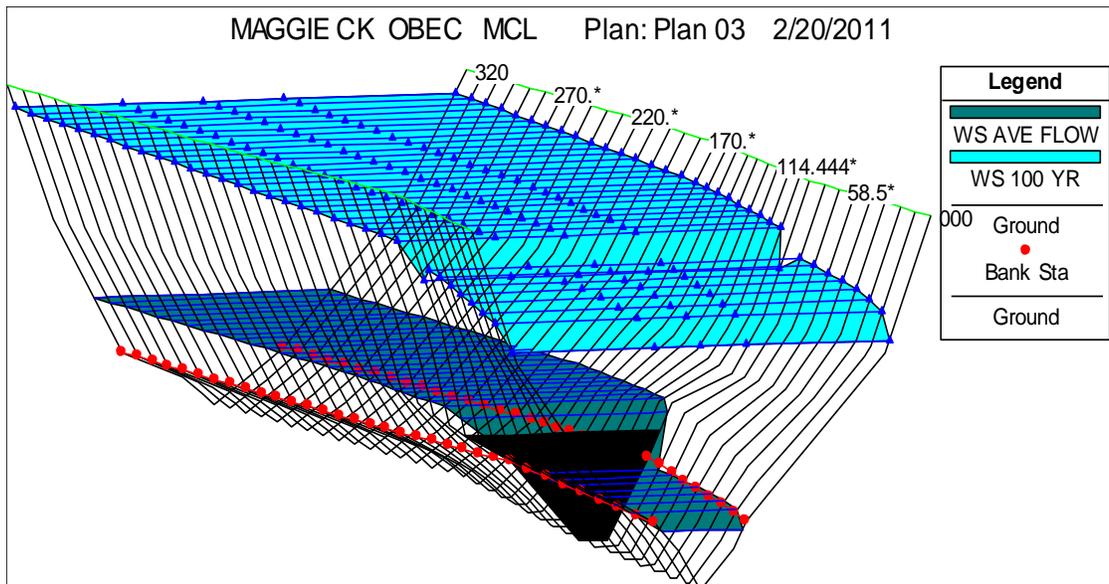


Maggie and Susie Creek Fish Barriers ENVIRONMENTAL ASSESSMENT



Maggie Creek Fish Barrier, Hydraulic Model

July, 2011
RIPS# 013162 (Maggie Fish Barrier)*
DOI-BLM-NV-N020-2011-0035-EA

*A RIPS number will be assigned to the Susie Barrier once the project is closer to construction.



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It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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Cover Graphic: Otis Bay Ecological Consultants, Inc., 2011

Maggie and Susie Creek Fish Barriers

CONTENTS

1 – INTRODUCTION	1
Summary	1
Purpose and Need	2
Authorizations	2
Conformance with Land Use Plan and Other Documents	2
2 - ALTERNATIVES	2
No Action Alternative	2
Proposed Action	3
Design Concept	4
Construction	5
Maggie Creek Upstream Alternative	6
Susie Creek Upstream Alternative	6
Environmental Protection Measures Common to All Alternatives	7
Monitoring and Evaluation Measures Common to All Alternatives	8
Alternatives Considered but Deleted from Proposed Action	8
Free Draining Rock Wall Barrier Designs for Maggie and Susie Creeks	8
Modify Culverts under Existing Road to Cooling Towers	8
Modification of Railroad and/or State Highway Bridge Abutments	9
3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS	9
General Setting	9
Maggie Creek	9
Maggie Creek Upstream Alternative	9
Susie Creek	10
Susie Creek Upstream Alternative	10
Scope of Analysis	10
Elements Not Present or Affected	10
Elements Present but Not Affected	10
Analysis of Affected Resources and/or Elements of the Human Environment	12
1. Wildlife (Aquatic) Including Special Status Species	14
2. Water Resources	19
3. Lands and Reality Actions	25
4. Wetlands and Riparian Zones	26
5. Soil Resources	27
6. Vegetation Resources Including Invasive/Non-Native Species (Uplands)	28
4 - CONSULTATION AND COORDINATION	29
5 – LITERATURE CITED	31
6 - APPENDICES	

Maggie and Susie Creek Fish Barriers

1 – INTRODUCTION

Summary

Maggie and Susie Creek drain into the Humboldt River approximately 20 miles west of Elko, Nevada. Maggie Creek supports Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (LCT), a federally listed threatened species. Susie Creek supported LCT historically; however, trout have been extirpated from this stream since at least the 1930's. The Maggie Creek Basin, including tributary streams, Coyote, Little Jack, Indian Jack and Beaver Creeks, represents one of few remaining systems Humboldt River Basin which supports an LCT metapopulation (interconnected population with potential for genetic mixing). Susie Creek is identified as a potential LCT reintroduction stream (Coffin and Cowan 1995; NDOW 2005).

In an effort to improve habitat for existing LCT populations and for a planned reintroduction, both the Maggie and Susie Creek drainages have been the focus of comprehensive watershed restoration efforts involving multiple public and private partners beginning in the early 1990's. In the Maggie Creek Basin, more than 90% of the 70 plus miles of LCT stream habitat have been improved through a combination of fencing, culvert replacements, water developments and prescriptive livestock grazing programs. In the Susie Creek Basin, approximately 22 miles of the main channel as well as several miles of tributary streams have been improved through livestock management, fencing, seeding, weed control and other measures.

Although efforts to improve riparian habitat in the Maggie and Susie Creek Basin for the benefit of LCT have been very effective, non-native fish now pose a significant threat to the recovery effort. State and federal biologists are concerned that improved water quality and habitat conditions in upstream reaches are making Susie and Maggie Creek increasingly attractive to non-native warm-water fish species as well as rainbow trout (*Oncorhynchus mykiss*), present in the Humboldt River. Smallmouth bass (*Micropterus dolomieu*) have recently been documented in portions of Maggie Creek below the area of occupied cutthroat habitat (Starr 2011; Jenne 2010; MFG Inc. 2007).



Maggie Creek, 2006



Susie Creek, 2007

Maggie and Susie Creek Fish Barriers

Purpose and Need

Construction of fish barriers in the lower reaches of Maggie and Susie Creek would prevent non-native fish species from the Humboldt River from gaining access to these streams. Non-native fish have the potential to destroy or reduce native fish, amphibian and mollusk populations directly or indirectly through hybridization, predation and competition. Installation of the barriers would ensure cooperative efforts to enhance or reestablish native LCT in the Maggie and Susie Creek Basins are successful.

Authorizations

The Elko District, Bureau of Land Management (BLM) is primarily responsible for authorizing the proposed action. Authorizations would also be required from the following state and federal agencies:

- Temporary Working in Waterways Permit – Nevada Division of Environmental Protection (NDEP), Bureau of Water Pollution Control
- 401 Water Quality Certification – NDEP, Bureau of Water Pollution Control
- U.S. Army Permit (404 Permit) – U. S. Army Corps of Engineers
- Occupancy or Encroachment Permit, Nevada Department of Transportation (NDOT)

Conformance with Land Use Plan and Other Documents

The proposal to construct fish barriers in the lower reaches of Susie and Maggie Creeks to protect existing and future LCT populations as well as other native aquatic wildlife species is consistent with the following:

- 1987 Record of Decision for the Elko Resource Management Plan (Objective to Conserve and Enhance Aquatic Wildlife Habitat; Standard Operating Procedure to improve threatened and endangered species habitat)
- 1995 Lahontan Cutthroat Trout Recovery Plan (Coffin and Cowan 1995) Lahontan Cutthroat Trout Species Management Plan for the Upper Humboldt River Drainage Basin (NDOW 2005)
- BLM Policy for Management of Special Status Species (BLM Manual 6840) Executive Order 11988 Floodplain Management
- Other federal, state and local plans, policies and programs to the maximum extent possible. This includes federal policies for the National Historic Preservation Act, the Endangered Species Act, the Clean Water Act as well as pertinent state and local laws, regulations, and plans.

2 - ALTERNATIVES

No Action Alternative

Fish barriers would not be constructed on Susie or Maggie Creeks.

Maggie and Susie Creek Fish Barriers

Proposed Action

The Elko District of the BLM would construct permanent barriers to upstream fish movement on the lower reaches of Maggie and Susie Creeks, on public lands (Map 1, Appendix I). The barriers would be constructed to allow for downstream passage of debris, water and aquatic life but preclude upstream movement of fish, particularly non-native trout, smallmouth bass and other non-native warm water fish species. Barrier construction on Maggie Creek would likely occur in 2012 as soon as runoff has subsided and the stream channel is dry. Timing of barrier construction on Susie Creek is dependent on funding and on re-introduction of LCT and consequently, would not likely occur for at least two years.

Depending on results of surveys planned for summer of 2011, a chain link fence would be added to the margins of the Maggie Creek fish barrier to prevent up upstream overland travel by bullfrogs (*Rana catesbeiana*). Although information collected in 2010 indicates bullfrogs have already invaded the upper reaches of Maggie Creek, any measures taken to prevent the further spread of this undesirable non-native may be beneficial (Gourley 2011). If surveys by NDOW and BLM in 2011 show little or only limited presence of bullfrogs in the Maggie Creek system, the fence would be installed in conjunction with the fish barrier (or soon thereafter). If surveys determine bullfrogs are widespread, the fence would not be constructed since it would be considered ineffective.



Figure 1. Area of proposed fish barrier on Maggie Creek. January, 2009.

Maggie and Susie Creek Fish Barriers



Figure 2. Area of proposed fish barrier location on Susie Creek. September, 2008.

Design Concept

BLM contracted with Otis Bay Ecological Consultants, Inc. to design the fish barriers for Maggie and Susie Creeks (Otis Bay Ecological Consultants, Inc. 2011a and b). Designs are based on hydraulic modeling using Log Pearson III flow ranges simulated by the Hydrologic Engineering Center River Analysis System (HEC-RAS) water surface profile backwater model. The design concept for both barriers utilizes a four-foot high vertical water drop with a minimal pool below the structure for the purpose of preventing upstream fish passage. The barriers would use sheet piles for efficiency of flow, ease of construction and effectiveness. Barriers would be 60 to 80 feet in length (depending on the stream) with a U shaped labyrinth weir alignment for the purpose of directing flows towards the middle of the channel. Sheet piles would be buried to a depth of 12 feet with abutments extending 16 feet into the bank on each side of the operational weir to prevent possible side cutting at higher flows. Both upstream and downstream channels would be rip-rapped, although the downstream channel would be more heavily rip-rapped for consideration of the 100 year storm potential. Streambanks would also be rip-rapped to prevent erosion. On Maggie Creek, rip rap on the west bank would extend slightly into an NDOT right-of-way (ROW) for State Route 766.

If needed, the design for the bullfrog fence on Maggie Creek would include a four foot high buried chain link fence extending out from both sides of the proposed barrier and then turning south (downstream) at either the highway on the right bank or the two-track road on the left bank. Downstream turns are expected to prevent bullfrogs from trying to go around the fence (Gourley 2011). For the left bank, the fence would extend out about 100 feet and then turn to parallel the existing two-track road for about 100 feet. On the right bank, the fence would extend out about 30 feet, 20 to the highway ROW and then turn south paralleling the fence for about 30 feet. The fence would include ½ inch x ½ inch galvanized wire cloth buried six inches underground and extending 30 inches aboveground and attached to the chain link fence. The ½ inch x ½ inch galvanized wire

Maggie and Susie Creek Fish Barriers

cloth would extend out about six inches creating a small lip to prevent bullfrogs from climbing over the fence.

The design for the Maggie Creek barrier imposes a formidable fish migration barrier for flows that occur over 90% of the time (Otis Bay Ecological Consultants, Inc. 2011a). Under most flows, lack of pool depth (required for leaping) and/or high water velocities preclude fish passage. However, flows in the five to 10 year flood frequency range for Maggie Creek (estimated to be between about 400 to 700 cubic feet per second (cfs) are technically navigable by rainbow trout and bass traveling at “burst” speeds although flow velocities over the barrier exceed “prolonged” swimming speeds¹. A barrier that would preclude any possibility of upstream fish migration would be excessively high and prohibitively expensive. It is the opinion of the design contractor that the proposed Maggie barrier imposes a considerable barrier at all flows and represents the best compromise between preventing upstream fish movement and at the same time addressing funding and any public road safety issues associated with potential structure failure.

The Susie Creek barrier is expected to block fish passage at all normal to flood profile levels (Otis Bay Ecological Consultants, Inc. 2011b).

Construction

Construction of the Maggie barrier would occur when the stream channel is dry (expected between July through December). Construction of the Susie Creek barrier would occur when the channel is either dry or when flows are very low and/or ponded (expected between July through November). Both project sites are mostly accessible from major roadways; although access to the Maggie and Susie Creek areas would entail about 0.8 miles and 0.3 miles, respectively, of travel on unmaintained secondary roads. A short distance of overland travel and/or travel on dry stream beds would also occur for both sites. Existing and secondary access roads would be regraded as necessary. Vegetation present on structural areas would be grubbed and removed from the site. Depending on the character of soils excavated during construction, excess material would be disposed of in several ways. Topsoil or soils characterized by fines would be used to cover any disturbed areas on uplands and/or thinly spread over existing secondary access roads. More gravelly soils would be spread over the riprapped channel for a short distance upstream from the barriers. The Maggie barrier would encroach slightly into a right-of-way (ROW) owned by the Nevada Department of Transportation (NDOT).

In addition to disturbance created from site access and construction activities, some new disturbance would occur as a result of staging of equipment and providing space for vehicles to turn around at the site. Most of this new disturbance would be the result of vehicles driving over undisturbed soils and vegetation, however, some vegetation clearing may need to occur for improved access and to reduce the probability of fire

¹ “Burst speeds” typically are sustained for less than 20 seconds, but are used to pass through a short distance of fast-moving water; “prolonged swimming speeds” can be sustained for up to 200 seconds but

Maggie and Susie Creek Fish Barriers

ignition. Travel and clearing within the stream channel would be avoided as much as possible, but some disturbance would be necessary for equipment access. Total new disturbance is estimated to be less than one half acre for each site. With the exception of the barriers themselves, disturbance would be temporary (less than one year). The footprint for the Maggie Barrier is estimated to be less than 0.1 acre, while the footprint for the Susie Barrier is estimated to be 0.15 acres.

Maggie Creek Upstream Alternative

Under this alternative, the Maggie Creek barrier would be constructed on a site approximately 400 feet upstream from the location selected for the proposed action. By moving the barrier upstream, encroachment onto the NDOT ROW would be avoided and the barrier would still be constructed on public lands.



Figure 3. Area of upstream alternative barrier location on Maggie Creek. January, 2011.

Approximately 0.5 acres of additional disturbance would occur in comparison to the proposed action. Access to the site would require extending the end of the existing two-track road for a distance of about 400 feet. Establishing a potential staging area upstream would also require additional disturbance since the adjacent slopes and terraces are steeper than for the proposed action.

Susie Creek Upstream Alternative

Selection of an alternate upstream location was recommended during public scoping (Reynolds 2009; Haden and Yard 2010). Under this alternative, the structure would be relocated six miles upstream to the site of a historic irrigation dam (Figure 4).



Figure 4. Susie Creek Upstream Alternative. Barrier would be constructed at narrowest point of the valley in the area of the historic irrigation dam. April, 2011.

The old dam site is situated where the valley bottom is narrower than for the proposed action. In this alternate location, the barrier would be incorporated into the adjacent hillsides, potentially making the barrier more stable than for the proposed action because of the existing unconsolidated alluvium.

Maggie and Susie Creek Fish Barriers

Although there is an existing two-track road in the area, approximately 1,100 feet of new road would need to be constructed in order for equipment to reach the construction site. The existing road is located on a terrace about 15-20 feet above the streambed. Access up the stream channel would not be possible since this portion of Susie Creek supports extensive beaver dam complexes. Staging areas would also have to be constructed below the terrace. Total area of new disturbance for this alternative would be approximately three acres.

Environmental Protection Measures Common to All Alternatives

- Equipment would be washed prior to and also during construction if noxious weeds were encountered along the route.
- Areas of noxious weeds would be identified and treated before/during or after (as applicable) construction activities. Treatment would be conducted by a certified applicator using BLM approved herbicides.
- Disturbed areas would be regraded and reseeded with a BLM approved and certified weed-free mix with some or all of the following species: Great Basin (*Leymus cinereus*) or Russian wildrye (*Psathyrostachys juncea*), bluebunch wheatgrass (*Pseudoroegneria spicata*) Indian ricegrass (*Achnatherum hymenoides*), crested wheatgrass (*Agropyron cristatum*) and/or thickspike wheatgrass (*Elymus lanceolatus*).
- BLM would be responsible for maintenance of the barriers.
- To ensure protection of cultural resources, staging of equipment would be confined to previously disturbed areas (delineated with a visible marker such as a snow fence).
- Gates would be kept closed if livestock are present in the area.
- Any fence damage occurring as a result of construction activities would be repaired as soon as possible.
- The Nevada Contractors Field Guide for Construction Site Best Management Practices Standard Best Management Practices (BMPs) would be followed for activities associated with access, staging and construction (NDEP 2011). Use of BMP's includes use of measures, practices and controls to reduce erosion and protect waterways.
- Any construction activities would be in accordance with effluent limitations, monitoring requirements, and other conditions set forth in the applicable state and federal permits for working in waterways.
- No construction or routine maintenance activities would be conducted when soils are too wet to adequately support construction equipment.

Maggie and Susie Creek Fish Barriers

Monitoring and Evaluation Measures Common to All Alternatives

BLM would periodically monitor the proposed barriers to assess effectiveness and condition. In the event of failure, BLM would repair or remove the barriers.

Fish population and habitat monitoring studies have been conducted by Trout Unlimited, Newmont Mining Corporation, NDOW and/or BLM for many years in the Maggie and Susie Creek drainages. These studies would continue at approximately three year intervals (following barrier installation) to verify on-going response by LCT to habitat improvements and to confirm that barriers have not been breached by non-native fish.

Alternatives Considered but Deleted from Proposed Action

Free Draining Rock Wall Barrier Designs for Maggie and Susie Creeks

In 2008, BLM contracted with Porior Engineering to prepare barrier designs on Maggie and Susie Creeks (Porior 2008a and b). The locations for these designs are similar to the proposed action with the exception that the barrier for Maggie Creek would be about 100 feet farther upstream, while the barrier for Susie Creek would be about 200 feet farther downstream and located on an existing roadway.

Barrier designs for both streams included vertical walls with free draining rock layered in the structure to allow water to drain through the system rather than forming a dam across the channel. Other design features included top and footings sloped to the center and downstream; a smooth surface on the top of the vertical walls; slope protection along edges of the barriers; and, installation of downstream riprap to prevent scour below the structures. On Susie Creek, the barrier would be constructed as an elevated road crossing that would raise the stream grade four feet above its present level upstream of the barrier.

The BLM eliminated these designs from further consideration based on the following:

- Review and comments by Natural Channel Design, Inc. indicating concerns with design assumptions for hydrology and fish passage, the actual design itself and site placement (Susie Creek) (Haden and Yard 2010).
- Lack of consideration for underlying substrates and potential effects that could occur on structure stability (both sites).
- Stability and erosional problems with a similar design on Dixie Creek (located about 40 miles southwest of Elko, Nevada).
- Close proximity to a buried natural gas pipeline (Susie Creek).
- Potential impacts to the existing roadway (Susie Creek) or adjacent roadway (Maggie Creek) should a failure occur.

Modify Culverts under Existing Road to Cooling Towers

The potential exists for modifying the existing culverts underneath the road crossing to Newmont Mining Company's cooling towers, which were constructed to treat mine discharge water as part of the 1993 South Operations Area Project. The existing culverts

Maggie and Susie Creek Fish Barriers

could be modified with an overhanging weir and concrete apron constructed below the outlet (Porior 2008a). Although the modifications might be accomplished fairly easily, BLM would not be able to ensure long-term control and maintenance of the culverts since the existing road is on land owned by Newmont. In addition, Reynolds (2009) notes that even weak swimming fish have the ability to “crawl” through a culvert at high water velocity and recommends that culverts not be included in the design of any fish barrier.

Modification of Railroad and/or State Highway Bridge Abutments

Alternate barrier locations were considered for Maggie and Susie Creeks where they flow under Interstate 80 and under railroad and frontage road crossings just south of the freeway. Potentially, the existing structures could be retrofitted with vertical weirs to preclude fish passage (Porior 2008a and b). However, Porior (2008a and b) concluded the weirs may not be effective at high flows and that they could cause excessive sediment deposition. In addition, BLM does not have authorization from either the railroad or NDOT for these modifications, nor does BLM want to propose any modifications to existing structures which could compromise structural integrity and public safety. Finally, BLM is concerned that smallmouth bass have already become established above these structures on Maggie Creek.

3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

General Setting

Maggie Creek

The proposed location for the Maggie Creek barrier is on a small area of public land at the south end of the Maggie Creek Canyon in Eureka County, Nevada in T34N, R51E, Sec. 26 NW¼ SE ¼ (MDM) (refer to Map 1, Appendix I). The site is located approximately eight miles north of the town of Carlin, Nevada and is just upstream from Newmont Mining Corporation’s South Operations Area Project. The site occurs as a narrow, relatively straight channel bounded by a steep rocky slope to the east and by the rip-rapped NDOT highway ROW on the west for State Route 776. The highway receives heavy mine traffic. An existing pasture fence crosses the stream just above where the barrier would be constructed. Although scattered willows line the channel, the stream is affected by mine dewatering in this location and is typically dry from about July to January.

Maggie Creek Upstream Alternative

The alternative location is about 400 feet upstream from the location for the proposed action (same township, range and section) (refer to Map 1, Appendix I). Maggie Creek is somewhat more sinuous in this area and has a broader floodplain rendering it more susceptible to sediment deposition. The site is also outside the NDOT ROW but is adjacent to a portion of the roadway which has been the site of a number of traffic accidents involving chemical spills and rollovers as a result of ice in a shaded portion of the canyon. Public safety as well as potential for structure damage would need to be considered in a barrier design for this location.

Maggie and Susie Creek Fish Barriers

Susie Creek

The proposed site for the Susie Creek Fish Barrier is located approximately two miles north of Interstate 80 (T. 33 N., R. 52 E., Sec. 13 SW $\frac{1}{4}$ NE $\frac{1}{4}$ MDM) and about two miles east of the town of Carlin, Nevada. The site is characterized by a vegetated, well developed floodplain situated between vertical banks within a broad alluvial plane. In recent years, the channel has been observed to go dry or to support only ponded or low flows by late summer and fall. A road crossing is located just downstream from the proposed barrier site and receives light traffic. Paiute Pipeline, a subsidiary of Southwest Gas, operates a buried natural gas pipeline approximately 200 feet downstream from the proposed barrier location.

Susie Creek Upstream Alternative

The upstream alternative site is located about eight miles north of Interstate 80 and about six miles upstream from the site of the proposed action in T.34N, R. 53E. Sec. 29 NW $\frac{1}{4}$ (refer to Map 1, Appendix I). The alternative site is located in a narrower valley with fewer anthropomorphic disturbances although stream and riparian habitat conditions are similar. Flows are more consistently perennial in this location.

Scope of Analysis

This scope of this analysis is limited to those resources and/or elements of the human environment which are affected by the proposal action or alternatives. The following sections address how various elements or resources will be considered in the Environmental Assessment (EA).

Elements Not Present or Affected

The following critical elements of the human environment are not present and would not be affected by the proposed action or alternatives and are not discussed further in this document:

- Areas of Critical Environmental Concern
- Environmental Justice
- Farmlands (Prime/Unique)
- Human Health and Safety
- Native American Religious Concerns
- Wastes, Hazardous/Solid
- Wild and Scenic Rivers
- Wilderness

Elements Present but Not Affected

The following resource issues are present but not affected by the proposed action or alternatives for the reasons and/or measures that would be implemented for resource protection, as noted:

Maggie and Susie Creek Fish Barriers

Air Quality

Vehicle and equipment used during construction would result in some emissions; however, proposed site locations for both barriers are near roadways with heavy traffic. In the case of the Maggie Creek site, major mining operations with associated impacts to air quality occur within one mile of the project area. The incremental increase in emissions associated with this project is considered minor especially in the context of ambient conditions.

Cultural Resources

Under the proposed action, construction of fish barriers on Maggie and Susie Creeks would have no effect on cultural resources for the following reasons:

- Barriers would be constructed within active floodplains and access would be mostly on highly disturbed areas including existing two-track roads.
- Cultural resources inventories were completed for construction areas and access routes for the general area of the proposed action on Maggie and Susie Creeks in 2009 and 2011 (BLM 1-2730n with Amendment, Elko District files). No resources of prehistoric or historic interest were found within the proposed area of potential impact. If one or both upstream alternative sites are selected, additional cultural inventories would need to be completed prior to any construction activities.
- Construction staging areas would be flagged by a BLM archeologist to prevent impacts to cultural resources.

Livestock Grazing

Neither the barriers nor activities associated with construction would affect livestock grazing in surrounding areas. Gates would be kept closed if livestock were in the area at the time of construction and any unintentional damage to fences as a result of equipment would be repaired (see Environmental Protection Measures Common to All Alternatives, page 7). In the area of both Maggie and Susie Creek where activities would occur, livestock are typically present only in the spring and construction would not occur until late summer or fall.

Recreation

Construction of fish barriers would have no impact on recreational uses of surrounding areas and are not analyzed further in the EA.

Visual Resources

The visual landscape surrounding the areas where barriers would be constructed on Maggie and Susie Creeks is highly altered by human activity. Man-made features including highways, two-track roads and power lines are part of the visual landscape for both the Maggie and Susie Creeks project areas. On Maggie Creek, Newmont's South Operations Area mining operations are visible from the proposed barrier site, and an active gravel pit and a mine equipment staging area are both visible from the Susie Creek site. Visual contrast or disturbance created by construction of fish barriers on both Maggie and Susie Creeks in these industrialized locations is considered negligible.

Maggie and Susie Creek Fish Barriers

Terrestrial Wildlife Including Special Status Species and Migratory Birds
Impacts to terrestrial wildlife including special status species and migratory birds resulting from the proposed action and alternatives are considered negligible. Both sites are adjacent to highly disturbed areas. In addition, any disturbance to upland or riparian wildlife habitats as a result of construction activities would be minimized or avoided through implementation and/or consideration of the following:

- Construction activities would take place in late summer or fall (after nesting and brooding/young rearing periods) and when streamflows are low to nonexistent.
- Construction activities would be of limited duration (one month or less).
- With the exception of the barriers themselves, any new disturbance would be temporary, and is expected to recover through either natural or anthropogenic efforts.
- The actual footprint of the barriers is extremely small (<0.2 acres).
- Disturbed areas would be contoured and reseeded with recovery occurring within one to two years.
- The willow species present at both sites, Coyote willow (*Salix exigua*), is highly rhizomatous and is expected to rapidly re-colonize disturbed areas following disturbance.
- If the bullfrog fence is constructed on Maggie Creek, effects to small mammals and reptiles would be considered negligible, since alternate travel areas away from the stream and the fence are present (Wilkinson 2011).

Analysis of Affected Resources and/or Elements of the Human Environment

The resources and elements of the human environment brought forward for analysis are those:

- Which have been identified through internal and external scoping.
- Are relevant to the supplemental authorities identified in Table 1, Appendix II.
- Are present within the applicable project areas.
- Would be directly, indirectly or cumulatively affected by the proposed action and alternatives. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action but are late in time and far removed in distance, yet are still reasonably foreseeable. Cumulative impacts result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Past, present and future actions relevant to the proposed action and alternatives are summarized in Table 1.

Maggie and Susie Creek Fish Barriers

Table 1. Summary of past, present and reasonably foreseeable actions or circumstances relevant to the proposed action and alternatives.

Action	Maggie Creek and Upstream Alternative		Susie Creek and Upstream Alternative	
	Past and Present	Reasonably Foreseeable	Past and Present	Reasonably Foreseeable
Mine dewatering - groundwater pumping (surface flow effects)	x	x		x
Mine dewatering - discharge (lower Maggie Creek channel)	x	x		
Mining Activities	x	x		
Road maintenance	x	x		
Utility/transportation ROWs or other land uses	x	x	x	x
Prescriptive livestock grazing management for habitat improvement	x	x	x	x
Culvert barrier removal	x			
LCT reintroduction				x
Fish population and habitat monitoring	x	x	x	x
Invasive aquatic species	x	x	x	x
Climate Change ¹		x		x

¹Potential for climate change on the Elko District is highly relevant to the proposed action and alternatives. Air temperatures are projected to increase from one to two degrees between the present and 2020, while precipitation could decrease by as much as 15% between 2080 and 2099 (Karl et al. 2009). These changes would fuel expansions of invasive species, lead to increased stream temperatures and create higher potential for floods and erosion, conditions which are all detrimental to native aquatic wildlife.

Note: The elements or resources most affected by the proposed action and/or alternatives are discussed in priority order. Direct, indirect and cumulative impacts are listed within the appropriate alternative. To provide the reader a visual identifier, the sections are highlighted follows:

No Action

Proposed Action or Alternative

Cumulative Effects

Maggie and Susie Creek Fish Barriers

1. Wildlife (Aquatic) Including Special Status Species

Study Area: The direct study area for the proposed action and alternatives is the stream channel immediately above and below the barrier. The indirect and cumulative effects study areas are the Maggie and Susie Creek drainages including tributary streams.

Amphibians

Several amphibians occur in the Maggie and Susie Creek drainages (Petersen 2011). Columbia spotted frogs (*Rana luteiventris*), a federal Candidate species for listing under the Endangered Species Act, occurs in Maggie Creek. This population of frogs is part of the Great Basin Distinct Population Segment and is considered geographically distinct from the remainder of the species. This species is thought to have recently been extirpated from Susie Creek. Other amphibians potentially occurring in both drainages include chorus frogs (*Pseudacris triseriata*), boreal toads (*Bufo boreas boreas*) and/or Great Basin spadefoot (*Scaphiopus intermontanus*) (Petersen 2011).

Bull frogs, a non-native, invasive species, occur in both the Maggie and Susie creek drainages. Bull frogs were observed for the first time in Susie Creek in 2007. Since 2007, the species has become abundant and widespread throughout the drainage. This rapid expansion of bullfrogs in Susie Creek is thought to be responsible for the presumed loss of spotted frogs in that drainage. The first evidence of bullfrogs in Maggie Creek was in June of 2010 when calls were heard in beaver dams located in the middle reaches (Evans 2010). Extensive beaver dam complexes which have developed in both streams in response to better livestock management are likely contributing to the spread of this species. Bull frogs prey on native amphibians (Petersen 2011) and represent a potential threat to the continued existence of the Columbia spotted frog (NDOW et al. 2003).

Fish Species

Maggie Creek: The Maggie Creek Basin supports both native and non-native aquatic wildlife species including special status species. LCT, a federally listed threatened species, is present in Maggie Creek and several of its tributary streams approximately six to eight miles upstream from the project area for the proposed action and upstream alternative (BLM file data). The population represents one of the few remaining metapopulations for LCT and one of the few populations which have not been compromised by introductions of non-native fish. Habitat conditions are good to excellent as a result of prescriptive grazing practices in place since the early 1990's. Removal of culvert barriers on tributary streams in 2005 further enhanced the importance of the system for LCT. LCT do not occupy the lower reaches of Maggie Creek where flows are intermittent and habitat conditions are degraded (BLM file data).

Other native fish species present in the Maggie Creek drainage include speckled dace (*Rhinichthys osculus*), Lahontan redbreast (*Richardsonius egregius*), Tahoe suckers (*Catostomus tahoensis*) and mountain suckers (*Catostomus platyrhynchus*). These species are more tolerant of warm stream temperatures than trout and are generally abundant in

Maggie and Susie Creek Fish Barriers

the mainstem of Maggie Creek and lower reaches of most tributary streams (BLM file data). Three of these four species including speckled dace, redbreast shiners and mountain suckers have been found in watered portions of Maggie Creek above and below the general project area (MFG, Inc. 2007). Although the project area is typically dry in all but runoff periods, water pumped as part of Newmont's mining operations to extract mine pit water is discharged into the lower Maggie Creek channel approximately two and a half miles downstream from the project site. The perennial nature of the flow regime as a consequence of mine water discharge has likely created a beneficial situation for fish in that area (MFG, Inc. 2007). The discharged water is warm at the source but temperatures cool as flows move downstream.

Smallmouth bass, a non-native fish species, were documented for the first time in the lower Maggie Creek channel (below the mine discharge point) in 2007 (MFG, Inc. 2007). At that time, only one bass was encountered during electroshocking surveys. By 2010 however, NDOW found bass to be common in the Maggie Creek channel below the discharge outfall (Jenne 2011). A single green sunfish (*Lepomis cyanellus*) was also found during the survey. Native minnows may have been very recently extirpated from the area occupied by bass but were still found in watered portions of Maggie Creek above the road culvert to Newmont's cooling towers (Jenne 2011). Two individual smallmouth bass were found above the narrows in 2011 (Starr 2011).

The bass are believed to have originated in the adjoining Humboldt River and are likely attracted to the consistent discharge flows and warmer stream temperatures (Coffin 2011). A road culvert on Newmont's access road to its cooling towers (close to the outfall) may be preventing this species from moving upstream (Figure 5). The culvert outlet is only a few inches above the stream channel and is not reliable as a barrier, especially to trout which are stronger swimmers and better jumpers.



Figure 5. Partial culvert barriers on the Newmont cooling tower road are likely limiting or preventing upstream movement of smallmouth bass on Maggie Creek. September, 2008.

Susie Creek: Studies by NDOW and BLM confirm that cutthroat trout have been extirpated from Susie Creek (BLM files); however, historical accounts indicated that this species was present and possibly abundant at one time. In June of 1869, the Elko Independent reported that small boys were catching long strings of cutthroat along Maggie and Susie Creeks (as referenced in Nevada Department of Conservation and

Maggie and Susie Creek Fish Barriers

Natural Resources and U.S. Department of Agriculture 1963). An historic stone fish dam (trap) constructed by Native Americans on Susie Creek not far from its confluence with the Humboldt was likely designed to capture spawning runs of large fish such as trout from the Humboldt River (Fawcett 2011). Other native fish species present in Susie Creek include specked dace, redbase shiners and Tahoe suckers. There is no documentation of non-native fish in this stream. However, the excellent habitat conditions which have developed in recent years are likely attractive to such species as bass and trout originating from the Humboldt River.

Susie Creek is identified as a priority stream for reintroduction of LCT (Coffin and Cowan 1995). BLM has been working actively with private land owners and livestock permittees in the Susie Creek watershed to improve habitat conditions since the early 1990's. Surveys show dramatic improvements in both the extent and amount of riparian vegetation on both the mainstem of Susie Creek and some of its tributaries as a result of prescriptive livestock grazing practices (BLM file data). Construction of a barrier on Susie Creek near its confluence with the Humboldt River is a necessary next step as part of the comprehensive effort to reestablish LCT.

Humboldt River: Both Maggie and Susie Creeks drain into the Humboldt River which supports an abundance of both native and non-native fish species associated with warm water conditions (BLM 1993). Bullheads and catfish were planted and became established early in the century. Other species, such as a smallmouth bass, largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), white crappie (*Pomoxis annularis*), channel catfish (*Ictalurus punctatus*) and white catfish (*Ictalurus catus*) have been sporadically stocked since the mid-1950's. Carp (*Cyprinus carpio*) also have colonized all portions of the Humboldt River in the vicinity of Maggie and Susie Creeks. In recent years, black bullhead catfish (*Ameiurus melas*) have also been found in the river (Elliot 2011). Native fish species include Lahontan redbase, redbase shiner, mountain sucker, speckled dace and Tui chub (*Gila bicolor*).

Although trout are not likely to reside in the mainstem of the Humboldt River due to warm water temperatures and generally degraded habitat conditions, out migrants from the South Fork of the Humboldt River could potentially access Maggie and Susie Creeks during good flow years (Coffin 2011, Elliot 2011). The South Fork of the Humboldt supports a recreational fishery where brown (*Salmo trutta*) and rainbow trout have been caught in most parts of the canyon. Large rainbow trout have also been observed in the South Fork of the Humboldt River just upstream from its confluence with the Humboldt River (Elliot 2011). The South Fork of the Humboldt River flows into the Humboldt River approximately 13 to 14 miles from the confluences of Susie and Maggie Creeks with the Humboldt.

The development of excellent habitat conditions in the Maggie and Susie creek drainages as a result of improved livestock management is thought to increase the threat posed by non-native fish. Many miles of both Maggie and Susie creek are now characterized by very well developed riparian zones, deep pools and extensive beaver dam complexes, habitat conditions favored by both native and non-native fish species.

Maggie and Susie Creek Fish Barriers

Mollusks

California floaters (*Anodonta californiensis*), a Nevada BLM sensitive species of freshwater mussels, have been documented in Maggie Creek approximately 10 miles upstream from the area of the proposed barrier (BLM 1993). This species can only survive in association with certain fish that serve as hosts for the mussel's parasitic life stage. In the Maggie Creek Basin, host species are thought to be native minnows and/or suckers. California floaters have not been documented in Susie Creek.

Effects to Aquatic and Special Status Species

Impacts to priority aquatic resources on Maggie and Susie Creeks are summarized in Tables 2 and 3. Generally, effects of the proposed action and alternatives are positive, while effects of the no action alternative are negative. These effects are discussed below.

Table 2. Summary of direct, indirect and cumulative impacts on aquatic resources as a result of the proposed action and alternatives for Maggie Creek.

Impact Type by Resource	No Action Alternative	Proposed Action	Maggie Upstream Alternative
LCT, Amphibians, California Floater			
Direct	0	0	0
Indirect	—	+	+
Cumulative	—	+	+
Native Minnows and Suckers			
Direct	0	0	0
Indirect	—	+	+
Cumulative	—	+	+

Key: 0 = Neutral; + = Positive; — = Negative

Table 3. Summary of direct, indirect and cumulative impacts on aquatic resources as a result of the proposed action and alternatives for Susie Creek.

Impact Type by Resource	No Action Alternative	Proposed Action	Susie Upstream Alternative
LCT			
Direct	0	0	0
Indirect	—	+	+
Cumulative	—	+	+
Native Minnows and Suckers			
Direct	0	—	—
Indirect	—	+	+
Cumulative	—	+	+

Key: 0 = Neutral; + = Positive; — = Negative

No Action Alternative

Maggie and Susie Creek Fish Barriers

In the absence of a fish barrier, non-native fish from the Humboldt River could gain access to many miles of stream habitat on both Maggie and Susie Creeks. Bullfrogs could also potentially expand upstream on Maggie Creek.

Non-native fish, especially salmonid species, are currently the greatest threat to LCT range-wide, resulting in loss of available habitat and range constrictions primarily through competition and hybridization (U.S. Fish and Wildlife Service 2009). Rainbow trout readily hybridize with LCT and produce fertile offspring. Genetic mixing of natives, non-natives and hybrids could lead to loss of locally adapted genotypes in Maggie Creek and its tributaries causing eventual extinction of this important population. Smallmouth bass have been found to consume juvenile salmonids (Frits and Pearsons 2006). Although LCT do not currently exist in Susie Creek, establishment of non-native trout in this system could jeopardize plans for a future reintroduction. Reestablishing LCT in historically occupied habitats is a key component of efforts to recover the species.

Expansion or establishment of bass or other non-native warm water fish in Maggie or Susie Creek would eliminate or decrease abundance and distribution of native amphibians (including Columbia spotted frogs) as well as native minnow and sucker populations in these drainages. Non-native warm water species such as largemouth bass, smallmouth bass and bluegill, prey on amphibians (Peterson 2011) and have been found to cause dramatic decreases in native dace, shiners and suckers (Kamerath et al. 2008, Zanden et al. 2004). Loss of native minnows could also impact California floaters since these fish are believed to be intermediate hosts for larval stages. Loss or a reduction in populations of native minnows appears to have already occurred in the lower Maggie Creek channel as a result of smallmouth bass.

Expansions in bullfrog populations in the Maggie Creek system would likely cause the small native population of Columbia spotted frogs present as well as other species of native amphibians to be extirpated.

Cumulative Effects of No Action Alternative

Establishment of non-native aquatic species in the Maggie and Susie Creek drainages would result in a negative cumulative effect. Both drainages are impacted from livestock grazing², past wildfires, weed infestations, irrigation diversions, roads and presence of bullfrogs. The lower reaches of Maggie Creek are also impacted by mine dewatering and establishment of smallmouth bass. Reasonably foreseeable impacts for both the Maggie and Susie Basins include mine dewatering and climate change. Dewatering could affect surface baseflows in areas occupied by native fish, amphibians and mollusks, while climate change is likely to alter environmental conditions to allow for the expansion of non-native fish (Kamerath et al. 2008 and Zanden et al. 2004).

Proposed Action and Maggie Creek Upstream Alternative

² Continuous hot season grazing by livestock in the Maggie and Susie Creek drainages is limited and has been mostly replaced by prescriptive grazing practices which promote healthy riparian areas.

Maggie and Susie Creek Fish Barriers

The Maggie Creek channel would be dry during construction and there would be no direct effects to any aquatic resources. Native minnows and suckers could be displaced during construction on Susie Creek if ponded or low flows are present. Any fish ending up below the barrier would be precluded from moving upstream after construction.

Preventing upstream movement of non-native fish (and possibly bullfrogs) would help preserve native fish, mollusk and amphibian populations in the Maggie Creek Basin and native minnows and suckers in the Susie Creek Basin. The ability to secure Susie Creek from the threat of non-native fish would also facilitate future plans to reestablish LCT. Non-native warm water fish and non-native trout would not be able to prey on, hybridize or otherwise compete with LCT, California floaters, native minnows and suckers and amphibians in one or both drainages. Although two bass were found by NDOW upstream from the project area in Maggie Creek in 2011; the invasion may be still be limited and controllable. State and federal fishery biologist feel it is still important to try to limit any further upstream expansion. Of greater concern is the need to prevent rainbow trout from becoming established in the Maggie Creek Basin since this species poses the greatest risk to LCT.

On Maggie Creek, there is a small chance that large rainbow trout could pass through the barrier under certain flow conditions (see Design Concept, 2 - Alternatives, page 5). However, these flow conditions occur only rarely and for only a very limited period of time. The chance that large rainbow trout would be present below the barrier during these times is thought to be very low (Coffin 2011). However, if rainbow did gain access to upstream reaches on either Susie or Maggie Creek, recovery efforts for priority aquatic resources including LCT would be jeopardized.

Susie Creek Upstream Alternative

Impacts would be the same as for the proposed action with the exception that under this alternative, six miles of high priority habitat for LCT would also be lost to all but out migrating fish. Native minnows and suckers trapped below the barrier during construction would no longer be able to access upstream areas.

Cumulative Effects of Proposed Action and Alternatives

Construction of barriers on Susie and Maggie Creeks would create a positive cumulative impact. The barriers would increase chances extensive efforts to restore LCT and other priority aquatic wildlife resources in both the Maggie and Susie Creek Basins are successful.

2. Water Resources

Study Area: The direct and indirect study area for the proposed action and alternatives is the stream channel 500 feet above and below the barriers (including streambanks up to the 100 year floodplain). The cumulative effects study area is the Maggie and Susie Creek watersheds.

Hydrology

Maggie and Susie Creek Fish Barriers

The Susie Creek drainage is about 25 miles long and covers an area of about 180 mi² (USGS 2010a). The basin is bounded by the Adobe Range and to the west by the Independence Mountains. The Maggie Creek Basin is divided into upper and lower basins by Maggie Creek Canyon or “the Narrows” and covers an area of about 396 mi². Length of the mainstem is approximately 30 miles (USGS 2010b). The upper Maggie Creek is bounded to the west by the Tuscarora Mountains and to the east by Independence Mountains. The lower Maggie Creek is bounded by poorly defined divides of Susie Creek on the east and Mary’s Creek on the West. Both drainages flow into the Humboldt River to the south.

Streamflows are highly variable on both Susie and Maggie Creek. Flow data collected by the U.S. Geological Survey (USGS) for the period 1992 through present for Susie Creek and for various periods between 1914 and present for Maggie Creek show discharge is typically greatest during April and May with the lowest flows occurring between July and December (USGS 2010b). Average mean monthly discharge for April and May ranges from 13 to 29 cubic feet per second (cfs) for Susie Creek and 92 to 106 cfs for Maggie Creek. The greatest record flow for Maggie Creek (2,440 cfs) occurred in February of 1962. A maximum recorded peak flow of 1,600 cfs per second was recorded for Susie Creek in December of 2005.

Mine dewatering, beginning in 1992, resulted in documented loss of baseflows in lower Maggie Creek. USGS gage data for the Maggie Creek Canyon (below the Maggie Creek Narrows) shows Maggie Creek started going dry between July and December beginning in 2000 in the area of the proposed action and upstream alternative (USGS 2010c). Pumped water (ranging in amounts from 4,000 to 20,000 gallons per minute) is discharged into Maggie Creek several miles downstream from the project area creating a perennial channel between the discharge point and Maggie Creek’s confluence with the Humboldt River. Although pumped water being discharged is warm (up to 84^oF), it cools as it moves toward the Humboldt River. Quality of the discharge water is considered good (within state standards) (BLM 2002).

Gage data show lower Susie Creek is frequently dry between July and September (USGS 2010a). Pondered flow however, can occur during baseflow periods in the project area for the proposed action which is located about a mile and a half upstream from the gage. Although flow data are not available for the project areas for the upstream alternative on Susie Creek, BLM stream survey data as well as presence of wetland vegetation indicate this area is consistently perennial (BLM files). Both Maggie and Susie Creeks are considered Waters of the U.S.

Floodplains

The 100-year floodplain, as defined by the Federal Emergency Management Agency (FEMA) has not been defined for lower Maggie Creek. However, lower Maggie Creek supports a small but confined floodplain situated between the slope formed by the rip-rapped road shoulder to the west and the steep slope formed by the hillside to the east

Maggie and Susie Creek Fish Barriers

(refer to Figure 1). Although the area supports scattered willows, riparian vegetation establishment on the floodplain is limited by lack of persistent flows. Floodplain function (including energy dissipation and capture of water and sediment) is limited by the proximity of the sideslopes and the relatively straight configuration of the channel.

The lower length of the Susie Creek, including the proposed barrier location, is included within the 100-year floodplain as defined by FEMA (Flood Insurance Rate Map #320037 3225 B). Executive Order 11988, as amended (Floodplain Management) requires public review of planned actions in floodplains as well as consideration of alternatives and/or development of mitigating measures to reduce impacts (FEMA 1977). These requirements are met through development and implementation of this EA.

On Susie Creek, historic channel incision has resulted in formation of a new floodplain at a lower elevation between cut banks. This “new” floodplain in its existing location is functioning to dissipate stream energy and to capture and water as a result of changes in livestock grazing practices which have favored growth and establishment of woody and herbaceous riparian vegetation since 1991 (refer to Figure 2).

Channel Characteristics

Rosgen³ channel type information for Maggie and Susie Creek (within the area of the proposed action) is summarized in Table 4. Channel type information for upstream alternative sites is not available for either stream.

Table 4. Summary of channel characteristics for proposed action locations on Maggie and Susie Creeks (Rosgen 1996).

Proposed Barrier Site	Channel Type	Stability/ Sediment Supply	Suitability for Migration Barrier	Limitations/Discussion
Maggie Creek	B4c ¹	-Relatively stable -Low sediment supply	Good	Proper site selection must be made within the reach where banks are high and stable.
Susie Creek (portions of reach)	C5	-Susceptible to lateral and vertical instability -High to very high sediment supply	Poor	Bank and bed instability can result in structure failure. Low banks – cannot create adequate height for falls. Rates of lateral adjustment are influenced by presence and condition of riparian vegetation.
Susie Creek (portions of)	E5	-Very stable -High sediment	Poor	Low bank heights and condition of streambanks are concerns.

³ Rosgen channel typing provides geomorphic information on site capability and potential especially in relation to suitability of the site for installation of structures (Rosgen 1996).

Maggie and Susie Creek Fish Barriers

Proposed Barrier Site	Channel Type	Stability/ Sediment Supply	Suitability for Migration Barrier	Limitations/Discussion
reach)		transport capacity		

¹Information in table is for B4 channel type. A B4c channel type is functionally similar; however, the c modifier means this stream reach is flatter than is typical for a B channel.

Substrate sampling was completed for both sites in 2010 (Otis Bay Ecological Consultants, Inc. 2011a and b). Sands and gravels were predominate surface substrates on Maggie Creek, while a combination of sands, silts and clays characterized substrates for Susie Creek. Although both sites had increasing amounts of cobbles at depths of 10-12 feet, boulders or bedrock was not encountered at either location.

Channel gradients are low for both streams (<2%) suggesting potential for backwatering and sediment deposition behind structures.

Water Quality

State water quality standards outlined in Nevada Administrative Code (NAC) 445A apply to Maggie and Susie Creeks. The lower reach of Maggie Creek is designated as class C water and is included in Nevada's 2006 303(d) list of impaired waters for pH. Susie Creek has not been designated, but standards and beneficial uses designated for the Humboldt River apply under the tributary rule. Numeric water quality standards for designated streams are based on a variety of beneficial uses including aquatic life, recreation, municipal and domestic supply, and irrigation. Quality of any waters receiving waste discharges must be such that no impairment of beneficial usage occurs as a result of the discharge.

Water quality monitoring data collected by Newmont Mining Corporation on Maggie and Susie Creeks since the early 1990's is summarized in BLM (2002). Several trace elements measured for Maggie Creek have exceeded drinking water and aquatic life standards. On Susie Creek, concentrations of iron and manganese were found to be in excess of the drinking water standard. On both Susie and Maggie Creeks, water temperatures and total dissolved solids (TDS) showed considerable seasonal variation.

Effects to Water Resources

No Action Alternative

None.

Proposed Action

Fish barriers have the potential to impact floodplains and channels by acting as small dams, causing water to slow and sediment to accumulate behind the structures. Structures can also create over width channels resulting in increases in bank erosion,

Maggie and Susie Creek Fish Barriers

turbidity, slope (due to decreased stream length) and loss of stream competency (stream power) to move sediment (Rosgen 1996). Barriers could also potentially concentrate flow energies downstream of the structure creating increased bed scouring. On Susie Creek, these concerns are amplified as a result of channel types being poorly suited to construction of in-stream structures.

The special design features of the proposed barriers minimize or mitigate these potential effects. The U-shaped sheet-pile, sharp-crested labyrinth weir design would result in water levels being elevated only slightly at the rip rapped weir site because of the efficiency of the labyrinth and sharp-crested weir. Flows at the weir would achieve super critical depth and the labyrinth shape of the sheet piles would increase efficiencies at low flows so depths at the weir would be only 1.89 feet deeper than historical depths at the weir location. Backwater effects upstream of the structure would be minimized to less than 1 foot 100 feet upstream of the sheet pile weir, with higher flows showing the greater efficiency and rapid convergence to historical levels. A hydraulic jump would develop in the rip rapped plunge pad below the weir, especially at higher flows, and dissipate between 50% and 70% of the falling flow energy. The U-shaped weir would spill flows toward a plunge pad in the center of the existing stream. The higher velocities on the weir would minimize erosion of the streambanks, allow for self-cleaning of the structure and reduce water pooling at low flows above the barrier. Appropriately sized rip rap placed above and below the barrier on streambanks would protect banks and reduce downstream scouring. Sheet pile wing walls would also prevent thalweg migration toward road and undercutting of streambanks.

The upstream channel would fill in naturally with soil and rock with subsequent floods and the downstream channel would be heavily protected with rip rap sized for the 100 year storm. In the case of Maggie Creek, the right side abutment wing wall would encroach slightly on the NDOT right-of-way as most historical floods already do. The constructed barrier would produce minimal additional flooding and the wing walls buried in the rip rap shoulders would protect the bed and bank in this area, preventing potential erosion and undermining and protecting the road. The structure and its fabrication would not encroach into or affect the existing roadway.

Although chances for structure failure are higher for Susie Creek, excellent growth and establishment of riparian vegetation across the floodplain would reduce potential for erosion and lateral channel adjustment. Use of sheet piles to achieve barrier height would also mitigate low bank height concerns. In the case of the Maggie Creek site, the adjacent banks are relatively high and stable; increasing chances the barrier would be structurally successful.

Substrate sampling for both streams suggests large boulders or bedrock would not be encountered during construction when sheet-piles are driven into the channel. Although substrate data indicate the barriers would be constructed in loose, erodible material, the proposed 12 foot depth for the pilings is expected to provide for adequate structure stability.

Maggie and Susie Creek Fish Barriers

Minor increases in turbidity could occur if sediments accumulate upstream from the barrier during periods of low flows but are washed downstream during high flows. Construction activities are not expected to appreciably impact water quality for the following reasons:

- The stream channel would be dry during construction (Maggie Creek proposed action and alternative).
- The stream channel would be dry or flows would consist of shallow pools (Susie Creek proposed action).
- Construction BMP's and state and federal permit requirements for reducing or preventing nonpoint source pollution in waterways would be adhered to
- Disturbed areas would be regraded and reseeded.

Maggie Creek Upstream Alternative

Effects to water resources would be similar to the proposed action with the exception that there would be a higher likelihood of bank erosion and sediment accumulation upstream of the barrier. Maggie Creek is more sinuous in this location (a result of a flatter gradient) and observations show increased deposition of sand and gravel within the channel and onto the adjacent floodplain following runoff events (Figure 6). Increased sediment deposition behind the barrier could increase potential for lateral erosion and decrease structure effectiveness.



Figure 6. Alternate upstream location on Maggie Creek. January, 2009.

Susie Creek Upstream Alternative

Effects to water resources would be similar to the proposed action with the exception that the barrier would likely be more stable and less susceptible to lateral erosion in comparison to the downstream site. The topography at the upstream point creates somewhat of a “pinch point” making the site more of a natural place for a dam or structure. Remnants of an old irrigation dam which include juniper logs and boulders can be seen on both banks in the vicinity of the proposed barrier site indicating the relative attractiveness of the site for dam construction.

Cumulative Effects of Proposed Action and Alternatives

Construction of barriers on Maggie and Susie Creeks would create a small incremental impact to water resources on Susie and Maggie Creeks. Roads, livestock grazing, past wildfires and construction activities in the floodplains have impacted hydrology and water quality on these streams. Mine dewatering has, or is projected to, contribute to loss of surface flows in the middle and lower reaches of Maggie and Susie creek, leading to loss of stabilizing riparian vegetation (BLM 2000). Particularly on Susie Creek, loss of

Maggie and Susie Creek Fish Barriers

riparian plant establishment on the floodplain may increase potential for lateral and vertical channel adjustments. Climate change could also potentially lead to increased erosion through predicted changes in streamflow duration and magnitude.

3. Lands and Reality Actions

Study Area: The study areas for direct, indirect and cumulative effects for the proposed action and alternatives are access roads as well as a one mile radius around the sites proposed for barrier construction. The areas for both the proposed action and upstream alternative on Maggie Creek site were identified as highly industrialized and as having numerous ROW's or other lands actions within the general area (BLM files).

Only one issue for Maggie Creek was identified through scoping and included slight but acceptable encroachment into the NDOW ROW (Serial No. NVN-0-067173) for State Route 766 under the proposed action, as explained below. The NDOW ROW, which extends 90 feet on either side of the centerline of Highway 766, and encompasses a rip-rapped bank adjacent to the Maggie Creek channel in the project area. No other issues with land uses in this area were identified.

The area for the proposed action on Susie Creek is also somewhat industrialized and includes a number of ROW's or other land uses in the immediate area. As with Maggie Creek, only one potential issue was identified through scoping and included possible intrusion of the barrier into the Paiute Pipeline Natural Gas pipeline ROW (Serial No. NVN-055315). Following an on-site coordination meeting with Paiute Pipeline Company, it was decided to move the proposed barrier location approximately 120 feet upstream to eliminate potential interference with their ROW.

No land use issues were identified through scoping for the Susie Creek Upstream alternative (BLM files).

Effects to Land and Realty Actions

No Action Alternative

None.

Proposed Action and Alternatives

Direct effects of the proposed action or any of its alternatives upon any ROWs, land uses or structures would be nonexistent to negligible with the exception of the NDOT ROW on Maggie Creek.

The right side abutment wing wall on the proposed Maggie Creek barrier would encroach slightly on the NDOT ROW (as most historical floods already do). Encroachment by historical peak and predicted 100 year flows on the NDOT ROW is exacerbated only slightly for a short distance by the fish barrier (Otis Bay Ecological Consultants, Inc. 2011a). The buried sheet pile wing walls would prevent migration of the stream

Maggie and Susie Creek Fish Barriers

thalweg⁴ toward the road and prevent undercutting of the streambank into the ROW. Existing rip-rap would also provide additional streambank protection and stabilization.

NDOT participated in the review process for development of the Maggie Barrier design. Prior to construction, BLM would apply for an Occupancy or Encroachment Permit from NDOT and would comply with any applicable measures or stipulations (see Authorizations, 1- Introduction, page 2).

Cumulative Effects of Proposed Action and Alternatives

The construction of fish barriers on Maggie and Susie Creeks would add an incremental land use impact. Increases in mining activity and/or land use in the areas of Maggie and Susie Creeks are reasonably foreseeable. If barriers were impacted by future land uses, they would need to be repaired or reconstructed in another location.

4. Wetlands and Riparian Zones

Study Area: The direct and indirect effects area for the proposed action and alternatives includes the active floodplain impacted by construction activities and equipment access. The cumulative effects study area is the Maggie and Susie Creek drainages.

The lower Maggie Creek channel is affected by mine dewatering and is dry significant periods of the year. Riparian vegetation is limited to scattered Coyote willow (*Salix exigua*). Grasses and forbs present in floodplain areas tend to be upland species.

Wetland and riparian habitat conditions along significant portions of Susie Creek (including project areas for both the proposed action and upstream alternative) are good to excellent as a result of a prescriptive livestock grazing program in place since the early 1990's. In upstream areas, beaver dams have created extensive ponds and wetlands. Dominant riparian/wetland species present at both the proposed action and upstream alternative project areas include Coyote willow, common threesquare bulrush (*Scirpus americanus*), baltic rush (*Juncus balticus*) and spikerush (*Eleocharis* spp.).

Effects to Wetlands and Riparian Resources

No Action Alternative

None.

Proposed Action and Maggie Creek Upstream Alternative

On both Susie and Maggie Creeks, limited amounts of riparian vegetation (primarily willow) would be removed during construction activities. Most disturbed areas would become recolonized with the same species within one to two seasons following construction. Both Coyote willow (present at both Maggie and Susie Creeks) and rush

⁴ Thalweg: In hydrologic terms, the line of maximum depth in a stream. The thalweg is the part that has the maximum velocity and causes cutbanks and channel migration.

Maggie and Susie Creek Fish Barriers

species (present at Susie Creek) are highly rhizomatous and quickly re-colonize disturbed areas.

Riparian plant establishment may actually increase slightly in response to sediment filling in around rip rap areas. Any ponding of flows above the barriers would also slightly increase potential for riparian plant growth in those areas.

Susie Creek Upstream Alternative

Impacts would be similar to the proposed action with the exception that more riparian vegetation would be disturbed during construction. The area where the barrier would be built includes beaver dam complexes and more extensive wetlands.

Cumulative Effects of Proposed Action and Alternatives

Activities associated with construction would create a small additive cumulative impact. Wetland and riparian plant communities on Maggie and/or Susie Creeks are impacted by livestock grazing, mine dewatering, past wildfires, weed infestations and roads. Some of these impacts, including implementation of prescriptive grazing practices, are positive.

5. Soil Resources

Study Area: The study area for direct, indirect and cumulative impacts for the proposed action and alternatives includes all areas potentially disturbed by construction activities, including the stream channel, floodplains, access roads and staging areas.

Generally, soils in the area are characterized as loams (combinations of silts and clays with lesser amounts of sand) (NRCS 2011). Coarser material occurs in alluvial areas, especially at depths of eight to 10 feet. Drainage is poor in low areas but improves on slopes. Land uses including construction and excavation are rated as limited to very limited for most of these soils which are easily compacted and prone to wind and water erosion (NRCS 2011). Special features required to overcome these limitations have been incorporated into both the barrier design and within the protection measures for this EA. For the Maggie and Susie barriers, these include use of sheet piles, a specialized weir design, placement of appropriately sized rip rap above and below the barrier and on streambanks, and wing wall placement (refer to Effects to Water Resources, 3 - Affected Environment and Environmental Effects, page 23).

Effects to Soil Resources

No Action Alternative

None.

Proposed Action and Maggie Creek Upstream Alternative

Effects would be limited in extent. Compaction and loss of plant productivity associated with impacts to soil structure and mixing of soil horizons would occur on less than one acre as a result construction activities. Risks of wind and water erosion would increase

Maggie and Susie Creek Fish Barriers

during construction and for some period after construction until vegetation becomes reestablished. Implementation of BMP's and other measures (see Environmental Protection Measures Common to all Alternatives, 1 – Introduction, page 7) would minimize soil loss during construction.

Susie Creek Upstream Alternative

Impacts to soils would be similar to the proposed action with the exception that a larger area would be disturbed as a result of new road construction.

Cumulative Effects of Proposed Action and Alternatives and Alternatives

Activities associated with construction of barriers would create a small additive cumulative impact. Soil resources on uplands and within the active stream channel on both Maggie and Susie Creeks are impacted by upstream watershed conditions, livestock grazing, road maintenance and construction and activities associated with mining or gravel pit operations. Increases in land uses associated with soil disturbance are reasonably foreseeable. However, impacts from the proposed action and alternatives are expected to improve naturally and would not affect soil quality or function on a large scale.

6. Vegetation Resources Including Invasive/Non-Native Species (Uplands)

Study Area: The study area for determining the direct and indirect impacts that could occur from the proposed action and alternatives includes all areas potentially disturbed by construction activities, including vehicle access and staging areas. The cumulative effects study area is the terraces and adjacent hillsides associated with the Maggie and Susie creek drainages.

Upland vegetation in the vicinity of the proposed action and upstream alternative for Maggie Creek includes a mixture of shrubs, grasses and forbs. Common native species include Wyoming and basin big sagebrush (*Artemisa tridentata* Nutt. Ssp. *Wyomingensis* and *tridentata*), various rabbitbrush species (*Chrysothamnus* spp.), basin wildrye (*Leymus cinereus*), Sandberg bluegrass (*Poa secunda*) and a variety of annual and perennial forbs. Several invasive non-native species including cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola kali*) occur in disturbed areas, especially on road shoulders. Scattered amounts of Scotch thistle (*Onopordum acanthium*), a noxious weed, have also been observed in the project area.

Upland vegetation in the project area for the proposed action and upstream alternative on Susie Creek also includes a mixture of shrubs, grasses and forbs. Common native species include rubber rabbitbrush (*Chrysothamnus nauseosus*), basin big sagebrush, basin wildrye, western wheatgrass (*Pascopyrum smithii*), beardless wildrye (*Leymus triticoides*) and various annual and perennial forb species. As with Maggie Creek, dominant invasive non-natives include cheatgrass and Russian thistle in disturbed areas. Scotch thistle occurs throughout the Susie Creek watershed and is especially prevalent along margins of floodplains.

Maggie and Susie Creek Fish Barriers

Effects to Vegetation Resource and Invasive/Non-Native Species

No Action Alternative

None.

Proposed Action and Maggie Upstream Alternative

Activities associated with construction and access (including using areas for parking and maneuvering) would create short-term losses in vegetation as a result of the proposed action and alternatives. Small numbers of native plants would be crushed or uprooted. Soil disturbance would also favor expansion of non-native plants including invasive and noxious weeds.

Reseeding of disturbed areas would allow native plant communities to return to pre-disturbance levels within two to three years. Weed control measures (see Environmental Protection Measures Common to all Alternatives, 1-Introduction, page 7) would prevent further spread of noxious weeds.

Susie Creek Upstream Alternative

Impacts to vegetation resources would be similar to the proposed action with the exception that more plants would be disturbed as a result of new road construction. The additional disturbance would also increase potential for expansion of invasive and noxious weeds.

Cumulative Effects of Proposed Action and Alternatives

Activities associated with construction would create a small additive cumulative impact. Surrounding upland vegetative communities are impacted by past wildfires, reseeding efforts, weed infestations, roads, livestock grazing and activities associated with mining or gravel pit operations.

4 - CONSULTATION AND COORDINATION

Because of the biological, technical, regulatory and hydrologic complexity of constructing a barrier to aquatic life in a major stream system, a wide array of agencies, individuals, businesses and groups were consulted in the development of this environmental assessment (Appendix III).

A number of the responses received through scoping were used to develop the final proposed action and alternatives. BLM's responses to these comments are summarized in Table 5.

Maggie and Susie Creek Fish Barriers

Table 5. Summary of comments and BLM responses as a result of scoping.

Source of Comment	Comment	BLM Response
Nevada Department of Wildlife	Expressed support for project.	Comment noted.
U.S. Fish and Wildlife Service	Expressed support for project.	Comment noted.
Trout Unlimited	Expressed support for project.	Comment noted.
Nevada Department of Transportation (NDOT)	Maggie Creek proposed action design encroaches onto the NDOT ROW for SR766.	Draft barrier designs provided to NDOT for review and comment; BLM would obtain an NDOT ROW Occupancy or Encroachment Permit prior to construction.
Newmont Mining Corporation	Expressed support of project; would allow for access on private lands.	Comment noted; access option incorporated into proposed action.
Natural Channel Design, Inc.* *Comments are based on review of free draining rock wall barrier design for Susie Creek (Porior 2008b).	<ol style="list-style-type: none"> 1) Re-analyze site to provide flood frequency analysis. 2) Use V-shaped weir design to ensure passage of sediment and flows. 3) Barrier should be solid without underlying porous layer. Make corrections to minimize upstream ponding. 4) Recommend selection of an alternative site for the Susie Creek barrier based on concerns with unstable channel type as proposed. 5) Concern that fish may be able to breach barrier at flows greater than 400 cfs. 	<ol style="list-style-type: none"> 1) – 3) Free draining rock wall designs eliminated from consideration. Otis Bay Ecological Consultants, Inc. contracted to design barriers for both Maggie and Susie Creeks. These issues addressed. 4) Upstream alternative for Susie Creek analyzed. 5) Risk analysis for fish passage at higher flows incorporated into analysis and design.
Jim Reynolds, Ph.D.	<ol style="list-style-type: none"> 1) Assumption that non-native fish have not invaded upstream reaches of Susie or Maggie Creeks may be based on false negatives. 2) Existing and planned LCT populations in Maggie and Susie Creeks need protection from non-natives. 3) Risk analysis related to hydrographic data, should be included in EA to determine likelihood of non-native fish invasion. 4) Location of the Susie Creek barrier should be moved four to six miles upstream to a more geomorphically stable area. 5) Monitoring program should be included to evaluate barrier effectiveness. 6) Culverts should not be assumed to represent effective fish barriers. 	<ol style="list-style-type: none"> 1) Local fisheries experts are reasonably confident non-native fish do not occur above proposed barriers sites on Maggie or Susie Creeks based on fairly comprehensive fish population and/or habitat surveys in recent years. 2) Comment noted. 3) Risk analysis included in EA. A comprehensive risk analysis is part of the barrier design reports is presented in Otis Bay Ecological Consultants, Inc. (2011a and b). 4) Analyzed as Susie Creek Upstream Alternative in EA. 5). Incorporated into Proposed

Maggie and Susie Creek Fish Barriers

Source of Comment	Comment	BLM Response
		Action in EA. 6) Use of existing culverts on the Newmont cooling tower road as barriers eliminated from consideration.
Paiute Pipeline, Inc.	Concern with possible impact to natural gas pipeline on Susie Creek.	Location of proposed barrier on Susie Creek moved upstream in cooperation with Paiute Pipeline to avoid any potential conflict with gas ROW.

List of Preparers

Preparer	Sections
Carol Evans	Lead Preparer, Wildlife (Aquatic), Vegetation (Uplands and Riparian Areas), Water Resources
John Daniel	Water Resources, Soils
Eric Ryder	Engineering
Jill Jensen	Cultural Resources
Bryan Mulligan	Noxious Weeds and Invasive Non-native Species
Steve Craddock	Lands and Realty Actions
Victoria Anne and Kirk Laird	National Environmental Policy Act (NEPA) Compliance
Leona Rodreick	Native American Consultation

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Maggie and Susie Creek Fish Barriers

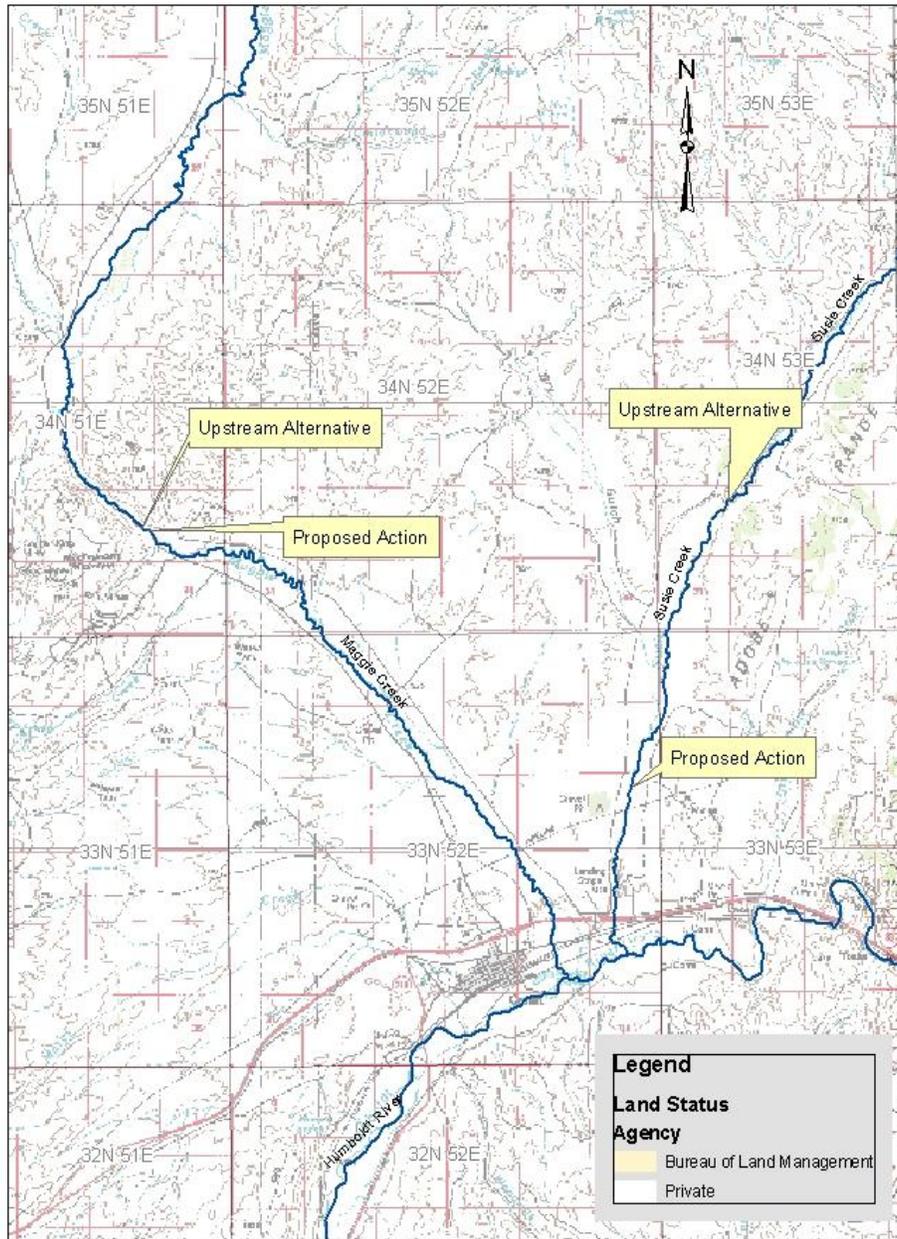
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Maggie and Susie Creek Fish Barriers

Appendix I, Map 1
Proposed Fish Barriers, Maggie and Susie Creeks



Data published in
North American Datum 1983 (NAD83)
UTM coordinate system 12N zone
The warranty is made by the Bureau of Land Management
as to the accuracy, reliability, or completeness of these
data for individual use or aggregate use with other data.

00.285 1 Miles



Maggie and Susie Creek Fish Barriers

Appendix II

Table 1. List of relevant authorities used by BLM for NEPA analysis.

Element	Relevant Authority	BLM Manual or Regulation
Air Quality	Clean Air Act, as amended (42 USC 7401 et seq.); Section 176(c) CAA - General Conformity	MS 7300 40 CFR 93 subpart B
Areas of Critical Environmental Concern	Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.)	MS 1613
Cultural Resources	National Historic Preservation Act, as amended (16 USC 470)	MS 8100
Environmental Justice	E.O. 12898 "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations" 2/11/94	H-1601-1
Farm Lands (Prime or Unique)	Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.) Farmland Protection Policy Act (7 USC 4202 et seq.)	7 CFR 658.4
Floodplains	E.O. 11988, as amended "Floodplain Management" 5/24/77	MS 7260
Forests and Rangelands	Healthy Forests Restoration Act of 2003 (P.L. 108-148). (HFRA projects only)	
Human Health and Safety	(Herbicide Projects). E.O. 13045 "Protection of Children from Environmental Health Risks and Safety Risks"	MS 9011
Migratory Birds	E.O. 13186 "Migratory Birds"; Migratory Bird Treaty Act (16 USC 703 - 711)	50 CFR 10, 17
Native American Religious Concerns	American Indian Religious Freedom Act of 1978 (42 USC 1996)	MS 8100 H-8160-1
Non-Native Invasive and Noxious Species	E.O. 13112, Invasive Species, 2/3/99	MS 9015 517 DM 1
Threatened and Endangered Species	Endangered Species Act of 1973, as amended (16 USC 1531)	MS 6840
Wastes, Hazardous or Solid	Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.) Comprehensive Environmental Response, compensation, and Liability Act of 1980, as amended (42 USC 9615)	MS 9180 MS 9183
Water Quality, Surface/Ground	Safe Drinking Water Act, as amended (42 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	MS 7240 MS 9184
Wetlands/Riparian Zones	E.O. 11990 "Protection of Wetlands" 5/24/77	MS 6740
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 USC 1271)	MS 8014
Wilderness	Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.) Wilderness Act of 1964 (16 USC 1131 et seq.)	43 CFR 6300 H-8550-1 MS 8560

Maggie and Susie Creek Fish Barriers

Appendix III Consultation

Agencies

Nevada Department of Wildlife, Region II
U. S. Fish and Wildlife Service, Nevada Fish and Wildlife Office
Jo Sherwood, Nevada Department of Transportation

Area Land Owners and/or Livestock Permittees

Dan Gralian, Elko Land and Livestock
Heguy Ranches, Inc.
Maggie Creek Ranch, LP
Willow Creek Partners, LLC
Pattani Ranch Partnership

Businesses

Natural Channel Design Incorporated
Michael C. Garello, P.E., FishPro
Paul Pettit, Newmont Mining Corporation
Paiute Pipeline Co. (Southwest Gas)
Sierra Pacific Power Company
Beehive Telephone Company, Inc., NV
Wells Rural Electric

Native American Consultation

Lynette Piffero, Elko Band Council
Robert Bear, Duck Valley Sho-Pai Tribes
Julie Stevens, Wells Band Council
Davis Gonzales, Te-Moak Tribal Council
Michael Young, Battle Mountain Band Council
Carrie Dann, Western Shoshone Defense Project
Joe McDade, Bureau of Indian Affairs
Cheryl Mose Temoke, South Fork Band Council
Jerry Millet, Duckwater Shoshone Tribe
Wayne Dyer, Yomba Shoshone Tribe
Deb Blossom, Western Shoshone Committee
Dianna Buckner, Ely Shoshone Tribe
Felix Ike, Western Shoshone Descendant of Big Smokey
Rupert Steele, Goshute Business Council
Mike Miller, Western Shoshone Defense Project

Other

Sherm Swanson, Ph.D., University of Nevada
Helen Neville, Ph.D., Trout Unlimited
Jim Reynolds, Ph.D., Instructor, Great Basin College, Elk
Nevada Fish Passage Working Group

Maggie and Susie Creek Fish Barriers

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