0.000	0.000	0.000	0.000	194.830	0.000	0.000	194.830	0.000	40.495	0.000	0.000	40.495
Non-Road Equipment	9.107	131.098	55.090	22.645	10.052	0.000	0.000	0.000	10.052	9.750	0.000	0.000	0.000	9.750	0.646	10.068	4.003	1.767	0.726	0.705	0.000	0.000	1.431	0.705	0.000	0.000	0.000	0.705
On-Road Haul Truck	17.653	202.006	115.483	0.295	6.185	0.000	18.100	322.510	346.795	5.166	0.000	3.056	0.000	8.223	1.296	14.827	8.476	0.022	0.454	0.000	1.329	23.138	24.921	0.379	0.000	0.224	0.000	0.604
Worker trip	2.766	73.086	24.280	0.063	1.311	0.000	3.836	0.000	5.147	1.095	0.000	0.648	0.000	1.743	0.351	9.280	3.083	0.008	0.166	0.000	0.487	0.000	0.654	0.139	0.000	0.082	0.000	0.221
Total	29.526	406.190	194.853	23.002	17.548	1884.963	21.936	322.510	2246.956	16.011	391.786	3.704	0.000	411.501	2.293	34.175	15.562	1.797	1.347	195.535	1.816	23.138	221.836	1.223	40.495	0.307	0.000	42.024

2,037,644

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1992.747	0.000	0.000	1992.747	0.000	414.188	0.000	0.000	414.188
Non-Road Equipment	5.488	64.961	30.898	11.118	5.777	0.000	0.000	0.000	5.777	5.604	0.000	0.000	0.000	5.604
On-Road Haul Truck	16.499	188.801	107.934	0.276	5.781	0.000	16.917	302.800	325.497	4.829	0.000	2.856	0.000	7.685
Worker trip	2.187	57.789	19.198	0.049	1.036	0.000	3.033	0.000	4.070	0.866	0.000	0.512	0.000	1.378
Total	24.174	311.550	158.030	11.443	12.595	1992.747	19.950	302.800	2328.091	11.298	414.188	3.369	0.000	428.855
					12.595	597.82402	5.984983	90.839865	707.244					

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	68.110	0.000	0.000	68.110	0.000	14.156	0.000	0.000	14.156
Non-Road Equipment	0.115	1.432	0.666	0.239	0.122	0.119	0.000	0.000	0.241	0.119	0.000	0.000	0.000	0.119
On-Road Haul Truck	0.313	3.617	2.068	0.005	0.111	0.000	0.324	5.746	6.181	0.093	0.000	0.055	0.000	0.147
Worker trip	0.215	5.675	1.885	0.005	0.102	0.000	0.298	0.000	0.400	0.085	0.000	0.050	0.000	0.135
Total	0.642	10.725	4.619	0.249	0.335	68.228	0.622	5.746	74.932	0.296	14.156	0.105	0.000	14.558
					0.335	20.46848	0.186591	1.723929	22.714					

Total Quantity (cy+ton)
819,741

Fugitive

Total days	yr-3	yr-4	ratio
540	365	175	0.48

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	363.384	0.000	0.000	363.384	0.000	75.529	0.000	0.000	75.529
Non-Road Equipment	2.050	23.714	11.145	4.243	2.158	0.000	0.000	0.000	2.158	2.094	0.000	0.000	0.000	2.094
On-Road Haul Truck	7.100	81.241	46.444	0.119	2.488	0.000	7.279	126.266	136.033	2.078	0.000	1.229	0.000	3.307
Worker trip	0.900	23.795	7.905	0.020	0.427	0.000	1.249	0.000	1.676	0.356	0.000	0.211	0.000	0.567
Total	10.050	128.750	65.493	4.382	5.073	363.384	8.528	126.266	503.252	4.528	75.529	1.440	0.000	81.497
					5.073	109.01533	2.558458	37.879931	154.526					

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	0.856	0.000	0.000	0.856	0.000	0.178	0.000	0.000	0.178
Non-Road Equipment	0.005	0.066	0.030	0.011	0.006	0.006	0.000	0.000	0.011	0.006	0.000	0.000	0.000	0.006
On-Road Haul Truck	0.011	0.189	0.108	0.000	0.006	0.000	0.017	0.294	0.317	0.005	0.000	0.003	0.000	0.008
Worker trip	0.074	1.963	0.652	0.002	0.035	0.000	0.103	0.000	0.138	0.029	0.000	0.017	0.000	0.047
Total	0.090	2.218	0.790	0.013	0.047	0.861	0.120	0.294	1.322	0.040	0.178	0.020	0.000	0.238
					0.047	0.258393	0.036	0.088294	0.429					

Total Quantity (cy+ton)

#REF!

Fugitive

Total days	yr-3	yr-4	ratio
540	365	175	0.48

	Peak Daily (lbs/day)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	3729.250	0.000	0.000	3729.250	0.000	775.117	0.000	0.000	775.117
Non-Road Equipment	6.773	76.818	38.111	12.876	6.927	0.000	0.000	0.000	6.927	6.719	0.000	0.000	0.000	6.719
On-Road Haul Truck	42.232	483.262	276.272	0.706	14.797	0.000	43.301	751.100	809.198	12.360	0.000	7.312	0.000	19.671
Worker Trip	2.959	78.185	25.974	0.067	1.402	0.000	4.104	0.000	5.506	1.171	0.000	0.693	0.000	1.864
Total	51.964	638.264	340.356	13.648	23.126	3729.250	47.405	751.100	4550.881	20.250	775.117	8.004	0.000	803.371

Total Quantity (cy+ton)

	Annual (tpy)													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	168.461	0.000	0.000	168.461	0.000	35.014	0.000	0.000	35.014
Non-Road Equipment	0.290	3.564	1.684	0.594	0.307	0.298	0.000	0.000	0.605	0.298	0.062	0.000	0.000	0.360
On-Road Haul Truck	2.490	28.497	16.291	0.042	0.873	0.000	2.553	44.291	47.717	0.729	0.000	0.431	0.000	1.160
Worker Trip	0.290	7.651	2.542	0.007	0.137	0.000	0.402	0.000	0.539	0.115	0.000	0.068	0.000	0.182
Total	***3.070***	***39.713***	***20.517***	***0.642***	***1.317***	***168.759***	***2.955***	***44.291***	***217.322***	***1.141***	***35.076***	***0.499***	***0.000***	***36.716***

Total Quantity (cy+ton)

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	4360.710	0.000	0.000	4360.710	0.000	906.365	0.000	0.000	906.365
Non-Road Equipment	8.126	105.553	47.437	17.916	8.646	0.000	0.000	0.000	8.646	8.386	0.000	0.000	0.000	8.386
On-Road Haul Truck	42.084	481.569	275.304	0.703	14.745	0.000	43.149	757.015	814.909	12.316	0.000	7.286	0.000	19.602
Worker trip	2.894	76.485	25.409	0.065	1.372	0.000	4.014	0.000	5.386	1.146	0.000	0.678	0.000	1.824
Total	53.104	663.608	348.151	18.684	24.763	4360.710	47.164	757.015	5189.651	21.848	906.365	7.964	0.000	936.177
						1308.213	14.14913	227.104386	1549.467					

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	308.066	0.000	0.000	308.066	0.000	64.031	0.000	0.000	64.031
Non-Road Equipment	0.593	8.811	3.611	1.519	0.662	0.642	0.000	0.000	1.304	0.642	0.133	0.000	0.000	0.775
On-Road Haul Truck	3.082	35.265	20.161	0.051	1.080	0.000	3.160	54.905	59.144	0.902	0.000	0.534	0.000	1.435
Worker trip	0.301	7.960	2.644	0.007	0.143	0.000	0.418	0.000	0.561	0.119	0.000	0.071	0.000	0.190
Total	3.976	52.036	26.416	1.578	1.884	308.707	3.578	54.905	369.074	1.663	64.164	0.604	0.000	66.431
						92.61224	1.073281	16.47139	110.157					

Total Quantity (cy+ton)
3,525,763

	lbs/day														t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	2744.414	0.000	0.000	2744.414	0.000	839.297	0.000	0.000	839.297	0.000	0.000	0.000	0.000	0.000	275.919	0.000	0.000	275.919	0.000	87.097	0.000	0.000	87.097
Non-Road Equipment	10.085	153.217	62.389	26.711	11.175	0.000	0.000	0.000	11.175	10.840	0.000	0.000	0.000	10.840	0.702	11.707	4.529	2.061	0.801	0.767	0.000	0.000	1.569	0.777	0.000	0.000	0.000	0.777
On-Road Haul Truck	16.914	193.544	110.645	0.283	5.926	0.000	17.342	300.811	324.079	4.950	0.000	2.928	0.000	7.878	1.205	13.785	7.881	0.020	0.422	0.000	1.235	21.425	23.082	0.353	0.000	0.209	0.000	0.561
Worker trip	4.551	69.422	32.361	0.083	1.738	0.000	5.085	60.348	67.170	1.451	0.000	0.859	0.000	0.729	0.310	5.741	2.357	0.006	0.127	0.000	0.371	2.920	3.418	0.106	0.000	0.063	0.000	0.092
Total	49.780	659.751	325.339	38.856	28.882	2744.414	36.869	586.184	3396.348	26.318	839.297	6.226	0.000	871.840	3.516	50.141	23.626	2.864	2.031	276.970	2.742	39.798	321.540	1.844	87.097	0.463	0.000	89.404

2,037,644

Fugitive																												
Total days	yr-3	yr-4	ratio																									
560	365	195	0.53																									
Alt4 Yr-3 MaCarran Rock Chanel Terracing	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
yr-3	0	0	0	0	0	635.49804	0	0	635.49804	0	132.08696	0	0	132.08696	0	0	0	0	0	81.02133	0	0	81.02133	0	16.84012	0	0	16.84012
yr-4	0	0	0	0	0	339.51265	0	0	339.51265	0	70.567007	0	0	70.567007	0	0	0	0	0	43.28537	0	0	43.28537	0	8.996775	0	0	8.996775
Exhaust(On-site Equipment + Haul Truck + Worker Trip)																												
yr-3	7.5276	110.1821	49.9203	9.23339	5.0436605	0	4.817181	74.2743744	80.737722	4.6705462	0	0.8134	0	0.2431531	0.6837	9.9298	4.5829	0.703	0.4264296	0.242329	0.486803	7.26032	7.913477	0.391222	0	0.082199	0	0.031002
yr-4	4.0216	58.8644	26.6698	4.93291	2.6945583	0	2.573562	39.6808302	43.133852	2.4952233	0	0.434556	0	0.1299037	0.3653	5.305	2.4484	0.3756	0.2278185	0.129464	0.260073	3.878801	4.227748	0.209009	0	0.043914	0	0.016563
Fugitive																												
Alt4 Yr-2 Chanel Terracing Vista	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
yr-3 (following yr-1)	0	0	0	0	0	1070.7897	0	0	1070.7897	0	222.56144	0	0	222.56144	0	0	0	0	0	136.5073	0	0	136.5073	0	28.37275	0	0	28.37275
Alt3 Yr-2 Vista to McCarran Levee & Floodwall																												
yr-3 (following yr-1)	0	0	0	0	0	222.82997	0	0	222.82997	0	46.314752	0	0	46.314752	0	0	0	0	0	6.6164	0	0	6.6164	0	1.375205	0	0	1.375205
Exhaust(On-site Equipment + Haul Truck + Worker Trip)																												
Alt4 Yr-2 Chanel Terracing Vista																												
Yr-3	7.2566	97.40781	48.1843	5.52286	4.0182845	0	5.709251	92.842968	102.5705	3.6348567	0	0.964029	0	4.598886	0.7723	10.594	5.1544	0.6412	0.4390913	0.228095	0.596795	9.562826	10.82681	0.398439	0	0.100771	0	0.499211
Alt4 Yr-2 Vista to McCarran Levee & Floodwall																												
Yr-3	10.973	146.1607	71.7598	6.25635	6.0244603	0	8.73337	132.181446	146.93928	5.4416033	0	1.474664	0	3.6782784	0.5262	8.3135	3.7049	0.1358	0.2414274	0.055561	0.538873	5.890033	6.725894	0.209372	0	0.090991	0	0.148567

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	3228.195	0.000	0.000	3228.195	0.000	670.974	0.000	0.000	670.974
Non-Road Equipment	9.026	105.271	49.838	18.186	9.418	0.000	0.000	0.000	9.418	9.136	0.000	0.000	0.000	9.136
On-Road Haul Truck	30.937	354.019	202.386	0.517	10.840	0.000	31.721	568.111	610.672	9.054	0.000	5.356	0.000	14.410
Worker trip	3.537	93.482	31.056	0.080	1.677	0.000	4.906	0.000	6.583	1.400	0.000	0.828	0.000	2.229
Total	43.501	552.772	283.279	18.783	21.935	3228.195	36.627	568.111	3854.868	19.590	670.974	6.185	0.000	696.749
					21.935	968.45861	10.98813	170.433292	1171.815					

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	ᴾM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	ᴾM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	75.187	0.000	0.000	75.187	0.000	15.627	0.000	0.000	15.627
Non-Road Equipment	0.151	1.906	0.855	0.319	0.159	0.155	0.000	0.000	0.314	0.155	0.000	0.000	0.000	0.155
On-Road Haul Truck	0.412	4.825	2.758	0.007	0.148	0.000	0.432	7.794	8.374	0.123	0.000	0.073	0.000	0.196
Worker trip	0.438	11.577	3.846	0.010	0.208	0.000	0.608	0.000	0.815	0.173	0.000	0.103	0.000	0.276
Total	1.001	18.309	7.460	0.336	0.515	75.341	1.040	7.794	84.690	0.451	15.627	0.176	0.000	16.254
					0.515	22.60244	0.311984	2.338262	25.767					

Total Quantity (cy+ton)
819,741

Fugitive

Total days	yr-3	yr-4	ratio
540	365	175	0.48

	lbs/day													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1443.443	0.000	0.000	1443.443	0.000	300.017	0.000	0.000	300.017
Non-Road Equipment	2.872	32.893	15.521	5.617	2.929	0.000	0.000	0.000	2.929	2.841	0.000	0.000	0.000	2.841
On-Road Haul Truck	11.622	132.996	76.031	0.194	4.072	0.000	11.917	215.252	231.241	3.401	0.000	2.012	0.000	5.414
Worker trip	1.158	30.594	10.164	0.026	0.549	0.000	1.606	0.000	2.154	0.458	0.000	0.271	0.000	0.729
Total	15.652	196.483	101.716	5.838	7.550	1443.443	13.522	215.252	1679.768	6.701	300.017	2.283	0.000	309.001
					7.550	433.03304	4.05672	64.5755497	509.216					

	t/y													
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	8.941	0.000	0.000	8.941	0.000	1.858	0.000	0.000	1.858
Non-Road Equipment	0.029	0.399	0.150	0.067	0.030	0.029	0.000	0.000	0.059	0.029	0.000	0.000	0.000	0.029
On-Road Haul Truck	0.094	1.075	0.614	0.002	0.033	0.000	0.096	1.842	1.971	0.027	0.000	0.016	0.000	0.044
Worker trip	0.239	6.323	2.100	0.005	0.113	0.000	0.332	0.000	0.445	0.095	0.000	0.056	0.000	0.151
Total	0.362	7.796	2.865	0.074	0.176	8.970	0.428	1.842	11.416	0.151	1.858	0.072	0.000	2.082
					0.176	2.690985	0.128448	0.552454	3.548					

Total Quantity (cy+ton)

#REF!

Fugitive

Total days	yr-3	yr-4	ratio
540	365	175	0.48

April 2008 Emissions Summaries

Yr-1	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Peak Daily (lbs/day)													
Fugitive	0.000	0.000	0.000	0.000	0.000	1622.642	0.000	0.000	1622.642	0.000	337.263	0.000	0.000	337.263
Non-Road Equipment	4.701	49.644	25.724	8.469	4.694	0.000	0.000	0.000	4.694	4.553	0.000	0.000	0.000	4.553
On-Road Haul Truck	18.793	215.048	122.939	0.314	6.585	0.000	19.269	334.235	360.088	5.500	0.000	3.254	0.000	8.754
Worker Trip	2.315	61.188	20.327	0.052	1.097	0.000	3.211	0.000	4.309	0.917	0.000	0.542	0.000	1.459
Total	25.809	325.880	168.991	8.835	12.376	1622.642	22.480	334.235	1991.733	10.970	337.263	3.796	0.000	352.028

Yr-2	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Peak Daily (lbs/day)													
Fugitive	0.000	0.000	0.000	0.000	0.000	1088.201	0.000	0.000	1088.201	0.000	226.180	0.000	0.000	226.180
Non-Road Equipment	3.340	39.287	18.514	6.659	3.465	0.000	0.000	0.000	3.465	3.361	0.000	0.000	0.000	3.361
On-Road Haul Truck	15.274	174.784	99.921	0.255	5.352	0.000	15.661	280.200	301.213	4.470	0.000	2.644	0.000	7.115
Worker trip	1.479	39.092	12.987	0.033	0.701	0.000	2.052	0.000	2.753	0.586	0.000	0.346	0.000	0.932
Total	20.094	253.163	131.422	6.948	9.518	1088.201	17.713	280.200	1395.633	8.417	226.180	2.991	0.000	237.588

Yr-3	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Peak Daily (lbs/day)													
Fugitive	0.000	0.000	0.000	0.000	0.000	1344.141	0.000	0.000	1344.141	0.000	259.503	0.000	0.000	259.503
Non-Road Equipment	3.701	42.487	20.492	7.379	3.868	0.000	0.000	0.000	3.868	3.752	0.000	0.000	0.000	3.752
On-Road Haul Truck	21.455	245.514	140.356	0.358	7.517	0.000	21.998	391.839	421.355	6.279	0.000	3.715	0.000	9.994
Worker trip	1.479	39.092	12.987	0.033	0.701	0.000	2.052	0.000	2.753	0.586	0.000	0.346	0.000	0.932
Total	26.636	327.093	173.834	7.771	12.086	1344.141	24.050	391.839	1772.117	10.616	259.503	4.061	0.000	274.180

Yr-4	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Peak Daily (lbs/day)													
Fugitive	0.000	0.000	0.000	0.000	0.000	3621.652	0.000	0.000	3621.652	0.000	752.753	0.000	0.000	752.753
Non-Road Equipment	4.196	53.055	24.163	9.092	4.541	0.000	0.000	0.000	4.541	4.405	0.000	0.000	0.000	4.405
On-Road Haul Truck	15.532	177.734	101.607	0.260	5.442	0.000	15.925	300.463	321.830	4.546	0.000	2.689	0.000	7.235
Worker trip	2.444	64.587	21.457	0.055	1.158	0.000	3.390	0.000	4.548	0.968	0.000	0.572	0.000	1.540
Total	22.172	295.376	147.227	9.407	11.141	3621.652	19.315	300.463	3952.571	9.918	752.753	3.261	0.000	765.932

Yr-5	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Peak Daily (lbs/day)													
Fugitive	0.000	0.000	0.000	0.000	0.000	259.715	0.000	0.000	259.715	0.000	53.981	0.000	0.000	53.981
Non-Road Equipment	1.590	10.202	6.797	1.801	1.260	0.000	0.000	0.000	1.260	1.380	0.000	0.000	0.000	1.380
On-Road Haul Truck	3.132	32.855	18.782	0.048	1.006	0.000	3.211	55.706	59.923	0.917	0.000	0.542	0.000	1.459
Worker Trip	0.579	15.297	5.082	0.013	0.274	0.000	0.803	0.000	1.077	0.229	0.000	0.136	0.000	0.365
Total	5.301	58.354	30.661	1.862	2.540	259.715	4.014	55.706	321.976	2.526	53.981	0.678	0.000	57.185

Yr-1	Unmitigated Annual t/y												
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	34.997	0.000	0.000	34.997	0.000	7.274	0.000	0.000	7.274
Non-Road Equipment	0.084	0.726	0.441	0.118	0.078	0.000	0.000	0.000	0.078	0.076	0.000	0.000	0.000	0.076
On-Road Haul Truck	0.308	3.521	2.013	0.005	0.108	0.000	0.316	5.473	5.896	0.090	0.000	0.053	0.000	0.143
Worker Trip	0.197	5.204	1.729	0.004	0.093	0.000	0.273	0.000	0.366	0.078	0.000	0.046	0.000	0.124
Total	0.589	9.451	4.183	0.127	0.279	34.997	0.589	5.473	41.338	0.244	7.274	0.099	0.000	7.617

Yr-2	Unmitigated Annual t/y												
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	14.421	0.000	0.000	14.421	0.000	2.997	0.000	0.000	2.997
Non-Road Equipment	0.138	1.850	0.685	0.313	0.139	0.000	0.000	0.000	0.139	0.135	0.000	0.000	0.000	0.135
On-Road Haul Truck	0.666	7.622	4.357	0.011	0.233	0.000	0.683	12.282	13.198	0.195	0.000	0.115	0.000	0.310
Worker trip	0.154	4.079	1.355	0.003	0.073	0.000	0.214	0.000	0.287	0.061	0.000	0.036	0.000	0.097
Total	0.959	13.551	6.398	0.328	0.445	14.421	0.897	12.282	28.045	0.391	2.997	0.151	0.000	3.540

Yr-3	Unmitigated Annual t/y												
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	39.604	0.000	0.000	39.604	0.000	8.232	0.000	0.000	8.232
Non-Road Equipment	0.078	0.992	0.441	0.173	0.084	0.000	0.000	0.000	0.084	0.082	0.000	0.000	0.000	0.082
On-Road Haul Truck	0.639	7.309	4.178	0.011	0.224	0.000	0.655	11.800	12.679	0.187	0.000	0.111	0.000	0.298
Worker trip	0.160	4.219	1.402	0.004	0.076	0.000	0.221	0.000	0.297	0.063	0.000	0.037	0.000	0.101
Total	0.876	12.520	6.021	0.187	0.384	39.604	0.876	11.800	52.665	0.332	8.232	0.148	0.000	8.711

Yr-4	Unmitigated Annual t/y												
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	39.012	0.000	0.000	39.012	0.000	8.109	0.000	0.000	8.109
Non-Road Equipment	0.129	1.477	0.732	0.245	0.133	0.000	0.000	0.000	0.133	0.129	0.000	0.000	0.000	0.129
On-Road Haul Truck	0.215	2.498	1.428	0.004	0.076	0.000	0.224	4.437	4.738	0.064	0.000	0.038	0.000	0.102
Worker trip	0.263	6.960	2.312	0.006	0.125	0.000	0.365	0.000	0.490	0.104	0.000	0.062	0.000	0.166
Total	0.608	10.935	4.472	0.254	0.335	39.012	0.589	4.437	44.373	0.297	8.109	0.099	0.000	8.505

Yr-5	Unmitigated Annual t/y												
	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	0.492	0.000	0.000	0.492	0.000	0.102	0.000	0.000	0.059
Non-Road Equipment	0.003	0.014	0.011	0.002	0.002	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.001
On-Road Haul Truck	0.007	0.069	0.040	0.000	0.002	0.000	0.007	0.117	0.126	0.002	0.000	0.001	0.000	0.001
Worker Trip	0.051	1.356	0.451	0.001	0.024	0.000	0.071	0.000	0.096	0.020	0.000	0.012	0.000	0.031
Total	0.061	1.439	0.502	0.003	0.028	0.492	0.078	0.117	0.715	0.024	0.102	0.013	0.000	0.093

Yr-1	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Mitigated Annual t/y													
Fugitive	0.000	0.000	0.000	0.000	0.000	6.999	0.000	0.000	6.999	0.000	1.455	0.000	0.000	1.455
Non-Road Equipment	0.084	0.726	0.441	0.118	0.078	0.000	0.000	0.000	0.078	0.076	0.000	0.000	0.000	0.076
On-Road Haul Truck	0.308	3.521	2.013	0.005	0.108	0.000	0.316	1.095	1.518	0.090	0.000	0.053	0.000	0.143
Worker Trip	0.197	5.204	1.729	0.004	0.093	0.000	0.273	0.000	0.366	0.078	0.000	0.046	0.000	0.124
Total	0.589	9.451	4.183	0.127	0.279	6.999	0.589	1.095	8.962	0.244	1.455	0.099	0.000	1.798

Yr-2	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Unmitigated Annual t/y													
Fugitive	0.000	0.000	0.000	0.000	0.000	2.884	0.000	0.000	2.884	0.000	0.599	0.000	0.000	0.599
Non-Road Equipment	0.138	1.850	0.685	0.313	0.139	0.000	0.000	0.000	0.139	0.135	0.000	0.000	0.000	0.135
On-Road Haul Truck	0.666	7.622	4.357	0.011	0.233	0.000	0.683	2.456	3.373	0.195	0.000	0.115	0.000	0.310
Worker trip	0.154	4.079	1.355	0.003	0.073	0.000	0.214	0.000	0.287	0.061	0.000	0.036	0.000	0.097
Total	0.959	13.551	6.398	0.328	0.445	2.884	0.897	2.456	6.683	0.391	0.599	0.151	0.000	1.142

Yr-3	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Unmitigated Annual t/y													
Fugitive	0.000	0.000	0.000	0.000	0.000	7.921	0.000	0.000	7.921	0.000	1.646	0.000	0.000	1.646
Non-Road Equipment	0.078	0.992	0.441	0.173	0.084	0.000	0.000	0.000	0.084	0.082	0.000	0.000	0.000	0.082
On-Road Haul Truck	0.639	7.309	4.178	0.011	0.224	0.000	0.655	2.360	3.239	0.187	0.000	0.111	0.000	0.298
Worker trip	0.160	4.219	1.402	0.004	0.076	0.000	0.221	0.000	0.297	0.063	0.000	0.037	0.000	0.101
Total	0.876	12.520	6.021	0.187	0.384	7.921	0.876	2.360	11.541	0.332	1.646	0.148	0.000	2.126

Yr-4	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Unmitigated Annual t/y													
Fugitive	0.000	0.000	0.000	0.000	0.000	7.802	0.000	0.000	7.802	0.000	1.622	0.000	0.000	1.622
Non-Road Equipment	0.129	1.477	0.732	0.245	0.133	0.000	0.000	0.000	0.133	0.129	0.000	0.000	0.000	0.129
On-Road Haul Truck	0.215	2.498	1.428	0.004	0.076	0.000	0.224	0.887	1.188	0.064	0.000	0.038	0.000	0.102
Worker trip	0.263	6.960	2.312	0.006	0.125	0.000	0.365	0.000	0.490	0.104	0.000	0.062	0.000	0.166
Total	0.608	10.935	4.472	0.254	0.335	7.802	0.589	0.887	9.614	0.297	1.622	0.099	0.000	2.019

Yr-5	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
	Unmitigated Annual t/y													
Fugitive	0.000	0.000	0.000	0.000	0.000	0.098	0.000	0.000	0.098	0.000	0.020	0.000	0.000	0.020
Non-Road Equipment	0.003	0.014	0.011	0.002	0.002	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.002
On-Road Haul Truck	0.007	0.069	0.040	0.000	0.002	0.000	0.007	0.023	0.032	0.002	0.000	0.001	0.000	0.003
Worker Trip	0.051	1.356	0.451	0.001	0.024	0.000	0.071	0.000	0.096	0.020	0.000	0.012	0.000	0.032
Total	0.061	1.439	0.502	0.003	0.028	0.098	0.078	0.023	0.228	0.024	0.020	0.013	0.000	0.058

	Unmitigated Alt-1 Annual (tpy)					
	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Alt-1 Yr-1	0.589	9.451	4.183	0.127	41.338	7.617
Alt-1 Yr-2	0.959	13.551	6.398	0.328	28.045	3.540
Alt-1 Yr-3	0.876	12.520	6.021	0.187	52.665	8.711
Alt-1 Yr-4	0.608	10.935	4.472	0.254	44.373	8.505
Alt-1 Yr-5	0.061	1.439	0.502	0.003	0.715	0.093
Max	0.959	13.551	6.398	0.328	52.665	8.711

	Alt-1 Annual (tpy)					
Yr-1	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**34.997**	**7.274**
Non-Road Equipment	0.084	**0.726**	0.441	0.118	**0.078**	**0.076**
On-Road Haul Truck	0.308	**3.521**	2.013	0.005	**5.896**	**0.143**
Worker Trip	0.197	**5.204**	1.729	0.004	**0.366**	**0.124**
Total	0.589	**9.451**	4.183	0.127	**41.338**	**7.617**

	Alt-1 Annual (tpy)					
Yr-2	VOC	NOx	CO	SO2	**PM10-TOT**	**PM25-TOT**
Fugitive	0.000	**0.000**	0.000	0.000	**14.421**	**2.997**
Non-Road Equipment	0.138	**1.850**	0.685	0.313	**0.139**	**0.135**
On-Road Haul Truck	0.666	**7.622**	4.357	0.011	**13.198**	**0.310**
Worker trip	0.154	**4.079**	1.355	0.003	**0.287**	**0.097**
Total	0.959	**13.551**	6.398	0.328	**28.045**	**3.540**

	Alt-1 Annual (tpy)					
Yr-3	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**39.604**	**8.232**
Non-Road Equipment	0.078	**0.992**	0.441	0.173	**0.084**	**0.082**
On-Road Haul Truck	0.639	**7.309**	4.178	0.011	**12.679**	**0.298**
Worker trip	0.160	**4.219**	1.402	0.004	**0.297**	**0.101**
Total	0.876	**12.520**	6.021	0.187	**52.665**	**8.711**

	Alt-1 Annual (tpy)					
Yr-4	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**39.012**	**8.109**
Non-Road Equipment	0.129	**1.477**	0.732	0.245	**0.133**	**0.129**
On-Road Haul Truck	0.215	**2.498**	1.428	0.004	**4.738**	**0.102**
Worker trip	0.263	**6.960**	2.312	0.006	**0.490**	**0.166**
Total	0.608	**10.935**	4.472	0.254	**44.373**	**8.505**

	Alt-1 Annual (tpy)					
Yr-5	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**0.492**	**0.059**
Non-Road Equipment	0.003	**0.014**	0.011	0.002	**0.002**	**0.001**
On-Road Haul Truck	0.007	**0.069**	0.040	0.000	**0.126**	**0.001**
Worker Trip	0.051	**1.356**	0.451	0.001	**0.096**	**0.031**
Total	0.061	**1.439**	0.502	0.003	**0.715**	**0.093**

	Mitigated Alt-1 Annual (tpy)					
	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Alt-1 Yr-1	0.589	9.451	4.183	0.127	8.962	1.798
Alt-1 Yr-2	0.959	13.551	6.398	0.328	6.683	1.142
Alt-1 Yr-3	0.876	12.520	6.021	0.187	11.541	2.126
Alt-1 Yr-4	0.608	10.935	4.472	0.254	9.614	2.019
Alt-1 Yr-5	0.061	1.439	0.502	0.003	0.228	0.058
Max	0.959	13.551	6.398	0.328	11.541	2.126

	Alt-1 Annual (tpy)					
Yr-1	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**6.999**	**1.455**
Non-Road Equipment	0.084	**0.726**	0.441	0.118	**0.078**	**0.076**
On-Road Haul Truck	0.308	**3.521**	2.013	0.005	**1.518**	**0.143**
Worker Trip	0.197	**5.204**	1.729	0.004	**0.366**	**0.124**
Total	0.589	**9.451**	4.183	0.127	**8.962**	**1.798**

	Alt-1 Annual (tpy)					
Yr-2	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**2.884**	**0.599**
Non-Road Equipment	0.138	**1.850**	0.685	0.313	**0.139**	**0.135**
On-Road Haul Truck	0.666	**7.622**	4.357	0.011	**3.373**	**0.310**
Worker trip	0.154	**4.079**	1.355	0.003	**0.287**	**0.097**
Total	0.959	**13.551**	6.398	0.328	**6.683**	**1.142**

	Alt-1 Annual (tpy)					
Yr-3	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**7.921**	**1.646**
Non-Road Equipment	0.078	**0.992**	0.441	0.173	**0.084**	**0.082**
On-Road Haul Truck	0.639	**7.309**	4.178	0.011	**3.239**	**0.298**
Worker trip	0.160	**4.219**	1.402	0.004	**0.297**	**0.101**
Total	0.876	**12.520**	6.021	0.187	**11.541**	**2.126**

	Alt-1 Annual (tpy)					
Yr-4	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**7.802**	**1.622**
Non-Road Equipment	0.129	**1.477**	0.732	0.245	**0.133**	**0.129**
On-Road Haul Truck	0.215	**2.498**	1.428	0.004	**1.188**	**0.102**
Worker trip	0.263	**6.960**	2.312	0.006	**0.490**	**0.166**
Total	0.608	**10.935**	4.472	0.254	**9.614**	**2.019**

	Alt-1 Annual (tpy)					
Yr-5	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**0.098**	**0.020**
Non-Road Equipment	0.003	**0.014**	0.011	0.002	**0.002**	**0.002**
On-Road Haul Truck	0.007	**0.069**	0.040	0.000	**0.032**	**0.003**
Worker Trip	0.051	**1.356**	0.451	0.001	**0.096**	**0.032**
Total	0.061	**1.439**	0.502	0.003	**0.228**	**0.058**

	Peak Daily (lbs/day)													
Yr-1	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1774.076	0.000	0.000	1774.076	0.000	368.738	0.000	0.000	368.738
Non-Road Equipment	4.701	49.644	25.724	8.469	4.694	0.000	0.000	0.000	4.694	4.553	0.000	0.000	0.000	4.553
On-Road Haul Truck	22.917	262.240	149.918	0.383	8.030	0.000	23.497	407.581	439.107	6.707	0.000	3.968	0.000	10.674
Worker Trip	2.315	61.188	20.327	0.052	1.097	0.000	3.211	0.000	4.309	0.917	0.000	0.542	0.000	1.459
Total	29.933	373.072	195.969	8.904	13.821	1774.076	26.709	407.581	2222.187	12.177	368.738	4.510	0.000	385.425

	lbs/day													
Yr-2	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1570.218	0.000	0.000	1570.218	0.000	326.367	0.000	0.000	326.367
Non-Road Equipment	3.715	43.082	20.567	7.280	3.834	0.000	0.000	0.000	3.551	3.719	0.000	0.000	0.000	3.444
On-Road Haul Truck	17.310	198.081	113.239	0.289	6.065	0.000	17.748	327.348	351.161	5.066	0.000	2.997	0.000	2.470
Worker trip	1.672	44.191	14.681	0.038	0.793	0.000	2.319	0.000	3.112	0.662	0.000	0.392	0.000	1.054
Total	22.698	285.355	148.487	7.607	10.691	1570.218	20.068	327.348	1928.325	9.447	326.367	3.389	0.000	339.202

	lbs/day													
Yr-3	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	1312.848	0.000	0.000	1312.848	0.000	272.873	0.000	0.000	272.873
Non-Road Equipment	4.277	48.915	23.558	8.534	4.463	0.000	0.000	0.000	4.463	4.329	0.000	0.000	0.000	4.329
On-Road Haul Truck	22.291	255.071	145.820	0.372	7.810	0.000	22.855	408.745	439.410	6.524	0.000	3.859	0.000	10.383
Worker trip	1.737	45.891	15.245	0.039	0.823	0.000	2.409	0.000	3.232	0.687	0.000	0.407	0.000	1.094
Total	28.304	349.877	184.623	8.946	13.096	1312.848	25.263	408.745	1759.953	11.540	272.873	4.266	0.000	288.679

	lbs/day													
Yr-4	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	976.187	0.000	0.000	976.187	0.000	202.899	0.000	0.000	202.899
Non-Road Equipment	3.950	47.932	22.443	8.216	4.207	0.000	0.000	0.000	4.207	4.081	0.000	0.000	0.000	4.081
On-Road Haul Truck	4.333	49.581	28.344	0.072	1.518	0.000	4.443	83.896	89.857	1.268	0.000	0.750	0.000	2.018
Worker trip	13.466	160.839	89.099	0.228	4.774	0.000	13.970	300.081	318.825	3.987	0.000	2.359	0.000	6.346
Total	21.749	258.351	139.886	8.516	10.499	976.187	18.412	383.977	1389.075	9.336	202.899	3.109	0.000	215.344

	lbs/day													
Yr-5	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	829.104	0.000	0.000	829.104	0.000	172.327	0.000	0.000	172.327
Non-Road Equipment	4.020	49.591	24.128	8.642	4.263	0.000	0.000	0.000	4.263	4.135	0.000	0.000	0.000	4.135
On-Road Haul Truck	12.842	146.950	84.008	0.215	4.500	0.000	13.167	228.394	246.060	3.758	0.000	2.223	0.000	5.982
Worker Trip	1.286	33.993	11.293	0.029	0.610	0.000	1.784	0.000	2.394	0.509	0.000	0.301	0.000	0.811
Total	18.148	230.534	119.429	8.885	9.372	829.104	14.951	228.394	1081.820	8.402	172.327	2.525	0.000	183.254

Yr-1	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
							Annual (tpy)							
Fugitive	0.000	**0.000**	0.000	0.000	0.000	57.818	0.000	0.000	**57.818**	0.000	12.017	0.000	0.000	**12.017**
Non-Road Equipment	0.088	**0.782**	0.467	0.127	0.083	0.000	0.000	0.000	**0.083**	0.080	0.000	0.000	0.000	**0.080**
On-Road Haul Truck	0.526	**6.014**	3.438	0.009	0.184	0.000	0.539	9.348	**10.071**	0.154	0.000	0.091	0.000	**0.245**
Worker Trip	0.197	**5.204**	1.729	0.004	0.093	0.000	0.273	0.000	**0.366**	0.078	0.000	0.046	0.000	**0.124**
Total	0.811	**12.000**	5.634	0.140	0.360	57.818	0.812	9.348	**68.338**	0.312	12.017	0.137	0.000	**12.467**

Yr-2	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	**PM10-TOT**	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	**PM25-TOT**
							t/y							
Fugitive	0.000	**0.000**	0.000	0.000	0.000	29.197	0.000	0.000	**29.197**	0.000	6.068	0.000	0.000	**6.068**
Non-Road Equipment	0.120	**1.439**	0.648	0.247	0.124	0.120	0.000	0.000	**0.244**	0.120	0.000	0.000	0.000	**0.120**
On-Road Haul Truck	0.617	**7.064**	4.038	0.010	0.216	0.000	0.633	11.713	**12.562**	0.181	0.000	0.107	0.000	**0.011**
Worker trip	0.179	**4.729**	1.571	0.004	0.085	0.000	0.248	0.000	**0.333**	0.071	0.000	0.042	0.000	**0.113**
Total	0.916	**13.232**	6.258	0.262	0.425	29.317	0.881	11.713	**42.336**	0.372	6.068	0.149	0.000	**6.589**

Yr-3	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
							t/y							
Fugitive	0.000	**0.000**	0.000	0.000	0.000	50.327	0.000	0.000	**50.327**	0.000	10.460	0.000	0.000	**10.460**
Non-Road Equipment	0.140	**1.669**	0.766	0.297	0.148	0.144	0.000	0.000	**0.292**	0.144	0.000	0.000	0.000	**0.144**
On-Road Haul Truck	0.866	**9.912**	5.667	0.014	0.304	0.000	0.888	16.454	**17.646**	0.254	0.000	0.150	0.000	**0.403**
Worker trip	0.192	**5.086**	1.690	0.004	0.091	0.000	0.267	0.000	**0.358**	0.076	0.000	0.045	0.000	**0.121**
Total	1.199	**16.667**	8.122	0.316	0.543	50.471	1.155	16.454	**68.623**	0.473	10.460	0.195	0.000	**11.129**

Yr-4	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
							t/y							
Fugitive	0.000	**0.000**	0.000	0.000	0.000	36.076	0.000	0.000	**36.076**	0.000	7.498	0.000	0.000	**7.498**
Non-Road Equipment	0.147	**1.539**	0.809	0.253	0.146	0.000	0.000	0.000	**0.146**	0.142	0.000	0.000	0.000	**0.142**
On-Road Haul Truck	0.018	**0.241**	0.138	0.000	0.007	0.000	0.022	0.447	**0.476**	0.006	0.000	0.004	0.000	**0.010**
Worker trip	0.497	**5.828**	3.274	0.008	0.175	0.000	0.513	11.342	**12.030**	0.146	0.000	0.087	0.000	**0.233**
Total	0.662	**7.608**	4.221	0.262	0.329	36.076	0.535	11.789	**48.728**	0.294	7.498	0.090	0.000	**7.883**

Yr-5	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
							t/y							
Fugitive	0.000	**0.000**	0.000	0.000	0.000	20.485	0.000	0.000	**20.485**	0.000	4.258	0.000	0.000	**4.258**
Non-Road Equipment	0.087	**1.343**	0.603	0.239	0.103	0.000	0.000	0.000	**0.103**	0.100	0.000	0.000	0.000	**0.100**
On-Road Haul Truck	0.286	**3.633**	1.910	0.239	0.172	0.000	0.207	3.589	**3.968**	0.157	0.000	0.035	0.000	**0.192**
Worker Trip	0.086	**2.262**	0.752	0.002	0.041	0.000	0.119	0.000	**0.159**	0.034	0.000	0.020	0.000	**0.054**
Total	0.459	**7.238**	3.265	0.480	0.316	20.485	0.326	3.589	**24.716**	0.291	4.258	0.055	0.000	**4.604**

	Mitigated annual (t/y)													
Yr-1	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	11.564	0.000	0.000	11.564	0.000	3.605	0.000	0.000	3.605
Non-Road Equipment	0.088	0.782	0.467	0.127	0.083	0.000	0.000	0.000	0.083	0.080	0.000	0.000	0.000	0.080
On-Road Haul Truck	0.526	6.014	3.438	0.009	0.184	0.000	0.539	1.870	2.593	0.154	0.000	0.091	0.000	0.245
Worker Trip	0.197	5.204	1.729	0.004	0.093	0.000	0.273	0.000	0.366	0.078	0.000	0.046	0.000	0.124
Total	0.811	12.000	5.634	0.140	0.360	11.564	0.812	1.870	14.605	0.312	3.605	0.137	0.000	4.054

	t/y													
Yr-2	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	5.839	0.000	0.000	5.839	0.000	1.821	0.000	0.000	1.821
Non-Road Equipment	0.120	1.439	0.648	0.247	0.124	0.024	0.000	0.000	0.148	0.120	0.000	0.000	0.000	0.120
On-Road Haul Truck	0.617	7.064	4.038	0.010	0.216	0.000	0.633	2.343	3.192	0.181	0.000	0.107	0.000	0.288
Worker trip	0.179	4.729	1.571	0.004	0.085	0.000	0.248	0.000	0.333	0.071	0.000	0.042	0.000	0.113
Total	0.916	13.232	6.258	0.262	0.425	5.863	0.881	2.343	9.512	0.372	1.821	0.149	0.000	2.341

	t/y													
Yr-3	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	10.065	0.000	0.000	10.065	0.000	3.138	0.000	0.000	3.138
Non-Road Equipment	0.140	1.669	0.766	0.297	0.148	0.029	0.000	0.000	0.177	0.144	0.000	0.000	0.000	0.144
On-Road Haul Truck	0.866	9.912	5.667	0.014	0.304	0.000	0.888	3.291	4.483	0.254	0.000	0.150	0.000	0.403
Worker trip	0.192	5.086	1.690	0.004	0.091	0.000	0.267	0.000	0.358	0.076	0.000	0.045	0.000	0.121
Total	1.199	16.667	8.122	0.316	0.543	10.094	1.155	3.291	15.083	0.473	3.138	0.195	0.000	3.807

	t/y													
Yr-4	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	7.215	0.000	0.000	7.215	0.000	2.249	0.000	0.000	2.249
Non-Road Equipment	0.147	1.539	0.809	0.253	0.146	0.000	0.000	0.000	0.146	0.142	0.000	0.000	0.000	0.142
On-Road Haul Truck	0.018	0.241	0.138	0.000	0.007	0.000	0.022	0.089	0.118	0.006	0.000	0.004	0.000	0.010
Worker trip	0.497	5.828	3.274	0.008	0.175	0.000	0.513	2.268	2.957	0.146	0.000	0.087	0.000	0.233
Total	0.662	7.608	4.221	0.262	0.329	7.215	0.535	2.358	10.437	0.294	2.249	0.090	0.000	2.634

	t/y													
Yr-5	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpav	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpav	PM25-TOT
Fugitive	0.000	0.000	0.000	0.000	0.000	4.097	0.000	0.000	4.097	0.000	1.277	0.000	0.000	1.277
Non-Road Equipment	0.087	1.343	0.603	0.239	0.103	0.000	0.000	0.000	0.103	0.100	0.000	0.000	0.000	0.100
On-Road Haul Truck	0.286	3.633	1.910	0.239	0.172	0.000	0.207	0.718	1.097	0.157	0.000	0.035	0.000	0.192
Worker Trip	0.086	2.262	0.752	0.002	0.041	0.000	0.119	0.000	0.159	0.034	0.000	0.020	0.000	0.054
Total	0.459	7.238	3.265	0.480	0.316	4.097	0.326	0.718	5.456	0.291	1.277	0.055	0.000	1.624

	Unmitigated Alt-2 Annual (tpy)					
	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Alt-2 Yr-1	0.811	12.000	5.634	0.140	68.338	12.467
Alt-2 Yr-2	0.916	13.232	6.258	0.262	42.336	6.589
Alt-2 Yr-3	1.199	16.667	8.122	0.316	68.623	11.129
Alt-2 Yr-4	0.662	7.608	4.221	0.262	48.728	7.883
Alt-2 Yr-5	0.459	7.238	3.265	0.480	24.716	4.604
Alt-2 Yr-6	0.215	3.387	1.528	0.229	11.562	2.155
Max	1.199	16.667	8.122	0.480	68.623	12.467

	Alt-2 Annual (tpy)					
Yr-1	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**57.818**	**12.017**
Non-Road Equipment	0.088	**0.782**	0.467	0.127	**0.083**	**0.080**
On-Road Haul Truck	0.526	**6.014**	3.438	0.009	**10.071**	**0.245**
Worker Trip	0.197	**5.204**	1.729	0.004	**0.366**	**0.124**
Total	0.811	**12.000**	5.634	0.140	**68.338**	**12.467**

	t/y					
Yr-2	VOC	NOx	CO	SO2	**PM10-TOT**	**PM25-TOT**
Fugitive	0.000	**0.000**	0.000	0.000	**29.197**	**6.068**
Non-Road Equipment	0.120	**1.439**	0.648	0.247	**0.244**	**0.120**
On-Road Haul Truck	0.617	**7.064**	4.038	0.010	**12.562**	**0.011**
Worker trip	0.179	**4.729**	1.571	0.004	**0.333**	**0.113**
Total	0.916	**13.232**	6.258	0.262	**42.336**	**6.589**

	t/y					
Yr-3	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**50.327**	**10.460**
Non-Road Equipment	0.140	**1.669**	0.766	0.297	**0.292**	**0.144**
On-Road Haul Truck	0.866	**9.912**	5.667	0.014	**17.646**	**0.403**
Worker trip	0.192	**5.086**	1.690	0.004	**0.358**	**0.121**
Total	1.199	**16.667**	8.122	0.316	**68.623**	**11.129**

	t/y					
Yr-4	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**36.076**	**7.498**
Non-Road Equipment	0.147	**1.539**	0.809	0.253	**0.146**	**0.142**
On-Road Haul Truck	0.018	**0.241**	0.138	0.000	**0.476**	**0.010**
Worker trip	0.497	**5.828**	3.274	0.008	**12.030**	**0.233**
Total	0.662	**7.608**	4.221	0.262	**48.728**	**7.883**

	t/y					
Yr-5	VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
Fugitive	0.000	**0.000**	0.000	0.000	**20.485**	**4.258**
Non-Road Equipment	0.087	**1.343**	0.603	0.239	**0.103**	**0.100**
On-Road Haul Truck	0.286	**3.633**	1.910	0.239	**3.968**	**0.192**
Worker Trip	0.086	**2.262**	0.752	0.002	**0.159**	**0.054**
Total	0.459	**7.238**	3.265	0.480	**24.716**	**4.604**

Mitigated Alt-2 Annual (tpy)					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.811	12.000	5.634	0.140	14.605	4.054
0.916	13.232	6.258	0.262	9.512	2.341
1.199	16.667	8.122	0.316	15.083	3.807
0.662	7.608	4.221	0.262	10.437	2.634
0.459	7.238	3.265	0.480	5.456	1.624
0.215	3.387	1.528	0.229	2.312	0.431
1.199	16.667	8.122	0.480	15.083	4.054

t/y					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.000	**0.000**	0.000	0.000	**11.564**	**3.605**
0.088	**0.782**	0.467	0.127	**0.083**	**0.080**
0.526	**6.014**	3.438	0.009	**2.593**	**0.245**
0.197	**5.204**	1.729	0.004	**0.366**	**0.124**
0.811	**12.000**	5.634	0.140	**14.605**	**4.054**

t/y					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.000	**0.000**	0.000	0.000	**5.839**	**1.821**
0.120	**1.439**	0.648	0.247	**0.148**	**0.120**
0.617	**7.064**	4.038	0.010	**3.192**	**0.288**
0.179	**4.729**	1.571	0.004	**0.333**	**0.113**
0.916	**13.232**	6.258	0.262	**9.512**	**2.341**

t/y					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.000	**0.000**	0.000	0.000	**10.065**	**3.138**
0.140	**1.669**	0.766	0.297	**0.177**	**0.144**
0.866	**9.912**	5.667	0.014	**4.483**	**0.403**
0.192	**5.086**	1.690	0.004	**0.358**	**0.121**
1.199	**16.667**	8.122	0.316	**15.083**	**3.807**

t/y					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.000	**0.000**	0.000	0.000	**7.215**	**2.249**
0.147	**1.539**	0.809	0.253	**0.146**	**0.142**
0.018	**0.241**	0.138	0.000	**0.118**	**0.010**
0.497	**5.828**	3.274	0.008	**2.957**	**0.233**
0.662	**7.608**	4.221	0.262	**10.437**	**2.634**

t/y					
VOC	NOx	CO	SO2	PM10-TOT	PM25-TOT
0.000	**0.000**	0.000	0.000	**4.097**	**1.277**
0.087	**1.343**	0.603	0.239	**0.103**	**0.100**
0.286	**3.633**	1.910	0.239	**1.097**	**0.192**
0.086	**2.262**	0.752	0.002	**0.159**	**0.054**
0.459	**7.238**	3.265	0.480	**5.456**	**1.624**

Unmitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt3-yr1	0.569	9.277	4.057	0.175	0.283	42.587	0.559	5.204	48.632	0.248	8.852	0.094	0.000	9.194
Alt3-yr2	1.324	19.286	9.035	0.785	0.694	145.305	1.158	15.653	162.810	0.620	30.201	0.196	0.000	31.017
Alt3-yr3	2.341	35.813	16.136	1.647	1.313	241.051	1.973	24.169	268.507	1.183	49.975	0.333	0.000	51.492
Alt3-yr4	1.572	23.750	10.838	0.995	0.864	**178.257**	1.350	16.767	197.238	0.776	36.970	0.228	0.000	37.974
Alt3-yr5	0.085	2.004	0.706	0.008	0.041	0.283	0.108	0.204	0.636	0.035	0.058	0.018	0.000	0.111
Max	2.341	35.813	16.136	1.647	1.313	241.051	1.973	24.169	268.507	1.183	49.975	0.333	0.000	51.492
						80.00%								

Mitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt3-yr1	0.569	9.277	4.057	0.175	0.283	8.517	0.559	1.041	10.399	0.248	1.770	0.094	0.000	2.113
Alt3-yr2	1.324	19.286	9.035	0.785	0.694	29.061	1.158	3.131	34.044	0.620	6.040	0.196	0.000	6.856
Alt3-yr3	2.341	35.813	16.136	1.647	1.313	48.210	1.973	4.834	56.331	1.183	10.020	0.333	0.000	11.537
Alt3-yr4	1.572	23.750	10.838	0.995	0.864	**35.651**	1.350	3.353	41.219	0.776	7.410	0.228	0.000	8.414
Alt3-yr5	0.085	2.004	0.706	0.008	0.041	0.057	0.108	0.041	0.246	0.035	0.012	0.018	0.000	0.065
Max	2.341	35.813	16.136	1.647	1.313	48.210	1.973	4.834	56.331	1.183	10.020	0.333	0.000	11.537

Truckee Meadows Emission Inventory

1. The Alternative 3 has been considered as the worst scenario on air quality impacts, and its emission inventory was developed for each construction year in separate spreadsheet.
2. In each spreadsheet, the red highlighted value is the calendar day, and the correponding workday is 255 per year.
3. For activities over 365 calendar days, the quantities were averaged by years. The number of year was calculated using the total calendar days divided by 365.
For example, if a construction activity lasts for 900 hundred days, the number of years will be approximated as 3 years, and annual excavation quantities were calculated by averaging in 3 years.
4. Fugitive dust emission sources were categorized into 3 groups based on emission factors: the excavation, the removal of concreate and asphalt, and the rock/aggregates.
For excavation activity, the methodology and emission factors from MRI report were used as shown in spreadsheet-Emission Factors.
For the fugitive dusts from the other two source groups, the AP-42 emission factors were used.
5. On-site equipment emissions were calculated for all criteria pollutants using emission factors by running EPA Non-Road model at county level in Washoe County, NV.
6. Haul truck emissions were also calculated for all creteria pollutants using emission factors from running EPA Mobile 6 for Washoe County.
Haul truck can generate fugitive dusts on paved and unpaved roads (on-site), which were calculated assuming that the on-site VMT is 0.01 mile.
With this assumption, the unpaved dust can contribute to the total PM10 rangin from 8 to 47 %. Assumption is too conservative? But they are applicable to dust mitigation.
7. The dust control efficiency was asuumed at **90%** with watering mitigations, which is recommended in EPA AP-42.
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Without unpaved road dust, the control efficiency can be reduced to 60%.

Unmitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt3-yr1	0.569	9.277	4.057	0.175	0.283	42.587	0.559	0.000	43.428	0.248	8.852	0.094	0.000	9.194
Alt3-yr2	1.324	19.286	9.035	0.785	0.694	145.305	1.158	0.000	147.157	0.620	30.201	0.196	0.000	31.017
Alt3-yr3	2.341	35.813	16.136	1.647	1.313	241.051	1.973	0.000	244.338	1.183	49.975	0.333	0.000	51.492
Alt3-yr4	1.572	23.750	10.838	0.995	0.864	**178.257**	1.350	0.000	180.471	0.776	36.970	0.228	0.000	37.974
Alt3-yr5	0.085	2.004	0.706	0.008	0.041	0.283	0.108	0.000	0.431	0.035	0.058	0.018	0.000	0.111

60.00%

Mitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt3-yr1	0.569	9.277	4.057	0.175	0.283	8.517	0.559	0.000	9.359	0.248	1.770	0.094	0.000	2.113
Alt3-yr2	1.324	19.286	9.035	0.785	0.694	29.061	1.158	0.000	30.913	0.620	6.040	0.196	0.000	6.856
Alt3-yr3	2.341	35.813	16.136	1.647	1.313	48.210	1.973	0.000	51.497	1.183	10.020	0.333	0.000	11.537
Alt3-yr4	1.572	23.750	10.838	0.995	0.864	**35.651**	1.350	0.000	37.865	0.776	7.410	0.228	0.000	8.414
Alt3-yr5	0.085	2.004	0.706	0.008	0.041	0.057	0.108	0.000	0.205	0.035	0.012	0.018	0.000	0.065

Unmitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt4-yr1	0.173	3.742	1.387	0.022	0.082	3.485	0.210	0.823	4.599	0.070	0.724	0.035	0.000	0.829
Alt4-yr2	1.404	20.683	9.627	0.790	0.728	146.412	1.249	16.432	164.820	0.648	30.431	0.211	0.000	31.291
Alt4-yr3	2.631	38.275	17.764	2.174	1.538	286.944	2.050	28.492	319.024	1.398	59.474	0.346	0.000	61.218
Alt4-yr4	1.466	20.698	9.870	0.995	0.813	**179.041**	1.196	17.060	198.110	0.733	37.133	0.202	0.000	38.068
Alt4-yr5	3.930	51.883	26.601	1.328	1.810	98.718	3.667	55.421	159.616	1.551	20.518	0.603	0.000	22.672
Max	3.930	51.883	26.601	2.174	1.810	286.944	3.667	55.421	319.024	1.551	59.474	0.603	0.000	61.218
						80.00%								

Mitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt4-yr1	0.173	3.742	1.387	0.022	0.082	0.697	0.210	0.165	1.153	0.070	0.145	0.035	0.000	0.250
Alt4-yr2	1.404	20.683	9.627	0.790	0.728	29.282	1.249	3.286	34.545	0.648	6.086	0.211	0.000	6.946
Alt4-yr3	2.631	38.275	17.764	2.174	1.538	57.389	2.050	5.698	66.675	1.398	11.928	0.346	0.000	13.672
Alt4-yr4	1.466	20.698	9.870	0.995	0.813	**35.808**	1.196	3.412	41.229	0.733	7.443	0.202	0.000	8.378
Alt4-yr5	3.930	51.883	26.601	1.328	1.810	19.744	3.667	11.084	36.305	1.551	4.104	0.603	0.000	6.257
Max	3.930	51.883	26.601	2.174	1.810	57.389	3.667	11.084	66.675	1.551	11.928	0.603	0.000	13.672
Alt4-yr6														
Unmitigated	2.841	36.405	19.073	1.003	1.310	72.484	2.611	41.326	117.718	1.151	15.065	0.441	0.000	16.603
Mitigated	2.841	36.405	19.073	1.003	1.310	14.497	0.522	8.265	23.544	1.151	3.013	0.088	0.000	3.321

Truckee Meadows Emission Inventory

1. The Alternative 3 has been considered as the worst scenario on air quality impacts, and its emission inventory was developed for each construction year in separate spreadsheet.
2. In each spreadsheet, the red highlighted value is the calendar day, and the correponding workday is 255 per year.
3. For activities over 365 calendar days, the quantities were averaged by years. The number of year was calculated using the total calendar days divided by 365.
For example, if a construction activity lasts for 900 hundred days, the number of years will be approximated as 3 years, and annual excavation
quantities were calculated by averaging in 3 years.
4. Fugitive dust emission sources were categorized into 3 groups based on emission factors: the excavation, the removal of concreate and asphalt, and the rock/aggregates.
For excavation activity, the methodology and emission factors from MRI report were used as shown in spreadsheet-Emission Factors.
For the fugitive dusts from the other two source groups, the AP-42 emission factors were used.
5. On-site equipment emissions were calculated for all criteria pollutants using emission factors by running EPA Non-Road model at county level in Washoe County, NV.
6. Haul truck emissions were also calculated for all creteria pollutants using emission factors from running EPA Mobile 6 for Washoe County.
Haul truck can generate fugitive dusts on paved and unpaved roads (on-site), which were calculated assuming that the on-site VMT is 0.01 mile.
With this assumption, the unpaved dust can contribute to the total PM10 rangin from 8 to 47 %. Assumption is too conservative? But they are applicable to dust mitigation.
7. The dust control efficiency was suumed at 60 - 70% with watering mitigations, which EPA AP-42 recommends the control efficiency up to 90%
\\irvsvr1\aq\Truckee Meadows\Emission Inventory\Emission Factors\AP-42 Fugitive Dust Control.doc

Without unpaved road dust, the control efficiency can be reduced to 60%.

Unmitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt4-yr1	0.173	3.742	1.387	0.022	0.082	3.485	0.210	0.000	3.776	0.070	0.724	0.035	0.000	0.829
Alt4-yr2	1.404	20.683	9.627	0.790	0.728	146.412	1.249	0.000	148.388	0.648	30.431	0.211	0.000	31.291
Alt4-yr3	2.631	38.275	17.764	2.174	1.538	286.944	2.050	0.000	290.532	1.398	59.474	0.346	0.000	61.218
Alt4-yr4	1.466	20.698	9.870	0.995	0.813	**179.041**	1.196	0.000	181.050	0.733	37.133	0.202	0.000	38.068
Alt4-yr5	3.930	51.883	26.601	1.328	1.810	98.718	3.667	0.000	104.195	1.551	20.518	0.603	0.000	22.672

60.00%

Mitigated t/y

	VOC	NOx	CO	SO2	PM10-Exh	PM10-Fug	PM10-Pav	PM10-Unpa	PM10-TOT	PM25-Exh	PM25-Fug	PM25-Pav	PM25-Unpa	PM25-TOT
Alt4-yr1	0.173	3.742	1.387	0.022	0.082	0.697	0.210	0.000	0.989	0.070	0.145	0.035	0.000	0.250
Alt4-yr2	1.404	20.683	9.627	0.790	0.728	29.282	1.249	0.000	31.259	0.648	6.086	0.211	0.000	6.946
Alt4-yr3	2.631	38.275	17.764	2.174	1.538	57.389	2.050	0.000	60.977	1.398	11.928	0.346	0.000	13.672
Alt4-yr4	1.466	20.698	9.870	0.995	0.813	**35.808**	1.196	0.000	37.817	0.733	7.443	0.202	0.000	8.378
Alt4-yr5	3.930	51.883	26.601	1.328	1.810	19.744	3.667	0.000	25.220	1.551	4.104	0.603	0.000	6.257

APPENDIX H

PUBLIC SCOPING

CESPK-PD (1105) 21 May 1998

MEMORANDUM FOR Commander, Army Publications and Printing Command,
ATTN: TAPC-PDR-P (Mr. Showalter), 6000 6th Street, Stop C55
Fort Belvoir, VA 22060-5576

SUBJECT: Notice of Intent - Truckee Meadows, Nevada, General Reevaluation Report

Enclosed are three copies of our Notice of Intent (NOI) to prepare a Draft Environmental Impact Statement for the Truckee River, Nevada, General Reevaluation Report. Please place the NOI in the Federal Register at the earliest possible time.

Encl

DOROTHY F. KLASSE
COL, EN
Commanding

cc:
CESPK-PD
PD-O
PD-R
CESPK-OC

a:\noi.

ROBERSON
MURPHY
CLARK
RICE

YEP

CLAY

WHITNEY

LTC GAULT

COL KLASSE

BILLING CODE: 3710-EZ

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS

Intent to Prepare a Draft Environmental Impact Statement (DEIS) for the Truckee Meadows, Nevada General Reevaluation Report.

AGENCY: U.S. Army Corps of Engineers, DOD.

ACTION: Notice of Intent.

SUMMARY: The U.S. Army Corps of Engineers (Corps), lead agency under the National Environmental Policy Act intends to prepare a draft EIS evaluating the environmental effects of flood control, environmental restoration, and recreation proposed for Truckee Meadows, Sparks, and downtown Reno. The Corps is working with Washoe County and the cities of Reno and Sparks to provide this protection.

SUPPLEMENTARY INFORMATION:

1. Project Location: The Truckee River basin in eastern California and western Nevada encompasses about 3,060 square miles. The drainage area upstream from Reno includes 1,067 square miles of mountainous terrain on the eastern slope of the Sierra Nevada, the crest of which forms the western boundary of the basin. The primary study area includes the Truckee River in Washoe and Storey Counties, Nevada, at and below Reno, Sparks, and the Truckee Meadows. The Truckee Meadows encompasses an area along the Truckee River from the central part of Reno on the west to the Virginia and Pah Rah Mountain Ranges on the east, south along Steamboat Creek to Huffaker Hills, and includes Sparks to the north.

2. Proposed Action and Alternatives: Alternatives to address resource problems and needs identified to date will include: (1) flood control improvements along the Truckee River in the Truckee Meadows, (2) non-structural flood control measures through downtown Reno, (3) improving Lake Tahoe operation for flood control, (4) environmental restoration measures, and (5) recreation features.

3. Scoping Process:

a. "Scoping" is a process to identify the actions, alternatives, and effects to be evaluated in an environmental document. The public is invited to assist the Corps and non-Federal sponsor in scoping this EIS. The process provides an opportunity for the public to identify significant resources with the study area that may be affects by the project. To facilitate this involvement, a public scoping meeting will be held in Reno, Nevada on June 10, 1998, from 5:30 to 7:30 p.m. at the Washoe County Department of Water Resources, 4930 Energy Way, Reno, Nevada . Individuals, organizations, and agencies are also encouraged to submit written scoping comments by July 10, 1998.

b. After the draft EIS is prepared, it will be circulated to all interested parties for review and comment. Public meetings will be held to receive verbal and written comments. All comments will be considered and responded to in the final EIS.

4. Availability: The draft EIS is scheduled to be distributed for public review and comment in spring 1999.

FOR FURTHER INFORMATION CONTACT: Questions concerning the proposed action and draft EIS should be addressed to Ms. Patricia Roberson, Planning Division, Environmental Resources Branch, Corps of Engineers, 1325 J Street, Sacramento, California 95814-2922, telephone (916) 557-6705.

Dorothy F. Klasse
Col, EN
Commanding

WILDLIFE

IMPACTS ON NATIVE SPECIES:

USFWS:
Past Corps actions which imposed flood control measures along the Truckee River have produced negative consequences to the environment. Both aquatic and terrestrial habitats have been affected.

Service is interested in a plan which provides for flood protection as well as providing for the Truckee River's natural process.

Plan created in Napa Valley may be applicable to situation in Truckee Meadows. Plan includes levee and bridge removal/alterations and greenbelt implementation.

Corps should request a list of endangered, threatened, and candidate species that could be affected, pursuant to section 7 of the Endangered Species Act of 1973, as amended (ESA).

Each alternative should include positive and negative impacts, both direct and indirect, to aquatic and terrestrial wildlife and their habitats..

Project activities, especially land clearing, should be coordinated to avoid potential impacts to bird nests and their young that breed in the area. Destruction may be a violation of the Migratory Bird Treaty Act (Act) (15 U.S.C. 701-718h). It is suggested that land clearing be performed outside the avian breeding season.

Construction is forbidden in the Truckee River after October 1 and before July 1 from Stateline to the East McCarran bridge in Reno in order to protect the mountain whitefish and brown trout spawning habitats.

Potential impacts of noise from construction activities on wildlife should be evaluated.

Potential impacts of all hazardous materials used on the site should be identified.

Transportation routes used for hazardous materials should be noted. Surface waters and endangered, threatened, and candidate species along these routes should also be identified.

The location of equipment and qualifications of personnel which would be used in response to hazardous spills should be identified.

USEPA
The Corps should take into consideration structural and non-structural alternatives which would be able to accommodate the basic needs of the project while also preventing or minimizing the loss of aquatic resources, in accordance with the Clean Water Act Section 404(b)(1) Guidelines.

The Corps should examine the CEQ's guideline document on "Considering Cumulative Effects under the National Environmental Policy Act." The information can be found at: http://www.ceq.eh.doe.gov/nepa/ccenepa.htm.

Project should minimize construction parallel to rivers or streams to decrease the amount of runoff from the roads.

Project should incorporate existing roadway alignments (if possible) to decrease the amount of waste produced as a result of construction activities and clearing.

Building should be prevented within a defined distance from the streambed to protect the streambank.

Streambank protection measures should be included in the design.

Flood walls and levees should be placed outside wetlands and riparian areas.

Channel slopes should be graded to let animals crawl or climb out.

Access routes and storage areas should be planned and placed to minimize the potential for erosion.

Construction workers should be required to confine activites to designated areas to prevent the destruction of vegetation and disturbance of soil.

Secondary containment should be in place in fueling areas for equipment in order to control spills. A plan for spills should also be identified.

Construction equipment cleaning should be performed in a controlled area away from surface water. Washwater should also be prevented from flowing into streams.

Alternative materials should be present to decrease the use of toxic and hazardous materials during construction.

Construction and storage areas should be placed away from critical habitats.

Methods that use chemicals, grazing, or burning in the removal of vegetation should not be used. Animals wastes and chemical herbicide residual can flow into waterways only during rainy periods. Burning can have a negative affect on air quality.

Marina fueling areas should be maintained regularly and leak checks performed.

Measures should be taken to avert downstream sediment loading during dredging operations.

STATE OF NEVADA Dept. of Administration

Conduct survey of potential habitat for threatened, endangered (including N.R.S. 527.270 state-listed) species before any disturbances, direct or indirect, due to project.

Avert direct and indirect impacts to sensitive habitats, native vegetation, and sensitive species.

Public Scoping Comments

Stop destruction of wetlands in order to provide for crucial percolation and distribution techniques critical to managing the heave water flows in wet conditions.

Stop channelization effort in conjunction with the halt in wetland developments.

Stop construction of Pyramid Link highway in wetlands areas.

MITIGATION:

USFWS

Project proponent should generate measures to avert, decrease, or compensate for habitat losses (direct and indirect) as well as other negative impacts to fish and wildlife resources that will result from project activities.

Only native plant species to the area should be used in revegetation.

Monitoring should be in place to judge the success of mitigation efforts and to implement any necessary remedial measures.

EPA

Nevada's water quality standards state that various life stages of whitefish and trout species are under concern from state line to Pyramid Lake.

All measures should be taken to identify the detrimental effects and impacts on fisheries and habitats and other aquatic resources such as wetlands.

The project should incorporate mitigation measures to decrease the impact of pollution runoff from the roadway.

The plan should encompass native plant revegetation of areas introduced upon by construction to minimize sedimentation and erosion.

Safe wildlife crossing structures and suitable fencing should be assimilated into the project to provide for the movements and needs of resident wildlife and mitigate habitat fragmentation.

Native species should be used for revegetation of disturbed areas.

STATE OF NEVADA Dept of Administration
Completely document all unavoided impacts to sensitive species.

Minimize the introduction or additional expansion of invasive exotic weed species. Use all means necessary.

Maximize the spread and assortment of locally-collected and/or locally-adapted native species in the final reclaimed vegetaion.

Individually examine and justify each persistent exotic species suggested.

Generate cooperative attempts with other groups and agencies to acquire cost-effective supplies of native substitutes for exotic species. Publication *Hortus West* (800-704-7927) is recommended as a good resource.

Public Scoping Comments
Department of Natural Resources and Conservation of the Nevada Division of Wildlife presented a mitigation plan to the Corps in April 1998. The Corps is asked to submit a follow-up report on the assessments.

ELEMENT QUALITY

USFWS
Soil quality impacts and the capability to revegetate disturbed areas should be mentioned.

Document should incorporate discussions of impacts to air quality from particulate and dust emissions caused by equipment and operations, and fugitive dust ensuing from ground cover loss.

USEPA
Water quality regulations state that the water temperature must not surpass 20 degrees Celsius for waters with trout and 34 degrees Celsius for waters without trout. The temperature increase allowed above normal receiving water temperature is 3 degrees Celsius.

NEPA documentation should incorporate an evaluation on the potential of the project to generate negative aquatic impacts.

Water quality certification or waiver needs to be acquired from the appropriate agency prior to any Section 402 permit(s) necessary for the project can be issued by the State of Nevada (for non-tribal lands) or by U.S. EPA Region IX (for tribal lands in the project area).

The Corps should start a wide range of feasible pollution prevention measures in the design, construction, and operation of the proposed project.

FLOOD PLAIN/TRUCKEE RIVER MODIFICATIONS

COMMUNITY INVOLVEMENT:

USFWS
Service encourages involvement of the community in the development of a flood management project. The Reno/Sparks community wants to continue the participation in the project which started with the Corp's public meeting on June 10, 1998.

USEPA
The DEIS should include a discussion on the consultation process that the Corps would take on with potentially-affected tribal governments in combination with the 1994 memorandum on Government-to-Government Relations with Native American Tribal Governments. These actions must be taken prior to any process which would affect federally recognized tribal governments.

The DEIS should discuss whether the proposed project may have any unbalanced or negative impacts to low-income or minority communities, including tribal populations in accord with Executive Order 12898.

The Corps should consider the Napa River DSEIS as a model for public involvement and inter-agency coordination.

Public Scoping Comments
University of Nevada, Reno officials express that converting University property into a catch basin for flood control reasons is not in their best interest.

Acquire property from residents in low lying areas as part of flood control program.

Raise property in the areas between McCarran Blvd., Reno International Airport, Boynton Slough, and Bristlepoint Apartments and build a floodwall around housing.

Raise all of property and relocate residents to another house on raised land.

CONSTRUCTION:

USFWS
Establish River corridor structured on Meander Zone idea.

Consider non-structural measures in diminishing the effects of flooding along the Truckee River. This includes greenbelts, flood detention basins, or purchase of flood easements.

USEPA
Full description of the physical characteristics of the proposed project area.

Full description of the surrounding terrain.

Full description of flow engines and release to date, and predicted flow releases to compensate for the possibility of high winter flows.

Outline potential dredge sites, determine dredged material volumes, and catalog resource protection for each river reach.

Identify technique for removal of dredged materials and the predicted starting and finishing dates for the dredging.

Identification of all possible disposal locations for each river reach and each project phase.

Examine modifications to existing flood control structures to determine if they are able to eliminate the need for the new channelization or channel modification project.

Land use and agricultural practices, along with the possibility for their contribution of pollutants to surface waters should be examined in channel design.

Construction take place in dry season?

STATE OF NEVADA Dept of Administration
Alter the Truckee river between Reno and Pyramid Lake to take more water.

ALTERNATIVES:

USFWS
A variety of alternatives should be provided in the EIS and focus on measures that accommodate the river's natural process.

USEPA
The Corps should consider both structural and non-structural alternatives which would be able to meet the basic purpose of the project while also averting and minimizing the loss of aquatic resouces, in accordance with the Clean Water Act Section 404(b)(1).

Actions which diminish dredging and the release of dredged or fill materials into the waters of the United States.

Strengthen levees to protect specific sites from flood water flows.

Minimal recontouring or channel reconfiguration to protect existing resources and constraining levees.

Allowing flood impact to some resources while providing flood protection for other resouces.

Levee setbacks or the use of floodways.

Upstream watershed management and floodplain widening.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

May 20, 1998

PUBLIC NOTICE

TO ALL INTERESTED PARTIES:

Introduction: The U.S. Army Corps of Engineers (Corps), in conjunction with Washoe County, and the cities of Reno and Sparks, is conducting a general reevaluation investigation of the Truckee Meadows, Nevada, project. The project was originally authorized for construction by Congress in the Water Resources Development Act of 1988. However, during detailed design studies in 1991, it was determined that increased land prices may make the project economically infeasible and the project was placed in a deferred status. In 1996, the Corps was directed by Congress to conduct a new reconnaissance study of the Truckee Meadows project. Flooding in the spring of 1997 caused $450 million in damages which added to the complexity and scope of the study. The reconnaissance study was completed in August 1997, and determined that the construction of the project may now be feasible.

Study Area: The primary study area includes the Truckee River in Washoe and Storey Counties, Nevada, at and below Reno, the city of Sparks, and the Truckee Meadows. The Truckee Meadows encompasses an area along the Truckee River from the central part of Reno on the west to the Virginia and Pah Rah Mountain Ranges on the east, along Steamboat Creek to Huffaker Hills on the south, and includes Sparks to the north.

Study Process: We are now initiating a more detailed reevaluation phase of the study. The purposes of this phase are to (1) reassess flooding and related water resources problems in more detail, (2) review available flood damage reduction measures and alternatives, including the 1988 authorized plan, (3) update the potential economic feasibility of the authorized project and other alternatives, (4) determine if there is a Federal interest in proceeding with a potential project, and if feasible, and (5) prepare a plan to define, design, and implement a plan of improvement. A General Reevaluation Report (GRR) will be prepared and submitted to Congress reporting the results of the study. The GRR is Federally funded.

Potential Solutions: The investigation will reexamine several flood damage reduction measures which were evaluated in the reconnaissance phase and identify a fish and wildlife habitat restoration plan. Measures to be evaluated consist of (1) taking no-action, (2) increasing the channel capacity of the Truckee River through the Truckee Meadows area, (3) implementing various "non-structural" improvements (flood proofing, zoning, etc.) along the Truckee River in Reno, (4) improving outlet controls at Lake Tahoe, (5) restoring environmental resources, and (6) providing recreation features.

Environmental Documentation: An environmental impact statement will be prepared to identify important social, environmental, and cultural resources in the study area, and possible impacts to these resources resulting from the alternatives analyzed. Measures to avoid or mitigate any adverse impacts will also be presented.

Public Involvement: The public is invited to assist the Corps in identifying significant resources within the study area that may be affected by the proposed alternatives. To facilitate this involvement, a public scoping meeting will be held on June 10, 1998, from 5:30 p.m. to 7:30 p.m. at the offices of the Washoe County Department of Water Resources at 4930 Energy Way in Reno. Individuals, organizations, and agencies are also encouraged to submit written scoping comments on the attached form by July 10, 1998. For further information, contact Patricia Roberson, Environmental Planner with the Corps of Engineers in Sacramento, California, at (916) 557-6705 or Leonard Crowe with Washoe County Department of Water Resources at (702) 954-4664.

Sincerely,

Walter Yep

Walter Yep
Chief, Planning Division

We would appreciate your comments on the
TRUCKEE MEADOWS, NV
GENERAL REEVALUATION INVESTIGATION

WRITE: U.S. Army Corps of Engineers, Sacramento District (CESPK-PD-A)
1325 J Street, Room 1320, Sacramento, CA 95814-2922
OR
CALL: 916-557-6695

NAME ______________________________ DATE __________

ADDRESS ______________________________ PHONE __________

CITY ____________________ STATE ______ ZIP CODE ________

cc:
ʼlng Div
AR/GBB*
Env Plng Sec
Econ Br
Eng Div
Des & Study Sec
Real Estate Div

~~WERNER~~
Robinson
~~RICE~~
~~MURPHY~~
~~PACHECO~~
~~VEP~~
ESC
SCOTT

US Army Corps
of Engineers
Sacramento District
1325 J Street
Sacramento, California
95814-2922

News Release

Contact: Jim Taylor

Date: June 4, 1998

Phone: (916) 557-7461

Meeting planned to discuss solutions to Reno area flood problems

Solving the flood problems and discussing related environmental issues in Reno, Sparks, and Truckee Meadows is the subject of an informal public meeting set for Wednesday, June 10, from 5:30 to 7:30 p.m. The meeting will be held at the County's Department of Water Resources Office at 4930 Energy Way in Reno.

The Washoe County Department of Water Resources and the Army Corps of Engineers' Sacramento District are reexamining several flood damage reduction measures which they evaluated in a study completed in mid-1997. They are also trying to develop features of a flood control project that focus on restoring affected environmental resources.

Measures being evaluated are: (1) increasing the channel capacity of the Truckee River through the Truckee Meadows area, (2) implementing various non-structural improvements such as flood proofing and zoning along the Truckee River in Reno, (3) improving outlet controls at Lake Tahoe, (4) restoring environmental resources, and (5) providing recreation facilities.

An environmental impact statement (EIS) will be prepared to identify important social, environmental, and cultural resources in the study area and the possible effects on these resources from the alternatives analyzed. One of the main purposed of the June 10 meeting is to identify the major issues to address in the EIS. The draft EIS will be ready for public review in the spring of 1999.

Additional information on the meeting and study is available from Leonard Crowe at the Washoe County Department of Water Resources, (702) 954-4664; or Donna Garcia with the Corps of Engineers' Sacramento office, (916) 557-6782.

-END-

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

July 10, 1998
File No. COE 3-19
Truckee Meadows, NV Project

Mr. Walter Yep
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

Dear Mr. Yep:

The Fish and Wildlife Service has reviewed the U.S. Army Corps of Engineers' (Corps) Notice of Intent, in conjunction with Washoe County and the Cities of Reno and Sparks, to prepare a draft Environmental Impact Statement (EIS) evaluating the environmental effects of implementing 100-year flood protection measures in the Truckee Meadows, Nevada. The Service welcomes the opportunity to work with your agency and the local community on a Truckee River flood management plan which incorporates preserving and enhancing environmental values. We anticipate coordinating with the Corps pursuant to the Fish and Wildlife Coordination Act on this important project. Our comments and recommendations regarding issues to be addressed in the EIS are provided below.

GENERAL COMMENTS

We strongly encourage including the community in the development of a flood management project that emphasizes accommodating natural river processes. The objectives of flood management and the preservation and enhancement of environmental values are compatible concepts. Both could be achieved through a greater emphasis on the establishment of a river corridor based on a meander zone concept. A meandering channel would allow natural geomorphic and hydrologic conditions to dictate ecosystem features, including a sustainable riparian corridor, healthy fish habitat, and natural wetland and floodplain functions.

The Service encourages serious consideration of non-structural measures to the greatest extent possible in reducing the effects of flooding along the Truckee River. Non-structural measures include strict limitations on floodplain development, and acquisition of flood prone areas and relocation of homes and businesses occurring in these areas. Subsequent creation of greenbelts in these areas could provide opportunities for recreational activities and wildlife habitat along the river. Construction of flood detention basins or purchase of flood easements are also appropriate measures for reducing impacts of flooding. The University of Nevada-Reno Agricultural Experiment Station lands may be a site worthy of investigation for this type of measure. Additional areas need to be investigated.

Over the years, the Corps has implemented several flood control measures along the Truckee River with the underlying principles of improving hydraulic efficiency through channelization. As a result of these activities, many negative environmental consequences have occurred. Reservoir operations have altered natural streamflows and sediment transport. Removal of the Vista Reefs resulted in down cutting of the Truckee River and subsequently a portion of Steamboat Creek, a major tributary to the Truckee River. Channel straightening, enlarging, dredging, and clearing and snagging have negatively impacted terrestrial and aquatic wildlife habitats, increased flow velocity and erosional forces along river banks, dewatered adjacent wetlands, and isolated riparian vegetation. Past maintenance activities such as dredging and gravel bar removal have been detrimental to spawning of the Federally listed endangered cui-ui, and the Federally listed threatened Lahontan cutthroat trout (LCT), both of which are found in the Truckee River. A significant amount of vegetation was removed during past activities and revegetation has not always occurred. Loss of vegetation reduces habitat for wildlife, especially migratory birds; increases water temperatures, adversely impacting aquatic organisms, especially fish; and reduces bank stability allowing increased erosion.

There is a great deal of interest in this project from the Reno/Sparks community; approximately 150 people attended the Corps' public meeting held on June 10, 1998. The Reno/Sparks community wants to continue to participate fully in the process. We believe a community-based plan that provides open space, recreational opportunities, and increased flood protection for economically important areas is desired by the public. The Service is also interested in a plan that incorporates inventive measures to provide flood protection while accommodating the Truckee River's natural processes. We recommend close coordination with the community before alternatives are selected for study.

We are interested in the decision made by the residents of Napa Valley, California, to reject their existing flood control system. They approved a plan which will involve lowering or removing dikes and levees, removing or raising bridges that impede flood flows, and buying out and relocating residents who live in areas that regularly flood. In addition, Denver, Colorado; Boise, Idaho; and many communities along the Mississippi River have incorporated greenbelts through their cities to reduce the impacts of flooding. These are departures from past practices of flood control projects and may be viable options for the Truckee Meadows.

There are numerous projects/programs being pursued along the Truckee River to restore a more healthy river environment. These include land purchases; instream, wetland and terrestrial habitat restoration efforts; and water quality improvements. These activities have involved City, State, Tribal, and Federal agencies, environmental groups, and interested individuals. We recommend you become more familiar with activities occurring along the river and incorporate them into a flood management approach for the Truckee Meadows.

SPECIFIC COMMENTS

Threatened and Endangered Species

A list of endangered, threatened, and candidate species that may be affected by the project should be requested from our office, pursuant to section 7 of the Endangered Species Act of 1973, as amended (ESA). We recommend that the environmental analysis address all species, including candidates and species of concern, which may appear on the list. Issues that should be covered include the potential occurrence of a species or its habitat within the impact assessment area and potential impacts which may result from project activities.

As mentioned earlier, past activities such as dredging and gravel bar removal have negatively impacted cui-ui and LCT. For these reasons, the Service recommends that these flood control methods be avoided and that alternatives focus on a natural river corridor. Regardless of the measures chosen to be implemented, impacts to listed fishes and their habitats, both beneficial and adverse, should be addressed, and a determination made if further consultation under section 7 of the ESA is warranted.

Wildlife Populations and Habitat

Positive and negative impacts, both direct and indirect, to terrestrial and aquatic wildlife and habitats should be identified for each alternative. Negative impacts that should be addressed include destruction or alteration of breeding, nesting, cover, and foraging habitat for wildlife. Descriptions of existing habitat should include both quantitative and qualitative information. Areas with sensitive resources such as unique plant community types, wetland and riparian habitats, raptor nesting sites, and wildlife corridors should be examined. Impacts to fish and wildlife and their habitats upstream and downstream of the project area should also be addressed.

We recommend project activities (land clearing) be timed to avoid potential destruction of active bird nests and young of birds that breed in the area. Such destruction may be a violation of the Migratory Bird Treaty Act (Act) (15 U.S.C. 701-718h). Under the Act, active nests (nests with eggs or young) of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to construction. If active nests are located or evidence of breeding found (which may include birds transporting nesting material or food, courtship behavior, and other breeding behaviors), a protective buffer (the size depending on the requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

To protect spawning habitat for the mountain whitefish and brown trout, construction activities are prohibited in the Truckee River after October 1 and prior to July 1 from Stateline to the East McCarran bridge in Reno. We recommend construction activities be timed to conform to this restriction.

Water Quality

Impacts to water quality from each alternative should be addressed. This should include a discussion of impacts to surface water from increased erosion and sediment. The potential for a catastrophic event with attendant release of toxic materials (oil and fuel leaks) to surface water should be assessed, and measures to prevent or reduce the likelihood of such an occurrence should be developed. If water diversions during construction periods are required, impacts to fish and wildlife resources should be discussed.

Distribution surveys are currently being conducted along the Truckee River for purple loosestrife, an introduced plant invasive to wetland areas. We recommend the Corps contact the Nevada Division of Agriculture to obtain survey results. If purple loosestrife is found in the project area, it should be eliminated prior to any earth moving activities to prevent its spread. Construction vehicles should also be washed prior to leaving an area to reduce the spread of tall whitetop and purple loosestrife. The EIS should include these as mitigation measures.

Soil Quality

Impacts to soil quality and the ability to revegetate disturbed areas should be addressed. These impacts should be related to the potential for restoring wildlife habitat types and values in the project area following project completion.

Air Quality

The document should include discussions of impacts to air quality from particulate and dust emissions from equipment operations and fugitive dust resulting from loss of ground cover.

Noise

We recommend impacts of noise from construction activities on wildlife be evaluated. High levels of background noise are likely to interfere with the ability of wildlife, especially birds, to detect their mates, young, and predators. This may result in reduced reproductive success and a possible subsequent decline of wildlife population numbers.

Hazardous Materials

Types and quantities of all hazardous materials used on site should be identified. Potential impacts of these materials to fish and wildlife should be discussed. Transportation routes for hazardous materials should be identified. Any surface waters and endangered, threatened, and candidate species occurring along these routes should be noted. The location and qualifications of personnel and equipment which would respond to transportation accidents involving hazardous materials should be identified.

Alternatives

A variety of alternatives should be provided in the EIS. These should focus on measures that accommodate the river's natural processes.

Cumulative Effects Analysis

Cumulative effects analysis should include other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. We recommend adherence to guidance provided in the Council on Environmental Quality's 1997 publication when considering cumulative effects under the National Environmental Policy Act.

Mitigation/Compensation for Impacts

The Service recommends that adverse impacts to fish, wildlife, and their habitats be avoided to the extent possible. The project proponent should develop measures to avoid, reduce, or compensate for direct and indirect habitat losses as well as other negative impacts to fish and wildlife resources that will result from project activities.

The environmental analysis should discuss mitigation/compensation measures in detail. We recommend that only native plant species indigenous to the area be used in revegetation. The goal of mitigation should be restoration of natural ecosystems as well as reduction of erosion potential. We recommend monitoring to determine the success of mitigation efforts and to implement remedial measures if necessary.

We appreciate the opportunity to provide scoping comments for the proposed EIS. We look forward to analyzing proposed project impacts to fish and wildlife resources in and along the Truckee River and coordinating with your agency under the Fish and Wildlife Coordination Act. If you have any questions, please contact Marcy Haworth or Mary Jo Elpers at (702) 861-6300.

Sincerely,

Robert D. Williams
Field Supervisor

cc:
City Manager, City of Reno, Reno, Nevada
Mayor, City of Reno, Reno, Nevada
Reno Community Development Department, Reno, Nevada (Attn: Dan Shaw)
Administrator, Reno Parks-Recreation & Community Services Department, Reno, Nevada
Reno Public Works Department, Reno, Nevada (Attn: Steve Varela)
Reno Redevelopment Agency, Reno, Nevada (Attn: Bruce Ambo)
Manager, City of Sparks, Sparks, Nevada
Mayor, City of Sparks, Sparks, Nevada
Director, Sparks Community Development, Sparks, Nevada
Superintendent, Sparks Parks & Recreation, Sparks, Nevada
Manager, Sparks Public Works Department, Sparks, Nevada
Director, Sparks Redevelopment Agency, Sparks, Nevada
Executive Director, Truckee Meadows Regional Planning Agency, Reno, Nevada
President, Truckee River Water Management Council, Reno, Nevada
Truckee River Water Management Council, Reno, Nevada (Attn: Peggy Bowker)
Manager, Washoe County Community Development, Reno, Nevada
Emergency Manager, Washoe County Emergency Management, Reno, Nevada
Manager, Washoe County Department of Water Resources, Reno, Nevada
Washoe County Department of Water Resources, Reno, Nevada (Attn: Leonard Crowe)

Manager, Washoe County Regional Water Planning Commission, Reno, Nevada
Washoe County Regional Water Planning Commission, Reno, Nevada (Attn: Steve Walker)
District Administrator, Washoe-Storey Conservation District, Reno, Nevada
President, Economic Development Authority of Western Nevada, Reno, Nevada
Chairman, Lahontan Valley Wetlands Coalition, Reno, Nevada
Director, The Nature Conservancy, Reno, Nevada
President, Nevada Waterfowl Association, Reno, Nevada
President, The Wildlife Society, Nevada Chapter, Carson City, Nevada
Public Resources Associates, Reno, Nevada (Attn: Susan Lynn)
President, Sierra Club, Toiyabe Chapter, Reno, Nevada
President, Trout Unlimited, Sagebrush Chapter, Reno, Nevada
President, Truckee River Fly Fishers, Reno, Nevada
Administrator, Nevada Department of Transportation, Carson City, Nevada
State Hazard Mitigation Officer, Nevada Division of Emergency Management, Carson City, Nevada
Administrator, Nevada Division of Environmental Protection, Carson City, Nevada
Administrator, Nevada Division of State Lands, Carson City, Nevada
Administrator, Nevada Division of Water Planning, Carson City, Nevada
Administrator, Nevada Division of Wildlife, Reno, Nevada
Regional Manager, Nevada Division of Wildlife, Fallon, Nevada
Chairman, Pyramid Lake Paiute Tribe, Nixon, Nevada
Chief, Federal Emergency Management Agency, San Francisco, California
State Conservationist, Natural Resources Conservation Service, State Office, Reno, Nevada
Chief, Nevada Field Office, U.S. Army Corps of Engineers, Reno, Nevada
Chief, Wetlands Section, Environmental Protection Agency, San Francisco, California
Assistant Regional Director, Klamath and California Ecoregions, Fish and Wildlife Service, Portland, Oregon
Assistant Regional Director, Interior Basins Ecoregion, Fish and Wildlife Service, Portland, Oregon

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Patricia Roberson
Planning Division, Sacramento Division
U.S. Army Corps of Engineers
1325 "J" Street
Sacramento, California 95814

Dear Ms. Roberson:

The U.S. Environmental Protection Agency (EPA) has reviewed the Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS) for ***Truckee Meadows, Nevada General Evaluation Report, Washoe and Storey Counties, Nevada***. Our comments are provided pursuant to the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508).

The DEIS will evaluate the environmental effects of flood control, environmental restoration, and recreation proposed for the Truckee Meadows, Sparks and downtown Reno. The Corps is working with Washoe County and the Cities of Reno and Sparks on the proposed project. The DEIS will examine a proposed action and alternatives to address flood control improvements along the Truckee River in the Truckee Meadows; non-structural flood control measures in downtown Reno; improving Lake Tahoe operation for flood control; environmental restoration measures; and recreational features.

We recommend that the DEIS include a clear description of the basic project purpose and need, project alternatives, potential environmental impacts, and mitigation measures for impacts. Particular attention should focus on an evaluation of the impacts of the proposal and alternatives in a comparative form, so as to sharply define the issues and provide a clear basis for choice among options for the decision-maker, agencies and the public, in accord with the CEQ's regulations. We also recommend a clear, concise analysis of the indirect and cumulative effects which may be caused by the action. Specific areas of concern to EPA are potential project impacts on water-related resources (water quality, fisheries, wetlands), fish and wildlife habitat, "in-kind" mitigation for loss of riparian and wetlands habitat, induced (secondary) growth, cumulative impacts, and air quality. We strongly urge the Corps to examine a range of structural and non-structural alternatives which are capable of accomplishing the basic purpose for the project while avoiding and minimizing the loss of aquatic resources, in accord with the Clean Water Act Section 404(b)(1) Guidelines. Please refer to our detailed comments (attached) for further discussion of these and other issues.

We appreciate the opportunity to comment. Please send two copies of the DEIS to our office (code: CMD-2) at the letterhead address when it is filed with EPA's Washington, D.C. office. If you have any questions, please call me at 415-744-1575.

Sincerely,

David Tomsovic

David Tomsovic
Federal Activities Office
Cross-Media Division

Attachment

U.S. EPA Scoping Comments on Notice of Intent - July 1998 - Truckee Meadows, Nevada General Evaluation Report - Washoe and Storey Counties, Nevada

JUL 17 1998

CLEAN WATER ACT

Dredged and Fill Material - Section 404

The proposed project requires authorization as a Federal civil works project rather than as a project for which the Corps of Engineers would issue a permit under Section 404 of the Clean Water Act (CWA). However, the Department of the Army's regulations stipulate that such projects must follow the substantive requirements of the Clean Water Act 404(b)(1) Guidelines. Our scoping comments are framed in that context. The 404(b)(1) Guidelines provide that no discharge of dredged or fill material can be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 CFR 230.10(a)). A practicable alternative is one that is available and capable of being done given the constraints of cost, logistics and technology in light of overall project purpose. For purposes of both the Clean Water Act and the National Environmental Policy Act (NEPA), the Corps should provide a clear, brief description of the basic project purpose. A range of reasonable (NEPA) and practicable (CWA) alternatives should be considered relative to the project purpose(s). In the case of this project, the NOI identifies what appear to be at least three distinct project purposes: flood control including improved operation of Lake Tahoe for flood control, environmental restoration and recreational features. The project purpose(s) must not be so narrowly defined in the DEIS so as to screen out otherwise practicable alternatives -- for example, a project purpose defined as "dredging flood control channels" would not provide for adequate consideration of non-dredging operations.

Because the NOI did not provide a description of potential alternatives and sub-alternatives, it is unclear whether dredging is or would be an element of the proposed project. Should dredging be analyzed in the DEIS, we believe the document should discuss whether non-dredging alternatives may be practicable under CWA Section 404 and reasonable under NEPA. EPA believes that the range of alternatives should include actions which eliminate or minimize dredging and the discharge of dredged or fill material into waters of the United States, including special aquatic sites. The 404(b)(1) Guidelines consider both wetlands and riffle-and-pool complexes as special aquatic sites deserving of heightened protection. Such alternatives may include, but are not limited to: (1) providing additional armouring or construction of levees to protect specific sites from flood water flows, (2) minor recontouring or channel reconfiguration to protect existing resources and constraining levees, and (3) allowing flood impact to some resources while providing flood protection for other resources (e.g., directing floodflows to agricultural fields parks, etc. while providing protection for residents and property). Additionally, for purposes of both the NEPA and CWA Section 404 analyses, we recommend that the DEIS examine hybrid or combination alternatives that provide a mix of structural and non-structural features. Such hybrid or combination alternatives may serve to reduce adverse impacts to aquatic ecosystems and still fulfill the basic purpose of the proposed project.

We recommend that the DEIS provide the following information:

- Complete description of the physical characteristics of the proposed project area, defining specific segments or reaches of the river, and existing conditions (e.g., elevation of river bed, flow and flood capacity, flow constraints, distribution of river sediments, etc.);

- Complete description of the surrounding terrain, including quantification of flood threat at each reach of the river; identification of resources potentially affected by flood flows (and the flows at which these resources would be affected); delineation of the extent of waters of the United States; identification of existing aquatic resources and other environmental resources proximate to the river; and occurrence of endangered species;

- Complete description of flow regimes and releases to date, and anticipated or potential flow releases to offset possible high winter flows (demonstrate that release of flows is being maximized);

- For each river reach, delineate possible dredge sites (e.g., location of channel, channel dimensions and configuration), determination of dredged material volumes (minimum and maximum amounts of material); and identify resource protected with each element of the dredging project

- Assessment of sediment quality (e.g., description of sediment analysis conducted to date -- including sediment sampling/coring locations and protocols; types of physical testing -- grain size, total organic carbon, etc.; chemical analysis -- constituents tested for, testing protocols used, detection limits, level of sediment contaminants; location and types of potential contaminant sources (including sewage treatment facilities, industrial discharges, hazardous waste storage facilities, etc.);

- For each river reach, identify method of removal of dredged materials (e.g., hydraulic dredge, dry land excavator) and the anticipated starting and completion date for the dredging;

- Identification of all potential disposal locations for each river reach and each project phase, including stockpile areas and final disposal sites; identify length of time material would be held in temporary locations; complete description and evaluation of environmental resources in all temporary and permanent disposal locations; identify all environmental impacts from the disposal, stockpiling and removal activities.

Based on the information provided above, the Corps must demonstrate that impacts from the discharge of dredged material to special aquatic sites and other waters of the United States is avoided to the maximum extent practicable. Additionally, the Corps must demonstrate that the proposed action complies with other relevant environmental laws (40 CFR 230.10[b]) including applicable water quality standards, toxic effluent standards and the Endangered Species Act, and that the discharge of dredged or fill material will not cause or contribute to significant degradation of water of the United States (40 CFR 230.10[c]). Finally, the Corps must clearly demonstrate that impacts from the least environmentally damaging practicable alternative adequately mitigates or offsets any unavoidable impacts to waters of the United States, including wetlands and riffle and pool complexes.

Water Quality

The DEIS should fully evaluate projected and potential impacts (direct, indirect, cumulative) to surface and groundwater quality. The document should discuss the proposed project's compliance with State-adopted, EPA-approved water quality standards. Project planning should be completed with the Nevada Division of Environmental Protection to fully ensure the protection of water quality and the maintenance of established beneficial uses. Beneficial uses for the Truckee River from Pyramid Lake to the state line are irrigation; livestock watering; recreation involving contact with the water; recreation not involving contact with the water; industrial supply; municipal or domestic supply or both; propagation of wildlife; and propagation of aquatic life. Under Nevada's water quality standards, the aquatic life of major concern are - -

- at the state line, all life stages of mountain whitefish, rainbow trout and brown trout;
- from the state line to Idlewild, all life stages of mountain whitefish, rainbow trout and brown trout;
- from Idlewild to East McCarran, all stages of mountain whitefish, rainbow trout and brown trout;
- from East McCarran to Lockwood, juvenile and adult rainbow trout and juvenile and adult brown trout;
- from Lockwood to Derby, juvenile and adult rainbow trout and juvenile and adult brown trout;
- from Derby to Wadsworth, early spawning Lahontan cutthroat trout and their incubation, larvae, juveniles, and migration, from May through June depending on hydrological conditions; and
- from Wadsworth to Pyramid Lake, early spawning Lahontan cutthroat trout and cui-ui, and their incubation, larvae, juveniles and migration, from May through June, depending on hydrological conditions (see Chapter 445A.183 State of Nevada Water Quality Regulations, revised 11/95).

The Notice of Intent indicates that Truckee Meadows encompasses the Steamboat Creek area. Nevada's water quality regulations define Steamboat Creek as a Class C water. The beneficial uses of Class C waters are for municipal or domestic supply (or both) following complete treatment; irrigation; livestock watering; aquatic life; propagation of wildlife; recreation involving contact with the water; recreation not involving contract with the water; and industrial supply. The Nevada water quality regulations establish numeric and descriptive criteria to ensure the protection of such waters from pollutants and other factors, including at least one which may result from the proposed project (a change in water temperature). The water quality regulations provide that the temperature must not exceed 20 degrees Celsius for waters with trout or 34 degrees Celsius for waters without trout. The allowable temperature increase above normal receiving water temperature is 3 degrees Celsius. (Refer to water quality standards, 445A.126).

In terms of the project's NEPA documentation, it should evaluate the potential to cause adverse aquatic impacts such as increased siltation and turbidity; changes in the direction of stream flow, substrate, dissolved oxygen, and temperature; and habitat loss or degradation associated with dredging or placement of dredged or fill material. It should identify critical fisheries habitat, especially spawning and rearing areas; and other sensitive aquatic resources such as wetlands and riffle-and-pool complexes. It should outline the existing beneficial uses of these areas and identify potential and projected impacts from the action alternatives. It should identify what measures would be taken to protect critical fish and wildlife areas from potential adverse effects of flood control and recreation activities. The feasibility of proposed mitigation measures should be clearly demonstrated in the DEIS. It should discuss what monitoring program would be implemented before and after the proposed action to identify potential impacts on water quality and beneficial uses, and whether the protection of water quality and beneficial uses can be ensured. Lastly, the DEIS should identify what party (Corps, local agencies) would be responsible for carrying out water quality-related mitigation measures, and ensuring the effectiveness of such measures.

National Pollutant Discharge Elimination System Permit - Section 402

We recommend that the DEIS discuss the potential need for National Pollutant Discharge Elimination System (NPDES) permits for the proposed project as required under Section 402 of the Clean Water Act, including any stormwater permit authorization. Such permits would be issued by the State of Nevada for project activities on non-tribal lands. At least two elements of the proposed project may be subject to NPDES permitting requirements: 1) the discharge of pumped groundwater into waters of the United States; and 2) the disturbance of soils associated with construction of the project should the disturbed area be five or more acres. Should any construction be required on tribal lands, CWA Section 402 permits would be issued by U.S. EPA Region IX rather than by the State of Nevada. In that case, EPA would be an agency with "jurisdiction by law" under the CEQ's NEPA Implementing Regulations (see 40 CFR 1508.15) and a potential cooperating agency (see 40 CFR 1508.5 on cooperating agencies as those which have jurisdiction by law or special expertise.).

Water Quality Certification - Section 401

Water quality certification or waiver needs to be obtained from the appropriate agency before any Section 402 permit(s) required for the project can be issued by the State of Nevada (for non-tribal lands) or by U.S. EPA Region IX (for tribal lands in the project area). In terms of water quality certification or waiver for Section 404-related issues, the State of Nevada would be responsible for such certification or waiver on non-tribal lands, and U.S. EPA for tribal lands.

CLEAN AIR ACT

Air Quality Conformity

We recommend that the DEIS discuss the applicability of EPA's general conformity rule. EPA's general conformity rule does not require a specific linkage between a Federal agency's general conformity determination and its NEPA document. However, the rule allows for a linkage to be made, and in some cases such linkage may be efficient or convenient. Should air conformity be applicable (i.e., if *de minimus* thresholds are exceeded), the Corps should determine the best way to link its NEPA compliance and general conformity processes. In the case of the Reno-Sparks area, that area is presently designated by U.S. EPA as "nonattainment" for carbon monoxide (CO) and particulate matter less than 10 microns in diameter (PM10), the two criteria pollutants for which the Corps would need to undertake an applicability analysis under EPA's general conformity rule. However, there is no need to prepare a separate conformity analysis (applicability analysis) or conformity determination for each action alternative analyzed in detail in the DEIS, but only for the selected alternative (proposed project). Therefore, at that point in the NEPA process when the specific action alternative is determined, the applicability analysis for general conformity should be performed. If the *de minimus* levels for CO and PM10 are exceeded, and should the Corps have a preferred alternative at the DEIS stage, it may be beneficial to have a joint notification and public participation process for both the DEIS and the draft conformity determination. Should the Corps not have a preferred alternative until the Final EIS (FEIS), that would be the proper time to circulate the FEIS and draft conformity determination, should one be required. In either case, we recommend that the conformity process be completed prior to issuance of the Corps' Record of Decision so that air quality mitigation measures required by the conformity process can be incorporated or referenced in the ROD and the Chief of Engineers' final report to Congress. You may want to refer to an EPA document on ***GENERAL CONFORMITY GUIDANCE: QUESTIONS AND ANSWERS*** (U.S. EPA, Office of Air Quality Planning & Standards, Research Triangle Park, N.C., July 13, 1994).

POLLUTION PREVENTION

The Council on Environmental Quality (CEQ) published a guidance memorandum for Federal agencies concerning the integration of pollution prevention techniques and mechanisms in agency NEPA documents (January 29, 1993 *Federal Register*, pp. 6478-6481). In this document, the CEQ encouraged all Federal agencies to incorporate pollution principles, techniques and mechanisms in NEPA planning and decision-making. We encourage the Corps and the local project sponsors to integrate a wide range of feasible pollution prevention measures in the design, construction and operation of the proposed project.

TOXIC AND HAZARDOUS MATERIALS/WASTE

The DEIS should discuss the nature and extent of hazardous substances contamination in the project area, both in terms of soil and groundwater contamination, as well as for facilities or structures that may be removed or disturbed during project construction. As one example, the DEIS should discuss whether project activities may disturb lead-based paint which may have been used in the past, due to the removal of existing structures or facilities. Similarly, the DEIS should discuss whether the project may involve the removal or disturbance of polychlorinated biphenyls (such as in electrical transformers etc). Appropriate means to protect public health and safety, and the health and safety of construction personnel, should be included in the DEIS, including limiting public access to areas containing lead-based paint or other toxic substances during construction.

GOVERNMENT-TO-GOVERNMENT COORDINATION WITH FEDERALLY-RECOGNIZED TRIBAL GOVERNMENTS

The President issued a 1994 memorandum for departments and agencies on **Government-to-Government Relations with Native American Tribal Governments**. To the extent that the proposed project may have direct, indirect or cumulative impacts for Federally-recognized tribal lands, the DEIS should discuss the consultation process that the Corps would undertake with potentially-affected tribal governments. Potentially affected tribes in the area could include the Reno-Sparks Indian Colony and the Pyramid Lake Indian Reservation. (Based on discussions with Patricia Roberson, July 17, 1998, the Corps does not envision construction work on lands of the Pyramid Lake Indian Reservation. However, the project may have potential indirect effects on Pyramid Lake Indian Reservation land and resources, e.g., by changing the flows that reach the reservation). The Presidential directive provides that each Federal agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments "prior to taking actions that affect federally recognized tribal governments." We recommend that the consultation process be documented in the DEIS.

ENVIRONMENTAL JUSTICE (EJ)

The DEIS should discuss the proposed project's consistency with Executive Order 12898, ***Federal Actions to Address Environmental Justice in Minority Populations & Low-Income Populations***, the Army's environmental justice strategy, and the CEQ's recent guidance document to Federal agencies on the matter. We recommend that the DEIS discuss whether the proposed project may have a disproportionate, adverse impacts to low-income or minority communities, including tribal populations. As one example, increased truck trips associated with project construction may have a variety of impacts such as exposure of residents to increased carbon monoxide, PM10 and other air pollutants; noise and vibration impacts from the truck trips; and temporary disruption of local traffic. The DEIS should identify potential mitigation measures for any adverse impacts to minority or low-income communities caused by the proposed project.

GENERAL COMMENTS

1. We recently reviewed the Draft EIS/EIR prepared by the U.S. Department of the Interior (DOI) and the California Department of Water Resources (DWR) for the ***Truckee River Operating Agreement, California and Nevada***, dated February 1998 (CA State Clearinghouse #91062092). In addition to the main text of the DEIS/EIR, there are appendices on hydrology, water quality, biological resources, recreation, economics, and cultural resources which are available from the DOI or DWR. There is a significant amount of information contained in these documents which the Corps may find valuable as it prepares the Truckee Meadows Flood Control DEIS.

2. The Sacramento District recently released a Draft Supplemental EIS (DSEIS) for Napa Flood Control, which was developed as a product of a community coalition process. The 1998 Napa River DSEIS made significant reductions in environmental impacts to aquatic resources, compared to the DEIS which had been issued in 1995. We encourage the Corps to use the Napa

River DSEIS as a model for public involvement and inter-agency coordination when developing the Truckee Meadows DEIS.

3. When preparing the document's cumulative impact analysis, the Corps should refer to the CEQ's recent guidance document on "Considering Cumulative Effects under the National Environmental Policy Act." This CEQ's document may be accessed on the world wide web at the following site: http://www.ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm

4. For purposes of NEPA public disclosure, we recommend that the DEIS/R describe the results of consultation efforts (formal or informal) with the U.S. Fish and Wildlife Service. We recommend that the DEIS provide a copy of any pertinent correspondence concerning the ESA consultation efforts undertaken by the Corps.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR FLOOD CONTROL PROJECTS

How Can Flood Control Projects Affect the Environment?

Flood control projects can include channelization and channel modification activities and levee construction. Such activities can change the ability of natural systems to filter pollutants from surface waters; alter the rates and paths of sediment erosion, transport, and deposition; increase the movement of pollutants from the upper reaches of watersheds into coastal waters; lower dissolved oxygen levels; increase salinity in marshes; reduce freshwater availability; and accelerate the delivery rate of pollutants to downstream sites. Pollution prevention techniques can reduce or eliminate some environmental effects.

Also see checklists on Ecosystem Preservation and Protection, Siting, Building/Housing Construction, Dredging Projects, Dams, Hydropower, and Water Supply Reservoirs.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Ecosystem Concerns

- Has the use of alternatives involving levee setbacks or the use of floodways been considered?
- Will the flood control project lead to land use changes in the watershed, particularly those changes that result in increased surface water runoff and nonpoint source pollution?
- Have modifications to existing flood control structures been evaluated to determine if they can eliminate the need for the new channelization or channel modification project?
- Have all environmentally sensitive areas been characterized? Have attempts been made to avoid construction in environmentally sensitive areas? *
- Does the project minimize construction parallel to rivers or streams to reduce the potential for direct runoff discharge from the roadway?
- Does the project make use of existing roadway alignments (if possible) to reduce the amount of waste generated as a result of clearing and construction activities?
- Has the project incorporated mitigation measures to reduce the impact of pollution runoff from the roadway? These measures may include stabilizing cut and fill slopes, shoulders, and medians with perennial vegetation and non-erosive materials, such as rip-rap or geotextiles, or establishing permanently controlled discharge points for storm water.
- Does the plan include native plant revegetation of areas disturbed by construction to minimize erosion and sedimentation?
- Have safe wildlife crossing structures and appropriate fencing been incorporated into the project to accommodate the movements and needs of resident wildlife and mitigate habitat fragmentation? *

* Indicates an environmental impact reduction opportunity.

Project Design and Planning. Flood control projects can affect the physical characteristics of surface waters and modify in-stream and riparian habitat.

- Have alternatives, such as upstream watershed management and floodplain widening, been considered? *
- Are land use and agricultural practices, as well as their potential for contributing pollutants to surface waters, considered in channel design? *
- Will building be prohibited within a defined distance from the streambed to protect the streambank?
- Are streambank protection measures, such as stone riprap, vegetation, erosion control fabrics, cellular concrete blocks, and gabions, included in the design?
- Will levees and flood walls be sited outside riparian areas and wetlands?
- Are channel slopes graded so that animals can crawl or climb out? *

Construction. Construction activities for channel modification include vegetation clearing, soil and rock excavation and placement, equipment operations, and energy, water, and hazardous materials use, all of which can cause pollution. Effects on river and coastal area ecology from increased sediment loads and the release of hazardous constituents can occur during construction. Pollution prevention techniques can reduce or eliminate some pollutants.

- Will measures be taken to prevent surface water from entering construction areas?
- Will construction take place during dry seasons?
- Will site access routes and equipment storage areas be planned and located to minimize erosion potential? Will existing roadways be used to gain site access?
- Will construction workers be required to limit activities to designated, controlled areas to prevent vegetation destruction and soil disturbance? *
- Will secondary containment be provided in equipment fueling areas to control fuel spills? Is a spill control plan specified?
- Will access to materials and equipment storage areas be controlled and limited? Will material storage areas be covered? Will materials be ordered only when necessary to prevent inventory from expiring?
- Will the cleaning of construction equipment be conducted in a controlled area away from surface water? Will the washwater be prevented from entering the stream?

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* Indicates an environmental impact reduction opportunity.

- Will reclaimed and/or recycled construction materials be used, including aggregate, rebar, lumber, and asphalt? *

- Are alternative materials available to reduce hazardous and toxic materials use during construction?

- Will construction and storage areas be sited away from critical habitats? *

- Will biotechnical methods, such as vegetated gabions, be used to stabilize levee and channel banks?

Maintenance. Pollution prevention can reduce or eliminate the environmental effects of flood control project maintenance. Maintenance generally consists of vegetation management, burrowing animal control, upkeep of recreational areas, and levee repairs. In-stream and riparian habitats, which provide soil erosion protection, and pollutant filtering can be affected by maintenance activities.

- Will vegetation removal methods that use chemicals, grazing, or burning be prohibited? Chemical herbicide residuals and animal wastes can be washed into waterways during rainy periods. Burning can negatively affect air quality.

- Will burrowing animals be controlled by non-chemical means? Burrowing animals can affect the integrity of structures, leading to significant reconstruction requirements.

- Will native plant species be used for revegetation of disturbed areas? *

- Will marina fueling areas be regularly maintained and checked for leaks? Will boat owners be required to remove their craft from waterways before conducting engine and other boat repairs using hazardous materials?

- Will measures be taken to prevent downstream sediment loading during dredging operations?

- Will dredging spoils be evaluated for nutrient and contaminant content before they are applied to land areas? *

Other References

Federal Interagency Floodplain Management Review Committee. August 1994. "Sharing the Challenge: Floodplain Management into the 21st Century."

Federal Interagency Floodplain Management Task Force. 1992. "Floodplain Management in the United States: An Assessment Report."

U.S. EPA, Office of Water. January 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* 840-B-92-002.

* Indicates an environmental impact reduction opportunity.