Sequoia and Kings Canyon National Parks

National Park Service
U.S. Department of the Interior

Sequoia and Kings Canyon
National Parks

Sierra Nevada Bighorn Sheep Environmental Assessment: Research and Recovery Actions

Photo by D. Graber

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CHAPTER 1: PURPOSE AND NEED

INTRODUCTION

The National Park Service (NPS), in cooperation with the California Department of Fish and Game (CDFG), the U.S. Geological Survey (USGS), and the U.S. Forest Service (USFS) Inyo National Forest, (Inyo NF) is proposing to conduct population monitoring, research, and a translocation of Sierra Nevada bighorn sheep (*Ovis canadensis sierra*) within Sequoia and Kings Canyon National Parks (SEKI). The Sierra Nevada bighorn sheep (hereafter, bighorn sheep) is a federally endangered species that utilizes habitat in the parks. It is currently the only federally endangered species in the parks.

These activities are being proposed primarily to facilitate meeting the goals of the Recovery Plan for Sierra Nevada Bighorn Sheep (hereafter, Recovery Plan; USFWS 2007) but also to inform the development of a new Wilderness Stewardship Plan and Environmental Impact Statement (WSP/EIS) for Sequoia and Kings Canyon National Parks. Goals of the Recovery Plan would be met by monitoring the status of radio-collared bighorn sheep, scientific study of bighorn sheep habitat use and the impacts of wilderness recreational activities on bighorn sheep and their habitat, and by a translocation of bighorn sheep into the Big Arroyo and Laurel Creek areas of Sequoia National Park. Development of the WSP/EIS would be informed by scientific study of the impacts of wilderness recreational activities on bighorn sheep and their habitat.

The project activities, including helicopter-supported capture of bighorn sheep with net-guns, would be conducted primarily in wilderness areas of Sequoia and Kings Canyon National Parks and in adjoining Inyo NF lands. Bighorn sheep movements would be remotely monitored using Very High Frequency (VHF) radio-transmitters and Geographic Positioning System (GPS) collars. Researchers would also collect complementary data on meadow habitat characteristics and responses of bighorn sheep to wilderness recreation (packstock presence and grazing and visitor activity). Results from these projects would directly aid in planning and implementing actions identified as necessary to enable the recovery of this endangered species.

PURPOSE AND NEED

In the *Recovery Plan*, potential bighorn sheep habitat is divided into 16 herd units, 10 of which are located wholly or partially within Sequoia and Kings Canyon National Parks. Of these 16 herd units, 12 have been identified as essential to recovery of the species because of habitat characteristics that make them the most likely areas where recovery could occur; 8 of the 12 essential herd units are located wholly or partially within Sequoia and Kings Canyon National Parks. These 12 essential herd units comprise approximately 417,577 acres (ac) of historic bighorn sheep habitat that has been federally designated as *critical habitat* (73 FR 4435). Within Sequoia and Kings Canyon National Parks, there is 93,174 ac of critical habitat—22% of the total. Much of that critical habitat is still unoccupied by bighorn sheep (i.e., the Big Arroyo and Laurel Creek herd units), but has been identified as potential areas for reintroduction (NPS 1987; USFWS 2007). Therefore Sequoia and Kings Canyon National Parks plays a significant role in the recovery and eventual delisting of bighorn sheep.

Purpose and Need for Population Monitoring

CDFG has been monitoring bighorn sheep throughout the Sierra Nevada, including bighorn sheep within Sequoia and Kings Canyon National Parks, for >30 years. Appendix D of the *Recovery Plan* (USFWS

2007) calls for continued monitoring bighorn sheep populations, especially with the aid of radio-telemetry when feasible, because of the several different types of data that can be collected. For example, monitoring bighorn sheep populations with radio-telemetry allows greater understanding of spatial patterns of habitat use and population dynamics. Spatial information on habitat use has allowed documentation of population substructuring (different home range patterns), seasonal migratory patterns, and occasional extreme movements that have brought bighorn sheep close to domestic sheep allotments where they risk transmission of disease. Disease transmission from domestic sheep has been hypothesized to play a significant role in catastrophic sheep die-offs throughout their range (Goodson 1982, Martin et al. 1996). Further, monitoring demographic parameters such as adult and lamb survival, cause-specific mortality, and obtaining population estimates allows a greater understanding of factors controlling population dynamics including density-dependence and predation. In addition to information gathered from radio-collars, biologists determine nutritional status, health/disease status, and pregnancy status by handling bighorn sheep during captures. Data obtained from these capture efforts has been used and would continue to be used to direct management and species recovery. This essential level of monitoring requires the capture and collaring of bighorn sheep to identify progress towards recovery goals and continuously evaluate threats.

Purpose and Need for Research

Research is distinguished from monitoring in the *Recovery Plan* and Recovery Action 6 calls for an adaptive approach to management that requires scientific research. Specific topics for research that are suggested include studies of habitat use and studies that analyze human use patterns relative to habitat use patterns of bighorn sheep. Both of these types of studies are being proposed in this Environmental Assessment (EA).

The proposed studies would provide essential information on bighorn sheep habitat selection, habitat quality and availability, and reactions of bighorn sheep to wilderness recreational activity that would inform park management and aid in the recovery of this endangered species. This data is needed to inform future management of bighorn sheep herds and critical habitat within Sequoia and Kings Canyon National Parks and Inyo NF and to determine what actions may be needed to protect, improve, and maintain habitat essential for bighorn sheep recovery and population viability. These studies would also provide adequate information to allow the NPS to develop alternatives for the Sequoia and Kings Canyon National Parks WSP/EIS, including any necessary adjustments to visitor and stock use.

Study of Bighorn Sheep Habitat Use
Although a large database of bighorn sheep observations has been collected by CDFG during the last several decades, the data is limited because of sampling biases (based on sexes and ages of animals collared and locations where collars have been deployed) or incomplete sampling throughout the year. The *Recovery Plan* states that the use of GPS radio-collars should be considered for developing "detailed, accurate information on the seasonal distribution and habitat selection patterns" of bighorn sheep. Further, studies of bighorn sheep habitat use could be used to develop a resource selection function (RSF), which is a model that can be used to predict the potential future distribution of bighorn sheep, based on their current patterns of habitat use. Following recovery of bighorn sheep, it is expected that they will occupy a much broader distribution that they currently do; the construction of RSF would therefore be useful to predict their future range extent.

Study of the Impacts of Wilderness Recreational Activities on Bighorn Sheep
Insufficient information is available for informing Sequoia and Kings Canyon National Parks managers of the impacts that both recreational activities (e.g., backpacking, hiking, and mountaineering) and packstock may have on bighorn sheep. Recreational activities in wilderness have the potential to disturb bighorn sheep and illicit behavioral responses that may have negative demographic consequences.

Packstock have the potential to negatively impact bighorn sheep through behavioral displacement, excessive consumption of forage, or habitat destruction, especially in meadow habitats. However, data regarding the impacts of these activities on bighorn sheep is sparse, limited in scope, and largely anecdotal (see Hicks and Elder 1979).

Bighorn sheep responses to human activity vary by location and in some areas, bighorn sheep can become quite habituated to human activity. Within Sequoia and Kings Canyon National Parks, there is anecdotal information that suggests habituation of bighorn sheep to humans is common, but this information is not sufficient for making optimal management decisions regarding wilderness recreation. There is even less information regarding the impacts of packstock on bighorn sheep, perhaps because of the more complex ways in which packstock and bighorn sheep interact with each other. Credible, scientific data is needed to ensure that bighorn sheep and critical habitat is protected while at the same time minimizing unnecessary restrictions on wilderness recreation.

Purpose and Need for Translocation

The *Recovery Plan* also calls for bighorn sheep translocations for both reintroductions and herd augmentations. The proposed translocation includes reintroducing bighorn sheep in to the Big Arroyo and Laurel Creek areas of Sequoia National Park, which are currently not occupied by bighorn sheep, but are 2 of the 12 critical habitat units essential to species recovery. Delisting of bighorn sheep as an endangered species cannot occur until these habitat units are occupied. Because bighorn sheep are naturally slow to disperse and colonize new habitat, occupation of Big Arroyo and Laurel Creek within a reasonable time period will ultimately depend on translocations of bighorn sheep from other areas.

Purpose and Need for NPS involvement

In accordance with NPS *Management Policies 2006*, parks are directed to:

- undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats;
- control detrimental nonnative species; manage detrimental visitor access; and reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend;
- manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species;
- cooperate with other agencies to ensure that the delineation of critical habitat, essential habitat, and/or recovery areas on park-managed lands provides needed conservation benefits to the total recovery efforts being conducted by all the participating agencies; and,
- participate in the recovery planning process, including the provision of members on recovery teams and recovery implementation teams where appropriate (Section 4.4.2.3).

Environmental Review and Compliance

This environmental assessment (EA) is being prepared by the NPS in accordance with the National Environmental Policy Act (NEPA, 1969, as amended), in cooperation with the CDFG, USGS, and the USFS. This EA presents and analyzes a range of alternatives, including "no action" (continue current management), and three "action" alternatives, and an environmental analysis of potential impacts to NPS and USFS resources from NPS-funded activities. A "Wilderness Minimum Requirement/ Minimum Tool Analysis" (MRMT) has been conducted to evaluate and minimize/avoid impacts to wilderness on NPS and USFS administered lands (Appendix A).

This EA will be distributed to agencies, tribes, and the public for consideration and input, and will also serve to meet public review requirements of the California Environmental Quality Act (CEQA). Although this EA would implement components of the *Recovery Plan*, which is an approved plan, site

specific analysis has not been conducted to evaluate the potential effects on NPS administered lands. Therefore, this EA will serve to evaluate impacts from those actions determined to be appropriate, based on laws and NPS policies, within Sequoia and Kings Canyon National Parks, and will also evaluate effects on adjacent USFS lands in Inyo NF for those portions of the proposed project specifically funded by the NPS.

The USFS, Inyo NF, is preparing a separate EA to analyze the effects on their lands and resources from CDFG-funded activities within designated wilderness areas on Inyo NF. The purpose of this project is to support CDFG implementation of the Recovery Plan for Sierra Nevada bighorn sheep (USFWS 2007) by authorizing the landing of a helicopter to conduct monitoring and translocation (introductions and augmentations) efforts within the bighorn sheep recovery areas on the Inyo NF and within Sequoia National Parks. This related work is analyzed in the "Cumulative Effects" portion of this EA.

BACKGROUND

History of Sierra Nevada Bighorn Sheep and their Management

Historically, bighorn sheep ranged widely throughout the Sierra Nevada alpine, from Sonora Pass to Olancha Peak (USFWS 2007). One of the largest concentrations of bighorn sheep may have been in the Mineral King area, which is now part of Sequoia and Kings Canyon National Parks. Near the turn of the 20th century, however, European settlement and mining in the Sierra Nevada corresponded with rapid bighorn sheep population decline. Unregulated hunting and competition from diseases transmitted by domestic stock were likely contributing factors.

Interagency research and recovery management actions for the bighorn sheep population throughout their range have been ongoing for more than thirty years. In 1972, CDFG officially listed the species as "rare." By the mid 1970s, researchers could find only three herds in two areas (Mt. Baxter and Mt. Williamson), with about 230 individuals remaining.

In 1979, CDFG, in cooperation with the Inyo NF and the NPS, began capturing and translocating bighorn sheep from the Mount Baxter herd to begin restoring historic herds (NPS 1989). Bighorn sheep were captured on their winter range in the Inyo NF and moved to Wheeler Crest (central Sierra), Lubkin Creek/Mount Langley (southern Sierra), and Lee Vining Canyon (central Sierra). Supplementary introductions occurred to the Wheeler Crest, Mt. Langley, and Lee Vining herds to help ensure bighorn sheep survival. Bighorn sheep fitted with VHF collars provided valuable data on their general movements and survivorship.

In 1984, bighorn sheep were reclassified from "rare" to "threatened" under the California Endangered Species Act. An initial recovery plan was developed in 1984 by an interagency committee of wildlife

biologists, researchers, and managers (Sierra Nevada Bighorn Sheep Interagency Advisory Group 1984). By 1988, bighorn sheep herds had been successfully translocated and established by CDFG to Wheeler Ridge, Mt. Langley, and Lee Vining Canyon, expanding bighorn sheep distribution to five distinct areas within their historic range. These translocations were initially successful, but overall the population was in decline by the late 1980s, dipping to a low in 1995 of 100 bighorn sheep. Biologists speculated that predation, natural mortality, severe weather, and the lack of recruitment played significantly in the drop in population.

In 1999, the USFWS enhanced the legal protection of bighorn sheep with an emergency-listing as an endangered species (65 FR 19300). The bighorn sheep was formally listed by the USFWS as an endangered species in February 2000 (65 FR 20). In 2007, the Recovery Plan was approved by USFWS and CDFG. It provides direction to federal and state agencies in the management and recovery of bighorn sheep and the protection of habitat. In 2008, the USFWS formally designated critical habitat for bighorn sheep and approved a taxonomic revision, acknowledging it as a distinct subspecies, *Ovis canadensis sierrae* (50 CFR Part 17). Today, there are more than 400 bighorn sheep in 10 of the 16 herd units in the Sierra Nevada (USFWS 2007; CDFG unpublished data). Twelve of these herd units have been identified as essential to recovery of the species (i.e., critical habitat) because of habitat characteristics that make them the most likely areas where recovery will occur; 8 of these 12 essential herd units are located partially or wholly within Sequoia and Kings Canyon National Parks (Figure 1). Factors limiting bighorn sheep recovery include disease potential, 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 populations. Since the vast majority of bighorn sheep habitat is publicly-owned land, the loss of habitat has not been a limiting factor. However, the management of bighorn sheep habitat (e.g., fire suppression) can result in habitat alterations and loss of key dispersal corridors connecting herds, which could be limiting factors (USFWS 2007).

Bighorn Sheep Radio-collaring History and Data Collection

During 1999 to 2010, CDFG deployed a total of 211 GPS collars and 230 VHF collars from 249 captures, representing 180 individual animals rangewide (Figure 2). To date, no more than 87 females and 37 males have been collared at any one time. Great effort is expended during captures to minimize the risk of injury and mortality to bighorn sheep. For example, during 249 captures of which 240 were by helicopter net-gun, 8 mortalities occurred over a 10-year period; this represents a capture related mortality rate of 3.3% when using a net gun from a helicopter. This observed capture-related mortality rate falls below the limits of the Recovery Permit issued from the USFWS for the capture of bighorn sheep, which allows for three bighorn sheep per year to be killed incidentally during the performance of permitted activities. Thus far, CDFG has retrieved GPS data from 140 different animals with additional GPS collars still deployed. Currently efforts are underway to use this data to understand habitat selection, identify disease risk posed by adjacent domestic sheep allotments, and determine optimal locations for future reintroductions and augmentations.

Captures are the only means to reintroduce and augment herds through translocations. Since bighorn sheep were federally listed, CDFG has translocated bighorn sheep for three augmentations: 1) two rams from Wheeler Ridge to Mt. Warren in 2005; 2) five ewes from Wheeler Ridge to Baxter/Sawmill in 2007; and, 3) three ewes from Wheeler Ridge to Lundy Canyon and 3 ewes from Mt. Langley to Lundy Canyon in 2009. Prior to listing, bighorn sheep were translocated from Baxter/Sawmill during 1979 to 1988 and resulted in the successful reestablishment of the Mt. Warren, Mt. Gibbs, Wheeler Ridge, and Mt. Langley herds.

Figure 1. Sierra Nevada Bighorn Sheep Critical Habitat Units in and near Sequoia and Kings Canyon National Parks.

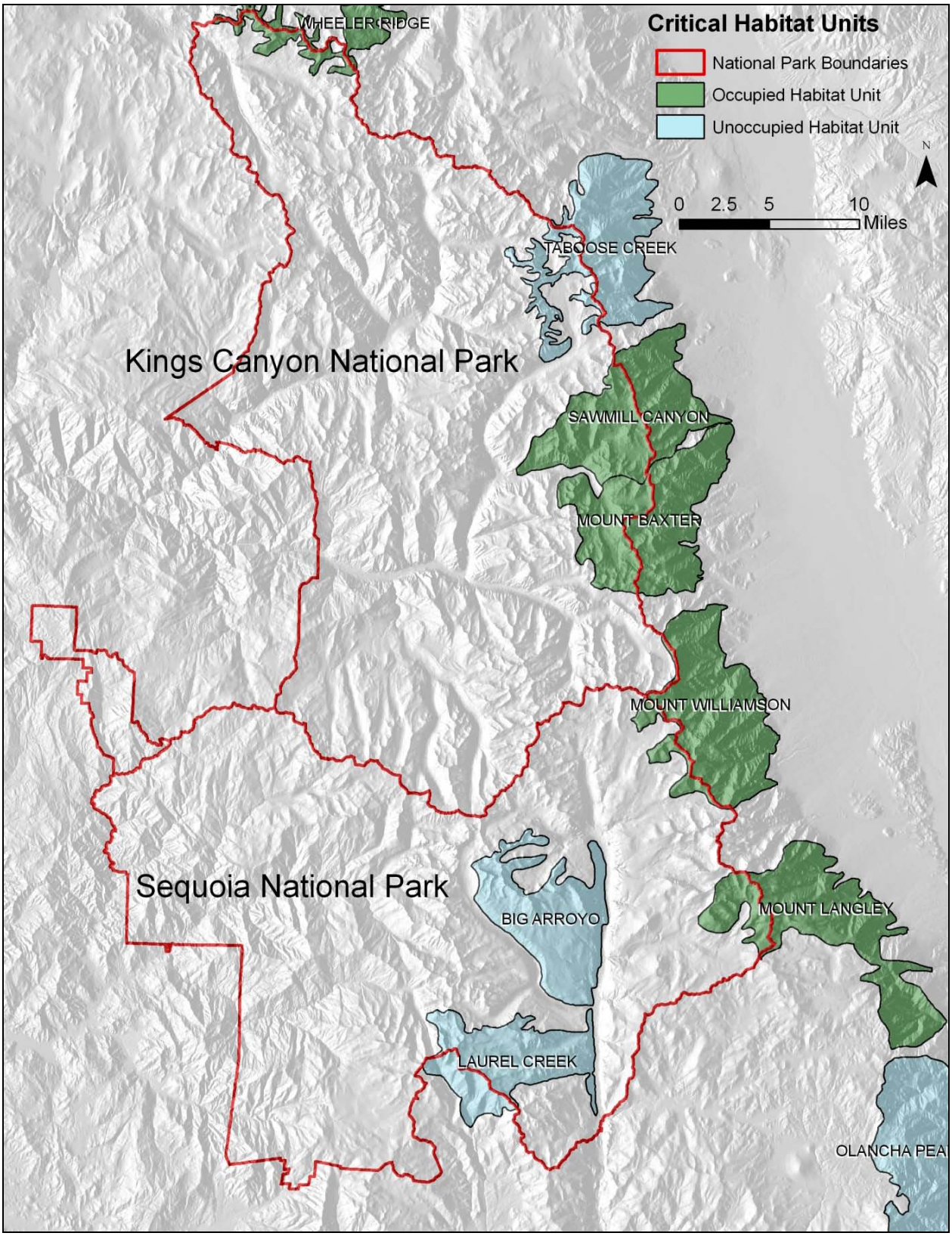
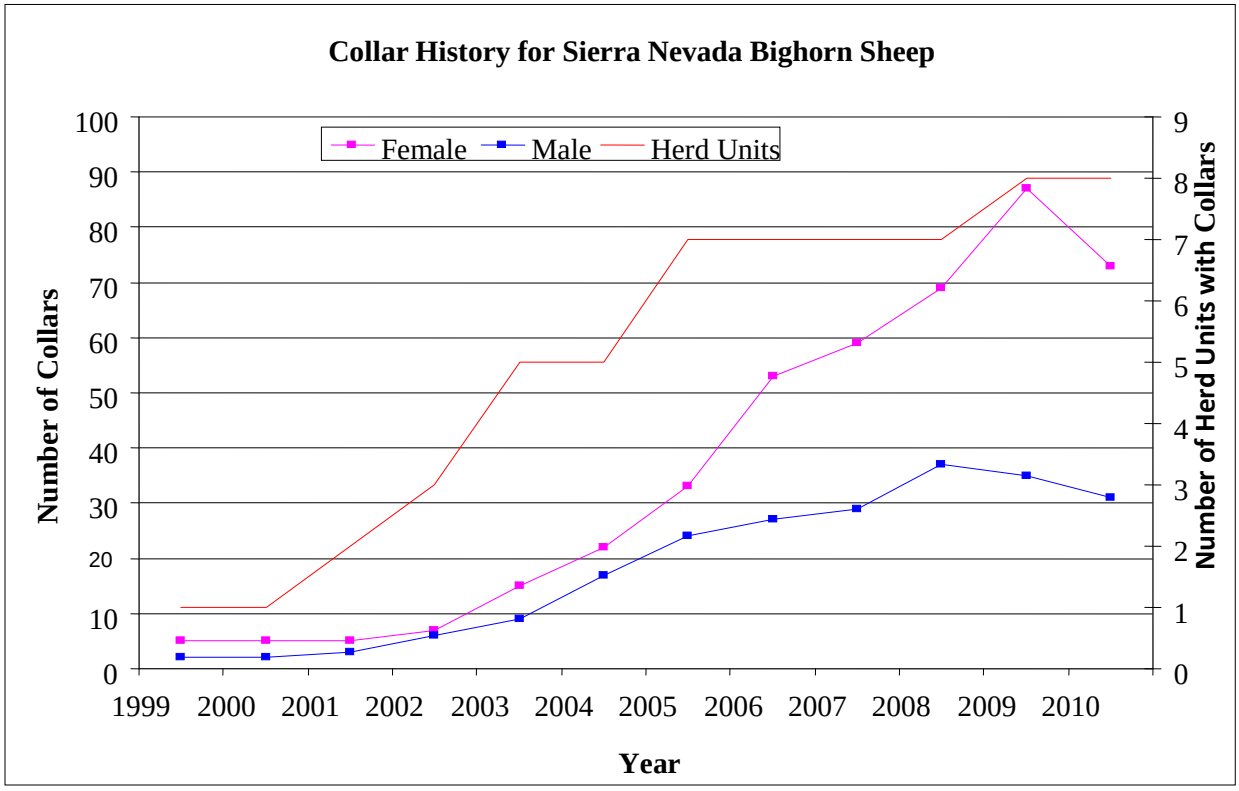


Figure 2. Collaring history for Sierra Nevada Bighorn Sheep



OBJECTIVES OF THE PROPOSED ACTIVITIES

Objectives are more specific statements of purpose that describe the desired outcomes a management alternative must largely achieve for the proposed projects to be considered a success. Objectives directly address the problems and issues mentioned in the purpose and need statement, and when possible, should be linked to legislation, legal requirements, executive orders, policies, and other guidance. As the ability to achieve objectives is part of what defines an alternative as reasonable, objectives also provide critical boundaries for action. The objectives of proposed activities are to:

Objective 1: Facilitate Recovery of Sierra Nevada Bighorn Sheep

The *Recovery Plan* (USFWS 2007) established conservation goals for the bighorn sheep, including restoring bighorn sheep in a geographic distribution throughout most of their native range with genetic representation that assures their long-term viability as a unique life form. The objectives of the recovery plan are to: (1) recover the bighorn sheep to a self-sustaining population size and geographic distribution that buffers them against extinction; and (2) maintain long-term viability through establishment of programs and mechanisms that ensures the protection of these populations from outside threats following a potential delisting.

The NPS, as a partner in recovery planning efforts and a federal land management agency, is obligated to protect bighorn sheep and critical habitat, and implement appropriate (based on NPS mandates and

policies) components of the *Recovery Plan*. The proposed population monitoring, research, and translocation are all components of the *Recovery Plan*.

Specific objectives include:

1a. Monitor indicators of population status such as abundance, recruitment and mortality, movements, body condition, disease, etc.
1b. Develop a predictive model of future bighorn sheep distribution to aid in identifying future habitat needs and movement corridors and selecting sites for reintroductions.
1c. Reintroduce bighorn sheep into the currently vacant Big Arroyo and Laurel Creek critical habitat units.

Objective 2: Inform development of the Sequoia and Kings Canyon National Parks Wilderness Stewardship Plan (WSP/ EIS) to develop strategies for managing recreational use in bighorn sheep habitat

Sequoia and Kings Canyon National Parks began developing a Wilderness Stewardship Plan in early 2011, and part of that process was to gather existing data and identify data gaps. The proposed research studies will support development of this plan and address data gaps.

Specific objectives include:

2a. Determine the degree of spatial overlap between bighorn sheep and areas grazed by packstock.
2b. Measure the impacts of packstock on bighorn sheep forage resources.
2c. Improve knowledge of bighorn sheep diet.
2d. Identify areas where visitor use inappropriately modifies bighorn sheep behavior.

LEGISLATION, GUIDANCE, AND PREVIOUS PLANNING

The *NPS Organic Act of 1916* (Organic Act) (16 U.S.C. 1, 2–4) and the *General Authorities Act* (16 U.S.C. 1a–8) direct the NPS to conserve the scenery, natural and historic objects, and wildlife, and to provide for the enjoyment of those resources in such a manner as to leave them unimpaired for future generations. The *Redwood Act* (16 U.S.C. 1a-1) reaffirmed the mandates of the *Organic Act* and provided additional guidance on the national park system management as follows:

The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the national park system and shall not be exercised in derogation of the values and purposes for which these various areas have been established. (16 U.S.C. 1a-1)

<u>Impairment of National Park Resources</u>
In addition to determining the environmental consequences of implementing the preferred and other alternatives, NPS Management Policies 2006 (section 1.4) requires analysis of potential effects to determine whether or not proposed actions would impair a park's resources and values.

The fundamental purpose of the national park system, established by the *Organic Act* and reaffirmed by the *General Authorities Act*, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (NPS Management Policies 2006). Whether an impact meets this definition depends on the particular resources that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park. Impairment findings are not necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. The determination of impairment for the preferred alternative is found in Appendix B.

Other Relevant Laws and Legislation

The *Endangered Species Act of 1973* (ESA, as amended, 16 U.S.C. 1531–1544; P.L. 93-205) directs all federal agencies to cooperate in the conservation and management of federally-listed threatened and endangered species and their habitats. The bighorn sheep is federally listed as an endangered species. The *California Endangered Species Act* (CESA, CA Fish & Game Code 2050, *et seq.*) provides special recognition and protection when listed as "a species or subspecies [native to the state, whose] prospects of survival and reproduction…are in immediate jeopardy from one or more causes…" Species listed by the state as "rare" are those that, while not currently considered "threatened with extinction, [are] in such small numbers throughout its range that it may be endangered if its environment worsens." California provided the first special status protection for the bighorn sheep under state law, when they listed the subspecies as "rare" in 1972. The CDFG has authority to manage wildlife on national forest lands. The CESA generally parallels the main provisions of the federal Endangered Species Act, and it is administered by the CDFG.

The *Wilderness Act of 1964* (16 U.S.C. 1131–1136, P.L. 88-577) established the national wilderness preservation system in order to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. Under the provisions of this act, wilderness areas are to be administered for the use and enjoyment of the American people in such a manner as to leave them unimpaired for future use and enjoyment as wilderness.

Sequoia and Kings Canyon National Parks' original wilderness designation occurred under the *California Wilderness Act of 1984* (16 U.S.C. 1131, P.L. 98-425, 98 Stat. 1619); additional acreage was designated as wilderness by the *Omnibus Public Land Management Act of 2009* (H.R. 146). Total designated

wilderness for the parks is 807,962 acres—approximately 93.3% of the parks' total acreage. In addition, there is approximately 30,000 acres of proposed wilderness that is managed as wilderness in accordance with NPS policy.

NPS *Management Policies 2006*, Section 4.2, provides guidance related to research and monitoring. The NPS will identify, acquire, and interpret needed inventory, monitoring, and research, including applicable traditional knowledge, to obtain information and data that will help park managers accomplish park management objectives provided for in law and planning documents; define, assemble, and synthesize comprehensive baseline inventory data describing the natural resources under NPS stewardship, and identify the processes that influence those resources; use qualitative and quantitative techniques to monitor key aspects of resources and processes at regular intervals; analyze the resulting information to detect or predict changes that may require management intervention and provide reference points for comparison with other environments and time frames; and use the resulting information to maintain—and where necessary restore—the integrity of natural systems.

The NPS may support studies to (among other things) provide a sound basis for policy, guidelines, and management actions; develop effective strategies, methods, and technologies to restore disturbed resources, and predict, avoid, or minimize adverse impacts on natural and cultural resources and on visitors and related activities.

Whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. The NPS may intervene to manage individuals or populations of native species only when such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them. The second is that at least one of the following conditions exists:

Management is necessary because

- a population occurs in an unnaturally high or low concentration as a result of human influences (such as loss of seasonal habitat, the extirpation of predators, the creation of highly productive habitat through agriculture or urban landscapes) and it is not possible to mitigate the effects of the human influences;
- to protect specific cultural resources of parks;
- to accommodate intensive development in portions of parks appropriate for and dedicated to such development;
- to protect rare, threatened, or endangered species;
- to protect human health as advised by the U.S. Public Health Service (which includes the Centers for Disease Control and the NPS public health program);
- to protect property when it is not possible to change the pattern of human activities; or
- to maintain human safety when it is not possible to change the pattern of human activities.

Or,

The removal of individuals or parts thereof

- is part of an NPS research project described in an approved management plan, or is part of research being conducted by others who have been issued a scientific research and collecting permit;
- is done to provide plants or animals for restoring native populations in parks or cooperating areas without diminishing the viability of the park populations from which the individuals are taken; or
- meets specific park management objectives. (NPS *Management Policies 2006* Section 4.4.2)

Section 4.4.2.2 of *Management Policies 2006* states that the NPS will strive to restore extirpated native plant and animal species to parks whenever all of the following criteria are met:

- Adequate habitat to support the species either exists or can reasonably be restored in the park and if necessary also on adjacent public lands and waters; once a natural population level is achieved, the population can be self perpetuating.
- The species does not, based on an effective management plan, pose a serious threat to the safety of people in parks, park resources, or persons or property within or outside park boundaries.
- The genetic type used in restoration most nearly approximates the extirpated genetic type.
- The species disappeared or was substantially diminished as a direct or indirect result of human induced change to the species population or to the ecosystem.
- Potential impacts upon park management and use have been carefully considered.

NPS *Management Policies 200*6 provide additional guidance for wilderness management. Management will include the protection of these areas, the preservation of their wilderness character, and the gathering and dissemination of information regarding their use and enjoyment as wilderness. The purpose of wilderness in the national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, and in accordance with the *Wilderness Act*, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use (Section 6.1).

Management Policies 2006 states that natural resources management in wilderness will include and be guided by a coordinated program of scientific inventory, monitoring, and research. The principle of non-degradation will be applied to wilderness management, and each wilderness area's condition will be measured and assessed against its own unimpaired standard. Natural processes will be allowed, insofar as possible, to shape and control wilderness ecosystems. Management should seek to sustain the natural distribution, numbers, population composition, and interaction of indigenous species. Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and influences originating outside of wilderness boundaries. Management actions, including the restoration of extirpated native species, the alteration of natural fire regimes, the control of invasive alien species, the management of endangered species, and the protection of air and water quality, should be attempted only when the knowledge and tools exist to accomplish clearly articulated goals. (Section 6.3.7).

Visitor use is addressed in *Management Policies 2006* Section 8.2. The enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks. The NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. To provide for enjoyment of the parks, the NPS will encourage visitor activities that are appropriate to the purpose for which the park was established; and are inspirational, educational, or healthful, and otherwise appropriate to the park environment; and will foster an understanding of and appreciation for park resources and values, or will promote enjoyment through a direct association with, interaction with, or relation to park resources; and can be sustained without causing unacceptable impacts to park resources or values.

U.S. Department of Agriculture Forest Service Legislation and Planning Documents

The following are several of the primary authorities directing or influencing the mission of the Forest Service:

Forest Service Organic Administration Act (Act of June 4, 1897) (16 U.S.C. §§ 473-478, 479-482 and 551, June 4, 1897, as amended 1905, 1911, 1925, 1962, 1964, 1968, and 1976). This act is the original organic act governing the administration of national forest lands. The act specified the purposes for which forest reserves might be established and provided for their protection and management. Today, this act is one of several Federal laws under which the Forest Service operates. While the Organic Administration Act remains significant, it must be read in conjunction with the later acts, which expand the purpose and uses of the national forests.

Multiple-Use Sustained Yield Act of 1960 (Act of June 12, 1960) (P.L. 86-517; 16 U.S.C. §§ 528-531). This act declares that the purposes of the national forests include outdoor recreation, range, timber, watershed, and fish and wildlife. The act directs the Secretary of Agriculture to administer national forest renewable surface resources for multiple use and sustained yield. The act does not affect the jurisdiction or responsibilities of the States, the use or administration of the mineral resources of national forest lands, or the use or administration of Federal lands not within the national forests.

National Forest Management Act of 1976 (Act of October 22, 1976) (P.L. 94- 588; 16 U.S.C. §§ 1600-1614, August 17, 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, 1988 and 1990). This act reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The *National Forest Management Act* requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.

USDA Forest Service Strategic Plan FY 2007-2012
This plan provides the strategic direction that guides the Forest Service in delivering its mission. The following sections are relevant to the proposed bighorn sheep activities.

Goal 1. Restore, Sustain, and Enhance the Nation's Forests and Grasslands

Means and Strategies for Accomplishing Goal 1 related to proposed project

- Develop and implement conservation strategies to conserve endangered, threatened, and other at-risk species.
- Monitor the status of congressionally designated areas and manage them to protect and enhance the values for which they were designated.

Other applicable management direction and policy for threatened, endangered and sensitive species is incorporated by reference from the following:

- Forest Service Manual and Handbooks (FSM/H 2670)
- Endangered Species Act, 1973, as amended (ESA)
- National Environmental Policy Act, 1969 (NEPA)
- Inyo National Forest Land and Resource Management Plan, 1988 (LRMP)
- Sierra Nevada Forest Plan Amendment, 2004 (SNFPA)
- Recovery Plan for Sierra Nevada Bighorn Sheep, 2007

- Pacific Southwest Region (R5) Sensitive Species List
- Wilderness Act, 1964
- Forest and Rangeland Renewable Resources Planning Act, 1974 (RPA)
- California Wilderness Act, 1984

Inyo National Forest Land and Resource Management Plan (LRMP)
The 1988 LRMP provides specific standards and guidelines for the management of forest resources throughout the Inyo NF, including rare wildlife species like Sierra Nevada Bighorn. Forestwide standards related to the proposed project include direction to cooperate with the Fish and Wildlife Service and California Department of Fish and Game in the management of threatened and endangered species and the restoration of habitat (p. 98).

2001 Wilderness Management Plan for the Ansel Adams and John Muir Wildernesses

Goals and objectives for wildlife management in the John Muir Wilderness (pp. 32-33) include:

- Listed TEPS (threatened, endangered, proposed, and sensitive) species and their habitats will be protected and assisted in their recovery.
- Increase the knowledge base for TEPS and candidate species through inventorying and monitoring to determine status of habitat and populations. Monitoring will determine effects of human activities on populations and habitat, the trends of TEPS species populations, and indicate the need for protective management and mitigation measures.

Direction specific to the management of Sierra Nevada Bighorn Sheep in the John Muir Wilderness (p. 34) includes:

- Implement the bighorn sheep recovery plan upon completion.
- Monitor bighorn sheep populations to identify changes in occupied habitat and implement changes in management as necessary.

Relationship to Other Planning

Sequoia and Kings Canyon National Parks-Specific Planning Documents and Other Guidance
The key park planning documents that affect this project are the parks' *Final General Management Plan/Final Environmental Impact Statement* (GMP; NPS 2007), *Natural and Cultural Resources Plan* (RMP; NPS 1999a), the *Backcountry Management Plan* (BMP; NPS 1986a) and the *Stock Use and Meadow Management Plan* (SUMMP; NPS 1986b). Collectively, these documents guide Sequoia and Kings Canyon National Parks' philosophy and practices in managing natural resources within the parks while ensuring a balance with other management objectives and visitor use and experience.

Sequoia and Kings Canyon National Parks General Management Plan (GMP) and Environmental Impact Statement, 2007
The 2007 GMP establishes a vision for what the parks should be, including the parks purpose and significance, desired future conditions for natural and cultural resources and visitor experiences, and includes a comprehensive river management plan for rivers within Sequoia and Kings Canyon National Parks that have been designated by Congress as components of the national wild and scenic rivers system. The GMP reiterated the goals and objectives of the 1999 RMP and establishes desired conditions for various natural resources.

Many desired conditions are relevant to this proposed project, including:

- Populations of native plant and animal species function in as natural a condition as possible except where special management considerations are warranted.
- Native species populations that have been severely reduced or extirpated from the park are restored where feasible and sustainable.
- The NPS will strive to protect the full range of genetic types (genotypes) of native plant and animal populations in the parks by perpetuating natural evolutionary processes and minimizing human interference with evolving genetic diversity.
- The NPS will maintain all the components and processes of naturally evolving park ecosystems.
- The NPS will re-establish natural functions and processes in human-disturbed natural systems in the parks unless otherwise directed by Congress. The NPS will restore the biological and physical components of human-disturbed systems as necessary, accelerating both their recovery and the recovery of landscape and community structure and function. The NPS will seek to return human-disturbed areas to conditions and processes representing the ecological zone in which the damaged resources are situated.
- The NPS will, within park boundaries, identify, conserve, and attempt to recover all federally listed threatened, endangered, or special-concern species and their essential habitats. As necessary, the NPS will control visitor access to and use of essential habitats, and may close such areas to entry for other than official purposes. Active management programs (such as monitoring, surveying populations, restorations, exotic species control) will be conducted as necessary to perpetuate, to the extent possible, the natural distribution and abundance of threatened or endangered species, and the ecosystems upon which they depend. Ongoing consultation related to threatened or endangered species will occur with the USFWS should any actions take place in the habitat of such species.
- The NPS will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or special concern species and their essential habitats that are native to and present in the parks. These species and their essential habitats will be considered in NPS planning and management activities.

Sequoia and Kings Canyon National Parks Resource Management Plan (RMP), 1999

The RMP(NPS 1999a) identifies: goals for the management of park natural and cultural resources, the condition of the parks' resources, stressors that impact resources, desired future conditions, constraints on achieving desired future conditions, strategies for achieving desired future conditions, and identification of projects that need funding for implementing the plan.

Sequoia and Kings Canyon Backcountry Management Plan, 1986

The parks' BMP was approved in 1986 and provides direction for managing wilderness and backcountry areas. The following philosophies identified in that plan are relevant to this Restoration Plan/DEIS:

- Allow administrative use of the backcountry to the extent necessary for maintenance, visitor protection and information, natural resource management, research and general management purposes. All administrative use will make every effort to keep imposition on visitors to a minimum and must lead by example in natural resource protection.
- Conduct research on park natural resources that can be used by management t o assure that natural processes continue unimpaired. A basic inventory of natural resources, a strong natural resource monitoring program, and scientific study of user and other external impacts on resources are essential to good backcountry management.
- To maintain, in a wild condition, the natural distribution and abundance of fauna by allowing natural processes to shape habitat and interactions among species.

Sequoia and Kings Canyon Stock Use and Meadow Management Plan, 1986
The *Stock Use and Meadow Management Plan* (NPS, 1986b) provides guidance to the management of pack stock within Sequoia and Kings Canyon National Parks. The plan specifies allowed use, controls to minimize effects and protect forage areas and other resources, prohibition of grazing in some meadows, public education, rehabilitation of impacted areas, and to monitor the impacts of stock use.

Sequoia and Kings Canyon Wildlife Management Plan, 1987
The 1987 Wildlife Management Plan, though updated through the 1999 RMP and 2007 GMP, provided direction for wildlife management, and in particular bighorn sheep management within Sequoia and Kings Canyon National Parks, and can provide a past perspective for this planning effort. Although the bighorn sheep was not yet classified as an endangered species at the time the plan was written, it establishes management direction for threatened and endangered species, and specific actions for bighorn sheep (known at that time as "California bighorn sheep"). The overall goal of the wildlife management program established by the Wildlife Management Plan was to perpetuate natural populations of wildlife in which animal behavior and ecological processes are essentially unaltered by human activities.
Specific goals were established in this plan and included:

- California bighorn sheep will be reintroduced to the Great Western Divide. The fate of the California bighorn sheep which are to be reintroduced to the Great Western Divide and their impact on the areas ecology and human use of the area will be monitored until the herds' survival is assured.
- Avoid any native species being lost from the fauna.
- Avoid anthropogenic activities which may significantly modify the ecology and behavior of wildlife populations.
- Provide opportunities for people to understand and appreciate wildlife in their natural environment.
- Provide public and employee education of wildlife management problems.
- To reestablish extirpated species wherever feasible.
- Monitor the status and distribution of each federal and state listed species. Monitor success and impact of reestablished species.
- The Parks' staff will consult with other agencies on wildlife activities or issues that may affect those agencies.
- Members of a native species [may] be imported and released within the parks' boundary [expressly] to restore an extirpated species or to maintain the genetic vitality of an isolated population…[based on] the recommendation of a professional population geneticist and with the approval of the Superintendent.

Environmental Assessment for the Restoration of Bighorn Sheep, 1987
This EA was a cooperative effort between the NPS, USFWS, CDFG, and the Inyo NF. The approved plan would have resulted in the reintroductions of bighorn sheep into certain areas of the Great Western Divide as early as 1989. However, bighorn sheep designated for this reintroduction went to other herds. When the population of bighorn sheep crashed in 1995, this planning effort was reevaluated and the reintroductions were postponed indefinitely.

Interagency Endangered Species Recovery Efforts and Planning

USDA Forest Service
The USFS, including Inyo, Sequoia, and Sierra National Forests, is committed to cooperating with state and other federal agencies to inventory, protect, manage, and plan for threatened, endangered, proposed, and sensitive species (FSM 2671.1). The 1995 Memorandum of Understanding (MOU) between the CDFG and the USFS and the 2006 Policies and Guidelines for Fish and Wildlife Management in National

Forest and Bureau of Land Management wilderness provides the basic framework for coordinating actions and resolving differences between the USFS and CDFG. Wildlife management actions that require USFS approval are listed in Appendix II (all National Forest System lands) and Appendix III (National Forest System lands within wilderness) of the 1995 MOU and 2006 Policies and Guidelines. Wildlife management actions that occur on National Forest System (NFS) lands include, but are not limited to: use of motorized equipment or mechanical transport, research or management surveys, wildlife transplants, including follow-up monitoring, and animal damage control.

Recovery Plan for the Sierra Nevada Bighorn Sheep (USFWS 2007).
The *Sierra Nevada Bighorn Sheep Recovery Plan* (USFWS 2007) updated the 1997 Conservation Strategy and established conservation goals for the bighorn sheep, including restoring bighorn sheep in a geographic distribution throughout most of their native range to ensure their long-term viability. This project would facilitate the implementation of key elements of the recovery plan including monitoring population size, causes of mortality, use of habitat, status of restored populations, certain social habitats, population/genetic dispersion, and bighorn sheep movement toward areas where domestic sheep or goats could be contacted (risking herd health).

ISSUES AND IMPACT TOPICS

Scoping

Internal scoping for this project began in fall 2009, as the park staff began considering development of a new wilderness stewardship plan. Resource managers noted key issues to be addressed in the future planning document, including concerns about impacts of off-trail use and social trailing, protection of sensitive wildlife and vegetation, and possible direct and indirect impacts to meadows and bighorn sheep from packstock and recreational activities. Bighorn sheep may use some of the same high elevation meadows used by packstock, and visitor "social trails" are extensive around some popular peaks where bighorn sheep herds exist. The planning team noted that concerns had been raised in the past regarding possible recreational conflicts with bighorn sheep. It is unclear whether packstock and humans cause detrimental impacts to bighorn sheep, by negatively influencing their behavior, affecting foraging and lambing areas, causing physiological stress, or competition and displacement from high quality habitat.

Public scoping was initiated for a proposed Sierra Nevada Bighorn Sheep Study on June 18, 2010. At the time, the objectives were limited to addressing research questions for a 2-year study in 2011 and 2012; population monitoring and translocation over a 10 year period were not being considered. These components have since been added to the proposed work partially due to the comments received during initial public scoping.

The 30-day public comment period ended on July 19, 2010. A press release was distributed to area media outlets, and letters with project information requesting public input were mailed to 83 individuals, agencies and organizations, and to 34 tribes or tribal representatives (Appendix C). In addition, scoping information was emailed to 311 agencies, organizations, businesses, and individuals.

Notification of the scoping period was published in the Kaweah Commonwealth newspaper on July 2, 2010. Information was also posted on the National Parks Travelers and the Wilderness Watch websites. Additionally, information was posted on the NPS Sequoia and Kings Canyon website and links were provided to the NPS Planning, Environment, and Public Comment (PEPC) website.

Public Comments Received

Five comment letters were received; two from individuals; one "no comment" letter was received from the California Department of Transportation; and two from interest groups, including High Sierra Hikers

Association and Wilderness Watch. All comments received were entered into the NPS PEPC system, where they may be viewed, as part of the public record (http://parkplanning.nps.gov/SEKISHEEP). Each letter was carefully reviewed by park staff to identify issues, concerns, and impact topics relevant to the project. A comment analysis /summary report was prepared and is also available at the above link on PEPC.

Consideration of Public Comments in Developing Alternatives

The comments received during the public scoping phase can be summarized as follows:

(1) Some commenters were concerned about the helicopter/net-gunning activities and potential detrimental effects this technique may have on bighorn sheep.

NPS Response: Net-gunning and helicopter operations do have the possibility of disturbing, injuring or killing bighorn sheep. However, research comparing this technique to alternatives (e.g., drop-nets, drive-nets, chemical immobilization) has found that it is the safest method for bighorn sheep capture (Kock et al. 1987, Jessup et al 1988). For example, Kock et al. (1987) found that only 2 of 137 (1.5%) of bighorn sheep captured with net-guns were accidentally killed and net-gunning had the lowest overall measure of risk (i.e., impacts of stress, capture myopathy, and accidental mortality) compared to other techniques. Further, as mentioned earlier, the capture related mortality rate of 3.3% when net-gunning that CDFG has experienced during the last 10 years falls below the limits of the Recovery Permit issued from the USFWS for the capture of bighorn sheep. Therefore, while implementation of this project might be expected to harm 1-3% of the bighorn sheep handled, the loss would be negligible compared to the value of the data obtained to guide their management. These effects are fully analyzed in the Environmental Consequences section of this EA.

(2) Some commenters did not want collars deployed on the bighorn sheep at all and recommended alternative methods for gathering spatial data on bighorn sheep movements and interactions with wilderness recreation users, such as direct observation.

NPS response: Direct observation could provide some bighorn sheep observations but the data would be significantly inferior to that collected with GPS collars because (1) the presence of observers would likely influence bighorn sheep movements, biasing the data, (2) the sample of observations would be further biased because bighorn sheep would not be observed at night, when they are in areas inaccessible to humans, or when they are in vegetative cover, (3) the movements of individual bighorn sheep could not be determined, (4) bighorn sheep could not be "followed" from one area to another, and (5) the number of observations would be too small to make statistical inferences. Direct observation would not allow research questions to be fully addressed.

(3) Some commenters thought past studies (i.e., Hicks and Elder 1979) provided enough information on wilderness recreational users impacts on bighorn sheep for the development of the WSP/EIS.

NPS response: The study by Hicks and Elder (1979) examined how bighorn sheep responded to hikers and pack trains near Baxter Pass, using direct observations of encounters. Findings suggested hikers and pack trains did not adversely affect bighorn sheep, but sample sizes were quite small to make definitive conclusions (only 20 interactions were observed in one summer and only one of these involved packstock). Further, visitor-use patterns and bighorn sheep population densities have changed since this study was conducted and other populations (e.g., the Mt. Langley herd) may respond differently due to significantly higher human-use. For example, Inyo NF just lifted restrictions on the Mt. Langley herd due to lack of observed impacts

from recreational use. Updated and more comprehensive data is therefore required to assess the impacts of wilderness recreational users on bighorn sheep.

(4) Some commenters expressed concerns that the project would not meet the goals of the *Recovery Plan* and was actually contradictory to it.

NPS response: This project does meet the goals of the *Recovery Plan*, which specifically calls for monitoring, research, and translocation [see sections 1.2 (page 48), 2.4 (page 52), 5.3 (page 54), 6.3 (page 55), and 6.4 (page 56)]. The *Recovery Plan* states that radio-telemetry serves many different recovery needs that include monitoring herds, understanding habitat use patterns, monitoring mortality and managing predation, assessing disease threats from domestic sheep, understanding dispersal, and acquiring additional biological data when handling the animals to deploy radio-collars. In addition, although initial public scoping indicated that the proposed project would only involve a scientific study to evaluate the impacts of wilderness recreation use on bighorn sheep, based on the concerns brought forth during internal and public scoping, the NPS determined that it would also include in this EA general population monitoring and the proposed translocation of bighorn sheep into Big Arroyo and Laurel Creek. These actions clearly meet the goals of the *Recovery Plan*, especially because delisting of the species cannot occur until the Big Arroyo and Laurel Creek herd units are inhabited by bighorn sheep.

(5) Some commenters thought that new information was not needed because adequate information is available to make habitat assessments and to direct management actions related to visitor use.

NPS response: Existing habitat models could be used to inform the WSP/EIS, but by monitoring the movement of radio-collared bighorn sheep, these models can be validated (i.e., determined whether they are accurate) and updated as bighorn sheep populations expand into new habitats or change habitat preferences due to increasing population densities.

(6) Some commenters recommended closing the entire bighorn sheep habitat area to visitor use as part of the project to evaluate bighorn sheep habitat use in the absence of human activity.

NPS response: To close the entire bighorn sheep summer range to recreational use as an experiment would eliminate the ability to evaluate the significance of existing potential competing uses. Such extreme measures are unwarranted for the purposes of this research and would not allow for the gathering of information on whether or how existing uses are impacting bighorn sheep populations.

(7) Some commenters recommended preparing a joint environmental impact report/environmental impact statement (EIR/EIS) with CDFG.

NPS response: The NPS, in cooperation with CDFG, USGS, and the Inyo NF is preparing this EA which will meet the requirements of the *California Environmental Quality Act* (CEQA). If, through the environmental analysis in this EA, it is determined that the selected action would not have "a significant effect on the human environment," an EIS will not be prepared (40 CFR 1508.13).

(8) Some commenters suggested that bighorn sheep were already on the path to recovery and no additional work was needed to restore the populations.

NPS response: At the moment, bighorn sheep are making an excellent comeback and the herd is estimated at close to 400 animals. However, this increase from a low of 100 animals in 1995 from an historic population that probably exceeded 1,000 individuals (USFWS 2007) is still insufficient to ensure long-term viability. Disease transmission from contact with domestic sheep or other vectors could cause the complete loss of entire sub-populations. In order to meet the objectives of the *Recovery Plan*, bighorn sheep need to be translocated into currently unoccupied areas of critical habitat within Sequoia National Park. In addition, we need the information from research studies to inform our management of wilderness and Section 7 consultations under the *Endangered Species Act* and to provide necessary factual scientific information to guide our future management of the species.

(9) Some commenters expressed concerns about the cost and necessity of the project.

NPS response: While the capturing and radio-collaring bighorn sheep is expensive, it is the only way to effectively monitor bighorn sheep populations, as required by the *Recovery Plan*. Further, the type of data it provides is far more accurate than can be obtained by any other technique and development of a WSP/EIS and subsequent management decisions must be based on defensible science. Examples of planning and management actions that require this level of information might include trail placement, removal, or reroutes, changes in grazing regulations or stock use within critical habitat, habitat restoration projects, fire management planning within critical habitat, manipulative research, or travel or camping restrictions in critical habitat. This data would also inform the required *Endangered Species Act* consultation that the parks would undertake during planning to determine how best to minimize or avoid harm to the endangered species and its critical habitat. Finally, capture and radio-collaring is the only means for reintroducing bighorn sheep into Big Arroyo and Laurel Creek in a reasonable time frame, given the limited dispersal capabilities of bighorn sheep.

(10) Several commenters expressed concerns about impacts to wilderness from the capturing and collaring operations and related research.

NPS response: According to the *Wilderness Act*, science is one of the purposes of wilderness (Section 4(b)). Each proposed project element will be evaluated through this compliance document to determine the potential adverse and beneficial effects, and any element that is a prohibited use (as stipulated in Section 4(c)) will be evaluated through a Minimum Requirements Analysis to determine 1) if the action is indeed necessary in wilderness, and 2) what specific activities are the minimum necessary to complete the action, in order to help preserve wilderness character. Section 6.3.5 of NPS *Management Policies 2006* states that the Minimum Requirement concept will be a two step process to determine (1) if the management action is necessary for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character, and (2) the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized. Also: "When determining minimum requirements, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than, economic efficiency and convenience."

In addition, an "Impacts and Benefits Filter" would be used to assess benefits along with incremental and cumulative impacts using numerical scores. This step takes into consideration benefits and impacts to wilderness stewardship in the present, as well as the benefits on larger

spatial and temporal scales, per the recommendations in the NPS "White Paper Guidelines: Scientific Activities and Research in NPS Wilderness, Version 1. January 2011."

Derivation of Issues and Impact Topics

Specific impact topics were developed for discussion and to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on internal and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies 2006* (NPS 2006); site visits; and NPS knowledge of limited or easily impacted resources. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration. The resources which could be affected and the impacts that could occur are described in detail in the "Affected Environment" and "Environmental Consequences" sections of this document.

Issues and Impact Topics Selected for Detailed Analysis

In this section and the following section on *Impact Topics Dismissed from Further Analysis*, the NPS takes into account all potential impacts by considering the direct, indirect and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by the NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this environmental document pertains to whether the NPS dismisses an impact topic from further detailed evaluation. The reason the NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

The following impact topics were selected for detailed analysis: wildlife, special-status species, wilderness resources and character, soundscapes, health and safety, visitor experience and recreational opportunities (Table 1).

Table 1. Impact Topics Retained for Further Evaluation and Relevant Laws, Regulations, and Policies

Impact Topic	Issues	Relevant Laws, Regulations, and Policies
Wildlife	Wildlife may be affected by noise associated with helicopter use, the presence of crews in habitat, and by the translocation of bighorn sheep.	NPS *Organic Act*; NPS *Management Policies 2006* (NPS 2006); NPS-77 (NPS 1991)
Federally listed and other special-status species – Sierra Nevada Bighorn Sheep	Sierra Nevada bighorn sheep are a federally endangered subspecies. Handling and monitoring bighorn sheep could result in adverse effects (e.g., modified behavior, physiological stress, or even death) to individuals within the population. There may be beneficial effects from future management actions, such as managing visitor use and the translocations of bighorn sheep to supplement or reestablish herds.	NPS *Organic Act*; *Endangered Species Act of 1973* (ESA)(16 U.S.C. 1531–1544; P.L. 93-205); NPS *Management Polices 2006* (NPS 2006) 4.4.2.3, Management of Threatened or Endangered Plants and Animals; NPS 75, *Natural Resources Inventory and Monitoring*

Impact Topic	Issues	Relevant Laws, Regulations, and Policies
Wilderness Resources and Character	Activities would occur within designated wilderness and have the potential to impact wilderness character and resources. In the short-term, activities could affect opportunities for solitude, the untrammeled nature of wilderness, the undeveloped nature, but could also restore natural conditions in the long-term as bighorn sheep reestablish in previously occupied habitat.	NPS *Organic Act*; *Wilderness Act of 1964*; The *California Wilderness Act of 1984* (PL 98-425, 98 Stat. 1619); *Omnibus Public Land Management Act of 2009*; *Reference Manual 41: Wilderness Preservation and Management* (NPS 1999b)*; Sequoia and Kings Canyon Management Directive 49* (NPS 2009)
Soundscapes	Aircraft use for capturing and/or monitoring would create human-generated noise disrupting the natural soundscape in and around the project area.	NPS *Management Policies 2006* (NPS 2006); *Director's Order 47: Soundscape Preservation and Noise Management* (NPS 2000)
Health and safety	The use of helicopters has inherent risks to employees and partners, therefore this topic will be further evaluated.	NPS *Management Policies 2006* (NPS 2006)
Visitor experience and recreational opportunities	The use of helicopters and the presence of work crews could adversely affect visitor experience. Therefore, this topic will be further evaluated.	NPS *Organic Act*; NPS *Management Policies 2006* (NPS 2006); NPS-77 (NPS 1991); the *Redwood Act of 1978*

Impact Topics Considered but Dismissed

Issues considered, but not carried forth for further analysis, are listed below, along with the rationale for their dismissal.

Sensitive or listed species (other than Sierra Nevada Bighorn Sheep) – No federally listed or candidate plant species are known to occur within Sequoia or Kings Canyon National Parks and within proposed project locations within Inyo NF. It is highly unlikely and improbable that any park sensitive species or California state-listed endangered, threatened, or rare species would be trampled or damaged during the proposed vegetation sampling or capture operations. Therefore, this topic will not be addressed in the EA.

Other federally listed or sensitive wildlife may occur near the project area. Several candidates for federal listing as endangered occur in or near some of the project sites. The mountain yellow-legged frog (*Rana muscosa*) occurred historically in waters in the vicinity of the project locations. However, the work would not occur in or near lakes and streams, therefore would have no effect on the frog. The Yosemite toad is a meadow species and would not likely be impacted by any of the project sites, even if they occurred within their range. The fisher (*Martes pennant*) typically occurs at lower montane elevations and would be extremely unlikely to be near any of the project areas. The California spotted owl (*Strix occidentalis occidentalis*) is a state species of special concern. Like the fisher, it occurs at much lower elevations than the project sites. The delisted (formerly threatened) bald eagle (*Haliaeetus leucocephalus*) is a rare visitor to the project area and would be extremely unlikely to be near project activities. None of the special-status species considered above would be affected by the proposed activities within the project areas (SEKI and Inyo NF); therefore, no further evaluation is necessary.

Other sensitive species that could be in the project area include the Sierra Nevada red fox (*Vulpes vulpes necator*), and wolverine (*Gulo gulo*). The capture sites within Sequoia and Kings Canyon National Parks are generally too high for these species, and the vegetative sampling would not affect them. The project areas offer suitable and potential habitat for wolverine and Sierra Nevada red fox within Inyo NF. Potential effects on these species on the Inyo NF are discussed below.

Sierra Nevada red fox

Historically, the Sierra Nevada red fox occurred at high elevations in the Sierra Nevada from Tulare County northward to Sierra County (USFS 2001). Although the Sierra Nevada red fox seem to range from 4,000 to 12,000 feet in elevation, they are seldom sighted below 5,000 feet and most often above 7,000 feet (ibid). The red fox prefers red fir and lodgepole pine forests in the subalpine zone and alpine fell fields of the Sierra Nevada. This species does not appear to require dense canopy closure; however, it uses forested areas in proximity to meadows, riparian areas, and brush fields. Forested habitats are used for reproduction and cover (ibid). Young may be reared in cavities or spaces within rock piles and talus slopes.

Sierra Nevada red fox have been identified on the Bridgeport Ranger District, Humboldt-Toiyabe NF in the Sonora Pass area in December 2010. Several individuals were identified via camera stations and DNA tests show that these individuals are related to an historic population of SN red fox from the Bridgeport area. These new occurrences have shown that a population of Sierra Nevada red fox inhabits the Sierra Nevada. There are historic observations of fox on the Inyo NF, and recently CDFG identified a red fox during deer count surveys in the Round Valley area (just west of Bishop, CA). The red fox was observed at the mouth of the Pine Creek drainage in a sagebrush/bitterbrush vegetation community (pers. correspondence Taylor 2011). DNA has not been collected from this individual and it has not yet been determined which population this fox may derive from. This new location is located near the project area, but not within potential capture areas. Camera stations established by CDFG after this sighting have not identified any Sierra Nevada red fox in the survey area (pers. comm. Lisius 2011).

Wolverine

Wolverines use a variety of habitats across their range in North America. This appears to be due to their large home ranges, which include a great diversity of forest and non-forest types. Wolverines predominately use coniferous forest types, but their significant use of non-forest alpine habitats distinguishes them from the fisher and marten (USFS 2004 and Ruggiero et al. 1994). Habitat use by wolverines may be associated more with year-round food supplies in large, sparsely inhabited wilderness areas, than in terms of particular habitat types (Ruggiero et al 1994). This also may explain the different habitat use by wolverines. Wolverines do appear to be particularly selective about two habitat elements. The first element is their natal dens, which occur in high-elevation rocky substrates and are often associated with wood or boulders in cirque basins. The second habitat element pertains to human disturbance: wolverines appear to select areas that are free from significant human disturbance, especially during the denning period from late winter through early spring (USFS 2004).

On December 14, 2010, the USFWS published a 12-month finding on the North American wolverine. The USFWS found that we find that the North American wolverine occurring in the contiguous United State is a distinct population segment (DPS) and the addition of this DPS to the Lists of Endangered and Threatened Wildlife and Plants is warranted but precluded (USFWS 2010). Threats to wolverines as discussed in the 12-month finding include modification of habitat by climate change, human use and disturbance, dispersed recreational activities, infrastructure development, transportation corridors, and land management (USFWS 2010).

There are 21 claimed recorded observations of wolverines along the Sierra crest and within bighorn sheep herd units, where helicopter flights and landing would occur (CNDDB 2010). These records are from

sightings occurring from 1911 to 1986. No recent observations of wolverines have been documented in these areas. The project area does offer potential habitat for wolverine, as this species may travel through these areas throughout the year.

Sierra Nevada Red Fox and Wolverine

Direct and Indirect Impacts

Helicopter landings would occur in visually open areas, outside of forested habitats. Sierra Nevada red fox do utilize open terrain and there may be potential, although small, that the landing of a helicopter may lead to displacement of Sierra Nevada red fox from the landing zone. Helicopter landings would occur in visually open areas, outside of forested habitats. Wolverines do utilize open terrain and there may be potential, although small, that the landing of a helicopter may lead to displacement of wolverine from the landing zone. There would be no impacts to red fox and wolverine habitat, as no vegetation would be altered or removed as part of this project.

Disturbances to these species may occur when a helicopter flies over the area in search of sheep. Noise and presence of the helicopter may lead toward red fox and wolverine movements out of the area for during the time of the flights. However, helicopter flights would only lead to short-term impacts to these species, as flights would be one to two days within each herd unit. Furthermore, not all herd units would receive helicopter use every year. Helicopter activity would not include following or purposefully moving the red fox and wolverine, if seen, out of the area.

There is potential that helicopter flights may impact red fox and wolverine during the denning season due to noise. The helicopter may fly over a den site, causing a short-term impact which may lead toward the red fox moving out of the den while the flight is occurring. Both species have the potential to return to the den once the helicopter has passed. Disturbances would not be prolonged enough to cause a red fox and wolverine to abandon the den site. Sierra Nevada red fox dens and wolverine dens have not been identified on the Inyo NF.

The project activities would result in negligible adverse effects on the Sierra Nevada red fox and wolverine. Therefore, the only special-status species that will be further evaluated within this document is the Sierra Nevada bighorn sheep.

Vegetation, geology, and soils – Vegetative sampling would be conducted by park staff and USGS researchers in sub-alpine meadows. The sampling would entail clipping and collecting small portions of the growing plants and would have no measureable effect on vegetation and soils and are considered non-destructive data collection. There may be some trampling of vegetation and soils by capture crews and bighorn sheep during capture operations, however crews strive to minimize stress to bighorn sheep during these operations to keep them calm, which minimizes disruption to the vegetation and soils. In addition, operations would be limited to small areas and capture crews of two individuals, with specific capture sites used only once during the entire operation. Mitigation would be instituted to reduce the likelihood of invasive or exotic vegetation establishing from project activities. In addition, there would be no ground disturbance or disturbance to the area's geological features. Therefore, vegetation, geology and soils are dismissed from further evaluation.

Air quality – There would be fumes generated by the use of helicopters and dust could be generated in landing and hovering areas. Should any of the action alternatives be selected, local air quality would be temporarily affected. The impacts would last only as long as the helicopter flights are underway, and would result in local, short-term, negligible adverse impacts on air quality. Therefore, air quality was dismissed as an impact topic.

Water resources and water quality; wetlands and floodplains; Wild and Scenic Rivers – No activities would occur in or near wetlands or floodplains, or Wild and Scenic Rivers; therefore there would be no effect on these resources.

Scenic resources and night sky, climate change, cultural resources, prime or unique farmlands, environmental justice, Indian Trust Resources, socioeconomics, and land use – No impacts on these resources/topics are anticipated.

CHAPTER 2: ALTERNATIVES

The following alternatives have been developed for further analysis:

- Alternative 1: No Action
- Alternative 2: Implement Bighorn sheep Research and Monitoring with No Translocations
- Alternative 3: Implement Bighorn sheep Translocations Only
- Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)

In addition, there are three components of research that do not involve radio-collaring of bighorn sheep which would be included in all alternatives: vegetation monitoring, a bighorn sheep diet study, and a visitor/bighorn sheep interaction study.

The alternatives are further detailed below. The no-action alternative provides a baseline from which action alternatives can be compared, magnitudes of proposed changes can be evaluated, and environmental impacts of those changes can be measured.

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

Vegetation Monitoring

The purpose of vegetation monitoring is to examine packstock use impacts on meadow vegetation. Meadows are important sources of forage for bighorn sheep and therefore bighorn sheep may be negatively impacted by stock use of meadows. Vegetation data would be collected by NPS and USGS staff at 20 meadows throughout Sequoia and Kings Canyon National Park during the summers of 2011 and 2012. The sampling would include hand clipping and collecting small portions of growing plants. Meadows would be accessed by hiking. Vegetation data would be gathered in four meadows conditions: (1) those used by bighorn sheep and packstock, (2) those used by bighorn sheep but not packstock, (3) those used by packstock but not bighorn sheep, and (4) those used by neither bighorn sheep nor packstock. Species composition, diversity, and biomass would be compared between the four meadow conditions.

Bighorn Sheep Diet Study

The purpose of examining bighorn sheep diets is to refine understanding of bighorn sheep diet and foraging behavior. CDFG biologists would assess bighorn sheep diet quality by measuring digestible energy and digestible protein of forage samples collected during vegetation monitoring. Diets would be determined by microhistological analysis of fecal samples. This work would occur during the summers of 2011 and 2012.

Visitor/ Bighorn Sheep Interaction Study

The purpose of examining visitor/bighorn sheep interactions is to evaluate the impacts that wilderness recreational activities have on bighorn sheep. This study, conducted by sociologists from Yosemite National Park (YOSE), would employ direct observation of bighorn sheep and visitor interactions coupled with GPS tracking of visitor movements. The study locations are expected to be Mount Langley and Baxter Pass. Visitor use estimation equipment would be used to understand the timing and quantity of visitors that frequent these locations over the course of the summer/fall seasons. This equipment would be limited to small 2" × 4" counter equipment obscured along trails. This work would occur only during the summer of 2012 and it is expected that the total number of equipment units would be 6-10 units.

ALTERNATIVE 1: NO ACTION

Under this alternative, bighorn sheep would not be captured and radio collared, for research, monitoring, or translocation. Existing collared bighorn sheep (approximately 18) within Sequoia and Kings Canyon National Parks would continue to be monitored by CDFG until the collars are no longer usable.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

During 2011 and 2012 bighorn sheep from Sequoia and Kings Canyon National Parks and the Inyo NF would be annually captured and fitted with GPS collars by CDFG biologists and qualified personnel certified by USFWS. Data obtained from these bighorn sheep would support the wilderness research needed to develop the Sequoia and Kings Canyon National Parks Wilderness Stewardship Plan; however data would also be used for the CDFG monitoring program for the overall recovery effort. Upon completion of the research project, CDFG would continue to implement their monitoring program using both VHF and GPS collars within Sequoia and Kings Canyon National Parks for an additional 8 years (i.e., 2013-2021).

Bighorn sheep would initially be located from a helicopter and captured by using a net gun fired from the helicopter at close range. Immediately after firing the net, the helicopter would be landed nearby and crew members (two personnel) would exit the helicopter and restrain the bighorn sheep. No chemical immobilization is required for this technique.

Captured bighorn sheep would then be transported via helicopter, using external rigging, to a staging area on the Inyo NF (located outside of designated wilderness) where they would receive a physical examination; age and body condition (i.e., body fat) would be measured, and blood and fecal samples would be collected to survey herd health by screening for exposure to diseases and parasites loads. A CDFG veterinarian would participate in all captures and translocations and would ensure the health of all animals and attend to any health concerns. Captured bighorn sheep would be fitted with VHF and/or GPS collars and marked with numbered and colored ear tags. Since VHF collars have a lifespan of at least five years and can be active for as long as 10 years, they would likely be on animals for the remainder of their lives. GPS collars in current use by CDFG are programmed to drop off automatically after two years. Care would be taken to ensure that the collars are fit snugly and do not slide up and down the animal's neck. Little impact on individual bighorn sheep is expected from the collars, since each animal would adjust to the presence of a properly applied collar within a short period of time. After handling is complete, bighorn sheep would be transported via helicopter to their initial capture location, where the capture crew would be waiting, and released. The entire operation, from capture to release is expected to take about 60 minutes.

Captures would be conducted at times of the year that minimize the impact to the animals both physically and socially. In most cases, captures would be conducted in October to avoid disturbance during the rut (November and December) and bighorn use of lower elevation winter ranges. Occasionally captures might occur in January through the first week of April, if animals were located in higher elevation winter habitat. No captures would occur from mid-April through October in order to avoid lambing season.

Table 2. Estimated numbers of research/monitoring captures, helicopter landings, and helicopter days required to implement bighorn sheep research and monitoring in SEKI and the Inyo NF.

Herd Unit	# of sheep research/ monitoring captures[1]			Approx. # of helicopter landings[3]			Approx. # of helicopter days		
	10 Year Maximum	Per year		10 Year Maximum	Per year		10 Year Maximum	Per year	
		Inyo	SEKI		Inyo	SEKI		Inyo	SEKI
Langley	75	2-12	1-5	150	4-24	2-10	20	3	2
Williamson	22	0-3	0-1	44	0-6	0-2	14	2	2
Bubbs	25	0	2-4	50	0	4-8	14	0	2
Baxter	59	1-8	0-3	118	2-16	0-6	20	3	2
Sawmill	56	2-6	1-3	112	4-12	2-6	20	3	2
Wheeler	66	4-13	0	132	8-26	0	20	3	0
Gibbs	32	2-5	0	64	4-10	0	14	2	0
Warren	33	1-5	0	66	2-10	0	14	2	0
Convict	10	0-2	0	20	0-4	0	14	2	0
Taboose	18	0-2	0-1	36	0-4	0-2	8	2	2
Olancha	21	0-3	0	42	0-6	0	8	2	0
Big Arroyo[2]	10	0	0-2	20	0	0-4	8	0	2
Laurel Creek[2]	10	0	0-2	20	0	0-4	8	0	2

[1]Research captures would occur only in 2011 and 2012. However, these captures would also be used for the CDFG monitoring program for the overall recovery effort.
[2]Monitoring captures of bighorn sheep in these herd units would only occur under Alternative 4.
[3] Because a variety of factors influence where and how many bighorn sheep will be captured in a given year (e.g., weather conditions, available funding for helicopter flight time, herd sex and age composition, etc.), it is impossible to know the exact location, number of captures, helicopter landings, and helicopter days that will occur each year. Further, should the high end estimate of sheep be captured in any given herd unit in a given year, fewer sheep would be captured in other herd units, thus resulting in fewer helicopter flights than would be predicted if the high end estimates were summed for a given year.

The bighorn sheep captured in 2011 and 2012 would be used for CDFG's population monitoring efforts, but they would also be used to achieve two research objectives: (1) quantify the degree of current and potential spatial overlap between bighorn sheep and areas grazed by packstock and (2) develop a predictive model of future bighorn sheep distribution to aid in identifying potential habitat and movement corridors and selecting sites for reintroductions. Achieving these objectives would allow for evaluation of the potential behavioral, nutritional, distributional, and demographic effects of packstock on bighorn sheep.

Two approaches would be used to quantify spatial overlap in habitat use between bighorn sheep and packstock. The first approach would compare data from GPS locations of bighorn sheep to Geographic Information Systems (GIS) layers of vegetation and packstock use, focusing on meadows because this is the vegetation type that packstock have the greatest potential to impact bighorn sheep. Meadows that are used by both bighorn sheep and packstock, those used by bighorn sheep but not packstock, those used by packstock but not bighorn sheep, and those that are not used by either species would be evaluated to determine which meadow type bighorn sheep are most associated. The second approach would use GPS locations of bighorn sheep to estimate "herd home ranges" and determine whether bighorn sheep exhibit habitat preferences for five different habitat classes: meadows without packstock use; meadows with packstock use; conifer; shrub; and barren (includes rock and sparsely vegetated alpine). If bighorn sheep use or avoid any of these habitats in a proportion that is different from their availability on the landscape, habitat selection would be inferred.

The type of predictive model of future bighorn sheep distribution to be developed is known as a Resource Selection Function (RSF). RSFs are models that can be used to predict the potential future distribution of bighorn sheep, based on their current patterns of habitat use. Following recovery of bighorn sheep, it is expected that they will occupy a much broader distribution than they do currently; the construction of a RSF would be used to predict their future range extent. Further, by intersecting the RSF with packstock use areas, the likelihood of bighorn sheep using these areas would be evaluated. GPS locations of bighorn sheep would be used to construct these models.

All bighorn sheep captured between 2011 and 2021, including those captured for research, would be used as part of CDFG's routine monitoring program. Collared animals are required to assess progress towards recovery goals, examine threats, and evaluate the success of management actions. Data collected from radio-collared bighorn sheep allows greater understanding of spatial patterns of habitat use and population dynamics. Spatial information on habitat use has allowed documentation of population substructuring (different home range patterns), seasonal migratory patterns, and occasional extreme movements that have brought bighorn sheep close to domestic sheep allotments (outside the parks), increasing risk of disease. Monitoring demographic parameters such as adult and lamb survival, cause-specific mortality, and obtaining population estimates allows a greater understanding of factors that drive population dynamics including density-dependence and predation. In addition to gathering data from collars, biologists determine nutritional status, health/disease status, and pregnancy status by handling bighorn sheep during captures. Data obtained from these capture efforts has been used and would continue to be used to direct management and species recovery.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

Under this alternative, bighorn sheep would be translocated into the currently vacant Big Arroyo and Laurel Creek critical habitat units when suitable stock becomes available (likely beginning within the next 3-5 years), but monitoring and research captures, as described in alternative 2, would not occur. Bighorn sheep would be captured from occupied source herd units that would be selected based on herd unit abundance and distribution, ability to support removals, and on genetic considerations of both source and reintroduced herds. The selected herd units may or may not be those that use Sequoia and Kings Canyon National Parks (i.e., source herd units may be those that exist exclusively on Inyo NF lands). Animals would be selected for translocation based on their age, prior reproductive success, nutritional condition, and absence of disease.

The techniques for capturing bighorn sheep in the source herd units would be the same as those described in alternative 2. Bighorn sheep would be transported by helicopter to the release sites within Sequoia and Kings Canyon National Parks and released the same day (usually within 12 hours). When possible, bighorn sheep released for translocation would be released in groups that include animals with prior social contact; this increases the potential for continued group association following release. Prior to release, each bighorn sheep would receive a physical exam to determine its suitability for translocation. A CDFG veterinarian would participate in all captures and translocations and will ensure the health of all animals and attend to any health concerns. The veterinarian would oversee disease screening for a variety of diseases. All released bighorn sheep would receive GPS and VHF telemetry collars so that monitoring could be conducted to determine the success of the reintroduction efforts.

The exact release sites within the Big Arroyo and Laurel Creek critical habitat units, within Sequoia National Park, would be determined in part based expert opinion and range conditions at the time of release. Since a RSF model would not be constructed under this alternative, it would not inform this process. Releases would likely occur during a 1 to 14 day period in late winter (March through the first week of April) to reduce the likelihood of severe winter weather during the period following release when animals are becoming familiar with their new habitat.

In each herd unit, a founder population of approximately 30 bighorn sheep would be released during a 6-year period, with a bias on adults and females. This founder population size is based on the success of previous reintroductions and the results of population viability modeling conducted by CDFG. However, the number and timing of releases may vary based on availability of source stock, available funding, and the findings of monitoring previously released bighorn sheep. Table 3 provides a range of potential values for translocation captures, helicopter landings, and helicopter days. Some information in this table is not applicable to translocations within Sequoia National Park (e.g., helicopter activity in the Gibbs and Convict herd units); it is provided here to provide an understanding of related bighorn sheep activities.

Table 3. Estimated numbers of translocation captures, helicopter landings, and helicopter days required to implement bighorn sheep research translocations into SEKI.

Herd Unit	# of sheep translocation captures			Approx. # of helicopter landings[2]			Approx. # of helicopter days		
	10 Year Maximum	Per year		10 Year Maximum	Per year		10 Year Maximum	Per year	
		Inyo	SEKI		Inyo	SEKI		Inyo	SEKI
Langley	30	0-11	0-5	30	0-11	0-10	10	0-6	0-4
Williamson	0	0	0	0	0	0	0	0	0
Bubbs	0	0	0	0	0	0	0	0	0
Baxter	32	0-11	0-5	32	0-11	0-10	10	0-6	0-4
Sawmill	32	0-11	0-5	32	0-11	0-10	10	0-6	0-4
Wheeler	33	0-15	0	33	0-15	0	10	0-6	0-4
Gibbs[1]	0	0	0	3	0-3	0	1	0-1	0
Warren	0	0	0	0	0	0	0	0	0
Convict[1]	0	0	0	5	0-5	0	2	0-2	0
Taboose	0	0	0	0	0	0	0	0	0
Olancha	0	0	0	0	0	0	0	0	0
Big Arroyo[1]	0	0	0	30	0	0-15	6	0	0-6
Laurel Creek[1]	0	0	0	30	0	0-15	6	0	0-6

[1]Helicopter activity for these herd units represents translocation arrivals. These herd units will not be used as source populations for translocation.

[2] Because a variety of factors influence where and how many bighorn sheep will be captured in a given year (e.g., weather conditions, available funding for helicopter flight time, herd sex and age composition, etc.), it is impossible to know the exact location, number of captures, helicopter landings, and helicopter days that will occur each year. Further, should the high end estimate of sheep be captured in any given herd unit in a given year, fewer sheep would be captured in other herd units, thus resulting in fewer helicopter flights than would be predicted if the high end estimates were summed for a given year.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

This alternative involves the bighorn sheep research and monitoring as described under alternative 2, plus the translocation of bighorn sheep as described under alternative 3. Because a RSF model would be built prior to the translocations, in addition to expert opinion and range conditions at the time of release, this model would be used to assist in determining exact release sites. Additionally, handling bighorn sheep during research and monitoring captures would provide an opportunity to conduct disease and health surveillance of herds intended for the removal and receipt of animals during translocations. During pre-translocation (i.e., research and monitoring) captures, samples are collected that permit determination of disease status, nutritional condition, and genetic diversity of herds. Knowledge of health status is essential for making informed decisions about where animals may be safely moved among herds to avoid disease transmission and ensure the success of recovery activities.

MINIMUM TOOL CONSIDERATIONS

As defined in *Reference Manual 41: Wilderness Preservation and Management* (NPS 1999b), "Minimum Tool means a use or activity, determined to be necessary to accomplish an essential task, which makes use of the least intrusive tool, equipment, device, force, regulation, or practice that will achieve the wilderness management objective. This is not necessarily the same as the term "primitive tool," which refers to the actual equipment or methods that make use of the simplest available technology (i.e., hand tools)."

The 2009 *Sequoia and Kings Canyon National Parks Management Directive 49* (NPS 2009) defines the minimum tool as "the management method (tool) that causes the least amount of impact to the physical resources and experiential qualities (character) of wilderness."

Considerations for Helicopter Use

Helicopters have been used in Sequoia and Kings Canyon National Parks and the project area on Inyo NF for project work since the early 1950s. From May through October, the NPS has a helicopter based at park headquarters for use in patrol and law enforcement functions, fire activities, search and rescue (SAR), resource management, research, and support of park wilderness management activities.

Based on the analysis conducted in the Minimum Tool Minimum Requirements Analysis (Appendix A), the use of a helicopter is the minimum tool necessary to accomplish bighorn sheep captures. This capture method requires the shortest amount of time to complete captures (reducing impacts to wilderness character), would allow CDFG to achieve its recovery plan goals before the start of the bighorn sheep lambing season (April 1 – July 15) when captures cannot occur, and is the safest capture method for bighorn sheep.

Considerations for helicopter use include the following:

1. The helicopter that would be used for this project would be the lightest and quietest helicopter possible to carry out the mission safely.
2. Flights and landings would occur for a maximum of 6 days annually in each of the herd units,
3. The time of year (i.e., research and monitoring captures primarily in October but possibly January-April translocation captures in March-April) is outside of the peak visitor season,

Helicopter flights could occur in any occupied herd unit. Once bighorn sheep are located, flights and landings would be limited to smaller, more specific locations.

MITIGATION MEASURES

Mitigation measures during bighorn sheep captures would include:

- All equipment (including the helicopter and nets) and clothing would be inspected for weeds and seeds prior to project activities. All soil and plant parts would be removed.
- Pursuits would occur only in terrain where bighorn sheep may be safely netted and recovered.
- After bighorn sheep are located and pursuit begins, pursuit would be terminated after 5 minutes if capture was unsuccessful.
- If the net misses or bighorn sheep escapes, pursuit would be terminated unless recapture was imminent (i.e., within 30 seconds).
- Nets that miss bighorn sheep would be collected to prevent adverse effects on wilderness character or the safety of wildlife and visitors.
- Helicopters would be landed immediately after bighorn sheep are netted. The helicopter would not park (i.e., the engine would not be turned off).
- The number of people needed to safely and efficiently handle each bighorn sheep would be minimized as well as all sudden movements, auditory, visual, and touch stimuli.
- Vital signs (temperature, pulse, and respiration) shall be assessed immediately after capture and monitored during processing. Water shall be available at both the capture and processing sites and used as necessary to cool animals.
- In the event of a major injury, the bighorn sheep would be quickly and humanely euthanized and the project would be stopped for a review and assessment of the incident.

Consultations and Permitting Requirements

The USFWS determined that any associated adverse effects on the bighorn sheep had already been analyzed through a section 7(a)(2) consultation as part of the process of issuing a recovery permit to CDFG, therefore no additional consultation for bighorn sheep or their critical habitat is necessary (December 22, 2010 memorandum). In addition, the USFWS determined that no other listed species would be affected because of the proposed action since they do not occur in the study area. Therefore, no additional consultation is required.

The CDFG would be responsible for receiving a permit from the USFS to conduct helicopter landings on Inyo NF.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

Monitor Bighorn sheep Movements by Direct Observation Only Without the Use of Radio-Collars

Direct observation could provide some bighorn sheep observations but the data would be significantly inferior to that collected with radio-collars because (1) the presence of observers would likely influence bighorn sheep movements, biasing the data, (2) the sample of observations would be further biased because bighorn sheep would not be observed at night, when they are in areas inaccessible to humans, or when they are in vegetative cover, (3) the movements of individual bighorn sheep could not be determined, (4) bighorn sheep could not be “followed” from one area to another and may not be reasonably observed in much of their habitat, and (5) the number of observations would be too small to make statistical inferences. Thus this alternative was ruled out from further consideration.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The CEQ defines the environmentally preferred alternative as "the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act (NEPA) § 101."

> [Section 101 states that] it is the continuing responsibility of the Federal Government to:
>
> Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
>
> Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
>
> Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
>
> Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
>
> Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
>
> Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The identification of the environmentally preferred alternative was based on an analysis that balances factors such as physical impacts on various aspects of the environment, mitigation measures to deal with impacts, and other factors, including the statutory mission of the NPS and the purposes for the project. (For a comparison of the alternatives and the potential environmental effects under each alternative, see Table 3. A full discussion of impacts is presented later in this document.)

Alternative 1 is not the environmentally preferred alternative for the following reasons: (1) it would not allow for the recovery of bighorn sheep as directed by the *Recovery Plan* and, (2) it would not provide adequate information to park managers to allow them to understand impacts to bighorn sheep from wilderness recreational activities, and to promote management actions to reduce impacts. Therefore, the NPS would not be fulfilling the responsibilities of each generation as a trustee of the environment, and the NPS would not be preserving important natural aspects of our national heritage, and there would be risk of not attaining the widest range of beneficial uses of the environment without degradation.

Alternative 2 would provide information to adequately manage wilderness visitor use in bighorn sheep habitat, but it would not provide for the recovery of bighorn sheep per the *Recovery Plan*, as one of the measures of success is restoring bighorn sheep to previously occupied habitat, including Big Arroyo and Laurel Creek. This alternative would allow the NPS to attain the widest range of beneficial uses of the environment without degradation or other undesirable and unintended consequences because managers would have information to understand impacts to bighorn sheep from wilderness recreational activities, and to promote management actions to reduce impacts. However, this alternative would not fulfill the responsibilities as a trustee of the environment for succeeding generations or preserve important natural aspects of our national heritage because the full recovery of bighorn sheep would not be attained without reintroductions, per the *Recovery Plan*. Therefore, while alternative 2 would be more environmentally preferable than alternative 1, it is still not the environmentally preferred alternative.

Alternative 3 would meet one of the goals of the *Recovery Plan* by restoring bighorn sheep into the previously occupied habitat of Big Arroyo and Laurel Creek. However, it would not provide park management with adequate information to understand impacts to bighorn sheep from wilderness recreational activities, and to promote management actions to reduce impacts. While alternative 3 would allow the NPS to fulfill the responsibilities as a trustee for future generations by restoring bighorn sheep in previously unoccupied areas, there may be undesirable and unintended consequences because managers would not have information to allow improved management of visitor use in wilderness. Therefore, alternative 3 is not the environmentally preferred alternative.

Alternative 4 would provide NPS managers with the information to understand impacts to bighorn sheep from wilderness recreational activities, promote management actions to reduce impacts, and it would meet one of the goals of the *Recovery Plan* by restoring bighorn sheep into the previously occupied habitat of Big Arroyo and Laurel Creek. Therefore, alternative 4 is the most environmentally preferred alternative because it would allow the NPS to fulfill the responsibility as trustee of the environment, it would allow for the widest range of beneficial uses without degradation or other undesirable and unintended consequences, and it would allow the NPS to preserve important natural aspects of our national heritage.

Table 3. How each alternative meets project objectives

Project Objectives	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocations Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
	This alternative provides a baseline from which action alternatives can be compared. Current management of bighorn sheep would continue. Existing collared bighorn sheep within SEKI would continue to be monitored by CDFG until the collars are no longer usable but no additional bighorn sheep would be captured for research, monitoring, or translocation. <u>Common to all alternatives</u>: NPS and USGS researchers would collect vegetation data. CDFG researchers would collect bighorn sheep diet data. YOSE researchers would collect visitor use/human interaction data.	Between 2011 and 2021, bighorn sheep would be annually captured and fitted with VHF or GPS radio-collars. All of these bighorn sheep would be used as part of the routine monitoring program of CDFG, but bighorn sheep captured in 2011 and 2012 and fitted with GPS radio-collars would also be used for research to develop a habitat model and evaluate the impacts of packstock on bighorn sheep. <u>Common to all alternatives</u>: NPS and USGS researchers would collect vegetation data. CDFG researchers would collect bighorn sheep diet data. YOSE researchers would collect visitor use/human interaction data.	In Big Arroyo and Laurel Creek, a founder population of approximately 30 bighorn sheep would be reintroduced when suitable stock becomes available. <u>Common to all alternatives</u>: NPS and USGS researchers would collect vegetation data. CDFG researchers would collect bighorn sheep diet data. YOSE researchers would collect visitor use/human interaction data.	Between 2011 and 2021, bighorn sheep would be annually captured and fitted with VHF or GPS radio-collars. All of these bighorn sheep would be used as part of the routine monitoring program of CDFG, but bighorn sheep captured in 2011 and 2012 and fitted with GPS radio-collars would also be used for research to develop a habitat model and evaluate the impacts of packstock on bighorn sheep. In addition, in Big Arroyo and Laurel Creek, a founder population of approximately 30 bighorn sheep would be reintroduced when suitable stock becomes available. <u>Common to all alternatives</u>: NPS and USGS researchers would collect vegetation data. CDFG researchers would collect bighorn sheep diet data. YOSE researchers would collect visitor use/human interaction data.

Project Objectives	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocations Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
1. Facilitate Sierra Nevada Bighorn Sheep Recovery				
1a. Monitor population status	*Partially meets objective:* After the radio-collars that are currently on bighorn sheep fail, no additional monitoring will occur.	*Fully meets objective:* A high proportion of bighorn sheep populations would be monitored; GPS locations would provide high quality data; decreased response time if predator or disease problems are encountered.	*Partially meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 2.
1b. Develop predictive model of future bighorn sheep distribution	*Does not meet objective:* Predictive model would not be developed. Increased potential for inappropriate management of future bighorn sheep habitat and/or movement corridors and poor site selection for reintroductions.	*Fully meets objective:* Predictive model would be developed. Decreased potential for inappropriate management of future bighorn sheep habitat and poor site selection for reintroductions.	*Does not meet objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 2.
1c. Recover bighorn sheep into Big Arroyo and Laurel Creek	*Does not meet objective:* Occasional male bighorn sheep may temporarily occupy these vacant herd units, but population recovery would be unlikely over the next several decades.	*Does not meet objective:* Same as Alternative 1.	*Partially meets objective:* Occupation of bighorn sheep into vacant herd units would be accelerated over natural movements, but there would be a lower probability of a successful reintroduction because information regarding habitat quality and appropriate release sites would not have been obtained through development of a habitat model.	*Fully meets objective:* Occupation of bighorn sheep into vacant herd units would be accelerated over natural movements, and there would be a higher probability of a successful reintroduction because information regarding habitat quality and appropriate release sites would have been obtained through development of a habitat model.

Project Objectives	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocations Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
2. Inform SEKI Wilderness Stewardship Plan				
2a. Determine degree of spatial overlap between bighorn sheep and areas grazed by stock	*Does not meet objective:* Degree of spatial overlap would be poorly documented, primarily through anecdotal accounts.	*Fully meets objective:* Degree of spatial overlap would be documented through unbiased GPS data.	*Does not meet objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 2.
2b. Measure impacts of stock on bighorn sheep forage resources	*Fully meets objective:* Researchers would collect vegetation data.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.
2c. Improve knowledge of bighorn sheep diets	*Fully meets objective:* Researchers would collect diet data.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.
2d. Identify areas where visitor use inappropriately modifies bighorn sheep behavior	*Fully meets objective:* Researchers would collect visitor use data.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.	*Fully meets objective:* Same as Alternative 1.

Table 4. Impact Summary Table

Impact Topic	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocation Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
Wildlife	There would be no effect and no cumulative effect on wildlife from the no action alternative.	Short-term moderate adverse effects on wildlife, due primarily to disturbance from helicopter use, and short-term minor to moderate cumulative adverse effects on wildlife would be expected.	Short-term moderate adverse effects on wildlife, due primarily to disturbance from helicopter use, and long-term beneficial effects on wildlife by restoring a species into previously occupied habitat. Cumulative effects would be short-term minor to moderate and adverse.	Alternative 4 would result in short-term moderate adverse effects on wildlife from the project work, due primarily to disturbance from helicopter use, and long-term beneficial effects on wildlife by restoring a species into previously occupied habitat. Cumulative effects would be short-term minor to moderate and adverse.
Sierra Nevada Bighorn Sheep	Bighorn sheep will likely continue to be at risk, and would likely not be removed from the federal listing of endangered species, resulting in long-term moderate adverse effects on this species. Cumulative effects would be long-term minor to moderate and adverse.	There would be short-term moderately adverse effects on bighorn subject to helicopter pursuit and handling that would result in stress on the animals involved. There could be a direct adverse effect for individual bighorn sheep if mortality occurs during capture operations, resulting in minor to moderate adverse effects. However, when compared with the overall benefit of the study that would help guide future management of visitor use in critical habitat, and because this would not threaten the existence of bighorn sheep populations, the impact would be negligible.	There could be a direct adverse effect for individual bighorn sheep if mortality occurs during capture operations, resulting in minor to moderate adverse effects. Because this would not threaten the existence of bighorn sheep populations, the impact would be negligible. There are potential adverse effects on bighorn sheep if the relocation efforts are not successful. However, if the relocation is successful, this alternative would result in long-term beneficial effects on bighorn sheep, and long-term beneficial cumulative effects towards the full implementation of the *Recovery Plan*.	There would be short-term moderately adverse effects on bighorn subject to helicopter pursuit and handling that would result in stress on the animals involved. There could be a direct adverse effect for individual bighorn sheep if mortality occurs during capture operations, resulting in minor to moderate adverse effects. However, when compared with the overall benefit of the study that would help guide future management of visitor use in critical habitat, and because this would not threaten the existence of bighorn sheep populations, the impact would be negligible.

Impact Topic	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocation Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
		Cumulative impacts would be long-term and beneficial.		Cumulative effects would be long-term and beneficial. There are potential adverse effects on bighorn sheep if the relocation efforts are not successful. However, if the relocation is successful, this alternative would result in long-term beneficial effects on bighorn sheep, and long-term beneficial cumulative effects towards the full implementation of the *Recovery Plan*.
Wilderness Resources and Character	There would be no change to the four qualities that comprise wilderness character, and no change to wilderness resources.	The project would result in short-term minor to moderate adverse effects on the untrammeled quality of wilderness, due to the capture operations which would occur over a short period of time each year for up to 10 years. The project would result in no change on the natural quality of wilderness. There would be long-term moderate adverse effects on the undeveloped quality from the presence of collars on bighorn sheep, and short-term minor adverse effects on opportunities for solitude or primitive and unconfined recreation from the project activities.	The project would result in short-term minor to moderate adverse effects on the untrammeled quality of wilderness, due to the capture operations which would occur over a short period of time for a period of 3-5 years. There would be short-term adverse effects on the undeveloped quality, and decrease opportunities for solitude or primitive and unconfined recreation in the short-term. However, these adverse effects would be countered by the long-term beneficial effects of restoring the natural quality of wilderness in the long-term by the translocation of bighorn	The project would result in short-term minor to moderate adverse effects on the untrammeled quality of wilderness, due to the capture operations which would occur over a short period of time each year for up to 10 years. There would be short-term adverse effects on the undeveloped quality, and decrease opportunities for solitude or primitive and unconfined recreation in the short-term. However, these adverse effects would be countered by the long-term beneficial effects of restoring the natural quality of wilderness in the long-term by the translocation of bighorn

Impact Topic	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocation Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
			sheep into previously occupied habitat by recovering an endangered species throughout its historic range in the park.	sheep into previously occupied habitat by recovering an endangered species throughout its historic range in the park.
Soundscapes	There would be no effect on the natural soundscapes and no cumulative effects.	The project would result in short-term moderate adverse impacts on the natural soundscapes during helicopter activities. There would be no cumulative effects.	The project would result in short-term moderate adverse impacts on the natural soundscapes during helicopter activities. There would be no cumulative effects.	The project would result in short-term moderate adverse impacts on the natural soundscapes during helicopter activities. There would be no cumulative effects.
Health and Safety	There would be no effect on health and safety and no cumulative effects.	Aerial capture and collaring activities could result in minor to major adverse impacts on the health and safety of those participating in these activities.	Aerial capture and collaring activities could result in minor to major adverse impacts on the health and safety of those participating in these activities.	Aerial capture and collaring activities could result in minor to major adverse impacts on the health and safety of those participating in these activities.
Visitor experience and recreational opportunities	There would be no change on the visitor experience and recreational opportunities. Visitors would continue to be able to view bighorn sheep in many areas of the parks, but would not be able to view them throughout their historic range.	This alternative would result in short- and long-term minor to moderate effects on the visitor experience, particularly on those visitors seeking a wilderness experience in the low visitor use season within because of the intrusion of motorized equipment and collars on animals. There would be short-term adverse effects on visitor opportunities if visitors chose to go elsewhere during project operations.	This alternative would result in short-term moderate adverse impacts from the helicopter/capture operations, long-term minor to moderate adverse impacts from the presence of collars on bighorn sheep, and long-term beneficial impacts from the increased potential to view bighorn sheep in additional habitat within Sequoia National Park. The cumulative effects would be short and long-term, moderate and adverse, and beneficial and long-term if	This alternative would result in short- and long-term moderate adverse effects on the visitor experience in the parks and forest from the use of helicopters and the presence of collars on bighorn sheep. There would be increased opportunities to view bighorn sheep in Sequoia National Park if translocations are successful in Laurel Creek and Big Arroyo. There would be long-term beneficial effects on visitor experience if bighorn sheep

Impact Topic	Alternative 1: No Action	Alternative 2: Implement Bighorn sheep Research and Monitoring with no Translocations	Alternative 3: Implement Bighorn sheep Translocation Only	Alternative 4: Implement Bighorn sheep Research and Monitoring with Translocations (Preferred Alternative)
			bighorn sheep recovery efforts continue to successful.	recovery efforts are successful and there are more opportunities to view bighorn sheep in their native habitat.

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CHAPTER 3: AFFECTED ENVIRONMENT

This section provides a summary of the resources associated with the alternatives and the environmental consequences of the alternatives. It is organized by impact and resource topics that were derived from internal park and external public scoping, and is limited to those topics that may be affected by the alternatives. More detailed information on resources in Sequoia and Kings Canyon National Parks can be found in the GMP (NPS 2007), Resources Management Plan (NPS 1999a), the Backcountry Management Plan (NPS 1986a), and the Stock Use and Meadows Management Plan (NPS 1986b).

LOCATION AND GENERAL PROJECT AREA DESCRIPTION

Sequoia and Kings Canyon National Parks and Inyo NF are located in the eastern part of central California (Figure 2). Although the two parks were established by separate acts of Congress, they are contiguous and managed jointly. Sequoia and Kings Canyon National Parks occupy approximately 1,350 square miles within the central and southern portion of the Sierra Nevada. Included in the parks' rugged landscape is the highest peak in the contiguous United States, Mount Whitney, which rises to about 14,497 feet above sea level. In Kings Canyon National Park, prominent ridges extend westward from the crest creating the Goddard and Monarch divides and rising to over 13,000 feet. In Sequoia National Park, a second prominent ridge of mountains, the Great Western Divide, parallels the Sierra crest. Both parks occupy the western slope of the Sierra Nevada. Combined acreage of the two parks is 865,964. Proposed project activities would occur primarily in the wilderness areas of Sequoia and Kings Canyon National Parks, in any of the ten herd units, and on any of the occupied herd units in adjacent lands within Inyo NF.

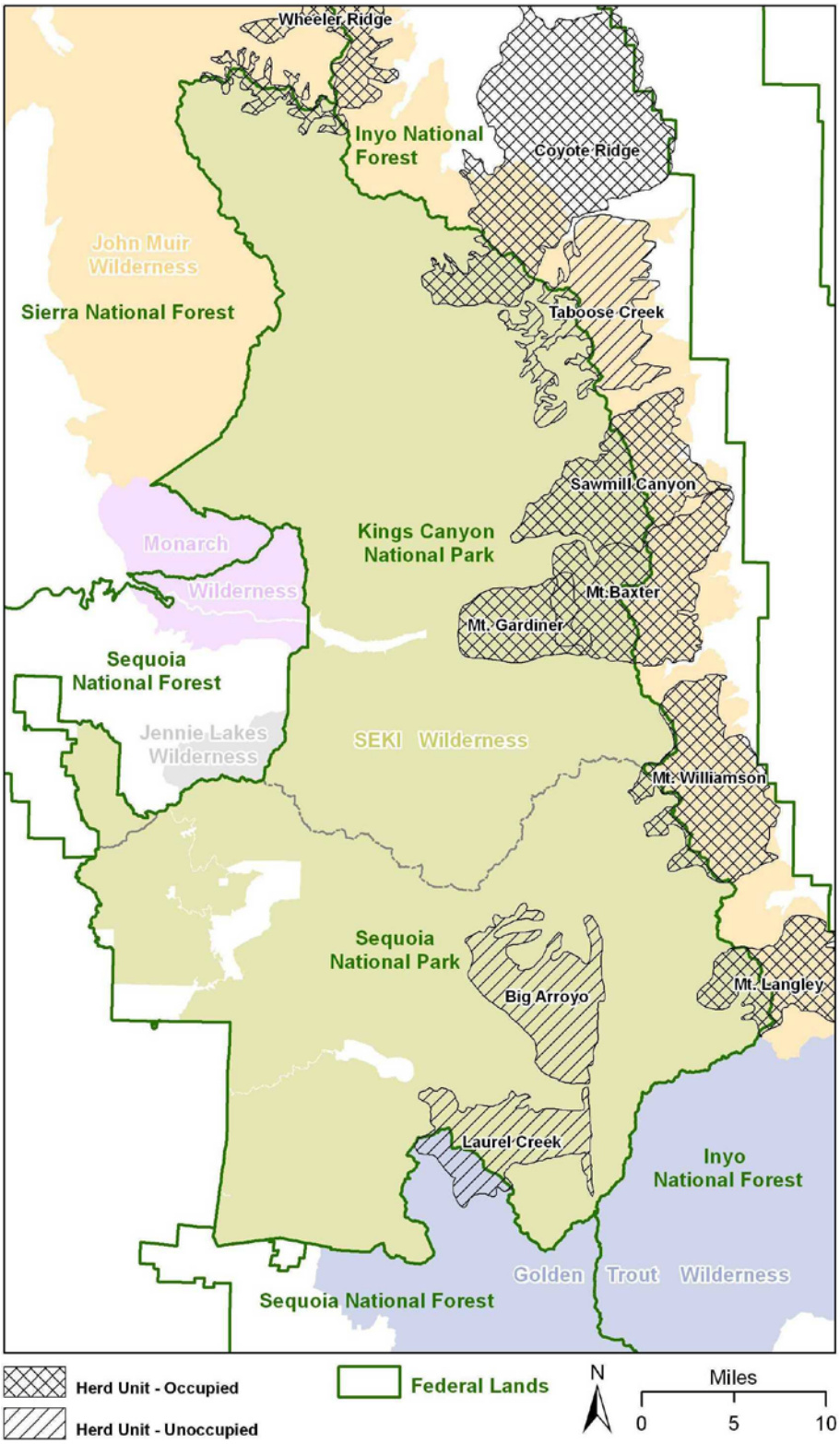
WILDLIFE

The southern Sierra Nevada includes some of the most extensive alpine habitats in California. Tree line is at an elevation of approximately 10,826 ft (3,300 m) in Sequoia National Park in the southern Sierra Nevada; the alpine zone extends above this elevation to the crest of the range (Mutch et al. 2007). Sequoia and Kings Canyon National Parks and Inyo NF support a wide diversity of animal species, reflecting the range in elevation, climate, and habitat variety.

The parks' and forest's high country consists of lakes, meadows, some open forest, and miles of granite (NPS 2011). Over 260 native vertebrate terrestrial species and an additional 25 species may be present (NPS 2007). Of the native vertebrates, five species have been extirpated from the parks, and over 125 species are rare or uncommon (NPS 2007). There have been some studies of invertebrates in the parks, but there is not enough information to know how many species occur (NPS 2011).

Mammals characteristic of the montane, subalpine, and alpine environments, include: Douglas squirrel (*Tamiasciurus douglasii*), golden mantled ground squirrel (*Spermophilus lateralis*), lodgepole chipmunk (*Tamias speciosus*), yellow-bellied marmot (*Marmota flaviventris*), mountain pocket gopher (*Thomomys monticola*), deer mouse (*Peromyscus* spp.), mule deer (*Odocoileus hemionus*), American pika (*Ochotona princeps*), coyote (*Canis latrans*), alpine chipmunk (*Tamias alpines*), and white-tailed jack rabbit (*Lepus townsendii*). Characteristic birds include: Clark's nutcracker (*Nucifraga Columbiana*), gray-crowned rosy finch (*Leucosticte tephrocotis*), dark-eyed junco (Junco hyemalls), and common raven (Corvus corax). This area also includes habitat for the mountain yellow-legged frog, a declining species that is a federal candidate for listing under the *Endangered Species Act*. Because of the elevation, no fish occur in the area naturally. However, the widespread introduction of brown, rainbow, and brook trout into high elevation lakes and streams has altered ecosystems (Mutch et al. 2007).

Figure 2. Map of Proposed Project Area – Bighorn Sheep Herd Units



FEDERALLY LISTED SPECIES – SIERRA NEVADA BIGHORN SHEEP

The endangered Sierra Nevada bighorn sheep is the only federally listed species that occurs in the project area and would be affected by the proposed project activities. Bighorn sheep inhabit portions of the Sierra Nevada located along the eastern boundary of California in Tuolumne, Mono, Fresno, Inyo, and Tulare Counties (USFWS 2008a) (Figure 3). Habitat occurs from the eastern base of the range as low as 4,790 feet (1,460 meters) to peaks above 14,100 ft (4,300 m) (USFWS 2008a). Critical habitat for the bighorn sheep was designated within the parks and forests effective September 2008 (USFWS 2008a).

Due to their extreme visual openness and steep rocky nature, alpine environments in the Sierra Nevada provide large expanses of habitat broken only by canyons containing forests and willow stands, which bighorn sheep tend to avoid (USFWS 2008a). The naturally fragmented distribution of bighorn sheep results in distinct herds. Meadow systems are important habitats to bighorn sheep and provide a high density of nutritional forage. Yet meadows occupy only 1-2% of the landscape at higher elevations in the Sierra Nevada.

Of the herd units identified for bighorn sheep in the *Recovery Plan* (USFWS 2007), 10 of 16 (62.5%) herd units are located partially or wholly within Sequoia and Kings Canyon National Parks. Two of these herd units, Laurel Creek and Big Arroyo, are the two proposed locations evaluated in this EA for translocation of bighorn sheep. These herd units are located in the southern portion of Sequoia National Park, and the Big Arroyo unit is situated just north of the Laurel Creek unit. The Kern River Canyon forms the eastern boundary of both units. Big Arroyo Canyon forms the western boundary of the Big Arroyo unit and the Little Kern River forms a portion of the western boundary of the Laurel Creek unit. The Big Arroyo and Laurel Creek units were identified as “essential herd unit” locations, which are units essential to the recovery of the bighorn sheep (USFWS 2007); they are also identified as critical habitat for Sierra Nevada bighorn sheep.

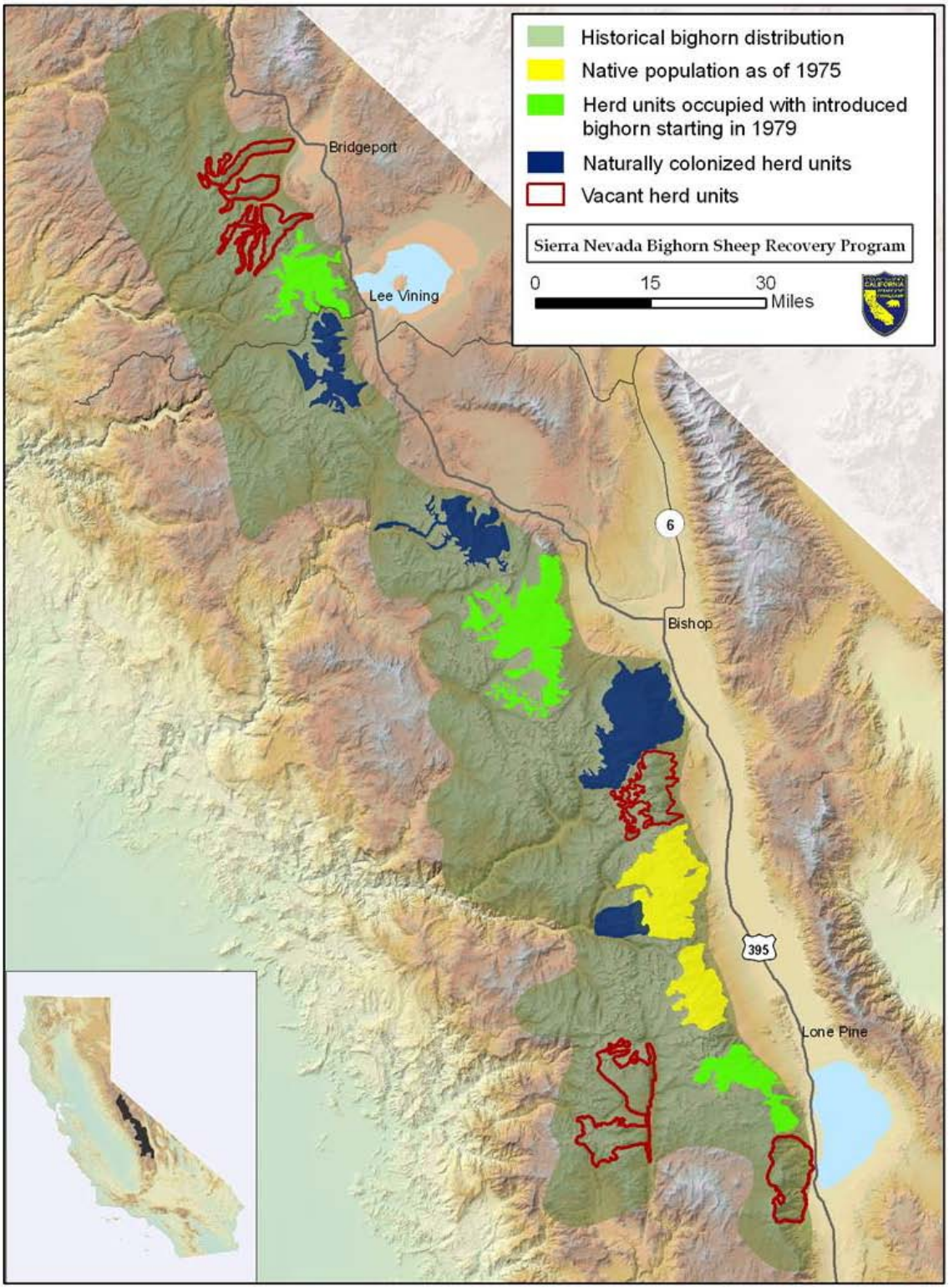
WILDERNESS RESOURCES AND CHARACTER

A wilderness, in contrast to those areas where humans dominate the landscape, is defined by the qualities comprising its wilderness character. Wilderness character is considered to have four general qualities: untrammeled, undeveloped, natural and primeval character, and having outstanding opportunities for solitude and a primitive and unconfined type of recreational experience.

Management of wilderness must preserve its wilderness character and allow for visitor enjoyment. There are six specified purposes of wilderness: recreational, scenic, scientific, education, conservation, and historical use. Land managers can approve and implement activities in wilderness provided that the activities further one or more purposes of wilderness without degrading wilderness character. Before an action can be implemented in wilderness, the action must be analyzed using the minimum requirements / minimum tool decision analysis. The minimum requirements / minimum tool decision analysis is a two-step process. The first step is to determine if any administrative action is necessary to meet minimum requirements for administration of the area for the purpose of the *Wilderness Act*. If action is deemed necessary, the second step is to determine the minimum activity (method or tool) needed to accomplish the action which would have the least impact to the wilderness resource, character, and purposes. The proposed bighorn sheep project would occur within wilderness; therefore, a minimum requirement / minimum tool analysis was completed for this project (Appendix A).

Sequoia and Kings Canyon National Parks’ total designated and managed wilderness is approximately 839,172 acres; approximately 96% of the parks’ total acreage of 865,964. Sequoia and Kings Canyon National Parks’ original wilderness designation occurred under the *California Wilderness Act of 1984* (16 USC 1131, P.L. 98-425, 98 Stat. 1619); additional acreage was designated as wilderness by the *Omnibus*

Figure 3. Sierra Nevada Bighorn Sheep Current and Historical Distribution Map



Public Land Management Act of 2009 (H.R. 146). The Sequoia-Kings Canyon and John Krebs wilderness areas are designated wilderness, both entirely located within the parks. This project would occur in both wilderness areas, and in adjacent wilderness areas in Inyo and Sequoia National Forests.

U.S. Forest Service Wilderness Areas

The project could occur in two wilderness areas managed by the USFS, including the John Muir and Golden Trout wilderness areas.

The John Muir Wilderness is located in the central Sierra Nevada, and is administered by the Inyo and Sierra National Forests. From Mammoth Lakes, California, in the north, it extends approximately 100 miles to the south, wrapping around the Sequoia and Kings Canyon Wilderness. The southern end is just west of Lone Pine, California. Elevations range from 4,000 feet to nearly 14,497 feet near the summit of Mt. Whitney with numerous peaks over 12,000 feet. Established in 1964 by the original Wilderness Act and enlarged by 81,000 acres by the California Wilderness Act of 1984, the John Muir is one of the most heavily visited wildernesses in the National Wilderness Preservation System. The John Muir Wilderness is accessed by trails from both the east and west sides.

From 1972 until 2010, off trail travel was prohibited within the California Bighorn Sheep Zoological Areas (near Mt. Williamson and Mt. Baxter) in the John Muir Wilderness on the Inyo NF. This restriction was recently lifted as a result of scientific studies and field observations which showed that recreational use within these areas was not adversely affecting Sierra Nevada bighorn sheep populations within those areas. The USFWS and CDFG were consulted and concurred with this determination.

In 2000, a forest order was enacted that closed the Zoological Areas to pack goat use and dogs (Goats and dogs are also prohibited in SEKI wilderness). In 2006, the closure area was expanded to include additional bighorn sheep habitat areas in the northern part of the forest.

The 303,287 acre Golden Trout Wilderness was designated by Congress in 1978. Of this total, 193,000 acres are on the Inyo NF and the remainder on the Sequoia National Forest. The Golden Trout Wilderness was named for the brightly colored native golden trout (California State fish). Two subspecies are recognized; South Fork Kern golden trout and the Little Kern golden trout. Both are found in the Golden Trout Wilderness. Portions of the Golden Trout Wilderness occur above timberline. The North and South Forks of the Kern Wild and Scenic Rivers bisect this wilderness.

NATURAL SOUNDSCAPES

Natural soundscapes are an intrinsic element of the park and forest wilderness environment. Natural soundscapes include all sounds that are inherent in nature, such as singing birds, insect noises, wind blowing through trees, waterfalls, rain events, and natural quiet. Natural sounds prevail in the subalpine environment. In contrast to the alpine zone, the natural soundscape of the montane and subalpine zones is less dominated by wind due to the presence of trees and tall shrubs that block and reduce wind speed. Animal sounds are more frequently audible in the montane and subalpine zones than in the alpine zone. Audible sounds are usually generated by nearby natural sources than carried from distances. Woodland birds such as thrushes and warblers can be heard in many areas. Flowing water is developing into larger streams, having a greater influence on the nearby soundscape, which then dominates the acoustics in the riparian and surrounding areas.

The soundscape also includes anthropogenic sounds. These human-generated sounds may originate from campsites, travel corridors, destination points, and areas near food storage lockers. Aircraft, both military and civilian, is also occasionally heard overhead. In addition, the crest of the Sierra is subject to an atmospheric phenomenon called Barisal Guns (or mistpoeffers). On certain days, loud booms can be heard along the crest of the Sierra. These apparently occur when upper atmosphere conditions propagate

sound waves from explosions which occur up to 100 miles away, such as at military bombing ranges, though sources can also be distant thunder.

HEALTH AND SAFETY

The health and safety of visitors and personnel involved with project activities is of utmost importance. The Sierra Nevada includes large open areas with steep terrain, swift rivers, extreme weather, and high altitude. Unexpected snow storms, lighting, hypothermia, heat-related illnesses, exhaustion, altitude sickness, exposure to cliffs and stream crossings, and cross-country route finding, can result in potentially hazardous situations to both visitors and employees. Weather conditions can change fast in the Sierra Nevada, and thorough preparation for both expected and unexpected conditions is essential for a safe trip or operation. This project proposes both terrestrial and aerial operations. Aircraft operations present a number of risks and safety considerations that managers would assess and evaluate.

There are a number of wilderness ranger stations throughout the parks' wilderness area. Rangers occupying these stations are qualified emergency medical technicians and provide initial assessment and patient care and stabilization for medical incidents. Wilderness ranger stations in closest proximity to the Big Arroyo and Laurel Creek herd units are Little Five Lakes Ranger Station and Kern Canyon Ranger Station. The Mineral King Ranger Station is the closest non-wilderness ranger station.

VISITOR EXPERIENCE AND RECREATIONAL OPPORTUNITIES

Sequoia and Kings Canyon National Parks offer numerous wilderness and frontcountry (developed area) opportunities to experience a spectrum of recreational, interpretive, and educational activities. In 2010, Sequoia and Kings Canyon National Parks had more than 1.6 million visitors. Visitation is seasonal with most visits occurring in the summer months. July and August are typically the most popular months. The developed areas that have NPS and/or concessioner-operated visitor facilities (about 2.5% of the parks) receive around 98% of the use; wilderness areas receive about 2% of the use (NPS 2007) however wilderness visitors tend to stay longer with an average length of stay in excess of 75 hours, versus other users whose average length of stay is less than 8 hours. Approximately 25,000 to 35,000 people enter the wilderness each year.

The project area is located within wilderness, and includes high elevation lakes, streams, and meadows which are destinations for wilderness users. The Sequoia and Kings Canyon wilderness areas offer opportunities to experience a variety of recreational activities away from the busy pace and noise of automobiles and modern technology. Visitors use the high country in many different ways and for many different reasons. Party sizes vary and range from one or two people to larger groups. Most visitors spend a few days in the wilderness, while others will stay for weeks at a time. Activities range from sightseeing and picnics to multiple-night backpacking or packstock trips. Visitors can enjoy the solitude of nature, the sounds of water and wind, and the natural scenery. Recreational opportunities include photography, nature study, hiking, backpacking, horseback riding/pack trips, swimming/wading, recreational fishing, camping, rock climbing, winter activities, and other similar activities. Sightings of bighorn sheep by the public can enhance visitor experiences, and Sequoia and Kings Canyon National Parks offer some of the best opportunities for viewing of bighorn sheep in the Sierra Nevada. A number of trail systems that traverse the parks pass through habitats frequented by bighorn sheep and offer prime opportunities for viewing and photography.

Although remote by California standards, the Inyo NF is a popular starting point for wilderness trips. Most visitation is associated with the John Muir and Golden Trout wildernesses and originates from east side trailheads. Use patterns generally funnel up the eastern canyons over the Sierra crest and disperse on the west side. Throughout the planning area, there are a few popular destinations where use is concentrated and which have been popular destinations for over thirty years. Use is also associated with access to adjoining Yosemite and Sequoia and Kings Canyon National Parks.

The John Muir Wilderness is the second-most visited wilderness in the National Wilderness Preservation System, with 48,000 visitors on the Inyo NF in 2009. In comparison, 2,000 overnight visitors traveled in or through the Golden Trout wilderness in 2009. Based on an analysis of 2001-2004 wilderness permits, 75% of Golden Trout visitors were traveling from the Inyo NF over Cottonwood Pass to destinations inside Sequoia and Kings Canyon National Parks (USFS 2006). Many of these visitors chose this route in order to hike Mt. Whitney, the tallest peak in the continental U.S.

The High Sierras have always been well known and a preferred location for mountaineering. There are many locations where this is the dominant use, including the east face of Mt. Whitney, Mt. Langley, Mt. Williamson, the Palisades, Bear Creek Spire, the Minarets, Mt. Ritter and Banner Peak.

There are numerous hiking trails in the wilderness, including the main Mt. Whitney trail and portions of the Pacific Crest and John Muir trails. There has been a noticeable increase in day use in the past decade within the planning area. Part of this increase can be attributed to the popularity of short duration, high-energy activities. Day hikes are extending further into the backcountry. Trail running has become more popular and "ultra marathon" running in the mountainous terrain appeals to those that train for this activity.

Stock use is moderate to high on the Inyo NF. Commercial pack operations provide service from many western and eastern trailheads. Stock use predates the establishment of these wilderness areas and is recognized by the NPS and the USFS as a historic and valid use. The use of stock is allowed within most all of the planning area although certain areas and trails are difficult or impossible for stock to use safely. Travel with stock is prohibited on the Mt. Whitney and Meysan Lake Trails on the Inyo NF. Several other areas are open to stock travel but with restrictions on grazing.

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CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences associated with the alternatives. Note that for all topics, the "Elements Common to All Alternatives" as explained in Chapter 2 were determined by park staff and subject matter experts to result in minor or less impacts. Therefore, this component of the project will not be further evaluated in this chapter.

This section contains the environmental impacts, including direct and indirect effects, and their significance to the alternatives. Impacts are evaluated based on context, duration, and intensity, and on whether they are direct, indirect, or cumulative impacts. The analysis is based on the assumption that the mitigation measures identified in the "Mitigation" section of this EA would be implemented for the action.

METHODOLOGY

Overall, the NPS based these impact analyses and conclusions on a review of existing literature and park studies; information provided by experts within the park, area tribes, and other agencies; professional judgment and park staff insights; and public input. There are several terms used within the "Environmental Consequences" section to assess the impacts of each alternative on each impact topic.

The following terms were used to define the nature of impacts associated with project alternatives:

Type: Impacts can be beneficial or adverse.

Context: Context is the setting within which an impact would occur, such as local, parkwide, or regional.
Impact intensity: Impact intensity is defined individually for each impact topic. There may be no impact, or impacts may be negligible, minor, moderate, or major.

Duration: Duration of impact is analyzed independently for each resource because impact duration is dependent on the resource being analyzed. Depending on the resource, impacts may last for the duration of the project, for a single year or season, or longer. For purposes of this analysis, impact duration is described as short term or long term.

Direct and indirect impacts: Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. Direct and indirect impacts are considered in this analysis, but are not specified in the narratives.

A table of impact intensity definitions (negligible, minor, moderate, and major) for each impact topic is included within each impact topic description.

CUMULATIVE EFFECTS

Cumulative effects are defined as "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 what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The CEQ regulations that implement NEPA require assessment of cumulative

effects in the decision-making process for federal projects. Cumulative effects are considered for all alternatives and are presented at the end of each impact topic discussion.

Methods for Assessing Cumulative Effects

To determine potential cumulative effects, actions and land uses were identified that have occurred, are occurring, or are reasonably expected to occur near the project areas. Potential future actions were determined by reviewing the plans and activities of Sequoia and Kings Canyon National Parks and the U.S. Forest Service, Inyo NF. Since the project area and areas of effect are well within designated wilderness, there are few planned actions for future projects. Identified actions include trail repairs and maintenance, and projects that involve ongoing and reoccurring flights over park wilderness. Also, existing and future visitor use was analyzed. These actions were then assessed in conjunction with the impacts of the alternatives to determine if they would have any added adverse or beneficial effects on a particular natural resource, park operation, or visitor use. The evaluation of cumulative effects was based on the available information about the actions.

Projects that Make Up the Cumulative Effects Scenario

To determine potential cumulative impacts, projects in the area within the wilderness of Sequoia and Kings Canyon National Parks and Inyo NF lands were reviewed. Potential projects identified as cumulative actions included any past projects that currently affect the same resources as the alternatives, and development or projects that are currently being implemented or that would be implemented in the reasonably foreseeable future that could impact the same resources as any of the alternatives.

These actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on a particular resource, including natural and cultural resources, the wilderness environment, and visitor use. Because some of the future activities are in the early planning stages, the evaluation of cumulative effects may be based on preliminary descriptions of those projects.

Past, Current, and Future Actions

Use and Existence of Ranger Stations and Other Structures in Wilderness

There are 20 ranger stations and patrol cabins located in the wilderness in Sequoia and Kings Canyon National Parks (9 in Kings Canyon and 11 in Sequoia). Of those, 12 are usually staffed during the summer, 3 are staffed periodically, 1 is rarely staffed, and 4 have not been staffed in recent history. Of those staffed, seven are used in the winter in support of snow surveys. The structures vary in construction type and include log structures, a board structure, platform/wall tents, stone/log construction, a yurt, and an A-frame. In the past ten years, light rehabilitation has occurred to four structures, and periodic maintenance has occurred to those stations that are usually or always staffed. Three structures are currently scheduled for reconstruction that will occur in the next several years. Mobilization and demobilization of the ranger stations, and construction of the replacement stations all may involve the use of helicopters, motorized and non-motorized equipment, and support staff.

Structures in the John Muir and Golden Trout wildernesses on the Inyo NF are not in use or staffed. Helicopters or other motorized equipment are not used to maintain or provide supplies to the structures.

Trail Maintenance and Rehabilitation

Parkwide trail maintenance and rehabilitation is ongoing, and additional work is planned in the future. This project involves the reconstruction and rehabilitation of deteriorated erosion-control structures and failing segments of trails throughout the park trail system, particularly in the wilderness. Project work will include replacing drainage structures, soil-retention devices, retaining walls, and similar trail structures that have failed or are beyond their normal service life. Segments of trail that are failing due to tread

erosion, side hill sloughing, or age will be reconstructed to good condition. Trail-associated meadow damage and erosion will be assessed and repaired to prevent the need for major repair or rehabilitation later. Basic tread filling, water bar repairs, corridor clearing, and storm damage rehabilitation work occurs to prolong the life of the trail systems and protect park resources.

The project involves at least two trail crews, packstock use, and occasional helicopter use to transport equipment and materials. The project will repair 20%, or approximately 143 miles, of the park trails over 5 years, and will result in improved trail conditions, reduced risk to visitors, improved visitor experience, and more effective resource protection. The equipment and tools used for the trail projects depends on the work involved and is determined through the minimum requirement / minimum tool analysis process, and could include non-motorized and motorized tools.

Wilderness trail maintenance and rehabilitation on the Inyo NF are conducted without the use of motorized or mechanized equipment. In the project areas, trail work is conducted during the snow-free summer months when work crews are available. No trail work would be conducted when project activities take place in October and January through April.

Flights
Every year, through the minimum requirement / minimum tool analysis, selective helicopter flights have been determined to be the minimum tool for project work. From May through October the park has a helicopter based at park headquarters for use in fire suppression, SAR, and support of park wilderness management activities. Except for SARs, most helicopter operations are completed in less than 30 minutes at the operation site. The helicopter normally based at Sequoia and Kings Canyon National Parks is classified as a light helicopter (Type 3).

There is an average of 288 planned and unplanned hours of helicopter flight time per year within and outside wilderness. Planned flights include those used for administrative purposes, and unplanned flights generally include law enforcement and SAR emergencies and fire-related flights. In 2007 there were approximately 87 flight hours for administrative purposes, and in 2008, 65 flight hours.

Types of projects where helicopter use may be considered the minimum tool include snow surveys, trail maintenance (delivery of equipment, materials, and supplies), restoration/rehabilitation activities, exotic plant removals, wildlife surveys, research and monitoring activities, mobilizing/demobilizing wilderness ranger stations, and radio repeater maintenance. Flights also occur for law enforcement, SAR operations, and fire suppression. As the projects are analyzed on a case-by-case basis, helicopter operations vary by project and by year. Flights can occur at any time in the year, but they are generally scheduled to avoid conflicts with wilderness users. It is likely that flight operations would continue to be the minimum tool for select projects in wilderness.

Resource Management and Research
Resource management, research, and monitoring activities occur in the parks' wilderness areas. Examples of ongoing and future planned activities include wildlife monitoring, lake sampling, air quality monitoring, exotic plant removal, resource rehabilitation and revegetation, and snow surveys. The equipment and tools used for these projects depends on the project and the minimum requirement / minimum tool analysis, and could include non-motorized and motorized tools.

Ongoing Sierra Nevada Bighorn Sheep Research and Recovery Programs
Numerous efforts for the conservation of bighorn sheep in the Sierra Nevada have taken place in recent decades including but not limited to: (1) intensive field studies; (2) reestablishment of three additional populations in historical habitat; (3) creation, in 1981, of the Sierra Nevada Bighorn Sheep Interagency Advisory Group, including representatives from federal, state, and local resource management agencies,

and (4) the development of the 1984 Sierra Nevada Bighorn Sheep Recovery and Conservation Plan and the 1997 Conservation Strategy for Sierra Nevada Bighorn Sheep.

Components of the *Recovery Plan* have been implemented. In the 5-Year Review: Summary and Evaluation (USFWS 2008b), the USFWS describes what steps have been taken to promote the recovery of the bighorn sheep. The review considered peer-reviewed literature; CDFG, Bureau of Land Management (BLM), USFS, and NPS reports; and the *Recovery Plan*.

In addition, for the next 10 years, CDFG will continue their research and recovery program in the Sierra Nevada. This includes the capture and collaring of bighorn sheep on USFS administered lands on Inyo NF. The Inyo National Forest proposes to authorize the California Department of Fish to land a helicopter within portions of the Ansel Adams, Golden Trout, Hoover, John Muir, and South Sierra Wildernesses for the purpose of conducting monitoring and translocating captures of Sierra Nevada bighorn sheep as listed in the Recovery Plan (USFWS 2007) over a 10-year period. The objectives of the proposed project include:

Maintaining VHF/GPS collars on 35% of the bighorn sheep population over a 10-year period. In order to collect demographic data with reasonable consistent variables, GPS collars need to be placed on 35% of the SNBS population (Personnel communication Stephenson 2011). The number of collars placed would be dependent on the population of SNBS for that year. Currently only 19% of the current bighorn sheep population are collared and there is a need to increase this to 35%. Placement of GPS collars needs to occur within the Mt. Warren, Mt. Gibbs, Convict Creek, Mt. Warren, Coyote Ridge, Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Mt. Langley, and Olancha Peak herd units.

Augmenting bighorn sheep populations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units. Due to the low natural population growth rate estimated within these herd units (2%), meeting the number of females required for downlisting would require approximately 30 years.

Introducing bighorn sheep into the Taboose Creek and Olancha Peak herd units. These herd units are currently unoccupied, but are part of the historic range of SNBS. They are listed as essential for recovery of SNBS and need to be occupied with both sexes of SNBS in order for downlisting to occur (USFWS 2007). Due to the low natural population growth rate estimated for these areas (2%) and the slow rates of natural colonization by bighorn sheep, the natural recovery of SNBS into these herd units is low (personnel communication CDFG 2011).

Threats to Bighorn Sheep

At the time of listing, mountain lion predation, the effects of small population size, abandonment of winter range, and the potential for disease transmission from domestic sheep were the primary threats to the bighorn sheep. According to the 2008 5-year review, bighorn sheep have begun to recover in some areas with notable increases in population size and distribution. Selective mountain lion control has also proceeded in some areas to reduce predation. It is likely that the combination of predator control (outside Sequoia and Kings Canyon National Parks) and increased population size has aided the recent return of the Mount Baxter, Mount Langley, and Wheeler Ridge populations to their winter range. In addition, the Inyo and Humboldt-Toiyabe National Forests have removed domestic sheep grazing from several allotments that posed a threat of contact between domestic sheep and bighorn sheep.

In addition to the primary threats discussed above, roadkills and capture-related deaths have resulted in a small amount of bighorn sheep mortality. The mortality from these threats does not result in substantial effects on the overall status of the species (USFWS 2008b). However, per the USFWS 5-year report, the bighorn sheep needs additional time to reach population and distribution recovery goals, additional

actions are needed to ensure protection of populations from external threats, and regulatory mechanisms need to be in place to ensure continued protection.

Fire and Fuels Management Program
The parks' fire and fuels management program occurs in park wilderness. Activities are planned to conform to the *Wilderness Act*, wilderness policies, and the parks' BMP. The fire and fuels management program at Sequoia and Kings Canyon National Parks focuses on the restoration and maintenance of natural conditions. Prescribed burning occurs periodically throughout the year to attain those goals (*Fire and Fuels Management Plan*, NPS 2003). If any portion of a planned burn falls within wilderness, fire managers complete the minimum requirement / minimum tool analysis to determine the appropriate tool for the project. The use of mechanized equipment in wilderness (including chainsaws and helicopters) must be justified and preapproved by park management in non-emergency incidents.

In March 2010, a prescribed burn was conducted on 180 acres of low elevation bighorn sheep winter habitat at Shepard Creek in the John Muir Wilderness additions (designated in 2009) on the Inyo NF. The purpose of the burn was to improve habitat condition by reducing pinyon pine encroachment. The project objectives of reducing pinyon by 80-100% were met on approximately 35 acres. No other fuels management activities within wilderness managed by the Inyo NF are planned at this time.

Unplanned events, either human-caused or natural fires, may occur and are evaluated to determine the response by park and forest managers. Managers identify the range of initial actions for all wildland fires. The response plan is designed to consider values to be protected, risks, hazards, forecasted fire danger, and ecological benefit. All fire management activities in wilderness rely on tactics that minimize resource damage while maintaining the safety of the public, firefighters, and other personnel. Tactical tools used in wilderness are chosen carefully.

Visitor Use
Approximately 25,000 to 35,000 visitors hike or use stock through the Sequoia and Kings Canyon wilderness areas each year. Stock use refers to travel and camping with stock (horses, mules, burros, or llamas) and grazing in designated forage areas. On the Inyo NF, there are approximately 48,000 visitors to the John Muir Wilderness and 2,000 visitors to the Golden Trout Wilderness annually.

WILDLIFE

Methodology
The NPS *Organic Act*, which directs parks to conserve wild life unimpaired for future generations, is interpreted to mean that native animal life should be protected and perpetuated as part of the parks' natural ecosystems. Natural processes are relied on to control populations of native species to the greatest extent possible; otherwise, they are protected from harvesting, harassment, or harm by human activities. According to NPS *Management Policies 2006* (NPS 2006), the restoration of native species is a high priority (section 4.1). Impacts were assessed based on satisfying management goals for wildlife, which include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals (Table 5). Information on the parks' wildlife was taken from park documents and records. Park natural resource management staff, USFWS, USFS, and the CDFG also provided information. Note that Sierra Nevada bighorn sheep are evaluated as a separate impact topic.

Table 5. Wildlife Impact and Intensity Descriptions

Impact Intensity	Intensity Description
Negligible	There would be no observable or measurable impacts on native species, their habitats, or the natural processes sustaining them. Impacts would be well within natural fluctuations.
Minor	Impacts would be detectable but they would not be expected to be outside the natural range of variability of native species' populations, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Breeding animals of concern are present; animals are present during particularly vulnerable life stages such as migration or juvenile stages; mortality or interference with activities necessary for survival could be expected on an occasional basis, but would not be expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and could be outside the natural range of variability. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and would be expected to be outside the natural range of variability. Key ecosystem processes might be disrupted. Loss of habitat might affect the viability of at least some native species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Short-term—impact occurs during project activities.

Long-term—impact continues to occur after project activities are completed.

ALTERNATIVE 1: NO ACTION

Under this alternative, bighorn sheep would not be captured and radio collared, for research, monitoring, or translocation. Existing collared bighorn sheep (approximately 18) within Sequoia and Kings Canyon National Parks would continue to be monitored by CDFG until the collars are no longer usable, though this has no effect on wildlife because the monitoring is conducted remotely either via plane for bighorn sheep with VHF radio-collars or satellites for bighorn sheep with GPS radio-collars. Therefore, there would no effect on wildlife under this alternative.

Cumulative Effects

Since there would be no effect on wildlife, there would be no cumulative effects.

Conclusion

There would be no effect and no cumulative effect on wildlife from the no action alternative.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

Between 2011 and 2021 bighorn sheep would be annually captured and fitted with VHF or GPS radio-collars. All of these bighorn sheep would be used as part of the routine monitoring program of CDFG, but bighorn sheep captured in 2011 and 2012 and fitted with GPS radio-collars would also be used for research to develop a habitat model and evaluate the impacts of packstock on bighorn sheep.

There would be adverse effects on wildlife in the project area due to the noise from the use of helicopters. This noise could result in flight responses by wildlife in a localized area, particularly where the helicopter

is in close proximity to the ground during chase activities, when it lands, and at the base of operations for fueling and support services. However, these impacts, while outside the normal range of variability for wildlife, would not be expected to result in mortality. Also since effects would be localized on individual animals, this alternative is not expected to threaten the continued existence of any species. Therefore, the impact would be short-term moderate and adverse.

The information gained from research and monitoring could benefit other wildlife in addition to bighorn sheep. For example, should restrictions on packstock grazing of meadows be implemented to protect bighorn sheep forage resources due to the findings of research, a variety of birds, small mammals, and amphibians that use these meadows would experience long-term beneficial effects as well.

Cumulative Effects

Past activities in wilderness, such as the placement of structures and trails in the wilderness, have resulted in the loss of habitat in localized areas. Many wildlife species, particularly small mammals, lizards, and birds, appear to have grown accustomed to the presence of humans and development where they occur in wilderness because the structures and trails have been there for many years. Ongoing and future park activities and visitor use can impact wildlife. The operation and maintenance of ranger stations and associated facilities, the maintenance of existing trails, wildfire and prescribed fire activities, research and monitoring activities, and the associated use of tools, equipment, stock, and helicopters can impact wildlife where humans are present, or in a given project area, or along a flight corridor. Visitor use can also impact wildlife by disturbance, resulting in flight response to human presence. These impacts are generally temporary and are not expected to be outside the natural range of variability for wildlife, and do not threaten the survival of any species. These impacts, when considered with the impacts from alternative 2, would result in short-term minor to moderate adverse cumulative effects on wildlife.

Conclusion

Alternative 2 would result in short-term moderate adverse effects and long-term beneficial effects on wildlife and short-term minor to moderate cumulative adverse effects on wildlife.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

Under this alternative, a founder population of approximately 30 bighorn sheep would be reintroduced into the currently vacant Big Arroyo and Laurel Creek critical habitat units when suitable stock becomes available (likely beginning within the next 3-5 years), but monitoring and research captures, as described in Alternative 2, would not occur.

Helicopter use would still be necessary to capture bighorn sheep for their reintroduction into the Big Arroyo and Laurel Creek areas of Sequoia National Park, resulting in the same impacts to wildlife from project work as described under alternative 2, but the number of flights needed would be fewer. Helicopters would be needed for approximately 1-14 days during the month of March through the first week of April, over the course of 6 years. This would result in temporary disturbance to wildlife in areas where the helicopters are flying at low levels and landing.

In addition, wildlife would be impacted from the relocation of bighorn sheep into Big Arroyo and Laurel Creek areas. These areas have not had a viable bighorn sheep population since the 1800s (Jones 1950), and some wildlife could be affected by the renewed presence of bighorn sheep. Interspecific competition occurs when a resource shared by two species is in short supply for at least one of those species (Krebs 1972). Native deer (*Odocoileus hemionus*) have overlapped winter ranges used by bighorn sheep in the Sierra Nevada. However, there is very little overlap of key forage species on the Mount Williamson and Mount Baxter winter ranges. Therefore, in the short-term, some wildlife species could be slightly affected due to the presence of bighorn sheep but that effect would be negligible and no competition would occur. Some wildlife species, such as mountain lions (*Felis concolor*), could benefit from an additional food

source. In the long-term, conditions should stabilize and with successful reintroductions, would result in improved ecosystem integrity.

Cumulative Effects
As described under alternative 2, there are several past, present, and future activities that effect wildlife in the project area. This alternative would add slightly to those cumulative effects primarily from the disturbance associated with helicopter use. Overall, cumulative effects from alternative 3 would be short-term minor to moderate and adverse.

Conclusion
Alternative 3 would result in short-term moderate adverse effects on wildlife from the project work, due primarily to disturbance from helicopter use, and long-term beneficial effects on wildlife by restoring a species into previously occupied habitat. Cumulative effects would be short-term minor to moderate and adverse.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)
This alternative involves the bighorn sheep research and monitoring as described under alternative 2, plus the translocation of approximately 30 bighorn sheep over a 5 year period into the Laurel Creek and Big Arroyo areas of Sequoia National Park, as described under alternative 3.

The impacts to wildlife from alternative 4 would be similar to those previously stated under alternatives 2 and 3, except that there would be longer periods of disturbance because both the research and monitoring and the reintroduction components would be implemented. Helicopter use would still create the primary adverse effect, but this effect would now be spread out in two different periods: for the research and monitoring capture operations in October and occasionally in January through the first week of April, and then for the capture operations from the translocations in March through the first week of April. This would result in two separate operations within the park and USFS lands. However, since these operations would be of short duration during each project component, and would still occur outside particularly sensitive periods for wildlife, the overall effects from project operations would be short-term moderate and adverse.

Restoring bighorn sheep into currently unoccupied areas of Big Arroyo and Laurel Creek within Sequoia National Park would have the same effect on wildlife as described under alternative 3.

Cumulative Effects
As described under alternative 2, there are several past, present, and future activities that effect wildlife in the project area. This alternative would add slightly to those cumulative effects primarily from the disturbance associated with helicopter use. Overall, cumulative effects from alternative 4 would be short-term minor to moderate and adverse.

Conclusion
Alternative 4 would result in short-term moderate adverse effects on wildlife from the project work, due primarily to disturbance from helicopter use, and long-term beneficial effects on wildlife by restoring a species into previously occupied habitat. Cumulative effects would be short-term minor to moderate and adverse.

FEDERALLY LISTED AND OTHER SPECIAL-STATUS SPECIES – SIERRA NEVADA BIGHORN SHEEP

Methodology

Section 7 of the ESA mandates all federal agencies to determine how to use their existing authorities to further the purposes of the ESA to aid in recovering listed species, and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. NPS *Management Policies 2006* (NPS 2006) state that potential effects of agency actions would also be considered for state- or locally listed species. Only one sensitive species would be affected by the project work – the Sierra Nevada bighorn sheep. Other species of concern have been dismissed from further evaluation because they either do not occur in the project areas, are rare visitors to the park, or the project would result in less than negligible effects (Table 6).

Table 6. Special Status Species Impact and Intensity Descriptions

Impact Intensity	Intensity Description
Negligible	The action could result in a change to a population or individuals of a species, but the change would not be of any measurable or perceptible consequence and would be well within natural variability. In the case of federally listed species, this impact intensity equates to a USFWS determination of *may affect, not likely to adversely affect*.
Minor	The action could result in a change to a population or individuals of a species. The change would be measurable, but small and localized, and not outside the range of natural variability. Mitigation measures, if needed, would be simple and successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of *may affect, not likely to adversely affect*.
Moderate	Impacts on special-status species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present, animals are present during particularly vulnerable life stages, and mortality or interference with activities necessary for survival could be expected on an occasional basis but is not expected to threaten the continued existence of the species in the park unit or conservation zone. Mitigation measures would be extensive and likely successful. In the case of federally listed species, this impact intensity equates to a USFWS determination of *may affect, likely to adversely affect*.
Major	The action would result in noticeable effects on the viability of the population or individuals of a species. Impacts on special-status species or the natural processes sustaining them would be detectable, both inside and outside the park. Loss of habitat might affect the viability of at least some special-status species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. In the case of federally listed species, the impact intensity equates to a USFWS determination of *may affect, likely to jeopardize the continued existence of a species*.

Short-term—impact occurs during project activities.

Long-term—impact continues to occur after project activities are completed.

ALTERNATIVE 1: NO ACTION

Under this alternative, no additional bighorn sheep would be captured and radio collared, for research, monitoring, or translocation. Currently collared bighorn sheep would continue to be monitored by CDFG; the current monitoring program has negligible effects on bighorn sheep from the presence of collars.

Under this alternative, the goals of the *Recovery Plan for Sierra Nevada Bighorn Sheep* would not be met because no additional monitoring would occur on bighorn sheep herds in the parks, no research would occur, and no bighorn sheep would be reintroduced into the unoccupied herd units of Big Arroyo and Laurel Creek. Per the *Recovery Plan*, the recovery of bighorn sheep in the Sierra Nevada requires an adaptive approach, one in which decisions made will depend on current information about key resources. Consequently, monitoring of those resources is a fundamental component of this recovery plan. In addition, monitoring is necessary to manage human use locally where it is found to cause bighorn sheep to avoid important habitat and thereby compromise survivorship or reproductive success. Without these three components, overall monitoring, research of human impacts on bighorn sheep, and the translocation of bighorn sheep, the bighorn sheep would likely continue to be at risk, and it would not be removed from the federal listing of endangered species, resulting in long-term moderate adverse effects on this species.

Cumulative Effects

Throughout their range bighorn sheep have been impacted in the past, and could be impacted in the future by mountain lion predation, small populations, abandonment of winter range, and disease transmission from domestic sheep. Where populations are located near roads, bighorn sheep can be adversely impacted by road kills. Capture mortality can occur during helicopter operations that occur outside the scope of this project. These threats do not result in substantial adverse effects on the overall status of the species and the 2008 5-year bighorn sheep status review (USFWS 2008b) determined that bighorn sheep have begun to recover in some areas with notable increases in population size and distribution.

Within Sequoia and Kings Canyon National Parks and Inyo NF, bighorn sheep could be impacted by past, current, and future operational activities (e.g. trail construction and the presence of work crews), and visitor activities (e.g. wilderness camps, backpackers, and stock use in bighorn sheep habitat).

Under the no action alternative, there would be no mortality within the parks due to capture activities. There would be no new information gained about the potential effects of operational activities and visitor use that would help guide park management. This could result in continued adverse effects on bighorn sheep from ongoing and future activities. The overall cumulative effects, when considered with the beneficial effects from ongoing bighorn sheep recovery efforts, and the potential adverse effects from management and visitor activities, would be long-term minor to moderate and adverse.

Conclusion

The no action alternatives includes no additional bighorn sheep captures for research and monitoring, no monitoring of human impacts on bighorn sheep, and no translocation of bighorn sheep—therefore, the bighorn sheep will likely continue to be at risk, and would not be removed from the federal listing of endangered species, resulting in long-term moderate adverse effects on this species. Cumulative effects would be long-term minor to moderate and adverse.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

Under alternative 2, a portion of the *Recovery Plan* would be met – the research and monitoring components. Under this alternative, the capture and collaring for the research and monitoring would occur primarily in occupied herd units within Sequoia and Kings Canyon National Parks, with the potential for a few captures in Inyo NF.

Net-gunning and helicopter operations do have the possibility of disturbing, injuring or killing bighorn sheep. However, research comparing this technique to alternatives (e.g., drop-nets, drive-nets, chemical immobilization) has found that it is the safest method for bighorn sheep capture (Kock et al. 1987, Jessup et al 1988). For example, Kock et al. (1987) found that only 2 of 137 (1.5%) of bighorn sheep captured

with net-guns were accidentally killed and net-gunning had the lowest overall measure of risk (i.e., impacts of stress, capture myopathy, and accidental mortality) compared to other techniques. Further, as mentioned earlier, the capture related mortality rate of 3.3% when net-gunning that CDFG has experienced during the last 10 years falls below the limits of the Recovery Permit issued from the USFWS for the capture of bighorn sheep. Therefore, while implementation of this project might be expected to harm 1-3% of the bighorn sheep handled, the loss would be negligible compared to the value of the data obtained to guide their management.

Captured bighorn sheep would be fitted with VHF or GPS radio-collars and marked with numbered and colored ear tags. Since VHF collars have a lifespan of at least 5 years and can be active for as long as 10 years, they would likely be on animals for the remainder of their lives. GPS collars in current use by CDFG are programmed to drop off automatically after two years. Care would be taken to ensure that the collars are fit snugly and do not slide up and down the animal's neck. Little impact to individual bighorn sheep is expected from the collars, since each animal would adjust to the presence of a properly applied collar within a short period of time.

Evidence exists that indicates bighorn sheep may travel further than expected and through different terrain and habitat than previously thought. Monitoring the bighorn sheep's movements at more frequent intervals with GPS will provide better information on their habitat preferences, and allow managers to protect suitable and preferred habitat, and to respond quickly to threats such as interactions with domestic stock, unacceptable levels of predation, or impacts from recreation or administrative activities.

The USFWS has issued permits to CDFG to utilize the method described above for the capture and collaring of bighorn sheep. They have determined that this project and any associated adverse effects on bighorn sheep have already been analyzed through section 7(a)(2) consultation as part of the process issuing a recovery permit to the CDFG.

Cumulative Effects

As described under the no action alternative, there are several threats to bighorn sheep, but bighorn sheep recovery is ongoing. This alternative would partially meet the goals of the recovery plan. There could be mortality from the bighorn sheep capture operations, but this is expected to have a negligible effect on bighorn sheep populations overall, particularly when compared to the overall benefit of the project by gaining increased knowledge of bighorn sheep and potential threats. Overall, this project would contribute slightly to the overall beneficial cumulative effects on bighorn sheep that are occurring as part of the recovery program.

Conclusion

There could be a direct adverse effect for bighorn sheep if mortality occurs during capture operations, resulting in minor to moderate adverse effects. However, when compared with the overall benefit of the study that would help guide future management of visitor use in critical habitat, and because this would not threaten the existence of bighorn sheep populations, the impact would be negligible. Cumulative effects would be long-term and beneficial.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

Under alternative 3, a portion of the *Recovery Plan* would be met – the translocation component. This alternative also involves the capture and collaring of bighorn sheep using the same techniques as described in alternative 2. The capture and collaring actions would occur primarily within Inyo NF and releases would occur within Sequoia and Kings Canyon National Parks.

Net-gunning and helicopter operations do have the possibility of disturbing, injuring or killing bighorn sheep. However, as stated under alternative 2, literature shows that use of a net-gun fired from a

helicopter is the safest method for bighorn sheep capture. Direct mortality could result from net-gun operations, and also from the translocation into Big Arroyo and Laurel Creek.

In the past, translocation has shown successful results. Since bighorn sheep were federally listed, CDFG has translocated bighorn sheep for three augmentations: 1) two rams from Wheeler Ridge to Mt. Warren in 2005; 2) five ewes from Wheeler Ridge to Baxter/Sawmill in 2007; and, 3) three ewes from Wheeler Ridge to Lundy Canyon and 3 ewes from Mt. Langley to Lundy Canyon in 2009. Prior to listing, bighorn sheep were translocated from Baxter/Sawmill during 1979 to 1988 and resulted in the successful reestablishment of the Mt. Warren, Mt. Gibbs, Wheeler Ridge, and Mt. Langley herds.

While this alternative would result in the expansion of bighorn sheep into currently unoccupied bighorn sheep habitat, it would not provide the information necessary to manage recreational use and park administrative activities in bighorn sheep habitat within Sequoia and Kings Canyon National Parks. Therefore, the potential would continue to exist for adverse impacts to bighorn sheep and bighorn sheep habitat from park administrative and visitor use activities. Overall, this alternative would result in short-term minor to moderate adverse effects on bighorn sheep from helicopter-netgun activities, and long-term beneficial effects on bighorn sheep from the expansion of occupied bighorn sheep herd units, should the relocations be successful.

Cumulative Effects

The recovery of the bighorn sheep is ongoing, and this alternative would allow one component of the Recovery Plan to be implemented, which could, when combined with other past, ongoing and future bighorn sheep recovery efforts, result in an eventual downlisting or delisting of bighorn sheep. This project would contribute moderately to the continued recovery of bighorn sheep region-wide, resulting in long-term and beneficial cumulative effects.

Conclusion

There would be short-term minor to moderate adverse effects on bighorn sheep from the helicopter-netgun activities, and potentially adverse effects on bighorn sheep if the relocation efforts are not successful. However, if the relocation is successful, this alternative would result in long-term beneficial effects on bighorn sheep, and long-term beneficial cumulative effects towards the full implementation of the *Recovery Plan*.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

Under this alternative, 3 components of the Recovery Plan would be implemented: research, monitoring, and the translocation of bighorn sheep into currently unoccupied herd units within Sequoia National Park at Big Arroyo and Laurel Creek.

As explained under alternatives 2 and 3, the helicopter-netgunning operations have the potential to disturb, injure or kill bighorn sheep. However, literature shows that use of a net-gun fired from a helicopter is the safest method for bighorn sheep capture. Direct mortality could result from net-gun operations, and also from the translocation into Big Arroyo and Laurel Creek.

However, this alternative would result in improved knowledge about the impacts of recreational use on bighorn sheep. Also, this alternative would relocate bighorn sheep into two vacant herd units, which, if successful, would benefit bighorn sheep populations and overall recovery efforts. While there is the potential for bighorn sheep mortality from the operations, the overall beneficial effects outweigh the potential adverse effects. Overall this alternative would result in short-term minor to moderate adverse effects on bighorn sheep from the helicopter net-gun activities, and long-term beneficial effects from

additional information needed to inform future wilderness management activities, and long-term beneficial effects from the translocation of bighorn sheep into unoccupied herd units.

Cumulative Effects
The recovery of the bighorn sheep is ongoing, and this alternative would implement two additional components of the *Recovery Plan*, which could, when combined with other past, ongoing and future bighorn sheep recovery efforts, result in an eventual downlisting or delisting of bighorn sheep. This project would contribute moderately to the continued recovery of bighorn sheep region-wide, resulting in long-term and beneficial cumulative effects.

Conclusion
This alternative would result in short-term minor to moderate adverse effects on bighorn sheep from the helicopter net-gun activities, and long-term beneficial effects from additional information needed to inform future wilderness management activities, and from the translocation of bighorn sheep into unoccupied herd units. Cumulative effects would be long-term and beneficial.

WILDERNESS RESOURCES AND CHARACTER

Methodology
Working from definitions included in the *Wilderness Act of 1964*; and *Keeping it Wild: An Interagency Strategy to Monitor Trends in Wilderness Character Across the National Wilderness Preservation System* (Landres et al. 2008a), and following the tradition of wilderness preservation in the Inyo NF and at Sequoia and Kings Canyon National Parks, the following wilderness resource values have been identified for the project area and are a component of the wilderness character. The USFS national framework for monitoring wilderness character (Landres et al. 2008b) concluded that wilderness character is ideally described as the unique combination of (a) natural environments that are relatively free from modern human manipulation and impacts, (b) opportunities for personal experiences in environments that are relatively free from the encumbrances and signs of modern society, and (c) symbolic meanings of humility, restraint, and interdependence in how individuals and society view their relationship to nature. The following are considered the four qualities of wilderness character:

Untrammeled: Wilderness is essentially unhindered and free from modern human control or manipulation.

Natural: Wilderness ecological systems are substantially free from the effects of modern civilization, and marked by the following:

- Absence of evidence of people and their activities.
- Perpetuation of natural ecological relationships and processes and the continued existence of native wildlife populations in largely natural conditions.

Undeveloped: Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.

Providing Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation: Wilderness provides outstanding opportunities for solitude or primitive and unconfined experiences, and promises the following:

- The likelihood of not encountering other people while in wilderness, including privacy and isolation.
- The absence of distractions (such as large groups, mechanization, unnatural noise, signs, and other modern artifacts).

- Freedom from the reminders of modern society.
- The freedom of visitors to explore, with limited or no restrictions; the ability to be spontaneous.
- Self-sufficiency and absence of support facilities or motorized transportation; direct experience of weather, terrain, and wildlife with minimal shelter or assistance from devices of modern civilization.

Impacts on natural resources, visitor use, and soundscapes are evaluated elsewhere in this section (Environmental Consequences of the Alternatives). The analysis for this topic will focus on wilderness character and wilderness experience, which are integrally related because much of wilderness character can only be subjectively determined by the visitor's experience (for example, solitude or freedom of movement) (Table 7). In addition, wilderness operations are evaluated as they relate to the ranger patrol function and the ability for the parks to carry out wilderness protection and administrative functions under each alternative.

Table 7 Wilderness Impact and Intensity Descriptions

Impact Intensity	Intensity Description
Negligible	There is little or no change to the four attributes of wilderness character or wilderness experience.
Minor	One or more attributes of wilderness character and wilderness experience change but the changes are temporary and occur in small ways in one or more locations.
Moderate	One or more attributes of wilderness character and wilderness experience change in substantial ways in a single distinct area, or it affects multiple areas but is not permanent.
Major	One or more attributes of wilderness character and wilderness experience changes substantially across more than one distinct area on either a permanent or frequent but temporary basis.

Short-term—effects occur during project work or within a week of project activities.

Long-term—effects occur after project work and would continue to impact wilderness resources in the future.

ALTERNATIVE 1: NO ACTION

Untrammeled: Under this alternative, there would be no change to the untrammeled quality of wilderness within the parks and forest.

Natural: Under this alternative, there would be no change to the natural quality of wilderness. Bighorn sheep would not be translocated into currently unoccupied areas; therefore the natural quality of the wilderness would not be restored in these areas.

Undeveloped: Under this alternative, there would be no change to the undeveloped quality of wilderness. The presence of collars on bighorn sheep (approximately 18) would continue to affect the undeveloped quality of wilderness since there would be a visual impact from the presence of collars on bighorn sheep. This would continue to impact the undeveloped quality of wilderness until the collars are no longer usable. GPS collars in current use by CDFG are programmed to drop off automatically after two years

Providing Solitude or Primitive and Unconfined Recreation: Under this alternative, the opportunities for solitude or primitive and unconfined recreation would not change.

Cumulative Effects
There would be no cumulative effects associated with this alternative because there would be no direct or indirect effects.

Conclusion
There would be no change to the four qualities that comprise wilderness character, and no change to wilderness experiences.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

Untrammeled: Collaring bighorn sheep for approximately 1-14 days annually over ten years would adversely affect the untrammeled quality of the park and forest wilderness areas from the handling of bighorn sheep during project work, as this is considered a manipulation of a component of the ecosystem. Trammeling activities per individual bighorn sheep are expected to take about 60 minutes from capture to release.

Natural: There would be little change to the natural quality of wilderness character. Information gained from project activities may allow wildlife managers to keep existing populations healthy and protected in the long-term. However, bighorn sheep would continue to be absent from previously occupied herd units within Sequoia National Park since this alternative does not involve translocations.

Undeveloped: The use of helicopters would cause temporary adverse effects on the undeveloped quality of park and forest wilderness areas. The project would affect the undeveloped quality for approximately 1-14 days annually over the next 10 years. Helicopter flights would occur along flight paths in occupied herd units once bighorn sheep are observed. Flights within the Taboose Creek herd unit (should they be necessary; this herd unit is not currently occupied) may not follow such specific flight paths, as bighorn sheep have not been collared in these areas and it may take longer for flight crews to locate the bighorn sheep. Once bighorn sheep are located the helicopter would continue flights along the same flight path when capturing occurs.

Helicopter landings within wilderness would occur when a bighorn sheep is captured. Landing is required to allow capture crews (two personnel) to exit the helicopter once an animal is captured by net-gun. The animal would then be flown to a processing station (located outside wilderness) where data are collected and collars are maintained or fitted. Helicopter landings would also occur to collect nets in the event a capture attempt is not successful. The helicopter use in wilderness would be short-term, moderate, and adverse. No staging would occur in wilderness.

The collaring of bighorn sheep also affects the undeveloped quality of wilderness since there would be a visual impact from the presence of collars on bighorn sheep. Since VHF collars have a lifespan of at least 4 years and can be active for as long as 10 years, they would likely be on the animals for the remainder of their lives.

Providing Solitude or Primitive and Unconfined Recreation: The sights and sounds of the helicopter and project crews would affect opportunities for solitude or primitive and unconfined recreation during project activities. The collaring involves helicopter use in the shoulder seasons (fall and spring). While the project would occur outside the peak visitor use season, opportunities for solitude or primitive and unconfined recreation could still be impacted for visitors to park and forest wilderness during project activities.

This project would introduce a short-term visual and audio disturbance to visitors in the specific areas where the helicopter would be operating. Users who visit these areas during helicopter operations include cross country or backcountry skiers, however, due to the time of year, visitation in these areas is lower than other months of the year. Visitors may see and/or hear the helicopter when it is in flight. However, this would be a short-term impact, limited to one day (or less) in each helicopter flight area. The helicopter may not be seen or heard continuously during the day from the same location, as flight paths may change depending on bighorn sheep locations or while the helicopter is parked at the base station. This would reduce the potential for recreationists in these areas to see or hear the helicopter. Potential helicopter landings are generally located above 9,000 feet and adjacent to steep topography, generally on wind-swept slopes. These locations are not ideal for winter recreation users as access is difficult and dangerous due to potential avalanches.

Cumulative Effects
Existing facilities, trails, park operations, and periodic flights result in adverse moderate cumulative effects on the wilderness character and experience. The use of helicopters would increase slightly under this alternative during project activities. However, it is unlikely that this slight increase in use would be noticeable to the average wilderness visitor and it would contribute only slightly to the overall cumulative effects from ongoing park activities. Therefore, cumulative effects on wilderness character and experience would be short- and long-term, moderate and adverse.

Conclusion
The project would result in short-term minor to moderate adverse effects on the untrammeled quality of wilderness, due to the collaring activities. The project would result in little change on the natural quality of wilderness. There would be short-term moderate adverse effects on the undeveloped quality from helicopter operations and long-term minor to moderate adverse effects from the presence of collars on bighorn sheep. There would be short-term minor adverse effects on opportunities for solitude or primitive and unconfined recreation.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

Untrammeled: Capturing and collaring approximately 30 bighorn sheep for translocations would adversely affect the untrammeled quality of the park and forest wilderness areas, primarily from the handling of bighorn sheep during project work, as this is considered a manipulation of a component of the ecosystem. Annually, operations would occur during a 1 to 14 day period, but may not occur each year depending on the status of the occupied herd units. Periodic captures would occur over a period of six years. Trammeling activities per individual bighorn sheep are expected to take no more than 12 hours from capture to release as bighorn would be released in groups at the translocation site.

Natural: The natural quality would be improved under this alternative as bighorn sheep are restored into previously occupied habitat in Laurel Creek and Big Arroyo within Sequoia National Park.

Undeveloped: The use of helicopters would cause temporary adverse effects on the undeveloped quality of park and forest wilderness areas. The project would affect the undeveloped quality for approximately 1-14 days in late winter over a period of six years. Helicopter operations would be the same as described under alternative 2, only operations would also occur to transport the bighorn sheep to the Laurel Creek and Big Arroyo areas within Sequoia National Park for the translocations.

Collaring and relocating 30 bighorn sheep between Big Arroyo and Laurel Creek would adversely affect the undeveloped quality of the park and forest wilderness areas over the duration of the project. Since

VHF collars have a lifespan of at least 4 years and can be active for as long as 10 years, they would likely be on animals for the remainder of their lives.

Providing Solitude or Primitive and Unconfined Recreation: The sights and sounds of the helicopter and project crews would affect opportunities for solitude or primitive and unconfined recreation during project activities. The translocation project involves helicopter use in late winter (March through the first week of April). The project would occur outside the peak visitor use season, but still could affect these opportunities for visitors to park and forest wilderness during project activities, as described in alternative 2.

Cumulative Effects

Existing facilities, trails, park operations, and periodic flights result in adverse moderate cumulative effects on the wilderness character and experience. The use of helicopters would increase slightly under this alternative during project activities. However, it is unlikely that this slight increase in use would be noticeable to the average wilderness visitor and it would contribute only slightly to the overall cumulative effects from ongoing park activities. Therefore, cumulative effects on wilderness character and experience would be short- and long-term, moderate and adverse. However, the cumulative effects from other ongoing bighorn sheep recovery efforts, when added to the translocation of bighorn sheep into previously occupied habitat, would result in a long-term beneficial impact on the natural quality of wilderness.

Conclusion

This alternative would result in short-term minor to moderate adverse effects on the untrammeled quality of wilderness character during the collaring activities. There would be long-term beneficial effects from restoring the natural quality of wilderness by the translocation of bighorn sheep into historically occupied, but currently unoccupied habitat. There would be short-term moderate adverse effects on the undeveloped quality from helicopter operations. The presence of collars on bighorn sheep would result in a long-term minor to moderate adverse effect on the undeveloped quality. Decreased opportunities for solitude or primitive and unconfined recreation would occur in the short-term during project activities.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

Untrammeled: Collaring bighorn sheep for approximately 1-14 days annually over ten years for research would adversely affect the untrammeled quality of the park and forest wilderness areas from the handling of bighorn sheep during project work, as this is considered a manipulation of a component of the ecosystem. Trammeling activities per individual bighorn sheep are expected to take about 60 minutes from capture to release.

Natural: The natural quality would be improved in the long term under this alternative as bighorn sheep are restored into previously occupied habitat in Laurel Creek and Big Arroyo within Sequoia National Park.

Undeveloped: The use of helicopters would cause temporary adverse effects on the undeveloped quality of park and forest wilderness areas. The project would affect the undeveloped quality periodically, for approximately 1-14 days a year over the next 10 years. Helicopter operations would be the same as described under alternative 2, only operations would also occur to transport the bighorn sheep to the Laurel Creek and Big Arroyo areas within Sequoia National Park for the translocations.

Collaring bighorn sheep annually over 10 years for research and monitoring, and relocating 60 bighorn sheep that would also be collared would adversely affect the undeveloped quality of the park and forest

wilderness areas over the duration of the project. Since VHF collars have a lifespan of at least four years and can be active for as long as 10 years, they would likely be on animals for the remainder of their lives.

Providing Solitude or Primitive and Unconfined Recreation: The impact on solitude or primitive and unconfined recreation would be the same as described under alternatives 2 and 3, as this alternative involves both research and monitoring, which involves helicopter use in the shoulder seasons (fall and spring), and the translocation project, which involves helicopter use in late winter (March through the first week of April).

Cumulative Effects

Existing facilities, trails, park operations, and periodic flights result in adverse moderate cumulative effects on the wilderness character and experience. The use of helicopters would increase slightly under this alternative during project activities. However, it is unlikely that this slight increase in use would be noticeable to the average wilderness visitor and it would contribute only slightly to the overall cumulative effects from ongoing park activities. Therefore, cumulative effects on wilderness character and experience would be short- and long-term, moderate and adverse. However, the cumulative effects from other ongoing bighorn sheep recovery efforts, when added to the translocation of bighorn sheep into previously occupied habitat, would result in a long-term beneficial impact on the natural quality of wilderness.

Conclusion

This alternative would result in a short-term minor to moderate adverse effect on the untrammeled quality of wilderness character. There would be long-term beneficial effects from restoring the natural quality of wilderness by the translocation of bighorn sheep into historically occupied, but currently unoccupied habitat. There would be short-term moderate adverse effects on the undeveloped quality from helicopter operations. The presence of collars on bighorn sheep would result in a long-term minor to moderate adverse effect on the undeveloped quality. Decreased opportunities for solitude or primitive and unconfined recreation would occur in the short-term during project activities.

SOUNDSCAPES

Methodology

NPS *Management Policies 2006* (NPS 2006), state that "the National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks." The policies require the restoration of degraded soundscapes to the natural condition whenever possible, and the protection of natural soundscapes from degradation due to unnatural sounds (noise). The NPS is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored." Overriding all of this is the fundamental purpose of the national park system, established in law (e.g., 16 U.S.C. 1 et seq.), which is to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values.

Noise can adversely affect park and forest resources by modifying or intruding upon the natural soundscape, and can also interfere with sounds important for animal communication, navigation, mating, nurturing, predation, and foraging functions. Noise can also adversely affect park visitor experiences by intruding upon or disrupting experiences of solitude, serenity, tranquility, contemplation, or a completely natural or historical environment. The methodology used to assess noise impacts in this document is consistent with NPS *Management Policies 2006* (NPS 2006) and *Director's Order 47: Soundscape Preservation and Noise Management* (NPS 2000).

Context, time, and intensity together determine the level of impact for an activity. It is usually necessary to evaluate all three factors together to determine the level of noise impact. In some cases an analysis of one or more factors may indicate one impact level, while an analysis of another factor may indicate a different impact level, according to the criteria below (Table 8). In such cases, best professional judgment based on a documented rationale must be used to determine which impact level best applies to the situation being evaluated.

Table 8. Soundscapes Impact and Intensity Descriptions

Impact Intensity	Intensity Description
Negligible	Natural sounds would prevail. Effects on the natural sound environment would be at or below the level of detection and such changes would be so slight that they would not be of any measurable or perceptible consequence to the visitor experience or to biological resources.
Minor	Natural sounds would prevail. Effects on natural sound would be localized and short term and would be small and of little consequence to the visitor experience or to biological resources. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Natural sounds would prevail, but activity noise could occasionally be present at low to moderate levels. Effects on the natural sound environment would be readily detectable, localized, and short term or long term, with consequences at the regional or population level. Human-generated noise would be occasionally heard during the day. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Natural sounds would be impacted by activity noise frequently for extended periods of time. Effects on the natural sound environment would be obvious and long term, and would have substantial consequences to the visitor experience or to biological resources in the region. Extensive mitigation measures would be needed to offset any adverse effects and success would not be guaranteed.

Short-term—effects would only be evident during project work.

Long-term—effects would occur after project work ends.

ALTERNATIVE 1: NO ACTION

There would be no change to the soundscapes in and around the project area as a result of the no action alternative.

Cumulative Effects

There would be no cumulative effects under the no action alternative.

Conclusion

There would be no effect on the natural soundscapes and no cumulative effects under the no action alternative.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

The use of a helicopter for the capture and collaring of bighorn sheep would adversely affect the natural soundscape on the eastern portions of Sequoia and Kings Canyon National Parks, and on the western side of Inyo NF during travel, hovering, takeoff, and landing. These flights would occur in sub-alpine and alpine areas, over a 1-14 day period annually, for no more than 8 hours per day. While the operations would occur after the primary visitor use season, there could be adverse impacts to the natural soundscape of the forest and parks. Noise from helicopters may generate flight responses from wildlife, including birds. Flight noise would be temporary and localized; overall impacts would be short-term, moderate and adverse.

Cumulative Effects
From May through October the park has a helicopter based at park headquarters for use in fire management activities, SAR, and support of park wilderness management activities. Except for SARs, most helicopter operations are completed in less than 30 minutes at the operation site. The helicopter normally based at Sequoia and Kings Canyon National Parks is classified as a light helicopter (Type 3). There is an average of 288 hours of planned and unplanned hours of helicopter flight time per year within and outside wilderness.

Other park operations that produce human-generated noise in the wilderness include trail maintenance activities, where mechanized and non-mechanized tools may be used depending on the circumstances. Rarely does blasting occur in the park, but it is possible when conditions warrant. The noise of crews working and talking can adversely impact the natural soundscape.

Outside sources of noise include military and commercial overflights, which occur periodically over the parks. Rangers are responsible for reporting violations of military aircraft flying below 3,000 feet above ground level over the wilderness areas of the park. The parks work closely with command staff at Edwards Air Force Base to reduce and eliminate such violations of military regulations. The noise created by these low-level flights is an intrusion on the natural soundscapes.

The project would occur outside the primary work season in the parks and forest, and other park and forest helicopter operations would likely not be underway during this period, except for emergency operations. Therefore there would be no cumulative effects on soundscapes.

Conclusion
The project would result in short-term moderate adverse impacts on the natural soundscapes. Natural sounds would continue to prevail in most of the parks and forest wilderness. There would be no cumulative effects.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY
This alternative would result in similar impacts as alternative 2, however the capture and relocation of bighorn sheep would occur over a larger area of wilderness, including the Laurel Creek and Big Arroyo areas where bighorn sheep would be relocated. The project timing and duration would be similar, with the project occurring in the shoulder seasons. The overall impact on soundscapes from the use of helicopters would be short-term, moderate and adverse.

Cumulative Effects
The projects considered in the cumulative impacts analysis are listed above under alternative 2. Similar to alternative 2, the translocation project would occur outside the primary work season in the parks and forest, and other park and forest helicopter operations would likely not be underway during this period, except for emergency operations. Therefore there would be no cumulative effects on soundscapes.

Conclusion
The use of a helicopter during the capture and translocation of bighorn sheep would result in short-term moderate adverse impacts on the natural soundscape. There would be no cumulative effects on soundscapes.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

As described in alternatives 2 and 3, helicopter use during the research and translocations would adversely affect the natural soundscape during project work. This alternative would be conducted over a larger geographic area and occur at two distinct time periods during the year (late fall and late winter to early spring) as it includes both research and translocation. The project would occur over a several year period and each capture operation would be of short duration (1-14 days annually). Therefore, the resulting effects on the soundscape from the use of helicopters would be short-term, adverse and moderate.

Cumulative Effects

The cumulative effects are the same as described under alternatives 2 and 3.

Conclusion

This alternative would result in short-term adverse moderate impacts on the soundscape, and would not result in any cumulative effects.

HEALTH AND SAFETY

Methodology

Health and safety, for the purposes of this analysis, refers to the potential for each alternative to directly or indirectly inflict injury on those involved with the aerial operations. NPS staff would not be involved with this component of the project; CDFG staff and contractors would carry out the operations. The project alternatives have the potential to affect safety because there are inherent, direct risks associated with the use of helicopters for aerial wildlife operations. Standard safety practices and mitigation measures and compliance with required policies serve to reduce these risks; however, they can never be completely eliminated. Therefore, there is the potential for injury and loss of human life during these operations (Table 9).

Table 9. Health and Safety Impact and Intensity Descriptions

Impact Intensity	Impact Description
Negligible	The impacts on safety would not be measurable or perceptible.
Minor	The effect would be detectable but short term, would be limited to a relatively small number of involved staff at a localized area, and would not have an appreciable effect on health and safety.
Moderate	The effects would be sufficient to cause a permanent change in forecasting accuracy or would be readily apparent and would result in substantial, noticeable effects on safety on a local scale on a short- or long-term basis.
Major	The impact on staff or cooperator safety would be substantial. Effects would be readily apparent and would result in substantial, noticeable effects on safety on a regional scale and on a long-term basis.

Short-term—effects last one year or less.

Long-term—effects last more than one year.

ALTERNATIVE 1: NO ACTION

This alternative would result in no change to staff and cooperators/contractors health and safety. There would be no effect on health and safety.

Cumulative Effects
There are no known or reasonably foreseeable other actions that would result in cumulative impact on health and safety when combined with this alternative.

Conclusion
There would be no effect on health and safety under this alternative, and no cumulative effects.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

Under this alternative, there would be helicopter use associated with the capturing and collaring of bighorn sheep. This would involve approximately 8 hours of flight time over a period of 1-14 days annually. These operations are hazardous to CDFG and contracted staff because they involve low-level flights over rugged terrain. However, CDFG has specific requirements for contractors who are hired for these operations, including experience in similar operations. Regardless, these types of operations can result in minor to major adverse impacts on the health and safety of those participating in these actions.

Cumulative Effects
There would be no cumulative effects associated with this alternative.

Conclusion
Aerial capture and collaring activities could result in moderate adverse impacts on the health and safety of those participating in these activities.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

Under this alternative, there would be helicopter use associated with the capturing, collaring, and translocation of bighorn sheep. This would involve approximately 8 hours of flight time over a period of 1-14 days annually during years in which translocations occur. These operations are hazardous to CDFG and contracted staff because they involve low-level flights over rugged terrain. However, CDFG has specific requirements for contractors who are hired for these operations, including experience in similar operations. Regardless, these types of operations can result in minor to major adverse impacts on the health and safety of those participating in these actions.

Cumulative Effects
There would be no cumulative effects associated with this alternative.

Conclusion
Aerial capture and collaring activities could result in moderate adverse impacts on the health and safety of those participating in these activities.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

Under this alternative, there would be helicopter use associated with the capturing, collaring, and translocation of bighorn sheep. This would involve approximately 8 hours of flight time over a period of 1-14 days annually over the next 10 years. These operations are hazardous to CDFG and contracted staff because they involve low-level flights over rugged terrain. However, CDFG has specific requirements for contractors who are hired for these operations, including experience in similar operations. Regardless, these types of operations can result in minor to major adverse impacts on the health and safety of those participating in these actions.

Cumulative Effects
There would be no cumulative effects associated with this alternative.

Conclusion
Aerial capture and collaring activities could result in moderate adverse impacts on the health and safety of those participating in these activities.

VISITOR EXPERIENCE AND RECREATIONAL OPPORTUNITIES

Methodology

NPS *Management Policies 2006* (NPS 2006) state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the NPS is committed to providing appropriate high-quality opportunities for visitors to enjoy the parks. Similarly, Forest Service policy is to protect the long-term public interest by maintaining and enhancing open space options, public accessibility, and cultural, wilderness, visual, and natural resource values (Forest Service Manual 2300). Part of the purpose of the parks and forest is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the parks' goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

The Sequoia and Kings Canyon BMP (NPS 1986a) states that the management objective for backcountry visitor recreation is to provide recreation featuring the opportunity for pastimes for which it is important that there be solitude, physical and mental challenges, and an environment where one depends on one's own abilities and knowledge. Use is managed to keep impacts on the resource and visitors at an acceptable level. In wilderness managed by the Inyo NF, including the proposed capture sites, the emphasis is on providing opportunities for solitude, challenge, and primitive recreation (USFS 1988).

Each alternative was examined to determine its effect on visitor enjoyment of park resources and opportunities for recreation. Public scoping input and observation of visitation patterns, combined with assessment of what is available to visitors under current park management, were used to estimate the effects of the alternatives. The impact on the ability of the visitor to experience a full range of park resources was analyzed by examining resources and objectives presented in the park significance statements, as derived from its enabling legislation. The potential for change in visitor experience proposed by the alternatives was evaluated by identifying projected increases or decreases in access and other visitor uses, and determining whether or how these projected changes would affect the desired visitor experience, to what degree, and for how long (Table 10).

Table 10. Visitor Experience and Recreational Opportunities Impact and Intensity Descriptions

Impact Intensity	Intensity Description
Negligible	Changes in visitor experience and recreational opportunities would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor experience and recreational opportunities would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
Moderate	Changes in visitor experience and opportunities would be readily apparent. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.

Impact Intensity	Intensity Description
Major	Changes in visitor experience and opportunities would be readily apparent and severely adverse or exceptionally beneficial. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Short-term—occurs only during project work.

Long-term—continues after project work.

Analysis was based on whether there would be a loss of a recreation opportunity, a change in access to or availability of a recreation opportunity, or a change in the aggregate of recreation opportunities for the visitor and the degree to which each alternative affects those opportunities.

ALTERNATIVE 1: NO ACTION

There would be no change to the visitor experience and recreational opportunities under the no action alternative. Most visitors would not be aware that bighorn sheep herds do not occupy all formerly occupied herd units in the project area, therefore their experience in those areas would not be affected. There would be no change on visitor use patterns or opportunities due to closures or limitations in bighorn sheep critical habitat at this time. There would be no change to existing conditions.

Cumulative Effects

There would be no cumulative impacts on the visitor experience and recreational opportunities under the no action alternative.

Conclusion

There would be no change on the visitor experience and recreational opportunities.

ALTERNATIVE 2: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH NO TRANSLOCATIONS

This alternative would result in a minor to moderate adverse effect on the visitor experience for those visitors who do not like to view or hear helicopter operations and view collars on bighorn sheep in wilderness. Some visitors would not be affected or only slightly affected, while others may feel that the study impinges on their wilderness experience. Members of the public could be adversely affected just with the knowledge that these operations are occurring, even if they are not visiting the park during the project work.

This alternative would not result in any change in visitor opportunities, except for those visitors who chose to avoid the area during the capture and collaring activities. However, since the operations would occur in late fall or early spring, between the primary visitor use season (summer and early fall), there would be fewer visitors affected. Still, there would be impacts on those visitors seeking a wilderness experience in the same location and period when the project operations are underway.

Cumulative Effects

At any given time, there may be several projects underway in the park and forest wilderness areas and in the vicinity of the project areas. Generally these projects occur in the summer, and would not occur during the proposed project in the fall and early spring. Past projects include construction and periodic maintenance to existing wilderness ranger stations. There are also periodic trail maintenance projects that occurred in the past and are likely to occur in the future. Other wilderness activities include ranger patrols, research, and SAR operations. These types of activities generally do not affect park visitor

experience and recreational opportunities unless there are closures associated with these activities, or the visitor's expectations of a wilderness experience are not met (see "Wilderness Resources and Character"). Again, these activities are not likely to occur at the same time and in the same place as the proposed captures, making the likelihood of cumulative effects extremely low.

Conclusion
This alternative would result in short- and long-term minor to moderate adverse effects on the visitor experience in the park and forest, particularly on those visitors seeking a wilderness experience in the low visitor use season with the intrusion of motorized equipment and collars on animals.

ALTERNATIVE 3: IMPLEMENT BIGHORN SHEEP TRANSLOCATIONS ONLY

This alternative results in the same adverse impacts as discussed in alternative 2 from the use of helicopters to capture and relocate bighorn sheep, and collaring the animals. However, this alternative has the potential to improve the visitor experience in the Laurel Creek and Big Arroyo portions of Sequoia National Park if the translocation of bighorn sheep is successful. Visitors would have additional opportunities to view bighorn sheep in these areas; many visitors enjoy viewing wildlife as part of their wilderness experience. Therefore, this alternative would result in both short-term adverse impacts from the helicopter/capture operations, long-term adverse impacts from the presence of collars on bighorn sheep, and long-term beneficial impacts from the increased potential to view bighorn sheep in additional habitat within Sequoia National Park.

Cumulative Effects
The cumulative impacts would be similar to those described under alternative 2, namely that they are extremely low.

Conclusion
This alternative would result in short-term moderate adverse impacts from the helicopter/capture operations, long-term minor to moderate adverse impacts from the presence of collars on bighorn sheep, and long-term beneficial impacts from the increased potential to view bighorn sheep in additional habitat within Sequoia National Park.

ALTERNATIVE 4: IMPLEMENT BIGHORN SHEEP RESEARCH AND MONITORING WITH TRANSLOCATIONS (PREFERRED ALTERNATIVE)

This alternative would have the same impacts as both alternatives 2 and 3, but the effects would be over a larger geographic area. Helicopter operations would occur for both the research, monitoring, and for the translocation efforts. Bighorn sheep would be collared for all of these efforts. Therefore, the impacts on visitors who wish to experience wilderness without human influence would be adversely affected in the short- and long-term. This is mitigated substantially by scheduling the helicopter operations in the lowest visitor use season; however some visitors would still be affected. As stated previously, the public could be adversely affected just with the knowledge that these operations are occurring, even if they are not visiting the park during the project work.

There would be beneficial effects on the visitor's experience from relocating bighorn sheep into currently unoccupied habitat as many visitors feel viewing wildlife is an important part of their wilderness experience. This alternative would provide additional opportunities to view wildlife and enhance overall wilderness character. Positive effects also include recovery of an endangered species over a broad region within the park.

Cumulative Effects
The cumulative impacts would be similar to those described under alternative 2, namely that they are extremely low. If bighorn sheep recovery efforts continue to be successful, there would be long-term beneficial cumulative effects from increased opportunities to view bighorn sheep in their natural habitats.

Conclusion
This alternative would result in short- and long-term moderate adverse effects on the visitor experience in the parks and forest from the use of helicopters and the presence of collars on bighorn sheep. There would be increased opportunities to view bighorn sheep in Sequoia National Park if translocations are successful in Laurel Creek and Big Arroyo. There would be long-term beneficial effects on visitor experience if bighorn sheep recovery efforts are successful and there are more opportunities to view bighorn sheep in their native habitat.

CHAPTER 5: CONSULTATION AND COORDINATION

PUBLIC SCOPING

Public scoping was initiated for the proposed Sierra Nevada Bighorn Sheep Study on June 18, 2010. The 30-day public comment period ended on July 19, 2010. A press release was distributed to area media outlets, and letters with project information requesting public input were mailed to 83 individuals, agencies and organizations, and to 34 tribes or tribal representatives. In addition, scoping information was emailed to 311 agencies, organizations, businesses, and individuals.

Notification of the scoping period was published in the Kaweah Commonwealth newspaper on July 2, 2010. Information was also posted on the National Parks Travelers and the Wilderness Watch websites. Additionally, information was posted on the National Park Service (NPS) Sequoia and Kings Canyon website and links were provided to the NPS Planning, Environment, and Public Comment website (PEPC

Five comment letters were received; two from individuals; one “no comment” letter was received the California Department of Transportation; and two comment letters were received from interest groups including High Sierra Hikers Association and Wilderness Watch. Commenters provided input by a variety of methods, including letters, email, and completing and submitting the form provided by the parks. All comments received were entered into the National Park Service (NPS) Planning, Environment, and Public Comment (PEPC) system and are a part of the public record. Each comment letter was reviewed by park staff to determine the potential issues and impact topics related to the proposed project.

In April of 2011, the project was listed on the quarterly Schedule of Proposed Actions (SOPA) for the Inyo NF. The SOPA was published on the forest website and distributed to more than 100 individuals and organizations interested in the ongoing management of the forest. Additional scoping was conducted concurrent with the 30-day comment period on this draft EA.

CONSULTATION AND PERMITTING REQUIREMENTS

The USFWS determined that any associated adverse effects on the bighorn sheep had already been analyzed through a section 7(a)(2) consultation as part of the process of issuing a recovery permit to CDFG, therefore no additional consultation for bighorn sheep or their critical habitat is necessary (December 22, 2010 memorandum, Appendix E). In addition, the USFWS determined that no other listed species would be affected by the proposed action since they do not occur in the study area. Therefore, no additional consultation is required.

The CDFG would be responsible for receiving a permit from the U.S. Forest Service for helicopter activities

AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED

Agencies and organizations contacted to assist in identifying issues and provided with an opportunity to review or comment on this EA include, but are not limited to, the following.

FEDERAL AGENCIES

U.S. Army Corps of Engineers: Lake Kaweah; Pine Flat Lake
National Park Service: Rivers, Trails, and Conservation Program; Yosemite National Park
U.S. Bureau of Management, Field Manager- Bakersfield
U.S. Fish and Wildlife Service
U.S. Geological Survey, Biological Resources Division, Western Ecological Research Center
U.S. Forest Service: Inyo, Sequoia, and Sierra National Forests

CONGRESSIONAL REPRESENTATIVES

U.S. Senator Barbara Boxer
U.S. Senator Dianne Feinstein
U.S. Congressman Jim Costa
U.S. Congressman Devin Nunes
California State Governor Jerry Brown
California State Senator Tom Berryhill
California State Senator Jean Fuller
California Assemblymember Linda Halderman
California Assemblymember Connie Conway

STATE, COUNTY, AND LOCAL AGENCIES

California State Historic Preservation Officer
California Department of Fish and Game
California Department of Forestry and Fire Protection
California Department of Transportation
Chamber of Commerce: Central Sierra; Clovis; Dinuba; Exeter; Fresno; Greater Reedley; Kingsburg; Lindsay; Lone Pine; Porterville; Sanger; Sequoia Foothills; Visalia; Central California Hispanic Chamber of Commerce; Fresno Area Hispanic Chamber of Commerce; San Joaquin Valley Black Chamber of Commerce; Tulare Kings Hispanic Chamber of Commerce
City Council of: Reedley; Woodlake
City of: Clovis; Dinuba; Exeter; Fowler; Fresno; Kingsburg; Orange Cove; Parlier; Sanger; Selma;Visalia
City of Visalia- Visalia Shuttle
Colonel Allensworth State Historic Park
Fresno City and County Convention and Visitors Bureau
Fresno County: Board of Supervisors; Parks and Recreation; Office of Tourism; Chairperson
Inyo County District Supervisors
Sierra Nevada Conservancy, Bishop Office
State of California Clearinghouse
Tulare County: Board of Supervisors; Community Development; Planner
Visalia Convention Center
Visalia Visitor Center and Convention Bureau

AMERICAN INDIAN TRIBES, ORGANIZATIONS, AND INDIVIDUALS

Big Pine Paiute Tribe of the Owens Valley
Big Sandy Rancheria of Mono Indians
California Native American Heritage Commission
Cold Springs Rancheria of Mono Indians

Dunlap Band of Mono Indians
Fort Independence Indian Community of Paiute Indians
Kern Valley Indian Community
North Fork Rancheria of Mono Indians
Paiute–Shoshone Indians of the Bishop Community
Santa Rosa Rancheria
Sierra Foothill Waksachi Tribe
Sierra Nevada Native American Coalition
Table Mountain Rancheria
Tule River Indian Reservation
Wukchumni Tribal Council

OTHER GROUPS AND ORGANIZATIONS

Backcountry Horsemen of California
Californians for Western Wilderness
California Preservation Foundation
California Travel and Tourism Commission
Center for Biological Diversity, California and Pacific Office
Fresno Audubon Society
Friends of the Earth
High Sierra Hiker's Association
Mineral King District Association
Mineral King Preservation Society
National Audubon Society; Tulare Audubon Society
National Parks and Conservation Association
The Nature Conservancy, California Field Office
Pacific Crest Trail Association
PEER
SCA Northwest Office
Sequoia Natural History Association
Sequoia Riverlands Trust
Sequoia Parks Foundation
Sierra Club- National Headquarters; Tehipite Chapter; Kern-Kaweah Chapter; Sacramento Field Office
The Wilderness Society
Wilderness Land Trust
Wilderness Watch
The Wildlife Society, San Joaquin Valley Chapter
Wilsonia Historic District Trust

AREA LIBRARIES AND UNIVERSITIES

California State University: San Joaquin Sierra Unit
Fresno County Libraries
- Bear Mountain Branch Library
- Central Branch Library
- Sunnyside Branch Library
- Fowler Branch Library
- Kingsburg Branch Library
- Orange Cove Branch Library
- Parlier Branch Library
- Reedley Branch Library
- Sanger Branch Library

Selma Branch Library
San Joaquin Valley College: Hanford Extension; Visalia Campus; Fresno Campus
Tulare County Law Library
Tulare County Libraries: Exeter Branch; Lindsay Branch; Three Rivers Branch

MEDIA
Bakersfield Californian
Fresno Bee
Kaweah Commonwealth
Kern Valley Sun
Noticiero Semanal
Porterville Recorder
Reedley Exponent
Sanger Herald
San Francisco Chronicle

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List is available upon request.

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CHAPTER 6: REFERENCES

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APPENDIX A – WILDERNESS MINIMUM TOOL MINIMUM REQUIREMENT ANALYSIS

Sequoia and Kings Canyon National Parks
Wilderness Minimum Tool Analysis - 2011

Background:

- Section 4(c) of the Wilderness Act states: *" . . .except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be . .* ***no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area****."*
- Section 6.3.5 of NPS Management Policies 2006 states that the Minimum Requirement concept will be a two step process to [1] determine if the management action is necessary *"for administration of the area as wilderness and does not cause a significant impact to wilderness resources and character; and* [2] *the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized."* Also: *"When determining minimum requirements,* ***the potential disruption of wilderness character and resources will be*** *considered before, and* ***given significantly more weight than, economic efficiency and convenience."***
- Section 5.14 Administration, of SEKI's Backcountry Management Plan (which covers both Wilderness and non-wilderness backcountry and is NEPA compliant), provides guidance on how park managers are to treat the above generally prohibited actions of Section 4(c) of the Wilderness Act. Specifically treated are Radio communications (5.14.2.1), helicopters (5.14.2.2), mechanized trail maintenance equipment (5.14.2.3), Cabins (5.14.2.4), Administrative camps (5.14.2.5), Administrative Stock Use (5.14.2.6), NPS backcountry crews (5.14.2.7), and NPS personnel (5.14.2.8). Section 5.14.3 also provides reference to the Administrative Use Guideline Addendum (January 1985) which provides further clarification on administrative and management actions occurring in SEKI's Wilderness and backcountry.
- Section 5.16 Scientific Study and Impact Monitoring, of SEKI's Backcountry Management Plan, provides guidance on how park managers are to conduct "scientific study and monitoring" in Wilderness and backcountry areas.
- The 2007 Record of Decision for the 2006 General Management Plan and FEIS states: "The parks' designated wilderness and other areas managed as wilderness are zoned to reflect the varying intensities of use of different areas. In heavily traveled zones, there exist engineered trails and bridges, food lockers, designated campsites, and toilets to protect park resources, while in less-used areas, amenities are minimal or non-existent. A new subsection, below in italics, entitled *"Decision-making Process for Facilities within Backcountry and Wilderness Zones,"* is added to the GMP/FEIS (Vol.1, Page 67) to clarify the action.

  > *This General Management Plan is a programmatic plan. The GMP provides conceptual guidance for park managers about the kinds of resource conditions, visitor services, and visitor experiences that best fulfill the mission of these parks. The listing of categories of "appropriate facilities" within the individual zone prescriptions serves only to exemplify the types of facilities that may now exist or that the parks may wish to consider at some point in the future. For a new facility to be considered, or for an existing facility to be repaired or replaced within the Major Trails, Secondary Trails, or Cross-Country Areas zones, the parks would conduct the appropriate level of compliance under the National Environmental Policy Act (i.e., Categorical Exclusion, EA or EIS). Incorporated into any such compliance would be appropriate consideration of the Wilderness Act (Minimum requirement analysis), the Endangered Species Act and the National Historic Preservation Act. Further, installation of or repairs to facilities would have to comply with any prescriptions contained in the action alternatives considered in this plan. Only facilities that undergo additional site-specific compliance and that comply with all applicable legal and planning requirements would be constructed or repaired."*

Analysis:
If you are proposing an action, you must complete the analysis below – no action as described above is to occur in wilderness unless this form has been completed and approved (use additional sheets if more space is needed).

- Describe the action you wish to take (e.g. helicopter flight, chainsaw use, install resource monitoring equipment, etc.), **not** a general project description. Please **provide detailed estimates on HOW MANY TIMES AND WHEN** (day/week/moth) the action will occur on this project (e.g. 3 helicopter landings, or rock drill will be used on 4 days, etc. ***the more detail, the better***):

In support of the Recovery Plan for Sierra Nevada Bighorn Sheep and development of the Wilderness Stewardship Plan/Environmental Impact Statement, we propose to use helicopter support to capture bighorn sheep for research, monitoring, and translocation purposes. Beginning in 2011 and continuing for up to 10 years, bighorn sheep would be annually captured and fitted with Very-High Frequency (VHF) or Global Positioning System (GPS) radio-collars in the parks by California Department of Fish and Game (CDFG) biologists and qualified personnel certified by the US Fish and Wildlife Service (USFWS). Bighorn sheep captures could occur in any of the bighorn sheep herds within the parks. The following table provides an estimate of the number of captures, helicopter landings, and helicopter days required for this project per year.

Herd Unit	# of sheep research/ monitoring captures	Approx. # of helicopter landings	Approx. # of helicopter days
Langley	1-10	2-20	2-6
Williamson	0-1	0-2	2
Bubbs	2-4	4-8	2
Baxter	0-8	0-16	2-6
Sawmill	1-8	2-16	2-6
Taboose	0-1	0-2	2
Big Arroyo	0-2	0-4	2
Laurel reek	0-2	0-4	2

Bighorn sheep capture operations would occur for 1-14 days annually. Research and monitoring captures would occur during October and occasionally in January through the first week of April and bighorn sheep would be translocated in March through the first week of April. Helicopters would be generally be required to land twice for each bighorn sheep capture—however for shee that are translocated into Big Arroyo and Laurel Creek, there will only be one landing per bighorn sheep.

Answer the following questions:

1. Does the purpose of this action meet Minimum Requirements, that is, does it support: a)Visitor Enjoyment and Recreation (e.g. trail system and camping), b) Resource Protection and Visitor Management (e.g. ranger stations, toilets, communication systems), or c) Resource Management and Research (e.g. monitoring, inventorying, pertinent research, restoration, barriers for protection) per SEKI's MD-049?

The proposed action supports all three Minimum Requirements. Visitor Enjoyment and Recreation is supported because this project involves restoration of a federally endangered species into formerly occupied habitat—many visitors feel viewing wildlife is an important part of their wilderness experience. Resource Protection and Visitor Management is supported because results from the research component of this project may be used to adjust wilderness visitor regulations to ensure that bighorn sheep are not negatively impacted by visitor activities. Resource Management and Research is supported because project activities involve research into bighorn sheep habitat use and the impacts of wilderness recreation on bighorn sheep.

2. Why is this action necessary (e.g. movement of heavy/bulky materials, safety, time sensitive, trail closed by snow or logs, sensitive park resources, stock not available, maximum resource protection)?

Bighorn sheep capture is necessary for the NPS to support implementation of the Recovery Plan for the Sierra Nevada Bighorn Sheep. This plan calls for research, monitoring, and translocation of bighorn sheep as components required for their eventual delisting from the endangered species list. Capturing and radio-collaring bighorn sheep is the only way to accomplish these tasks.

3. What other Wilderness Act compatible alternatives (e.g. hand tools, stock, foot) were considered? Explain why these were determined to not be feasible?

Alternative techniques for capturing bighorn sheep (e.g., drop-nets, drive-nets, chemical immobilization) were considered but dismissed. Helicopter supported captures using net-guns has been found to have the lowest overall measure of risk to bighorn sheep (i.e., impacts of stress, capture myopathy, and accidental mortality) compared to other techniques. Further, these techniques would have higher impacts on wilderness values because they require longer periods of time to implement and require increased numbers of personnel and stock support.

4. If this action is not taken will wilderness resources be at risk (e.g. social trails created, over-use of grazing resources, illegal camping, bear management problems, critical snow surveys not taken, erosion, resource depredations, human waste/pollution problems, etc.)?

If this action is not taken, the federally endangered Sierra Nevada Bighorn Sheep will continue to be at risk of extinction. The actions these helicopter activities would support include research that will inform SEKI of ways to mitigate wilderness visitor impacts to bighorn sheep, monitoring of bighorn sheep populations to prevent population declines due to disease or predation, and translocation of bighorn sheep into currently vacant herd units. Translocation, in particular, is a requirement of the Recovery Plan to assure long-term population viability.

5. Will alternate means of accomplishing the action provide for resource degradation (e.g. trail or meadow impacts from increased stock use, increased erosion from use trails)?

Alternate means of accomplishing bighorn sheep captures would likely provide for increased resource degradation over helicopter supported captures. The use of drop-nets, drive-nets, or chemical immobilization requires longer periods of time to implement and require increased numbers of personnel and stock support. Anticipated impacts would include (1) impacts to meadows from stock grazing, (2) impacts to trails from personnel/stock use, and (3) potential litter in the wilderness from irretrievable equipment (e.g., darts that miss bighorn sheep during chemical immobilization).

6. What wilderness resources might be at risk as a result of this action (e.g. character, soundscapes)? (Note: some of this can be mitigated with proper scheduling.)

Wilderness resources that would be at risk as a result of this action include all 4 qualities of wilderness character: (1) untrammeled, (2) natural, (3) undeveloped, and (4) opportunities for solitude.

Untrammeled: The untrammeled quality of the parks would be adversely affected because bighorn sheep would display evidence of human control or manipulation (i.e., the presence of radio-collars and eartags).

Natural: The natural quality would be positively affected because bighorn sheep would be restored into previously occupied habitat in Laurel Creek and Big Arroyo within Sequoia National Park.

Undeveloped: The use of helicopters would cause temporary adverse effects (approximately 1-14 days annually) to the undeveloped quality of parks. This would be mitigated though (1) scheduling of flights during off-peak

visitation (October and occasionally in January through the first week of April), (2) following specific flight paths, and (3) processing animals at a staging area outside of wilderness.

Opportunities for solitude: The sights and sounds of the helicopter and project crews would affect opportunities for solitude or primitive and unconfined recreation during project activities. This would be mitigated by scheduling of flights during off-peak visitation (October and occasionally in January through the first week of April) and because of the fact that helicopter landings are generally located above 9,000 feet and adjacent to steep topography, generally on wind-swept slopes. These locations are not ideal for winter recreation users as access is difficult and dangerous due to potential avalanches.

7. Is the action necessary at the time it is scheduled, i.e. can it be accomplished at a later date without utilizing a generally prohibited 4(c) action?

The research and monitoring captures are necessary at the time they are scheduled because continued monitoring is a component of the Recovery Plan and research is needed to inform the Wilderness Stewardship Plan/Environmental Impact Statement, which is currently in development. The translocation captures could potentially occur at a later date, but this would delay recovery of a federally listed endangered species.

The times chosen during the year (October and occasionally in January through the first week of April) are based on biological constraints of bighorn sheep—they were chosen to minimize impacts to them during the breeding and lambing seasons.

8. What other aspects, that are relevant to protecting wilderness character and resources, have been considered in this analysis?

Additional mitigation measures would include: (1) after bighorn sheep are located and pursuit begins, pursuit would be terminated after 2 minutes if capture was unsuccessful, (2) if the net misses or bighorn sheep escapes, pursuit would be terminated unless recapture was imminent (i.e., within 30 seconds), (3) nets that miss bighorn sheep would be collected to prevent adverse effects to wilderness character or the safety of wildlife and visitors, (4) helicopters would be landed immediately after bighorn sheep are netted and the helicopter would not park (i.e., the engine would not be turned off), (5) the number of people needed to safely and efficiently handle each bighorn sheep would be minimized as well as all sudden movements, auditory, visual, and touch stimuli, (6) pursuits would occur in relatively open areas away from topographic features that may be dangerous (i.e., steep cliffs, ravines, etc.), (7) capture of multiple animals in a net would be avoided, (8) in the event of a major injury, the bighorn sheep would be quickly and humanely destroyed and the project would be stopped for a review and assessment of the incident.

Approvals and Routing:

Printed name Signature Date Submitted by (program manager)	Recommended by (Division Chief) Date

Approved by (Superintendent) Date

NOTE: Upon receiving all above signatures, route original to Wilderness Coordinator for administrative record.

APPENDIX B - IMPAIRMENT DETERMINATION

A determination of impairment is made for each of the resource impact topics carried forward and analyzed in the environmental assessment for the preferred alternative. The description of park significance is found below and was used as a basis for determining if a resource is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

Impairment determinations are not necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. These impact areas are not generally considered to be park resources or values according to the *Organic Act*, and cannot be impaired the same way that an action can impair park resources and values.

Description of Park Purpose and Significance
Sequoia National Park was established on September 25, 1890. The primary purpose for establishing the park is described in the act's preamble:

> *Whereas, the rapid destruction of timber and ornamental trees in various parts of the United States, some of which trees are the wonders of the world on account of their size and limited number growing, makes it a matter of importance that at least some of said forests should be preserved. (26 Stat. L., 478)*

The legislation further stated that Sequoia National Park is to be a place "dedicated and set apart as a public park, or pleasuring ground, for the benefit and enjoyment of the people," and shall be managed "for the preservation from injury of all timber, mineral deposits, natural curiosities and wonders … [and for] their retention in their natural condition."

The purpose of Sequoia and Kings Canyon National Parks as defined in the parks' FGMP/FEIS (NPS 2007) is as follows:

- Protect the greater Sierran ecosystem—including the sequoia groves and high Sierra regions of the park—and its natural evolution forever.
- Provide appropriate opportunities to present and future generations to experience and understand park resources and values.
- Protect and preserve significant cultural resources.
- Champion the values of national parks and wilderness.

Sequoia and Kings Canyon National Parks are significant because they contain the following resources (FGMP/FEIS):

- The largest giant sequoia trees and groves in the world, including the world's largest tree, the General Sherman tree
- An extraordinary continuum of ecosystems arrayed along the greatest vertical relief (1,370 to 14,497 feet in elevation) of any protected area in the lower 48 states

- The highest, most rugged portion of the high Sierra, which is part of the largest contiguous alpine environment in the lower 48 states
- Magnificent, deep, glacially carved canyons including Kings Canyon, Tehipite Valley, and Kern Canyon
- The core of the largest area of contiguous designated wilderness in California—the second largest in the lower 48 states
- The largest preserved southern Sierra foothills ecosystem
- More than 300 known marble caverns, many inhabited by cave wildlife that is found nowhere else
- A wide spectrum of prehistoric and historic sites documenting human adaptations in their historical settings throughout the Sierran environments

NATURAL RESOURCES TOPICS

Wildlife

The project would occur in montane, subalpine and alpine areas of Sequoia and Kings Canyon National Parks. There are a variety of wildlife in these areas, including small mammals, mule deer, and birds. There is also habitat that supports the mountain yellow-legged frog. Healthy wildlife is necessary to fulfill the purposes for which the parks were established, and are key to the natural integrity of the parks.

While wildlife in localized areas could be disturbed from the flight operations and landing of helicopters, the actions undertaken as part of the preferred alternative would have only short-term temporary adverse impacts to wildlife primarily due to flight response that would lead to a temporary disruption in normal behaviors. These temporary responses would not permanently alter behavior, would not remove or damage habitat, and would only affect individual species in a small area, and therefore would not result in impairment.

Federally Listed Species – Sierra Nevada Bighorn Sheep

The *Endangered Species Act* requires federal agencies to ensure that their activities would not jeopardize the existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. The endangered Sierra Nevada bighorn sheep is the only federally listed species that occurs in the project area and would be affected by the proposed project activities. Of the herd units identified for bighorn sheep in the 2007 *Recovery Plan for Sierra Nevada Bighorn Sheep* (USFWS 2007), 10 of 16 (62.5%) herd units are located partially or wholly within Sequoia and Kings Canyon National Parks. This makes habitat within the parks vital to the recovery of the bighorn sheep. Two of these heard units, Laurel Creek and Big Arroyo, are the two locations proposed for translocation of bighorn sheep under the preferred alternative.

There is the potential for adverse effects to occur as a result of the helicopter/netgun operations that would be used to capture, collar, and relocate bighorn sheep. However, research comparing this technique to alternatives (e.g., drop-nets, drive-nets, chemical immobilization) has found that it is the safest method for bighorn sheep capture (Kock et al. 1987, Jessup et al 1988). For example, Kock et al. (1987) found that only 2 of 137 (1.5%) of bighorn sheep captured with net-guns were accidentally killed and net-gunning had the lowest overall measure of risk (i.e., impacts of stress, capture myopathy, and accidental mortality) compared to other techniques. Further, as mentioned earlier, the capture related mortality rate of 3.3% when net-gunning that CDFG has experienced during the last 10 years falls below the limits of the Recovery Permit issued from the USFWS for the capture of bighorn sheep. Therefore, while implementation of this project might be expected to harm 1-3% of the bighorn sheep handled, the loss would be negligible compared to the value of the data obtained to guide their management, and the value of restoring bighorn sheep populations into unoccupied habitat.

The USFWS has issued permits to CDFG to utilize this method for the capture and collaring of bighorn sheep. The USFWS have determined that this project and any associated adverse effects on bighorn sheep have already been analyzed through section 7(a)(2) consultation as part of the process issuing a recovery permit to the CDFG, and that the preferred alternative would not jeopardize the continued existence of the bighorn sheep nor result in the destruction or adverse modification of critical habitat.

In addition, the management of critical habitat to protect the bighorn sheep and implementation of the translocation portion of the recovery plan would result in long-term beneficial effects on bighorn sheep. The long-term beneficial effects of increasing knowledge of bighorn sheep and visitor interactions, and translocating bighorn sheep into previously occupied areas outweigh the potential for harm, injury, or death to an individual bighorn sheep during project activities. Thus, there would be no impairment to bighorn sheep.

Wilderness Resources and Character

Sequoia and Kings Canyon National Parks' total designated and managed wilderness is approximately 839,172 acres; approximately 96% of the parks' total acreage of 865,964. Sequoia and Kings Canyon National Parks' original wilderness designation occurred under the *California Wilderness Act of 1984* (16 USC 1131, P.L. 98-425, 98 Stat. 1619); additional acreage was designated as wilderness by the *Omnibus Public Land Management Act of 2009* (H.R. 146). The Sequoia-Kings Canyon and John Krebs Wildernesses are the officially designated wilderness areas, both entirely located within the parks. This project would occur in both wilderness areas, and in adjacent wilderness areas in Inyo, Sequoia, and Sierra National Forests.

Management of wilderness must preserve its wilderness character and allow for visitor enjoyment. There are six specified purposes of wilderness: recreational, scenic, scientific, education, conservation, and historical use. Land managers can approve and implement activities in wilderness provided that the activities further one or more purposes of wilderness without degrading wilderness character.

There are several components of the preferred alternative that result in adverse effects on wilderness character and resources. Collaring operations (use of helicopters) would adversely affect the untrammeled quality of the park and forest wilderness areas temporarily during project activities. The use of helicopters would cause temporary adverse effects on the undeveloped quality of park and forest wilderness areas. VHF collars have a lifespan of at least 4 years and can be active for as long as 10 years, and would likely be on animals for the remainder of their lives, affecting the undeveloped quality of wilderness. The sights and sounds of the helicopter and project crews would affect opportunities for solitude or primitive and unconfined recreation during project activities. The project would occur outside the peak visitor use season, but still could affect these opportunities for visitors to park and forest wilderness during project activities. Therefore, effects on wilderness character and resources would be short- and long-term, moderate and adverse.

While there would be adverse effects on three qualities of wilderness character as a result of implementing the preferred alternative, these effects would be mitigated by the long-term beneficial effects of restoring a native species into vacant habitat within Sequoia National Park. Viable populations of special status species, including bighorn sheep, are necessary to fulfill the purposes for which the park was established, and are key to the natural integrity of the park. The natural quality of wilderness would be improved under this alternative as bighorn sheep are restored into previously occupied habitat in Laurel Creek and Big Arroyo within Sequoia National Park.

When considering the temporary nature of the adverse effects, and the long-term beneficial effects of the preferred alternative, this alternative would not result in impairment of park resources.

Natural Soundscapes
Natural soundscapes are an intrinsic element of the parks' wilderness environment. Natural soundscapes include all sounds that are inherent in nature, such as singing birds, insect noises, wind blowing through trees, waterfalls, rain events, and natural quiet. Natural sounds prevail in the subalpine environment. In contrast to the alpine zone, the natural soundscape of the montane and subalpine zones is less dominated by wind due to the presence of trees and tall shrubs that block and reduce wind speed. Animal sounds are more frequently audible in the montane and subalpine zones than in the alpine zone. Audible sounds are usually generated by nearby natural sources than carried from distances. Woodland birds such as thrushes and warblers can be heard in many areas. Flowing water is developing into larger streams, having a greater influence on the nearby soundscape, which then dominates the acoustics in the riparian and surrounding areas.

Natural soundscapes in wilderness areas of the park are necessary to fulfill the purposes for which the park was established, and are key to the natural integrity of the park. The actions in the preferred alternative including helicopter operations would result in short-term adverse effects in a localized area over a period of several years during project work. However, individual flights in any given location would be short-term, and impacts would be localized and would not affect the soundscape in large portions of the wilderness, and would not result in permanent adverse effects. Therefore, the preferred alternative would not result in impairment.

SUMMARY
As described above, adverse impacts anticipated as a result of implementing the preferred alternative on a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or identified as significant in the park's general management plan or other relevant NPS planning documents, would not rise to levels that would constitute impairment.

APPENDIX C – PUBLIC SCOPING PRESS RELEASE

National Park Service
U.S. Department of the Interior

Sequoia and Kings Canyon
National Parks

47050 Generals Highway
Three Rivers, CA 93271

559 565-3341 phone
559 565-3730 fax

Sequoia and Kings Canyon National Parks

News Release

For Immediate Release June 18, 2010
Contact: Malinee Crapsey 559/565-3138

Research on Sierra Nevada Bighorn Sheep Proposed for Sequoia and Kings Canyon National Parks

A study on Sierra Nevada bighorn sheep within and adjacent to Sequoia and Kings Canyon National Parks is being proposed by the National Park Service (NPS) in cooperation with the California Department of Fish and Game.

The Sierra Nevada bighorn sheep was listed as an endangered species on April 20, 1999, under the Endangered Species Act. An "endangered species" is an animal or plant species in danger of extinction throughout all or a significant portion of its range. In the late 1990s, the population of bighorn had declined to about 100 animals and very few remained within Sequoia and Kings Canyon. Today, the population numbers about 370 animals, an increasing number of which are using the parks.

Meadows are focal vegetation communities for both wildlife and human activities. The preliminary objectives of the study are to: (1) identify the extent to which bighorn sheep use meadows within these parks, specifically meadows and other habitats that are used by pack stock and backpackers; (2) determine whether the use of meadows and other habitats by pack stock or backpackers limits use by bighorn sheep either through competition for forage or by the presence of pack stock; and 3) develop a model to predict the relative probability of use of various habitats by bighorn sheep.

Meadow systems are important habitats to Sierra Nevada bighorn and provide a high density of nutritional forage. Meadows occupy only 1-2% of the landscape at higher elevations in the Sierra Nevada, and the persistence of high-elevation meadows is threatened by a number of factors, including climate change. Given their sensitivity to disturbance and their slow recovery following disturbance, it is important that the NPS understand the extent to which human activities affect the value of meadows as wildlife habitat.

The draft study details are being developed, but it is likely that up to 40 Sierra Nevada bighorn sheep would be captured and collared using helicopter/net-guns. About 75% of the work would occur in the sheep's winter range, which is located outside and east of Sequoia and Kings Canyon National Parks. Some of the captures, however, could occur within the eastern portion of these parks. The California Department of Fish and Game would be the principal investigator on this project, conducting the operation under their existing permit with the Fish and Wildlife Service.

The NPS is interested in any public concerns and potential issues related to the proposed study. Public comments are currently being accepted during this scoping phase. After analyzing comments received during scoping, the NPS will determine the level of analysis needed for this project.

More information on the proposed project is available online at the NPS Planning, Environment and Public Comment website, http://parkplanning.nps.gov/seki, then clicking on Sequoia and Kings Canyon National Parks. Information is also available by contacting Environmental Protection Specialist Nancy Hendricks at (559) 565-3102 or Wildlife Biologist Harold Werner at (559) 565-3123.

All comments must be received in writing by July 19, 2010. It may be submitted at this website, or sent to the park via e-mail to seki_planning@nps.gov or via mail or hand delivery to:

EXPERIENCE YOUR AMERICA
The National Park Service cares for special places saved by the American people so that all may experience our heritage.

Superintendent
Sequoia and Kings Canyon National Parks
Attn: Bighorn Sheep Study
47050 Generals Highway
Three Rivers, CA 93271

Before submitting comments, participants should be aware that the entire comment – including any personal identifying information such as name, address, phone number, e-mail address, or other personal identifying information included – may be made publicly available at any time. Those submitting comments can request in their comment that personal identifying information be withheld from public review, but the NPS cannot guarantee that they will be able to do so. Submissions from organizations or businesses, and from individuals identifying themselves as representatives of or officials of organizations or businesses, are always made available for public inspection in their entirety. Anonymous comments will not be accepted.

-- NPS --

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APPENDIX D – U.S. FISH AND WILDLIFE SERVICE RESPONSE LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO
81440-2011-TA-0038

December 22, 2010

Memorandum

To: Park Superintendent, Sequoia and Kings National Parks, National Park Service, Three Rivers, California

From: Senior Biologist, Ventura Fish and Wildlife Office, Ventura, California

Subject: Proposed Study of Sierra Nevada Bighorn Sheep in Sequoia and Kings Canyon National Parks (L7617 (SEKI))

We are responding to your letter, dated October 27, 2010, and received in our office on November 8, 2010, requesting consultation under section 7 of the Endangered Species Act of 1973 (Act) for a study of the potential impacts of packstock and wilderness recreation on the federally endangered Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*). The proposed study would provide information on Sierra Nevada bighorn sheep habitat use and behavioral responses to packstock and other wilderness recreation activities in the Sequoia and Kings Canyon National Parks. The information from the proposed study would assist in development of the Sequoia and Kings Canyon Wilderness Stewardship Plan and an associated environmental impact statement. Additionally, a habitat model, developed from the information generated by the study, would assist in the management of herds and designated critical habitat within the Sequoia and Kings Canyon National Parks.

The proposed study would involve capture and attachment of radio collars to approximately 55 Sierra Nevada bighorn sheep over the course of 2 years. Study personnel would select male and female adult bighorn sheep from herd units with summer range in the Sequoia and Kings Canyon National Parks. Qualified personnel would use net-guns from helicopters to capture Sierra Nevada bighorn sheep on their winter range. Following captures, survey personnel would attach global positioning system (GPS) and very high frequency (VHF) radio collars to all study animals. The GPS collars are remotely released and retrieved; therefore, recapture of these animals would not be required. The VHF collars would remain in place for 5 to 6 years. All of these activities would occur under Dr. Tom Stephenson's recovery permit (TE-050122-4), which we issued under the authorities of section 10(a)(1)(A) of the Act.

After reviewing the proposed project, we have determined that any associated adverse effects to Sierra Nevada bighorn sheep have already been analyzed through section 7(a)(2) consultation as part of the process issuing a recovery permit to Dr. Stephenson. Therefore, further consultation

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with the U.S. Fish and Wildlife Service, under section 7 of the Act, is not required for Sierra Nevada bighorn sheep. If the proposed study changes in such a manner that makes it inconsistent with Dr. Stephenson's recovery permit, he would need to request an amendment to his permit. Lastly, we do not have any comments or recommendations regarding the draft study proposal.

We have also reviewed the list you provided of other federally listed and candidate species that may occur within the study area. Based on our review, we have determined that none of the federally listed species occur within the proposed study area. The fisher (*Martes pennanti*) and the Sierra Nevada distinct population segment of mountain yellow-legged frog (*Rana muscosa*), which are both candidates for listing, may occur in the Sequoia and Kings Canyon National Parks. However, the fisher is unlikely to occupy habitat where the proposed study activities would occur (precipitous terrain and open spaces) and the mountain yellow-legged frog is unlikely to be affected due to the timing and location of captures (mountain yellow-legged frogs overwinter at the bottom of lakes). Furthermore, section 7 of the Act does not require agencies to consult on candidates.

We appreciate the opportunity to review your proposed project. If you have any questions regarding this matter, please contact Erin Shapiro of the Ventura Fish and Wildlife Office at (805) 644-1766, extension 369.

cc:
Dr. Tom Stephenson, California Department Fish and Game, Bishop, California
Ryan Olah, Sacramento Fish and Wildlife Office, Sacramento, California

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS SEKI (May 2011)