Draft Supplemental Watershed Plan No. 9 and Environmental Assessment for the Rehabilitation of Silver Lake Flat Dam

American Fork-Dry Creek Watershed
Utah County, Utah

Sponsoring Local Organizations:
North Utah County Water Conservancy District
Utah Division of Wildlife Resources

Prepared by:
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Prepared for:
U.S. Department of Agriculture
Natural Resources Conservation Service

In cooperation with:
U.S. Department of Agriculture
U.S. Forest Service Uinta-Wasatch-Cache National Forest

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Title and Document Status: Draft Supplemental Watershed Plan No. 9 and Environmental Assessment (Draft Plan-EA) for the Rehabilitation of Silver Lake Flat Dam. The Project is located in Utah County, Utah.

Lead Agency: U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)

Cooperating Agencies: USDA U.S. Forest Service (USFS) Uinta-Wasatch-Cache National Forest (UWCNF)

Sponsoring Local Organizations: North Utah County Water Conservancy District (NUCWCD) and Utah Division of Wildlife Resources (UDWR)

Authority: This Draft Plan-EA has been prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law (PL) 83-566, as amended (16 U.S.C. 1000-1008, 1010 and 1012) and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, PL 91-190, as amended (42 U.S.C. 4321 et seq.).

Abstract: Silver Lake Flat Dam (#UT00276) was originally built in 1971 and was designed and constructed as a high hazard (Class "C") dam due to the high probability of loss-of-life if the dam should fail. The dam was planned and built for the primary purpose of irrigation water storage but has incidental benefits to flood control, sediment retention, and recreation. In accordance with the rehabilitation provisions of NRCS's Small Watersheds Program, Silver Lake Flat Dam is eligible for rehabilitation funding due to its high hazard class and outdated infrastructure. This project is needed to rehabilitate the Silver Lake Flat Dam to meet current NRCS and Utah State Dam Safety regulations and current engineering standards. The need for the project is to extend the life of the dam for 71 years starting in 2017 to continue to provide economic benefit through the primary use of water storage. The purpose of the project is to continue to provide rural water supply for irrigation, recreation, and fish and wildlife uses, in a manner that minimizes the risk of loss of human life, is cost efficient, and environmentally acceptable.

The preferred alternative includes the rehabilitation of the dam and replacement of the spillway in the same location. Rehabilitation of the dam would consist of measures to meet current NRCS and Utah Dam Safety regulations, current engineering standards and extend the life of the dam for 71 years starting in 2017. Rehabilitation of the dam would include installing new riprap on the upstream face, placing additional fill on the downstream face for stability, raising the auxiliary spillway elevation 2.5 feet, replacing the existing spillway, installing new toe drains, replacing two low-level outlet gates, installing a seepage monitoring system, clearing vegetation around the dam and reservoir, and installing improvements to the dam access road for construction equipment access. The estimated construction cost for the rehabilitation of the dam is $3,538,000.

Comments: NRCS has completed this Draft Plan-EA in accordance with the National Environmental Policy Act (NEPA). Reviewers should provide their comments to NRCS during the allotted Draft Plan-EA review period. Comments need to be submitted by September 25, 2013. Please send comments to:

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SUPPLEMENTAL WATERSHED PLAN AGREEMENT NO. 9

(TO BE INCLUDED IN FINAL PLAN-EA)

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S.2 County, State

Utah County, Utah

S.3 Congressional District

Utah Congressional District 2

S.4 Sponsoring Local Organizations

North Utah County Water Conservancy District (NUCWCD) and Utah Division and Wildlife Resources (UDWR)

S.5 Authority

Natural Resources Conservation Service (NRCS) – Lead Federal Agency under Public Law 83-566 Stat. 666 as amended (16 U.SC. Section 1001 et. Seq.) 1954

S.6 Cooperating Agency

U.S. Department of Agriculture (USDA) U.S. Forest Service (USFS) Uinta-Wasatch-Cache National Forest (UWCNF)

S.7 Purpose and Need for Action

The purpose and need of this project is to rehabilitate the Silver Lake Flat Dam (#UT00276) to meet current NRCS and Utah State Dam Safety regulations (Utah Division of Water Rights [UDWRt] 2013) and current engineering standards (NRCS 2005). Stabilizing the existing dam structures would address the risk of loss-of-life and flooding associated with a dam failure because the dam is not meeting current safety criteria.

The purpose of the project is to continue to provide rural water supply for irritation, recreation and fish and wildlife uses, minimize the risk of loss of life, is cost efficient, and environmentally acceptable. The preferred alternative and project need would result in extending the life of the dam for 71 years starting in 2017 to continue to provide economic benefit through the primary use of water storage with incidental benefits to flood damage reduction, sediment retention and recreation. The project would restore the design storage capacity in the reservoir by raising the water level, enlarging the spillway to pass the Probable Maximum Precipitation (PMP) event, provide slope stability for seismic events, and as a result increase the reservoir surface area.

S.8 Description of the Preferred Alternative

The Preferred Alternative is the Rehabilitate Dam-Replace Spillway alternative. Rehabilitation of the dam would consist of measures to meet current NRCS and Utah Dam Safety regulations, current engineering standards and extending the life of the dam for 71 years starting in 2017. Rehabilitation of the dam would include installing new riprap on the upstream face, placing additional fill on the downstream face for stability, raising the auxiliary spillway elevation 2.5 feet, replacing the existing spillway in the same location, installing new toe drains, replacing two low-level outlet gates, installing a seepage monitoring system, clearing vegetation around the dam and reservoir, and installing improvements to the dam access road for construction equipment access. Construction activities would be expected to be completed in one season during the months of May through November in 2014, pending weather conditions.

S.9 Resource Information

The following lists the relevant resource information for Silver Lake Flat Dam and Reservoir:

Table S-1. Existing Resource Information

Resource	Description
Latitude / Longitude	40.50106 / -111.65504 (WGS84)
Hydrologic Unit Number	16020201 (Utah Lake)
Climate	July average 90.1°F January average 20.0°F
Topography	Mountainous
Annual Precipitation / Snowfall	24.8 inches / 85.1 inches
Watershed Area	185.5 square miles
Reservoir Drainage Area	4.3 square miles
Reservoir area	45 acres
Sediment Storage	26.5 ac-ft
Floodwater Storage	0 ac-ft
Recreation Storage	100 ac-ft
Irrigation Storage	884.5 ac-ft
Total Reservoir Storage	1,011 ac-ft
Land Uses	Public 100%
Land Ownership	Federal 100% (USFS UWCNF)
Population (Utah County)	Population: 540,504
Demographics (Utah County)	White: 86.1% Hispanic or Latino: 9.2% Two or More Races: 1.6% Asian: 1.4% Native Hawaiian and Other Pacific Islanders: 0.6% American Indian and Alaska Native: 0.5% Black: 0.5%
Farms Present (Utah County)	16,700
Land in Farms (Utah County)	11,094,700 acres
Average Farm Size (Utah County)	664 acres

S.10 Alternative Plans Considered

Alternatives that were analyzed in detail in this Draft Plan-EA include the following:

- The No Action alternative assumes that the dam would fail under extreme flood conditions since it is not meeting current NRCS and Utah Dam Safety regulations and engineering standards. Costs associated with a dam failure cannot be estimated at this time but would be expected to be tens of millions of dollars.
- The Dam Decommissioning alternative assumes that a decommissioning order would be placed on the dam by Utah State Dam Safety since it is not meeting current NRCS and Utah Dam Safety regulations and engineering standards. The cost for this alternative is $4,595,000.
- The Rehabilitate Dam – Replace Spillway alternative would rehabilitate the dam to meet current NRCS and Utah State Dam Safety regulations and engineering standards. The spillway would be replaced in the same location. The cost for this alternative is $3,538,000.
- The Rehabilitate Dam – Left Abutment Closed Spillway alternative would rehabilitate the dam to meet current NRCS and Utah State Dam Safety regulations and engineering standards. The spillway would be moved off of the dam at the base of the left abutment. The cost for this alternative is $4,030,000.

The National Economic Development (NED) alternative is the Rehabilitate Dam – Replace Spillway alternative which reasonably maximizes the net economic benefit consistent with protecting the nation's resources.

S.11 Project Costs by Purpose and Funding Source

The estimated project cost for the Preferred Alternative is summarized in Table S-2.

Table S-2. Estimated Project Costs

	PL 83-566 Funds		Other Funds		Total	
Structure Rehabilitation	$2,300,000	65%	$1,238,000	35%	$3,538,000	78%
Technical Assistance	$700,000	71%	$288,000	29%	$988,000	22%
Total	$3,000,000	66%	$1,526,000	34%	$4,526,000	100%

S.12 Project Benefits

Silver Lake Flat Dam would be rehabilitated for the primary benefit of sustained irrigation water storage as well as provide incidental benefits to flood protection, sediment retention, and recreation.

S.13 Net Economic Benefits

The estimated project economic benefits for the Preferred Alternative are summarized in Table S-3. The Preferred Alternative is also the National Economic Development (NED) Alternative for the project and primarily has agricultural benefits with incidental recreation benefits.

Table S-3. Estimated Net Economic Benefits

Alternative	Irrigation Water Storage Benefits				
	Agricultural	Non-Agricultural	Average Annual Benefits	Average Annual Costs	Benefit Cost Ratio
Silver Lake Flat Dam Rehabilitation	$52,000	$175,000	$227,000	$178,000	1.3

S.14 Period of Analysis

The standard period of analysis for dam rehabilitation under PL 83-566 is a minimum of 50 years and a maximum of 100 years. Silver Lake Flat Dam was analyzed for a period of 71 years starting in 2017. After 71 years, sediment accumulation in the reservoir would reduce the economic benefit of the structure.

S.15 Project Life

The life of Silver Lake Flat Dam would be extended for 71 years starting in 2017.

S.16 Environmental Impacts

The environmental impacts of the Preferred Alternative include temporary impacts to the reservoir during construction from draining and pumping/bypassing around the dam, permanent vegetation removal immediately downstream of the dam and around the reservoir, permanent impacts to streams and wetlands, minor impacts to fish during salvage and relocation downstream of the dam, and temporary impacts to recreationists during the summer of 2014 from construction. Table S-4 lists the resources of concern associated with the Preferred Alternative. Resources that are not of concern are not listed in this table.

Table S-4. Summary of Resource Concerns and Impacts

Resource of Concern	Summary of Concern	Effects Summary for Rehabilitate Dam – Replace Spillway (Preferred Alternative)
Air Quality/Noise/Light	Heavy construction equipment and would require trucks for hauling and disposal of material.	Activities would temporarily adversely affect air quality. BMPs would be implemented to reduce the release of fugitive dust from the project area.
Climate	The reduction of precipitation in the watershed upstream of the reservoir may result in the decline of vegetation.	The decline of precipitation could indirectly impact the reservoir by causing slopes and stream banks to become unstable and erode during high volume precipitation events which could lead to an increase in sediment accumulation in the reservoir decreasing the economic viability of the dam and reservoir
Cultural Resources	There are no known cultural/historical resources located in the project area.	Dam rehabilitation is expected to have no effect on historical structures, places or sites or potentially eligible archeological sites.
Fish	Fish will be relocated during draining of the reservoir to replace the two low-level outlet gates.	Fish salvage activities will capture and relocate them downstream of the dam. Handling of fish may injure or cause mortality during salvage. However, most of the fish in the reservoir are stocked by Utah Division of Wildlife Resources and impacts are expected to negligible.
Geology and Soils	Soils would be displaced onto the face of the dam for structural fill and the trench would be lined with imported suitable base material for the new spillway pipe. The top of the alignment would be recovered with native soil.	A small portion of the soils within the reservoir would be directly impacted during excavation and placement on the downstream embankment of the dam for structural fill. The new spillway would require the excavation of soils within the new alignment at the toe of the left abutment. Best Management Practices would be used.
Land Use	The entire project area and surrounding lands are owned by the	Lands would not be affected in the long term.

Resource of Concern	Summary of Concern	Effects Summary for Rehabilitate Dam – Replace Spillway (Preferred Alternative)
	USFS. Special Use permit is required for use of Forest Service lands.	
Prime and Unique Farmlands	Agricultural lands would continue to receive the same level of irrigation water with the project.	No effects expected from dam rehabilitation.
Public Health and Safety	Inhabitants downstream of the dam will continue to reside downstream of a High Hazard dam.	Rehabilitating the dam will lessen the potential for a breach during an extreme flood event resulting in a beneficial effect to the community downstream.
Recreation	Disturbance would occur during construction. Recreational use by the public will be reduced during construction.	The portion of the trail in the seepage monitoring area and on the dam would be closed during construction, but would be rehabilitated upon construction completion. Silver Lake Trailhead parking area will remain open during construction. Increased travel time would occur due to construction. Public parking would be reduced due to the closure of the horse transfer station. The dispersed parking areas on the west and north side of Silver Lake Flat Reservoir would be used for staging areas during construction.
Riparian Areas	The area surrounding Silver Lake Flat Reservoir has been designated as a Riparian Habitat Conservation Area (RHCA) by the USFS.	RHCA provides protection for riparian forests and maintain ecological functions and processes necessary for the creation and maintenance of habitat for fish and other-riparian dependent organisms
Aesthetics	Disturbance during construction	The scenic area may be effected during construction activities.
Soil and Sediment	Sediment containing elevated levels of metal in the reservoir could be transported downstream.	Sediment with elevated levels of metals may be used for dam rehabilitation. These sediments would not allowed to be transported downstream past the dam. There is no risk of bioaccumulation of the metals in flora and fauna and recreation anglers consuming fish since the metals present do not accumulate in the ecosystem.
Streams and Wetlands	Impacts to Silver Creek from reservoir water surface raise and extension of the spillway downstream. Impacts to Wetland A from the seepage monitoring system.	The reservoir will be temporary drained for one season during construction in 2014. Approximately 170 feet of Silver Creek will be impacted downstream of the dam from the extension of the spillway, and 46.8 acres of deepwater habitat would be effected. Wetland A will be permanently impacted (0.2 acres) from the installation of the seepage collection system. Mitigation for impacts will be coordinated during the Section 404 permitting process with the USACE.
Threatened/Endangered Species	The Action Area for the dam rehabilitation relates to ESA listed fish and plant species defined as the inlet to Silver Lake Flat Reservoir on Silver Creek down to the inlet of	No Threatened and Endangered Species have been documented in the Action Area.

Resource of Concern	Summary of Concern	Effects Summary for Rehabilitate Dam – Replace Spillway (Preferred Alternative)
	the American Fork River into Tibble Fork Reservoir.	
Transportation/ Infrastructure	Traffic on Silver Lake Flat Road will be restricted during construction.	The public will be allowed to access Silver Lake Flat Reservoir via the access road but will be restricted to travel around construction traffic by flaggers.
Vegetation	Removal of vegetation downstream of the dam and around the edge of the reservoir for a total of 5.35 acres.	Vegetation will be removed to prevent debris from entering into the reservoir, create a safety clearance zone at the base of the dam, and allow construction of the seepage monitoring system. There is no mitigation proposed for the loss of vegetation.
Water Quality	Water quality could be temporarily impacted during construction in Silver Creek.	Specific Best Management Practices will be employed to reduce the amount of sediment laden water flowing downstream from the project area during construction.
Water Resources	Silver Creek is the only stream flowing through the project area The stream is approximately 10 to 15 feet wide and has a moderate slope with boulders and large woody debris. .	Approximately 150 feet of Silver Creek will be impacted downstream of the dam from the extension of the spillway.
Wildlife	Approximately 5.35 acres of wildlife habitat would be cleared.	Five acres of wildlife habitat would be permanently cleared to account for the increase in dam size, safety zone at the base of the dam and the 2.5-foot spillway raise in water surface elevation. Additional wildlife habitat would be cleared for the installation of the seepage monitoring system downstream of the right abutment (0.35 acres).

There is currently no compensatory mitigation proposed for the project. The United States Army Corps of Engineers (USACE) will be consulted regarding wetland and stream impacts during final design of the project to comply with the Section 404 permitting process.

S.17 Major Conclusions

The Rehabilitate Dam – Replace Spillway is the most environmentally friendly alternative and also has the greatest net economic benefits of all alternatives analyzed. This alternative is both the Preferred Alternative and the NED Alternative.

S.18 Areas of Controversy and Issues to be Resolved

The anticipated areas of controversy for the rehabilitation of Silver Lake Flat Dam includes the following:

- Silver Lake Flat Dam safety
- Clearing of vegetation around the base of the dam, edge of the reservoir, and seepage monitoring area

The anticipated issues to be resolved for the rehabilitation of Silver Lake Flat Dam includes the following:

- Temporary reduction of recreational opportunities in the vicinity of Silver Lake Flat Reservoir
- Permanent impacts to streams and wetlands

CHAPTER 1.0
INTRODUCTION

1.0 Introduction

The NRCS, lead Federal agency, is proposing to partially fund the rehabilitation of Silver Lake Flat Dam (#UT00276) located within the American Fork-Dry Creek Watershed in Utah County, Utah (Appendix B-Figure 1). NRCS performed an assessment of Silver Lake Flat Dam in 2004 (NRCS 2004) which concluded that Silver Lake Flat Dam does not meet current NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (NRCS 2005) for a high hazard (Class "C") dam (potential "Loss of Life"). The rehabilitation of Silver Lake Flat Dam is eligible for inclusion in the Small Watershed Rehabilitation Program (Public Law [PL] 83-566, as amended by PL 106-472) which authorizes funding (65% of project cost) and technical assistance to rehabilitate aging flood control dams.

This Draft Plan-EA is being prepared by the NRCS to comply with the requirements of the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations, which are set forth in the Council on Environmental Quality regulations 40 CFR Parts 1500-1508; the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (March 10, 1983) established pursuant to the Water Resources Planning Act of 1965 (PL 89-80) as amended by Executive Order 12322 (September 17, 1981), and NRCS policy and guidelines (NRCS 2006 and 2011). The format of this Draft Plan-EA follows the plan format outline that must be followed for all Watershed Project Plans as outlined in the NRCS National Watershed Program Manual (NRCS 2009) Parts 501 through 505 and NRCS National Watershed Program Handbook (NRCS 2010) Parts 600 through 606.

Silver Lake Flat Dam is located within the boundaries of the USFS UWCNF. This Draft Plan-EA has been prepared in cooperation with the USFS and to comply with USFS NEPA standards set forth in 36 CFR Part 220, as well as the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a). The USFS 2003 Final Environmental Impact Statement for the 2003 Land and Resource Management Plan was also referenced for compliance within this Draft Plan-EA (USFS 2003b).

1.1 Purpose and Need Statement

In accordance with the rehabilitation provisions of NRCS's Small Watersheds Program, Silver Lake Flat Dam is eligible for rehabilitation funding due to its high hazard class and outdated infrastructure.

The purpose of this project is to rehabilitate the Silver Lake Flat Dam to meet current NRCS and Utah State Dam Safety regulations (UDWRt 2013) and current engineering standards (NRCS 2005). Stabilizing the existing dam structures would address the risk of loss-of-life and flooding associated with a dam failure because the dam is not meeting current safety criteria.

The need for the project is to extend the life of the dam for 71 years starting in 2017 to continue to provide economic benefit through the primary use of water storage with incidental benefits to flood damage reduction, sediment retention and recreation. The project would restore the design storage capacity in the reservoir by raising the water level, enlarging the spillway to pass the Probable Maximum Precipitation (PMP) event, provide slope stability for seismic events, and as a result increase the reservoir surface area.

1.2 Scope of Draft Plan-EA

This Draft Plan-EA has been organized into the following chapters:

- Summary: Office of Management and Budget Fact Sheet – This chapter presents a summary of the entire document and project.
- Chapter 1.0: Introduction – This chapter describes the purpose and need for the project and background information pertaining to the proposed project.
- Chapter 2.0: Affected Environment – This chapter contains the past and current conditions of the project area and describes relevant environmental resources that would be affected by the alternatives.
- Chapter 3.0: Alternatives – This chapter provides a summary of the alternatives considered for detailed study as well as alternatives considered for the project but were eliminated from detailed study. It also states which is the preferred alternative and provides a resource impact comparison of all alternatives considered.
- Chapter 4.0: Environmental Consequences – This chapter describes the analysis of impacts to resources from each of the alternatives considered for detailed study. These impacts include direct, indirect and cumulative impacts.
- Chapter 5.0: Consultation, Coordination, and Public Participation – This chapter summarizes the steps taken to involve government agencies, tribes and the public in the project. It also presents a summary of anticipated permits and approvals required prior to the start of construction that should be obtained outside of the NEPA process.
- Chapter 6.0: Preferred Alternative – This chapter describes the preferred alternative for the project and presents the economic evaluation.
- Chapter 7.0: References – This chapter lists the references used in support of the information presented in the document.
- Chapter 8.0: List of Preparers – This chapter contains a list of the document preparers, respective agency or company, and their associated qualifications.
- Chapter 9.0: Distribution List – This chapter lists the government entities that the local notice of availability for this document was distributed to for comment.
- Chapter 10.0: Acronyms, Abbreviations and Short Forms – This chapter defines the acronyms, abbreviations and short forms used throughout the report.
- Appendices – This section of the document provides supporting documentation for the information presented in the report.

1.2.1 Resource Issues Studied In Detail

The following resource considerations were determined to be relevant to the decisions that must be made concerning the Silver Lake Flat Dam Rehabilitation project and require further analysis in this Draft Plan-EA. These resources were selected by internal project coordination and through public scoping.

- Aesthetics
- Air Quality/Noise/Light
- Agricultural Lands
- Climate
- Cultural/Historic
- Demographics
- Fish and Wildlife
- Geology/Soils
- Land Use/Rights
- Public Health and Safety
- Recreation
- Socioeconomics
- Surface Water
- Streams and Wetlands
- Threatened and Endangered Species
- Vegetation

1.2.2 Resource Issues Eliminated From Further Study

As directed by CEQ regulations 1500.1(b), 1500.2(b) and other sections, the NRCS eliminated the following resource considerations from detailed study because the proposed action would cause only inconsequential or no effect to occur to these issues. In accordance with NRCS policy, an Environmental Evaluation (located in Appendix D) was completed for the proposed project which documented the environmental conditions at the project site. Other than the information presented below; this Draft Plan-EA contains no further information on these eliminated resource issues.

- Coral Reefs
- Ecologically Critical Areas
- Environmental Justice and Civil Rights
- Essential Fish Habitat
- Floodplain Management
- Forest Resources
- Prime and Unique Farmlands
- Regional Water Resource Plans
- Migratory Birds
- Scientific Resources
- Sole Source Aquifers
- Social Issues
- Wild and Scenic Rivers

1.2.3 Decision Matrix

The NRCS must decide whether to implement one of the proposed action alternatives or the no-action alternative. The NRCS must also decide if the selected alternative would or would not constitute a major federal action significantly affecting the quality of the human environment. If the NRCS State Conservationist (responsible official) determines that the selected alternative would not significantly affect the quality of the human environment, then the NRCS State Conservationist will prepare and sign a Finding of No Significant Impact (FONSI), and the project may proceed. If the NRCS State Conservationist determines that the selected alternative would significantly affect the quality of the human environment, then an Environmental Impact Statement (EIS) and a Record of Decision (ROD) must be prepared and signed before the project can proceed.

1.3 Project Background

Silver Lake Flat Dam was built within the American Fork – Dry Creek Watershed under the Small Watersheds Program (PL 83-566) and construction of the dam started in 1970 and was completed in 1971. Initial filling of the reservoir occurred in 1972. The dam was originally designed to serve irrigation regulation purposes, but in addition it also provides incidental benefits to flood prevention, sediment retention, and recreation. In 2004, the project Sponsoring Local Organization (NUCWCD) requested an assessment of the dam due to concerns relating to the additional demands placed on the dam from the decrease in available storage from sediment accumulation in Tibble Fork Reservoir downstream. As a result of the sediment accumulation, Silver Lake Flat Reservoir may no longer be capable of serving its irrigation retention purposes. There were also concerns regarding whether Silver Lake Flat Dam could sufficiently handle the PMP event flow given existing hydrologic conditions within the watershed.

The Silver Lake Flat and Tibble Fork Dams exist in a series within the American Fork watershed. If either dam fails, the general public, USFS staff and National Park Service Timpanogos Cave staff present in American Fork Canyon, and occupants of the cities of Alpine, Highland, American Fork, and Lehi would be in imminent danger since they are located in the breach inundation area of the dam.

1.4 Project Area and Existing Dam Conditions

The Silver Lake Flat Dam site was designed and constructed as a high hazard (Class "C") site, meaning there was a high probability of loss-of-life if the dam should fail. The drainage area of the dam is 4.3 square miles (Appendix B-Figure 2) and the dam was planned and built for the primary purpose of storage of irrigation water. However, it also has incidental benefits of flood control, sediment retention, and recreation. The dam was originally designed to have a 50-year economic life.

The project area consists of the extents depicted on Figures 3 and 4 in Appendix B. This area encompasses the construction limits that would be utilized during the rehabilitation of Silver Lake Flat Dam. The existing dam conditions are described in this section and include the following elements.

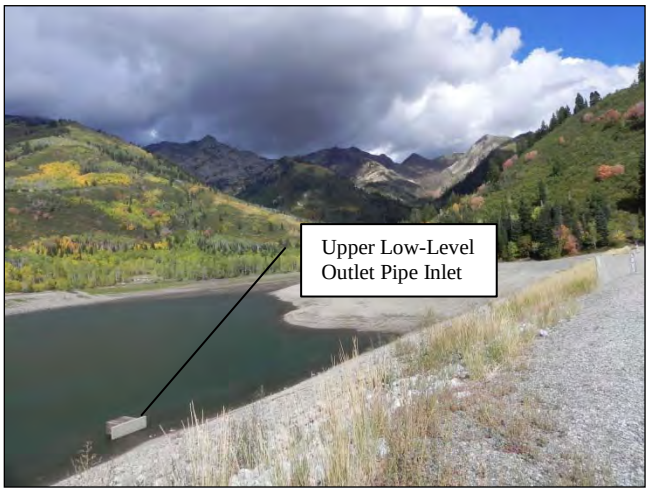
- Dam
- Low-Level Outlet
- Spillway
- Reservoir
- Horse Trail Seepage Area
- Silver Lake Flat Road

Dam: The dam is located on Silver Creek which is a tributary of the American Fork River. The top of the dam sits at elevation 7,535 feet Above Mean Sea Level (AMSL). The top width of the dam is 23 feet and the top length is 1,430 feet. The dam is 85.5 feet tall at its highest point and is a constructed earthen embankment.

The dam has been generally well maintained by the owner (NUCWCD) in accordance with the Operations and Management (O&M) agreements. There are minor erosional areas on the upstream left abutment of the dam due to Off Road Vehicles (ORV) and an existing horse trail on the downstream dogleg bend of the dam. There is erosion on the upstream left abutment at the full pool level of the reservoir from wave action and the lack of riprap. Due to disturbance to dam infrastructure by the general public, the top of the dam has been closed to the public via a locked gate at the entrance off of Silver Lake Flat Road (FSR70008). The dam face contains herbaceous species and there are no shrubs or trees growing on the upstream or downstream face of the dam. Structural features of the dam are identified on Figures 3 and 4 in Appendix B.

Picture 1-1. Silver Lake Flat Dam

Low-Level Outlet: The low-level outlet (principal spillway) system consists of a 600-foot long, 30-inch diameter reinforced concrete pipe passing through the dam with two concrete intake structures in the pool area of the reservoir. The upper outlet is 32 feet and the lower outlet is 14 feet from the bottom of the reservoir. Both outlets contain a gate that controls the release of water through the dam and discharges into a reinforced concrete stilling basin at the end of the auxiliary spillway.



Picture 1-2. Low-Level Outlet Pipe Inlet

Spillway: The spillway that transports water over the top of the dam (auxiliary spillway) is an open channel concrete spillway with dimensions of 10 feet wide (17 feet wide at inlet) by 3 feet high by 320 feet long. The current slope of the spillway is about 2.5:1 and it exits into a concrete stilling basin at the bottom. The spillway is only active when the reservoir is full and there is no trashrack installed on the spillway inlet.

Picture 1-3. Spillway Inlet

Picture 1-4. Spillway

Picture 1-5. Spillway Stilling Basin and Low-Level Pipe Outlet

Reservoir: Table 1-2 lists the original water allocations for Silver Lake Flat Reservoir (Alpine Soil Conservation District *et al.* 1963). However, these numbers presented in Table 1-2 were prior to the construction of Silver Lake Flat Dam and the dam as-built drawings (Soil Conservation Service [SCS] 1972) identify that the reservoir was originally built to store 1,109 acre feet (ac-ft) of water with a surface area of 45 acres. The as-built drawings volumes and areas are used as the real data for the reservoir and are also presented in Table 1-2 for comparison. Although, due to the lack of suitable topographic survey from dam construction in 1971 the original reservoir capacity of 1,109 ac-ft is an estimate and may not have been accurate.

Table 1-2. Silver Lake Flat Reservoir Water Allocations

Item	Volume (ac-ft)	
	1963	1972 As-Built
Sediment	24	24
Floodwater Pool	--	--
Irrigation Pool	976	985
Recreation	100	100
Total	1,100	1,109

The current storage capacity of the reservoir is 1,011 ac-ft and the reservoir surface area has remained the same since construction (45 acres). The original designed sediment storage capacity was 24 ac-ft. The reservoir has experienced sedimentation rates higher than was originally designed, which limits the volume of irrigation water storage available. A detailed discussion of sedimentation is discussed in Chapter 2.3 and Appendix D.

Picture 1-6. Silver Lake Flat Reservoir Looking Upstream

Horse Trail Seepage Area: An active seepage area was identified downstream of the right abutment of the dam as depicted on Appendix B-Figure 4. This seep is located in a separate drainage than Silver Creek to the west adjacent to a UWCNF designated horse trail. According to project personnel (Clark 2012) who helped build the dam in 1971, this specific seep showed up the year following dam construction completion implying that it is not a natural seep to the drainage. However, analysis of pre-dam historical aerial photos (1940) on Picture 1-7 shows this same area bare of tree vegetation indicating that there may have been a disturbance (possible natural wetland seep) in this area prior to dam construction. Regardless if a seep was present prior to dam construction, it is known that the current seep is hydraulically connected to the water level in the reservoir.

Picture 1-7. 1940 Aerial Photo of Silver Lake Flat Area

Silver Lake Flat Road (FSR70008): The road leading up to Silver Lake Flat Dam is comprised of sand and gravel and contains large boulders protruding from the ground surface. The width of the road averages between 15 to 20 feet and is approximately 2 ½ miles long.

Picture 1-8. Silver Lake Flat Road

Picture 1-9. Silver Lake Flat Road on Top of Ridge

CHAPTER 2.0
AFFECTED ENVIRONMENT

2.1 Climate

While uncertainties remain regarding the timing, extent, and magnitude of climate change impacts, the scientific evidence predicts that continued increases in greenhouse gas emissions will lead to climate change. A number of reports (State of Utah 2007) have concluded that climate is already changing; that the change will accelerate, and that human greenhouse gas (GHG) emissions, primarily carbon dioxide emissions, are the main source of accelerated climate change. Projected climate change impacts include air temperature increases; sea level rise; changes in the timing, location, and quantity of precipitation; and increased frequency of extreme weather events. These changes will vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture.

In Utah, climate change is predicted to result in warmer, drier climates (State of Utah 2007).

> "Utah is projected to warm more than the average for the entire globe and more than coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves. Studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that ongoing greenhouse gas emissions at or above current levels will likely result in a decline in Utah's mountain snowpack and the threat of severe and prolonged episodic drought in Utah is real."

Throughout the 20th Century Western United States has experienced an increase of ambient air temperature (approximately 2°F). Current projections have estimated that much of the Western United States will experience further increases ranging from 5-7°F. Warmer air temperatures will produce milder winters with more spring and fall rains resulting in lower water levels from the reduced snowpack.

2.1.1 Silver Lake Flat Dam Local Climate

Silver Lake Flat Dam is located seven miles northeast of Alpine, Utah at approximate elevation 7,535 feet AMSL. The closest weather station to the dam is at the National Park Service Timpanogos Cave (Station 428733) in the American Fork Canyon approximately 4.6 miles to the southwest (Western Regional Climate Center 2012). Timpanogos Cave averages a yearly rainfall of 24.8 inches and yearly snowfall of 85.1 inches. The highest average monthly rainfall occurs in May with 2.81 inches and the lowest occurs in July with 1.03 inches at Timpanogos Cave. The highest average monthly snowfall occurs in January with 20.4 inches. The average temperature reaches its maximum in July at 90.1°F and its minimum in January at 20.0°F. On average, there are 222 sunny days per year in Alpine, Utah (City Data 2012).

During winter and spring, temperatures average below freezing and most of the precipitation comes in the form of snow with a deep snowpack accumulating in many of the mountainous high elevations. By late spring, temperatures warm up in the lower valley elevations and the mountain snowpack begins to melt. The high mountain roads and trails are not normally free of snow until mid- to late-June. The summer season brings warm temperatures to most areas in the valleys with hot temperatures in the desert areas. Afternoon thunderstorms become common by June and can be expected into September. The topographic effect of the steep mountains rising abruptly from the valley floor, in conjunction with the convective type storm, produces the intense rainfall which is the principal cause of flood damage in this watershed (Alpine Soil Conservation District *et al.* 1958). Winds are typically gentle to moderate, with the occasional strong winds.

2.2 Geology and Soils

2.2.1 Geology

Silver Lake Flat Dam is situated in the American Fork Canyon drainage in the Wasatch Mountains northeast of the cities of Lehi and American Fork, Utah. The Wasatch Mountains are part of the Middle Rocky Mountains physiographic providence. The western side of the Wasatch Mountains forms the eastern boundary of the Basin and Range Physiographic Provinces which occurs west of the Wasatch Fault (NRCS 2012a). The Wasatch Fault occurs approximately five miles (8 kilometer (km)) west of the Silver Lake Flat Dam and is the structural element that separates the two provinces. The geologic units in the immediate vicinity of the dam and reservoir include the following:

- Quaternary Alluvial Deposits (Qal) - stream gravel, valley fill and low angle alluvial cones.
- Quaternary Glacial Deposits (Qm) including the glacial moraine deposits composed of dominantly of monzonite and metamorphic rocks.
- Tertiary Tibble Formation (Tt) - coarse red conglomerate, with some greenish reworked tuff, breccia and white algal limestone.
- Mississippian Doughnut Formation (Mdo) – thin-bedded dark gray fine-grained fossiliferous silty limestone
- Mississippian Humburg Formation (Mh) – dark to light-gray limestone interbedded with sandstone.

The Qal is found at the reservoir and dam site, with this unit continuing upstream for over 0.25 miles. The Qm unit essentially surrounds the reservoir and dam site. The foundation of the dam is mostly Qm with minor Qal. Below the Quaternary deposits is bedrock (Mdo and Tt). The bedrock (Mdo, Mh) was originally compressed by crustal shortening along a thrust fault juxtaposing older rocks over younger rocks. This thrust fault was later re-activated by crustal extension into a normal fault (Deer Creek fault). The Deer Creek fault is believed to occur approximately 90 feet below the left abutment of the dam as documented by drilling prior to dam construction. The Deer Creek fault is not a Quaternary fault and is not considered active, as defined by Utah Division of Water Resources ([UDWRe] 2013a) and NRCS (NRCS 2012a). The last movement of the Deer Creek fault was normal. The movement on this fault continued through Oligocene to early Miocene (34 to 20 years ago); therefore, the last movement on this fault is probably older than 18 Ma (Maastrichtian Age). Because the fault is not a Quaternary fault (older than 1.65 Ma), seismic activity is not anticipated along this fault. Additionally, dam failure potential from seismic activities is considered medium.

2.2.2 Soils

Soil information for the project area was obtained from the USFS (2012a) since there is not a NRCS soil survey completed for this area. Soils that are found within the work area are depicted in Appendix C-Figure 14 and consist of the following:

- Silver Lake Flat Dam and Reservoir
  - PGGC9: Lady of snow family extremely cobbly loam, 0 to 16 % slopes;
  - PGSC5: Climber family-Horrocks family complex, 35 to 80% slopes; and
  - PGGM3: Wander family very gravelly loam, 30 to 100% slopes, <50% crown cover;
- Access Road
  - PGSC5: Climber family-Horrocks family complex, 35 to 80% slopes;
  - PGLS1: Storm family very gravelly loam, 40 to 60% slopes;
  - PGTM21: Sawpit family gravelly loam; and

- PGGC9: Lady of snow family extremely cobbly loam, 0 to 16 % slopes.

The soils within the reservoir and dam area are typical of a creek system with vegetated loams consisting of cobbles and loam within the soil profile. Soils were verified at the site when sediment samples were taken from the reservoir and surrounding upland area. The samples revealed the presence of coarse sediment and gravels with small amounts of decaying plant matter (AMEC 2010).

2.2.2.1 Soil and Sediment Contamination

Sampling of sediment in Silver Lake Flat Reservoir was conducted in 2010 to determine the presence of metals in the reservoir (AMEC 2010; NRCS 2012a). A total of nine core samples were analyzed and compared to the Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCL) for residential soils. Table 2-1 presents a brief summary of the findings of the analysis.

Table 2-1. Silver Lake Flat Reservoir Sediment Sampling Results

Parameter	Above EPA (MCL) Screening Levels
Antimony	No
Arsenic	Yes (Primary MCL)
Barium	No
Cadmium	No
Chromium	No
Cobalt	No
Copper	No
Iron	Yes (Secondary MCL)
Lead	Yes (Primary MCL)
Magnesium	No
Manganese	No
Mercury	No
Molybdenum	No
Nickel	No
Selenium	No
Silver	No
Strontium	No
Tin	No
Zinc	No
Zirconium	No

Arsenic, Iron and Lead tested above the MCL for the core sediment samples collected from Silver Lake Flat Reservoir. Sediment samples were also collected below the dam embankment. These samples also tested positive for Arsenic and Lead. This positive test below the dam concludes that the soil in the watershed naturally contains high levels of these metals and the levels present within the reservoir sediment are natural to the area. The results of the tests concluded that all metals are below the Hazardous Waste Limit and sediment in the reservoir does not need to be treated as hazardous waste.

2.3 Sedimentation and Erosion

Silver Lake Flat Dam was originally designed for an economic sediment pool storage capacity of 50 years and the designed sediment storage capacity was 24 ac-ft. The constructed reservoir capacity of the dam was 1,109 ac-ft (SCS 1972) and the current capacity of the reservoir is 1,011 ac-ft (NRCS 2013a). However, due to the lack of suitable topographic survey from dam construction in 1971 it is difficult to determine the exact original reservoir capacity and pinpoint the exact accumulation volume over the past

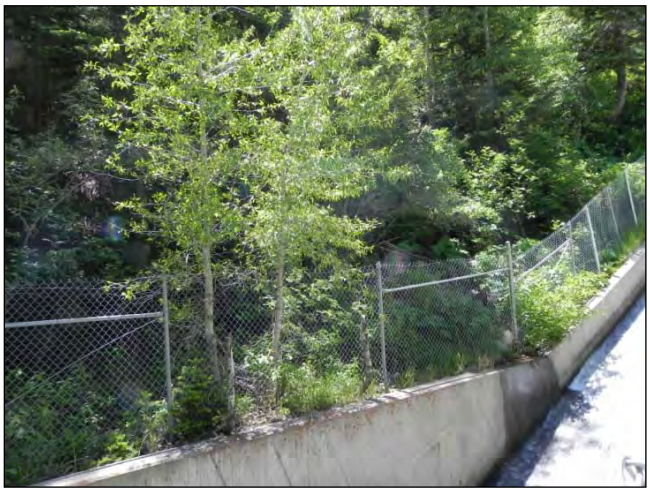
42 years. Currently, the calculated sediment accumulation in the reservoir is 0.63 ac-ft/year and the existing sediment volume was calculated to be 26.53 ac-ft. Sedimentation from the watershed has been higher than originally expected resulting in a reduction of irrigation water storage capacity faster than the economic life of the reservoir was originally designed to handle. A detailed description of the sedimentation analysis is presented in Appendix D.

Sedimentation and erosion conditions upstream of the reservoir are relatively stable. Approximately half of the upstream watershed is located in USFS wilderness area with no development. The other half is on USFS land that was historically mined but currently there are minimal mining operations that could input sediment into the reservoir. Thus, erosion in Silver Creek and sedimentation into the reservoir is expected to stay the same and there are minimal best management practices that could be implemented to reduce erosion due to the flash flood nature of the watershed above the dam.

Seasonal fluctuations in Silver Lake Flat water levels can make it difficult for native vegetation to establish itself on areas between the minimum and full pool elevations. Consequently, barren soil conditions are evident in these areas, allowing for wind and water soil erosion to occur. Several seeps downstream of the dam and left abutment have resulted in some soil sloughing and minor erosion. However, these seeps produce minimal erosion and dam failure potential from these seeps is low.

2.3.1 Landslides

There are two remnant landslide areas (left abutment landslide and the spillway landslide) within the immediate project area (NRCS 2012a). The left abutment landslide is located on the eastern edge of the reservoir and occurred prior to glaciations. The spillway landslide is associated with a seep area on the west side of the spillway. Both of these slides are described in detail in Appendix D. Both of these landslides have been determined that they are most likely stable and do not present a threat to the dam or reservoir resulting in a low dam failure potential.



Picture 2-1. Spillway Landslide Area Showing Seep on Concrete (Wet Area)

A slump is located along the access road (Silver Lake Flat Road) leading up to the dam and reservoir. This slump appears to be stable, draining well, and has minimal erosion. This area is the narrowest portion of the road (shown by the sign in Picture 2-2) and impacted the greatest from vehicular traffic.

Picture 2-2. Access Road Slump Area

2.4 Surface Water

Silver Creek is a tributary of the American Fork River. The headwaters are located near Twin Peaks where the river continues down through the American Fork Canyon passing through the UWCNF and Timpanogos Cave National Monument (Appendix B-Figures 1 and 2). Exiting the canyon, the river runs through northern Utah County and empties into Utah Lake on the north shore.

The Silver Creek watershed is located within the USFS UWCNF, and the Lone Peak Wilderness area is just west of the Silver Lake Flat Dam. The watershed divide is situated at elevation 10,200 feet AMSL (Appendix B-Figure 2). The dam collects and stores all water in the watershed above elevation 7,525 feet AMSL. All of the water collected behind Silver Lake Flat Dam drains down Silver Creek into Tibble Fork Reservoir on the American Fork River.

The Silver Creek watershed is part of the Utah Lake Hydrologic Unit (16020201) and the entire watershed receives an average of approximately 50 to 55 inches of precipitation per year, with the majority of that precipitation falling during the months of October through April in the form of snow. Peak flows in Silver Creek historically occur during spring run-off, but some of the snow-melt is now captured in the Silver Lake Flat Reservoir and released slowly in the later spring and early summer months for irrigation purposes. The reservoir is drained low by the middle of the summer; however, it is seldom drained below the small conservation pool (100 ac-ft) that is present below the low-level outlet.

Picture 2-3. Silver Lake Flat Reservoir Low Water Level

2.4.1 Water Quality

Most of the contaminants in the reservoir are trapped within the sediment and are not transported by clean surface water as discussed in Chapter 2.2.2.1. The EPA's Water Quality Assessment for reporting year 2010 found that the water quality in Silver Creek and in Silver Lake Flat Reservoir is not impaired and is considered "Good" (EPA 2012). The "Good" status indicates that a waterbody is neither "Threatened" nor "Impaired" according to EPA's assessment determinations.

Two sets of water quality samples were collected from Silver Lake Flat Reservoir and the Groin Seep in 2012. The first set was sampled for Aluminum, Arsenic, Iron, Lead and Mercury and the second set was sampled for solutes, Tritium, and Oxygen and Deuterium isotopes (NRCS 2012a). The first set of samples contained slightly elevated levels of Aluminum and Iron. The second set of samples indicates that reservoir and groundwater are similar and from the same water source suggesting that the reservoir and seeps are connected. Overall, the location of the reservoir in the UWCNF and proximity to the Lone Peak Wilderness area suggests the water quality should be fairly clean and that there is no indication that the water is corrosive to metal or concrete (NRCS 2012a).

2.4.2 Hydrology

The low-level outlet has a maximum flow capacity of 190 cfs when the reservoir is full which would result in the reservoir draining in three days with the low-level outlet completely open. Flows in Silver Creek above 190 cfs when the reservoir is full are directed over the spillway at the top of the dam. The spillway has a maximum capacity of 838 cfs for a total flow capacity of 1,028 cfs. Flows in Silver Creek have been estimated at the following flow events as calculated by the UDWRe (2013b) and the United States Geological Survey ([USGS] 2012). The Probable Maximum Precipitation (PMP) event is the worst-case scenario precipitation and snowmelt event that would yield the largest volume of water flowing into Silver Lake Flat Reservoir.

- 2-year: 137 cfs (USGS)
- 10 year: 274 cfs (USGS)
- 25-year: 310 cfs (USGS)
- 100-year: 6-hour: 835 cfs (UDWRe)
- PMP-year: 72-hour: 743 cfs (UDWRe)
- PMP-year: 24-hour: 1,884 cfs (UDWRe)

- PMP-year: 6-hour 3,462 (UDWRe)

Silver Lake Flat Reservoir was not designed to have any flood storage associated with the dam and as a result only offers incidental benefits to flood reduction. The amount of flood reduction in the American Fork-Dry Creek Watershed is negligible from storage in the reservoir and is not analyzed in detail.

2.4.3 Watershed Resources

Utah's antidegradation policy (UAC R317-2-3) does not prohibit degradation of water quality, unless the Water Quality Board has previously considered the water to be of exceptional recreational or ecological significance (Category 1 or Category 2 waters). All of the streams within the boundary of USFS land in Utah are Category 1 streams and the antidegradation policy applies to these streams. Since the project is located on USFS land, the antidegredation policy applies to the rehabilitation of Silver Lake Flat Dam.

The USFS is directed by several major federal laws, as amended, to protect watershed resources through sound management. These major federal laws include:

- Organic Administration Act of 1897
- Multiple Use-Sustained Yield Act of 1960
- Endangered Species Act of 1973
- National Forest Management Act of 1976
- Federal Land Policy and Management Act of 1976
- Clean Water Act of 1977

The USFS must also comply with State of Utah laws and regulations to protect watershed resources. These state laws include:

- Utah Water Quality Act – Title 19, Chapter 5 (Utah State Legislature 2012)
- Division of Water Quality Rules – Title R317 (Division of Administrative Rules 2012)

The USFS has developed a Memorandum of Understanding (FS# 09-MU-11046000-027) with the Utah Department of Environmental Quality (UDEQ) relative to the Utah Nonpoint Source Pollution Management Plan (UDEQ 2000). The USFS complies with the rules and regulations outlined in the plan. The USFS must also conform to two executive orders designed to protect watershed resources. These orders include:

- Executive Order 11988 (Floodplain Management), and
- Executive Order 11990 (Protection of Wetlands).

Additional USFS management direction for watershed resources is identified in the Uinta National Forest Land and Resource Management Plan (LRMP) (USFS 2003a). The following standards and guidelines outlined in the plan must be followed for any project occurring on USFS land:

- Soil and Water Resource Management Standards and Guidelines (III-8 through 10)
    - Maintain or improve long-term soil productivity and hydrologic function of the soil by limiting activities that would cause detrimental soil disturbance.
    - Avoid land use practices that reduce soil moisture effectiveness, increase average erosion, cause invasion of exotic plants and reduce abundance and diversity.
    - Borrow material should be taken from upland sources wherever feasible.
    - Where practical, on-site topsoil should be conserved and replaced on disturbed areas.

  - Riprap or other erosion protection materials should be sufficient in size and placed in such a manner as to withstand peak flows comparable to a 100-year flood.
  - Reduce stream sedimentation created as a result of construction.
  - Cleaning or dredging of de-silting basins, ponds, and reservoirs should be done in a way that minimizes the transport of accumulated fine sediment downstream.
- Aquatic, Terrestrial and Hydrologic Resources Standards and Guidelines III-43 and Management Prescription (IV-4 through 5)
  - Total soil resource commitment should be limited to no more than 4 percent of the riparian area acreage with this prescription within any given watershed.
  - Vegetation management activities may be allowed if they maintain or enhance biophysical resources
  - This prescription includes lands where management emphasis is on preserving, maintaining, or restoring quality aquatic, terrestrial and/or hydrologic conditions.
  - Emphasis is on maintaining or improving existing quality aquatic, terrestrial, and hydrologic conditions through limited to moderate management activity.
  - Managed for quality habitat to contribute toward maintenance and/or recovery of plant and animal species. Resources are maintained or improved to achieve desired conditions for habitats of Threatened, Endangered, Sensitive, and Management Indicator species (MIS).
- Watershed Emphasis Standard and Guidelines/Management Prescriptions (III-43)
  - Watershed emphasis are managed to achieve high quality soil productivity and watershed conditions.
- Total soil resource commitment should be limited to no more than 3 percent of the riparian area acreage with this prescription within any given watershed. Aquatic and Terrestrial Habitat Standards and Guidelines/Management Prescription (III-44 through 46)
  - This prescription applies to areas with multiple habitats.
  - Vegetation management activities may be allowed if they maintain or enhance biophysical resources.
  - Designated, hardened, dispersed recreational facilities may be developed to concentrate use and reduce resource impacts to the biophysical resources.
  -

2.5 Vegetation

A botanical survey was conducted in the project area for the rehabilitation of Silver Lake Flat Dam and this report (McMillen 2013a) is located in Appendix E which describes botanical occurrences and habitat in detail.

2.5.1 Dominant Vegetation Communities

Dominant vegetation cover types and plant species within the project area consist primarily of an aspen and conifer plant community. A basic land cover map depicting the approximate location of land cover types was obtained from the USFS (2012a) and is depicted in Appendix C-Figure 15. Field observations revealed the presence of quaking aspen (*Populus tremuloides*) interspersed in a coniferous canopy consisting of Engelmann spruce (*Picea engelmannii*), Douglas fir (*Pseudotsuga menziesii*), subalpine fir (*bies lasiocarpa*) and white fir (*Abies concolor*). The surrounding hills contain a mixture of gambel oak (*Quercus gambelii*) and bigtooth maple (*Acer grandidentatum*) with an understory of miscellaneous upland grasses. There appears to have been no active timber harvest in the area of Silver Lake Flat Dam since its construction in 1971.

2.5.2 Special Status Plant Species

Special status plant species include all taxa with federal or state protective status. Specifically, this section discusses species that are included in any one of the following groups:

- Federal Species – Species listed by the United States Fish and Wildlife Service (USFWS).
    - Listed or Proposed Species - Species that are listed and protected under the Endangered Species Act (ESA) of 1973, as Endangered (E) or Threatened (T), or proposed for listing.
    - Candidate (C) - Species for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation has not occurred because of other higher priority listing activities. Candidate species receive no statutory protection under the ESA.
- Global Conservation Status – Plant species as ranked by the NatureServe global conservation status ranks (NatureServe 2012).
    - Critically Imperiled (G1) – At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
    - Imperiled (G2) – At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.
    - Vulnerable (G3) – At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.
    - Apparently Secure (G4) – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
    - Secure (G5) – Common; widespread and abundant.
- State Species - Species listed by the Utah Division of Wildlife Resources (UDWR) that require special protection.
    - Conservation Agreement Species (CAS) – species or subspecies of concern that receive special management under a conservation agreement developed or implemented by the State to preclude the need for listing under the ESA
    - Wildlife Species of Concern (WSoC) – Species for which there is a credible scientific evidence to substantiate a threat to continued population viability.

- USFS Species - Species on the Intermountain Region's Threatened (T), Endangered (E) & Sensitive (S) Species program list for the Uinta National Forest (USFS 2013).

The information documented in this section is compiled from exiting data, lists within the vicinity of Silver Lake Flat Dam, and the Botanical and Wildlife Survey Report (McMillen 2013a) located in Appendix E. Table 2-2 identifies the plant species on the USFWS Utah County list (USFWS 2013), and the USFS Uinta National Forest list (USFS 2013). There were no plant species identified by the UDWR Utah Conservation Data Center (2012a, 2012b and 2012c) and each plant identified by the USFWS and USFS has also been ranked according to their global conservation status (Utah Native Plant Society 2012).

Table 2-2. Special Status Plant Species

Common Name	Scientific Name	USFWS Status[1]	Global Status[2]	USFS Status[3]	Suitable Habitat Present (Observed)
Barneby woody aster	*Tonestus kingii var. barnebyana*	--	G3	S	No (No)
Clay phacelia	*Phacelia argilacea*	E	G1	E	No (No)
Dainty moonwort	*Botrychium crenulatum*	--	G3	S	Yes (No)
Deseret milkvetch	*Astragalus desereticus*	T	G1	T	No (No)
Garrett bladderpod	*Lesquerella garrettii*	--	G2	S	No (No)
Garrett's fleabane	*Erigeron garrettii*	--	G2	S	No (No)
Rockcress draba	*Draba globosa*	--	--	S	No (No)
Santaquin draba	*Draba santaquinensis*	--	G1	S	No (No)
Slender moonwort	*Botrychium lineare*	--	G1	S	Yes (No)
Utah ivesia	*Ivesia utahensis*	--	G2	S	No (No)
Ute ladies' tresses	*Spiranthes diluvialis*	T	G2	T	No (No)
Wasatch draba	*Draba brachystylis*	--	G1	S	Yes (No)
Wasatch fitweed	*Corydalis caseana spp. brachycarpa*	--	G5	S	Yes (No)
Wasatch jamesia	*Jamesia Americana var. macrocalyx*	--	G5	S	No (No)
Wasatch pepperwort	*Lepidium montanum var. alpinum*	--	G5	S	Yes (No)
Wheeler's angelica	*Angelica wheeleri*	--	G2	S	Yes (No)

Notes: [1] USFWS Status – (E) Endangered, (T) Threatened, (C) Candidate
[2] Global Conservation Status – (G1) Critically Imperiled, (G2) Imperiled, (G3) Vulnerable, (G4) Apparently Secure, (G5) Secure
[3] USFS Status – (E) Endangered, (T) Threatened, (S) Sensitive

2.5.3 Noxious Weed and Invasive Plant Species

Noxious weeds are non-native plants introduced into an area. They spread quickly and can be difficult to control. They invade croplands, rangeland, forests, prairies, rivers, lakes and wetlands causing both ecological and economical damage. Utah has developed a list of noxious weeds that occur in the entire state (Utah Department of Agriculture 2010). The following tabulates the state listed Utah noxious weeds that have been recorded by the USFS (2012a) and the Botanical and Wildlife Survey Report (McMillen 2013a) located in Appendix E in the immediate vicinity of Silver Lake Flat Dam and the gravel access road (Silver Lake Flat Road):

- Canada thistle (*Cirsium arvense*): Class C Weed Containment
- Dalmation toadflax (*Linaria genistifolia*): Class B Weed Control
- Gypsy flower (*Cynoglossum officinale*): Class C Weed Containment
- Nodding plumeless thistle (*Carduus nutans*): Class B Weed Control

The USFS (2012a) has identified the following invasive species within the immediate vicinity of Silver Lake Flat Dam and the gravel access road:

- Common mullein (*Verbascum thapsus*)
- Lesser burdock (*Arctium minus*)
- Yellow sweetclover (*Melilotus officinalis*)

Noxious weeds and invasive plant species are not common in the landscape primarily due to the lack of development in the UWCNF. Weeds have been primarily observed along the edges of roads and heavily disturbed areas. Existing conditions at Silver Lake Flat Reservoir consist of a fluctuating lake elevation

with exposed sediment during portions of the year. Noxious weed and invasive species presence are concentrated in the disturbed areas along the sides of roads, parking area and walking trails. The USFS controls noxious weed establishment adjacent to Silver Lake Flat Road but does not control establishment on the dam or within 50 feet of the reservoir or Silver Creek. The NUCWCD is responsible for controlling the establishment of vegetation on the dam at its own discretion.

2.6 Streams and Wetlands

National Wetland Inventory (NWI) maps from the USFWS (1983) as well as wetland data obtained from the USFS (2012a) identified zero wetlands and one deepwater habitat within the project area as depicted in Appendix C-Figure 16. Silver Lake Flat Reservoir is listed as the deepwater habitat: Lacustrine, Limnetic, Aquatic Bed, Intermittently Exposed, Diked/Impounded (L1ABGh). The reservoir does not contain any wetlands due to the fluctuation of the water level and high presence of gravels and cobbles.

A wetland and stream delineation was conducted in the project area for the rehabilitation of Silver Lake Flat Dam and this report (McMillen 2013b) is located in Appendix E which describes these waters in detail. One wetland (Wetland A) was identified and delineated within the seep monitoring area downhill of the right abutment. This wetland is assumed to be fed by water flowing subsurface from the reservoir. According to a project personnel (Clark 2012) who helped build the dam, the seep showed up the year following dam completion. However, the pre-dam 1940 historical aerial photograph (Picture 1-7) depicts this seepage area bare of mature tree vegetation which suggests that a wetland area may have been present prior to the dam construction. Wetland A is approximately 0.50 acres in size and is classified as: Palustrine, Emergent, Saturated (PEMB).

Silver Creek is the only stream flowing through the project area. A stream delineation of Silver Creek was performed from the stilling basin outlet downstream 500 feet. The stream is approximately 10 to 15 feet wide and has a moderate slope with boulders and large woody debris. The NUCWCD releases water from the reservoir year-round and Silver Creek is a perennial stream.

The area surrounding Silver Lake Flat Reservoir and Silver Creek has been designated as a Riparian Habitat Conservation Area (RHCA) by the USFS (2012a) as depicted in Appendix C-Figure 16. The RHCA provides protection for riparian forests and maintain ecological functions and processes necessary for the creation and maintenance of habitat for fish and other-riparian dependent organisms

2.7 Fish

2.7.1 Fish Habitat

Silver Lake Flat Reservoir is a managed lake with water level fluctuations which vary based upon the time of year and seasonal precipitation. The reservoir reaches its fullest level during the spring when there is more water flowing into the reservoir than the low-level outlet can transport downstream through the dam. The dam typically reaches its highest point during May-June, and at this time the auxiliary spillway on top of the dam becomes active. Fish habitat within the reservoir varies based on the operating regime of the NUCWCD and annual fish spawning habitat is not consistently available to fish. There are no permanent large woody debris habitat features or aquatic vegetation within the reservoir.

Silver Creek is a natural-flowing perennial stream above the reservoir but is a regulated stream below the dam. The creek contains typical high elevation stream habitat consisting of large woody debris, riffles, pools, and spawning gravels. Silver Lake Flat Dam is a fish barrier to upstream migration of fish and there is no upstream fish passage in place. Fish are able to pass downstream over the spillway when active or through the low-level outlet. Tibble Fork Dam is located on the American Fork River

downstream of Silver Lake Flat Dam and is also a fish barrier to upstream fish passage.

2.7.2 Special Status Fish Species

The information documented in this section is compiled from exiting data and lists within the vicinity of Silver Lake Flat Dam. No formal studies were conducted for the preparation of this Draft Plan-EA. Table 2-3 identifies the fish species on the USFWS Utah County list (USFWS 2013), the UDWR Utah Conservation Data Center (2012a, 2012b and 2012c) for sensitive species occurring in the Dromedary Peak and Timpanogos Cave 7.5' quadrangle maps, and the USFS Uinta National Forest list (USFS 2013). The definition of each species status is listed in Chapter 2.5.2.

Table 2-3. Special Status Fish Species

Common Name	Scientific Name	USFWS Status[1]	State Status[2]	USFS Status[3]	Suitable Habitat Present
Bonneville cutthroat trout	*Oncorhynchus clarki utah*	--	CAS	S	Yes
Bonytail	*Gila elegans*	E	--	--	No
Colorado pikeminnow	*Ptychocheilus lucius*	E	--	--	No
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	--	--	S	Yes[4]
Humpback chub	*Gila cypha*	E	--	--	No
June sucker	*Chasmistes liorus*	E	--	--	No
Least chub	*Iotichthys phlegethontis*	C	--	--	No
Razorback sucker	*Xyrauchen texanus*	E	--	--	No
Southern leatherside chub	*Lepidomeda aliciae*	--	SoC	S	No

Notes: [1] USFWS Status – (E) Endangered, (T) Threatened, (C) Candidate
[2] State Status – (CAS) Conservation Agreement Species, (SoC) Wildlife Species of Concern
[3] USFS Status – (E) Endangered, (T) Threatened, (S) Sensitive
[4] Suitable habitat is present in the drainage; however this species is not native nor has it been documented to occur in the area and would only occur if it was transplanted to Silver Lake Flat Reservoir or Silver Creek.

2.7.3 Fish Stocking

Annual stocking of fish by the UDWR (2012d) has been performed in Silver Lake Flat Reservoir and Silver Lake for more than the last ten years. Silver Lake Flat Reservoir has been stocked with 3- to 4-inch Brook trout (*Salvelinus fontinalis*) and 9- to 11-inch Rainbow trout (*Oncorhynchus mykiss*) with annual plants of about 3,000 and 8,000 fish respectively. Silver Lake has been stocked with 3-inch Brook trout and 1- to 2-inch Arctic grayling (*Thymallus arcticus*) with annual plants of about 1,500 and 2,000 fish respectively. The Arctic grayling planted in Silver Lake are assumed to migrate downstream into Silver Lake Flat Reservoir.

2.8 Wildlife

A wildlife survey was conducted in the project area for the rehabilitation of Silver Lake Flat Dam and this report (McMillen 2013a) is located in Appendix E which describes wildlife occurrences and habitat in detail.

2.8.1 Wildlife Habitat

Silver Lake Flat Reservoir and Dam are located within the Wasatch Mountains, which are characterized by moderate to steep slopes and rocky, pointed mountain summits. Vegetation in the vicinity of the

project area is categorized as aspen-fir, oak-maple and spruce vegetation communities. The combination of geographical location and diverse mixture of vegetation communities results in high wildlife species richness, particularly for mammals and birds.

Native ungulates are common inhabitants of this area and the UDWR Utah Conservation Data Center has identified the area as habitat for moose, Rocky Mountain elk, and mule deer (UDWR 2012a). Ruffed grouse habitat is also located in the project area due to the presence of fir and spruce trees (UDWR 2012a). There are numerous conifer and deciduous trees large enough to support raptor nests in the area surrounding the reservoir as well as riparian and deciduous trees that would support nests for migratory bird species.

Silver Lake Flat Reservoir, Silver Creek and the seepage monitoring area both have sufficient habitat to support amphibians and reptiles during certain times of the year. These aquatic features provide wet soils, slack water habitat as well as moving water that would support herptiles and other species native to the area.

2.8.2 Special Status Wildlife Species

The information documented in this section is compiled from existing data, lists within the vicinity of Silver Lake Flat Dam, and the Botanical and Wildlife Survey Report (McMillen 2012a) located in Appendix E. Table 2-4 identifies the wildlife species on the USFWS Utah County list (USFWS 2013), the UDWR (2012a, 2012b and 2012c) Utah Conservation Data Center list for sensitive species occurring in the Dromedary Peak and Timpanogos Cave 7.5' quadrangle maps, and the USFS Uinta National Forest list (USFS 2013). The definition of each species status is listed in Chapter 2.5.2.

Table 2-4. Special Status Wildlife Species

Common Name	Scientific Name	USFWS Status[1]	State Status[2]	USFS Status[3]	Suitable Habitat Present
Bald eagle	*Haliaeetus leucocephalus*	--	SoC	S	Yes
Bighorn sheep	*Ovis canadensis*	--	--	S	No
Black swift	*Cypseloides niger*	--	SoC	--	No
Bobolink	*Dolichonyx oryzivorus*	--	SoC	--	No
Boreal toad	*Bufo boreas*	--	SoC	S	Yes
Canada lynx	Lynx canadensis	T	--	T	No
Columbia spotted frog	*Rana luteiventris*	--	--	S	No
Ferruginous hawk	*Buteo regalis*	--	SoC	--	Yes
Fisher	*Martes pennant*	--	--	S	No
Flammulated owl	*Otus flammeolus*	--	--	S	No
Fringed myotis	*Myotis thysanodes*	--	SoC	--	Yes
Greater sage-grouse	*Centrocercus urophasianus*	C	C	S	No
Kit fox	*Vulpes macrotis*	--	SoC	--	No
Northern goshawk	*Accipiter gentilis*	--	CAS	S	Yes
Peregrine falcon	*Falco peregrines anatum*	--	--	S	Yes
Short-eared owl	*Asio flammeus*	--	SoC	--	No
Spotted bat	*Euderma maculatum*	--	--	S	Yes
Three-toed woodpecker	*Picoides tridactylus*	--	--	S	Yes
Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	--	SoC	S	Yes

Common Name	Scientific Name	USFWS Status[1]	State Status[2]	USFS Status[3]	Suitable Habitat Present
Yellow-billed cuckoo	*Coccyzusamericanus*	C	C	S	No

Notes: [1] USFWS Status – (E) Endangered, (T) Threatened, (C) Candidate
[2] State Status – (CAS) Conservation Agreement Species, (SoC) Wildlife Species of Concern
[3] USFS Status – (E) Endangered, (T) Threatened, (S) Sensitive

2.8.3 Management Indicator Species

The UWCNF utilizes Management Indicator Species (MIS) to assess management effects on habitat for all vertebrate species, monitor selected habitats, and provide sufficient populations for wildlife related recreation (USFS 2012b). Management indicator species were chosen to provide habitat needs of all vertebrate species, to monitor selected habitats that could become limiting to some species through forest management activities, and to provide sufficient populations of selected species to meet demands for wildlife-related recreation. Table 2-5 displays the MIS and the habitat community represented.

Table 2-5. UWCNF Management Indicator Species

Common Name	Scientific Name	Habitat Community Represented
American Beaver	*Castor canadensis*	Riparian
Bonneville Cutthroat Trout	*Oncorhynchus clarki utah*	Aquatic
Colorado Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	Aquatic
Northern Goshawk	*Accipiter gentilis*	Aspen, Conifer, Mixed Conifer
Snowshoe Hare	*Lepus americanus*	Pole/Sapling Aspen, Conifer, and Mixed Conifer

2.9 Threatened and Endangered Species

A review of the USFWS ESA list for Utah County dated April 2, 2013 (USFWS 2013) was performed within the vicinity of Silver Lake Flat Dam. This review identified species that historically or currently use habitat or could potentially migrate into the area. Table 2-6 identifies the ESA listed species in Utah County.

Table 2-6. Federally Listed Species and Critical Habitat within Utah County, Utah

Common Name	Scientific Name	Federal Status	Designated Critical Habitat within the project area?
Fish			
Bonytail	*Gila elegans*	Endangered	No
Colorado Pikeminnow	*Ptychocheilus lucius*	Endangered	No
Humpback Chub	*Gila cypha*	Endangered	No
June Sucker	*Chasmistes liorus*	Endangered	No
Least Chub	*Iotochthys phlegethontis*	Candidate	No
Razorback Sucker	*Xyrauchen texanus*	Endangered	No
Plants			
Clay Phacelia	*Phacelia argillacea*	Endangered	No
Deseret Milkvetch	*Astragalus desereticus*	Threatened	No
Ute Ladies-tresses	*Spiranthes diluvialis*	Threatened	No
Wildlife			

Canada Lynx	*Lynx canadensis*	Threatened	No
Greater Sage-grouse	*Centrocercus urophasianus*	Candidate	No
Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Candidate	No

A review of the USFWS Information, Planning, and Conservation System (IPaC) identified the June sucker, Least chub, Ute ladies'-tresses, Canada lynx, greater sage-grouse, and the yellow billed-cuckoo within the vicinity of the project area (USFWS 2012b). The Bonytail, Colorado pikeminnow, Humpback chub, Razorback sucker, clay phacelia, and Deseret milkvetch were not on this list and will not be discussed further in this section.

2.9.1 June Sucker

The June sucker is listed as Endangered by the USFWS (51 FR 10851-10857) and is primarily found in Utah Lake and the Provo River approximately 13 miles southwest of the project area. There have been no recorded observations of the June sucker in Silver Creek or the upper American Fork River and they are not expected to be present within the project area. Tibble Fork Dam, and other smaller fish passage barriers restrict the movement of fish upstream in the American Fork River. Silver Lake Flat Dam restricts fish passage upstream in Silver Creek. They typically reside in larger streams with slower water velocities. Critical habitat for the June sucker has only been designated in the Provo River which is a tributary to Utah Lake outside of the project area (51 FR 10851-10857).

2.9.2 Least Chub

The Least chub is listed as Candidate by the USFWS (76 FR 66370-66439) and typically inhabits slow moving stream segments and spring seep pools with dense vegetation. There are no documented occurrences of the Least chub in Silver Creek or the American Fork River and the river does not contain suitable habitat. They are not expected to be present within the project area. There is no critical habitat designated for the Least chub since they are listed as Candidate.

2.9.3 Ute Ladies'-tresses

The Ute ladies'-tresses is listed as Threatened by the USFWS (57 FR 2048-2054) and typically grows in high elevation undisturbed moist to very wet meadows, along streams and near springs, seeps and lake shores. It prefers sandy or loamy soils that are mixed with gravels in undisturbed areas. Most surviving populations are small and appear to be relict in nature. There are no documented occurrences of Ute ladies'-tresses near the project area. The Ute ladies'-tresses is not expected to occur in the vicinity of the project due to the high disturbance to the native landscape from construction of the dam, lack of wet meadows and wetlands along streams, and high elevation. No critical habitat rules have been published for the Ute ladies'-tresses.

2.9.4 Canada Lynx

The Canada lynx is listed as Threatened by the USFWS (65 FR 16052-16086) and typically resides in moist boreal forests at high elevations that have cold, snowy winters. The predominant vegetation of boreal forests is montane conifer trees with minimal human disturbance. The Canada lynx is nocturnal and its major food source is the snowshoe hare. The area surrounding the reservoir and dam does not contain a large unfragmented tract of montane coniferous forest and is disturbed from recreational human presence. The Canada lynx is not expected to occur in the vicinity of the project since there is no suitable habitat or prey base within the vicinity of the site. The USFWS has published a critical habitat

designation for the Canada lynx (74 FR 8616-8702); however, there is no designated critical habitat in Utah.

2.9.5 Greater Sage-Grouse

The greater sage-grouse is listed as Candidate by the USFWS (76 FR 66370-66439) and inhabits sagebrush plains, foothills and mountain valleys that contain sagebrush as the primary plant community. There are no primary sagebrush plant communities located within the immediate vicinity of the project area. The greater sage-grouse is not expected to occur in the project area since there is no suitable habitat within the vicinity of the dam. There is no critical habitat designated for the greater sage-grouse since they are listed as Candidate.

2.9.6 Yellow-billed Cuckoo

The yellow-billed cuckoo is listed as Candidate by the USFWS (76 FR 66370-66439) and typically inhabits lowland large space riparian areas (~100+ acres) with dense cottonwood trees, willows and other riparian shrubs. They prey upon large insects from tree and shrub foliage. The reservoir and dam are located in a mountainous area primarily comprised of aspen and conifer trees with minimal riparian species. The project area does not contain a large unfragmented tract of riparian habitat suitable for the yellow-billed cuckoo and they are not expected to inhabit this area. There is no critical habitat designated for the yellow-billed cuckoo since they are listed as Candidate.

2.10 Cultural/Historical Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. A letter report describing the cultural resources inventory at Silver Lake Flat Dam and Reservoir is located in Appendix E. A literature review of known and recorded cultural resources was conducted by Native X Inc. on October 29, 2012. The literature review consisted of accessing both archival and digital records maintained by the Department of Heritage and Arts, Division of State History, Antiquities Section; Government Land Office plat maps, and the National Register of Historic Places. These searches did not identify any previous recorded cultural site within the project area. However, one abandoned site was identified ¾ mile away from the project area. After the literature review was completed, a pedestrian survey was conducted in November 2012 to examine the project area. The pedestrian survey was conducted by John W. Jones (Native X, Inc.) on November 4 and 5, 2012. No cultural resource sites or finds were discovered during survey. Silver Lake Flat Dam was built in 1971 and is less than 50 years old; therefore, it is not eligible for the National Register of Historic Places. NRCS is currently consulting with Utah SHPO and the USFS.

2.11 Land Use and Recreation

2.11.1 Land Use

Land uses in the project area include Silver Lake Flat Reservoir, Silver Lake Flat Dam and associated infrastructure that pass water flows through or over the top of the dam into Silver Creek. A parking area and restroom facilities are located on the north end of the reservoir at the Silver Lake Trailhead. The entire project area and surrounding lands are owned by the USFS, are located within the boundaries of the UWCNF, and managed by the Pleasant Grove Ranger District.

Silver Lake Flat Reservoir and Dam are accessed via the American Fork Canyon Road (Hwy 92/FSR70098), North American Fork Canyon Road (Route 144/FSR 70085), Granite Flat Campground

Road (FSR 70010) and Silver Lake Flat Road (FSR 70008). There are 13 privately-owned vacation homes located off of Silver Lake Flat Road in the Silver Lake Summer Homes area. The locked entrance to this permitted private community is less than 1,000 feet south of Silver Lake Flat Dam.

Silver Lake Flat Dam is located within the American Fork Management Area of the UWCNF. Within the National Forest, it is has been designated as a "wildland-urban interface" which is defined as the area where buildings and/or structures meet or intermingle with undeveloped wildland vegetation. Within the wildland-urban interface boundary, Silver Lake Flat Reservoir and Dam are designated as "dispersed recreation". The dispersed recreation designation is described as activities that take place outside of developed camping or concessionaires (operated facilities, excluding motorized recreation). The private residences in the Silver Lake Summer Homes area are designated as "general recreation", which includes private recreation properties that were platted many years ago.

Urban areas are located outside of the UWCNF at the mouth of the American Fork Canyon. These urban areas include the cities of Alpine, Highland, American Fork, and Lehi. The primary use of land in these urban areas is residential and small commercial businesses with limited agricultural fields interspersed between communities.

2.11.2 Recreation

The Silver Lake Flat Reservoir area provides numerous recreational opportunities to the public during the summer months when the American Fork Canyon Road is open. Recreational opportunities include hiking, biking, climbing, camping, canoeing, fishing, equestrian riding, hunting, picnicking and nature viewing. The following USFS designated recreational trails and areas (USFS 2012a) are located near the project site as depicted on Appendix C-Figure 17.

Trails: The following trails are located within the vicinity of the project area.

- Silver Lake Trail No. 036: This non-motorized trail (4.4 miles) begins at the northern end of the reservoir at the Silver Lake Trailhead and travels up to Silver Lake.
- Silver Lake Flat Connector Trail No. 045: This non-motorized trail is a connector (1 mile) that links the horse transfer station, located across from the Granite Flat Campground, to Silver Lake Flat Dam. This trail is known to have high levels of use including horses, hikers and other types of user groups on any given day.
- Deer Creek-Dry Creek Trail No. 043: This non-motorized trail begins at Granite Flat Campground and crosses Silver Lake Flat Road at the second hairpin turn. It heads northwest to Box Elder Peak.
- Box Elder Trail No. 044: This non-motorized trail begins at the Box Elder trailhead at the Granite Flat Campground and continues west towards Box Elder Peak.

Picture 2-4. Silver Lake Flat Connector Trail No. 045 on Downstream Dam Embankment

Trailheads: The following trailheads are located within the vicinity of the project area.

- Silver Lake Trailhead: This area is the start of the Silver Lake Trail No. 036 on the northern side of Silver Lake Flat Reservoir.
- Box Elder Trailhead: This area is the start of the Box Elder Trail No. 044 at the Granite Flat Campground.

Campgrounds: The following campgrounds are located within the vicinity of the project area.

- Granite Flat: This campground is located to the south of the connection between the paved (Granite Flat Campground Road) and unpaved (Silver Lake Flat Road) entrance to Silver Lake Flat Dam. It offers 44 single sites, 8 double sites and 3 group sites. Picnic tables and campfire rings are provided, as are vault toilets and drinking water. Horseshoe pits and a grassy baseball field are also located on-site. Roads and parking spurs at the campground are paved.
- No camping is allowed within ½ mile of Silver Lake Flat Reservoir.
- Little Mill: This campground is located along American Fork Canyon Road approximately four miles downstream from Silver Lake Flat Dam. It offers 34 single sites, 2 double sites and 1 group site. Picnic tables and campfire rings are provided, as are flush toilets. Roads and parking spurs at the campground are paved.

Summer Homes: The Silver Lake Summer Homes are located downstream of the dam outside of the breach inundation area and consist of the following elements.

- Silver Lake: There are 13 private homes located off of Silver Lake Flat Road and approximately 1,000 feet downstream of the dam.
- The drinking water supply for the Silver Lake Summer Homes is collected from springs upstream of the reservoir. The 2-inch plastic supply pipeline runs parallel on the east side of the reservoir and is buried on the southeastern edge of the dam crest. The pipeline leaves the dam crest before it reaches the dogleg bend and travels southeast in the forest until it reaches the summer homes.

Horse Transfer Stations: The following horse transfer stations are located within the vicinity of the project area.

- Horse Transfer Station: This station is the trailhead of Silver Lake Flat Connector Trail No. 045 where equestrian riders can park and load/unload horses. A vault toilet is provided at this transfer station.

Picture 2-5. Horse Transfer Station

Parking Areas: The following parking areas are located within the vicinity of the project area.

- Tibble Fork: This is a USFS designated parking area on the north side of the Tibble Fork Reservoir.
- Silver Lake Flat (west side of reservoir): This parking area is dispersed and not designated by the USFS. This is a day-use only area used for recreational access to the reservoir.
- Silver Lake Trailhead: This is a USFS designated parking area on the north side of the Silver Lake Flat Reservoir.
- Silver Lake Flat (north side of reservoir): This parking area is dispersed and not designated by the USFS. This is a day-use only area used for recreational access to the reservoir.

Picture 2-6. Silver Lake Flat Reservoir West Side Parking Area

Picture 2-7. Silver Lake Trailhead Parking Area

Picture 2-8. Silver Lake Flat Reservoir North Side Parking Area

Reservoirs: The following reservoirs are located within the vicinity of the project area.

- Silver Lake Flat
  - This reservoir is stocked with brook trout and rainbow trout numerous times per year as described in Chapter 2.7-Fish.
  - No motors are allowed on this reservoir.
  - No trailers are allowed to travel up Silver Lake Flat Road up to the reservoir.
- Tibble Fork
  - This reservoir is stocked with rainbow trout numerous times per year as described in Chapter 2.7-Fish.
  - No motors are allowed on this reservoir.
- Silver Lake:
  - This reservoir is stocked with brook trout and arctic grayling numerous times per year as described in Chapter 2.7-Fish.
  - This lake is located in wilderness and only hiking is allowed to this lake.

National Monuments: The Timpanogos Cave National Monument is located along American Fork Canyon Road and consists of the following elements.

- Timpanogos Cave (National Park Service): Timpanogos Cave is located in the American Fork Canyon Road approximately 2.6 miles east of the mouth of the canyon. The monument and parking areas are situated directly on the side of the road. The location of the Timpanogos Cave National Monument is depicted in Appendix B-Figure 1.

Day-Use Sites: There are five day-use picnic areas along American Fork Canyon Road and North American Fork Canyon Road up to Tibble Fork Reservoir: Mile Rock, Martin, Roadhouse, Echo, and Grey Cliffs. These sites are occupied during daylight hours only and there is no overnight camping allowed.

2.11.2.1 USFS Recreation Opportunity System

The American Fork Canyon receives over a million visitors on an annual basis according to the USFS. The Silver Lake Flat Dam area receives approximately 21,000 visitors per year. The USFS Recreation Opportunity Spectrum (ROS) identifies recreation opportunities on a continuum ranging from Primitive to Semi-primitive non-motorized to Semi-primitive motorized to Roaded Natural to Roaded Modified and Rural (USFS 2002a; 2002c). The entire Silver Lake Flat project area is designated as "Roaded Modified" (USFS 2003a). Roaded Modified has typically been defined as areas exhibiting evidence of forest activities that are dominant on the landscape. Standards generally include the following:

- Visual Quality: Not to exceed the Maximum Modification Visual Quality Objective (USFS 2002b).
- Access: All forms of access and travel modes may occur although roads are not well suited to highway-type vehicles. Off Highway Vehicle on designated routes are encouraged.
- Remoteness: Remoteness from urban conditions and public access is provided only by the USFS road system.
- On-site Recreation Development: Facilities and structures are maintained to accommodate the types and levels of use anticipated for the site and area.
- Social Encounters: User meets less than 20 other parties per day on trails and in dispersed areas during at least 80% of the primary use season. Numerous other parties may be encountered on roads.
- Visitor-caused impacts are noticeable, but not degrading to basic resource elements.

The USFS Recreation Opportunity system defines the "Roaded Modified" category as meeting less than 20 parties (assume party is 4 people average) per day at Silver Flat Lake, on trails and in dispersed areas during at least 80% of the primary use season (May-October). If you meet 16 parties per day, including the Silver Lake Flat area and four trails within the vicinity of the project area would amount to approximately 49,600 visitor days (May-October), and 320 visitors per day. Because no recreation counts have been taken at the dam and surrounding area, this method is reasonable for this purpose.

2.11.2.2 Weekends and Holidays

The UWCNF experiences increased levels of recreationists on the weekends during the summer months. This increase results in higher volumes of automobile traffic on the American Fork Canyon Road, North American Fork Canyon Road, Granite Flat Campground Road, and Silver Lake Flat Road. The following holidays are recognized in the State of Utah and the Silver Lake Flat area may also experience increases in recreationists during the spring, summer and fall time periods:

- Memorial Day: Last Monday of May
- 4th of July
- Pioneer Day: July 24
- Labor Day: First Monday in September

2.12 Air Quality/Noise/Light

The Air Conservation Act (Title 19, Chapter 2 of the Utah Code) provides authority to enact rules pertaining to Air Quality activities. The UDEQ Division of Air Quality (DAQ) is responsible for ensuring that the air in Utah meets health and visibility standards established under the Federal Clean Air Act. To fulfill this responsibility, DAQ is required by the federal government to ensure compliance with the EPA National Ambient Air Quality Standards (NAAQS) statewide and visibility standards at national parks.

The closest air monitoring station that is currently in use is located in Highland, Utah in Utah County approximately nine miles to the southwest of Silver Lake Flat Dam. Areas that are not in compliance with the NAAQS are referred to as nonattainment areas. Based on maps showing nonattainment areas (UDEQ 2013), Utah County is considered a nonattainment area for PM_{10}–particulate matter, while all other criteria pollutants in Utah County are in compliance with the air quality standards. Silver Lake Flat Dam is located at the far eastern edge of the nonattainment area, along the Utah and Wasatch Counties border, and is likely not affected.

The Silver Lake Flat Dam and surrounding area is within the UWCNF and adjacent to the Lone Peak Wilderness. Ambient noise is generally negligible, with the exception of a few vehicles traveling on the windy dirt road to Silver Lake Flat Reservoir. Ambient light in the forested project area is negligible and there is no lighting associated with the dam.

2.13 Transportation/Infrastructure

Silver Lake Flat Reservoir and Dam are accessed via the following roads (USFS 2012a):

- American Fork Canyon Road: From Interstate 15, the American Fork Canyon Road (Hwy 92/FSR70098) runs east up the canyon for about five miles.
- North American Fork Canyon Road: The North American Fork Canyon Road (Route 144/FSR 70085) travels northeast for 2½ miles to the Tibble Fork Reservoir.
- Granite Flat Campground Road: At the upper end of the Tibble Fork Reservoir, USFS Granite Flat Campground Road (FSR 70010) heads northwest for around ¾ of a mile to the junction with USFS Silver Lake Flat Road.
- Silver Lake Flat Road: The Silver Lake Flat Road (FSR 70008) heads north and continues up the small, steep, winding gravel road for 2½ miles to Silver Lake Flat Dam.

The American Fork Canyon Road is closed during the winter and road closure can extend into the spring and early summer due to high waters, lingering snowpack and mudslides. USFS entrance fees are collected at the American Fork Canyon Entrance Station near the mouth of the canyon and the following lists the prices:

- 1-3 Day: $6.00
- 7-Day: $12.00
- Annual: $45.00

The Granite Flat Campground Road (FSR 70010) is a USFS local road. From the campground to the turnoff to Silver Lake Flat Road, the road is asphalt surfaced and generally in good condition. The USFS Road Management Objective (RMO) is Service Level 4 Maintenance Level 4.

Silver Lake Flat Road (FSR 70008) is a USFS local road. The road is intermittently surfaced with gravel and relatively rugged and narrow with many hairpin turns and steep slopes on both sides. The surface of the road contains protruding rocks and boulders as well as numerous stormwater ditches that cross the road. The USFS RMO for the road is Service Level 3 Maintenance Level 3.

2.13.1 Roadless Area

The USFS has designated roadless areas within the UWCNF that are defined as an area without any improved roads maintained for travel by standard passenger type vehicles (USFS 2003a). Roadless areas within the project area are depicted on Appendix B-Figure 7 and Appendix C-Figure 17. This area is started at the western edge of Silver Lake Flat Road and heads west. The majority of the project area is located outside of this roadless area except for the seepage monitoring area.

The entire Silver Lake Flat site is designated as a Roaded Modified Area which allows the 1) construction of temporary roads, 2) construction of new classified roads, and 3) reconstruction or realignment of existing classified roads to address public safety and resource concerns (USFS 2003a and 2003b).

2.14 Socioeconomics

Utah County was founded in 1892 and the northern boundary is located approximately 20 miles south of Salt Lake City, Utah. The County Seat is the City of Provo. Provo and Orem constitute the heart of Utah County's economic sphere, and is classified as one of Utah's two major Metropolitan Statistical Areas. Brigham Young University lies on the eastern foothills of Provo, and Orem is home to Utah Valley University. Health care and computer technologies are also an integral part of the Utah County economy. Table 2-7 shows the major employers in Utah County (Utah's Right 2011).

Table 2-7. Utah County Major Employers

Employer	Business	# Employees	Year
Brigham Young University	Education Services	5,000-6,999	2011
Intermountain Health Care, Inc.	Health Care And Social Assistance	3,000-3,999	2011
Utah Valley University Foundation,	Education Services	3,000-3,999	2011
Im Flash Technologies, LLC	Manufacturing	1,000-1,999	2011
Nestle Prepared Foods Company	Manufacturing	1,000-1,999	2011
Vivint, Inc.	Construction	1,000-1,999	2011
Adobe Systems Incorporated	Information	500-999	2011
Alpine School District	Education Services	500-999	2011
Central Utah Medical Clinic	Health Care And Social Assistance	500-999	2011
Chrysalis Utah, Inc.	Health Care And Social Assistance	500-999	2011
Intermountain Health Care, Inc.	Health Care And Social Assistance	500-999	2011
Myfamily Com Inc	Information	500-999	2011
Nexeo Staffing, LLC	Admin., Support, Waste Mgmt, Remediation	500-999	2011
Novell Inc	Information	500-999	2011
Pinnacle Security Group, LLC	Admin., Support, Waste Mgmt, Remediation	500-999	2011
State Of Utah	Health Care And Social Assistance	500-999	2011

Employer	Business	# Employees	Year
State Of Utah	Education Services	500-999	2011
Timpanogos Regional Medical Service	Health Care And Social Assistance	500-999	2011
Us Synthetic Corporation	Manufacturing	500-999	2011

Silver Lake Flat Dam is located approximately 18 miles northeast of the metropolitan areas in Utah County and within the boundaries of the UWCNF. There are no private industries or major employers within the project area.

2.14.1 Environmental Justice

There are no low-income or minority groups located within the project area at Silver Lake Flat Dam that would be adversely impacted.

2.15 Demographics

Population, demographic, and economic data for Utah County were collected from the U.S. Census Bureau 2012 census. In 2012, Utah County's population was 540,504 (94% urban, 6% rural). Of the county's total population, 86.1% are White, 9.2% are Hispanic or Latino, 1.6% are two or more races, 1.4% are Asian, 0.6% are Native Hawaiian and Other Pacific Islanders alone, 0.5% are American Indian and Alaska Native alone, and 0.5% are Black. The percentage of residents living in poverty in Utah County in 2010 was 12.9%, compared to the 11.4% poverty level in the State of Utah. The National average poverty level in 2010 was 13.8%.

The 2010 unemployment rate in Utah County was 7.5% as compared to 7.6% for the State of Utah. The unemployment rate in Utah County has been highly variable during the last ten years ranging from 2% in 2000 to 7.5% in 2010. Per capita income in Utah County in 2011 was $20,794 and the average per capita income in Utah State was $23,650. The National per capita income in 2010 was $27,334.

2.16 Land Rights

Silver Lake Flat Reservoir and Dam are located within the boundaries of the UWCNF. A Special Use Permit was issued to the NUCWCD to operate and maintain the dam for irrigation storage. The NRCS is the lead agency preparing the NEPA compliance document and is partially funding the dam rehabilitation. There are no private lands located within the project area.

2.17 Agricultural Lands

Construction of Silver Lake Flat Dam was finished in 1971. The purpose of the dam is to store irrigation water, although the dam also has incidental benefits of flood control, sediment retention and recreation. The dam provides water for agriculture in the Utah Lake Valley, as well as recreational, residential and business areas downstream. Water rights at Silver Lake Flat Reservoir are held by the American Fork Irrigation Company, Lehi Irrigation Company and the Pleasant Grove Irrigation Company. The maximum annual water right (55-7198) allotted to these irrigation companies is 441.6 cfs (Utah Division of Water Rights 2012).

Utah County has had, and continues to have, the largest amount of agricultural lands in Utah, with 11,094,700 acres in 2007 (Census of Agriculture 2007). There were 16,700 farms averaging 664 acres in Utah County in 2007. Approximately 79% percent of farms in Utah County are irrigated, harvested cropland. Agriculture lands can be found from the mouth of the American Fork Canyon to Utah Lake,

but most are located within the valley lands from Orem to the south end of the valley. Many of the agricultural lands have been threatened by housing developments. There are no agricultural lands within the project area and approximately 30 acres in the dam breach inundation area.

2.18 Aesthetics

Silver Lake Flat Reservoir and Dam are located within the American Fork Canyon drainage in the Wasatch Mountains northeast of the towns of Lehi and American Fork, Utah. The Silver Lake Flat viewshed including the Silver Creek drainage and surrounding glaciated basins are dominated by granite rock and sub-alpine conifer forest, rocky slopes, aspen, mountain shrubs, and grass-forb meadow habitat.

Picture 2-9. Silver Lake Flat Reservoir at Highest Level looking North

Picture 2-10. Silver Lake Flat Reservoir at Lowest Level looking North

The shoreline of Silver Lake Flat Reservoir appears to be natural when the reservoir is full, but exhibits the characteristic bare soil banks of a reservoir when the water level is low. The dam itself does not look natural at any reservoir level due to the manicured riprap and lack of vegetation. The geometry of the dam would likely be apparent from the foreground views (within 0.5 miles) along Silver Lake Flat Road that parallels the western shoreline, and possibly in the middle-ground views (between 0.5 and 3 miles) from the roads and trails that continue uphill towards Silver Lake. It is unlikely that the dam would be obvious from background views (more than 3 miles). Unless the reservoir water is high, the intake

structure would likely be visible offshore in foreground views. The intake pipe disappears underground through the dam and exits from the outlet works on the downward side of the dam. The spillway runs on the surface of the dam and can be seen from foreground views of the reservoir side of the dam. From the downward side of the dam, an approximate 200 foot open concrete spillway is visible in the near foreground, where the spillway empties into Silver Creek.

The USFS Visual Quality Objectives (VQO) takes into consideration distance zones, as well as sensitivity levels and landscape variety classes. The Silver Lake Flat Dam, Reservoir and adjacent areas are designated as "maximum modification" (USFS 2012a) which permits a dominant change to the original landscape, particularly in the foreground and middle-ground. Lands to the east and south of the Silver Lake Flat area are designated as "retention" which provides for management activities that are not visually evident. The Lone Peak Wilderness parallels the west side of the reservoir is which is designated as "preservation" and requires that no visible change occurs in the landscape (Appendix C-Figure 17).

2.19 Public Health and Safety

2.19.1 Dam Breach Analysis and Hazard Classification

The current hazard classification for Silver Lake Flat Dam is high hazard (Class "C") meaning that if the dam should fail for any reason there is a high probability that loss-of-life would occur. The potential losses exist due to the hazards associated with the recreation areas, homes, businesses, and schools that are downstream of the site and within the flood zone if the dam should fail. Since the dam has a high hazard (Class "C") classification, it must be able to pass a flood event equivalent to the PMP event through the open channel spillway without catastrophic failure. The PMP event is defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area. Basically, an extreme snow melt and precipitation event combined together. The downstream floodplain outside of American Fork Canyon is rapidly developing and it is certain that additional homes and businesses will continue to be constructed within the dam breach inundation zone in the future.

The dam and reservoir were designed in 1967. A Dam Failure Inundation Study was completed in 1992 for both Silver Lake Flat and Tibble Fork Dams. The conclusion of this report was that the emergency spillways of both dams meet agency criteria. The hydrologic design conditions used for sizing the low-level outlet (principal spillway) and spillway (auxiliary spillway) were re-evaluated in 2012 with regards to current hydrological design criteria and the results are documented in a hydrologic study completed by NRCS (NRCS 2012b). The findings of this report state that the current spillway at Silver Lake Flat Dam is not sized adequately to pass the PMP event (at approximately 3,462 cubic feet per second (cfs)) .

A seismic hazard evaluation for Silver Lake Flat Dam was prepared by the NRCS (2012c) to determine the seismic parameters that should be used for dam rehabilitation if selected. Geology information is located in Chapter 2.2.1. A deterministic evaluation was performed using the Provo section of the Wasatch fault which is the most critical source identified. The highest deterministic value was from the Provo section of the Wasatch fault which produced seismic parameters of 0.49g that were generated from a Magnitude 7.5 event. This value is the recommended ground acceleration and magnitude to be used for analysis of the dam foundation for Silver Lake Flat rehabilitation.

2.19.2 Dam Failure Consequences

The exact event and timing of dam failure scenarios are extremely difficult to predict. The most likely scenario would be from overtopping due to excessive hydrologic inflows into the reservoir from the PMP event. If Silver Lake Flat Dam were to suddenly fail at a high reservoir stage (over the top of dam), the

catastrophic impacts would include potential loss of life to any person located within the American Fork Canyon as well as residents and businesses in the cities of Alpine, Highland, American Fork, and Lehi near the mouth of the canyon. Sediment deposition from the dam failure would also likely fill culverts and drainages in the valley potentially creating additional flooding issues in the low-lying residential and commercial areas during precipitation events.

In the event of Silver Lake Flat Dam failure, a large volume of water would either surge down 1) the left abutment drainage (Silver Creek) into the American Fork River with a peak discharge of 72,000 cfs or 2) the right abutment drainage (unnamed) with a peak discharge of 43,470 cfs. Both dam failure scenarios would flow into Tibble Fork Reservoir and this large volume of water would surge down the American Fork Canyon and into Alpine, Highland, American Fork and Lehi. Maps of the dam breach inundation area (NRCS 2013b) are located in Appendix C-Figures 11 through 13.

An analysis of the population-at-risk (PAR) was performed using the dam failure scenario. The method used to estimate the loss-of-life was the Flood Comparison Method as described in the 2011 Homeland Security Report *Methods for Estimating Loss of Life Resulting from Dam Failure.* A detailed analysis of using this method is presented in Appendix D. The following states the results for the four potential loss-of-life timing scenarios:

- Night (Summer): 283 people
- Night (Non-Summer): 208 people
- Day (Summer): 409 people
- Day (Non-Summer): 867 people

CHAPTER 3.0
ALTERNATIVES

3.1 Project Scoping

Scoping questions, comments and concerns were requested from the public and government agencies during the preliminary scoping period both orally at public meetings and via written submittal of comments. The primary purpose of the scoping meetings were to gather input and feedback on the projects' purpose and need statement, potential alternatives for consideration, environmental issues to be addressed in the Draft Plan-EA, methodologies to be used to evaluate impacts, and the overall public participation process. There were no scoping comments received orally or via written comment during the scoping period. A detailed description of the public scoping process is located in Chapter 6.0.

3.2 Formulation Process

The formulation process of alternatives for the rehabilitation of Silver Lake Flat Dam followed procedures outlined in the NRCS National Watershed Program Manual (NRCS 2009) Parts 501 through 505, NRCS National Watershed Program Handbook (NRCS 2010) Parts 600 through 606, and other NRCS watershed planning policy. Numerous alternatives were developed by the project team based on the ability to address the purpose and need of the project. If scoping comments had been received during the scoping period they would have been incorporated into the formulation process for the initial alternatives. Some of these initial alternatives were eliminated from further analysis due to high cost or other critical factors. Two Action alternatives and two No Action alternatives were selected by NRCS and the project team to be analyzed in this Draft Plan-EA. The cost estimates presented in this section were provided by the UDWRe.

3.3 Alternatives Considered but Eliminated from Detailed Study

Six alternatives were discussed for the project but were eliminated from further study in this Draft Plan-EA. A list of alternatives is presented below followed by a brief summary of these six alternatives and the reason(s) for elimination. Dam features and associated nomenclature are shown on Appendix B-Figure 4.

- Dam Decommissioning – Complete Dam Removal
- Dam Decommissioning – Partial Breach
- Rehabilitate Dam – New Spillway Open Channel Dogleg
- Rehabilitate Dam – Remove Sediment from Reservoir
- Rehabilitate Dam – New Spillway Open Channel Left Abutment
- Rehabilitate Dam – New Spillway Open Channel Right Abutment

3.3.1 Dam Decommissioning – Complete Dam Removal

Complete dam removal would entail the excavation and disposal of the entire earthen dam consisting of approximately 250,000 cubic yards (Alpine Soil Conservation District *et al.* 1958) and reclamation of the dam area to match existing contours. A new stable channel would be constructed to allow unobstructed flow through the upstream and downstream reaches of Silver Creek. This alternative would provide additional flood plain access for a short distance along the restored channel for a minimal additional benefit compared to an excavated dam breach. The cost associated with this alternative is $6,000,000. This alternative would require more extensive earthwork than an excavated dam breach resulting in

greater short term impacts to the surrounding environment and higher cost.

Complete removal of the dam would not allow any water to be stored for irrigation purposes. The elimination of water storage does not meet the purpose and need for this federally funded project and supplemental methods would be required to acquire the same water volume as allotted on the NUCWCD water right. The cost estimate for acquiring new water sources (new wells, water purchase, new dam, etc.) would cost between $5,000,000 to $10,000,000. Therefore, the complete dam removal alternative was eliminated from detailed study.

3.3.2 Dam Decommissioning – Partial Breach

Decommissioning the dam would involve excavating a breach in the dam through the low point of the valley and disposal of 125,000 cubic yards onto the exposed reservoir area. A new stable channel would be constructed to allow unobstructed flow through the upstream and downstream reaches of Silver Creek. Material excavated from the dam breach and new channel would be disposed of in the drained reservoir area and graded to match existing topographic contours at stable slopes. This alternative would provide additional flood plain access for a short distance along the restored channel. The cost estimate for this alternative is $5,000,000.

Partial breaching of the dam would not allow any water to be stored for irrigation purposes as similar to the complete dam removal alternative. The elimination of water storage does not meet the purpose and need for this federally funded project and supplemental methods would be required to acquire the same water volume as allotted on the NUCWCD water right. The cost estimate for acquiring new water sources (new wells, water purchase, new dam, etc.) would cost between $5,000,000 to $10,000,000. Therefore, the partial dam breach alternative was eliminated from detailed study.

3.3.3 Rehabilitate Dam – New Spillway Open Channel Dogleg

This alternative would consist of the dam rehabilitation alternatives discussed in Chapter 3.4.3 to bring the dam into compliance with NRCS and Utah State Dam Safety regulations and current engineering standards. The existing spillway would be completely demolished and the excavated area filled in with compacted structural fill similar to the fill used on the downstream face of the dam. A new open channel auxiliary spillway would be installed at the dogleg in the dam and flow to the existing spillway outlet area. The spillway would cross the dam crest and follow the downstream toe of the dam in the upland. The cost estimate for this alternative is $3,800,000. The new spillway location would cross through a small area of foundation material in the adjacent upland not suitable for supporting a new spillway as discussed in Chapter 2.3.1. This alternative was eliminated from detailed study due to the lack of suitable foundation material for the new spillway.

3.3.4 Rehabilitate Dam – Remove Sediment from Reservoir

This alternative would consist of the dam rehabilitation alternatives discussed in Chapter 3.4.3 to bring the dam into compliance with NRCS and Utah State Dam Safety regulations and current engineering standards. Dredging of the reservoir sediment would be performed to restore all of the design storage capacity. Sediment deposits within the limits of the reservoir have elevated levels of some metals (i.e.-arsenicand lead) as described in Chapter 2.2.2.1. Dredging of the reservoir would require that all of the sediment containing contaminants, not being used for fill on the dam, to be hauled off-site and disposed at an appropriate location. The cost estimate for this alternative is $6,200,000. Due to the high volume of sediment that would require removal off-site, the cost associated with this alternative is high and was eliminated from detailed study.

3.3.5 Rehabilitate Dam – New Spillway Open Channel Left Abutment

This alternative would consist of the dam rehabilitation alternatives discussed in Chapter 3.4.3 to bring the dam into compliance with NRCS and Utah State Dam Safety regulations and current engineering standards. The existing spillway would be completely demolished and the excavated area filled in with the compacted structural fill similar to the fill used on the downstream face of the dam. A new open channel auxiliary spillway would be installed on the downstream left abutment at the toe of the dam. The spillway would be constructed across the upland on undisturbed native soils and flow into the existing spillway outlet area. The cost estimate for this alternative is $4,000,000. This alternative was eliminated from detailed study because an open channel spillway increases the maintenance requirements of the channel, creates a public health and safety risk for recreationists, and requires additional clearing of vegetation at the toe of the dam.

3.3.6 Rehabilitate Dam – New Spillway Open Channel Right Abutment

This alternative would consist of the dam rehabilitation alternatives discussed in Chapter 3.4.3 to bring the dam into compliance with NRCS and Utah State Dam Safety regulations and current engineering standards. The existing spillway would be completely demolished and the excavated area filled in with compacted structural fill similar to the fill used on the downstream face of the dam. A new open channel auxiliary spillway would be installed on the downstream right abutment at the toe of the dam. The spillway would be constructed across the upland on undisturbed native soils and flow into a separate drainage from Silver Creek. The cost estimate for this alternative is $4,000,000. This alternative was eliminated from detailed study because the spillway would discharge into a different drainage basin resulting in a shift in drainage patterns. This shift in drainage pattern could cause a potential hazard at the Granite Flat Campground which could cause a safety risk for the public. The potential impacts to the environment from this drainage pattern shift would be high and it does not conform to Utah State Dam Safety standards that require spillway discharges to remain in the same drainage.

3.4 Alternatives Considered for Detailed Study

There are two No Action alternatives and two Action alternatives considered for the project that were carried forward to further study in this Draft Plan-EA. A list of these alternatives is presented below followed by a summary of these alternatives.

- No Action
- Dam Decommissioning
- Rehabilitate Dam – Replace Spillway
- Rehabilitate Dam – Left Abutment Closed Spillway

The designs presented in this section for each alternative considered for detailed study were obtained from the UDWRe (2013a).

3.4.1 No Action

The No Action alternative consists of leaving the dam “As-Is” without any federal funding, performing no structure modifications, and operating the dam under existing conditions which do not meet NRCS and Utah State Dam Safety regulations. Under this alternative, the residents in Highland, Alpine and Lehi cities would continue to live below a dam structure with documented deficiencies in spillway capacity and integrity that do not meet revised dam safety standards. The NUCWCD would continue to store water in a reservoir that does not meet revised NRCS and Utah State Dam Safety standards. The worst-

case-scenario is the failure of the dam during a PMP event resulting in severe flooding in the American Fork Canyon potentially causing loss-of-life. A dam failure event is most likely to occur during late summer to early fall when precipitation is at its highest probability. Costs associated with a dam failure can vary depending on the severity of the dam breach and are broadly estimated to be $20,000,000. Proposed mitigation measures for the No Action alternative are presented in Chapter 4.22.

3.4.2 Dam Decommissioning

The Dam Decommissioning alternative consists of removing the hazard of the dam per a Decommissioning Order from the State of Utah. Decommissioning the dam would involve excavating a breach in the dam through the low point of the valley (125,000 cubic yards) and constructing a new stable channel to allow unobstructed flow through the upstream and downstream reaches of Silver Creek (Appendix B-Figure 5). Material excavated from the dam breach and new channel would be disposed of in the drained reservoir area and graded to match existing topographic contours at stable slopes. Sediment in the drained reservoir area would be stabilized using native vegetation (trees, shrubs and forbs) and habitat features (woody debris) to mimic the surrounding environment. The flood and sediment retention capacity of the dam would be lost and invalidate the original economic justification for constructing the dam. This alternative does not meet the purpose and need of the project and the NUCWCD may lose their water right associated with the dam. Improvements to the existing USFS road, including the installation of 0.5- to 1-foot of gravel and road drainage features, would be required for heavy machinery and dump truck access to the project site. The cost estimate for this alternative is $4,595,000. Dam decommissioning construction activities would be expected to be completed in one season. Proposed mitigation measures for the Dam Decommissioning alternative are presented in Chapter 4.22.

3.4.3 Rehabilitate Dam – Replace Spillway

Rehabilitation of the dam would consist of measures to meet current NRCS and Utah Dam Safety regulations, current engineering standards and extend the life of the dam for 71 years starting in 2017. Rehabilitation of the dam is depicted on Appendix B-Figures 6 and 7 and would include the following measures:

- Place riprap (5,000 cubic yards) on the existing upstream face of the dam to protect the slope from wave action erosion at varying water surface elevations in the reservoir. Some of the existing riprap stockpiled near the western dispersed parking area may be utilized on the upstream dam face protection;
- Place and compact additional fill (10,750 cubic yards) on the downstream face of the dam to increase slope stability. Some of this fill material would be excavated from the reservoir near the western dispersed parking area. Only selective native granular borrow fill material underneath the reservoir sediment deposition layer would be utilized. The location of this existing borrow fill source is shown on Appendix B-Figure 3 and the parking area would be reshaped and raised five feet to compensate for the increase in reservoir water surface elevation;
- Raise the elevation of the spillway 2.5 feet to add extra storage capacity in the reservoir. The new storage capacity would be increased from the existing capacity of 1,011 ac-ft to 1,120 ac-ft (Appendix B-Figure 8);
- Replace existing spillway (800 cubic yards of reinforced concrete) with a larger one to pass the PMP event (worst-case scenario flood event) without overtopping the dam. The spillway outlet would extend an additional 150 feet downstream of the existing spillway outlet;
- Install new toe drains (810 cubic yards) at the downstream toe of the dam in various places to collect and convey seepage water away from the dam infrastructure;

- Replace the two (2) low-level outlet gates in the reservoir;
- Clear vegetation (approximately 5 acres) for dam rehabilitation at the base of the dam (25 feet) and around the edge of the reservoir (Appendix B-Figure 8);
- Improvements to the existing unpaved USFS Silver Lake Flat Road from the Granite Flat Campground past the dam to the northern side of the reservoir (up to 2.5 miles), including the installation of 0.5- to 1-foot of gravel and road drainage features in places as selected by the contractor. The largest area improved would include the entire length of the road for heavy machinery, concrete and dump truck access to the project site; and
- Utilize the Horse Transfer Station off of Granite Flat Campground Road, dispersed parking area on the west side of the reservoir and the dispersed parking area on the north side of the reservoir as staging areas as depicted on Appendix B-Figure 3.
- Clear vegetation (approximately 0.35 acres) and install a seepage monitoring system on the downstream side of the right abutment as described in Chapter 3.4.5 (Appendix B-Figure 7).
- Proposed mitigation measures for the Rehabilitate Dam – Replace Spillway alternative are presented in Chapter 4.22.

Replace Spillway: Replacing the spillway would consist of demolishing the existing spillway and removing all material from the dam. A new closed channel concrete spillway designed to pass the PMP event would be installed in the same location as the existing spillway (Appendix B-Figures 9 and 10). A new rock riprap plunge pool would be created approximately 150 feet downstream from the existing plunge pool about 20 feet in length. The existing low-level outlet would also be extended approximately 150 feet to the new spillway outlet. The cost estimate for this alternative is $3,538,000.

Construction activities would be expected to be completed in one season during the months of May through November in 2014, pending weather conditions. Preliminary estimates indicate that around 20 trucks per day (6 days a week) mostly during daylight hours would be required at the site during the life of the project rehabilitation in order to complete the project in the 2014 construction season.

Table 3-1. Rehabilitate Dam - Replace Spillway Parameters

Description	Existing Conditions	Dam Rehabilitation
Spillway Crest (feet)	7525.5 El AMSL	7528 El AMSL
Spillway Dimensions (feet)	10 W x 3 H x 320 L	12 W x 7 H x 477 L
Top of Dam (feet)	7535 El AMSL	7535 El AMSL
Top Width of Dam (feet)	23	23

Rehabilitating the dam using the prescribed methods above would not modify the dam hazard classification of high hazard (Class “C”) since the risk to the PAR, infrastructure and property will not change downstream.

3.4.4 Rehabilitate Dam – Left Abutment Closed Spillway

Rehabilitation of the dam would consist of measures to meet current NRCS and Utah State Dam Safety regulations, current engineering standards and extend the life of the dam for 71 years as described in the Rehabilitate Dam – Replace Spillway alternative and as depicted on Appendix B-Figures 6 and 7. Proposed mitigation measures for the Rehabilitate Dam – Left Abutment Closed Spillway alternative are presented in Chapter 4.22.

Left Abutment Closed Spillway: The existing spillway would be completely demolished and filled in with compacted fill material. A new spillway would be installed on the left abutment at the toe of the dam on

the downstream face in the existing upland (Appendix B-Figure 9). The spillway would be sized to pass the PMP event. A new rock riprap plunge pool would be created approximately 150 feet downstream from the existing plunge pool about 20 feet in length. The existing low-level outlet would also be extended approximately 150 feet to the new spillway outlet. The cost estimate for this alternative is $4,030,000.

Construction activities would be expected to be completed in one season during the months of May through November in 2014, pending weather conditions. Preliminary estimates indicate that around 20 trucks per day (6 days a week) mostly during daylight hours would be required at the site during the life of the project rehabilitation in order to complete the project in the 2014 construction season.

Table 3-2. Rehabilitate Dam - Left Abutment Closed Spillway Parameters

Description	Existing Conditions	Dam Rehabilitation
Spillway Crest (feet)	7525.5 El AMSL	7528 El AMSL
Spillway Dimensions (feet)	10 W x 3 H x 320 L	12 W x 7 H x 700 L
Top of Dam (feet)	7535 El AMSL	7535 El AMSL
Top Width of Dam (feet)	23	23

Rehabilitating the dam using the prescribed methods above would not modify the dam hazard classification of high hazard (Class "C") since the risk to the PAR, infrastructure and property will not change downstream.

3.4.5 Rehabilitate Dam – Seepage Monitoring System

This design element is applicable to both the Rehabilitate Dam – Replace Spillway and the Rehabilitate Dam – Left Abutment Closed Spillway alternatives. The seep identified downstream of the right abutment is known to be hydraulically connected to the reservoir and the UDWRt has issued a letter (2012) stating that this seep area must be monitored to provide collection of seepage water, monitoring for erosion, and measurement of seepage flow rates in relation to reservoir water level. A copy of this letter is presented in Appendix E. This seepage monitoring system would minimize the chances of internal erosion of foundation materials by seepage flows that could lead to dam instability. The cost estimate for the seepage monitoring system is $155,000 and has been included in the overall cost for both of the dam rehabilitation cost estimates listed in Chapters 3.4.3 and 3.4.4.

The location of the seepage monitoring system is depicted on Appendix B-Figure 7 and would consist of the following elements:

- Construct a 10-foot wide temporary construction access road (175 feet long) to the seep area from Silver Lake Flat Road clearing 0.05 acres of vegetation within the access road area. This temporary access road would be constructed in a USFS designated roadless area but this would only be used as a road during construction;
- Clear vegetation (0.30 acres) within the excavation area;
- Excavate a 12-foot deep trench and install a collection pipe surrounded by drain rock (150 feet);
- Route all subsurface water collected into the pipe and discharge at a single location in the middle of the seep area (Wetland A). The water would be returned to existing wetland and flow into the stream channel.

3.5 National Economic Development

The National Economic Development (NED) Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the project consistent with protecting the Nation's environment. The net economic benefit is the benefit minus the cost. For the rehabilitation program, when human life is potentially at risk, the NED alternative is defined as the federally assisted alternative with the greatest net economic benefits.

3.6 Summary and Comparison of Alternative Plans

The alternatives proposed for consideration and analyzed in detail in this Draft Plan-EA have been compared against each other to discern the merits and disadvantages of each alternative. This comparison of environmental, social and economic effects is summarized in Table 3-3.

Table 3-3. Summary and Comparison of Alternative Plans

Effects	No Action	Dam Decommissioning	Rehabilitate Dam – Replace Spillway	Rehabilitate Dam – Left Abutment Closed Spillway
Environmental				
Air Quality/ Noise/ Light	Air quality/noise/light resources would experience temporary effects from emergency services responding to the incidents as well as cleanup services which would create additional emissions, noise and light.	Activities will temporarily adversely affect air quality and generate additional noise and light in the project area.	Activities will temporarily adversely affect air quality and generate additional noise and light in the project area.	Activities will temporarily adversely affect air quality and generate additional noise and light in the project area.
Climate	During precipitation events, slopes and stream banks could become unstable and erode which could lead to an increase in sediment accumulation in the reservoir.	No effect	During precipitation events, slopes and stream banks could become unstable and erode which could lead to an increase in sediment accumulation in the reservoir.	During precipitation events, slopes and stream banks could become unstable and erode which could lead to an increase in sediment accumulation in the reservoir.
Cultural/Historic	No effect.	No effect.	No effect.	No effect.
Demographics	Effects to downstream communities.	Downstream inhabitants susceptible due to flooding from loss of storage.	No effect.	No effect.
Fish	Possible destruction of fish habitat in the stream downstream of the dam if the dam fails.	Loss of lake habitat.	Temporary relocation during dewatering of reservoir.	Temporary relocation during dewatering of reservoir.
Geology	No effect.	No effect.	No Effect.	No effect.
Land Use/Rights	Disruption of lands.	Lose flood and sediment retention capacity.	No Effect.	No effect.
Natural Areas	Disruption of lands.	Loss of lake habitat.	May affect.	May affect.
Prime and Unique Farmlands	Downstream Effects.	No effect.	May affect.	May affect.

Effects	No Action	Dam Decommissioning	Rehabilitate Dam – Replace Spillway	Rehabilitate Dam – Left Abutment Closed Spillway
Public Health and Safety	Adverse effect from the loss-of-life downstream of the dam.	Reduction of loss-of-life potential.	Reduction of loss-of-life potential.	Reduction of loss-of-life potential.
Recreation	Adverse effect from inundation in canyon from dam failure.	Loss of lake recreational opportunities.	Temporary loss of recreational activities around reservoir for one season.	Temporary loss of recreational activities around reservoir for one season.
Riparian areas	Damage to vegetation downstream of dam from failure.	Loss of riparian vegetation.	Removal of vegetation downstream of the dam in new structural fill area.	Removal of vegetation downstream of the dam in new structural fill area and spillway alignment.
Scenic Beauty/ Aesthetics	Adverse effects from dam failure.	Loss of lake aesthetics to drained reservoir until vegetation reestablishes.	No adverse effect.	No adverse effect.
Socioeconomics	Adverse effects to downstream businesses.	Loss of irrigation water to the agricultural community.	No effects.	No effects
Soil and Sediment	Scouring of soil downstream of dam from dam failure. Elevated metals in sediments	Soil and sediment would be transported downstream. Elevated metals in sediments	Sediment will be trapped above the dam. Potential soil disturbance and sediment into Silver Creek during construction. Elevated metals in sediments	Sediment will be trapped above the dam. Potential soil disturbance and sediment into Silver Creek during construction. Elevated metals in sediments
Streams and Wetlands	Adverse effects to streams and wetlands. Stream channel altered and wetlands washed away or filled with sediment from dam failure.	Silver Creek may be altered and wetland A would dry up. Effects of 45 acres of deepwater habitat and 0.5 acres of wetlands to be permanently cleared.	Loss of approx. 170 ft of stream. Portions of wetland will dry up. Effects 46.8 acres of deepwater habitat and 0.2 acres of wetlands to be permanently cleared.	Loss of approx. 170 ft of stream. Portions of wetland will dry up. Effects 46.8 acres of deepwater habitat and 0.2 acres of wetlands to be permanently cleared.
Threatened and Endangered Species	No effect.	No effect.	No effect.	No effect.
Transportation/ Infrastructure	Adverse effects from damage to roads from a dam failure. Loss of access during floods.	Temporary affects to Silver Lake Flat Road access for one season. Loss of access during floods.	Temporary affects to Silver Lake Flat Road access for one season.	Temporary affects to Silver Lake Flat Road access for one season.
Vegetation	Damage to vegetation downstream of dam from	No adverse affect.	Removal of vegetation at the	Removal of vegetation at the downstream toe of dam,

Effects	No Action	Dam Decommissioning	Rehabilitate Dam – Replace Spillway	Rehabilitate Dam – Left Abutment Closed Spillway
	failure.		downstream toe of dam, left abutment, increased, footprint and seepage monitoring system/right abutment. Total 6.03 acres, of which 5 acres permanently cleared.	left abutment, increased, footprint and seepage monitoring system/right abutment. Total 6.03 acres, of which 5 acres permanently cleared.
Water Quality	Decreased water quality from dam failure and erosion.	Sediment will be transported downstream decreasing water quality..	Sediment will be trapped behind the dam, maintaining the present water quality.	Sediment will be trapped behind the dam, maintaining the present water quality.
Water Resources	Elimination of deepwater habitat in Silver Lake Flat Reservoir and Wetland A from dam failure.	Elimination of deepwater habitat in Silver Lake Flat Reservoir. Restoration to a natural stream environment. Elimination of Wetland A.	Temporary draining of reservoir for one season. Affects to Wetland A from seepage collection system.	Temporary draining of reservoir for one season. Impact to Wetland A from seepage collection system.
Wildlife	Injury or fatality in the inundation area from dam failure.	No adverse affect.	5 acres of wildlife habitat permanently cleared, and 0.35 cleared (seepage monitoring system).	5 acres of wildlife habitat permanently cleared, and 0.35 cleared (seepage monitoring system).
National Economic Development[1]				
Installation Cost	$20,000,000	$4,595,000	$3,538,000	$4,030,000
Project Environmental, Engineering and Administrative Costs	$5,585,000	$1,283,000	$988,000	$1,125,000
Total Project Cost	$25,585,000	$5,878,000	$4,526,000	$5,155,000
Cost Sharing (NRCS)	$0	$0	$3,000,000	$3,408,000
Cost Sharing (Sponsor)	$25,585,000	$$5,878,000	$1,526,000	$1,747,000
Annual Installation Cost	$824,000	$189,000	$146,000	$152,000
O&M Cost	$14,000	$14,000	$32,000	$32,000
Annual Sum Cost	$838,000	$203,000	$178,000	$184,000
Annual Benefit	$18,000	$18,000	$227,000	$227,000
Benefit Cost Ratio	0.02	0.1	1.3	1.2

Note: [1] Both of the dam rehabilitation alternatives were adjusted at the same rates as calculated for the Rehabilitate Dam-Replace Spillway in Chapter 6.8.

CHAPTER 4.0
ENVIRONMENTAL CONSEQUENCES

The NRCS has the responsibility under NEPA to identify and address effects on the human environment that may occur as a result of the alternative plans. These alternatives include the No Action, Dam Decommissioning, Rehabilitate Dam – Replace Spillway, and Rehabilitate Dam – Left Abutment Closed Spillway. The action alternatives would be consistent with the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a). The following describes the potential effects of the alternatives within each resource category as described in Chapter 2.0.

The No Action alternatives discuss the potential effects if the dam was not rehabilitated to meet NRCS and Utah State Dam Safety regulations and engineering standards. Some of the environmental consequences for the Rehabilitate Dam – Replace Spillway and the Rehabilitate Dam – Left Abutment Closed Spillway alternatives are identical in nature and have been combined into one analysis in this section. For environmental consequences that differ between the two dam rehabilitation alternatives, the analysis has been separated.

The following describes the type of effects and impacts analysis used in this chapter (NRCS 2011):

- Direct Effect: Impacts caused by a proposed action and occurring at the same time and place.
- Indirect Effect: Impacts caused by an action that are later in time or farther removed in distance, but are still reasonably foreseeable.
- Cumulative Effect: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertaking such other action.
    - Past and present actions may involve construction activities at and near the site, soil contamination, downstream sediments, fish and wildlife habitats, and recreation activities. Cumulative effects are related to downstream flooding as well as the need for irrigation storage in the watershed. Foreseeable future actions also include additional commercial and residential development near American Fork Canyon and adjacent low-lands, and related reduction of crops in the area (also refer to Section 4.20).
    - The assessment of cumulative impacts is not substantially different from the assessment of direct or indirect impacts. The same types of considerations are made to determine the environmental consequences of the alternatives for direct, indirect, or cumulative impacts. Cumulative impact assessment, however, generally entails a broader perspective (or broader scale) such as what else is happening in the area and/or downstream.
    - The spatial definition for the cumulative effects includes the area above and around the Silver Lake Flat reservoir, and downhill along Silver Creek to Tibble Fork Reservoir, and due to potential dam failure, within the American Fork Canyon as well as residents and businesses in the cities of Alpine, Highland, American Fork, and Lehi near the mouth of the canyon.

4.1 Climate

None of the project alternatives would have any noticeable change to climate conditions in Utah. This section analyzes the impacts from climate change on each of the project alternatives.

No Action

The effects of climate change on Silver Lake Flat Dam and Reservoir if No Action is performed would not increase the risk of the dam to fail under the PMP event. Climate change in Utah is resulting in

declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway.

The reduction of precipitation in the watershed upstream of the reservoir may result in the decline of vegetation. This decline could indirectly impact the reservoir by causing slopes and stream banks to become unstable and erode during high volume precipitation events which could lead to an increase in sediment accumulation in the reservoir decreasing the economic viability of the dam and reservoir.

There are no cumulative effects from climate change to the project.

Dam Decommissioning
Removal of the dam and reservoir would eliminate the impoundment of water on Silver Creek and the creek would be allowed to flow naturally year-round in a restored area. Restoration of ecosystems to properly functioning conditions can respond to climate change through providing more resilient ecosystems that can withstand the stresses of climate change. In addition, ecosystem restoration (e.g. dam removal) can also aid in retention of habitats and reduce habitat fragmentation through time, allowing species to better withstand changes in temperature and the potential for sites to become drier. Removal of the dam could result in beneficial direct effects to the environment through restoring the area to pre-dam conditions.

Indirectly, the removal of the dam could lead to increased volumes of sediment settling out in Tibble Fork Reservoir downstream leading to a reduced economic life for Tibble Fork Dam.

There would be no cumulative effects from climate change under the Dam Decommissioning alternative.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
The effects of climate change on Silver Lake Flat Dam and Reservoir under the Rehabilitate Dam alternatives would not increase the risk of the dam to fail under the PMP event. Climate change in Utah is resulting in declining snowpack and an increase in droughts. Direct effects from the reduction in precipitation in the area would result in a lower risk for high volumes of water to flow through the reservoir and over the spillway.

The reduction of precipitation in the watershed upstream of the reservoir may result in the decline of vegetation. This decline could indirectly impact the reservoir by causing slopes and stream banks to become unstable and erode during high volume precipitation events which could lead to an increase in sediment accumulation in the reservoir decreasing the economic viability of the dam and reservoir (71 years) faster than calculated.

There are no cumulative effects from climate change to the project.

4.2 Geology and Soils

No Action
Geology would not experience direct, indirect or cumulative effects from a potential failure of the dam.

Direct and indirect effects to soils within the Silver Creek drainage downstream of the dam would potentially be washed downstream from the high volumes of water exiting the dam and new soil layers would become exposed. These soils would settle out of the water column in slower velocity areas covering existing stream, riparian and wildlife habitat.

Post dam failure clean up actions would have indirect and cumulative effects in the project area and flood inundation zone

Indirect and cumulative effects would result in soils migrating downstream and potentially to the low lying areas.

Dam Decommissioning
Geology would not experience direct, indirect or cumulative effects from dam decommissioning.

Soils in the reservoir would be directly altered from the regrading of the exposed reservoir bottom and the removal of the dam notch.

Soils downstream of the dam would have indirect and cumulative effects from coarse sediment being transported and settling out in slow velocity areas of Silver Creek and the American Fork Reservoir that previously accumulated in the reservoir.

Rehabilitate Dam – Replace Spillway
Geology would not experience direct, indirect or cumulative effects from dam rehabilitation.

A small portion of the soils within the reservoir would be directly impacted during the excavation and placement on the downstream embankment of the dam for structural fill. Removing these soils would create additional active water storage within the reservoir.

There would be no indirect or cumulative effects to soils from dam rehabilitation.

Rehabilitate Dam – Left Abutment Closed Spillway
Geology would not experience direct, indirect or cumulative effects from dam rehabilitation.

A small portion of the soils within the reservoir would be directly impacted during excavation and placement on the downstream embankment of the dam for structural fill. Removing these soils would create additional active water storage within the reservoir. The new spillway would require the excavation of soils within the new alignment at the toe of the left abutment. These soils would be displaced onto the face of the dam for structural fill and the trench would be lined with imported suitable base material for the new spillway pipe. The top of the alignment would be recovered with native soil.

There would be no indirect or cumulative effects to soils from dam rehabilitation.

4.2.1 Soil Contamination

No Action

Contaminated soils within the reservoir would potentially be washed downstream in the case of dam failure and fall out of the water column in areas that do not contain contaminated soils.

There would be no indirect or cumulative effects to soil contamination from dam failure.

Dam Decommissioning
Contaminated soils within the reservoir would be left undisturbed to the maximum extent practical. Metals within the soils are consistent with background levels and are not expected to affect the vegetation establishment in the reservoir.

There would be no indirect or cumulative effects to soil contamination from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway

Contaminated soils not classified as hazardous waste could be used for structural fill on the dam. These soils are not expected to be transported downstream and would not affect the surrounding environment if displaced, since the metal presence is consistent with background levels.

There would be no indirect or cumulative effects to soil contamination from dam rehabilitation.

4.3 Sedimentation and Erosion

No Action
The dam would be left in its current condition and sediment would continue to accumulate within the reservoir. In the event of dam failure, scouring in the channel below the dam would occur. The extent of channel scour would be dependent upon how badly the dam failed. A complete failure of the dam could result in appreciable erosion of the Silver Creek and American Fork River channels as well as clearing of the majority of vegetation in the flow path.

Indirect effects would include exposed soils that could result in future erosion downstream of the dam during precipitation events.

There are a few old abandoned mines, hiking trails, and dispersed recreation sites in the project area, although they are expected to input very minimal sediment into Silver Creek. Because these mines and trails experience little to no usage and because of the long distance away from Silver Creek, there are expected to be no cumulative effects to sedimentation and erosion from these features.

Downstream sediment (deposition) in the channel and Tibble Fork reservoir would occur if the dam failed. Direct and indirect effects would expose soils resulting in erosion and sedimentation in the stream. Cumulative present and potential foreseeable future effects downstream can add to the effects that have taken place in the past. Sediment deposition from dam failure would also likely fill culverts and drainages in the valley potentially creating additional flooding issues in the low-lying residential and commercial areas during precipitation events.

Dam Decommissioning
Decommissioning the dam would involve excavating a breach in the dam and constructing a new channel resulting in unobstructed flow through the reservoir in Silver Creek. Sediment flowing from the upstream reach of Silver Creek would not be impounded and would be transported directly downstream. Sediment that has been trapped behind the dam has greater potential to be transported downstream during flood events until the site is stabilized. Excavation would result in direct effects from sediments entering Silver Creek as well as the loss of sediment impoundment in the reservoir. Best Management Practices (BMPs) would be implemented to reduce sediments entering into waterways during and after construction.

Indirect effects include erosion of the restoration area during future precipitation events and transportation of sediment into Tibble Fork Reservoir.

If Tibble Fork Reservoir were decommissioned downstream, cumulative effects to the streams could occur from the addition of sediment in the American Fork River and Utah Lake.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitating the dam would continue to trap sediment from flowing downstream such that there would be no change from the existing condition. The dam would regulate the release of flows aside from events that flow over the spillway. Direct and potential indirect impacts would be related to soil disturbance and potential sediment entering Silver Creek during construction. Raising the auxiliary spillway 2.5 feet would increase the reservoir sediment storage capacity extending the life of the dam for 71 years starting in 2017 with an additional 44 ac-ft set aside for sediment accumulation. Improvements to the Silver Lake Flat Road would be conducted, as needed to provide heavy machinery and truck access to the site (refer to Table 6-1 (Silver Lake Flat Road). Road improvements may include regrading the surface, paving with asphalt, adding guard rails, signage, and providing stormwater drainage according to USFS road improvement guidelines. BMPs for dam rehabilitation and road improvements would be implemented to reduce sediments entering into waterways during and after construction.

4.3.1 Landslides

No Action
Direct effects from the failure of the dam would potentially create new landslides within the Silver Creek and American Fork Canyons. The existing landslide adjacent to the spillway would be reactivated and intensified. There would be no effects to the slump area on Silver Lake Flat Road since it is located in a separate drainage.

Based on future projects and management by the UWCNF, there could be cumulative effects within the downstream canyons over time from continued erosion in landslide areas until they are stabilized.

Dam Decommissioning
The existing landslide adjacent to the spillway would be stabilized in connection with the stabilization of the dam breach. Road stabilization features including gravel installation and reshaping the road for proper drainage would be installed in the slump area on Silver Lake Flat Road. These measures would provide beneficial direct effects and would protect the existing slump and road banks from further erosion.

There would be no indirect or cumulative effects from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
The landslide adjacent to the spillway would be partially stabilized from the installation of the new fill and drainage system on the downstream embankment and new spillway. Road stabilization features including gravel installation and reshaping the road for proper drainage would be installed in the slump area on Silver Lake Flat Road. These measures would protect the road banks from further erosion and provide beneficial direct effects.

There would be no indirect or cumulative effects to the landslide adjacent to the spillway or slump on the access road from dam rehabilitation.

4.4 Surface Water

No Action
Dam failure would send a large volume of water and stored sediment through the Silver Creek and American Fork Canyons over a very short period of time. Surface water quality would be directly negatively affected from erosion of the dam fill material, upland soils, and destruction of vegetation violating federal and state water quality rules and regulations.

Indirect effects would include bed and bank erosion to the channel of Silver Creek and the American Fork River from gradual erosion until the banks channel becomes stabilized over time. Flows in Silver Creek would also be indirectly affected during the summer months from the elimination of a constant outlet flow from the reservoir as regulated by the NUCWCD.

Indirect and cumulative effects due to dam failure would result in large amounts of water flowing down Silver Creek, Tibble Fork Reservoir, and within the American Fork Canyon. The effects would likely affect residents and businesses in the cities of Alpine, Highland, American Fork, and Lehi near the mouth of the canyon.

Dam Decommissioning

This would include excavating a breach in the dam and constructing a new channel to allow unobstructed flow through the reservoir in Silver Creek. Excavation would result in direct and potentially indirect effects to surface water from sediments entering Silver Creek during construction and until the edge of the stream is stabilized. The sediment generated by the watershed would no longer be trapped behind the dam and would be transported downstream in Silver Creek potentially decreasing surface water quality potentially violating the federal and state water quality rules and regulations. This action could also result in the restoration of a natural sediment transport regime and channel maintenance processes in the reach between the two dams. Sediment may also be conveyed downstream to Tibble Fork Reservoir causing it to fill with sediment at faster rates. BMPs would be implemented to reduce sediments from entering the creek, to the extent possible, to protect surface water.

This alternative would not provide for irrigation storage or flood control. The lack of flood control could likely result in property damage downstream. Flows in Silver Creek would also be indirectly affected during the summer months from the elimination of a constant outlet flow from the reservoir as regulated by the NUCWCD.

Indirect and cumulative effects related to downstream flooding, as well as the need for irrigation storage in the watershed. may result in DWR condemning the structure.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway

Rehabilitating the dam would not alter surface water quality or sedimentation from existing conditions at the reservoir. The reservoir would continue to trap sediment (0.63 ac-ft/year) flowing downstream and keep it from adding to sediment accumulation in Tibble Fork Reservoir downstream over the 71 year extension of the dam life. The replacement of the spillway with the capacity to pass the PMP would result in a beneficial impact from the stabilization of the dam during high volume flood events.

Direct and potential indirect impacts would be related to soil disturbance and potential sediment entering Silver Creek during construction. Temporary impacts to water delivery for one year would occur in 2014 from dam rehabilitation activities. Construction would require that the reservoir is drained throughout the irrigation season for dam safety purposes. This would result in a loss of 976 ac-ft (441.6 cfs) of irrigation water for one full season.

Mitigation measures and project design elements, including BMPs will be used (USFS, 2012), at the Silver Lake Flat site and access road would be implemented to reduce sediments from entering Silver Creek, flowing downstream and violating any federal or state water quality rules and regulations. The dam rehabilitation would also meet Utah antidegredation requirements.

Indirect and cumulative effects related to water quality due to replacement of either spillway options would be minimal, as long as BMP are in place.

4.5 Vegetation

No Action
Failure of the dam would send a large volume of water down the Silver Creek canyon into the American Fork Canyon. This discharge of water would directly negatively affect vegetation within the flow path by destroying tree, shrub and herbaceous plant species. If present within the canyons downstream of the dam, special status plants would also most likely be destroyed. Excessive amounts of sediment would be anticipated to settle out in the canyon covering small vegetative species and creating unsuitable growing conditions for vegetation.

This disturbance would indirectly and cumulatively increase the potential for noxious weed and invasive plant species to establish within the inundation area.

Dam Decommissioning
The reservoir area below the full pool would be restored using native plants to match existing plant communities surrounding the reservoir. Until the revegetated areas are established, the potential for noxious weeds and invasive plant species to establish would be dramatically increased. During construction and until the restoration area is fully established, it would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species.

Decommissioning of the dam would not have indirect or cumulative effects on the existing vegetation or special status plants within the vicinity of the reservoir.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitation of the dam would require clearing a width of approximately 25 feet of aspen and conifer trees at the downstream toe of the dam to allow for additional structural fill placement and for dam safety purposes. An additional width of 25 feet of trees would be cleared on the left abutment in the spillway location (approximately 0.5 acres) for the Rehabilitate Dam – Left Abutment Closed Spillway alternative. These trees would be cut and either given to the USFS for use in other UWCNF restoration projects or chipped on-site and spread on the disturbed portions of the site to protect the bare ground from erosion until native vegetation reestablishes. No vegetation would be allowed to grow on the dam for dam safety purposes. There are no special status plant species documented to occur within the clearing limits for dam rehabilitation. Thus, there would be no effect to special status plant species.

Vegetation disturbed from construction activities outside of the dam rehabilitation footprint would be restored using native plant species. During construction and until the restoration area is fully established, it would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the project site, eradicating them before the start and during construction as discovered, and routine monitoring after construction completion.

The typical vegetation community within the dam rehabilitation area consists of mature conifer and deciduous trees downstream of the dam and along the edge of the reservoir. Approximately 5 acres of wildlife habitat would be permanently cleared to account for the increase in dam size, safety zone at the base of the dam and the 2.5-foot raise in water surface elevation. Additional vegetation would be cleared for the installation of the seepage monitoring system downstream of the right abutment (0.35 acres). This area is primarily composed of shrub (alder and willow) and emergent (sedge) wetland plants. Trees and shrubs would be completely removed and the area would be replanted or seeded.

Mitigation would include avoidance, minimization, and/or compensation.
There is expected to be no cumulative effects to vegetation from either dam rehabilitation alternative.

4.6 Streams and Wetlands

No Action
Stream and wetland resources downstream of the dam would be indirectly affected by the failure of the dam. The stream channel would be altered and wetlands may be washed away or filled in from sediment deposition. Wetland A at the seepage monitoring area would dry up from the elimination of the reservoir resulting in approximately 0.5 acres of wetland loss.

Cumulative effects due to dam failure would result in large amounts of water, effecting wetlands and stream channels downstream.

Dam Decommissioning
Removal of the dam would directly eliminate 45 acres of seasonal deepwater habitat created by the impoundment of water in the reservoir at full pool. Removal of a portion of the dam would restore approximately 2,500 feet of Silver Creek stream channel. Wetland A at the seepage monitoring area would dry up from the elimination of the reservoir resulting in approximately 0.5 acres of wetland loss.

New wetland features may indirectly be created from the removal of the dam.

There are no cumulative effects anticipated from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
There would be a direct loss of approximately 170 feet of stream in Silver Creek below the dam outlet from the expansion of the dam. When the reservoir is at full pool level, there would be approximately 20 feet inundated upstream of the reservoir from the increase in full pool reservoir elevation. Raising the auxiliary spillway 2.5 feet would directly increase the deepwater habitat area in the reservoir to 46.8 acres when the water surface elevation is at full pool. During construction, water would be diverted over the dam so that a large pool does not form in the reservoir and construction may be performed in the dry. This would also keep Silver Creek from running dry during the summer months.

Wetland A would have approximately 0.2 acres of permanent loss from the installation of the seepage collection system. The upper portion of the slope wetland would be excavated and filled with impermeable material to a depth up to 12 feet. This would block all water from flowing subsurface downslope and prevent day-lighting naturally. As a result, the northwestern portion of Wetland A downstream of the collection trench would completely dry up and revert to upland conditions. Water would be discharged from the end of the collection pipe back into the southwestern portion of the wetland and the portion of Wetland A not downstream of the collection trench would not be altered.

Stream and wetland resources would not experience any indirect or cumulative effects from dam rehabilitation.

4.7 Fish

No Action
Failure of the dam would result in direct negative effects from water draining the reservoir very quickly along with any fish present. Silver Lake Flat is stocked with Brook trout and Rainbow trout on an annual basis. Arctic grayling are stocked in Silver Lake and are presumed to migrate down to Silver Lake Flat Reservoir. Bonneville cutthroat trout have also been documented to occur in this drainage and may be present in Silver Creek. A surge of water from dam failure would destroy fish habitat within Silver Creek and the American Fork River.

Sediment deposition within the canyons would most likely destroy suitable fish habitat for many years following the canyon inundation resulting in indirect negative impacts.

Failure of the dam would result in indirect and cumulative effects to fish resources.

Dam Decommissioning
Decommissioning of the dam would remove the lake habitat and return the reservoir to stream channel habitat. The reservoir is stocked by the Utah Department of Wildlife Resources with fish adapted for both lake and stream environments. Displaced fish from the lake would cause in increase in Silver Creek which could result in a reduction of available resources decreasing habitat quality. Fish would be salvaged and transplanted downstream of the dam prior to the start of the dam breach. Water in Silver Creek would be pumped/bypassed around the dam during construction so that Silver Creek downstream of the dam does not become dry. There would be no negative effects to special status fish species and the Bonneville cutthroat trout would experience a beneficial effect from the reconnection of Silver Creek through the reservoir.

Indirect effects include the elimination of the fishery from the watershed which may put stress on other fisheries in the area.

There are no cumulative effects anticipated from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitation of the dam would not have direct, indirect, or cumulative effects to fish species over the long term for the project. During construction in 2014, the reservoir would not be stocked by the Utah Department of Wildlife Resources. Fish present in the reservoir would be salvaged and transplanted downstream of the dam or into Tibble Fork Reservoir once the water level is lowered to the low-level outlet and prior to the start of the dam rehabilitation. Water in Silver Creek would be pumped/bypassed around the dam during construction so that Silver Creek downstream of the dam does not become dry and negatively impact fish. A screen would also be placed upstream of the reservoir to prevent fish from swimming downstream to the pump/bypass system and becoming entrained. There would be no effect to special status fish species

There are no cumulative effects anticipated from dam rehabilitation.

4.8 Wildlife

No Action
Dam failure would result in a large volume of water sent down Silver Creek canyon and American Fork Canyon. Any wildlife located within the boundary of the inundation area would be dispersed, injured or killed. Wildlife habitat would be destroyed including trees, rocks, meadows, and riparian areas. Special status species, MIS and their associated habitat outlined in Tables 2-4 and 2-5 would also potentially be directly and indirectly affected from the failure of the dam.

Failure of the dam would result in indirect and cumulative effects to wildlife.

Dam Decommissioning
Decommissioning of the dam would permanently remove the lake habitat that currently exists at the reservoir. Removal of this habitat would directly negatively affect wildlife that utilizes lake environments such as birds and herptiles. However, removal of the dam and reservoir would remove a migration barricade for mammals in the area. There is no removal of vegetation that wildlife would use for habitat

expected as part of decommissioning of the dam. Temporary direct construction effects would include wildlife dispersal from the area during construction from May through November in 2014. Dispersal of wildlife from the area surrounding Silver Lake Flat Dam is not expected to adversely affect wildlife in the area. Special status species, MIS, and their associated habitat outlined in Tables 2-4 and 2-5 would also potentially be directly and indirectly affected from the removal of the reservoir.

There are no cumulative effects anticipated from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitation of the dam would directly and indirectly affect wildlife species during construction from May through October in 2014. Temporary direct construction effects would include wildlife dispersal from the area surrounding Silver Lake Flat Dam; however, this dispersal is not expected to adversely affect wildlife in the area. Special status species and MIS outlined in Tables 2-4 and 2-5 would be temporarily experience direct and indirect effected during construction. There would be no permanent direct, indirect or cumulative effects to these wildlife species after construction is complete.

Wildlife habitat within the dam rehabilitation area consists of mature conifer and deciduous trees downstream of the dam and along the edge of the reservoir. Approximately 5 acres of wildlife habitat would be permanently cleared to account for the increase in dam size, safety zone at the base of the dam and the 2.5-foot raise in water surface elevation. Additional wildlife habitat would be cleared for the installation of the seepage monitoring system downstream of the right abutment (0.35 acres). This area is primarily composed of shrub and emergent wetland plants that support reptile and herptile species. Habitat in this seepage monitoring system area would be completely removed and a portion Wetland A located in this area would be converted to upland. Construction activities are not expected to impact large amounts of habitat within the UWCNF to cause a loss of occupancy by special status species or MIS.

4.9 Threatened and Endangered Species

A review of the USFWS ESA list for Utah County dated April 2, 2013 (USFWS 2013) was performed within the vicinity of Silver Lake Flat Dam. This review identified species that historically or currently use habitat or could potentially migrate into the area. Table 2-6 identifies the ESA listed species in Utah County. An additional review and analysis of these species identified that the Bonytail, Colorado pikeminnow, Humpback chub, Razorback chub, clay phacelia, and Deseret milkvetch are not expected to occur within the vicinity of the project area due to lack of suitable habitat. There would be No Effect to the species or their critical habitat from implementation of any of the alternatives.

No Action
The Action Area for the dam failure alternative that relates to ESA listed fish and plant species is defined as the inlet to Silver Lake Flat Reservoir on Silver Creek down to Utah Lake which is in the dam breach inundation zone. The Action Area for the dam failure alternative that relates to ESA listed bird species is defined as the dam breach inundation zone and a 0.5 mile radius around the project site. The 0.5 mile buffer signifies the extent that general construction noise can travel until it typically reaches background levels.

The June sucker and the Least chub have not been documented to occur and are not expected to be present within Silver Creek or Silver Lake Flat Reservoir; therefore, failure of the dam would have No Effect on these species or critical habitat designated for the June sucker. There is no critical habitat designated for the Least chub.

Ute ladies-tresses has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (vegetated wetland meadows); therefore, failure of the dam would have No Effect on Ute ladies-tresses.

The Canada lynx has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (montane coniferous forest) and suitable prey base (snowshoe hares); therefore, failure of the dam would have No Effect on the Canada Lynx or critical habitat designated.

The greater sage-grouse has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (sagebrush); therefore, failure of the dam would have No Effect on the greater sage-grouse.

The yellow-billed cuckoo has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (unfragmented large space riparian areas); therefore, failure of the dam would have No Effect on the yellow-billed cuckoo.

Dam Decommissioning

The Action Area for the dam decommissioning alternative that relates to ESA listed fish and plant species is defined as the inlet to Silver Lake Flat Reservoir on Silver Creek down to the inlet of the American Fork River into Tibble Fork Reservoir. The Action Area for the Dam Decommissioning alternative that relates to ESA listed bird species is defined as a 0.5 mile radius around the project site. This buffer signifies the extent that general construction noise can travel until it typically reaches background levels.

The June sucker and the Least chub have not been documented to occur and are not expected to be present within Silver Creek or Silver Lake Flat Reservoir; therefore, decommissioning of the dam would have No Effect on these species or critical habitat designated for the June sucker. There is no critical habitat designated for the Least chub.

Ute ladies-tresses has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (vegetated wetland meadows); therefore, decommissioning of the dam would have No Effect on Ute ladies-tresses.

The Canada lynx has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (montane coniferous forest) and suitable prey base (snowshoe hares); therefore, decommissioning of the dam would have No Effect on the Canada Lynx or critical habitat designated.

The greater sage-grouse has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (sagebrush); therefore, decommissioning of the dam would have No Effect on the greater sage-grouse.

The yellow-billed cuckoo has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (unfragmented large space riparian areas); therefore, decommissioning of the dam would have No Effect on the yellow-billed cuckoo.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway

The Action Area for the rehabilitate dam alternatives that relates to ESA listed fish and plant species is defined as the inlet to Silver Lake Flat Reservoir on Silver Creek down to the inlet of the American Fork

River into Tibble Fork Reservoir. The Action Area for the Rehabilitate Dam alternatives that relates to ESA listed bird species is defined as a 0.5 mile radius around the project site. This buffer signifies the extent that general construction noise can travel until it typically reaches background levels.

The June sucker and the Least chub have not been documented to occur and are not expected to be present within Silver Creek or Silver Lake Flat Reservoir; therefore, rehabilitation of the dam would have No Effect on these species or critical habitat designated for the June sucker. There is no critical habitat designated for the Least chub.

Ute ladies-tresses has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (vegetated wetland meadows); therefore, rehabilitation of the dam would have No Effect on Ute ladies-tresses.

The Canada lynx has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (montane coniferous forest) and suitable prey base (snowshoe hares); therefore, rehabilitation of the dam would have No Effect on the Canada Lynx or critical habitat designated.

The greater sage-grouse has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (sagebrush); therefore, rehabilitation of the dam would have No Effect on the greater sage-grouse.

The yellow-billed cuckoo has not been documented to occur and is not expected to be present within the vicinity of Silver Creek or Silver Lake Flat Reservoir due to the lack of suitable habitat (unfragmented large space riparian areas); therefore, rehabilitation of the dam would have No Effect on the yellow-billed cuckoo.

4.10 Cultural/Historic Resources

Utah SHPO consultation is being performed to obtain concurrence that there would be No Effect to resources. In the event that cultural/archeological resources are found during construction activities, construction would stop and the appropriate agencies would be notified according to NRCS protocol.

No Action
There are no cultural/historical resources within the surveyed area; thus, there would not be any direct, indirect or cumulative effects from the failure of the dam.

Dam Decommissioning
There are no cultural/historical resources located in the project area. Utah SHPO consultation is being performed to obtain concurrence that there would be No Effect to resources. In the event that cultural/archeological resources are found during construction activities, construction would stop and the appropriate agencies would be notified.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
There are no known cultural/historical resources located in the project area. Dam rehabilitation is expected to have no effect on historical structures, places or sites or potentially eligible archeological sites.

4.11 Land Use and Recreation

No Action
If the dam fails, there would be direct negative effects to recreation within the American Fork Canyon. Trails, trailheads, campgrounds, summer homes, horse transfer stations, parking areas, reservoirs, and the Timpanogos Cave National Monument would be temporarily closed until repairs were completed to roads, structures and infrastructure.

Cumulative effects may include the reduction of commerce in the Utah Lake valley resulting in decreased revenue for recreation based businesses.

Dam Decommissioning
Decommissioning the dam would consist of permanent direct impacts to the area.

Trails: There would be no impacts to the Silver Lake Trail No. 036, Deer Creek-Dry Creek Trail No. 043, and Box Elder Trail No. 044. The Silver Lake Flat Connector Trail No. 045 runs up a canyon to Silver Lake Flat Dam. The northern end of this trail travels up the side of the dam and exits on top of the dam. The portion of the trail on the dam would be permanently closed or rerouted.

Trailheads: There would be no direct or cumulative impacts to trailheads. Indirect effects would include increased travel time for recreationists to the Silver Lake Trailhead due to construction vehicle flaggers regulating the flow of traffic as described in Chapter 4.13.

Campgrounds: There would be no direct or cumulative impacts to campgrounds. Indirect effects would include increased travel time for campers to the campground from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic as described in Chapter 4.13. The campgrounds along American Fork Canyon Road would experience increases in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas.

Summer Homes: The 13 private residences in the Silver Lake Summer Homes area would not experience direct or cumulative impacts from dam rehabilitation. Indirect effects would include increased travel time for residents to their homes from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic as described in Chapter 4.13. The drinking water supply pipe buried in the dam would be relocated as part of dam decommissioning. A new connection would be made around the dam so that water is supplied to the summer homes.

Horse Transfer Station: The horse transfer station located off of Granite Flat Campground Road would be used as a staging area during construction. This station would be completely closed to the public during construction and horse recreationists would be directed to use the Tibble Fork parking area. Any damage incurred to this area would be restored back to pre-construction conditions or better upon construction completion.

There would be no indirect or cumulative impacts to the horse transfer station.

Parking Areas: The Tibble Fork parking area would directly experience an increase in traffic from construction vehicles and dump trucks during construction as well as public parking from the closure of the horse transfer station. The dispersed parking area on the west side of Silver Lake Flat Reservoir would be used for a staging area during construction. This parking area would be completely closed to the public during construction.

The dispersed parking area on the north side of Silver Lake Flat Reservoir would also be used for a staging area during construction. This parking area would be completely closed to the public during construction and modified to allow the staging of construction equipment and materials. Any damage incurred to this parking area would be restored back to pre-construction conditions or better upon construction completion.

There would be no indirect or cumulative impacts to parking areas.

Reservoirs: Silver Lake Flat Reservoir would be permanently drained resulting in direct negative impacts to recreation. The removal of the reservoir would indirectly cause an increase in public use at Tibble Fork Reservoir. Tibble Fork Reservoir and Silver Lake would not experience impacts from construction activities.

There would be no cumulative impacts to reservoirs.

National Monuments: The Timpanogos Cave is located on the American Fork Canyon Road approximately five miles down the road from Silver Lake Flat Dam. This area would experience indirect effects from the increase in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in this area and would also be prohibited to use noise making compression brakes within ½ mile of the monument.

There would be no direct or cumulative impacts to national monuments.

Day-Use Sites: These areas would experience indirect effects from the increase in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas.

There would be no direct or cumulative impacts to day-use sites.

Recreation Opportunity Spectrum: There would be direct negative impacts to recreation from the elimination Silver Lake Flat Reservoir.

There would be no indirect or cumulative impacts to the ROS.

Visual Quality Objectives: There would be direct negative impacts to the VQO parameters outlined by the UWCNF (USFS 2002b) as a result of the loss of lake aesthetics and the appearance of exposed bare reservoir shoreline.

There would be no indirect or cumulative impacts to VQO.

Holidays: The UWCNF experiences increased numbers of recreationists during holidays and weekends. Construction would limit direct effects by not occurring during official holidays including Memorial Day, 4th of July, Pioneer Day and Labor Day and would be limited to weekdays (Monday through Friday) only.

There would be no indirect or cumulative impacts to holidays.

<u>Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway</u>
Rehabilitation of the dam would consist of temporary direct impacts from May through November in 2014. There would be no direct, indirect, or cumulative effects to land use from dam rehabilitation. Overall, recreationists would not be allowed to use the areas listed in this section since they would be

closed or restricted during construction. Recreationists would be displaced primarily to the Tibble Fork Reservoir area or would not recreate in the North American Fork watershed basin.

Trails: There would be no direct, indirect or cumulative impacts to the Silver Lake Trail No. 036, Deer Creek-Dry Creek Trail No. 043, and Box Elder Trail No. 044.

The Silver Lake Flat Connector Trail No. 045 runs up a canyon to Silver Lake Flat Dam. The northern end of this trail travels through the seepage monitoring area and up the side of the dam and exits on top of the dam. The portion of the trail in the seepage monitoring area and on the dam would be closed during construction in that specific area and would be rehabilitated upon construction completion. Rehabilitation may consist of stabilizing the trail to USFS standards so that horses do not cause future erosion on the side of the dam, can safely pass through both of these areas, and stay out of the seepage monitoring area. There would be no indirect or cumulative impacts to Silver Lake Flat Connector Trail No. 045.

Trailheads: There would be no direct, indirect or cumulative impacts to trailheads.

Campgrounds: There would be no direct or cumulative impacts to Granite Flat Campground. Indirect effects would include increased travel time for campers to the campground from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic as described in Chapter 4.13. The campgrounds along American Fork Canyon Road would experience increases in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas.

Summer Homes: The 13 private residences in the Silver Lake Summer Homes area would not experience indirect or cumulative impacts from dam rehabilitation. Direct effects would include increased travel time for residents to their homes from Tibble Fork Reservoir due to construction vehicle flaggers regulating the flow of traffic as described in Chapter 4.13. The drinking water supply buried in the dam would be relocated as part of dam construction actions. A bypass connection would be made around the dam so that water is supplied to the summer homes during construction. A temporary water outage would occur during bypass connections but coordination would be performed with the Silver Lake Summer Homes Homeowners Association so that water supply is only interrupted for the minimum time period required.

Horse Transfer Station: The horse transfer station located off of Granite Flat Campground Road would be used as a staging area during construction. This station would be completely closed to the public during construction and horse recreationists would be directed to use the Tibble Fork parking area. Any damage incurred to this area would be restored back to pre-construction conditions or better upon construction completion.

There would be no indirect or cumulative impacts to the horse transfer station.

Parking Areas: The Tibble Fork parking area would directly experience an increase in traffic from construction vehicles and dump trucks during construction as well as public parking from the closure of the horse transfer station. The dispersed parking areas on the west and north side of Silver Lake Flat Reservoir would be used for staging areas during construction. These parking areas would be completely closed to the public during construction. The 2.5-foot raise of the reservoir water surface would possibly inundate portions of the west side parking area at full pool. This parking area would be raised five feet upon construction completion.

There would be no indirect or cumulative impacts to parking areas.

Reservoirs: Silver Lake Flat Reservoir would be drained during construction and water would be pumped around the dam during modifications to the low-level outlet gates and outlet. The public would not be allowed to enter the reservoir area during construction. The temporary closure of the reservoir would indirectly cause an increase in public use at Tibble Fork Reservoir.

There would be no cumulative impacts to reservoirs.

National Monuments: The Timpanogos Cave is located on the American Fork Canyon Road approximately five miles down the road from Silver Lake Flat Dam. This area would experience indirect effects from the increase in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in this area and would also be prohibited to use noise making compression brakes within ½ mile of the monument.

There would be no direct or cumulative impacts to national monuments.

Day-Use Sites: These picnic areas would experience increases in construction traffic during the day possibly elevating the level of traffic congestion. Construction equipment and dump trucks would reduce speeds in these areas.

There would be no direct, indirect or cumulative impacts to day-use sites.

Recreation Opportunity Spectrum: There would be no direct effects to the ROS parameters outlined by the UWCNF (USFS 2002a and 2002c).

There would be no indirect or cumulative impacts to the ROS.

Visual Quality Objectives: There would be no direct effects to the VQO parameters outlined by the UWCNF (USFS 2002b).

There would be no indirect or cumulative impacts to VQO.

Holidays: The UWCNF experiences increased numbers of recreationists during holidays and weekends. Construction would limit direct effects by not occurring during official holidays including Memorial Day, 4th of July, Pioneer Day and Labor Day.

There would be no indirect or cumulative impacts to holidays.

4.12 Air Quality/Noise/Light

No Action

Air quality/noise/light resources would experience temporary direct and indirect effects from emergency services responding to the incidents as well as cleanup services which would create additional emissions, noise and light. However, these effects are expected to be negligible in nature.

There would be no cumulative effects to air quality, noise or light from the failure of the dam.

Dam Decommissioning

Dam decommissioning would involve the direct use of heavy construction equipment and would require trucks for hauling and disposal of material. These activities would temporarily adversely affect air quality and generate additional noise and light in the project area. Activities would be limited to the normal

working hours during daylight hours only. BMPs would be implemented to reduce the release of fugitive dust from the project area.

There would be no indirect or cumulative effects to air quality, noise or light from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Dam rehabilitation would involve the direct use of heavy construction equipment and would require trucks for hauling and disposal of material. These activities would temporarily adversely affect air quality and generate additional noise and light in the project area. BMPs would be implemented to reduce the release of fugitive dust from the project area.

There would be no indirect or cumulative effects to air quality, noise or light from dam decommissioning.

4.13 Transportation/Infrastructure

No Action
Transportation and infrastructure would be temporarily directly and indirectly impacted from the failure of the dam. The American Fork Canyon and North American Fork Canyon Roads would be closed until repairs were completed to reconstruct the roads. This negative impact would impact transportation up and through the American Fork Canyon during the summer months when the road is open for travel. The USFS would not be able to access or maintain this portion of their forest and there would be lost revenue from the lack of vehicle entrance fees into the UWCNF. This loss of recreation travel on these roads could indirectly negatively impact the surrounding communities of Alpine, Highland and American Fork from a decrease in vehicle traffic. The loss of safe access during a dam failure could also negatively impact emergency services from accessing injured public in the local communities.

There would be no cumulative effects to transportation/infrastructure from dam failure.

Dam Decommissioning
Decommissioning of the dam would directly increase the number of construction equipment transportation vehicles and dump trucks that travel on the American Fork Canyon, North American Fork Canyon, Granite Flat Campground, and Silver Lake Flat Roads. This extra vehicular traffic on these roads would extend for one season. This increase in construction traffic would be temporary but may deter the general public from traveling on these roads during days of construction operation. Any improvements to roads to allow for construction equipment access to Silver Lake Flat Dam would be left in-place upon construction completion. Flaggers would be utilized to control construction traffic, as well as traffic from the general public, starting at the Tibble Fork parking area, past the dam and up to the northern side of the reservoir. A Traffic Control Plan would be prepared in coordination with the USFS to address construction related traffic within the UWCNF.

Indirect effects would include the decrease of vehicular traffic after dam decommissioning is complete and the reservoir is no longer present. This loss of recreation travel on these roads could also indirectly negatively impact the surrounding communities of Alpine, Highland and American Fork from a decrease in vehicle traffic.

There would be no cumulative effects to transportation/infrastructure from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitation of the dam would be performed starting in May and ending in November of 2014, pending weather conditions. Preliminary estimates indicate that around 20 trucks per day (6 days a week) mostly during daylight hours would be required at the site during the life of the project rehabilitation in order to

complete the project in the 2014 construction season. Allowing construction and truck travel 6 days per week would allow the project to be constructed in one season instead of two reducing the impacts to transportation and recreation in the vicinity of Silver Lake Flat Dam.

Direct short-term temporary impacts are expected from vehicular traffic increase from construction equipment transportation vehicles and dump trucks that travel on the American Fork Canyon Road, North American Fork Canyon Road, Granite Flat Campground Road, and Silver Lake Flat Road. This increase in construction traffic would be temporary but may deter the general public from traveling on these roads during days of construction operation. The improvement to the Silver Lake Flat access road would be left in-place for the long-term which would result in a beneficial impact which may attract additional traffic once the dam rehabilitation is complete. Any other upgrades to roads to allow for construction equipment access to Silver Lake Flat Dam would be left in-place upon construction completion also. Upon project completion, vehicle traffic may increase to the Silver Lake Flat area resulting in indirect effects to the surrounding UWCNF.

Flaggers would be utilized to control construction traffic, as well as traffic from the general public, starting at the Tibble Fork parking area, past the dam and up to the northern side of the reservoir. A Traffic Control Plan would be prepared in coordination with the USFS to address construction related traffic within the UWCNF.

4.13.1 Roadless Area

No Action
There would be no direct, indirect or cumulative effects to roadless areas in the immediate vicinity of the project if the dam failed.

Dam Decommissioning
There would be no direct, indirect or cumulative effects to roadless areas in the immediate vicinity of the project if the dam were to be removed.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
A temporary construction access road would be constructed within the roadless area to allow construction access to the seepage monitoring area as depicted in Appendix B-Figure 7. The construction of a temporary road is allowed in a Roaded Modified Area of the UWCNF (USFS 2003a and 2003b). This road would require clearing vegetation (0.35 acres) and establishing a stabile surface to drive equipment on in order to install the seepage monitoring system for approximately 325 feet. The general public would not be allowed to travel on this temporary road. Upon construction completion, this road would be decommissioned and it would be classified as an area without any "improved road maintained for travel by standard passenger type vehicles" to stay in compliance with the Uinta National Forest Land and Resource Management Plan (USFS 2003a).

Impacts to roadless areas must be analyzed using nine characteristics according to the Uinta National Forest Land and Resource Management Plan (USFS 2003a). This analysis is presented below and is a summary other sections of this chapter.

- Soil, Water, and Air: Soil within the seepage monitoring area would be excavated and replaced with drain material to collect subsurface water. Temporary improvements to allow construction traffic would be made to the ground surface. Impacts to these resources are identified in Chapters 4.2 and 4.4. There would be no disturbance to air.
- Sources of Public Drinking Water: There are no sources of public drinking water within the roadless modification area.

- Diversity of Plant and Animal Communities: Impacts to plant and animal communities would be negligible and modifications to the roadless area would not impact their diversity.
- Primitive, Semi-Primitive Non-Motorized, and Semi-Primitive Motorized Classes of Recreation Opportunities: The creation of a road in the roadless area would be temporary and not open to the general public. The road would be decommissioned upon construction completion.
- Reference Landscapes: There would be no impact to reference landscapes within the roadless area from the creation of a temporary road.
- Landscape Character and Scenic Integrity: There would be alteration to the landscape character and scenic integrity of the area from the creation of a temporary road.
- Traditional Cultural Properties, Sacred Sites, and National Register Areas: There would be no impacts to cultural sites since there are none located in the project boundary.
- Other Locally Identified Unique Characteristics: This project would not affect the Lone Peak Wilderness Area to the west of the project area.
- Adjacency, Content, Size, and Shape: Impacts to this roadless area would be temporary and the general public would not be allowed to use this area. There would be no noticeable long-term impacts to the adjacency, content, size, and shape of the overall roadless area.

There are no indirect or cumulative effects to this roadless area from the installation of the temporary access road.

4.14 Socioeconomics

No Action

Dam failure could result in economic hardship with the potential loss-of-life and loss-of-land from the surge of water down the American Fork Canyon and into the cities of Alpine, Highland and American Fork. Potential interruption in agriculture irrigation would occur to the Utah Lake valley and direct and indirect impacts would occur in the form of economic hardship from the loss or reduction of crops, buildings, and businesses.

Cumulative effects may include the reduction of commerce in the cities of Alpine, Highland and American Fork resulting in non-flood impacted businesses to experience a decrease in revenue.

Dam Decommissioning

Decommissioning the dam would include excavating a breach in the dam and constructing a new channel to allow unobstructed flow through Silver Creek which would temporarily increase employment in the area for one year. However, there would be negative direct and indirect impacts from the loss of irrigation to agricultural lands in the Utah Lake valley. The loss of agricultural productivity from the decrease in available irrigation water could decrease the economic profitability of the agricultural businesses for farmers and ranchers that utilize the irrigation water.

Cumulative socioeconomic impacts would be incurred if irrigation to downstream agricultural lands were eliminated in the form of reduced economic business.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway

Dam rehabilitation would continue to provide direct and indirect socioeconomic benefits due to continued irrigation water supply and flood protection. Socioeconomic benefits would also be incurred due to additional employment requirements for one year during the dam rehabilitation and access road improvements. Rehabilitation of the dam would reduce the threat of the dam failing and the associated socioeconomic hardships that might occur.

There are no cumulative effects to socioeconomics from dam rehabilitation.

4.15 Demographics

No Action
Dam failure would directly jeopardize the populations of Alpine, Highland and American Fork due to the potential of dam failure.

Indirect cumulative downstream effects to downstream communities would include temporary evacuation of homes.

Cumulative effects could include the relocation of populations in the Alpine, Highland and American Fork from the dam failure event.

Dam Decommissioning
Decommissioning of the dam would remove the dam and reservoir resulting in the elimination of dam failure hazards at the Silver Lake Flat Dam. However, the downstream inhabitants would be more susceptible to direct and indirect impacts related to flooding in the American Fork Canyon from the loss of added flood storage in the reservoir.

There would be no cumulative effects to demographics from the decommissioning of the dam.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
There would be no direct, indirect or cumulative impacts to demographics from dam rehabilitation.

4.16 Land Rights

No Action
Land rights would not experience direct, indirect or cumulative effects from a potential failure of the dam.

Dam Decommissioning
The existing Special Use Permit from the USFS would be terminated that would allow the NUCWCD to operate and maintain Silver Lake Flat Dam and Reservoir within the boundary of the UWCNF. Land rights would not experience direct, indirect or cumulative effects from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
A new Special Use Permit(s) or modification to the existing permit from the USFS would be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, staging area use outside of the project footprint, and changes in use of the dam.

Land rights would not experience indirect or cumulative effects from dam rehabilitation.

4.17 Agricultural Lands

No Action
There is a small amount of agricultural land (approximately 30 acres) within the breach inundation boundary if the dam were to fail. This area would be temporarily flooded and crops may be lost for one year. Irrigation water stored in Silver Lake Flat Reservoir and Tibble Fork Reservoir would be directly eliminated resulting in a decrease of irrigation water supplied to agricultural lands. This decrease would potentially indirectly result in decreased crop yields devaluing agricultural land in the Utah Lake valley.

Cumulative effects may include the reduction of commerce in the Utah Lake Valley resulting in decreased revenue for businesses.

Dam Decommissioning
Decommissioning the dam would completely remove irrigation water storage from Silver Lake Flat Reservoir. Irrigation water stored in the reservoir would be eliminated resulting in a direct decrease of irrigation water supplied to agricultural lands. This decrease would potentially indirectly result in decreased crop yields devaluing agricultural land in the Utah Lake valley.

Cumulative effects may include the reduction of commerce in the Utah Lake Valley resulting in decreased revenue for businesses.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Agricultural lands would continue to receive the same level of irrigation water and they would not experience direct, indirect or cumulative effects from dam rehabilitation.

4.18 Aesthetics

No Action
If the dam were to fail, the reservoir would drain all water and a large notch would be eroded in the dam. This event would directly and indirectly change the aesthetic landscape of the area via the reduction of the lake. The surrounding area would consist of non-vegetated sediment that would be noticeable for more than 3 miles. Aesthetic impacts to the American Fork Canyon would be noticeable from erosion and vegetation damage.

There are no cumulative effects anticipated to aesthetics from dam failure.

Dam Decommissioning
Decommissioning the dam would consist of draining the reservoir and creating a large notch in the dam to allow unobstructed passage of Silver Creek through the reservoir. This event would directly and indirectly change the aesthetic landscape of the area via the reduction of the lake. The surrounding area would consist of non-vegetated sediment that would be noticeable for more than 3 miles until revegetation efforts have grown and blended into the surrounding landscape. This could take up to 30 years to resemble natural landscape conditions within the restored reservoir area.

There are no cumulative effects anticipated to aesthetics from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitation of the dam would consist of adding additional riprap of varying shapes (angular and round) and color (gray and whitish) to the upstream embankment, additional fill to the downstream embankment, clearing of vegetation downstream of the dam to accommodate for the additional fill, and raising the dam and reservoir 2.5 feet. There would be temporary direct effects to aesthetics from the construction on the dam and equipment from May through November in 2014. Upon construction completion, the changes in the dam and reservoir would be negligible and would likely not impact the visible character of the area.

There are no indirect or cumulative impacts to aesthetic resources from dam rehabilitation.

4.19 Public Health and Safety

No Action
The failure of Silver Lake Flat Dam would directly result in the loss-of-life. The extent of loss-of-life would depend on the time of year and day that the breach occurred.

The general public would be indirectly affected from hazardous conditions in the beach inundation area until the damage was cleaned up. This includes debris and rubble from damaged structures, excess deposits of sediment, and closed transportation and infrastructure.

There are no cumulative effects to public health and safety from dam failure.

Dam Decommissioning
Dam decommissioning would directly result in the elimination of a loss-of-life hazard to the public located in the breach inundation zone.

There are no indirect or cumulative effects to public health and safety from dam decommissioning.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
Rehabilitating the dam would reduce the hazard potential for the loss-of-life hazard to the public located in the breach inundation zone. The dam would be capable of passing the PMP event safely and would also help temporarily reduce the flood effects from the PMP event in the watershed.

There are no indirect or cumulative effects to public health and safety from rehabilitating the dam.

4.20 Past, Present and Reasonably Foreseeable Actions

Past: Silver Lake Dam upstream of Silver Lake Flat Dam was rehabilitated in summer 2012. Rehabilitation actions included stabilizing the dam structure to keep a constant water surface elevation year-round. Construction was performed by hand since Silver Lake Dam is located within the Lone Peak Wilderness area and motorized vehicles are not allowed. Equipment was transported to and from the site via helicopter for one day at the beginning and one day at the end of construction. This project did not have any impacts on Silver Lake Flat Dam or Reservoir.

Present: There are no projects presently occurring within the vicinity of Silver Lake Flat Dam that could impact the rehabilitation of the dam.

Future: Tibble Fork Dam downstream of Silver Lake Flat has been identified as not meeting current NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (NRCS 2005) associated with a high hazard (Class "C") dam. NRCS is currently in the process of developing a conceptual design and preparing a Draft Plan-EA for the project. Construction is expected to occur in 2016.

4.21 Risk and Uncertainty

A variety of factors contribute to the potential for dam failure, including the intensity of a storm event, construction materials and techniques, and operation and maintenance (O&M) activities. Silver Lake Flat Dam has operated for 42 years with few problems and the NUCWCD has a great record in performing maintenance as needed and operating the dam as designed. There is no unusual risk or uncertainty that Silver Lake Flat Dam would not continue to operate as intended. Dams are inherently hazardous

structures, but with continued maintenance, it should continue to provide irrigation storage with indicentdal benefits to flood protection, sediment retention, and recreation for 71 years starting in 2017.

Estimating project costs and benefits involves a certain degree of risk and uncertainty. Since the project is located in the UWCNF, land use is not expected to change from existing conditions as described in the Uinta National Forest Land and Resource Management Plan (USFS 2003a). During the aging dam rehabilitation planning process, decisions are made with information that is uncertain including errors in measurements and climatic changes that could alter rainfall storm events. Assumptions made during the planning process are based on the best available science, technology and information. Extended delays between the planning process and construction increase the degree of risk and uncertainty. Estimated project costs are based on computed work quantities multiplied by the appropriate unit cost for that type of work. Unit costs are based on current market prices from similar projects. Costs can be influenced by economic factors that cannot be predicted between the planning process and construction that could increase the actual cost and decrease the availability of materials.

Economic benefits from projects are based on material values of floodplain property, infrastructure and agricultural land. Such property is expected to become more valuable in the future but it can be difficult to predict future economic conditions. There is also uncertainty in estimating the social and environmental costs associated with each alternative because interested party values, judgments and opinions may shift over time.

4.22 Summary of Adverse Environmental Impacts and Mitigation Measures

Mitigation includes all measures undertaken to avoid, minimize, or compensate for potential adverse environmental impacts. This section briefly discusses mitigation for impacts to jurisdictional waters of the U.S. but does not include specific compensatory mitigation requirements for impacts to these waters.

No Action

Soils: Soils within the breach inundation zone would be stripped and deposited further downstream. Removal of these soils downstream would be required during cleanup and disposed at an appropriate location.

Water Quality: A temporary surge of sediment laden water would be flushed down Silver Creek and the American Fork River. There is no mitigation proposed for this temporary decrease of water quality.

Vegetation: Vegetation would be cleared and damaged in the breach inundation zone. Mitigation would consist of replanting vegetation in the damaged areas using USFS approved plant species.

Streams and Wetlands: Streams and wetlands within the breach inundation zone would be impacted to varying extents. Coordination with the USACE would be performed to determine if compensatory mitigation would be required for impacts to jurisdictional waters of the U.S.

Recreation: The American Fork Canyon area would be closed for cleanup activities. There would be no mitigation proposed for displacement to recreationists. Mitigation for impacts to recreation facilities would be determined on a case-by-case basis and would consist of restoring the facilities to pre-flood conditions or better.

Transportation/Infrastructure: Roads would be damaged within the breach inundation zone. Mitigation for impacts to transportation/infrastructure would be determined on a case-by-case basis and would consist of restoring roads to pre-flood conditions or better.

Aesthetics: Dam failure would alter the scenic view from a lake landscape to a drained reservoir landscape. The area would be revegetated with native vegetation to match the existing forest. There is no mitigation proposed to offset the change from a lake to a forest landscape.

Public Health and Safety: Based on PAR and calculated loss-of-life estimated, a small population in the breach inundation area would be susceptible to fatality. Mitigation for a loss-of-life would be determined on a case-by-case basis.

Dam Decommissioning

Soils: Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Proper BMPs would be installed so prevent and control soil erosion.

Suitable growing medium may be imported to the reservoir for plant species to become established.

Vegetation: Vegetation would be installed in the drained reservoir area to restore the area to pre-dam conditions. Plant species would match the surrounding communities, as approved by USFS, and would consist of tree, shrub, and herbaceous species.

Streams and Wetlands: 45 acres of deepwater habitat would be eliminated and 2,500 feet of Silver Creek would be restored to a free flowing stream. Coordination with the United States Army Corps of Engineer (USACE) would be performed to determine if compensatory mitigation would be required for impacts to jurisdictional waters of the U.S.

Fish: Eliminating the reservoir would result in the loss of the fishery for anglers and recreationists. There is no mitigation proposed for displaced anglers and recreationists.

Cultural/Historical Resources: There are no cultural/historical resources known at the project area. If encountered during excavation activities, construction would stop and the appropriate agencies would be notified.

Recreation: Certain parking areas and trailheads would be used for staging areas during construction and would be completely closed to public use. High use and/or limited access parking areas would left open (Silver Lake Trailhead Parking Area) so that the public is not completely displaced from using the Silver Lake Flat area. There is no mitigation proposed for the elimination of the reservoir.

Transportation/Infrastructure: The public would be allowed to access the Silver Lake Flat area during construction. Flaggers would be utilized to control construction traffic up and down Silver Lake Flat Access Road. The general public would experience minor delays at the top and bottom of the road while construction traffic is traveling to and from the project area.

Silver Lake Flat Road may be resurfaced with aggregate to allow safe passage of construction equipment and dumptrucks. Any improvements to the road would be left in place upon construction completion.

Agricultural Lands: Dam decommissioning would permanently eliminate the storage of water for irrigation purposes. Pending on negotiations with UDWRt Dam Safety, the water right for the irrigation storage in the reservoir may be terminated or transferred.

Aesthetics: Decommissioning of the dam would alter the scenic view from a lake landscape to a forest landscape over time. Native vegetation would be installed to match the existing forest. There is no

mitigation proposed to offset the change from a lake to a forest landscape.

Rehabilitate Dam – Replace Spillway / Rehabilitate Dam – Left Abutment Closed Spillway
The mitigation measures for both dam rehabilitation alternatives consist of the same elements.

Soils: Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Proper BMPs would be installed so prevent and control soil erosion.

Soil used for dam fill that is borrowed from the reservoir would be separated and filtered for appropriate size and composition of material. The top layer of sediment would be discarded do to the high density of fine material and elevated metals.

Vegetation: Vegetation would be removed at the downstream toe of the dam to allow for additional structural fill and provide an unvegetated buffer from the base of the dam. Vegetation removal would be limited to the smallest extent practical within this area. An herbaceous plant seed mixture, as approved by USFS, would be used in these areas cleared of trees and shrubs. All temporary disturbed areas not associated with direct dam rehabilitation would be revegetated with approved USFS plant species to match the surrounding plant community. There is no compensatory mitigation proposed for vegetation clearing associated with the project.

Streams and Wetlands: Dam rehabilitation would impact Silver Creek and Wetland A. The seepage monitoring system has been designed to impact the smallest footprint in Wetland A practical. Coordination with the USACE would be performed to determine if compensatory mitigation would be required for impacts to jurisdictional waters of the U.S.

Fish: Silver Lake Flat Reservoir would be completely drained to replace the low-level outlet gates at the bottom of the reservoir. As part of this, water in Silver Creek would not flow through the outlet pipe which would cause Silver Creek to become dry below the dam. Water would be pumped/bypassed around the dam so that typical flow conditions are not interrupted in the system. The upstream end of the reservoir would have a net system or the pump/bypass system would have a screen to prevent fish from becoming entrained. Prior to draining of the reservoir, a small pool would be established so that fish can be salvaged and relocated downstream of the dam or into Tibble Fork Reservoir. This salvage would be performed by the UDWR or an approved specialist so that fish are not injured or killed during salvage.

Draining the reservoir would result in the loss of the fishery for anglers and recreationists during the summer of 2014. There is no mitigation proposed for displaced recreationists during construction. After construction is complete, the fish stocking regime in Silver Lake Flat Reservoir would resume.

Cultural/Historical Resources: There are no cultural/historical resources known at the project area. If encountered during excavation activities, construction would stop and the appropriate agencies would be notified.

Recreation: Certain parking areas and trailheads would be used for staging areas during construction and would be completely closed to public use. High use and/or limited access parking areas would left open (Silver Lake Trailhead Parking Area) so that the public is not completely displaced from using the Silver Lake Flat area.

To account for the water surface elevation raise, the west dispersed parking area would be reshaped and raised five feet to allow continued use by recreationists.

Transportation/Infrastructure: The public would be allowed to access the Silver Lake Flat area during

construction. Flaggers would be utilized to control construction traffic up and down Silver Lake Flat Access Road. The general public would experience minor delays at the top and bottom of the road while construction traffic is traveling to and from the project area.

Silver Lake Flat Road may be resurfaced with aggregate to allow safe passage of construction equipment and dumptrucks. Any improvements to the road would be left in place upon construction completion.

The seepage monitoring area temporary access road would be constructed in a designated USFS roadless area. This road would be temporary in nature and the general public would not be allowed to travel on this temporary road. Upon construction completion, this temporary road would be decommissioned and passenger type vehicles would not be allowed to travel in this roadless area.

Agricultural Lands: Dam rehabilitation would eliminate the storage of water for irrigation purposes during the 2014 growing season. There is no mitigation proposed for this loss of irrigation water.

CHAPTER 5.0
CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

5.1 Consultation

The USFWS and UDWR were invited to comment on the project during the scoping period. Consultation will be performed with both agencies during the Draft Plan-EA review period and the results of this consultation will be documented in the Final Plan-EA.

NRCS has coordinated with Utah SHPO regarding the project under formal consultation (Utah State Antiquities Project Number: U-12-XN-1053f). The letter report prepared for the project describing the results of the literature review and pedestrian survey concluded that there are no cultural or historical resources within the project area. This letter (Appendix E) was submitted to Utah SHPO in April 2013 for a concurrence of No Effect. The results of this consultation will be documented in the Final Plan-EA.

The Preferred Alternative would require work within jurisdictional waters of the U.S. A USACE Section 404 permit will be required to complete the dam rehabilitation activities for the project. Consultation with the USACE will be performed once the project design has advanced to identify dredge/fill impacts (area and volume) to jurisdictional waters. Precursory discussions with the USACE regarding project impacts to jurisdictional waters of the U.S have identified that there will be impacts from each of the alternatives described in this Draft Plan-EA. Further coordination with the USACE will be performed as the project progresses.

5.2 Coordination

The NUCWCD requested financial assistance from the NRCS through Standard Form 424 – Application for Federal Assistance in September 2009. Initial coordination was conducted between the NUCWCD, NRCS and the USFS regarding the project and the proposed rehabilitation activities. Meetings were conducted with the USFS NEPA and resource specialists to discuss the project and identify potential concerns relating to the project. The results of these meetings and discussion have been incorporated into this Draft Plan-EA.

5.3 Public Participation

5.3.1 Scoping

Project scoping questions, comments and concerns were requested from the public and government agencies during the preliminary scoping period, both orally at public meetings and via written submittal of comments. The main goal of public participation during the scoping period was to involve a diverse group of public and government agency participants to solicit input and provide timely information regarding their concerns for the project and the proposed alternatives.

A scoping notice was prepared and sent to interested parties and regulatory agencies on April 11, 2012. The list of recipients, as presented in Chapter 9.0, was prepared by both the NRCS and USFS. The scoping notice gave a description of the project, location and overview, purpose and need, identified preliminary scoping issues, and requested public participation. The scoping notice also identified the location of public meetings, contact information to submit written comments, and the scoping period closure date. Two public notices were posted in the Utah County Daily Herald newspaper on April 15 and April 22, 2012 announcing the project and public meeting. The scoping notices were also posted to the NRCS website (http://www.ut.nrcs.usda.gov/programs/pl566.html) to make it available for public

review on the internet. One agency scoping meeting was conducted on April 25, 2012 and one public scoping meeting was conducted on April 26, 2011. There was zero (0) non-project staff attendance at both meetings.

The scoping period officially opened on April 11, 2012 and ended on May 11, 2012 for a total of 31 days. Written comments could have been submitted via mail, e-mail, facsimile, or comment card, and oral comments could have been submitted at the scoping meetings. There were zero (0) oral or written comments received for Silver Lake Flat Dam Rehabilitation project during the scoping period.

Official comments received during the Draft Plan-EA review period will be included in Appendix A in the Final Plan-EA.

CHAPTER 6.0
PREFERRED ALTERNATIVE

6.1 Purpose and Summary

The Preferred Alternative for the project is the Rehabilitate Dam – Replace Spillway alternative based on the ability to meet the purpose and need for the project, least impacts to environmental and social resources, and the greatest net economic benefits out of all the alternatives. Several items need to be addressed in order for the Silver Lake Flat Dam to meet current NRCS and Utah State Dam Safety regulations (UDWRt 2013) and engineering standards (NRCS 2005) associated with a high hazard (Class "C") dam site and to insure the useful life of the site for 71 years starting in 2017. The rehabilitated dam structure would reduce the risk of a catastrophic failure, and would continue to provide irrigation storage, flood protection to properties and structures downstream, and sediment retention.

6.2 Rationale for Preferred Alternative Selection

The Preferred Alternative consists of rehabilitating the dam to protect the existing dam structure, restoring the original water storage capacity, eliminating the liability to the NUCWCD of operating a dam in non-compliance, and continuing to provide incidental benefits to flood protection, sediment retention, and recreation. Through the analysis of environmental and social resources in the Environmental Consequences Chapter (4.0), it was determined that the Preferred Alternative for the rehabilitation of the dam would provide the least negative and most beneficial effects for the project. The Preferred Alternative is also the NED Alternative because it has the highest net economic benefits. The annualized benefit for the dam would be $227,000 and the annualized cost would be $178,000 resulting in the best benefit-cost ratio (1.3) out of all of the alternatives analyzed.

6.3 Measures to be Installed

The measures proposed for the rehabilitation of Silver Lake Flat Dam would be designed to NRCS, USFS, and UDWRt Dam Safety standards. The design for the items listed below, as well as construction practices, will be submitted to USFS for review and adherence to the 2003 Uinta National Forest Land and Resource Management Plan (USFS 2003a) prior to the start of construction. The rehabilitation features of the Preferred Alternative are shown on Appendix B-Figures 6 through 10 and are summarized below:

- Place riprap (5,000 cubic yards) on the existing upstream face of the dam to protect the slope from wave action erosion at varying water surface elevations in the reservoir. Some of the existing riprap stockpiled near the western dispersed parking area may be utilized on the upstream dam face protection;
- Place and compact additional fill (10,750 cubic yards) on the downstream face of the dam to increase slope stability. Some of this fill material would be excavated from the reservoir near the western dispersed parking area. Only selective native granular borrow fill material underneath the reservoir sediment deposition layer would be utilized. The location of this existing borrow fill source is shown on Appendix B-Figure 3 and the parking area would be reshaped and raised five feet to compensate for the increase in reservoir water surface elevation;
- Raise the elevation of the spillway 2.5 feet to add extra storage capacity in the reservoir. The new storage capacity would be increased from the existing capacity of 1,011 ac-ft to 1,120 ac-ft (Appendix B-Figure 8);

- Replace existing spillway (800 cubic yards of reinforced concrete) with a larger one to pass the PMP event (worst-case scenario flood event) without overtopping the dam. The spillway outlet would extend an additional 150 feet downstream of the existing spillway outlet;
- Install new toe drains (810 cubic yards) at the downstream toe of the dam in various places to collect and convey seepage water away from the dam infrastructure;
- Replace the two (2) low-level outlet gates in the reservoir;
- Clear vegetation (approximately 5 acres) for dam rehabilitation at the base of the dam (25 feet) and around the edge of the reservoir (Appendix B-Figure 8);
- Install seepage monitoring system in Wetland A;
- Improvements to the existing unpaved USFS Silver Lake Flat Road from the Granite Flat Campground past the dam to the northern side of the reservoir (up to 2.5 miles), including the installation of 0.5- to 1-foot of gravel and road drainage features in places as selected by the contractor. The largest area improved would include the entire length of the road for heavy machinery, concrete and dump truck access to the project site; and
- Utilize the Horse Transfer Station off of Granite Flat Campground Road, dispersed parking area on the west side of the reservoir and the dispersed parking area on the north side of the reservoir as staging areas as depicted on Appendix B-Figure 3.
- Clear vegetation (approximately 0.35 acres) and install a seepage monitoring system on the downstream side of the right abutment as described in Chapter 3.4.5 (Appendix B-Figure 7).

Table 6-1 compares the existing dam features with the Preferred Alternative features.

Table 6-1. Comparison of Existing Dam and Preferred Alternative

Description	Existing Conditions	Preferred Alternative
Spillway Crest (ft)	7525.5 El	7528 El
Spillway Dimensions (Ft)	10 W x 3 H x 320 L	12 W x 7 H x 477 L
Top of Dam (ft)	7535 El	7535 El
Top Width of Dam (ft)	23 ft	23 ft
Downstream Embankment Slope	2.5:1	2.5:1 and 4:1
Low-level Outlet	600 feet long, 30-inch reinforced concrete pipe	750 feet long, 30-inch reinforced concrete pipe
Reservoir Storage Capacity	1,011 ac-ft	1,120 ac-ft
Silver Lake Flat Road (Construction Access)	Unpaved access road from Granite Flat Campground to the Dam with protruding rocks and boulders.	Improvements would be made to access road from Granite Flat Campground to Dam for safe passage of construction equipment and dumptrucks. Improvements would be left in-place upon construction completion.

6.4 Mitigation

Soils: Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Proper BMPs would be installed to prevent and control soil erosion.

Vegetation: Vegetation would be removed at the downstream toe of the dam to allow for additional structural fill and provide an unvegetated buffer from the base of the dam. Vegetation removal would be

limited to the smallest extent practical within this area. An herbaceous plant seed mixture, as approved by USFS, would be used in these areas cleared of trees and shrubs. All temporary disturbed areas not associated with direct dam rehabilitation would be revegetated with approved USFS plant species to match the surrounding plant community. There is no compensatory mitigation proposed for vegetation clearing associated with the project.

Streams and Wetlands: Dam rehabilitation would impact Silver Creek and Wetland A. The seepage monitoring system has been designed to impact the smallest footprint in Wetland A (0.5 acres). Coordination with the USACE would be performed to determine if compensatory mitigation would be required for impacts to jurisdictional waters of the U.S.

Fish: Silver Lake Flat Reservoir would be completely drained to replace the low-level outlet gates at the bottom of the reservoir. As part of this, water in Silver Creek would not flow through the outlet pipe which would cause Silver Creek to become dry below the dam. Water would be pumped/bypassed around the dam so that typical flow conditions are not interrupted in the system. The pump/bypass system would have a screen to prevent fish from becoming entrained. Prior to draining of the reservoir, a small pool would be established so that fish can be salvaged and relocated downstream of the dam or into Tibble Fork Reservoir. This salvage would be performed by the UDWR or an approved specialist so that fish are not injured or killed during salvage.

Draining the reservoir would result in the loss of the fishery for anglers and recreationists during the summer of 2014. There is no mitigation proposed for displaced recreationists during construction. After construction is complete, the fish stocking regime in Silver Lake Flat Reservoir would resume.

Cultural/Historical Resources: There are no cultural/historical resources known at the project area. If encountered during excavation activities, construction would stop and the appropriate agencies would be notified.

Recreation: Certain parking areas and trailheads would be used for staging areas during construction and would be completely closed to public use. High use and/or limited access parking areas would be left open (Silver Lake Trailhead Parking Area) so that the public is not completely displaced from using the Silver Lake Flat area.

To account for the water surface elevation raise, the west dispersed parking area would be reshaped and raised five feet to allow continued use by recreationists.

Transportation/Infrastructure: The public would be allowed to access the Silver Lake Flat area during construction. Flaggers would be utilized to control construction traffic up and down Silver Lake Flat Access Road. The general public would experience minor delays at the top and bottom of the road while construction traffic is traveling to and from the project area.

Silver Lake Flat Road may be resurfaced with aggregate to allow safe passage of construction equipment and dumptrucks. Any improvements to the road would be left in place upon construction completion.

The seepage monitoring area temporary access road would be constructed in a designated USFS roadless area. This road would be temporary in nature and the general public would not be allowed to travel on this temporary road. Upon construction completion, this temporary road would be restored to pre-construction conditions and passenger type vehicles would not be allowed to travel in this roadless area.

Agricultural Lands: Dam rehabilitation would eliminate the storage of water for irrigation purposes during the 2014 growing season. There is no mitigation proposed for this loss of irrigation water.

6.5 Permits and Compliance

The following permits and compliance actions will be required for construction of the Preferred Alternative:

- Federal
  - *USFS:* A new Special Use Permit(s) or modification to the existing permit will be required for dam rehabilitation construction activities, increased reservoir surface water elevation, road improvements, staging area use outside of the project footprint, and changes in use of the dam. Forest Plan Guideline Aqua-2 requires consideration for minimum instream flow required under the new SUP.
  - *USACE:* Under Section 404 of the Clean Water Act, a USACE permit will be required for discharge of dredged or fill materials in waters of the U.S. including wetlands.
  - *USFWS:* There are no endangered species documented to occur within the vicinity of the project area. Therefore, no further consultation will be required for the project unless there are unforeseen impacts expected to ESA listed species.
- State
  - *Utah Division of Water Rights Dam Safety:* Approval will be required for the final design report, construction drawings, and specifications by the Utah State Assistant Engineer.
  - *Utah Division of Water Quality:* Under Section 401 of the Clean Water Act, an approval will be required so that the project does not violate state water quality standards. Certification is obtained as part of the USACE Section 404 Permit review process.
  - *Utah Division of Water Quality:* Under Section 402 of the Clean Water Act, a Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permit for Construction Activities is required for construction activities that disturb more than 1 acre and discharge pollutants to surface waters. A Storm Water Pollution Prevention Plan (SWPPP) will be developed, including submitting a Notice of Intent (NOI), to the Utah Division of Water Quality.
  - *Utah SHPO:* There are no cultural sites documented to occur within the immediate vicinity of the project area. Consultation is currently being performed with SHPO during this NEPA Plan-EA review process. If during construction, previously unevaluated cultural resources are discovered, then the area of discovery would be avoided, the discovery given adequate protection, and NRCS and SHPO would be notified. Procedures for discoveries outlined in the cultural resources NRCS State Level Agreement would be followed.
  - *Utah Division of Oil, Gas and Mining:* If riprap for dam rehabilitation will be obtained from a source that does not have an existing mining permit, a mining operations permit will be required in order to mine the riprap.
- Local: There are no local permits anticipated for this project since the dam is located within the boundaries of the USFS UWCNF.

A Watershed Agreement and a Memorandum of Understanding shall be completed and signed by the NRCS and the NUCWCD prior to the obligation of construction funds for the Preferred Alternative.

6.6 Installation and Financing

6.6.1 Planned Sequence of Installation

The NUCWCD will complete all approvals and permits for the project prior to the start of construction

which may take up to one year to obtain. The major construction elements for the Preferred Alternative would be sequenced to complete the critical path items first which include the replacement of the spillway, raising the spillway, placing fill on the dam, and installing the toe drains on the downstream face of the dam. These activities would be completed first in the summer of 2014 followed by the installation of the low-level outlet gates and riprap on the upstream face.

6.6.2 Responsibilities

The original Watershed Work Plan (Alpine Soil Conservation District *et al.* 1958) set forth the responsibilities of the NRCS (formerly SCS) and the NUCWCD. The roles and responsibilities for the NRCS and the NUCWCD would continue in accordance with this Draft Plan-EA, the Watershed Agreement and the Memorandum of Understanding. The NRCS is responsible for leading the planning efforts and providing engineering support, the UDWRe is responsible for the project design and the NUCWCD is responsible for environmental permits and construction implementation. NRCS would assist the NUCWCD during construction by providing oversight and certify completion of the project.

6.6.3 Contracting

Dam rehabilitation improvements installed from NRCS funding mechanisms would be procured using contracts awarded. The NUCWCD would oversee and administer the construction of the project in coordination with the NRCS.

6.6.4 Real Property and Relocations

All construction activities would occur on lands owned and managed by the USFS UWCNF. No real property transactions or relocations would be required for the Preferred Alternative to rehabilitate Silver Lake Flat Dam. A new or modified Special Use Permit(s) would be issued by the UWCNF for the rehabilitated dam and long-term operation on USFS land.

6.6.5 Emergency Action Plan

The NUCWCD has prepared an Emergency Action Plan (EAP) for Silver Lake Flat Dam (NUCWCD 2011) in accordance with the 1) 210- NRCS National Engineering Manual, Part 520, Subpart B, Section 520.27, 2) 180- NRCS National Operations and Maintenance Manual, Part 500, Subpart F, Section 500.52, and 3) meet applicable Utah State Dam Safety requirements. A new EAP must be completed by the NUCWCD to address the rehabilitation changes to the dam and must be prepared as a standalone document. The NRCS would determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the dam. EAPs shall be reviewed and updated by the NUCWCD annually for consistency with the project and to include all local points of contact necessary for an emergency response. The EAP must include pertinent dam information, contacts, flood inundation maps for the freeboard hydrograph (PMP event) and for a dam-breach flood, and emergency action procedures if there is a threat of dam failure.

6.6.6 Financing

The NRCS will provide 65% of the total construction rehabilitation cost for the Preferred Alternative with funding from the Small Watershed Rehabilitation Program (PL 83-566, as amended by PL 106-472). The NUCWCD is responsible for providing the remaining non-federal funded 35% of the rehabilitation cost of the project. NRCS will provide 100% of design engineering and project administration costs for the project.

Funding for O&M of the dam after construction will be derived from normal revenues of the NUCWCD. This O&M cost will be budgeted annually so that the dam is kept in good condition and meeting current NRCS and Utah State Dam Safety regulations. The NUCWCD may also request financial assistance through the UDWRt to help with the 35% cost share of the project.

6.7 Operation and Maintenance

Operation of the dam includes the administration, management and performance of non-maintenance actions needed to keep the dam structure safe and functioning as designed. Maintenance includes performance of work, measuring the recording instrumentation data, preventing deterioration of structures, and repairing damage or replacement of the structure as-needed to prevent failure. Damages to completed structures caused by normal deterioration, droughts, flooding, or vandalism are considered maintenance. Maintenance includes both routine and as-needed measures which include:

- Annual control of woody species on or near the dam and spillway. Chemical control would only be used after determining there would be no ill-effect on human, fish or wildlife health and as approved by the USFS.
- Operating both low-level outlet gates on an annual basis to remove any accumulated sediment at the entrance and ensure proper performance of the gate.
- Other specific items that will be identified during design.

Inspection of the dam is necessary to verify that the structures are safe and functioning properly. The NUCWCD and UDWRt Dam Safety are responsible for inspecting the dam on an annual basis as well as after major events such as floods and earthquakes. Inspection reports will be supplied to the NRCS following each inspection. Inspections and the associated reports will assess the following items:

- The adequacy of O&M activities,
- Identify needed O&M work,
- Identify unsafe conditions, including changes in the use of the floodplain below the dams,
- Specify ways of relieving unsafe work or performing other needed work, and
- Set action dates for performing corrective actions.

NUCWCD will continue to be responsible for the operation, maintenance, rehabilitation and future modifications to the dam and the estimated annual O&M cost is $32,000 as stated in Table 6-5. A specific O&M Plan will be prepared by the NRCS and the NUCWCD in accordance with the NRCS National Operation and Maintenance Manual (NRCS 2003). This plan and agreement will be entered into prior to the start of construction activities and will be in place for the extended life of the project which will be for 71 years starting in 2017. The agreement will provide for inspections, reports, and procedures for performing the maintenance items. The agreement will include specific provisions for retention, use, and property improved with PL 83-566, as amended by PL 106-472, assistance.

6.8 Costs

The planning level cost estimate (including environmental and design) for the Preferred Alternative (Rehabilitate Dam-Replace Spillway) is $4,526,000 as identified in Table 6-2. Economic tables have been included to present information relevant to the costs and benefits of the Preferred Alternative and NED Alternative. Structural tables have been included to present the relevant structural information pertinent to the design of the Preferred Alternative. The planning level costs for the Preferred Alternative are conceptual level cost estimates only with an estimated range of accuracy at ±30% and are intended to reflect the maximum level of cost that could be associated with the rehabilitation of Silver Lake Flat Dam.

Detailed structural designs and construction cost estimates will be prepared for project during the final design phase and prior to the start of the competitive bidding process. The final cost of the project will be the price received from the winning construction bid plus or minus the amount of contract modifications. Assessments, considerations, and calculations are based on a 71-year evaluation period and a discount rate of 3.75 percent.

The Estimated Installation Cost table documents land status upon which the project structures reside, as well as federal and non-federal funding sources respectively.

Table 6-2. (Table 1) Estimated Installation Cost

Works of Improvement	Number				PL83-566 Funds			Other Funds			
	Unit	Federal Land	Non-Federal Land	Total	Federal Land	Non-Federal Land	Total	Federal Land	Non-Federal Land	Total	Total
Silver Lake Flat Dam Rehabilitation	Each	1	0	1	3,000,000	0	3,000,000	1,526,000	0	1,526,000	4,526,000

Notes: Amounts are shown in dollars.
Prices based in August 2013.

The Estimated Cost Distribution table shows the estimated costs to be charged to the PL 83-566, as amended by PL 106-472, Funds and the costs borne by the NUCWCD.

Table 6-3. (Table 2) Estimated Cost Distribution – Water Resource Project Measures

Works of Improvement	Construction	Design Engineering[2]	Construction Management[2]	Real Property Rights	Relocation Payments	Road and Utility Modifications[1]	Project Admin[2]	Total
Planned Improvements Dam Rehabilitation (PL83-566)	Installation Cost - PL83-566 Funds							
	2,685,020	468,000	124,000	0	0	0	108,000	3,385,020
Planned Improvements Dam Rehabilitation (Other)	Installation Cost - Other Funds							
	1,238,000	0	203,000	0	0	0	85,000	1,526,000
Total Estimated Rehabilitation Cost	3,538,000	468,000	327,000	0	0	0	193,000	4,526,000

Notes: Amounts are shown in dollars.
Prices based in August 2013.
[1] Silver Lake Flat Road improvements are included in the construction cost.
[2] NRCS design engineering, construction management, and project admin costs are not cost-shared by the sponsor.

The Structural Data table shows important physical characteristics for Silver Lake Flat Dam after the Preferred Alternative has been constructed.

Table 6-4. (Table 3) Structural Data – Dams with Planned Storage Capacity

Item	Unit	Silver Lake Flat Dam Preferred Alternative
Dam Number		UT00276
Hazard Class of Structure		High (Class "C")
Seismic Zone		3
Controlled Drainage Area (Silver Lake Flat)	sq mi	4.3
Controlled Drainage Area (American Fork-Dry Creek)	sq mi	86.9
Runoff Curve No. - (1-day) AMC II		49
Time of Concentration (Tc)	hrs	1.19
Elevation top dam	ft	7,535
Elevation crest auxiliary spillway (spillway)		7,528
Elevation crest high stage inlet		7,496.5
Elevation crest low stage inlet		7,471.5
Auxiliary spillway (spillway) type		Rectangular Concrete Closed Channel
Auxiliary spillway (spillway) bottom width	ft	12
Auxiliary spillway (spillway) exit slope	%	25
Maximum Height of Dam	ft	85
Volume of Fill		265,000+
Total Capacity	ac-ft	1120
Sediment Submerged	ac-ft	70.5
Surface Area		
Sediment Pool	ac	11.5
Beneficial Use Pool (Irrigation, recreation)	ac	44.8
Floodwater Retarding Pool	ac	44.8
Principal Spillway (low-level outlet) Design		
Rainfall Volume (1-day)	ac-ft	477
Rainfall Volume (10-day)	ac-ft	750
Capacity of Low Stage Outlet (max.)	cfs	51
Capacity of High Stage Outlet (max.)	cfs	2,672
Dimension of Conduit (low-level outlet)	in	30
Type of Conduit (low-level outlet)		Reinforced Concrete Pipe
Frequency of Operation Auxiliary Spillway (spillway)	% chance	Annually
Auxiliary Spillway (spillway) Hydrograph		
Rainfall Volume (100 yr)	in	1.65
Storm Duration	hr	6
Velocity of Flow (Vc)	ft/s	60
Maximum Aux. Spillway Discharge	cfs	870
Max. Reservoir Water Surface Elevation	ft	7,535
Freeboard Hydrograph		
Rainfall Volume	ac-ft	477
Storm Duration	hr	6
Velocity of Flow (Vc)	ft/s	10
Max. Reservoir Water Surface Elevation	ft	7,535
Capacity Equivalents		
Sediment Volume	ac-ft	44
Floodwater Retarding Volume	ac-ft	0
Beneficial Volume (irrigation)	ac-ft	976
Beneficial Volume (recreation)	ac-ft	100
Water Right # 55-7198, 55-7379	cfs	441.6

The Average Annual Cost table shows the anticipated installation costs of the Preferred Alternative. It also summarizes the total annual cost based on the annualized cost of installation, amortized over 71

years, and the average annual cost for operations and maintenance. The original annual Operation and Maintenance Cost for Silver Lake Flat Dam was $1,000 (Alpine Soil Conservation District *et al.* 1958).

Table 6-5. (Table 4) Average Annual NED Costs

Improvements	Project Outlays Installation (Plan Year Dollars)	Project Outlays Amortization of Installation Cost[1]	Project Outlays, Operation, Maintenance and Replacement Cost[2]	Total
Silver Lake Flat Dam Rehabilitation	4,526,000	146,000	32,000	178,000

Notes: Amounts are shown in dollars
Prices based in August 2013.
[1] Amortized at 3.75%% annually for 71 years.
[2] Estimated to be 0.7% of project cost.

The Estimated Average Irrigation Water Storage Benefits table summarizes the results of the irrigation water economic benefit analysis conducted for this project. It includes a summary of the agricultural and non-agricultural benefits which the project is expected to provide.

Table 6-6. (Table 5) Estimated Average Irrigation Water Storage Benefits

Item	Irrigation Water Storage Benefits		Total
	Agriculture-Related	Non-Agriculture-Related	
Water Conservation	52,000	166,000	218,000
Offsite/Public (Recreation)	0	9,000	9,000
Total Estimated Annual Benefit	52,000	175,000	227,000

Notes: Amounts are shown in dollars.
Prices based in August 2013.
Average annual benefits are in 2013 dollars.

The Comparison of NED Benefits and Costs table summarizes the benefits and costs of each analysis unit within the project and documents the overall benefit to cost ratio of the proposed rehabilitation improvements.

Table 6-7. (Table 6) Comparison of NED Benefits and Costs

Item	Irrigation Water Storage Benefits				
	Agricultural	Non-Agriculture	Average Annual Benefits	Average Annual Costs	Benefit Cost Ratio
Silver Lake Flat Dam Rehabilitation	52,000	175,000	227,000	178,000	1.3

Notes: Amounts are shown in dollars.
Prices based in August 2013.

CHAPTER 7.0
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The names and addresses of private parties who received notice of the Draft Plan-EA are not listed in this section for privacy.

CHAPTER 10.0
ACRONYMS, ABBREVIATIONS AND SHORT FORMS

10.1 Acronyms, Abbreviations and Short Forms

ac-ft	acre-feet
AMSL	Above Mean Sea Level
BMPs	Best Management Practices
DAQ	Division of Air Quality
Draft Plan-EA	Draft Supplemental Watershed Plan No. 9 and Environmental Assessment
CFR	Code of Federal Regulations
cfs	cubic feet per second
EA	Environmental Assessment
EAP	Emergency Action Plan
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
NAAQS	National Ambient Air Quality Standards
ORV	Off Road Vehicles
PAR	Population-At-Risk
Draft Plan EA	Preliminary Draft Supplemental Watershed Plan No. 9 and Environmental Assessment
PMP	Probable Maximum Precipitation
MCL	Maximum Contaminant Level
MIS	Management Indicator Species
NED	National Economic Development
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NUCWCD	North Utah County Water Conservancy District
O&M	Operations and Maintenance
PL	Public Law
RHCA	Riparian Habitat Conservation Area
RMO	Road Management Objective
ROS	Recreation Opportunity Spectrum
SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
UDEQ	Utah Department of Environmental Quality
UDWRe	Utah Division of Water Resources
UDWRt	Utah Division of Water Rights
UDWR	Utah Division of Wildlife Resources
UPDES	Utah Pollutant Discharge Elimination System
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UWCNF	Uinta-Wasatch-Cache National Forest
VQO	Visual Quality Objectives

WSEL	Water Surface Elevation