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Managing Water in the West

Environmental Assessment for the Walker River Basin Cloud Seeding Project

Lahontan Basin Area Office
Carson City, Nevada
Mid-Pacific Region

U.S. Department of the Interior
Bureau of Reclamation

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Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Contents

Section 1
Introduction

This document is an Environmental Assessment (EA) for the Walker River Basin Cloud Seeding Project and has been prepared in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508), and Department of Interior regulations for the Implementation of the National Environmental Policy Act of 1969 (43 CFR Part 46).

Reclamation proposes to provide $1,358,000 in funding to the Desert Research Institute (DRI) for ground-based and airborne cloud seeding that is intended to enhance precipitation, primarily in the form of snowfall, in a portion of the Walker River Basin in eastern California and western Nevada. The benefit of the seeding operations would be evaluated using a hydrologic model developed specifically by DRI for predicting stream flow for the Walker River.

1.1 Purpose of and Need for Action

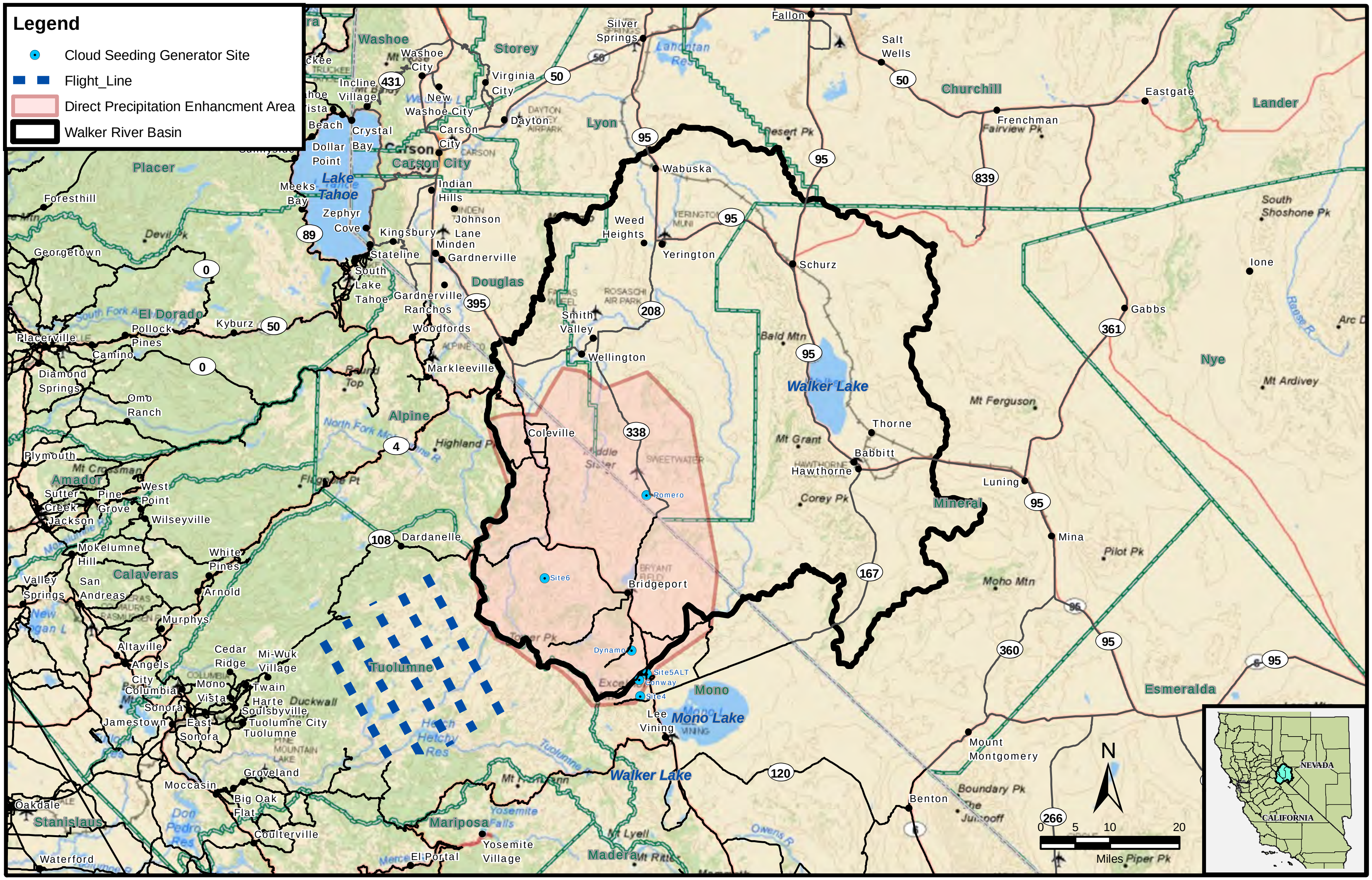
1.1.1 Purpose of and Need for Proposed Action

The purpose of the Proposed Action is to increase precipitation in the Walker River Basin through cloud seeding to enhance snowpack and stream flow.

Reclamation proposes to fund DRI to conduct the Walker River Basin Cloud Seeding Project over a period of five years. The grant funding would allow DRI to extend their cloud seeding program which has been used in the upper Walker River Basin from 1992-2009, with minor changes. DRI would also conduct research to evaluate the effects of the cloud seeding project to provide an objective assessment of project benefits to stream flow in the Walker River.

1.1.2 Location of Analysis Area

The analysis area includes the Walker River Basin located in eastern California in Mono County and in western Nevada in Lyon, Mineral, Douglas and Churchill Counties. Airborne cloud seeding is also proposed to be conducted over Tuolomne County, California. The location of the area analyzed in the EA for the Walker River Basin Cloud Seeding Project is shown in Figure 1.



Walker River Basin Cloud Seeding Project

Area Map

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Figure 1

The project area includes:

- Five ground-based cloud seeding sites; Site 5 alternate is proposed cloud seeding generator site at the Communications Site east of Conway Summit. Site 4 has been withdrawn as a ground seeding site, based on the results of scoping.
- Approximate aircraft flight tracks for the airborne seeding over Tuolomne County, California;
- Precipitation Enhancement Area for additional snow and rain from the cloud seeding effort;
- Walker River Basin in Nevada and California.

Ground-based Cloud Seeding Sites

Table 1: Location of Walker River Basin Cloud Seeding Generator Sites

Site Name	Description	Location Township	Range	Section	Land Ownership	State	County
Conway	West of Conway Summit	3N	25E	NESE 34	BLM*	CA	Mono
Dynamo	Dog Creek area	3N	25E	NENESW 3	BLM	CA	Mono
Romero	Sweetwater Flat area	7N	25E	SWSE 16	Private	NV	Lyon
Site 6	Willow Flat area	5N	23E	SENW 16	Private	CA	Mono
Site 5 Alternate	East of Conway Summit, (New site)	3N	25E	SWNWSW 25	BLM	CA	Mono

* BLM = Bureau of Land Management

A***ircraft Cloud Seeding Area***

The approximate area of proposed airborne cloud seeding is in the Sierra Nevada Mountains of California, south of State Route (SR) 108, north of SR 120, near the Sierra crest. The land area below the cloud seeding is within the upper elevations of the Stanislaus National Forest, south of SR 4, and Yosemite National Park, all in Tuolomne County.

Precipitation Enhancement Area

Areas expected to receive additional snow or rain from the proposed project extend eastward from the Sierra crest in California, south of SR 89 and north of SR 167. In Nevada the area extends south of SR 208 near Wellington and about 10 miles east of SR 338. Much of the precipitation enhancement area in both Nevada and California is within the boundaries of the Humboldt-Toiyabe National Forest and on Bureau of Land Management public lands.

1.1.3 Background

Walker River Basin

The following information is excerpted from Reclamation's 2010 Walker River Basin Water Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010).

The Walker River Basin encompasses approximately 4,050 square miles in east-central California and west-central Nevada. The Walker River originates in the eastern portion of the Sierra Nevada in California, flows into eastern Nevada, and empties into Walker Lake. The Walker River consists of the West Walker River, East Walker River, and mainstem Walker River, which flows into Walker Lake. Walker Lake is a terminal lake; i.e., it has no outlet.

Water diversions from the Walker River, primarily for irrigation, sustain the agricultural economies and communities in the basin. From 1882 to present, these diversions for upstream irrigated agriculture have resulted in an approximate 150-foot drop in Walker Lake's surface elevation and a corresponding reduction in volume from about 10 million acre feet (af) to less than 2 million af of water. The decline in lake elevation has threatened the lake's ecosystem and viability as a fishery.

Cloud Seeding

Cloud seeding to enhance snowpack and stream flow has been conducted in the Sierra Nevada for over 50 years. The DRI Cloud Seeding Program is operated from the Desert Research Institute Division of Atmospheric Sciences, located in the Northern Nevada Science Center, Reno, Nevada. DRI has conducted both research and operational cloud seeding projects in the Lake Tahoe region since the early 1960s and in the Walker River Basin since 1992. DRI has also completed research studies in the Walker River Basin under the U.S. Bureau of Reclamation Weather Damage Modification Program (WDMP) in water years 2004 and 2005 (Huggins et al. 2005), and developed a hydrologic modeling research tool within the Walker Basin Project (Collopy and Thomas 2009).

The elements of ground-based and airborne cloud seeding are described by the following sequence of events. The seeding material is silver iodide (AgI). Seeding "generators" burn a solution containing AgI dissolved in acetone. The burning process produces a "smoke" of microscopic AgI particles (about 0.0001 mm in size) which can create additional ice crystals, then snow in winter clouds. From ground sites the particles are transported downwind and dispersed into clouds over the mountains. Vertical dispersion up to at least 2,000 feet above the surface is produced by the turbulence created by wind moving over the uneven terrain.

A seeding aircraft is used to augment ground seeding operations by releasing silver iodide from pyrotechnic flares or wing-mounted solution burners. With airborne seeding the particles are released directly into clouds at appropriate distances upwind of a target. In the presence of cloud droplets existing at temperatures below -5^{o} C the silver iodide particles act as ice-forming nuclei and enhance the ice particle concentration in the natural clouds. Once initiated by silver iodide the ice particles grow in size and mass as they move downwind, and then begin falling to the surface when they have sufficient mass to overcome the upward motion in the clouds. Within 20 to 30 minutes snow within the seeding plume can reach the surface within the target area. This "chain-of-events" in the cloud seeding process has been verified by numerous detailed experiments conducted in the Sierra Nevada and other mountainous regions of the western U.S. A summary of these results can be found in Huggins (2009) and other published papers discussed later in this EA.

Each ground seeding site consists of a seeding device mounted on trailer, a propane tank and a 16' high lattice antenna. The Dynamo cloud seeding site shown in Figure 2 is an example of a ground-based site.

Figure 2 - Dynamo Site – ground based cloud seeding site.

Research results from cloud seeding experiments in the Sierra Nevada and other mountainous regions of the western U. S. have shown that snowfall can be increased by 5% to 15% annually in the specific areas targeted by cloud seeding operations. DRI developed a method of assessing snowfall enhancement based on the trace chemical content of snow layers, and the physical characteristics of the snow. The technique has been tested in several project areas in the Sierra Nevada, the Snowy Mountains of Australia and the mountains of southern Idaho. One California project published results of an 8% increase in snow water equivalent using this evaluation technique (McGurty 1999). This was the first project to provide an area evaluation of snowfall enhancement in a specific watershed, and to provide an estimate of the amount of water in the snowpack that could be attributed to cloud seeding.

DRI used this trace chemistry technique to evaluate the targeting effectiveness of seeding operations in the Walker River Basin during the two years of the USBR WDMP (Huggins et al. 2005). The results indicated that snowfall in portions of the basin was being routinely enhanced by cloud seeding conducted by the Nevada State Program. The WDMP research included application of a USGS hydrologic model (Boyle et al. 2006) to assess how snowfall enhancement in specific regions of the Walker River Basin would impact the flow in the Walker River. An improved version of this hydrologic model would be used to assess the effectiveness of cloud seeding in the Walker River Basin.

1.1.4 Authority

Program Authorization and Funding

Since 2002, Congress has passed eight pieces of Desert Terminal Lakes legislation related to the Walker River Basin. Pertinent portions of the primary public laws related to the proposed Cloud Seeding project are discussed below.

- PL 107-171 (Farm and Rural Security Investment Act enacted in 2002) Section 2507 provided $200 million to Reclamation to provide water to at-risk natural desert terminal lakes.
- PL 108-7 (Omnibus Appropriations Bill enacted in 2003) Section 207 clarified that the money provided in PL 107-171 could only be used for Pyramid, Summit, and Walker Lakes in Nevada.
- PL 110-246 (Food, Conservation, and Energy Act of 2008) amended PL 107-171 to provide an additional $175 million to benefit at-risk natural desert terminal lakes.
- PL111-85 (Energy and Water Development Appropriations Act of 2010) amended previous Desert Terminal Lakes legislation including adding that permitted uses of funding is for efforts consistent with researching, supporting, and conserving fish, wildlife, plant, and habitat resources in the Walker River Basin.

Cloud Seeding is expected to provide water to Walker Lake per the requirements of the Desert Terminal Lakes legislation as follows:

1. Provide some additional water for all decreed rights that are supplied by the Walker River which would include augmenting decreed rights acquired or leased by the National Fish and Wildlife Foundation (NFWF) for intended transfer to Walker Lake (the benefits to the lake would occur during years after the acquired water right transfers are approved and implemented). NFWF is authorized in legislation to make acquisitions from willing sellers that NFWF determines are the most beneficial to environmental restoration in the Walker River Basin; and

2. Augment flows to Walker Lake during potential high run-off events during the non-irrigation winter months when Walker Lake typically receives the bulk of its inflows.

Grant Authority

Section 207(b) of Public Law 108-7 (Omnibus Appropriations Bill, enacted in 2003) states, *"The Secretary of the Interior, acting through the Commissioner of Reclamation, may provide financial assistance to State and local public agencies, Indian tribes, nonprofit organizations, and individuals to carry out this section and section 2507 of Public Law 107 171"*.

1.2 Resource Issues

The following resource issues have been identified as the primary issues that should be analyzed in detail in this EA. They were identified through scoping activities conducted by Reclamation in August, 2010, and will be used to guide analysis of environmental consequences.

- Concern about a reduction in precipitation in non-target areas resulting from downwind effects of cloud seeding.
- Concern about the priority of funding cloud seeding over other projects that produce water such as water acquisition.
- Concern about the toxicity of cloud seeding materials, including potential environmental and human health impacts, and the cumulative effects of silver iodide on the water, soils, plants and animals.
- Concern about the effects to the hydrologic regime.
- Recommendation to analyze effects of the project on the following special status species: Lahontan cutthroat trout; Sierra Nevada bighorn sheep; Paiute cutthroat trout; greater sage-grouse; pygmy rabbit. Other species of concern include Yosemite toad; Mountain yellow-legged frog; migratory birds, including bald eagles and golden eagles.
- Address impacts to fish and wildlife habitats, air and water quality.
- Mitigate any negative effects to fish, wildlife and their habitats.
- Monitor the project for intended objectives and resource protection measures.
- Consider if the proposed new ground based cloud seeding site (Site 5 alternate) could affect existing communications equipment located east of Conway Summit.

Section 2
Alternatives Considered

2.1 No Action

Under the No Action alternative, Reclamation would not provide $1,358,000 in funding through Reclamation's Desert Terminal Lake Program for cloud seeding operations and post-operation evaluation by DRI for the Walker River Basin. It is expected that DRI's efforts over the last 18 years to implement cloud seeding operations in the Walker River Basin would be curtailed in the foreseeable future due to reduced funding opportunities. Benefits from the project would not occur, specifically an estimated possible 5% to 15% projected increase in precipitation to the Walker River Basin over the next five years. In addition, information about the impacts of cloud seeding on stream flow would not be obtained from DRI's unique hydrologic model.

2.2 Proposed Action

Under the Proposed Action, Reclamation would provide $1,358,000 in funding through Reclamation's Desert Terminal Lakes Program to DRI for cloud seeding intended to augment precipitation within the Walker River Basin over a 5-year period. The proposed project would be focused on increasing snowpack and flow into the Walker River from cloud seeding operations in the upper portion of the Walker River Basin.

Beginning in the fall of 2010 and continuing through the spring of 2015, the cloud seeding project would include:

- During each winter season of the project, DRI would install and operate five ground-based seeding generators in the Walker River Basin from November through April. DRI would develop and implement a service contract for 50 hours of airborne seeding during the period from December through March.

- Based on prior research results DRI would evaluate the benefits of the seeding operations based on a DRI modeling system developed specifically by DRI for predicting stream flow for the Walker River.

The project's design and method of operation would be nearly identical to those used by DRI's Nevada state-funded project conducted from about 1992-2009. As shown in Figure 1, cloud seeding would be conducted in the eastern Sierra Nevada and interior ranges of the Walker River Basin. The precipitation enhancement area shown in Figure 1 approximately encloses the area over which snowfall from the five ground seeding sites and seeding aircraft flight tracks might be expected to fall in a variety of wind directions, although any single seeding event would likely target only a fraction of the entire precipitation enhancement area. Based on DRI's prior experience with cloud seeding in the Walker River Basin, 20 to 30 ground seeding events and 15 to 20 separate flights can be expected during each winter period.

The ground-based seeding sites proposed to be used in seeding operations shown in Figure 1 include 2 sites located on private land; the remaining 3 sites are located on public lands and authorized by the Bureau of Land Management (BLM), including Site 5 Alternate which is proposed to be located on an existing concrete pad at the Conway Communications site, east of Highway 395 near Conway Summit.

Established project seeding criteria ensure that the proper cloud cover, cloud depth and temperature, and wind direction and speed are present to optimize cloud seeding effectiveness. All operational guidelines, safety restrictions and suspension criteria for the project have previously been developed, but would be reviewed and modified as necessary. These guidelines and criteria can be found on the DRI cloud seeding web site at: http://www.dri.edu/cloudseeding . The guidelines specify the conditions in which a seeding event can be initiated and also hazardous weather conditions (for example, potential flooding situations) in which no seeding can be conducted. DRI would comply with the California Department of Water Resources and National Oceanic and Atmospheric Administration filing and reporting requirements.

A key component of the proposed project is hydrologic modeling. An evaluation of the impact of cloud seeding on stream flow would follow the hydrologic modeling method described by Boyle et al. (2006). DRI would model data with and without the seeding augmentation to assess the change in stream flow in the Walker River. The research task is unique to cloud seeding evaluations and would provide a more objective assessment of benefits than can be provided by estimates of snow water increases alone. An annual report on project operations, including the estimated amount of snow water augmentation and the stream flow results from the modeling study, would be completed by July 31 of each year.

Section 3

Affected Environment and Environmental Consequences

This section presents the environmental consequences of the No Action and Proposed Action alternatives. The affected environment (or present condition or characteristics of the resource) is discussed first under each environmental factor. This is followed by a description of the predicted effects of the No Action and

Proposed Action alternatives. Direct, indirect and cumulative effects have been considered.

3.1 Assumptions for Environmental Analysis

Accuracy of Target Area Predictions

Research on predicting the accuracy of precipitation enhancement targeting has been on-going for several decades with positive results (Huggins 2009). More recent research has used techniques such as tracer chemicals and refined modeling to evaluate the accuracy of target predictions (Huggins et al 2005, Boyle et al 2006).

The Proposed Action is similar to past projects completed by DRI in the same geographic area. During prior projects DRI collected snow samples at various locations in the Walker River Basin and performed trace chemical analyses of the samples. The most recent results from 2004 indicated that the seeding material was reaching the target area downwind of seeding sites as intended (Huggins et al 2005).

Based on the recent site-specific monitoring and the similarity to previous projects, there is a high amount of confidence in the accuracy of the target area predictions. Therefore, the discussion of direct environmental effects of cloud seeding material and resulting precipitation is confined to the predicted precipitation enhancement area shown in Figure 1.

"Downwind" Effects in Precipitation

In a 2007 report for the California Energy Commission, Steven Hunter of the Bureau of Reclamation addressed concerns sometimes associated with proposed cloud seeding projects (Hunter 2007), including changes to downwind precipitation. Hunter's literature review showed no decrease in precipitation downwind of the target area and a possible slight increase in some cases. Hunter explained that the lee (downwind) side of a mountain range such as the Sierra Nevada has a "rain shadow" that greatly affects the atmospheric moisture supply. Cloud seeding could only enhance the baseline moisture supply downwind, not decrease it.

The "downwind" concern is also addressed in the 2009 California Water Plan Update (Calif. Dept. of Water Resources 2009), citing information from the Bureau of Reclamation's Project Skywater and 1981 Sierra Cooperative Project EIS, and concluding that seeding clouds with silver iodide does not cause a decrease in downwind precipitation and may increase precipitation up to 100 miles downwind in certain situations.

In a 1998 position statement, the American Meterological Association (AMS) addressed the "extra-area" (downwind) concern by the public and called for improved quantification of the associated hydrological effects (American Meteorological Society 1998). The monitoring, modeling, and research aspects of this and earlier DRI projects meet the intent of the AMS's position on scientific credibility of cloud seeding projects.

Based on the most recent literature and for the purposes of this EA, the assumption is that there would be no measurable change to background precipitation downwind of the target area. Any changes to downwind precipitation would be within the annual range of variability.

Magnitude and Timing of Enhanced Precipitation

As described in the Background section of Section 1, a 5% to 15% increase in annual precipitation in the Walker River Basin could result from the cloud seeding project. This projection is based on DRI's experience with similar projects in roughly the same target area (Huggins 2009) and is consistent with other published literature (Hunter 2007, Calif. Dept. of Water Resources 2009, Reynolds 1988).

In a 1998 position paper, the American Meteorological Society (AMS) stated: "There is statistical evidence that precipitation from supercooled orographic clouds (clouds that develop over mountains) has been seasonally increased by about 10%. The physical cause-and-effect relationships, however, have not been fully documented. Nevertheless, the potential for such increases is supported by field measurements and numerical model simulations." (American Meteorological Society 1998).

Harris (1981) discussed the impacts of a 5% to 7.5% increase in precipitation on biological resources, the human environment and land uses. Largely because this range is smaller than the annual range of variability in natural precipitation, the report concluded there would be no significant impacts. Additional safeguards mentioned are threshold criteria that are designed to stop cloud seeding if there is a flood concern, staff meteorologists monitoring weather conditions during the project and agency water specialists monitoring stream flow and reservoir storage.

DRI's safety guidelines (Desert Research Institute 2010), also known as "suspension criteria," include thresholds of avalanche danger, warm winter storm predictions, predicted flood conditions in or around the project area, high winds, adverse wind direction, excessive water content in the snowpack, and major winter holiday periods (because of traffic concerns). The detailed guidelines can be found on DRI's cloud seeding website: http://www.dri.edu/guidelines-a-restrictions .

Therefore, the overall consequences for resources would be within the natural range of variation for a winter season and not expected to result in a measurable effect on those resources.

Toxicity of silver iodide (AgI) on the environment

Several 1970s-era studies examined the environmental and health impacts of cloud seeding in the United States, including such as Harris (1981), Howell (1977), and Klein (1978). A more comprehensive list of world-wide laboratory and field studies is contained in the Weather Modification Association's 2009 "Position Statement on the Environmental Impact of Using Silver Iodide as a Cloud Seeding Agent." The conclusion of the policy statement is: "*The published scientific literature clearly shows* ***no environmentally harmful effects*** *arising from cloud seeding with silver iodide aerosols have been observed, nor would be expected to occur. Based on this work, the WMA finds that silver iodide is environmentally safe as it is currently being used in the conduct of cloud seeding programs*."

Williams and Denholm (2009) provide an in-depth literature review of the toxicity of silver iodide on the environment, as well as the most recent monitoring results of the large-scale Snowy Precipitation Enhancement Study (SPERP), an eleven-year cloud seeding research program designed to assess the technical, economic and environmental feasibility of augmenting snowfall in the Snowy Mountain Region of New South Wales, Australia. The literature review summarizes findings from both field and laboratory toxicity studies, including studies on fish and amphibians. The authors concluded that there is compelling evidence that the use of silver iodide for the SPERP will not result in an adverse ecotoxicological impact on the study area environment.

Monitoring by the Desert Research Institute of past cloud seeding projects in and near the proposed project area has not been able to detect an increase in silver above levels naturally present in soil and streams (i.e., baseline numbers are not elevated). DRI uses ultra-sensitive laboratory methods which can detect parts-per-trillion concentrations (Huggins 2010).

All of these studies are consistent in concluding the contribution of silver iodide (AgI) to the environment from cloud seeding is negligible (i.e., in quantities too small to be measured) compared to background levels and are well below threshold limits for human safety, aquatic organisms, and water quality standards.

Overall, the conclusions reached in the published scientific literature center around these points:

- Background levels of silver far exceed silver contributed from cloud seeding projects. Silver is found naturally and through industrial emissions. Silver is a trace element in many organisms. Numerous studies report no detected AgI in samples of cloud seeded areas vs. control areas.

- In studies where silver (all compounds and all sources) was detected it was in the range of 0.1 to 0.01 micrograms per liter. The U.S. Public Health Service established a concentration limit of 50 micrograms/liter in public water supply. In a 1978 study, cloud seeding AgI was estimated to contribute 0.1 percent of overall silver emissions (Eisler 1996).

- The quantities of AgI used in cloud seeding are minute because very little material is needed to form the desired ice crystals. Furthermore, cloud seeding material is dispersed over very large areas. In sampling waterbodies in mountain areas of California subject to long-term cloud seeding, no detectable silver above the natural background was found in seeded target area water bodies, precipitation and lake sediment samples, or any evidence of silver accumulation after more than fifty years of continuous seeding operations (Stone et al 1995; Stone 2006).

- AgI is considered water insoluble and not able to bio-accumulate to toxic levels. This insoluble property is what makes AgI maintain its structure and serve as an effective cloud seeding agent. Some silver compounds are toxic, especially to aquatic organisms in laboratory studies. However, in an environmental setting AgI is immobilized and is not bio-active. Studies were conducted as part of an environmental monitoring effort to determine if cloud seeding was impacting Sierra Nevada alpine lakes. No evidence was found that silver from seeding operations was detectable above the background level. There was also no evidence of an impact on lake water chemistry, which is consistent with the insoluble nature and long times required to mobilize any silver iodide released over these watersheds. Comparisons of silver with other naturally occurring trace metals measured in lake and sediment samples collected from the Mokelumne watershed (northeast of the proposed project area but in comparable ecosystems) in the Sierra Nevada indicate that the silver was of natural origin (Stone 2006).

3.2 Vegetative Communities

3.2.1 Affected Environment

Walker River Basin

Most of the Walker River watershed is located in the Great Basin Province, which extends from the region south of Lake Tahoe across Nevada, east of the Sierra Nevada. The region supports sagebrush steppe, pinyon/juniper woodland, and riparian cottonwood communities (Hickman 1993). Large areas of agriculture also exist, primarily in Mason and Smith valleys in Nevada and in Bridgeport and Antelope valleys in California.

Figure 3, a map from Boone et al (2000), shows seven major vegetation types within the Walker River Basin.

Following an elevation gradient from Billings (1951), ranging from 3900’ to 12,000’, major vegetation types are salt desert scrub, sagebrush-grass scrub, piñon-juniper woodland, coniferous forest, montane shrubland, and alpine tundra, with riparian habitat and meadows at a wide range of elevations.

The vegetation along the Walker River corridors in Nevada and adjacent to Walker Lake is described in detail in the 2010 Walker River Basin Water Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010). The document also describes special status plants and noxious weeds in the Walker River Basin.

The Walker River watershed is identified as having noxious weed infestations (Nevada Department of Agriculture 2008) and requires control of specific noxious weeds. A noxious weed of high concern in riparian habitats in the Walker River Basin is tamarisk, also known as salt cedar. Reduction of tamarisk along the Walker River was the number one riparian weed goal cited by a special focus group, along with reducing other noxious weeds such as knapweed (University of Nevada, Reno 2001). Tamarisk consumes groundwater and can cause a lowering of the water table and drying of groundwater-fed surface water (Wiesenborn 1996). Tamarisk is also better adapted than native riparian vegetation to saline conditions and lowered water tables (Zouhar 2003). Current Desert Terminal Lakes' legislation has provided funds for tamarisk treatment, which are being used to treat tamarisk infestations along the mainstem Walker River upstream of Walker Lake and reduce its spread.

West-slope Sierra Nevada

The aerial cloud seeding would take place in the upper elevations of the southeastern part of the Stanislaus National Forest and Yosemite National Park. Aircraft would be at altitudes of 14,000 feet and above, which is 3,000 to 4,000 feet above the highest peaks in the area. The area below is dominated by red and white fir forests, lodgepole pine, western white pine and other high elevation pine, upland brush communities, and a mix of riparian associated communities including aspen, willow and wet meadow habitat types.

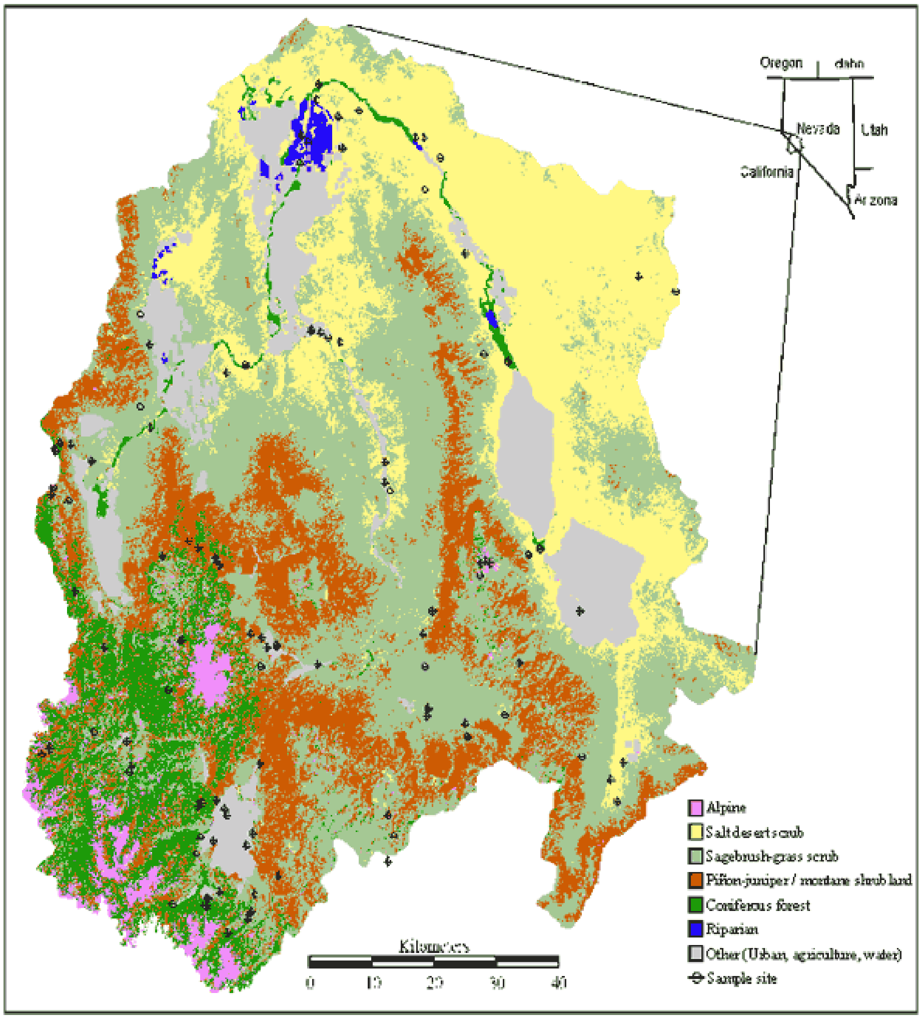

Figure 3 - Walker River Basin Vegetation

3.2.2 Environmental Consequences

No Action Alternative

The No Action Alternative would not use the five ground-based generator sites, so there would be no possible impact on vegetation from their use for this project.

Under the No Action Alternative, there would be no possibility of additional precipitation from cloud seeding efforts that could provide additional water to the Walker River Basin. Upland vegetation communities would not change from background conditions. Wetland and riparian communities along the river would be expected to continue to decline or may improve as a result of other restoration projects. Unless mitigated by other restoration programs, noxious weed invasion of riparian habitat in the lower Walker River would likely continue as a result of the increased salinity and erosion and lowered groundwater table expected to occur under background conditions of the No Action alternative. Unless water contributed by other projects stabilized or reversed current trends, the decline and recession of wetlands would continue; however, where these wetlands are primarily spring fed at Walker Lake, they would likely persist at lower lake elevations.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

There would be no effect to vegetation from the five ground-based generator sites. The ‘footprint’ of the equipment is small, limited (the equipment is mostly on trailers) and located on previously disturbed sites. Access to the sites is on existing vehicle routes.

There would be no expected discernable effect to upland vegetation from implementation of the Proposed Action alternative’s cloud seeding because the amount, timing and duration of the enhanced precipitation are expected to be within the existing range of variability for seasonal precipitation and snowpack runoff.

While studies show that cloud seeding can increase precipitation by 5-15%, the amount of extra precipitation from cloud seeding that could reach the Walker River is unknown, as is the amount of additional water that could flow to Walker Lake. These questions are a focus of the research component of the project. Additional precipitation from cloud seeding in the Walker River Basin may result in slightly increased flows in the Walker River during high runoff events in winter and in spring prior to the irrigation diversion season, when Walker Lake typically receives the bulk of its inflows. In addition, cloud seeding could augment all decreed water rights that are supplied by the Walker River, thus providing extra water for both agricultural vegetation and for NFWF’s water acquisitions that are intended for transfer to Walker Lake during any years that they are transferred. The project is not expected to have a measurable effect on riparian vegetation or noxious weeds along the Walker River. Any increased precipitation that is held in the snowpack and is subject to diversion during the irrigation season may not benefit riparian vegetation in a measurable or significant way. The Proposed Action is not expected to have any measurable effect on the wetlands associated with farmland, shallow areas around Walker Lake, the Alkali Wildlife Management Area, the south end of Walker Lake and submergent wetlands in Walker Lake.

Westside Sierra vegetation would be expected to have no effects from enhanced precipitation because it is not within the precipitation enhancement area, only beneath the aircraft seeding flight tracks.

3.3 Water Resources

3.3.1 Affected Environment

Introduction

The Walker River Basin is approximately 4,050 square miles and encompasses parts of California and Nevada; approximately 1,002 square miles of the basin are in California (Lopes and Smith 2007). The river and its watershed originate in the eastern Sierra Nevada and terminate at Walker Lake. Most precipitation in the basin occurs as snow in the Sierra Nevada. Snowmelt from the Sierra Nevada and other ranges flows down the East Walker River and the West Walker River, which merge into the mainstem Walker River in Mason Valley, Nevada. The river continues flowing downstream into the northern end of Walker Lake.

Walker River Flows

Each major reach of the Walker River has a complex relation of accretions and depletions (i.e., inflow gains and losses), with resulting effects on water supplies and habitat. The current situation is described in detail in the Walker River Basin Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010). That document also provides information on water rights and irrigation usage within the Walker River Basin.

Walker Lake

The volume of water in Walker Lake has a direct relation to water surface elevation and surface area. Surface area affects the volume of water that leaves the lake through evaporation, and changes in lake elevation expose or cover portions of the lake bed, which can affect resources discussed in other sections of this EA. Lake volume has a strong influence on water quality, in particular, Total Dissolved Solids (TDS).

Walker Lake has fluctuated well above and below the present lake elevation as a result of climate fluctuation and changes in the course of the Walker River.
The volume of Walker Lake is dependent on inflow from Walker River, groundwater inflow, local surface water inflow, precipitation, and evaporation. However, groundwater inflow is relatively small (less than 10%) compared to Walker River inflow and much of the groundwater inflow may be derived from the river (Lopes and Allander 2009).

Groundwater

Surface water is the primary source of groundwater in the Walker River Basin. Groundwater inflow occurs via infiltration into alluvial aquifers from both crop irrigation water and from water bodies, primarily the Walker River (Sharpe et al. 2008). There is little groundwater movement between the groundwater basins associated with each valley (Thomas 1995).

The Walker River Basin Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010) provides in-depth information on each groundwater basin, pumping, and groundwater levels.

Water Quality

The East and West Walker Rivers and the mainstem Walker River are listed as impaired waters by Nevada Division of Environmental Protection on Nevada's 303(d) list for various parameters. Sediment and elevated levels of phosphorus are of particular concern for the Walker River system Walker Lake is also named on the 303(d) list for cadmium, arsenic, molybdenum, selenium and total phosphorus. Total dissolved solids (TDS) have increased within the lake as a result of reduced freshwater inflow and evaporation. A Total Maximum Daily Load (TMDL) for TDS has been approved for Walker Lake and approved by the Environmental Protection Agency.

The Walker River Basin Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010) provides detailed information on key water quality issues in the proposed project area.

Hydrologic Modeling Studies

Huggins (2009) summarized the results of several research projects related to seeding winter orographic cloud systems, providing documentation of the effectiveness of these types of cloud seeding projects when a conceptual model or specific procedures are followed.

Statistical evaluations of wintertime seeding projects produced similar results. Storm increases were as high as 50% under optimal seeding conditions. A seasonal increase of 8 percent was documented using trace chemicals in a project in the Sierra Nevada (McGurty 1999). Overall, Huggins (2009) supported the 15 percent augmentation quoted in capability statements of the World Meteorological Organization and the American Meteorological Society, but outlined additional research needs for continuing uncertainties in operational weather modification.

In research for the Bureau of Reclamation's Weather Damage Modification Program, Huggins (2005) reported on the effectiveness of using trace chemical analyses to aid in evaluating the success of wintertime snowfall augmentation projects. Information was gained about sampling techniques to improve target predictions. The study was conducted in the same general area as the Proposed Action and was valuable in refining the research component of this proposed project.

Boyle et al (2006) in a hydrologic modeling study of a similar 2003-4 cloud seeding project in the upper Walker River Basin assumed a 10% increase in precipitation. The modeling case studies showed increases in evaporation and runoff from the target area, but the enhanced precipitation did not significantly affect the groundwater storage or soil moisture storage for all five target areas. The amount of additional water attributable to the cloud seeding that resulted in stream flow varied from 49% to 89% (the remainder of the precipitation left the areas as evapotranspiration). The study did not address flows in the lower Walker River or into Walker Lake.

The authors pointed out uncertainty in the ability of operational cloud seeding projects to achieve the assumed 10% seasonal increase in precipitation and did not claim that the modeling accurately reflected the actual increase in stream flow as a result of the 2003-4 cloud seeding project. They stated the modeling results were intended to provide water managers with a better understanding of how targeted areas could respond to an increase in precipitation, which would lead to more efficient cloud seeding and water management activities.

3.3.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no possibility of additional precipitation from cloud seeding efforts that could provide additional water to the Walker River Basin. The existing DRI cloud seeding program in the Walker River Basin would likely be curtailed due to reduced funding opportunities. Any increased precipitation that could result from cloud seeding would not be available to augment water rights acquired or leased by NFWF to be transferred to Walker Lake during any years that they are transferred. The No Action Alternative would not produce potentially increased flow in the Walker River from cloud seeding efforts and therefore no water quality benefits from increasing dilution of poor quality inflows or reducing river water temperature would occur.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

Enhanced precipitation from the proposed cloud seeding project could result in some increase in soil moisture and surface runoff in the target area during the winter and early spring months prior to agricultural irrigation when runoff to the Walker River and inflows to Walker Lake are at their highest levels. However, it is unlikely the project would result in major inflows to Walker Lake that would significantly reduce the rate of decline in lake level. Any increased precipitation that is held in the snowpack could result in increased diversions during the irrigation season. If diversions were increased, flows in the Walker River or inflows to Walker Lake wouldn't be expected to occur. However, water rights acquired or leased by NFWF could be augmented by the increased precipitation and would be transferred to Walker Lake increasing both stream flows and lake inflows during any years that they are transferred.

While modeling results indicate the increase in seasonal precipitation could be in the range of 5% to 15%, the quantity of precipitation reaching target areas and the accuracy of targeting is part of the research aspect of the project. A very large increase in runoff resulting from cloud seeding (i.e., flooding) would not occur because of the operational constraints in place (Desert Research Institute 2010). The overall effect is expected to be a minor increase in precipitation within the target area, but an amount which would be within the annual range of variability for precipitation for the Walker River Basin.

Indirect effects of cloud seeding on water quality are not expected to have any measurable effects. Any enhanced precipitation from cloud seeding that may result in increased river flows and additional seasonal inflow to Walker Lake could have a slight improvement in water quality, although these effects are not expected to be discernable. Potential water quality benefits include improving river water quality by increasing dilution of poor quality inflows and by reducing river water temperature which is desirable for aquatic habitat, by increasing flows. As river flows increase, the potential for erosion and greater sediment transport also increases, which would be a negative effect. However, the amount of added precipitation generated by cloud seeding is expected to be within the annual range of variability for precipitation within the Walker River Basin, and is expected to have no discernable effect on stream erosion and sediment transport.

No negative direct effects on water quality are anticipated from cloud seeding operations. As discussed in the Assumptions for Environmental Analysis section, cloud seeding material (AgI) has been studied for many years and has been found to be present in well below background levels of naturally occurring silver in the environment, is in an insoluble form that is not toxic to the environment, and does not bio-accumulate. All cloud seeding chemicals are mixed at the DRI maintenance facility in Reno. The stainless steel tanks holding the cloud seeding solution are transported to the seeding sites in accordance with Department of Transportation regulations. Secondary spill containment is provided by the trailer enclosure with a sealed floor and a 6-inch lip around the bottom that would contain all solution in the tanks, in the event of a leak. Ground-based cloud seeding sites are located on high points away from drainages and watercourses.

3.4 Fish and Threatened Fish Species

Introduction

This section describes the affected environment for fish species (including special-status species) and fish habitat and the potential impacts on fish species and habitat that would result from the No Action alternative and the Proposed Action alternative. The contents of this section are excerpted from the 2010 Walker River Basin Water Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010).

3.4.1 Affected Environment

This section describes the environmental setting related to fish resources, including special-status fish species, and fish habitat in the area projected to receive increased precipitation, primarily the East and West Walker Rivers and the mainstem Walker River, up to and including Weber Reservoir and Walker Lake. The discussion focuses on Walker Lake and the mainstem Walker River upstream of Weber Dam, which would benefit from any enhanced precipitation that increased flows. Lahontan cutthroat trout (LCT) are described and Paiute cutthroat trout (PCT) are mentioned in the threatened fish species section. PCT habitat is adjacent to, but not within the proposed project area.

Habitat Conditions, Fish Species Composition, and Distribution in the Walker River Basin

Table 2 lists fish species observed in the Walker River Basin, along with their associated habitats. Nonnative species are stocked (historically and/or currently) in the reservoirs of the Walker River Basin and also the rivers. Irrigation structures have been constructed throughout the Walker River Basin. Many of these structures fragment the basin and act as complete or partial barriers to fish migration, limiting the ability of fish to migrate to required habitats (Deacon and Minckley 1974, Behnke 1992). When access to spawning areas is limited, fish may spawn in and use suboptimal habitats. Regulated flow in the Walker River Basin has disrupted the natural channel-forming processes that create and maintain river and stream habitats.

West Walker River

The headwaters of the West Walker River lie east of the Sierra Nevada crest just south of Sonora Pass, California. Four of the six remaining LCT populations in the Walker River Basin are found in the West Walker River tributaries. (Sharpe et al. 2008). Other native fish species occurring in the West Walker River include mountain whitefish, Lahontan redside, Lahontan speckled dace, Tahoe sucker, Lahontan mountain sucker, Paiute sculpin, and Lahontan tui chub (Stockwell

1994). Nonnative species such as common carp, largemouth bass, brown trout, rainbow trout, and others occur in the West Walker River (Sada 2000).

Water is diverted from the main river channel downstream into Topaz Lake Reservoir. From Topaz Lake Reservoir, the West Walker River is predominantly bordered by sagebrush shrub-scrub and irrigated agricultural fields and flows through Smith Valley, Wilson Canyon, and Mason Valley. The West Walker River and East Walker River join in Mason Valley to form the mainstem Walker River (Sharpe et al. 2008).

East Walker River

The East Walker River originates in the Sierra Nevada above Twin Lakes outside of Bridgeport, California. LCT occurs in By-Day Creek Reservoir and in Murphy Creek, approximately 4 miles downstream of Bridgeport Reservoir. Nonnative rainbow trout and brown trout from the Mason Valley Fish Hatchery are stocked in the East Walker River (Sharpe et al. 2008).

Downstream of Bridgeport Reservoir, the river is lined with high desert riparian woodland habitat and supports mountain whitefish, Lahontan redside, speckled dace, Tahoe sucker, Lahontan mountain sucker, tui chub, and nonnative species such as common carp, brown trout, and rainbow trout (Sada 2000).

Mainstem Walker River

The mainstem Walker River begins downstream of the convergence of the West and East Walker Rivers in Mason Valley and terminates at Walker Lake. Fish species found in the mainstem Walker River are Paiute sculpin, Lahontan mountain sucker, Lahontan redside, smallmouth bass, brown bullhead, and common carp.

The riparian zone along mainstem Walker River to Weber Reservoir is dominated by cottonwood and willows; below Weber Reservoir tamarisk (saltcedar), an invasive species is a substantial component of the riparian zone. (Sharpe et al. 2008). Historically, the mainstem Walker River was part of the migratory corridor for LCT to reach their spawning grounds (U.S. Fish and Wildlife Service 1995). The entire river reach from Weber Reservoir to Walker Lake does not provide quality migratory, spawning, or rearing habitat for LCT.

A fish survey on the mainstem Walker River was conducted on May 28, 2008, between Weber Reservoir and Schurz. No LCT were found at any of four sampling sites. All captured fish were warmwater nonnative species such as bluegill, largemouth bass, and common carp (Walker Lake Fisheries Improvement Team 2008). Cooper and Koch (1984) reported that LCT and Tahoe suckers no longer spawn in the mainstem Walker River.

Walker Lake

Walker Lake is the terminus of the Walker River Basin. LCT was once abundant in the Walker River system and supported an extensive fishery (LaRivers 1962). However, the decline of lake surface elevation and loss of access to spawning habitat led to the near loss of this fishery by the 1950s (Koch et al. 1979, Cooper and Koch 1984). LCT has been produced by Lahontan National Fish Hatchery and Mason Valley Hatchery since the 1960s. The 1995 LCT Recovery Plan (U.S. Fish and Wildlife Service 1995) identifies the importance of maintaining these populations while recovery strategies are developed and Lahontan National Fish Hatchery Complex provides production to support recovery and recreational fishing.

Table 2. Fish Species of the Walker River Basin

Species	Scientific Name	Native or Introduced	Abundance	Current Distribution	Habitat
Lahontan cutthroat trout	*Oncorhynchus clarki*	Native	Uncommon /Stocked	Walker River, Walker Lake	River type fish: pools with cover (instream woody material, undercut banks) and velocity breaks, and riffle-run habitats with clear water and rocky substrate (U.S. Fish and Wildlife Service 1995, 19**{**tc "USFWS 1995, 19" \f C \l 1**}**). Lake fish: water temperatures less than 22°C, pH values of 6.5 to 8.5, TDS concentrations less than 11,000 mg/l, and dissolved oxygen concentrations greater than 8 mg/l (Moyle 2002, 290**{**tc "Moyle 2002, 290" \f C \l 1**}**).
Lahontan tui chub	*Siphateles bicolor*	Native	Common	Walker River, Walker Lake	Quiet alkaline water with well-developed aquatic vegetation and fine substrate. Summer temperatures in excess of 20°C (Moyle 2002, 124).
Lahontan redside	*Richardsonius egregius*	Native	Uncommon	Walker River	Pools and slow riffles and alkaline lakes. Swim close to the surface during summer months and in the winter descend to lake bottoms in deep water (Moyle 2002, 135).
Lahontan speckled dace	*Rhinichthys osculus robustus*	Native	Unknown	Walker River	Clear, well-oxygenated water, with abundant cover such as woody debris, submerged aquatic plants, and moving water from stream currents, springs, or wave action (Moyle 2002, 162).
Tahoe sucker	*Catostomus tahoensis*	Native	Common	Walker River	Abundant in natural lakes. Also inhabit small streams with pools and runs and heavy cover. Can be found in waters exceeding 25ºC in the summer (Moyle 2002, 192).
Lahontan mountain sucker	*Catostomus platyrhynchus*	Native	Uncommon	Walker River	Clear streams with moderate gradients and substrate of rubble, sand, or boulders. Also live in large rivers and turbid streams. Found in waters ranging from 1-28ºC (Moyle 2002, 180).
Mountain whitefish	*Prosopium williamsoni*	Native	Unknown	Walker River	Clear, cold streams with large pools and mountain lakes. Can be found in summer water temperatures of 11-21 ºC (Moyle 2002, 244).

Species	Scientific Name	Native or Introduced	Abundance	Current Distribution	Habitat
Paiute sculpin	*Cottus beldingi*	Native	Uncommon	Walker River	Clear, cold mountain streams (< 20ºC) with shallow, rocky riffles, in association with trout (Moyle 2002, 358).
Rainbow trout	*Oncorhynchus mykiss*	Introduced	Common/ Stocked	Walker River	Well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18°C (Moyle 2002). Habitat types are riffles, runs, and pools.
Smallmouth bass	*Micropterus dolomieu*	Introduced	Common/ Stocked	Walker River, Weber Reservoir	Large, clear lakes and clear rivers with abundant cover and summer water temperatures 20-27ºC (Moyle 2002, 402).
Largemouth bass	*Micropterus salmoides*	Introduced	Common/ Stocked	Walker River, Weber Reservoir	Warm, shallow, low-velocity waters of moderate clarity and dense aquatic plants. Optimal temperatures of 25-30 ºC (Moyle 2002, 398).
Sacramento perch	*Archoplites interruptus*	Introduced	Unknown	Weber Reservoir	Lakes and reservoirs. Associated with aquatic vegetation and submerged objects. Prefer summer water temperatures range from 18-28ºC (Moyle 2002, 378).
Brown trout	*Salmo trutta*	Introduced	Common/ Stocked	Walker River	Medium to large slightly alkaline streams with riffles and large, deep pools. Prefer water temperatures of 12 to 20°C (Moyle 2002, 294).
Mosquitofish	*Gambusia affinis*	Introduced	Uncommon	Walker River	Many habitats. Can tolerate high water temperatures (up to 35ºC), various salinities, and low dissolved oxygen (Moyle 2002, 318).
Yellow perch	*Perca flavescens*	Introduced	Common/ Stocked	Weber Reservoir	Lakes associated with heavy growth of aquatic plants. Prefer warm water (22-27ºC) and can tolerate low dissolved oxygen concentrations (Moyle 2002, 412).
Black crappie	*Pomoxis nigromaculatus*	Introduced	Common/ Stocked	Weber Reservoir	Large warmwater lakes and reservoirs with water temperatures up to 29ºC. Associate with large submerged objects (Moyle 2002, 396).

In November 2005, Congress appropriated $5 million funding in PL 109-103 for Western Inland Trout Initiative and Fishery Improvements through Reclamation's Desert Terminal Lakes Program. This funding was transferred to the U.S. Fish and Wildlife Service (USFWS) and funds a collaborative partnership between Nevada Department of Wildlife (NDOW), Walker River Paiute Tribe (WRPT), and USFWS to design and implement fishery improvements in the State of Nevada with an emphasis on the Walker River Basin. The Walker Lake Fishery Improvement Program emphasizes improving understanding of the fishery in Walker Lake and lower Walker River, helping to improve the stocking and survivability of LCT, and refining strategies for establishing a self-sustaining, lacustrine LCT population. This allows adaptive management for long-term recovery and maintenance of a healthy recreational fishery (Walker Lake Fisheries Improvement Team 2008).

The decrease in Walker Lake surface elevation and depth has changed the entire lake ecosystem— physically, chemically, and biologically. Increasing Total Dissolved Solids (TDS) concentration and water temperature and decreasing dissolved oxygen concentration have played a role in altering nutrient cycling, changing biotic communities, and affecting the extent and quality of fish habitat, particularly in summer months. As a result, Walker Lake is experiencing eutrophication, a degradation of lake water quality (Sharpe et al. 2008). Insufficient freshwater inflow to Walker Lake has resulted in aquatic conditions that are inhospitable to LCT, its prey base, and probably other lake-dependent faunal species.

Threatened Fish Species

LCT is the only threatened fish species listed under the Endangered Species Act (ESA) that is found in the Walker River Basin. Lahontan tui chub is discussed because of its importance as a prey base for LCT. Paiute cutthroat trout is also a threatened fish species listed under the ESA but it occurs in tributary streams to the Carson River, adjacent to the northwestern boundary of the analysis area for the proposed action.

Lahontan Cutthroat Trout

Lahontan cutthroat trout (Oncorhynchus clarki) is currently listed as threatened by USFWS under the ESA (40 FR 29864, 1975) and is a Nevada protected species (U.S. Fish and Wildlife Service 2008a). It is also listed as at-risk (Nevada Natural Heritage Program 2007). No critical habitat has been designated (U.S. Fish and Wildlife Service 1995, 2009a).

There are two forms of LCT: fluvial (stream-dwelling) and lacustrine (lakedwelling). Fluvial type fish prefer pools with cover (instream woody material, undercut banks) and velocity breaks, and riffle-run habitats with clear water and rocky substrate (U.S. Fish and Wildlife Service 1995). Optimal riverine habitat consists of clear cold water, well-vegetated streambanks, abundant instream cover, stable water flow, and approximately 1:1 pool-to-riffle ratio (Hickman and Raleigh 1982). Fluvial LCT can tolerate water temperatures up to 25°C, but growth ceases at 24°C. High mortality occurs at water temperatures of 26°C and above (Dickerson and Vinyard 1999).

Lacustrine type LCT can tolerate relatively high alkalinity and TDS concentration (U.S. Fish and Wildlife Service 1995). Numerous studies have examined optimal water quality conditions for lacustrine type LCT. Studies have shown that 20% of acclimated LCT survived when TDS concentration exceeded 15,000mg/L and that only 4 to 5% of acclimated LCT survived when TDS concentration reached 16,000 mg/L (Nevada Department of Wildlife 2006).

Both types of LCT spawn in stream habitats from April to July. The timing and success of spawning depend on stream flow, surface elevation, and water temperature. Lacustrine type fish migrate into tributaries to spawn. Spawning occurs in riffle habitat over gravel substrate. Migration to spawning areas is observed in water temperatures ranging from 5°C to 16°C. Eggs hatch in 4 to 6 weeks, depending on water temperature, and fry emerge 13 to 23 days later. Fry typically will move out of tributary spawning locations in the fall and winter when flows increase, but some stay in their natal streams for 1 to 2 years (U.S. Fish and Wildlife Service 1995).

Fluvial fish are opportunistic feeders, typically feeding on drift such as aquatic and terrestrial invertebrates. In Walker Lake, LCT feed primarily on Odonata nymphs (damselflies and dragonflies) and tui chub (Nevada Department of Wildlife 2007).

In the Walker River Basin, six populations exist in the tributaries of the East and West Walker River (Murphy, Mill, Slinkard, Silver, Wolf, and By-Day Creeks). By-Day Creek has the only endemic population, and its fish have been introduced into the other creeks (U.S. Fish and Wildlife Service 1995). The population of LCT in Walker Lake is maintained by annual NDOW and USFWS stocking programs (U.S. Fish and Wildlife Service 1995). All stocked LCT are produced at either Mason Valley Hatchery or Lahontan National Fish Hatchery.

Lahontan Tui Chub

Lahontan tui chub is listed as a subspecies of special concern by the Endangered Species Committee of the American Fisheries Society, but it is not protected by law. Tui chub is self-sustaining in Walker Lake and is a prey item for LCT. The upper limit of TDS tolerance for tui chub is unclear.

Paiute Cutthroat Trout

Paiute cutthroat trout (PCT), (*Oncorhynchus clarki selenirisis)*, is a subspecies of cutthroat trout native only to Silver King Creek, a headwater tributary of the East

Fork Carson River in Alpine County, California. PCT are listed by the USFWS as threatened under the ESA.

The Silver King Creek watershed is adjacent to the proposed cloud seeding project area, but not within the project area. Alpine County was, however, included in the scoping for this environmental analysis. Additionally, the USFWS requested analysis of the effects of the project on PCT in their scoping comments. The current and historic range of PCT is not within the proposed project area, therefore PCT would not be affected by the project.

3.4.2 Environmental Consequences

No Action Alternative

The No Action Alternative would not result in potentially increased flow in the Walker River from cloud seeding efforts and therefore would not improve water quality or increase fish habitat for native fish species that reside in the Walker River. Walker Lake volume and surface elevation would continue to decline at the current rate or at a reduced rate due to implementation of projects and programs designed to deliver additional water to Walker Lake (see Section 3.11 Cumulative Effects.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

The amount of extra precipitation from cloud seeding that could reach the Walker River is unknown, as is the amount of additional water that could flow to Walker Lake. These questions are a focus of the research component of the project.

Additional precipitation from cloud seeding may result in slightly increased flows in the Walker River during high runoff events in winter and early spring prior to agricultural diversions when Walker Lake typically receives the bulk of its inflows. However, it is unlikely the project would result in significantly increased flows in the Walker River that would show a discernable positive effect on fish habitat or populations. The same situation applies to increased inflows to Walker Lake, where water quality could be positively affected, but likely not to a level that could be measured or have a discernable positive effect on fish habitat or populations. Any increased precipitation that is held in the snowpack and is subject to diversion during the irrigation season may not benefit fisheries in a measurable or significant way.

The primary cloud seeding material (AgI) has been studied for many years and has been found to be present in well below background levels of naturally occurring silver in the environment, is in an insoluble form that is not toxic to the environment, and does not bio-accumulate.

There would be no impact to fish from the five ground-based generator sites because they are located on mountain tops and ridges, relatively far from watercourses, and have no impacts that could affect fish.

The Proposed Action alternative would not have any effect on Paiute cutthroat trout because PCT are not located in the proposed project area or the enhanced precipitation area (upper Walker River Basin).

3.5 Wildlife and Endangered, Threatened, Candidate Wildlife Species

3.5.1 Affected Environment

The number of wildlife species occurring in the Walker River Basin is extensive because of the large area and the variety of habitats encompassed by the basin. Some wildlife species are associated with one specific habitat type, while others may use a variety of different habitats. Some wildlife species use specific habitats seasonally, such as migratory birds and migrating deer, and other wildlife species are year-round residents of specific habitats.

Federal and state agencies own and manage much of the wildlife habitat throughout the Walker River Basin. While federal agencies are responsible for managing wildlife habitat on federal land, Nevada Department of Wildlife (NDOW) and the California Department of Fish and Game (CDFG) manage the wildlife. NDOW is charged with restoring and managing fish and wildlife resources on all public lands throughout Nevada with the exception of tribal lands and lands withdrawn for military operations

Habitats

Lacustrine

Lacustrine habitats are associated with open waters, lakes and reservoirs for the purposes of this EA. Lacustrine habitats in the Walker River Basin are important to wildlife species, especially water birds, because there is relatively little freshwater habitat in the Great Basin (Ryser 1985). The water environments in lacustrine habitats include the shallow areas close to shore and the deeper mid-lake areas. The physical characteristics of these environments are not static and change daily, seasonally, and annually.

Walker Lake is at the terminus of the Walker River. Walker Lake is an important water source for a number of wildlife species, especially water birds. The Lahontan tui chub is presently the most abundant fish species in the lake and a food source for the lake's LCT and migratory fish-eating species such as the common loon and white pelican (Wildlife Action Plan Team 2006).

Walker Lake is an important stopover for many birds on their migration routes. During periods of migration, Walker Lake has the highest number of waterfowl in the state of Nevada and its importance to waterfowl has been increasing as the lake recedes. The use of Walker Lake by migratory birds changes seasonally. In the spring, shorebirds, waterfowl, and other water birds stop at Walker Lake for food and rest during their northward migration. In the summer, Walker Lake is used by resident birds. During the fall, migratory birds use Walker Lake for food and rest during their southward migration. Significant numbers of waterfowl, such as ducks and coots, may remain at Walker Lake in the winter.

A freshwater marsh at the southern end of Walker Lake provides important habitat for many bird species. This freshwater marsh is fed by springs that flow into the lake. The dominant vegetation of the marsh is cottonwoods and cattails (Espinoza and Tracy 1999). This freshwater marsh provides important habitat for wildlife species, especially as feeding grounds for wading birds and shorebirds.

The shoreline of Walker Lake provides important foraging ground for bird species that feed on aquatic macroinvertebrates such as white-faced ibis, western snowy plover, and American avocet. Western snowy plover are also known to nest on the dry lakebed east of Walker Lake (Stockwell 1999).

Riverine

The riverine system in the Walker River Basin provides important habitat value for wildlife species. The rivers, creeks, and associated wetlands provide habitat for aquatic invertebrates, fish, and amphibian species that are food sources for many wildlife species. Riparian and marsh habitats provide important nesting and foraging habitat for many species of birds and the understory of riparian habitat is used by mammals and reptiles.

West Walker River

The headwater of the West Walker River originates in the Sierra Nevada in California, just south of Sonora Pass. In Nevada, the West Walker River flows through Smith Valley, Wilson Canyon, and Mason Valley. In the vicinity of the California/Nevada border, the uplands adjacent to the West Walker River are predominantly big sagebrush shrubland, xeric mixed sagebrush shrubland, and agriculture. Along the river is riparian vegetation and emergent marsh, with patches of greasewood flat, semi-desert grassland, and forbland outside the riparian border. Small inclusions of mixed salt desert scrub and pinyon-juniper woodland are also present. Areas of montane sagebrush steppe are scattered in this region. At the south end of Smith Valley, foothills support pinyon-juniper woodland, xeric mixed sagebrush shrubland, semi-desert shrub steppe, and Sierra and basin cliff and canyon. Between Smith Valley and Mason Valley, the West Walker River supports riparian vegetation, with mostly mixed salt desert scrub outside of the riparian corridor. Near the confluence with the East Walker River, the West Walker River supports a mix of riparian, big sagebrush shrubland, and greasewood flat.

East Walker River

The headwaters of the East Walker River originate in the Sierra Nevada in California, west of the town of Bridgeport. Where the East Walker River crosses into Nevada, it enters the Pine Grove Hills and flows though canyons and more open valleys before entering Mason Valley, where it merges with the West Walker River. In Nevada, the East Walker River flows through open sagebrush and irrigated agricultural lands. High desert riparian woodlands occur along the banks of the river for much of its stretch in Nevada.

Mainstem Walker River

The mainstem Walker River flows from the convergence of the West Walker River and the East Walker River through the Mason Valley to Walker Lake. At the confluence of the East and West Walker Rivers, the mainstem Walker River area is mostly agricultural with vegetation along the river similar to that described for the West Walker River upstream of the confluence. Between the Wabuska gage and Weber Reservoir, the Walker River supports a broad riparian corridor that provides important habitat for migrating birds and mammals. Downstream of Weber Reservoir, a riparian corridor persists for several miles along the Walker River. The delta region of the Walker River where it flows into Walker Lake is primarily mixed salt desert scrub and greasewood flat, with emergent marsh within the river channel. There are areas of invasive tamarisk and semi-desert grassland.

Uplands

Most of the area in the Walker River Basin is upland habitat. Upland habitats in the basin include sagebrush, pinyon-juniper forest, upland conifer forest, and subalpine habitats at the highest elevations. Upland habitats near Walker Lake support amphibian and reptile species. Western toad and Great Basin spadefoot occur along the southwest shore of the lake (Espinoza and Tracy 1999). Reptiles that occur close to Walker Lake include side-blotched lizard, zebra-tailed lizard, Great Basin collared lizard, western whiptail, desert horned lizard, long-nosed leopard, and common kingsnake (Stebbins 2003, Espinoza and Tracy 1999).

The predominant habitat in Smith Valley is sagebrush scrub and agricultural fields. In Mason Valley, habitats include mixed desert scrub, greasewood flat, semi-desert grassland, playa, scattered dunes, and agricultural fields. Sagebrush occurs over large areas in the Smith Valley and provides habitat for many reptiles, birds, and mammals. Sagebrush lizard, Great Basin collared lizard, Great Basin gopher snake, common kingsnake, and western rattlesnake are common reptile species found in sagebrush habitats. Many species of passerine birds and small mammals occur in sagebrush habitat. Large mammals that inhabit sagebrush include mule deer, mountain lion, kit fox, and coyote. Greater sage grouse and pygmy rabbit are sagebrush-obligate species of concern. They are discussed in more detail below in the Special Status Wildlife section below.

Pinyon-juniper woodlands are common in the mid-elevation areas (6,000 to 9,000 feet) and adjoin many other habitat types, such as sagebrush at lower elevations and eastside pine and Jeffery pine at higher elevations. Common wildlife species that occur in pinyon-juniper woodlands include juniper titmouse, pinyon jay, ferruginous hawk, pinyon mouse, and mule deer (Wildlife Action Plan Team 2006).

Coniferous forests and subalpine habitats dominate the higher elevation of the study area. Coniferous forests provide habitat for many bird and mammal species, including white-headed woodpecker, pygmy nuthatch, American marten, golden-mantled ground squirrel, and black bear (Wildlife Action Plan Team 2006).

Cliffs and canyons include barren and sparsely vegetated areas (less than 10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops. Bighorn sheep and American pika are mammals that are adapted to the rocky habitats. Golden eagle and prairie falcon use cliff areas for nesting (Wildlife Action Plan Team 2006).

Agricultural Lands

Much of the native habitats now in agricultural production began to be converted to agriculture starting in the mid-1800s. Before the land in these valleys was irrigated, only a small fraction of these valleys supported riparian and wetland habitat. Irrigation in the Walker River Basin has allowed the expansion of riparian and wetland habitat, although these habitats still make up only a small fraction of these valleys used for agriculture in Nevada and California.

Irrigated agricultural lands, such as pasture, alfalfa and other crops, provide foraging habitat for a number of wading birds and waterfowl. Many upland species such as quail, mourning dove, pheasant, turkey, mule deer, and many species of small mammals have adapted to and commonly use agricultural lands. Agricultural lands also provide important foraging habitat for snakes, raptors, and owls that feed on small mammals and small birds.

Canals and drains transport water to and from agricultural fields. The water elevation in these canals and drains varies greatly during irrigation season. Riparian vegetation can become established on their banks and wetland vegetation can become established in the beds of the canals and drains, although this vegetation may be cleared periodically for maintenance.

Wildlife Corridor

The area lies within the Pacific Flyway, the primary seasonal movement corridor for birds migrating west of the Rocky Mountains. This flyway adds significantly to the diversity of bird species within the Basin in Nevada. Wetlands, lakes, rivers, riparian forests, and agricultural fields provide resting and foraging opportunities for migrating birds.

Threatened or Candidate Wildlife Species

Several wildlife species that are listed or are candidates for listing under the Endangered Species Act (ESA) occur or have potential to occur within the proposed project area. Scoping comments from USFWS recommended the following species for consideration in this EA or in project planning:

- Sierra Nevada bighorn sheep, (*Ovis Canadensis)*, Endangered
- Greater sage-grouse, (*Centrocercus urophasianus)*, and Bi-state Distinct Population Segment DPS, Candidate
- Yosemite toad, (*Bufo canorus)*, Candidate
- Mountain yellow-legged frog (Sierra Nevada DPS), (*Rana muscosa)*, Candidate

The USFWS also requested consideration of pygmy rabbit (*Brachylagus idahoensis*), which had been under status review for listing under the ESA. The northern sagebrush lizard (*Sceloporus graciosus graciosus*) is a USFWS species of concern and a Bureau of Land Management (BLM) sensitive species. Bald eagles, golden eagles and migratory birds are also of concern; these species are discussed below and in the previous general wildlife section.

Sierra Nevada Bighorn Sheep

The following section is largely excerpted from the U.S. Fish and Wildlife Service's Recovery Plan for the Sierra Nevada Bighorn Sheep (U.S. Fish and Wildlife Service 2007).

Sierra Nevada bighorn sheep (SNBS) were listed as an endangered species on January 3, 2000, following emergency listing on April 20, 1999. In 1995 the Sierra Nevada bighorn sheep hit a population low of about 100 individuals, distributed across 5 separate areas of the southern and central Sierra Nevada. The total population has grown to 325-350 individuals (U.S. Fish and Wildlife Service 2007).

Sierra Nevada bighorn sheep use habitats ranging from the highest elevations along the crest of the Sierra Nevada 13,120+ feet to winter ranges at the eastern base of the range as low as 4,760 feet. These habitats range from alpine to Great Basin sagebrush scrub. Primary elements of preferred habitats are visual openness and close proximity to steep rocky terrain used to escape from predators. Forage resources vary greatly across habitats used by Sierra Nevada bighorn sheep, and plant species eaten vary accordingly. (U.S. Fish and Wildlife Service 2007)

Factors limiting Sierra Nevada bighorn sheep recovery include disease, predation, low population numbers and limited distribution, availability of open habitat, and potential further loss of genetic diversity due to small population sizes and inadequate migration between them. Since the vast majority of Sierra Nevada bighorn sheep habitat is publicly-owned land, loss of habitat has not been a limiting factor (U.S. Fish and Wildlife Service 2007).

The proposed cloud seeding project area slightly overlaps the northernmost occupied habitat of SNBS in Mono County, California. During scoping, the Bureau of Land Management identified ground based cloud seeding Site 4 near Copper Mountain as within critical habitat for SNBS. DRI has withdrawn their application to use this site for a ground based cloud seeding unit based on considerations for SNBS.

Greater Sage Grouse

The following information is largely excerpted from the 2004 Nevada Department of Wildlife's Greater Sage Grouse Conservation Plan for Nevada and Eastern California (Nevada Department of Wildlife 2004).

The greater sage grouse and the Bi-State Distinct Population Segment (DPS) of the greater sage grouse (formerly termed the Mono Basin population of greater sage grouse), including those that occur in Lyon, Mineral, and Douglas Counties, Nevada, and Mono County, California, were placed on the candidate list for future action under the Endangered Species Act following a 12-month status review which was published in the Federal Register (75 FR 13910). The greater sage grouse is also listed as a BLM sensitive species.

Sage grouse occurs throughout the northern two-thirds of Nevada and in eastern California in sagebrush-dominated vegetation communities. Occupied sage grouse habitat occurs in the proposed project area. (Wildlife Action Team Plan 2006).

Sage-grouse are considered a sagebrush ecosystem obligate species. Obligate species are those species that are restricted to certain habitats or to limited conditions during one or more seasons of the year to fulfill their life requirements. Sage-grouse are only found where species of sagebrush exist. Sagebrush species provide nesting, brood, and fall/winter cover as well as forage throughout the year.

Male sage-grouse congregate in late winter through spring on leks to display their breeding plumage and to attract hens for mating. As defined by Connelly et al. (2003), a lek is a traditional display area where two or more male sage-grouse have attended in two or more of the previous five years. The area is normally located in a very open site in or adjacent to sagebrush-dominated habitats. Taller sagebrush on the outskirts of the leks is necessary as a food source, escape cover, nesting cover for females, and loafing cover during the day.

Early brood-rearing generally occurs close to nest sites and in habitat consistent with nesting habitat. The habitats used during the first few weeks after hatching need to provide cover to conceal the chicks and to provide the nutritional requirements during period of rapid development. Brood-rearing habitats that have a wide variety of plant species tend to provide a corresponding variety of insects that are important chick foods.

When chicks are about six weeks of age, sage-grouse hens will usually move the chicks from the early brood habitat/nest area to summer habitat, where the majority of brood rearing occurs. Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields (Connelly et al. 2000). In general, a sagebrush ecosystem with a good understory of grasses and forbs, and associated wet meadow areas, are essential for optimum habitat. Sage-grouse will also utilize agricultural areas during the late summer and early fall.

Fall habitat consists of mosaics of low-growing sagebrush. Similar to other seasons of the year, a mosaic of sagebrush vegetation (different species, different cover values, different height classes, etc.) provides the necessary food and cover requirements during the fall period.

Information on winter habitats in Nevada and California are based on limited data. In general, winter movements are related to severity of winter weather, topography, and vegetative cover (Beck 1977). Sage-grouse habitats must provide adequate amounts of sagebrush because their winter diet consists almost exclusively of sagebrush. It is crucial that sagebrush be exposed at least 10 to 12 inches above snow level as this provides both food and cover for wintering sage-grouse (Barrington and Back 1984, Hupp and Braun 1989).

Sage-grouse habitat, when considered over the period of a year, consists of a variety of habitats or habitat conditions over a large area. A mosaic of these habitat types or conditions must be available on the landscape to provide all of the sage-grouse seasonal cover and nutritional needs. Adequate grass and forb cover is an important component to nesting and early brood rearing habitats for both forage and concealment from predators.

The risk factors affecting sage-grouse and sage-grouse habitat include habitat quantity, habitat quality and nutrition, wildfire, habitat fragmentation, livestock grazing, wild and free roaming horses, predation, changing land uses, hunting and poaching, disturbance, disease, pesticides, cycles, and climate/weather. Of these risk factors, habitat quantity, habitat quality, and wildfire have affected Nevada and California sage-grouse populations the most (Nevada Department of Wildlife 2004).

Habitat quantity has been reduced because of pinyon-juniper encroachment and changes in the plant community from sagebrush to annual grasses due to high severity wildfire. Habitat quality has been reduced due to invasion of exotic annuals and other invasive weed species, improper grazing management systems, and wild horse over-utilization (Nevada Department of Wildlife 2004).

Predation is an important cause of sage-grouse mortality, especially for eggs, chicks, newborn chicks and juvenile birds. The primary strategies for addressing predation within the Population Management Units include site-specific measures appropriate to the area. Measures to reduce impacts from predators include actions that can make the habitat less suitable for the identified predator. In the case of avian predators (ravens, raptors) aerial structures can be removed or modified to discourage perching.

Disturbance can include various types of disruption. Increased traffic on a road that formerly had little traffic and is located near a lek is an example of a disturbance that may cause the birds to abandon a lek. Limited research has been done to document the effects of various types of disturbance on populations, but measures can be taken to reduce disturbance in and near active leks.

Weather can influence annual populations by changing the availability and quality of sage-grouse food. Newly hatched chicks must acquire a highly nutritional diet during the first few days after hatching. This diet is comprised primarily of insects, and insect availability is highly dependent on weather. Cold, wet weather causes many insects to seek shelter and become inactive, reducing their availability to sage-grouse chicks. Chicks that are stressed are more vulnerable to predators and to direct effects of weather. During cold, dry winters, sage-grouse may not find suitable snow for snow roosting, reducing their ability to build up energy reserves for spring breeding. All of these factors can limit recruitment to the population in any given year. Because these types of weather events generally occur over a broad area, population effects can be realized (Nevada Department of Wildlife 2004). The effects of weather on chick survival can be reduced by maintaining high quality habitat conditions that favor quality egg production, abundant insects and forbs for chick nutrition, and adequate cover for protection from inclement weather.

All 3 of the ground cloud seeding generator sites located or proposed to be located on Bureau of Land Management (BLM) public lands and the Romero site located on private land are within sage grouse habitat. The Nevada and California (NV/CA) Bureau of Land Management is committed to implementing the actions identified in the Greater Sage-Grouse Conservation Plan for Nevada and Eastern California (the Nevada-California Plan), where feasible and through collaborative action with partners, to the extent consistent with the agency mission and within the constraints of statute and regulation. Significant laws and regulations regarding sage-grouse are:

- Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), as amended 2004
- Sikes Act, Title II (16 U.S.C. 670g et seq.), as amended
- The Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), as amended.

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Yosemite Toad

The following section is largely excerpted from the USFWS's species assessment for the Yosemite toad (U.S. Fish and Wildlife Service 2009b).

Yosemite toads use high elevation meadow habitats, including the edges of wet meadows, slow-flowing streams, shallow ponds and shallow areas of lakes, springs and seeps. The historic range of the Yosemite toad in the Sierra Nevada occurs from the Blue Lakes region north of Ebbetts Pass (Alpine County) to miles south of Kaiser Pass in Fresno County (Jennings and Hayes 1994). The historic elevational range of Yosemite toads is 4,790 to 11,910 feet (Stebbins 1985).

The historic and current acreage of Yosemite toad habitat within the historic range of Yosemite toad is unknown. The vast majority of land within the range of the Yosemite toad is federally managed by the U.S. Forest Service, National Park Service, and Bureau of Land Management.

Primary threats to Yosemite toads are livestock grazing, roads and timber harvest, vegetation and fire management activities, recreation activities, dams and water diversions, and disease (U.S. Fish and Wildlife Service 2009b). Environmental contamination, most likely from airborne pollutants such as pesticides in the Central Valley, is a concern and a possible factor in the species' decline.

There are few, if any, studies on the direct effect of contaminants on Yosemite toads. One study shows that there are significant levels of contaminants that have been deposited in the Sierra Nevada, and the correlative evidence between areas of contamination in the Sierra Nevada and areas of amphibian decline (Jennings 1996; Sparling et al. 2001).

Seasonal changes in weather can have effects on Yosemite toads. Especially harsh winters would force longer hibernation times, and could stress the toads by reducing the time available for them to feed and breed. Severe winters may also depress reproductive effort. On the other hand, mild winters have reduced precipitation, which can lead to stranding and death of Yosemite toad eggs and tadpoles or to increased exposure to predatory fish.

The proposed cloud seeding project area overlaps the northernmost potential habitat of Yosemite toad in the upper elevation areas of Mono County, California.

Mountain Yellow-legged Frog

On October 12, 2000, the U. S. Fish and Wildlife Service announced a 90-day finding on the petition to list the mountain yellow-legged frog as endangered (Federal Register, Vol. 65, No. 198). USFWS found that the petition presents substantial information indicating that listing the species may be warranted. The USFWS 12-month petition finding was completed on January 16, 2003. It concluded that the petitioned action is warranted, but precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants (Federal Register, Vol. 68, No. 11). Upon publication of this 12-month petition finding, this species was added to the USFWS candidate species list.

Mountain yellow-legged frogs occur in the Sierra Nevada from 4,500 feet to over 12,000 feet elevation (Jennings and Hayes 1994). Mountain yellow-legged frogs are seldom far from water. Mountain yellow-legged frogs prefer well illuminated, sloping banks of meadow streams, riverbanks, isolated pools, and lake borders with vegetation that is continuous to the water's edge (Martin 1992, Zeiner et al. 1988). Since the adults and tadpoles over winter underwater, in high elevations they are restricted to relatively deep lakes (over 5 feet deep) that do not freeze solid in winter (Knapp 1994).

Suitable breeding habitat for mountain yellow-legged frogs is considered to be low gradient (up to 4%) perennial streams and lakes. Streams in this category generally have the potential for deep pools and undercut banks that provide the habitat requirements of this frog. Adults primarily feed on aquatic and terrestrial invertebrates. Garter snakes and introduced trout prey upon mountain yellow-legged frog tadpoles (Zeiner et al. 1988).

The mountain yellow-legged frog has two main experimentally verified threats: 1) introduced trout and 2) the pathogenic chytrid fungus, *Batrachochytrium* *dendrobatidis*. Both of these factors are widespread throughout the range of the mountain yellow-legged frog. Both have also been shown in peer-reviewed scientific studies to have dramatic adverse effects on the mountain yellow-legged frog. Other threats, including degradation of habitat by grazing livestock, disturbance by recreationists, and environmental contaminants, may have some effect on this species, but the immediacy of these threats and the magnitude of their effects is unknown (U.S. Fish and Wildlife Service 2009c).

Recent assessment of the species status in the Sierra Nevada indicates that mountain-yellow legged frogs may occur at less than 8 percent of the sites from which they were historically observed (U.S. Fish and Wildlife Service 2009c).

The southwestern part of the project area lies within the geographical and elevation range of mountain yellow-legged frogs.

Pygmy Rabbit

On January 8, 2008, the U.S. Fish and Wildlife Service published a substantial 90-day finding to list the pygmy rabbit outside the state of Washington as threatened or endangered under Endangered Species Act, thereby initiating a status review of the species (the Columbia Basin distinct population segment was listed as endangered by USFWS in 2003). On September 30, 2010 the USFWS published a notice in the Federal Register with a determination that the pygmy rabbit does not warrant protection under the Endangered Species Act. The pygmy rabbit is a BLM sensitive species and is therefore evaluated for effects from the Proposed Action.

Pygmy rabbits are the smallest rabbit in North America. Pygmy rabbits are generally found throughout the Great Basin in areas dominated by tall and dense big sagebrush. Other shrub species that may co-occur include bitterbrush, rabbitbrush, greasewood, and juniper. Another important aspect of suitable habitat is the presence of deep and friable soils (Ulmschneider 2004). The pygmy rabbit is believed to be one of only two Leporids in Northern America that digs its own burrows. They occasionally make use of burrows abandoned by other species and as a result, may occur in areas of shallower or more compact soils that support sufficient shrub cover. In Nevada, pygmy rabbit is found in broad valley floors, drainage bottoms, alluvial fans, and other areas with friable soils (Ulmschneider 2004). Based on range maps (Wildlife Action Team Plan 2006, Hall 1981), the proposed project area lies within the geographical and elevation range of the pygmy rabbit range.

Pygmy rabbits are typically found in areas of tall, dense sagebrush (Artemisia spp.) cover, and are highly dependent on sagebrush to provide both food and shelter throughout the year. Their diet in the winter consists of up to 99 percent sagebrush. In the summer and spring months, their diet becomes more varied, including more grass and new foliage.

Threats to pygmy rabbit include habitat loss and fragmentation caused by: conversion of sagebrush rangeland to agriculture; development; frequent wildfire; predation by various mammals and avian species (ravens and raptors); invasive plant species; and diseases such as tularemia and sylvatic plague.

Northern Sagebrush Lizard

The northern sagebrush lizard (*Sceloporus graciosus graciosus*) is a USFWS species of concern and a Bureau of Land Management (BLM) sensitive species. The northern sagebrush lizard is widely distributed in montane chaparral, hardwood and conifer habitats, eastside pine and juniper habitats, and Great Basin shrub habitats of the Cascades and Sierra Nevada, and east of the Sierra crest in desert mountains. They are active spring through fall and hibernate in the winter. They are mostly terrestrial and escape danger by running into rock crevices, brush, rodent burrows, or trees when frightened. They eat a variety of insects, such as ants, beetles, grasshoppers, flies, butterflies or moths, spiders and other bugs. Snakes and birds of prey are the main predators of the northern sagebrush lizard.

Bald Eagle

Bald eagles, except for those that occur in the Sonora Desert in central Arizona, have been removed from protection under the Endangered Species Act. However, they are still protected under the Bald Eagle and Golden Eagle Protection Act, are listed as a protected species under the Migratory Bird Treaty Act (MBTA) and are listed as a BLM sensitive species. Bald eagles nest in large trees and on cliffs, often near large water bodies. Winter roosts commonly are large trees and other sheltered sites. They feed primarily on fish but will prey on injured waterfowl, various small mammals, and carrion. Few nests sites have been recorded in northern Nevada and winter numbers are low across the state (Wildlife Action Team Plan 2006). Bald eagles are not known to nest around Walker Lake, although the fishery of Walker Lake and agricultural lands in Mason Valley may provide important hunting grounds for bald eagles.

Golden Eagle

Golden eagles are protected under the Bald Eagle and Golden Eagle Protection Act, are listed as a protected species under the Migratory Bird Treaty Act (MBTA) and are listed as a BLM sensitive species. Secluded cliffs with overhanging ledges and large trees are commonly used for nesting and cover. Preferred territory sites include those that have a favorable nest site, a dependable food supply of medium to large mammals and birds, and broad expanses of open country for foraging. Mountainous terrain where takeoff and soaring are supported by updrafts is generally preferred to flat habitats. Golden eagles are present throughout the Walker River Basin.

Common Loon
The common loon is listed as a protected species under the MBTA. Common loons are large birds that breed in freshwater lakes located in the boreal and mixed conifer forests across North America. Their winter ranges include the coastal waters along California and Baja California in the Pacific and the coastal waters of Virginia, the Carolinas, and the North Gulf Coast of Florida. In the west, most common loons migrate along the Pacific coast, although a significant number migrate through western Nevada (Mcintyre and Barr 1997). Walker Lake is an important stopover for the interior western continental migrants (Wildlife Action Team Plan 2006). Over 1,400 common loons have been observed at Walker Lake during their spring migration (Evers 2004). However, recent surveys have documented a significant decrease in loon numbers on Walker Lake. The 2009 spring survey counted 150 loons; 127 loons were counted in the 2009 fall survey (USBR 2010).

American White Pelican
The American white pelican is listed as a protected species under the MBTA. American white pelicans occur mainly along the western and southern portions of North America. White pelicans breed on isolated islands in inland lakes and winter along the southern coasts. American white pelicans feed on a variety of fish that generally are captured in shallow areas of marshes or along the shorelines of deeper lakes (Knopf and Evans 2004). American white pelicans are not known to breed on Walker Lake, although Walker Lake is used for feeding, especially when the tui chub spawn (USBR 2010).

White-Faced Ibis

The white-faced ibis is listed as a protected species under the MBTA. White-faced ibis inhabits freshwater wetlands, especially cattail and bulrush marshes, although it feeds primarily in flooded hay meadows, agricultural fields, and estuarine wetlands (Ryder and Manry 1994). White-faced ibis is known to breed in the Mason Valley WMA (USBR 2010).

Western Snowy Plover
Western snowy plover is listed as a protected species under the MBTA. Western snowy plover occurs on dry mud or salt flats and on the sandy shores of rivers and lakes. It nests on the ground of dry mud or salt flats where vegetation is sparse or absent. Snowy plover feeds on insects and other invertebrates that are picked or probed from the substrate (Wildlife Action Team Plan 2006). Western snowy plover has been known to nest at the Alkali Lake WMA (Nevada Natural Heritage Program 2008) and on dry lake beds just to the east of Walker Lake (Stockwell 1999).

3.5.2 Environmental Consequences

No Action Alternative

The existing cloud seeding program in the Walker River Basin would likely be curtailed due to reduced funding opportunities. There would be no opportunity for any additional precipitation from cloud seeding that could provide increased moisture for native plants and irrigated agriculture that would benefit wildlife habitat for the various terrestrial species considered in this section.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

Over the entire target area the enhanced precipitation from the proposed cloud seeding project could be in the range of 5% to 15% above precipitation expected without the project (No Action alternative). How much of the enhanced precipitation that would reach the lower Walker River and Walker Lake is unknown. Terrestrial wildlife discussed in this section of the EA, and the plants that constitute their habitat, are adapted to annual changes in precipitation. The levels of additional precipitation and stream flow estimated from cloud seeding activity are within that annual range of variability. Excessive amounts of precipitation from cloud seeding activity would not occur because project suspension criteria would be in place, so there would not be severe events (flooding, avalanches, extreme snow depth) that could adversely affect wildlife species. Additional precipitation from cloud seeding could provide increased moisture for both native plants and irrigated agriculture that would be beneficial for these different types of wildlife habitat.

As discussed in more detail in Assumptions for Environmental Analysis, cloud seeding material (silver iodide) is not toxic to wildlife. Several studies have confirmed that AgI is insoluble and not available to bio-accumulate. Quantities of AgI used in cloud seeding are very small. Studies of terrestrial and aquatic sites near the proposed project area that have had long-term cloud seeding have not found levels of silver above background levels. Recent studies have found no toxic effects from cloud seeding operations or in the laboratory (Williams and Denholm 2009).

The ground-based cloud seeding generator sites could have potential negative effects on greater sage-grouse. The primary concerns are habitat (perches) for avian predators, disturbance from winter cloud seeding (noise), and disturbance from site support (vehicle traffic). Mitigation measures where these concerns exist include:

- Removing the equipment during non-use (late spring and summer)
- Lowering the antenna if equipment removal is not feasible
- Minimizing site support traffic

Noise generated by the ground based cloud seeding equipment is similar to a furnace in operation and has been measured at 54 decibels at a 50 foot distance away from the site, which is less than an idling pickup truck (Wyoming Game and Fish 2007) and is not expected to influence sage grouse activity at the lek sites.

Ground based cloud seeding sites on BLM would be authorized by permits. Special conditions in the BLM permit direct that equipment be removed only after the grouse have left the area, and to lower the antenna in the spring to prevent birds of prey from using it as a perch to hunt sage grouse.

The BLM will evaluate the ground based cloud seeding sites under their authorization for habitat suitability for pygmy rabbit and northern sagebrush lizard and add mitigation measures if necessary. The proposed ground based cloud seeding site at the Conway Communications site would be located on an existing concrete pad adjacent to existing permanent communications equipment and will not involve new ground disturbance.

All ground based sites are accessed by existing roads and maintenance would be performed by 4 wheel drive vehicle and snowmobile. The equipment is trailer-based and can be moved if necessary.

There would be no expected effects to wildlife from airborne seeding. Those operations would occur at elevations of 14,000 feet and above, which is 3,000 to 4,000 feet above the highest peaks in the area.

3.6 Land Uses and Socio-Economics

3.6.1 Affected Environment

The primary target area for enhanced precipitation is the upper Walker River Basin in Lyon and Mineral Counties, Nevada and in Mono County, California. Much of the land in the Walker River Basin is BLM land. These lands are used for a variety of purposes, such as herd management areas for wild horses, recreation, mineral and energy leases, and grazing allotments.

Other federal lands within the project area include Bureau of Land Management public lands in California, the Humboldt-Toiyabe National Forest east of the Sierra Nevada crest and the Stanislaus National Forest and Yosemite National Park to the west. National Forest and National Park lands west of the Sierra crest would be within the aircraft cloud seeding area but not in the target area for enhanced precipitation.

Nevada

The Department of Defense's (DOD) Hawthorne Army Depot is a 147,000-acre ammunition storage depot on the south end of Walker Lake. DOD has jurisdiction over the southern portion of Walker Lake. Several creeks run through the depot and eventually discharge into Walker Lake. The depot uses surface water from Cottonwood Creek, Rose Creek, and Cat Creek, and also has groundwater pumping rights.

The Walker River Indian Reservation comprises 325,000 acres between the northeast end of Mason Valley and Walker Lake. Most of the land is used for agriculture and is the county's major farming district (Mineral County 2008). Grazing is the primary land use, as well as some ranching (Walker River Paiute Tribe 2008a), but agricultural crops are also an important part of the economic base. The Tribe has jurisdiction over the northern portion of Walker Lake.

The Yerington Reservation and Colony consist of two land areas: the Yerington Indian Colony (Colony) and the Yerington Indian Reservation, which is also known as Campbell Ranch. The population of the Colony and Campbell Ranch is 400 tribal members. Land uses at the Campbell Ranch are primarily agricultural and residential. Tribal members collect culturally significant plants and animals on both the reservation and public land.

The State of Nevada, through Nevada Department of Wildlife, owns or has long-term leases on land incorporated into Wildlife Management Areas across the state. The management focus of most WMAs, including both the Alkali Lake and Mason Valley WMAs, is development of wetland- and waterfowl-related activities. Public uses include bird watching, hiking, fishing, and hunting.

The Alkali Lake WMA is located at the north end of Smith Valley and is approximately 3,448 acres, of which at least 3,000 acres are a playa lake and a small portion is upland habitat. The WMA relies almost solely on drain and return agricultural flows, which have been reduced over the past decades. When water is present in Alkali Lake, the playa lake provides wetland habitat and shallow water for a wide variety of shorebirds and wading birds. When wet, the lake is also used by ducks and geese.

The Mason Valley WMA is approximately 13,735 acres and includes 35 water bodies and a fish hatchery. Seasonal fishing and hunting are permitted. About 1,200 acres of the WMA are farmed to enhance wildlife habitat and livestock grazing is permitted as another management tool for wildlife. Water is supplied from several surface and groundwater sources.

Mason Valley is a rural farm and ranch community located in southeastern Lyon County. The valley's population in 2006 was 8,740, which includes the City of Yerington and the communities of Mason, Nordyke, and Weed Heights (Lyon County 2006a).

Smith Valley is a rural farm and ranch community located in the southwestern portion of the Lyon County. The valley's population in 2006 was 1,977, which includes the communities of Wellington, Smith, and Simpson (Lyon County 2006a; Economic Development Authority of Western Nevada 2008).

The city of Yerington is located in north central Lyon County on Highway 95A and has an estimated population of 3,319 (Nevada Small Business Development Center 2007). Yerington is the county seat. Land uses in the city include agriculture, low- and medium-density residential, commercial, and industrial uses (Lyon County 2006b).

Much of the population of Mineral County lives in the county seat of Hawthorne, which is located at the southern end of Walker Lake and has an estimated population of 2,960 (Nevada Small Business Development Center 2007). Land uses in Hawthorne include residential and some commercial and public facilities. The town is almost completely surrounded by the Hawthorne Army Depot. Other communities in the study area are the town of Walker Lake, which is located on the western edge of Walker Lake and has an estimated population of 299, and Schurz, which has an estimated population of 711 (Nevada Small Business Development Center 2000).

California

Mono County, situated southeast of Alpine County along the California-Nevada border, is largely a rural county, with a population of 13,759 in 2008. There is one incorporated city in Mono County, the City of Mammoth Lakes, but it is not located near the proposed project area. As described above, there are several small communities in Mono County located in or near the proposed project, including Walker (population: 558), Coleville (population: 77), and Bridgeport (population: 794) (Mono County 2008).

Local industries in Mono County support about 6,920 jobs. Employment in the public sector (i.e., Federal, state and local government) totals approximately 1,530 jobs (nearly one-quarter of employment). Private employment totals 5,360, with service-related industries accounting for most of the employment in Mono County with 4,710 jobs. Of this total, 2,830 jobs are in the leisure and hospitality sector, such as recreation outfitters, local retailers, lodging, and restaurants.

3.6.2 Environmental Consequences

No Action Alternative

The existing cloud seeding program in the Walker River Basin would likely be curtailed due to reduced funding opportunities. Local economies and socioeconomics are not expected to be affected by the No Action alternative.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

Local economies and socioeconomics would not be expected to be affected by the proposed project. The project is expected to add slightly more precipitation to the precipitation enhancement area (shown in Figure 1), possibly more flows to the Walker River and its tributaries, and slightly increased in-flows to Walker Lake from augmentation of NFWF's acquired and leased water rights during any years that water is transferred to the lake. Downwind areas would have no change or a possibility of slightly increased precipitation. These changes in the annual precipitation pattern are within the range of variability for the area and are unlikely to be discernable. Cloud seeding operations would be suspended when meteorological conditions indicate a potential for severe weather.

The primary cloud seeding material (AgI) has been studied for many years and has been found to be to be present in well below background levels of naturally occurring silver in the environment, is in an insoluble form that is not toxic to the environment, and does not bio-accumulate.

Cloud seeding in the area has been conducted in the past with no apparent effects on local economies and socioeconomics.

Congress has provided approximately $183 million for many projects to a variety of entities for environmental restoration in the Walker River Basin with an emphasis on providing water to the imperiled Walker Lake. In particular, approximately $136 million in funding has been provided for NFWF (and formerly the University of Nevada Reno) for research, water leasing and acquisitions for transfer to Walker Lake and stewardship activities in the basin. Cloud seeding is part of a combination of projects designed to cumulatively improve the health of the watershed with a focus on improved Walker River stream flow and inflows to the lake.

The proposed ground based cloud seeding generator site east of Conway Summit is expected to have no physical effect on communications equipment located at the site because it would always be downwind of existing tower structures during seeding operations.

3.7 Air Quality, Climate Change and Greenhouse Gases

3.7.1 Affected Environment

Air Quality

The primary air pollution concern in the Walker River Basin is windblown dust. Walker River Basin topography has a dominating effect on wind patterns. Winds tend to blow parallel to the valley and mountain range orientation. In spring and early summer, thermal low-pressure systems develop over the interior basins east of the Sierra Nevada, and the Pacific high pressure cells move northward. These developments and the study area topography produce the high incidence of relatively strong northwesterly winds in the spring and early summer (Lopes and Smith 2007).

Windblown dust in the Great Basin area is a significant air pollution concern. Long-term water diversions have led the alkaline, and now almost dry, Owens Lake to become the largest single source of windblown dust in the United States. Walker Lake elevations have declined approximately 150 feet over the past 126 years, and the receding lake elevation has exposed outer portions of the lakebed making them susceptible to windblown dust. The drying of the shoreline at Walker Lake mimics the wind erosion and dust emissions conditions described for Owens Lake.

Dust is also a concern in other areas of the Walker River Basin. Because of the relatively low precipitation, particularly in the lower elevations, direct precipitation contributes only sporadically to soil moisture. The generally warm to hot air temperatures, along with low humidity and moderate winds, mean that soil surfaces are typically dry.

Five ground based seeding generators located on the east slope of the Sierra Nevada (see Table 1 and Figure 1) would operate in the winter season during 20 to 30 seeding events. The ground-based seeding generators would have to be installed and maintained using ground equipment (pickup trucks, ATVs, snowmobiles). Estimated annual fuel use would be 500 gallons (gasoline and/or diesel).

Approximately 50 hours of aircraft use per winter season would also occur, with 15 to 20 separate flights. Seeding flight tracks would be at 13,000 feet altitude or greater, centered over the highest elevations of Tuolumne County, California (see Figure 1). The estimated annual aircraft fuel use would be 1,690 gallons.

Using propane for combustion, seeding generators would burn a solution of silver iodide, sodium iodide, salt and acetone to release microscopic silver iodide (AgI) particles (about 0.0001 mm in size) which can create ice crystals, then snow in winter clouds. The estimated annual propane use would be 1,500 gallons. The estimated annual acetone use would be 600 gallons.

Climate Change and Greenhouse Gases

Climate change implies a significant change having important economic, environmental and social effects in a climatic condition such as temperature or precipitation. Climate change is generally attributed directly or indirectly to human activity that alters the composition of the global atmosphere, additive to natural climate variability observed over comparable time periods.

As described in the Background section of Section 1, a 5% to 15% increase in annual precipitation in the Walker River Basin could result from the cloud seeding project. This projection is based on DRI's experience with similar projects in roughly the same target area (Huggins 2009) and is consistent with other published literature (Hunter 2007, Calif. Dept. of Water Resources 2009, Reynolds 1988).

Greenhouse gases in the atmosphere allow short wavelength solar radiation to pass through the atmosphere to reach the earth's surface, but absorb the longer wavelength heat that is radiated back into the atmosphere from the earth. The concentration of greenhouse gases in the atmosphere has an effect on the average temperature at the surface of the earth. If the atmospheric concentration of greenhouse gases decreases over time, then more heat will escape through the atmosphere, and the average temperature at the earth's surface will go down. If the greenhouse gas concentration in the atmosphere increases, however, less heat will escape to outer space and the average temperature at the earth's surface will increase.

Cloud seeding project operations would be emission sources and sources of CO_2, a 'greenhouse gas.' Sources would be vehicle fuel use, aircraft fuel use, as well as propane and acetone use in the seeding solution.

The greenhouse gas of interest in the proposed project is carbon dioxide (CO_2) because it is a combustion product of vehicle and aircraft fuel burning, and propane burning during cloud seeding operations.

The total amount of material expected to be used annually in cloud seeding operations was estimated, then CO_2 emissions projected using a U. S. Department of Energy calculator (USEIA 2010):

- Gasoline burned by vehicles during field operations: ~500 gallons = 4430 kg of CO_2
- Propane burned during seeding operation: ~1500 gallons = 8625 kg of CO_2
- Acetone in seeding solution burned during seeding operations: ~600 gallons = 3470 kg of CO_2
- Aviation fuel burned during seeding flights: ~1690 gallons = 14,060 kg of CO_2

Projected total annual CO_2 emissions = 30,585 kg of CO_2 (about 30 metric tons)
Projected total CO_2 emissions over the length of the project (5 years) = 152, 925 kg of CO_2 emissions (about 153 metric tons).

3.7.2 Environmental Consequences

No Action Alternative

The existing cloud seeding program in the Walker River Basin would likely be curtailed due to reduced funding opportunities. There would be no effects to air quality under the No Action alternative.

Proposed Action Alternative

From an air quality standpoint, the emissions from cloud seeding operations would be minimal relative to background levels from traffic on nearby roads and highways, commercial and military aircraft flying over the project area, and propane used by businesses and residences in and near the project area.

The estimated increase in annual precipitation resulting from the cloud seeding project is smaller than the annual range of variability in natural precipitation, therefore there would be no significant impacts on climate change resulting from implementation of the Proposed Action.

For NEPA compliance, there are no generally accepted significance thresholds for climate change-related impacts resulting from greenhouse gas emissions. In February 2010, the Council on Environmental Quality (CEQ) provided draft guidance on consideration of the effects of climate change and greenhouse gas emissions in NEPA documents and sought public comment on those draft guidelines. CEQ suggested a threshold of 25,000 metric tons of greenhouse gas emissions for disclosure in NEPA documents. CEQ did not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of greenhouse gas emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of greenhouse gases. As discussed in the Affected Environment section above, the estimated annual CO_2 emissions from the proposed project are 30 metric tons, which is within the disclosure threshold in CEQ's 2010 draft guidance.

3.8 Cultural Resources

Historic resources would not be affected by the proposed project. Beginning in the fall of 2010 and continuing through 2015, five ground-based seeding generators will be installed and operated in the Walker River Basin from November through April. Two of the existing ground-based sites are located on public lands and two existing sites are located on private land. The fifth site (Site 5 Alternate) would be located on an existing concrete pad at the Conway Communications Site, on BLM lands east of Conway Summit. Each ground-based site consists of a cloud seeding device mounted on trailer, a propane tank, and a 16-inch high lattice antenna. All sites are accessed by existing roads and maintenance would be performed by 4 wheel drive vehicle and snowmobile. No road or site improvements are necessary. Spill containment measures would be in place.

As the proposed action has no potential to affect historic properties pursuant to 36 CFR Part 800.3(a)(1), no additional consideration under Section 106 of the National Historic Preservation Act is required.

3.9 Indian Trust Assets

3.9.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States government for federally recognized Indian tribes or individual Indians. ITAs can include, but are not limited to, land, minerals, federally reserved hunting and fishing rights, federally reserved water rights, instream flows associated with trust land, water quality, fisheries, native plants, wildlife resources, and cultural sites. These resources are important for both cultural and traditional practices.

Beneficiaries of the Indian trust relationship are federally recognized Indian tribes and tribal members with trust land; the United States government is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without the approval of the United States government. The characterization and application of the United States government trust relationship have been defined by case law that interprets congressional acts, executive orders, and historic treaty provisions.

The key sources of data and information used in the preparation of this section are listed below.

- Bureau of Reclamation Indian Trust Asset Policy and NEPA Implementing Procedures (Bureau of Reclamation1994)
- Weber Dam Repair and Modification Project EIS (Miller Ecological Consultants 2005)
- Walker River Paiute Tribe's official website

The ITAs within the proposed project area includes the lands owned by two federally recognized tribes in the Nevada portion of the Walker River Basin: the Yerington Paiute Tribe (YPT) and the Walker River Paiute Tribe (WRPT). The Bridgeport Indian Colony is located in Bridgeport Valley, California. The Washoe Tribe has lands in both California and Nevada.

Yerington Paiute Tribe

YPT has historically and prehistorically occupied the entire Walker River Basin and areas beyond, such as Mono Lake, Bodie, Sweetwater, the Desert Creek area, and Aurora. The YPT Indian Reservation was set aside in 1916. YPT was recognized under the Indian Reorganization Act of June 1934, and the bylaws and constitution were approved in 1936 recognizing the tribal government (Sharpe et al. 2008).

The YPT's lands consist of YPT Indian Colony and YPT Indian Reservation (also known as Campbell Ranch). The Colony occupies 13.7 acres within the city limits of Yerington, Nevada. Land uses at the Colony are a mix of residential and commercial.

Campbell Ranch encompasses 1,162 acres 10 miles north of Yerington. Land uses at Campbell Ranch are primarily agricultural and residential. The final Walker River Decree (Decree C-125) provides water rights for the YPT Reservation and Colony, which are primarily used for agricultural purposes.

Walker River Paiute Tribe

WRPT refers to itself as Agai-Dicutta (Trout Eaters) Band of Northern Paiute Nation (Walker River Paiute Tribe 2008a). The Walker River Indian Reservation is located on 325,000 acres between the northeast end of Mason Valley and Walker Lake and has a population of approximately 1,200. The reservation was set aside by federal action on November 29, 1859, and later affirmed by Executive Order in 1874. Most of the land is held in trust by the United States for the benefit of WRPT (Miller Ecological Consultants 2005).

Agriculture production on the reservation represents Mineral County's major farming district (Mineral County 2008). Grazing is the primary land use, as well as some ranching (Walker River Paiute Tribe 2008a), but agricultural crops are also an important part of the economic base.

Weber Dam and Reservoir provides storage and regulates the delivery of the reservation's direct flow water rights under Decree C-125 for irrigation water used on the Walker River Indian Irrigation Project. In 2007, 2008, and 2009, all the allotments on the reservation were part of a fallowing program funded by a desert terminal lakes grant with the purpose of providing inflows to Walker Lake.

The unincorporated town of Schurz is located on the reservation at the intersection of U.S. Highways 95 and 95-A. Land uses in Schurz include residential, tribal headquarters, and commercial uses.

ITAs include, but are not limited to, the reservation, irrigated and non-irrigated trust allotment lands, water rights, Weber Dam and Reservoir, and the fish, wildlife, and riparian vegetation in and along mainstem Walker River and Weber Reservoir (Miller Ecological Consultants 2005).

The WRPT's water rights, which are provided under Decree C-125, are held in trust by BIA (USBR 2010).

Washoe Tribe

The Washoe Tribe of Nevada and California (Washoe Tribe) is a federally recognized Indian tribe organized pursuant to the Indian Reorganization Act of June 18, 1934, as amended. The Tribal office is located in Gardnerville, Nevada. The Washoe Tribe has four communities, three in Nevada (Stewart, Carson, and Dresslerville), and one in California (Woodfords). There is also a Washoe community located within the Reno-Sparks Indian Colony. The Washoe Tribe has jurisdiction over trust allotments in both Nevada and California, with additional Tribal Trust parcels located in Alpine, Placer, Sierra, Douglas, Carson, and Washoe Counties. Tribal history extends an estimated 9,000 years in the Lake Tahoe basin and adjacent east and west slopes and valleys of the Sierra Nevada (Washoe Tribe 2010).

Bridgeport Indian Colony

The Bridgeport Indian Colony (BIC) is located just outside of Bridgeport, California, located in the Eastern Sierra Mountain range. The 120- member community consists of descendants from Miwok, Mono, Paiute, Shoshone, and the Washoe tribes (Bridgeport Indian Colony 2010).

On October 17, 1974, the Bridgeport Indian Colony became a federally recognized American Indian tribe, in accordance with Title I Public Law 93-638 (25 U.S.C. 450 [c][d]). The Tribe is a sovereign government located within Mono County's geographical boundaries. The Tribe's current land base (reservation) of approximately 40 acres is located in northeast Bridgeport. The greater Bridgeport Valley area is the ancestral homeland of the tribal members.

3.9.2 Environmental Consequences

No Action Alternative

The existing cloud seeding program in the Walker River Basin would likely be curtailed due to reduced funding opportunities. There would be no effects to Indian Trust Assets under the No Action alternative.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

Implementation of the Proposed Project is not expected to have an effect on Indian trust assets. The project is a continuation of many years of similar cloud seeding activities in the Walker River Basin and adjacent areas in Nevada and California. As discussed in “Assumptions” in Section 2 and individual resource sections in Section 3, the primary cloud seeding material (AgI) has been studied for many years and has been found to be present in well below background levels of naturally occurring silver in the environment, is in an insoluble form that is not toxic to the environment, and does not bio-accumulate.

The enhanced precipitation is expected to be within the annual range of variability, so animals and plants would be adapted to slight changes from increased precipitation and stream flow. Increases in precipitation are expected to have minor beneficial effects to a variety of trust assets including: native plants, instream flows, fisheries, wildlife habitat, and associated hunting and fishing. Suspension criteria would be in place if meteorological conditions indicated a risk of unacceptably severe weather.

3.10 Environmental Justice

3.10.1 Affected Environment

Executive Order 12898 (1994), Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, provides that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Environmental justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities.

The project area encompasses most of the Walker River Basin. Minority or low-income populations occur in or near the precipitation enhancement area (shown in Figure 1), and some of these people use the natural resources of the area for food and cultural activities. Details and data on minority and low-income populations, race and ethnicity, and income and poverty are presented in Reclamation's 2010 Walker River Basin Water Acquisition Program Revised Draft Environmental Impact Statement (USBR 2010).

3.10.2 Environmental Consequences

No Action Alternative

There would be no effects to environmental justice under the No Action alternative.

Proposed Action Alternative

See Section 3.1 Assumptions for Environmental Analysis, for discussion on:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide on the environment.

Environmental conditions such as precipitation and stream flow would be within the range of annual variability and unlikely to be discernable from background conditions. There would not be a disproportionate effect on different areas of the Basin. As discussed in more detail under "Assumptions," there would be no expected downwind reduction in precipitation from the cloud seeding project. The primary material used for cloud seeding (AgI) would be used at very low rates, with well below background levels of naturally occurring silver in the environment. AgI is not toxic to humans, plants or animals and does not bio-accumulate. The intent of the project is to increase flows in the Walker River Basin with potential benefits to Walker Lake.

In summary, there would be no adverse human health or environmental effects to minority or low-income populations as a result of the proposed project.

3.11 Cumulative Effects

Introduction

The cumulative impacts analysis addresses the combined impacts of implementing the Proposed Action alternative and No Action alternative with those of other related past, present, and reasonably foreseeable projects that could result in impacts on the same environmental resources.

Legal Requirements

The CEQ regulations implementing NEPA (40 CFR 1508.7) define a cumulative impact for purposes of NEPA as follows:

> *Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.*

Associated actions (past, present, or future) which, when viewed with the proposed actions, may have cumulative significant impacts. To determine the scope of the cumulative impacts analysis, related projects were identified. These include past, present, and reasonably foreseeable projects that may contribute to cumulative impacts, including, any projects outside of the control of the project proponent or agency.

CEQ regulations also state, “In general, actions can be excluded from analysis of cumulative impacts if the action will not affect resources that are the subject for the cumulative impacts analysis” (Council on Environmental Quality 1997).

Assumptions for Cloud Seeding Analysis

Section 3.1 Assumptions for Environmental Analysis, provides a technical framework for the project with information about:

- Accuracy of target area predictions;
- Downwind effects in precipitation;
- Magnitude and timing of enhanced precipitation; and
- Toxicity of silver iodide in the environment.

Agreements, Plans, and/or Projects with Potential Related Cumulative Impacts

Table 3 lists the past, present, and reasonably foreseeable actions considered in the cumulative impacts analysis.

Table 3 – Activities Considered in Cumulative Effects Analysis

Project or Program Name	Implementing Agency	Desert Terminal Lakes Project
NFWF Water Acquisition Program	Reclamation and NFWF	Yes
WRID 3-Year Water Leasing Demonstration Program	WRID	Yes
Tamarisk Eradication, Riparian Area Restoration, and Channel Restoration	USFWS, with NDOW and WRPT	Yes
Mason Valley Wildlife Management Area – Water Conservation and Other Improvement	Reclamation and NDOW	Yes
Walker River Indian Reservation Storage and Water Rights Litigation, Mineral County Walker River Action litigation, and United States Walker River Basin litigation.	Not applicable	No

Desert Terminal Lakes Program

Beginning in 2002, Congress has passed several pieces of desert terminal lakes legislation related to the Walker River Basin. Reclamation's Desert Terminal Lakes Program was established in 2002 pursuant to Section 2507 of PL 101-171. The proposed cloud seeding project would be funded under the Desert Terminal Lakes Program.

National Fish and Wildlife Foundation (NFWF) Water Acquisition Program

The purpose of the Acquisition Program is to support efforts to preserve Walker Lake while protecting agricultural, environmental, and habitat interests in the Walker River Basin. Reclamation's role for the Acquisition Program as authorized in Public Law (PL) 109-103 and PL 111-85 is to provide funding through Reclamation's Desert Terminal Lakes Program to the University of Nevada (University) or the National Fish and Wildlife Foundation (NFWF). Under an agreement entered into by NFWF and the University in December 2009, the University assigned to NFWF all of the University's rights, interests, and obligations for the Acquisition Program. This includes all the option and purchase agreements previously entered into by the University. NFWF's role going forward will be to further develop and administer the Acquisition Program.

Walker River Basin WRID 3-Year Water Leasing Demonstration Program

NFWF was funded under PL 111-85 to provide funds to WRID, acting in accordance with an agreement between WRID and NFWF to administer and manage a 3-year water leasing demonstration program in the Walker River Basin to increase Walker Lake inflow. This program is intended to provide information regarding the establishment, budget, and scope of a longer-term leasing program.

Tamarisk Eradication, Riparian Area Restoration, and Channel Restoration within the Walker River Basin

Reclamation contracted with USFWS to implement PL 109-103 Section 208(c) and earmarked $10 million for restoration activities in the Walker River Basin. The funds were obligated in May 2006, and are being administered by USFWS. The funds were not earmarked for specific locations and USFWS formed the Walker River Basin Advisory Group to provide advice on the use of this funding in 2006. USFWS initiated activities by preparing a baseline watershed assessment (currently in review) to determine current channel conditions, riparian health, and other factors that affect the overall health of the Walker River watershed. The baseline assessment will be used to detail processes occurring in the basin, prioritize future restoration activities, and set a baseline for monitoring the success of restoration projects. Actual restoration actions are uncertain at this time because of opportunity and funding constraints. Future restoration projects will likely include tamarisk removal, riparian revegetation, and improvements to channel function in the lower Walker River. The types of actions included for funding will likely result in beneficial impacts on wildlife habitat, water quality, and water supply.

Mason Valley Wildlife Management Area – Water Conservation and Other Improvements

The Mason Valley WMA is owned by the State of Nevada with management authority assigned to NDOW. The WMA supports an abundance of fish and wildlife that contribute significantly to the biological diversity of the region. The Walker River floodplain meanders through the WMA, which has decreed Walker River water rights, and is the next-to-last diverter of water before the river empties into Weber Reservoir, which lies on the Walker River Indian Reservation.

The actual amount of water delivered to the WMA varies considerably based on precipitation, snow pack, and the total amount of water in the Walker River system. A fish hatchery on the WMA derives its water from five onsite production wells, and discharges approximately 5,700 af/yr to the WMA where the water is reused for wetland enhancement. Groundwater is also used for crop and wetlands irrigation. Other sources of water for the WMA include Nevada Energy's Fort Churchill Cooling Pond and treated effluent from the City of Yerington. The various water supplies are used to maintain wetlands and ponds, and no surface water flows from the WMA into the Walker River because of water quality concerns associated with the hatchery, cooling pond, and effluent waters.

In March, 2004, Reclamation and NDOW entered into a grant agreement for Desert Terminal Lakes Project funds to construct water conveyance systems and implement conservation measures that would result in a net reduction in use of Walker River water. The goals of the water conservation program would be achieved by:

- providing the means for the Mason Valley WMA to more efficiently use alternative water supplies, thereby reducing the total net usage of decree water; and
- implementing water management strategies that would improve water quality to meet established standards for discharge to the Walker River.

An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) addressing improvements at the Mason Valley WMA were completed in March 2004.

Walker River Indian Reservation Storage and Water Rights Litigation

WRPT and the United States government are currently involved in litigation concerning water rights for the Walker River Indian Reservation and efforts to settle claims regarding the provision of water to Walker Lake. WRPT has filed pleadings in federal district court to resolve outstanding issues related to its water rights. Specifically, WRPT is seeking recognition of storage rights for Weber Reservoir and water rights for lands that were returned to the reservation in 1936. Because the final Walker River Decree (Decree C-125) did not provide for an express right to store water in Weber Reservoir, the United States, on behalf of WRPT, is seeking to establish such a right (together with various other rights) under litigation now pending in U.S. District Court of Nevada (United States *v.* WRID, Case in Equity, C-125). Currently, development of farmland on the Walker River Indian Reservation is limited to the current 2,100 acres because no additional state or federal water right allocations are available.

Attempting to predict the outcome of the litigation and any environmental impacts that may result is purely speculative and would not be meaningful. Timing of resolution of litigation is also unknown. Therefore, no analysis related to the litigation outcome possibilities is included in this EA.

Other Walker River Decree Litigation

The United States has claims pending for the use of surface and underground water for numerous federal enclaves throughout the Walker River Basin. Mineral County has moved to intervene in the Walker River Action to assert a claim under the public trust doctrine that seeks "an adjudication and reallocation of the waters of Walker River to preserve minimum levels in Walker Lake."

Attempting to predict the outcome of the litigation and any environmental impacts that may result is purely speculative and would not be meaningful. Timing of resolution of litigation is also unknown. Therefore, no analysis related to the litigation outcome possibilities is included in this EA.

Cumulative Impact Analysis

This section describes the cumulative impacts that could be associated with the cloud seeding project alternative and No Action Alternative when combined with other related past, present, and reasonably foreseeable actions in the Walker River Basin. Cumulative impacts would not be considered adverse for one or both of these reasons:

- cumulative impacts would be beneficial, or
- the impact of the proposed project alternative would not be added to the impact of other projects (i.e., no cumulative impact would occur) or would be too minor or localized to be considered cumulatively.

Water Resources

Implementation of the cloud seeding project, in combination with other related actions in the Walker River Basin, could result in impacts on water resources as described below. The contribution of the enhanced precipitation from the cloud seeding project would be minor compared to the contribution of other programs and projects.

Water Supply

The cloud seeding project is expected to add a small, but undetermined amount of water supply to Walker River Basin. A research aspect of the project is quantifying the amount of water that reaches various parts of the Walker River Basin including Walker River and Walker Lake.

Any additional water provided by cloud seeding would result in more water for all decreed water rights that are supplied by the Walker River, including decreed water rights acquired by NFWF to benefit environmental restoration in the Walker River Basin and inflows to Walker Lake from transferred water rights during years that water is transferred to the lake. The added water from cloud seeding could also directly or indirectly augment stored water that the Walker River Irrigation District (WRID) would lease to NFWF for transfer to Walker Lake. Cloud seeding could augment flows to Walker Lake during high run-off events and the non-irrigation winter months when Walker Lake typically receives the bulk of its inflows. Cloud seeding could have a minor positive effect on small amounts of increased inflows to Walker Lake from these cumulative actions.

Other actions occurring in the Walker River Basin are expected to cumulatively increase surface water supply in the Walker River Basin including the removal of invasive plants (tamarisk) and water conservation and efficiency efforts. These actions would result in a beneficial cumulative impact on water supply.

Groundwater

The cloud seeding project is not expected to change groundwater levels in a measurable way. Projects and programs listed in Table 3, especially NFWF water acquisition and WRID leasing, are more likely to potentially affect groundwater recharge in the Walker River Basin or potentially affect groundwater levels. Cumulative impacts to groundwater from the cloud seeding project are not anticipated.

Water Quality

Enhanced precipitation from cloud seeding could result in small amounts of increased river flows and some additional seasonal inflow to Walker Lake, resulting in a slight improvement in water quality, although these effects are not anticipated to be measurable. Land retirement and water conservation associated with the NFWF water acquisition program is expected to have a relatively greater beneficial impact on water quality, but the cumulative impact of all programs and projects on the lower Walker River and Walker Lake water quality may be limited given the current conditions and ongoing trends. Therefore, the cloud seeding project would not have discernable cumulative impacts on water quality.

As discussed in the Assumptions for Environmental Analysis section, cloud seeding material (AgI) has been studied for many years and has been found to be present in well below background levels of naturally occurring silver in the environment, is in an insoluble form that is not toxic to the environment, and does not bio-accumulate. Based on the studies, no cumulative impacts to water quality would be expected from cloud seeding.

Biological Resources – Vegetation and Wetlands

The Walker River Basin has been subjected to extensive human impacts from land and water development, population growth, and recreation. These impacts have altered the physical and biological integrity of the basin causing loss of native riparian vegetation along the river system and wetlands around the lake. Implementation of the cloud seeding project could have a minor positive effect with enhanced seasonal precipitation in upland areas, including irrigated agriculture lands, and increased winter and spring flows in riparian areas. The level of Walker Lake is expected to improve as a result of other projects such as the NFWF water acquisition program and any minor increased flows resulting from the cloud seeding project that could augment water acquired or leased by NFWF to benefit Walker Lake and riparian and wetland vegetation. Various habitat restoration from other projects implemented or planned in the Walker River Basin would also increase riparian vegetation within important river system areas. Cumulative impacts from enhanced precipitation, although slight, would result in increased beneficial impacts to riparian vegetation along the river system. Similarly, the cumulative impacts to wetlands along the Walker River from cloud seeding precipitation, although expected to be minor, would be beneficial when combined with other projects and programs in Table 3. The Proposed Action is not expected to have to contribute any measurable effect on the wetlands associated with farmland, shallow areas around Walker Lake, the Alkali Wildlife Management Area, the south end of Walker Lake and submergent wetlands in Walker Lake in combination with other projects discussed in Cumulative Effects.

Biological Resources – Fish

The cloud seeding project, when considered along with other past, present, and reasonably foreseeable future projects, such as the NFWF acquisition program, the WRID 3-year demonstration leasing program and the USFWS Walker River Restoration Program, would have an overall minor beneficial impact on LCT and other native fish species. Implementation of these combined programs and projects would improve native fish habitat as a result of increased flows, reduced temperatures, and improved LCT spawning habitat in the Walker River. Programs and projects discussed in the Cumulative Effects section, along with the augmented precipitation from cloud seeding could result in minor improved conditions for fish in the Walker River and Walker Lake.

Biological Resources – Wildlife

The programs and projects listed in Table 3, along with cloud seeding, would have an overall beneficial cumulative impact by increasing and improving wildlife habitat for birds and other species in other areas, primarily along the river corridor.

Land Use and Agriculture

The Proposed Action is not expected to significantly contribute to the cumulative impacts to the agricultural land base along the Walker River when combined with other projects and programs in Table 3. Those projects are expected to result in reductions to the agricultural land base and increases in fallowed and restored farm lands. The cloud seeding project, in combination with these projects would have minor impacts on land use and agriculture by providing a temporary increase in natural soil moisture and slightly less need for water diversions over the duration of the project from additional precipitation. The additional precipitation would also be expected to augment decreed water rights providing some additional water for agriculture in the Walker River Basin, however the amount of added water may not be discernable.

Air Quality

Cumulative air quality impacts are not expected from the cloud seeding project in combination with projects listed in Table 3.

Cultural Resources

Implementation of the cloud seeding project would not result in ground-disturbing activity. The cumulative impacts of past, present, and future actions on cultural resources in the Walker River Basin relate primarily to the potential for damage to cultural resources and their context from ground-disturbing activities. Other federal projects occurring in the region would also be required to comply with Section 106 of the NHPA if applicable. Pursuant to the definition at 40 CFR Part 1508.27(b)(8), any potential adverse impacts on cultural resources from federal projects would be mitigated to less-than-significant levels using the Section 106 process.

The cloud seeding project, along with other known activities occurring in the Walker River Basin, is not expected to result in any cumulative impacts on cultural resources.

Socioeconomics

The cloud seeding project combined with the other programs and projects in Table 3 is not expected to have cumulative impacts on socioeconomics.

Indian Trust Assets

The cumulative effects of some additional water from the cloud seeding project, combined with the programs and projects listed in Table 3 would improve habitats of fish, wildlife, and vegetation ITAs in the lower Walker River and Walker Lake, and would improve the Walker Lake ecosystem. Cloud seeding is not anticipated to contribute to adverse cumulative impacts on ITAs in combination with other projects and programs in the Walker River Basin.

Environmental Justice

The cloud seeding project would have no effect on minority and low-income groups. The NFWF acquisition program listed in Table 3 could result in localized losses of agricultural employment and other services and employment for minority and low-income populations (USBR 2010). Other projects within the region including implementing potential federal and private construction work, conservation and stewardship activities, fisheries and habitat improvements, and restoration could result in beneficial impacts on environmental justice populations. Cloud seeding would not result in any cumulative adverse impact on environmental justice populations when combined with other activities in the basin.

Section 4
Coordination and Consultation

4.1 Consultation and Coordination

Consultation on the proposed cloud seeding project occurred with the Walker River Paiute Tribe, the Yerington Paiute Tribe, the Bridgeport Indian Colony, and the Washoe Tribe of Nevada and California. Reclamation requested input from these Tribes on the cloud seeding proposal pursuant to federal legislation and executive orders concerning Native American government-to-government consultation, including NEPA and Indian Trust Assets in letters dated August 9, 2010. Both the Walker River Paiute Tribe the Washoe Tribe of Nevada and California submitted scoping comments. Comments received during scoping were incorporated into the list of issues and concerns in Section 1.2. The Tribes contacted during the scoping period were also sent letters advising them of the comment period on the Draft EA and the Walker River Paiute Tribe submitted a letter in response to the Draft EA.

As part of the scoping process for this EA, the Nevada Office of the U.S. Fish and Wildlife Service was consulted and provided comments on fish and wildlife species recommended for analysis or consideration in project planning.

Aspects of the project and environmental documentation were coordinated with the Desert Research Institute, which is the environmental research arm of the Nevada System of Higher Education.

Three of the five ground-based cloud seeding sites are located on Bureau of Land Management (BLM) public lands. Reclamation's Lahontan Basin Area Office coordinated with personnel at BLM's Bishop office on various aspects of the project planning, permitting, and environmental documentation.

4.2 Other Federal Laws, Regulations, and Executive Orders

In undertaking the proposal, Reclamation will comply with the following federal laws, executive orders, and legislative acts: Floodplain Management (Executive Order 11988); Protection of Wetlands (Executive Order 11990); Migratory Bird Treaty Act (16 U.S.C. 703 et seq.); Federal Noxious Weed Control Act, E.O. 13112, and 43 CFR 46.215 (l), Environmental Justice (Executive Order 12898), and the Fish and Wildlife Coordination Act (16 U.S.C. § 661).

4.3 Public Involvement

Public scoping for this project was initiated on August 9, 2010, when Reclamation's Lahontan Basin Area Office sent letters to a mailing list of eighty-six (86) potentially interested parties announcing the preparation the Environmental Assessment and requesting input to help identify issues to be addressed in the EA. Comments were requested to be received by August 27, 2010.

The Mid-Pacific Regional Office issued a news release on August 13, 2010, soliciting public scoping comments. Subsequent newspaper articles appeared in the following publications: Nevada Appeal, Reno Gazette-Journal, the Mineral County Independent News, the Mason Valley News and the Union Democrat.

Six (6) public scoping comments were received from individuals and agencies, in addition to responses from Federally recognized tribes. Public scoping comments were used to develop a list of issues and concerns in Section 1.2 to be addressed in the EA.

The Draft EA was released for public comment from November 12, 2010 to December 3, 2010. Ninety-two (92) letters were sent to interested parties requesting comments on the Draft EA. A news release on the public comment period was released to the media on November 12, 2010. The Nevada Appeal newspaper published an article advising the public of the comment period. One (1) letter was received from the Walker River Paiute Tribe during the comment period and responses to the comments in that letter are included as Appendix A in this EA for the Walker River Basin Cloud Seeding Project.

Section 5

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Prepared by

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Jane Schmidt, Natural Resource Specialist, Bureau of Reclamation.

APPENDIX A

Response to Public Comments on the Draft Environmental Assessment
for the
Walker River Basin Cloud Seeding Project

Reclamation Response to Comments
Walker River Basin Cloud Seeding Project – Environmental Assessment

Comment 1:

Upon consultation with the Tribal council and the Walker River Paiute Tribe Land and Water Department, we have opted for Alternative A - No Action Alternative: Reclamation would not provide $1,358,000.00 in Congressional funding to provide water to at-risk desert terminal lakes, specifically Pyramid, Summit, and Walker Lakes in the State of Nevada.

<u>Response</u>: While the comment does not pertain to, or raise environmental issues related to the environmental assessment, the comment may be considered by the decision-maker during project deliberations; however, written responses to such comments are not required by NEPA.

Comment 2:

The areas of concern were the toxicity levels involved in the cloud seeding process.

<u>Response</u>: Reclamation considered published scientific literature that examines the environmental and health impacts of cloud seeding in the United States, and includes a summary of that analysis in Section 3.1 of the Environmental Assessment. All of the studies are consistent in concluding that the contribution of the primary cloud seeding material (silver iodide) to the environment from cloud seeding is negligible compared to background levels and are well below threshold limits for human safety, aquatic organisms, and water quality standards. Silver iodide is considered water insoluble and is not able to bio-accumulate to toxic levels.

Monitoring by the Desert Research Institute (DRI), using ultra-sensitive laboratory methods which can detect parts-per-trillion concentrations, of past cloud seeding projects in and near the proposed project area has not been able to detect an increase in silver above levels naturally present in soil and streams.

Comment 3:

We have discussed the cloud seeding issue amongst ourselves. Our general comment is that funding should/could be spent on other ways to produce water. Acquisition of water rights seems to be the more feasible way to produce water for Walker Lake. There is no way to quantify how much water is actually produced as a result of cloud seeding.

<u>Response</u>: A 5% to 15% increase in annual precipitation in the Walker River Basin could result from the cloud seeding project. This projection is based on DRI's experience with similar projects in the same vicinity and is consistent with other published literature documenting research conducted on cloud seeding experiments in the Sierra Nevada and other mountainous regions of the western United States.

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BUREAU OF RECLAMATION
Lahontan Basin Area Office

Walker River Paiute Tribe

1022 Hospital Road • Post Office Box 220 • Schurz, Nevada 89427
Telephone: (775) 773-2306
Facsimile: (775) 773-2585

November 16, 2010

To: Kenneth Parr
Bureau of Reclamation
705 N. Plaza Street Rm 320
Carson City, Nevada 89701

From: Lorren Sammaripa
P.O. Box 220
Schurz, Nevada 89427

Dear Mr. Parr;

Upon consultation with the Tribal council and the Walker River Paiute Tribe Land and Water Department, we have opted for Alternative A- No Action Alternative: Reclamation would not provide $1,358,000.00 in Congressional funding to provide water to at-risk desert terminal lakes, specifically Pyramid, Summit, and Walker Lakes in the State of Nevada. Comment 1

The areas of concern were the toxicity levels involved in the cloud seeding process, and the following statement from our Land and Water Department: Comment 2

"We have discussed the cloud seeding issue amongst ourselves. Our general comment is that funding should/could be spent on other ways to produce water. Acquisition of water rights seems to be the more feasible way to produce water for Walker Lake. There is no way to quantify how much water is actually produced as a result of cloud seeding." Comment 3

Best regards,

Lorren Sammaripa

Tribal Chairman,

Walker River Paiute Tribe

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