Environmental Assessment

Authorizing Helicopter Landings By the California Department of Fish and Game For Capturing Sierra Nevada Bighorn Sheep Within Portions of the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wilderness Areas

USDA Forest Service, Inyo National Forest
Mono Lake, Mammoth, White Mountain, and Mount Whitney Ranger Districts

Inyo and Mono Counties, California
Revised May, 2012

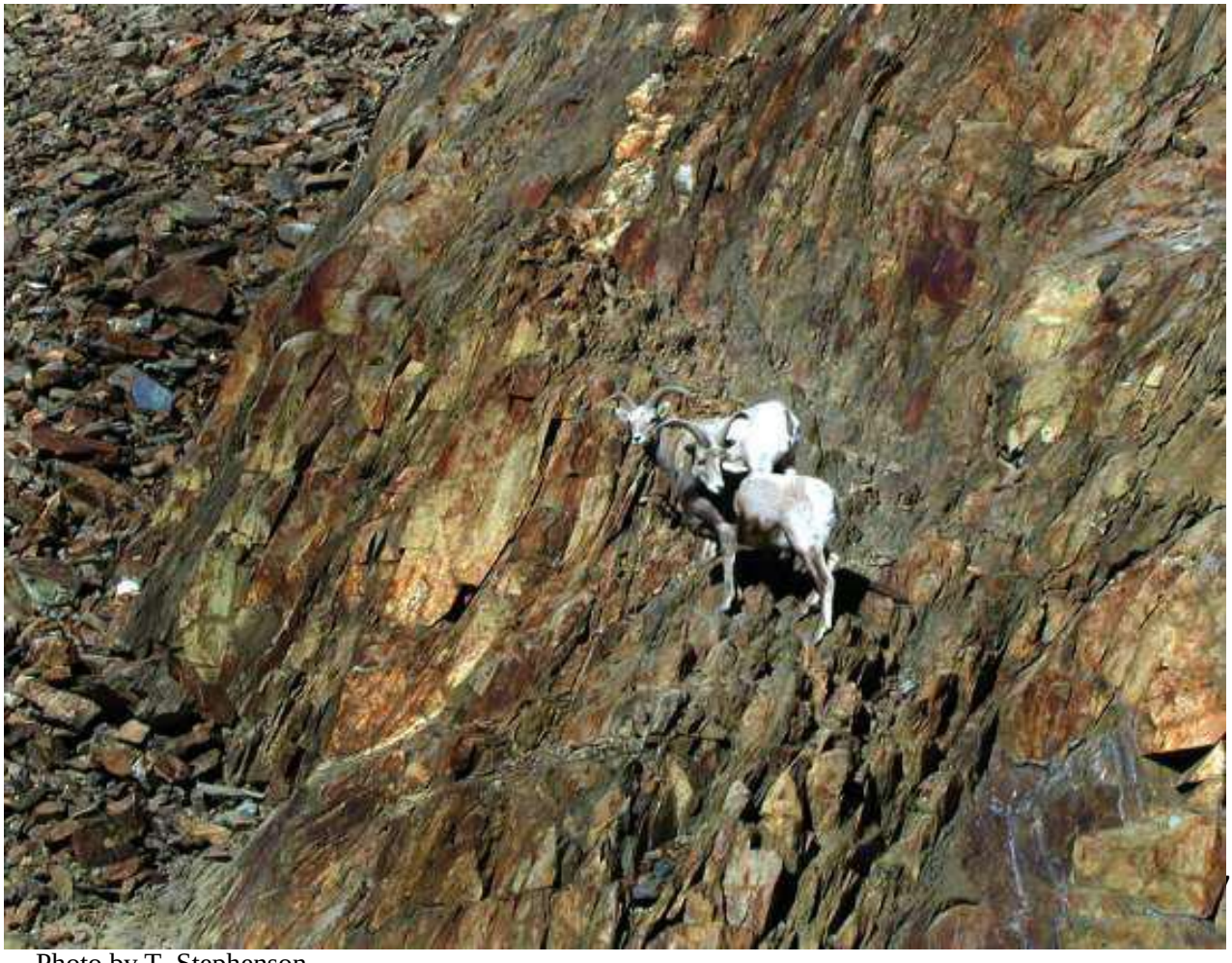

Photo by T. Stephenson

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Chapter 1 Purpose and Need for Action

1.1 Summary

The Inyo National Forest proposes to authorize helicopter landings by the California Department of Fish and Game (CDFG) within designated wilderness areas for the purposes of population monitoring and translocation of endangered Sierra Nevada bighorn sheep (SNBS). This action is needed to meet recovery actions established in the Sierra Nevada Bighorn Sheep Recovery Plan (hereafter, Recovery Plan, USDI 2007a). Recovery of this unique subspecies depends on gathering information on habitat use and vital rates that determine population dynamics through the placement of Very High Frequency (VHF) and Global Positioning System (GPS) collars on individual bighorn sheep, as well as augmenting populations of bighorn sheep and introducing animals into currently unoccupied portions of their historic range. These actions require the use of a helicopter in capturing and transport efforts. The project area is located within portions of the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wildernesses on the Mono Lake, Mammoth, White Mountain, and Mt. Whitney Ranger Districts, Inyo National Forest, California. Management of SNBS was delegated to the California Department of Fish and Game by the U.S. Fish and Wildlife Service. On the Inyo National Forest, the majority (80% or approx. 275,210 acres) of the recovery area for SNBS is within designated wilderness areas and is not accessible by road. Wilderness is designated by Congress and management of these areas differs from the general forest portions of National Forest System Lands. Wilderness is a unique and vital resource; offering opportunities for primitive recreation, for scientific and educational uses, as a benchmark for ecological studies, and for the preservation of historical and natural features.

In addition to the proposed action, the Forest Service also evaluated the following alternative:

- *No Action Alternative: This alternative was considered the baseline for the analysis of the proposed action. Under this alternative, prohibited uses (i.e., helicopter landings) requiring Forest Service approval would not be implemented in wilderness areas. SNBS capture activities that do not require Forest Service authorization in wilderness include: monitoring captures conducted by drop-net and drive-net capture methods. Captures would be attempted in the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units. Population augmentations would be attempted within the Mt. Warren herd unit, as animals can be released by vehicle into the Mt. Warren herd unit.*

As described in Section 3.2.2.2 of this Environmental Assessment (EA), the proposed action may result in short-term impacts to wilderness character, specifically the opportunities for solitude or primitive recreation through the presence of mechanized equipment; however, long-term beneficial impacts would allow for progress towards downlisting and delisting goals which would lead toward recovery of Sierra Nevada bighorn sheep throughout its historic range, which includes wilderness areas.

Based upon the effects of the alternatives, the responsible official will decide whether to authorize the landing of a helicopter within designated wilderness areas by the California Department of Fish and Game for the purposes of meeting recovery actions for the Sierra Nevada bighorn sheep.

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).

1.2 Introduction

1.2.1 Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* This section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by issues.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Inyo National Forest Supervisor's Office in Bishop, California.

1.2.2 Background

The United States Department of Agriculture Forest Service (USFS), Inyo National Forest is committed to cooperating with state agencies to inventory, protect, manage, and plan for threatened, endangered, proposed, and sensitive species (FSM 2671.1). The 1995 Memorandum of Understanding between State of California Department of Fish and Game (CDFG) and United States Department of Agriculture Forest Service and the 2006 Policies and Guidelines for Fish and Wildlife Management in National Forest and Bureau of Land Management Wilderness provide the basic framework for coordinating actions and resolving differences between the USFS and CDFG. Wildlife management actions that require Forest Service 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.

Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) are a unique subspecies of North American wild sheep, with distinct genetic and morphological traits relative to other wild sheep in California. Sierra Nevada bighorn sheep inhabit alpine and subalpine environments in the Sierra Nevada for most or all of the year. On the Inyo National Forest, the majority (80% or approx. 275,210 acres) of the recovery area for SNBS is within designated wilderness areas and is not accessible by road. Bighorn sheep utilize visually open areas next to extremely steep slopes and cliffs that provide escape terrain. Bighorn sheep can generally be found in lower elevations in the winter. However, a portion of all SNBS herds exhibit habitat use patterns whereby some individual SNBS remain at higher elevations during the winter months. Consequently,

SNBS are extremely difficult to monitor because of the remoteness and ruggedness of the habitats in which they occur during all seasons.

This taxon was federally listed as endangered on January 3, 2000 following emergency listing on April 20, 1999. After federal listing and the completion of the Recovery Plan for Sierra Nevada bighorn sheep in 2007, the California Department of Fish and Game was authorized by the U.S. Fish and Wildlife Service (USFWS) to be the agency responsible for management and implementation of recovery actions for Sierra Nevada bighorn sheep. In order to meet recovery actions CDFG must gather information on population dynamics, habitat use, and individual animal health. This data is gathered using ground surveys, aerial over-flights, and capture and collaring efforts. CDFG is authorized by the USFWS to take (capture, handle, mark, collect biological samples, radio-collar, survey, translocate, and release) SNBS for the purpose of promoting recovery (USDI 2007b). CDFG has managed for SNBS since 1979. Management efforts have intensified since SNBS was emergency listed in 1999 and the Sierra Nevada Bighorn Sheep Recovery Program has focused on monitoring of bighorn sheep, their predators, and domestic species of concern, as well as through implementation of translocations (Stephenson et al 2012; Appendix B).

1.2.3 Description of the Project Area

The project area encompasses approximately 297,270 acres of SNBS habitat that includes portions of eleven herd units that occur within wilderness boundaries and areas which SNBS occupy located adjacent to, but outside, herd unit boundaries on the Inyo National Forest (Figure 1). The project area is located within portions of the Ansel Adams, Golden Trout, Hoover, John Muir, and South Sierra Wildernesses. It ranges from the Olancha Peak area north to Lundy Canyon on the eastside of the Sierra Nevada mountain range and west of Highway 395. The project area includes portions of the recovery area as identified in the Sierra Nevada Bighorn Sheep Recovery Plan (USDI 2007a). Table 1 displays the herd units within the project area, the wilderness area in which they occur and whether they are currently occupied by SNBS. The project area consists of smaller segments, i.e. capture areas, which give a more specific location to where captures would most likely occur. These capture areas represent the portions of the project area where SNBS occur and therefore where the majority of captures would take place (Figures 2, 3, and 4). Capture areas total approximately 69,640 acres.

The project area includes a variety of vegetation communities, as elevations for helicopter landings vary from 4,000 to 14,000 feet, including, 1) Great Basin sagebrush-bitterbrush-bunchgrass shrub, 2) pinyon-juniper woodland and mountain mahogany

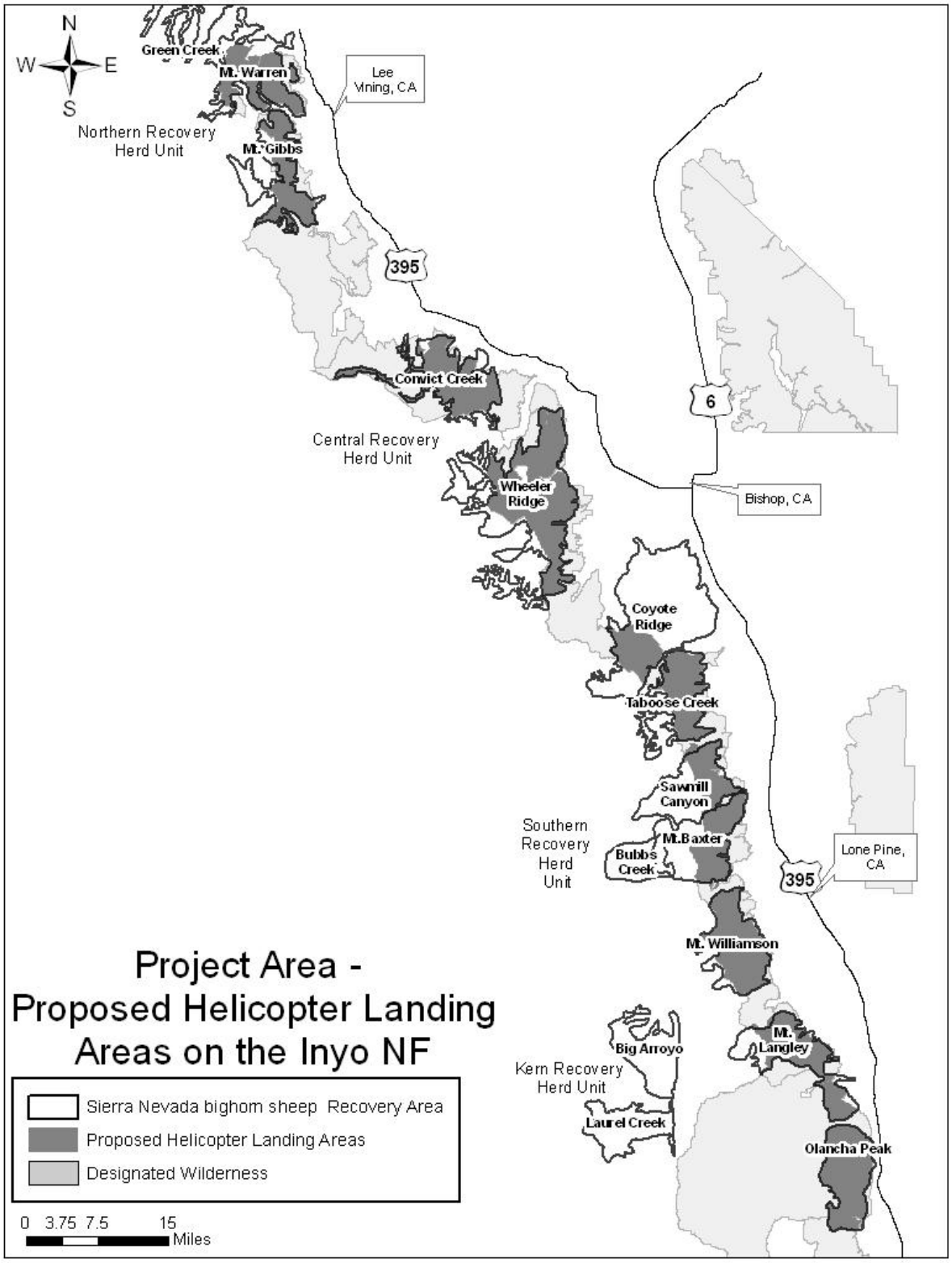
scrub, 3) mid-elevation and subalpine forests, woodlands, and meadows, and 4) alpine meadows and other alpine habitats varying from cliffs to plateaus. Optimal bighorn sheep habitat is visually open and contains steep, generally rocky, slopes (USDI 2007a).

Table 1. Sierra Nevada bighorn sheep Recovery and Herd Units within the recovery area and project area and the Wilderness Areas in which they occur

Recovery Unit	Herd Unit	Currently Occupied	Within Project Area	Wilderness
Northern	Twin Lakes	No	No	Hoover
	Green Creek	No	No	
	Mt. Warren*	Yes	Yes	
	Mt. Gibbs*	Yes	Yes	Ansel Adams
Central	Convict Creek*	Yes	Yes	John Muir
	Wheeler Ridge*	Yes	Yes	
Southern	Coyote Ridge	Yes	Yes	
	Taboose Creek*	No	Yes	
	Sawmill Canyon*	Yes	Yes	
	Bubbs Creek	Yes	No	
	Mt. Baxter*	Yes	Yes	
	Mt. Williamson*	Yes	Yes	
	Mt. Langley*	Yes	Yes	John Muir, Golden Trout, and Sequoia Kings Canyon**
	Olancha Peak*	No	Yes	Golden Trout and South Sierra
Kern	Big Arroyo*	No	No	Sequoia Kings Canyon**
	Laurel Creek*	No	No	

* Indicates herd units that need to be occupied by both sexes to meet delisting goals (also see Table 5).
**The project area is limited to National Forest System lands managed by the Inyo National Forest. The herd units or portions of herd units managed by the Sequoia and Kings Canyon National Parks are outside the project area.

Figure 1. Project Area Map



1.3 Purpose and Need

The purpose of this project is to support CDFG in its implementation of the Recovery Plan for SNBS (USFWS 2007a) by authorizing the landing of a helicopter to conduct population monitoring and translocation (introductions and augmentations) efforts within the SNBS recovery area on the Inyo National Forest. The Inyo National Forest is required, following Forest Manual direction, to manage habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the Endangered Species Act are no longer necessary (FSM 2670.21). Furthermore, the Endangered Species Act requires federal agencies to carry out programs for the conservation of endangered and threatened species (ESA Section 7 (a)(1)). There is a need to follow this direction and incorporate and implement recovery objectives that are identified in the Recovery Plan (USDI 2007a).

The recovery area was originally defined in the 2007 Recovery Plan by the U.S. Fish and Wildlife Service and includes four Recovery Units which are made up of 16 herd units and total approximately 554,940 acres. Eleven herd units (343,660 acres) occur on the Inyo National Forest, of which 80% is located within wilderness (275,210 acres) (Table 2). At the time of listing, seven herd units were occupied by SNBS (278,620 acres) of which 161,880 acres were located within the Hoover, Ansel Adams, John Muir, and Golden Trout Wilderness areas. Since listing one additional herd unit has been naturally colonized by SNBS and there was also an increase in Wilderness areas due to the signing of the 2009 Omnibus Bill, increasing the amount of occupied SNBS herd units to 237,510 acres within Wilderness.

This action is needed because the majority of SNBS habitat (61%) and occupied habitat (75%) occurs on the Inyo National Forest.

Table 2. Percentage of Sierra Nevada bighorn sheep habitat which occurs within wilderness

Land Manager	Acres of SNBS Habitat	Acres of SNBS habitat within wilderness	Percent of SNBS habitat within wilderness
Inyo NF	343,660	275,210	80%
Other Managed Lands (Humboldt-Toiyabe NF, Sierra NF, Sequoia NF, Yosemite NP, Kings Canyon NP, and Sequoia NP)	211,280	196,350	92%
Total	**554,940**	**471,560**	**84%**

Furthermore, based on GPS collar information gathered by CDFG from 2007 through January of 2012, approximately 19,906 SNBS locations have been documented on the Inyo National Forest, of which 91% occur within wilderness (Table 3). The action is needed because the majority (91%) of SNBS locations occurs within wilderness areas managed by the Inyo National Forest.

Table 3. Percentage of Sierra Nevada bighorn sheep GPS collar locations which occur within wilderness

Land Manager	Number of SNBS GPS Collar Locations	Number of SNBS GPS Collar Locations within Wilderness	Percent of Collar Locations within Wilderness
Inyo NF	19,906	18,186	91%
Other Managed Lands (Humboldt-Toiyabe NF, Sierra NF, Sequoia NF, Yosemite NP, Kings Canyon NP, and Sequoia NP)	3,634	3,480	95%
Total	**23,540**	**21,666**	**92%**

The SNBS Recovery Plan (USDI 2007a) outlined criteria for both downlisting and delisting this species through the implementation of recovery actions. This project will support the following recovery actions:

- Monitoring exposure to disease organisms of concern by sampling and testing for disease pathogens when SNBS are captured and tracking SNBS movements

using VHF and GPS collars in herd units with domestic sheep allotments in close proximity.

- Investigating genetic population structures and determining genetic diversity from blood samples collected during captures and fecal samples collected during ground monitoring efforts.
- Gathering data on population parameters, seasonal distribution, and monitoring status and trends of bighorn sheep herds and habitats by placing new, or replacing old, Very High Frequency (VHF) and Global Positioning System (GPS) collars on any captured SNBS.
- Increasing the geographic distribution and overall number of sheep by translocating sheep from herd units with suitable population numbers to augment smaller population herd units and re-introduce sheep into currently unoccupied herd units.

In order to accomplish recovery actions, bighorn sheep need to be handled to take blood samples, to affix new or repair old VHF and GPS collars, and translocate selected sheep to new herd locations. In order to capture bighorn sheep the landing of a helicopter is needed. In this case, helicopter landing includes the firing of hand-held net guns from the helicopter by capture specialists and brief landings to allow the capture crews to restrain and prepare the bighorn sheep for transport, and to release the sheep following data collection.

Captures would be conducted at times of the year that minimize the impact to the animals both physically and socially. Monitoring captures would be conducted in October, in most cases, to avoid disturbance during the rut (November and December) and bighorn use of lower elevation winter ranges. Occasionally monitoring captures may occur in January through the first week of April, if animals are located in higher elevation winter habitat. Translocation captures would be conducted in the spring (March through first week in April) and would focus on the capture of pregnant ewes. Moving pregnant ewes allows for minimizing the number of animals captured, while maximizing the number of animals translocated. Translocating bighorn sheep in the spring prevents animals from experiencing prolonged, severe winter conditions in a new environment as they would if moved in the fall. No captures would occur from mid-April through September in order to avoid lambing season and because helicopters are unable to work at higher elevations in warmer conditions.

Data gathered on genetic diversity, presence of disease, and reproductive status during monitoring captures informs CDFG's management decisions on which animals to use

for translocations. When translocating sheep, CDFG selects pregnant females with high genetic diversity and reproduction rates, which are determined based on long-term data sets made possible by monitoring captures. Monitoring captures are needed to allow CDFG to employ an adaptive management strategy in which data collected from collared SNBS are used to determine the best possible options in SNBS management. Sampling a representative portion of the population is required to allow monitoring of population size, vital rates, habitat use, health, and cause specific mortality. GPS and VHF collars are used to mark those representative individuals. Currently 30% of SNBS ewes are collared. CDFG has estimated the need to mark 35% of the current population to meet the sampling design.

In 2012 and 2013, some of the captures in the Sawmill Canyon, Mt. Baxter, Mt. Williamson, and Mt. Langley herd units would be used to increase understanding of SNBS use of high elevation summer habitat for the Sequoia-Kings Canyon National Parks (SEKI) Wilderness Stewardship Plan. Data obtained from these captures and collared SNBS would support the wilderness research needed for the SEKI Wilderness Stewardship Plan currently being developed. SEKI has also authorized CDFG to conduct re-introductions of SNBS into the Big Arroyo and Laurel Creek herd units located in the parks. The source herd units for these translocations are located in Inyo NF wilderness areas (Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley). Monitoring and translocation captures would occur within Inyo NF wilderness because approximately 75 percent of SNBS located in herd units adjacent to SEKI (i.e., Sawmill Canyon, Mt. Baxter, Mt. Williamson, and Mt. Langley) occupy Inyo NF wilderness areas in the fall and spring when captures can safely occur.

Project Objectives

Project objectives are specific actions that are tied to recovery actions and downlisting and delisting criteria as listed in the Recovery Plan and described in the next subsection.

1) *Maintaining VHF/GPS collars on 35% of SNBS ewes and collar all SNBS rams within the Northern Recovery Unit:* Ewes are used to determine population growth rates and recovery status is based on the number of ewes present within each Recovery Herd Unit, therefore the priority is to increase the percentage of SNBS ewes collared. Currently 30% of SNBS ewes are collared. In order to collect demographic data with reasonable statistical power, GPS collars need to be placed on 35% of SNBS ewes (Appendix C). 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 because these herd units are listed as essential for recovery to occur.

The needs for collaring rams differ among Recovery Units. In the Northern Recovery Unit there is a high risk of potential disease transmission between domestic sheep and SNBS. SNBS rams are the potential vector for this transmission and therefore data on ram movements is needed in order to inform management decisions on domestic sheep grazing in this area. Therefore there may be a higher percentage of SNBS rams collared in the Northern Recovery Unit than the Central or Southern Recovery Units.

Captures conducted to meet the purposes of SEKI's research and monitoring project would also be added to the percentage of ewes and rams collared in the Sawmill Canyon, Mt. Baxter, Mt. Williamson, and Mt. Langley herd units. Monitoring of these additional collared animals would continue for the life of the collar allowing CDFG to gather more information on SNBS in these areas and to further recovery efforts.

2) *Augment SNBS populations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units:* The current population of SNBS does not meet the recovery goals established in the Recovery Plan. This is because population numbers in essential herd units such as Mt. Warren, Mt. Gibbs, and Convict Creek (Northern and Central Recovery Units) are low enough where a stochastic event may lead to a delay in recovery in these areas or localized extirpation. CDFG has determined the need to augment SNBS populations in these herd units, as these herd units are essential for recovery and the numbers of female SNBS in each herd unit need to be increased in order to meet downlisting and delisting criteria (Appendix C).

3) *Introduce SNBS populations into the Taboose Creek and Olancha Peak herd units:* In order to meet the distribution of SNBS needed for recovery, SNBS need to be introduced into the currently unoccupied Taboose Creek and Olancha Peak herd units on the Inyo National Forest. Two additional herd units are required for delisting and occur in the Sequoia and Kings Canyon National Parks, Big Arroyo and Laurel Creek herd units. Although these herd units not on the Inyo NF; SNBS need to be captured on the Inyo NF to be placed in these two herd units (Appendix C).

Recovery Plan Downlisting and Delisting Criteria

Downlisting criteria identify the conditions at which the status of the species has improved to the point that it is no longer endangered, and may be proposed to be reclassified as threatened. Delisting criteria represent the minimum conditions necessary to propose removing the taxon from the endangered species list. The recovery plan for SNBS outlines two downlisting criteria and four delisting criteria. The action needed would address one of the downlisting criteria and two of the delisting criteria.

Downlisting Criteria

Downlisting criteria for SNBS require a minimum total of 305 females at least one year of age. At least 50 of those females must be in the Kern Recovery Unit, 155 females in the Southern Recovery Unit, 50 females in the Central Recovery Unit, and 50 females in the Northern Recovery Unit. The numbers outlined in Table 4 display the SNBS present within the recovery area at the time of listing, SNBS numbers in 2010, and the numbers needed for downlisting.

Table 4. Downlisting recovery criteria for the number of females at least one year of age for each recovery unit and the progress made toward those goals to date

Recovery Unit	**Females at least 1 year of age**		
	At time of listing	2010	Needed for Downlisting
Northern	8	25	50
Central	18	33	50
Southern	29	124	155
Kern*	0	0	50
Total	**55**	**182**	**305**

***** Indicates recovery unit outside of the project area.

Delisting Criteria

Delisting criteria for SNBS requires: 1) the number of female bighorn sheep in each recovery unit would meet downlisting criteria and be maintained as an average for at least seven years without intervention and 2) bighorn sheep of both sexes will be present in a minimum of 12 specifically identified herd units (essential herd units)

distributed as two in the Kern Recovery Unit, six in the Southern Recovery Unit, two in the Central Recovery Unit, and two in the Northern Recovery Unit. Table 5 displays the estimated number of herd units which would be occupied by both sexes over a ten-year period in order to meet the delisting criteria. These estimates are based on a predictive model of SNBS population growth rates, which can be subject to significant stochastic effects such as avalanches or disease outbreaks. These stochastic effects may lead to changes in actual population growth rates and delay recovery of SNBS in herd units with smaller population levels such as the Mt. Warren, Mt. Gibbs, and Convict Creek herd units. Augmentations into these three herd units would help the population be resistant to loses due to stochastic events.

Translocation captures are needed to achieve the population distribution required by criteria 1A. Bighorn sheep are naturally slow to disperse and colonize new habitat (USDI 2007a), thus the Olancha Peak, Taboose Creek, Laurel Creek, and Big Arroyo herd units remain unoccupied. Without introductions into these areas, downlisting goals will not be met. These herd units are geographically isolated from current SNBS populations, and population modeling conducted by CDFG indicates a low likelihood of natural colonization unless management action is taken to introduce SNBS in these units.

Recovery Timeline

As stated in the Recovery Plan: With optimal population growth rates, recovery criteria might allow downlisting within 10 years (2017) and delisting within another 10 years (2027). Under less than optimal scenarios, including unexpected catastrophes, one or more additional decades might be needed (USDI 2007a).

Table 5. Number of essential herd units occupied by both sexes and what is needed to meet delisting recovery goals (also see Table 1)

Recovery Unit	Essential Herd Units Occupied by both sexes		
	At time of listing	2010	Needed for Delisting
Northern	2	2	2
Central	1	2	2
Southern	4	4	6
Kern*	0	0	2
Total	**7**	**8**	**12**

***** Indicates recovery unit outside of the Inyo National Forest.

1.3.1 Laws, Regulations, and Policies

This action responds to the goals and objectives outlined in the Inyo National Forest Land Management Plan (LRMP), and helps move the project area towards desired conditions described in that plan (INF LRMP 1988). This project also meets wilderness management policy as outlined in the Forest Service Manual (FSM 2320).

The LRMP direction for threatened, endangered, and sensitive animal species is as follows:

- Emphasize the protection and improvement of habitat for threatened or endangered wildlife. Manage for the protection and enhancement of all historically and potentially threatened or endangered species habitat as necessary to meet recovery levels (Wildlife Standards and Guidelines page 98).

- 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 (Wildlife Standards and Guidelines page 98).

- Evaluate potential transplant sites, giving preference to sites that have no current livestock grazing (Mountain Sheep Habitat Management Prescription page 116).

Forest Service manual direction states the following policy for wilderness (FSM 2323.31, FSM 2323.32, FSM 2323.33, and FSM 2323.37):

- Provide protection for known populations and aid recovery in areas of previous habitation, of federally listed threatened or endangered species and their habitats.

- Manage wilderness to protect known populations of federally listed threatened or endangered species where necessary for their perpetuation and aid in their recovery in areas of previous habitation. When alternative areas outside of wilderness offer equal or better protection, take actions to recover threatened or endangered species outside of wilderness areas first.

- Reintroduce wildlife species only if the species was once indigenous to an area and was extirpated by human induced events. Favor federally listed threatened or endangered species in reintroduction efforts. Reintroductions shall be made in a manner compatible with the wilderness environment. Motorized or mechanical transport may be permitted if it is impossible to do the approved reintroduction by nonmotorized methods (sec. 2326).

- Conduct wildlife habitat surveys and population assessments in a manner compatible with the wilderness environment.

- Wildlife and fish research is an appropriate activity in wilderness. In all cases, research shall be conducted in such a way as to minimize any adverse impacts on the wilderness resource or its users. Research methods that temporarily infringe on wilderness character may be used provided the information sought is essential for wilderness management and alternative methods or locations are not available. Capturing and inconspicuous marking of animals, including telemetry, is permitted.

Forest Service manual direction states the following for threatened and endangered species (FSM 2670.21, FSM 2672.24b, FSM 2673.5 and FSM 2674).

- Manage National Forest System habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the Endangered Species Act are no longer necessary.

- Fully coordinate recovery strategies for fish and wildlife with the objectives of state fish and wildlife agencies.

- Translocation to achieve recovery objectives of listed species may be desirable to meet purposes of the Endangered Species Act. Translocation of species on National Forest System lands is primarily the responsibility of the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state fish and wildlife management agencies, with cooperation from the Forest Service.

- The Forest Service shall encourage the reintroduction of listed wildlife, fish, and plants onto suitable unoccupied habitat when such actions promote recovery of the species. Reintroduction of species on National Forest System lands is primarily the responsibility of U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state fish and wildlife management agencies, with cooperation from the Forest Service. All reintroduction projects should be consistent with objectives of approved recovery plans, if available.

1.4 Proposed Action

The Inyo National Forest proposes to authorize the California Department of Fish and Game to land a helicopter within portions of the Ansel Adams, Golden Trout, Hoover, John Muir, and South Sierra Wildernesses for the purpose of conducting population monitoring and translocation captures of Sierra Nevada bighorn sheep over a 10-year period. These activities are being proposed to facilitate meeting the goals of the Recovery Plan (USDI 2007a). Goals of the Recovery Plan would be met by monitoring the status of radio-collared bighorn sheep to determine vital rates, estimate population size, understand bighorn sheep habitat use, and by augmentation and reintroduction of SNBS to restore this unique subspecies to portions of its historic range in the Sierra Nevada and ensure its long-term viability. Helicopter-supported capture of bighorn sheep with net-guns would occur to support both population monitoring and translocation activities. Captures for monitoring purposes would fit VHF radio-transmitters and GPS collars onto SNBS allowing movements of these SNBS to be monitored remotely. Translocation captures would allow for SNBS to be moved into currently occupied habitat (augmentations) or into historical, unoccupied habitat (introductions). Additional information about the Proposed Action can be found in Chapter 2, Section 2.2.

1.5 Decision Framework

Given the purposes and need, the deciding official will review the proposed action and the other alternatives in order to determine whether or not to authorize helicopter landings by the CDFG within designated wilderness areas for the purposes of capturing Sierra Nevada bighorn sheep.

1.6 Public Involvement

The proposal was listed in the Schedule of Proposed Actions on April 1, 2011. The proposed action was provided to the public and other agencies for comment during scoping (April 2011). In addition, as part of the public involvement process, the agency conducted pre-scoping of interested parties in February, 2011. These parties included Wilderness Watch, Wilderness Society, and High Sierra Hikers Association. Interested parties were contacted by Acting Forest Supervisor, Jon Regelbrugge, and Acting Recreation Staff Officer, Diana Pietrasanta. Eight comment letters were received during scoping, including John Benediktson (citizen), Craig London (Rock Creek Pack Station), Lone Pine Paiute-Shoshone Reservation, Lahontan Regional Water Quality Control

Board, Los Angeles Department of Water and Power, Wilderness Watch, Sierra Nevada Bighorn Sheep Foundation, and the Wild Sheep Foundation.

1.6.1 Native American Consultation

Native American Tribes that claim ancestral home lands within the project area were consulted pursuant to the American Indian Religious Freedom Act of 1978, Executive Order 13007 (1996), and under Section 101(d)(6)(B) of the National Historic Preservation Act of 1966 (as amended). No issues or concerns have been brought forward. This project has been discussed with the following Tribes via formal letters, phone calls and meetings. Formal consultation for this project began in April 2011.

Federally Recognized Tribes:

Benton Paiute Reservation
Big Pine Paiute Tribe of Owens Valley
Bishop Paiute Indian Tribe
Ft. Independence Community of Paiute Indians
Kern Valley Indian Tribe
Tubatulabals of Kern Valley
Lone Pine Paitue-Shoshone Reservation
Timbisha Shoshone of Death Valley

Not Federally Recognized Tribe:

Mono Lake Kutzadika[a] Tribe

1.7 Issues

An issue is a point of debate, dispute, or disagreement regarding anticipated effects of the proposed action. Public and internal scoping identified the following issues concerning the effects of the proposed action.

Wildlife – Sierra Nevada bighorn sheep: Concerns were raised during scoping regarding the effects of helicopter net-gun captures on SNBS and the long-term effects of captures in low elevation SNBS winter range.

In order to display the differences in the direct effects from capturing SNBS between each alternative the duration of each capture method was selected as an indicator. A capture event is defined as the time from the animal being controlled by a net or dart through processing the animal and then releasing it. Each capture method has a difference in the amount of time a SNBS is handled. Although each capture event is different and there may be many variables in determining how long a SNBS will be captured, the average times were used for this analysis. Average timeframes were discussed with CDFG biologists who have conducted this work on SNBS over the last 10 years.

Quantifiable indicators are used to compare effects between alternatives for the three objectives mentioned in the purpose and need for the project: 1) The percentage of SNBS ewes and rams collared over 10-years; 2) The number of SNBS placed within the Mt. Warren, Mt. Gibbs, and Convict Creek herd units for the purposes of augmenting these herd units; and 3) The total number of SNBS placed within the Taboose Creek and Olancha Peak. Effects of the alternatives on wildlife are disclosed in Section 3.2.1.

Wilderness*:* Concerns were raised during scoping regarding the effects of the proposed action on wilderness quality characteristics, including: natural, untrammeled, undeveloped, and opportunities for solitude.

Several indicators are used to compare the effects of the alternatives on wilderness character: 1) The number of herd units occupied by SNBS, a species endemic to the alpine ecological systems in Inyo NF wilderness areas; 2) The duration of a capture event and the duration of the handling of SNBS; 3) The number of helicopter landings; and 4) The number of days over which helicopter landings would occur. Effects of the alternatives on wilderness are disclosed in Section 3.2.2.

Chapter 2 Alternatives

2.1 Introduction

This chapter describes and compares the alternatives considered for the Authorization of Helicopter Landings for SNBS captures by CDFG in Wilderness Areas Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter landings versus no helicopter landings) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., translocation of SNBS).

2.2 Alternatives

2.2.1 Alternative 1 (No Action)

The Inyo National Forest recognizes that the California Department of Game and Fish is the responsible agency in charge of managing Sierra Nevada bighorn sheep and therefore may conduct captures of bighorn sheep within wilderness boundaries with the use of capture methods that do not require authorization for prohibited uses (i.e., helicopter landings). Two capture methods, drop-nets and drive-nets, may be conducted without Forest Service authorization. In order to fully compare the effects of these capture methods on wilderness quality and wildlife, this No Action Alternative describes what activities CDFG may conduct in wilderness areas if they are not permitted to land helicopters associated with helicopter net-gun captures of SNBS.

The herd units listed for these captures are those in which SNBS still utilize low elevation winter range and were used in the past by CDFG when conducting captures using these methods (Appendix B).

Monitoring captures would be conducted with the use of drop-nets and drive-nets, described below. The feasibility of using drop-net and drive-net methods is dependent upon: capture areas being located adjacent to roads so capture crews can easily access the site; ensuring the capture area is located within or adjacent to low elevation winter range being currently used by SNBS, length of time each method would take in capturing SNBS, and the number of SNBS captured during each capture event.

Drive-netting would not be used in the Mt. Langley herd unit because the terrain is unfavorable for helicopter flights, which are a part of this capture method.

Monitoring Activities

Monitoring activities include those which involve locating SNBS, affixing VHF/GPS collars, and obtaining health information on individual SNBS.

Monitoring Captures Conducted by Drop-net and Drive-net: Drop-net activities would be attempted in the Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units. Drive-netting would occur in the Wheeler Ridge, Mt. Baxter, and Sawmill Canyon herd units.

Drop-net and drive-net monitoring captures would occur in January through the first week of April, and although they would take several weeks, would cease before lambing season (latter part of April through end of May). Captures would occur in each herd unit every four years over a ten-year period.

Translocation Activities

The translocation of SNBS for the purpose of augmenting existing herds or introducing sheep into currently unoccupied herd units requires both the capture of individual sheep from a source population, and the transport and release of those sheep into the new herd unit.

Population Augmentations:

- Conducting drop-net captures in the lower elevation portions of the Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units which are located in wilderness areas.

- Conducting drive-net captures in the lower elevation portions of the Wheeler Ridge, Sawmill Canyon, and Mt. Baxter herd units which are located in wilderness areas.

- Moving SNBS from the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, or Mt. Langley herd units and placing them in the Mt. Warren herd unit. Augmentations or introductions would not be conducted in any other herd unit as explained in Appendix C.

These captures would occur in March to the first week of April. Captures would occur in each herd unit every four years over a ten-year period. Generally SNBS are specifically chosen to be moved based on their current health and reproductive success; however, due to the limitations in conducting captures using these methods (Appendix C), the

SNBS captured for augmentation purposes would be any of those located within the capture area at that time. SNBS would be moved to the Mt. Warren herd unit by vehicles and released in the lower elevations of this herd unit. Population augmentations would be conducted in the Mt. Warren herd unit because this herd unit is essential for recovery of SNBS and is accessible to vehicles. SNBS would be moved to the herd unit by vehicles and released in the lower elevations of this herd unit outside wilderness.

Table 6. Activities and location of proposed activities under Alternative 1 (No Action)

Herd Unit	Monitoring and Translocation		Time of Year	
	Drop-Net	Drive-Net	Monitoring	Augmentation
Mt. Warren			January to 1st week of April	March to 1st week of April
Mt. Gibbs				
Convict Creek				
Wheeler Ridge		✓		
Coyote Ridge				
Taboose Creek				
Sawmill Canyon	✓	✓		
Mt. Baxter	✓	✓		
Mt. Williamson				
Mt. Langley	✓			
Olancha Peak				

Description of capturing methods:

There are two methods of capturing SNBS proposed under Alternative 1; these include drop-net and drive-net. Each capture method would include the same techniques in gathering data once a SNBS is captured. This involves: each SNBS receiving 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.

Drop-net: Drop-netting involves catching groups of bighorn sheep by dropping a net on them after luring SNBS into a specific area. Supplies and equipment would be transported along roads adjacent to capture locations.

A crew of ten to twenty-five people is needed to set up the drop-net station and conduct the capture. The crew may be present within each drop-net station area for a few days at a time while they set up the station and conduct the capture. At least three crew members would visit the drop-net station, daily, to observe bighorn activity and replace bait. The net-station is established for approximately six weeks.

The drop-net capture area is approximately 20 feet by 20 feet. Some vegetation may be trimmed or removed to allow for nets to effectively capture SNBS (i.e. nets completely touch the ground when released). Bait consists of hay, which would be certified weed-free. Bait needs to be left on-site for a few weeks to allow bighorn sheep to be attracted to the area. After bighorn are observed using the area, the net is suspended above the bait by poles. The crew then waits a few days more for the bighorn sheep to use the area again once they are used to the presence of the net. Once the crew determines the bighorn are comfortable with the presence of the drop-net station the net is dropped on top of the sheep. Once caught in the net, the bighorn sheep would be restrained, health data collected, and then fitted with tracking collars. After processing the bighorn sheep will be released at the capture site and all capture equipment is taken down and removed from the site.

Drive-net: Drive-netting involves capturing groups of bighorn sheep by driving them into a net using a helicopter. A crew of ten to twenty-five people is needed to set up the drive-net station. Captures would more than likely occur in low elevation habitat where stations are easily accessible by roads. The crew may be present within each drive-net station area for up to a week.

Helicopter landings are not required because all animal handling is performed by the ground crew. The helicopter is used solely to drive the bighorn into the drive-net at the capture site.

The drive-net capture area is approximately 40 feet by 40 feet and can be linear in shape, angled, or shaped like a corral, depending on terrain. Some vegetation may be trimmed or removed to allow for nets to effectively capture SNBS. Nets are generally

placed on the lee-side of small ridges or hills where they are out of sight from the bighorn being driven into the net. Once caught in the net, the bighorn sheep would be restrained, health data collected, and then fitted with tracking collars. After processing, Sierra Nevada bighorn sheep will be released at in the capture site for monitoring captures, or crated and transported to the nearest vehicle for driving to a new release site. All capture equipment is taken down and removed once the capture is completed.

2.2.2 Alternative 2 (Proposed Action)

Under the Proposed Action, helicopter landings would be authorized within portions of the Ansel Adams, Golden Trout, Hoover, John Muir, and South Sierra Wildernesses to conduct population monitoring and translocation captures of Sierra Nevada bighorn sheep over a 10-year period. These activities are being proposed to facilitate meeting the goals of the Recovery Plan (USFWS 2007). Goals of the Recovery Plan would be met by monitoring the status of radio-collared bighorn sheep, to determine vital rates, estimate population size, understand bighorn sheep habitat use, and by augmentation and reintroduction of SNBS to restore this unique subspecies to portions of its historic range in the Sierra Nevada and ensure its long-term viability. The project area includes the portions of herd units and SNBS use areas which are located in wilderness. This area totals approximately 279,270 acres. Based on actual SNBS location data gathered by CDFG from GPS/VHF collars and ground surveys, approximately 90% of captures are expected to occur in smaller capture areas within the larger project area (Figures 2, 3, and 4).

As explained in Appendix C, the minimum number of captures necessary to meet project objectives is 424 SNBS. Approximately 654 helicopter landings would be required over a 10-year period to capture SNBS for monitoring purposes, with a maximum of 70 landings occurring per year (Table 8). Translocation captures would occur for the purpose of augmentations and reintroductions and require approximately 101 helicopter landings, on the Inyo National Forest, over a 10-year period, with a maximum of 30 landings occurring per year (Table 8). Total landings over a 10-year period would be 755 with a maximum of 100 occurring per year.

The following design features were created to help minimize impacts to wilderness quality:

- Captures will be scheduled for weekdays, but in the event weather conditions or equipment and personnel availability postpone or require quick response, helicopter flights and landings may occur on a weekend. In order to minimize potential conflicts with wilderness character caused by the sound of helicopters in wilderness and helicopter landings in wilderness, all efforts will be taken to

reduce capture events on the weekends.

- When safe to do so and operationally feasible, flight paths will avoid trail corridors in the Recovery Units. When conducting capture activities in the Southern Recovery Unit in October, avoid areas with likely visitation (Lone Pine Creek, Meysan Creek, and North Fork Lone Pine Creek) when possible.

- Nets that miss bighorn will be collected to prevent adverse effects on Wilderness character and or the safety of wildlife and visitors. The helicopter will land immediately after a bighorn is netted, but the helicopter will not park (i.e. turn the engine off).

- Helicopters will land on bare ground whenever possible to avoid disturbing vegetation at the site.

- SNBS will be processed and fitted with collars outside of Wilderness to avoid additional helicopter landings in Wilderness.

- All equipment including helicopter and nets will be inspected prior to use. Any weeds, seeds, or soil will be removed prior to the project activities.

- To provide for adaptive management for the protection of sensitive plant species located on Olancha Peak in the Olancha Peak herd unit, SNBS populations would be monitored and protective measures may need to be implemented if SNBS are having negative impacts to these sensitive and rare plant populations.

- All fueling activities would occur outside wilderness areas and Riparian Conservation Areas (RCAs).

- If a fuel spill occurs the following Best Management Practices (BMPs) would be implemented:

    - If helicopters are to be refueled outside of an airport/helipad, ensure that a spill kit is on-site and that procedures to prevent fuel spills are in place. Have the helicopter operators provide the Forest Hydrologist with a copy of their fueling guidelines/Best Management Practices to review before work begins.

Monitoring Activities

Monitoring activities include those which involve locating SNBS, affixing VHF/GPS collars, and obtaining health information on individual SNBS.

Monitoring Captures: Activities would occur in all herd units

- Affixing new or repairing/replacing old VHF and GPS collars,
- Collecting blood samples,
- Monitoring individual bighorn sheep health (age, presence of diseases, pregnancy, etc.)

Monitoring captures would occur within the Mt. Warren, Mt. Gibbs, Convict Creek, Wheeler Ridge, Coyote Ridge, Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Mt. Langley, and Olancha Peak herd units.

Monitoring captures would be conducted in October, in most cases, to avoid disturbance during the rut (November and December) and bighorn use of lower elevation winter ranges. Occasionally monitoring captures may occur in January through the first week of April, if animals are located in higher elevation winter habitat.

Captures would be planned based on current weather conditions and needs. The need for monitoring captures is based upon the repair and replacement schedule of VHF/GPS collars (the average collar life is 5 years). Not all herd units would receive monitoring captures every year, as the needs for monitoring captures can change from year to year and depend on available funding, equipment, personnel and weather conditions. In any given year the maximum number of days spent on monitoring capture work for all herd units is 14 days and the approximate number of helicopter landings, in any given year, is 70 (Table 8).

In 2012 and 2013, some of the captures in the Sawmill Canyon, Mt. Baxter, Mt. Williamson, and Mt. Langley herd units would be used to increase understanding of SNBS use of high elevation summer habitat for the Sequoia-Kings Canyon National Parks (SEKI) Wilderness Stewardship Plan. Approximately 40 SNBS would be captured for monitoring purposes. Although these additional bighorn sheep would be captured for the purposes of SEKI's Wilderness Stewardship Plan, CDFG would continue to monitor these animals throughout the life of the collar and all information gathered would be used to further recovery efforts. Once collars are placed on SNBS for the purposes of meeting SEKI's project objectives, monitoring captures in these four herd units would decrease in accordance to the maintenance needs of those collars.

Translocation Activities

The translocation of SNBS for the purpose of augmenting existing herds or introducing sheep into currently unoccupied herd units requires both the capture of individual sheep from a source population, and the transport and release of those sheep into the new herd unit.

Population Augmentations:

- Conduct captures in the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units,

- Move captured SNBS into the Mt. Warren, Mt. Gibbs, and Convict Creek herd units.

Population Introductions:

- Conduct captures in the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units

- Move captured SNBS into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units

Translocations would only occur in years where population size supports the removal of animals; therefore translocation captures may not occur every year, and may not occur in the same herd unit every year. In any given year, a maximum of 30 helicopter landings would occur over a maximum of nine days for translocation captures (Table 8).

Helicopter landings would occur when bighorn sheep are captured from the source population (Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units) and would be used to release animals from a flight box (container carried by a helicopter to the release location) in the Mt. Gibbs and Convict Creek. In the Mt. Warren, Taboose Creek, or Olancha Peak herd units, road access allows animals to be transported to the release site by vehicle outside of designated wilderness.

Translocation captures would be conducted in the spring (March through first week in April) and would focus on the capture of pregnant ewes. No captures would occur from mid-April through September in order to avoid lambing season and because helicopters are unable to work at higher elevations in warmer conditions.

Captures would be planned based on current weather conditions and the availability of source stock. Capture periods within these source population herd units occur over a total of a one-week period, with work occurring over a one to three day period within

each herd unit. The maximum number of animals removed per year from a single herd unit (source population) would be approximately 10 ewes and 5 rams.

Description of capture methods

Helicopter net-gun: 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 one or two crew members 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). Once a SNBS is captured it receives 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.

After handling is complete, bighorn sheep would be transported via helicopter to their initial capture location, where the release crew would be waiting to release the animal. After the bighorn is released, the crew will re-enter the helicopter. Capture time for this method is approximately one day in each capture area.

A flight box would be used during translocation captures to release animals at higher elevations in the Mt. Gibbs and Convict Creek herd units. A capture crew would be flown in and left at the release site. The helicopter would then return with the bighorn sheep, which would be released from the flight box by the capture crew. The flight box would then be flown to the base station and detached from the helicopter, which would then fly back and pick up the capture crew.

Although the number of captures–and therefore the number of helicopter landings--can vary in any given year, they would not exceed the maximum number shown in Table 8. All monitoring and translocation captures are dependent upon multiple variables which only allow for best approximations or averages for a maximum number of landings and days spent on captures annually and over the 10-year authorization period (Table 8). Population growth rates, collar condition and functionality, weather conditions, and

stochastic events (avalanches, disease outbreaks, etc.) may affect the number and type of captures conducted, as would the availability of funds, equipment, and personnel. The maximum numbers presented for days and landings are based on the best information available at this time, including projected population growth rates, collar replacement schedule, and CDFG's experience from past capture events.

Table 7. Activities and location of proposed activities under Alternative 2 (Proposed Action)

Herd Unit	Monitoring and Translocation Capture Method	Time of Year	
		Monitoring	Translocation
Mt. Warren	Helicopter net-gun	October or January through first week of April (if SNBS occur in higher elevations)	March to 1st week of April
Mt. Gibbs			March to 1st week of April
Convict Creek			---
Wheeler Ridge			March to 1st week of April
Coyote Ridge			---
Taboose Creek			March to 1st week of April
Sawmill Canyon			March to 1st week of April
Mt. Baxter			March to 1st week of April
Mt. Williamson			---
Mt. Langley			March to 1st week of April
Olancha Peak			March to 1st week of April

Table 8. Maximum number of helicopter landings and days monitoring and translocation captures would occur within wilderness for all herd units.

	Maximum number of landings in any given year	Maximum number of days in any given year
Monitoring Captures	70	14
Translocation Captures	30	9
Combined Maximum Number for any given year	**100**	**17***

*These days are not additive because funding constraints limit the maximum number of days a helicopter can be used in a year.

Figure 2. Proposed Capture Areas for the Northern Recovery Area (Mt. Warren and Mt. Gibbs Herd Units)

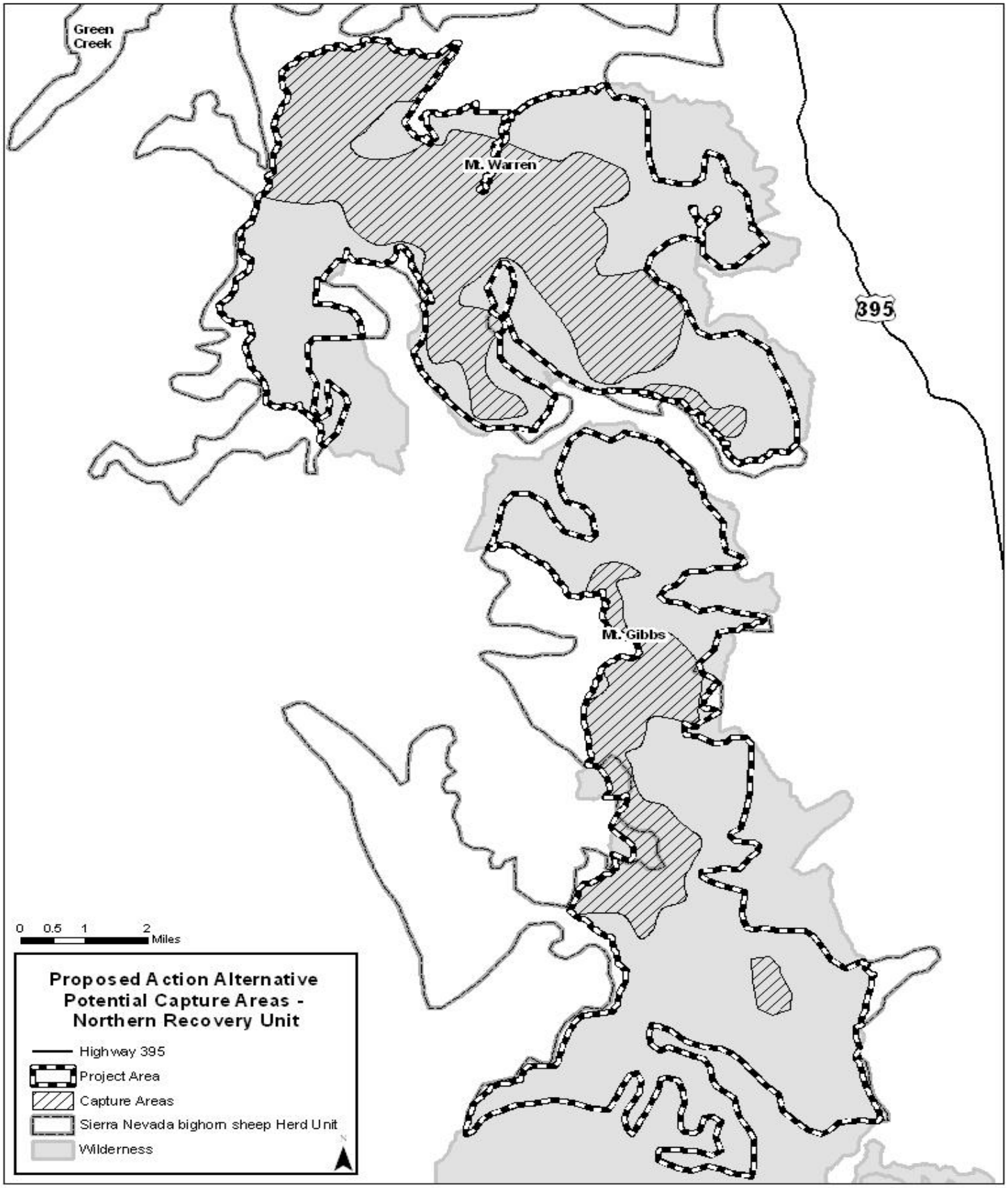


Figure 3. Proposed Capture Areas for the Central Recovery Area (Convict Creek and Wheeler Ridge Herd Units)

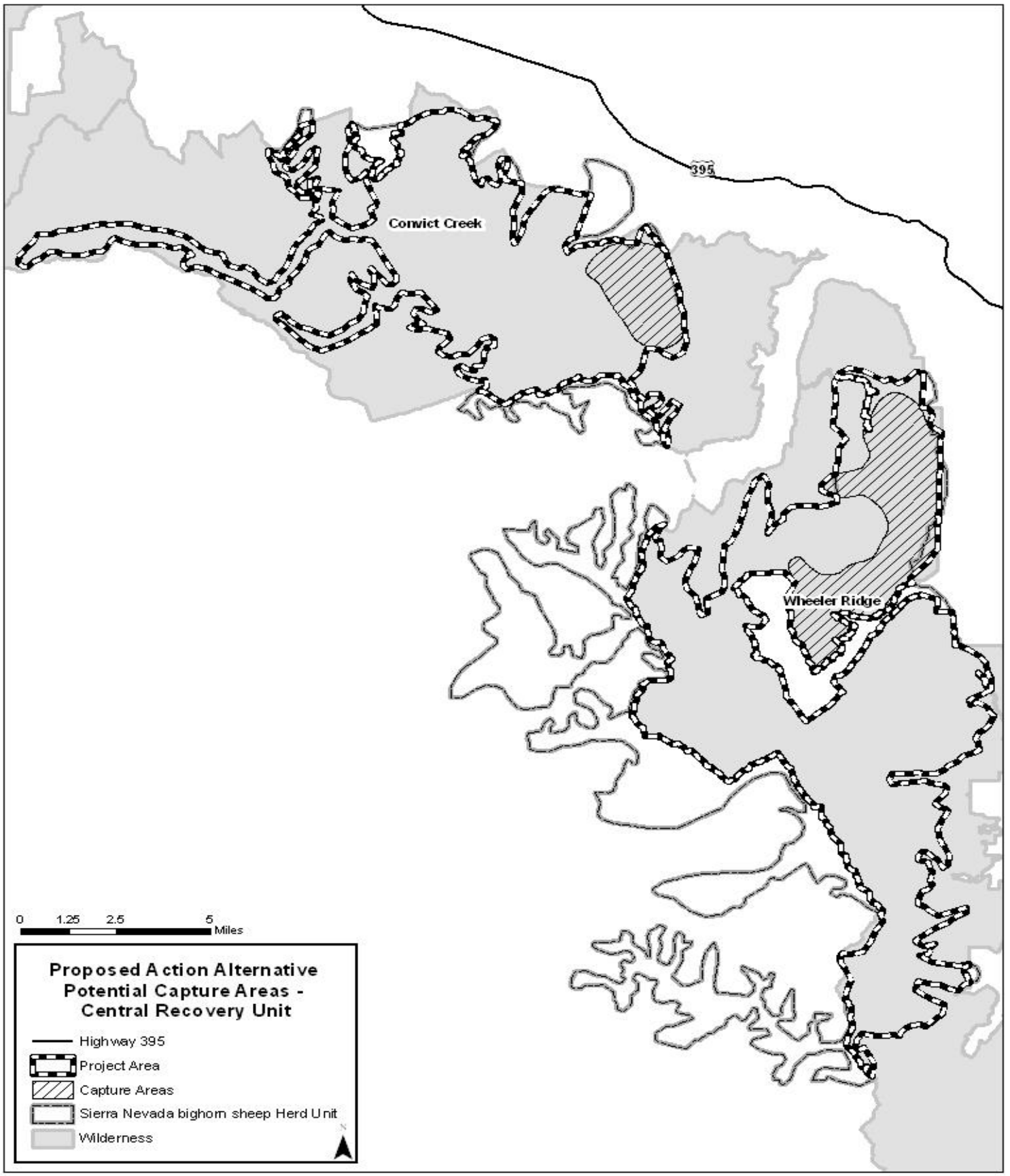
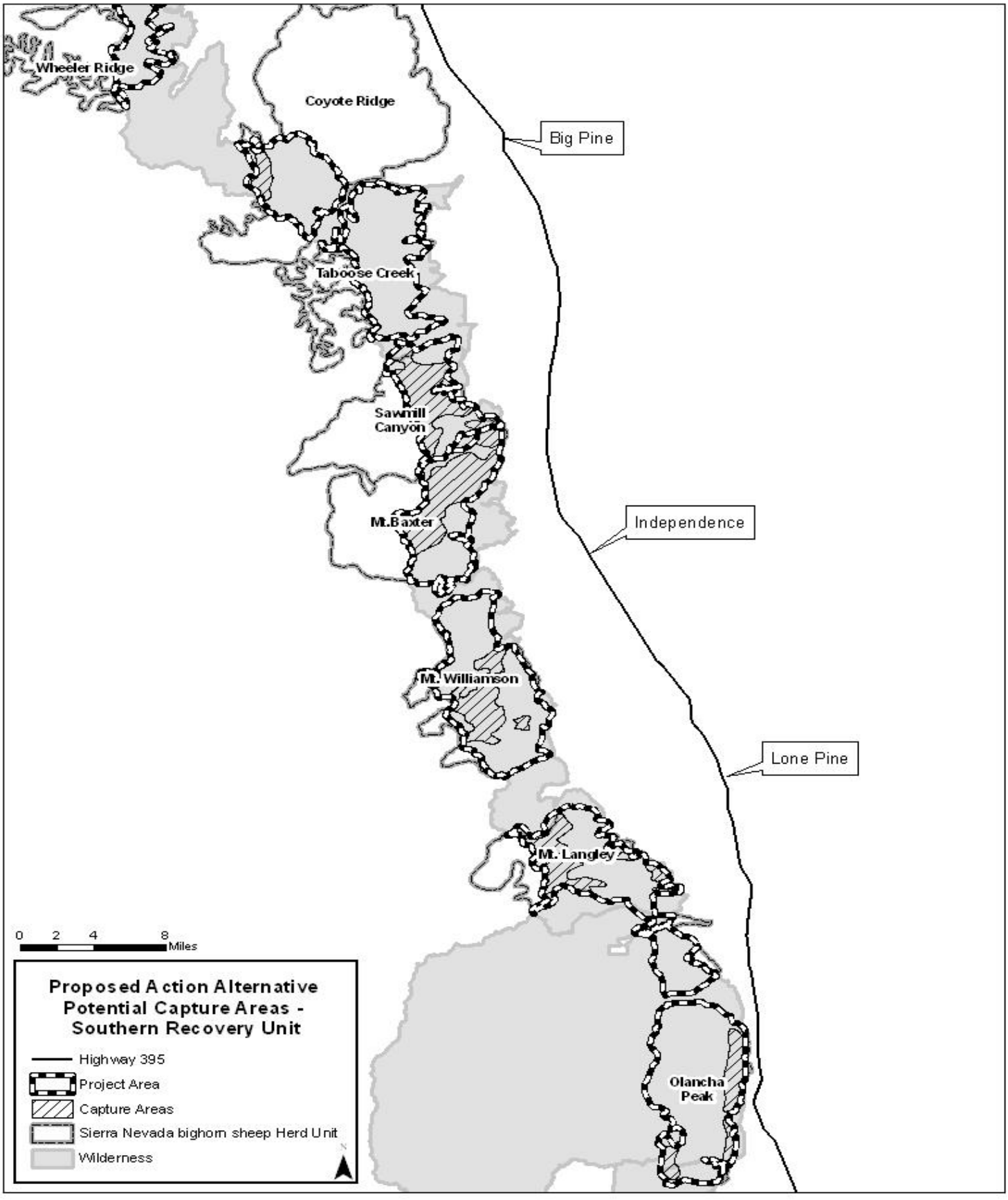


Figure 4. Proposed Capture Areas for the Southern Recovery Area (Coyote Ridge, Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Mt. Langley, and Olancha Peak Herd Units)



2.3 Alternatives Considered But Eliminated

The following are alternatives that were considered but eliminated from analysis.

2.3.1 Non-motorized Alternative

This alternative was brought forth through scoping comments provided by Wilderness Watch and High Sierra Hikers in which they requested an "alternative that would minimize the use of helicopters temporally and spatially" (Wilderness Watch and High Sierra Hikers 2011). In order to reduce effects from motorized use within wilderness areas, this alternative would only allow for non-motorized captures within wilderness areas (i.e., drop-nets and darting, described in Section 2.2.1).

The effects of these capture methods are analyzed in detail in Alternative 1 (No Action) and can be found in Sections 3.2.1.1, 3.2.2.1, and 3.3.1. Although these capture methods would reduce motorized use within wilderness areas, this alternative would not meet the purpose and need of the project. This is because: 1) the ability to capture specific SNBS for the purposes of replacing collars would be low (Sections 3.2.1.1 and 3.3.1), 2) the ability to capture the amount of animals needed for a successful translocation would not be met (Sections 3.2.1.1 and 3.3.1), 3) no population introductions would occur within the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units which are essential for recovery, as there would not be a safe method for transporting SNBS out of wilderness areas (Sections 2.2.1, 3.2.1.1 and 3.3.1), 4) population augmentations would only occur in one herd unit (Mt. Warren) out of three needed for recovery to occur, as there would not be a feasible way to transport SNBS out of and into release sites (Sections 3.2.1.1 and 3.3.1), 5) the total cost of the project would be prohibitive, CDFG would not be able to fund the number of needed personnel to be able to meet recovery goals of increasing the distribution and population numbers within a reasonable time period (Novak 2011), 6) the risk of injury or mortality to SNBS is higher especially if using only drop-nets for capturing, as more animals may be captured than personnel can handle safely (Sections 3.2.1.1, 3.3.1, and Novak 2011), 7) CDFG requires having a veterinarian present during capture events and a large number of personnel are required to conduct drop-net captures (5-20); these personnel may not be available during the time (a few days to four weeks) capturing would occur, limiting the time period during which captures could occur and reducing the ability to capture all animals necessary to meet project goals (Section 3.3.1 and Novak 2011), and 8) the time of year in which captures must occur (October and January through the first week of April) would put capture crews at a greater safety risk, as weather conditions can be unpredictable and there is an increase in the potential for snow blindness, frostbite, hypothermia and avalanches (Novak 2011).

2.3.2 No Capture Alternative

Under this alternative the capturing of Sierra Nevada bighorn sheep, by any method (motorized and non-motorized), for monitoring and translocations would not occur. All management efforts by the California Department of Fish and Game for the recovery of SNBS which include the capturing and handling of SNBS would not occur.

This alternative was not analyzed further because:

1) It would not be in compliance with laws, regulations, or policies regarding the management of endangered species
    - As declared in the Endangered Species Act of 1973, as amended;
    - Forest Service Manual direction for endangered species (FSM 2670.21 and 2670.31); and
    - Forest Service Manual direction for management of wildlife being the responsibility of state game and fish agencies (FSM 2603)

2) It would not be consistent with the Wilderness Management Plan for the Ansel Adams, John Muir, and Dinkey Lakes Wildernesses, which indicate the management direction for wildlife is to implement the Recovery Plan for the Sierra Nevada Bighorn Sheep.

3) It would not meet the recovery objectives established in the Recovery Plan for the Sierra Nevada Bighorn Sheep (USDI 2007a), such as:
    - Restoring SNBS throughout their historic range; and
    - Increasing the number of ewes within essential herd units

4) It would not meet the purpose and need for this project because:
    - Placement of GPS/VHF collars would not occur
    - Augmentations of SNBS ewes would not occur
    - Introductions of SNBS into four essential herd units would not occur

2.3.3 Combined Capture Method Alternative

This alternative considers using three capture methods for SNBS, helicopter net-gun, drive-netting, and drop-netting, in order to reduce the amount of helicopter use within wilderness areas. It is a combination of the current No Action Alternative and Proposed Action Alternative.

Drive-nets and drop-nets would be used in those herd units where SNBS are known to use low elevation winter range (Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt.

Langley herd units) for monitoring captures. Drive- or drop-netting captures would be conducted once every four years in these herd units. Helicopter net-guns would be used in those herd units where drive-nets and drop-nets cannot be used to capture SNBS in high elevation habitat (Mt. Warren, Mt. Gibbs, Convict Creek, and Mt. Williamson) for monitoring captures.

This alternative was not analyzed further because:

1) The number of SNBS needed for successful translocations (both augmentations and introductions) would not be met using drop-and drive-net capture methods. This is because of the limitations in the number of times captures could occur in the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units (once every four years) in order to reduce impacts to SNBS use on low elevation winter range (Appendix C). In addition, smaller groups of SNBS are dispersed over the entire winter range within these herd units, limiting the number of SNBS you can successfully capture at one time (Appendix B and C).

   The use of the helicopter net-gun in the Mt. Warren, Mt. Gibbs, Convict Creek, and Mt. Williamson herd units could not substitute for this reduction in the number of bighorn captures because the areas in which this method would be used for capturing are not in herd units with large enough SNBS populations to provide for source stock for translocations (Appendix C).

2) Drop-and drive-nets limit the ability to capture specific animals needing collar replacement; therefore there would be a reduction in the overall percentage of collared SNBS ewes within the project area, due to the lower numbers of SNBS captured by these methods. The percentage of collared rams within the Northern Recovery unit may be met because helicopter net-gun captures would be used in these herd units (Appendix C).

Due to these limitations this alternative would not meet:

- The purpose and need for this project because:
  - Placement of GPS/VHF collars would not occur
  - Augmentations of SNBS ewes would not occur
  - Introductions of SNBS into four essential herd units would not occur

- Recovery objectives established in the Recovery Plan for the Sierra Nevada Bighorn Sheep (USDI 2007a), such as:
  - Restoring SNBS throughout their historic range; and
  - Increasing the number of ewes within essential herd units

2.4 Comparison of Alternatives

This section compares the alternatives by indicators for both wilderness and wildlife. Wilderness indicators included quantifiable data for effects to the four qualities of wilderness character (Table 9a). To compare direct effects to SNBS (Section 1.7 and 3.3), the total number of minutes SNBS are handled for each different capture method was used as an indicator to compare the alternatives (Table 9b). An indicator was also used to display how each alternative would meet the project objectives outlined in the purposed and need (Table 9c).

Table 9a. Comparison of Alternatives for Wilderness Indicators

Wilderness Quality	Analysis Indicator	Alternative 1 – No Action	Alternative 2 – Helicopter Capture
Natural Quality	Number of occupied essential herd units after 10 years	8	12
Untrammeled Quality	Duration of capture event that manipulates or controls SNBS	1-6 weeks	1-3 days
	Duration of SNBS being handling	130 minutes	70 minutes
Undeveloped Quality	Number of helicopter landings per year	0	100 per year
	Duration of capture event in a given herd unit	1-6 weeks for each capture event	1-3 days for each capture event
Outstanding opportunities for solitude or a primitive and unconfined type of recreation	Number of days helicopter landings would occur per year	0	17 maximum per year
	Duration of capture event in a given herd unit	1-6 weeks for each capture event	1-3 days for each capture event

Table 9b. Comparison of Alternatives on Direct Impacts to Sierra Nevada Bighorn Sheep Indicators (Total number of minutes SNBS are handled for each capture method)

Herd Unit	Capture Method		
	Alternative 1 – No Action		Alternative 2 – Proposed Action
	Drop-net	Drive-net	Net-gun
Mt. Warren	No Captures		70
Mt. Gibbs	No Captures		70
Convict Creek	No Captures		70
Wheeler Ridge		130	70
Coyote Ridge	No Captures		70
Taboose Creek	No Captures		70
Sawmill Canyon	130	130	70
Mt. Baxter	130	130	70
Mt. Williamson	No Captures		70
Mt. Langley	130		70
Olancha Peak	No Captures		70

Table 9c. Comparison of Alternatives for Sierra Nevada Bighorn Sheep Indicators (Ability to meet project objectives)

Wildlife		
Project Objective (Indicator)	**Alternative 1 – No Action**	**Alternative 2 – Helicopter Capture**
Maintaining collars on 35% of SNBS ewes.		
Percentage of ewes collared (currently 30% of ewes are collared)	0-5%	33%
Augmentations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units		
Number of animals placed in each herd unit:		
Mt. Warren	6	3
Mt. Gibbs	0	2
Convict Creek	0	5
Introductions into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units		
Total number of SNBS released over a ten-year period	0	115

Chapter 3 Environmental Consequences

This chapter summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

3.1 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 are considered for all alternatives and are presented for each issue.

The Cumulative Effects Area (CEA) was established for each resource and varies between resources. The analysis considers present and reasonably foreseeable future actions which occur within the same temporal and spatial scale and which have the same type of effect as described in direct and indirect effects as the alternatives (see Sections 3.2.1 and 3.2.2). The time frame for the analysis is focused on the fall (October) and portions of winter/spring (January to 1st week in April) over the ten year authorization period.

Past Actions

In order to understand the contribution of past actions to the cumulative effects of the alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The following past activities are described in detail because they have similar direct and indirect effects to SNBS and wilderness qualities and occur during the same timeframe as Alternatives 1 and 2 are located within portions of the Hoover, Ansel Adams, John Muir, Golden Trout, and South Sierra Wildernesses.

Helicopter captures on the Inyo NF and SEKI (1979-2009) – Sierra Nevada bighorn sheep management actions have led to an increase in the population and distribution of SNBS since the 1980s when the population of SNBS only occurred in three areas (Mt. Baxter, Sawmill Canyon, and Mt. Williamson) (USDI 2007a). Over the past several decades, through the use of management tools, such as capturing with helicopters,

SNBS herds have expanded to ten populations distributed widely throughout SNBS historic range. Monitoring and translocations of SNBS in the past have allowed the California Department of Fish and Game to increase their knowledge of habitat use, population distribution, and genetic diversity between each subpopulation. This knowledge guides management decisions regarding new translocation efforts.

For a more detailed description of past management actions conducted by CDFG see Appendix B.

Sierra Nevada Bighorn Sheep Winter Habitat Enhancement Projects (2010) – The Inyo National Forest has conducted several prescribed burns within SNBS winter habitat, but only one occurred within wilderness when it was implemented; Shepard Creek (Mt. Williamson herd unit). This burn was implemented using a helitorch. The purpose of the burn was to remove expanding pinyon pine within areas which were determined to be potential winter habitat for adjacent SNBS herds. Implementation occurred over a two day period in March, 2010.

Current Actions

Actions which are occurring or have the potential to occur within the portions of the Hoover, Ansel Adams, John Muir, Golden Trout, and South Sierra Wildernesses in October and January through the first week in April are described below.

California Department of Fish and Game Sierra Nevada Bighorn Sheep Management – CDFG will continue to monitor SNBS populations, animal health, and habitat use through the use of telemetry by ground surveys, fixed-wing aircraft, and helicopter over flights and captures. Telemetry studies occur throughout the year; with ground surveys occurring in the spring through fall when weather conditions allow, and aircraft flights when equipment is available and typically in the fall through spring, when ground crews cannot access SNBS habitats. In the next 10 years, CDFG has introductions planned in addition to what is proposed in this environmental assessment, specifically in the Big Arroyo and Laurel Creek herd units located in the Sequoia and Kings Canyon National Parks (Reasonably Foreseeable Future Actions section).

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 SNBS. According to the 5-year review (USDI 2008) and 2010-2011 Annual Report (Stephenson et al 2012) SNBS have begun to recover in some areas with notable increases in population size and distribution. Selective mountain lion control has occurred in some areas to reduce predation. It is likely that the combination of predator control and increased population size has aided the recent

return of the Mt. Baxter, Mt. 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 and bighorn sheep.

In addition to the primary threats discussed above, roadkills and capture-related deaths have resulted in a small amount of SNBS mortality. The mortality from these threats does not result in substantial effects to the overall status of the species (USDI 2008). However, per the 5-year review (USDI 2008), SNBS need 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.

Administrative and emergency helicopter landings– Helicopter landings can be separated into two categories: authorized and emergency landings. To show a representation of the average number of helicopter landings associated with these activities, data was averaged over a five year period (2006-2010).

Authorized landings– In the Ansel Adams and John Muir Wildernesses (Gem Lake, Gem Pass, and Agnew Pass areas) one landing per month during January, February, March, April for snow surveys is administratively approved in each wilderness if avalanche conditions preclude safe access by skis over snow. In the five years since 2006, there have been several landings in the Ansel Adams and several landings in the John Muir Wilderness for snow surveys. In the Golden Trout and South Sierra Wildernesses in the last five years, there has been one administrative approval to land a helicopter to repair a Forest Service radio antenna.

Emergency landings– There are two types of emergency landings: 1) search and rescue landings, where a helicopter is used either to transport search and rescue personnel into the wilderness or transport an accident victim out of the wilderness; 2) response to wildfires in wilderness, where Forest Service firefighters and their equipment are either transported into or out of wilderness. Table 10 displays the number of days, over the last five years, search and rescue landings in wilderness occurred. The frequency of helicopter use for emergency purposes is expected to occur at the same level, or slightly higher, as in the past.

Table 10. Number of Days, by Year and Wilderness, Search and Rescue Landings Occurred.

Wilderness	2010	2009	2008	2007	2006
Ansel Adams	6	4	9	3	3
John Muir	11	16	7	2	5
Golden Trout	0	1	0	1	0
South Sierra	0	0	0	0	0
Hoover	0	1	0	0	0

The number of days with emergency helicopter landings in wilderness that were wildfire related has ranged from zero to seventeen days over the last five years. Table 11 displays the number of days these helicopter landings occurred, note that there is high variability between years and areas in which these landings occurred.

Table 11. Number of Days with Emergency Wildfire Helicopter Landings

Wilderness	2010	2009	2008	2007	2006
Ansel Adams	1	0	3	6	8
John Muir	0	6	2	1	10
Golden Trout	0	0	17	2	1
South Sierra	0	0	1	0	0
Hoover	0	1	0	0	0

Backcountry Recreation (Skiing and Snowshoeing) – Recreational activities which can occur within the CEA can include hiking, backpacking, backcountry skiing and snowshoeing. Within October recreation use is moderate to high in the McGee Creek and Hilton Lakes areas, as these areas offer fall colors visited by hikers and backpackers. These areas occur within the Convict Creek herd unit. Backcountry skiing and snowshoeing occurs in higher numbers in the Tioga Pass, Dana Plateau, Mt. Gibbs, Mt. Morrison, Mt. Baxter, and Mt. Williamson areas. Visitor use in these areas is generally low during the week, but increases over the weekends throughout the winter and early spring months.

Reasonably Foreseeable Future Actions

Actions which have the potential to occur within the portions of the Hoover, Ansel Adams, John Muir, Golden Trout, and South Sierra Wildernesses in October and January through the first week in April are described below.

Sierra Nevada Bighorn Sheep Study and Translocation Project – Sequoia and Kings Canyon National Parks - This proposed project would include monitoring captures occurring in Sequoia and Kings Canyon National Parks (SEKI). These monitoring captures would include placement of GPS/VHF collars on approximately 40 SNBS, with captures occurring over a two-year period. This project would also include introducing SNBS into the Big Arroyo and Laurel Creek herd units (Kern recovery unit) in the parks with bighorn captured on the Inyo National Forest. SEKI is proposing approximately 8 to 38 helicopter landings per year for monitoring captures and 60 helicopter landings for translocation captures.

Backcountry Recreation (Skiing and Snowshoeing) – This use is expected to continue in the foreseeable future at the same rate described under the Current Actions section.

Administrative and emergency helicopter landings – This use is expected to continue in the foreseeable future at the same rate described under the Current Actions section.

3.2 Direct, Indirect, and Cumulative Effects Relative to Issues

3.2.1 Issue 1: Effects to Sierra Nevada Bighorn Sheep

In 1991 the U.S. Fish and Wildlife Service and the California Department of Fish and Game (CDFG) entered into a Cooperative Agreement regarding management of Endangered and Threatened Fish, Wildlife and Plants in the State of California (USDI 1991). This agreement stated that the State of California (through CDFG) is designated to assist in the conservation and recovery of resident endangered and threatened wildlife and will carry out activities for their benefit.

After SNBS was listed as a federally endangered subspecies in 2000, CDFG was issued a Federal Fish and Wildlife Permit by the U.S Fish and Wildlife Service authorizing the agency to conduct activities which would aid in the recovery of the species. The most recent permit (2007) authorized the following:

(1) Take (capture, handle, mark, collect biological samples, radio-collar, survey, translocate, and release) SNBS in conjunction with surveys and the collection of biological information for the purpose of enhancing their survival.

(2) Survey SNBS from the ground, in a helicopter, or in a fixed-wing aircraft, to fulfill research agreements with the U.S. Fish and Wildlife Service.

Mitigations in regards to the above authorized activities include:

(1) Minimizing disturbance to SNBS by minimizing the frequency and duration of all survey and capture activities.

(2) Methods used for captures shall be conducted using net-guns from helicopters, trucks, or on the ground; and drop-nets, or tangle-nets, and chemical immobilization (darting). These are methods that have been proven to reduce the potential for injury to sheep given the specific set of circumstances during capture and processing.

(3) Only authorizing darting when netting methods are not feasible or safe because of terrain, location, or other reasons, or when this method would have desired results.

(4) All possible precautions shall be taken to avoid injuring SNBS during the capture process.

(5) Net-gun capture operations shall minimize the probability of injuring or killing sheep to the greatest extent practicable. Once an animal is successfully netted, the gun-ship shall refrain from pursuing another animal until the gun-ship dispatches a qualified mugger to attend the netted animal, confirms that a qualified mugger has been dispatched from a sister ship, or confirms that qualified and adequately equipped ground personnel are within the immediate vicinity of the netted animal. Two animals may be captured in one net if terrain, animal speed, and crew are optimal. Nets posing the potential for severe injury to an animal should be cut. At no time during the operation, are restrained bighorn to be left unattended.

(6) Before greater than 50 percent of females in any herd unit are captured in any single year, the Ventura Fish and Wildlife Office (VFWO) shall be notified and permission obtained to capture additional sheep within the ewe group.

(7) Pursuit shall only occur in terrain where bighorn can be safely netted and recovered.

(8) After bighorn sheep are located, pursuit time will be limited to five minutes. If capture is unsuccessful, pursuit will be terminated after 5 minutes.

(9) 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.

(10) If an animal is determined to be excessively stressed, it shall be released as quickly as possible provided that it is in a stable condition. Prior to release, confirmation shall be received from the project leader of project veterinarian, unless extenuating circumstances prevent rapid communication.

(11) In the event of significant injury or stress, qualified personnel and equipment shall be available to provide immediate care.

(12) Injections of MU-SE (vitamin E and selenium) and additional medications may be administered to address individual sheep needs at the discretion of the on-site veterinarian(s).

(13) Translocations shall be conducted according to the protocol outlined in the CDFG Plan for Capture, Monitoring, Research, and Translocation of Sierra Nevada Bighorn Sheep, 2006.

(14) CDFG conducts disease surveillance on the overall health of the herd. At the time of capture, veterinarians shall conduct an examination to determine if the animal is healthy. The CDFG shall not translocate any animal that exhibits clinical signs of disease.

(15) Translocate up to 25 adult SNBS and up to 10 lambs per year.

(16) In the event that bighorn health and safety are of concern, DFG will cease capture operations to discuss modifications to the capture operation with the capture crew. If concerns are not sufficiently addressed, DFG will terminate the capture effort.

(17) Radio-collared sheep shall be monitored during the first 10 post-capture days to evaluate their health. All injuries and mortalities that occur during this time shall be reported to the VFWO within 24 hours of observation.

(18) The number of individuals allowed to be incidentally injured or killed during performance of all permitted activities involving SNBS is three in any calendar year.

Through the issuance of the Federal Fish and Wildlife permit authorizing the above activities, the U.S. Fish and Wildlife Service has determined that these activities, and those methods used to carry out these activities, would not jeopardize the existence of SNBS (USDI 2011). CDFG also adheres to guidance sponsored by the Northern Wild Sheep and Goat Council (NWSGC) and Desert Bighorn Council (DBC). These guidelines describe the steps necessary to have a successful capture event and state

that helicopter net-gunning is the most commonly used capture technique, followed by drop-nets, drive-nets, and then darting (Foster 2005). This document also addresses the safety obligations needed for conducting captures under each of these methods, which CDFG implements during captures.

Kock et al. (1987) compared the success rate of four capture methods (drop-net, drive-net, net-gun, and darting) on 644 bighorn sheep in the western United States. The net-gun was found to have considerable advantages over the use of ground nets and chemical immobilization, and the net-gun had the lowest proportion of compromised bighorn sheep, had no capture myopathy (CM) mortality, and resulted in a 2% (2/137) accidental mortality. Other studies (Jessup et al 1988) and local results by CDFG have had similar results. Over the past ten years CDFG has successfully conducted 249 captures, of which 240 were by helicopter net-gun and represent 180 individual SNBS captured (CDFG 2011a). Ten mortalities have occurred over this ten-year period; representing a capture related mortality rate of 3.33% (less than one individual per year) (Stephenson et al 2012). This mortality rate falls below the limits of the take allowed under the Federal Fish and Wildlife Permit issued by the U.S. Fish and Wildlife Service (CDFG 2011a).

Tracking collars would be placed on SNBS under both alternatives. If collars are not fitted correctly they can lead to injuries such as abrasions and open wounds along the neck and jawline (Foster 2005). CDFG fits each collar to the specific animal to ensure that it is loose enough to allow for growth if the animal is a juvenile and tight enough to ensure it does move enough to cause abrasions. CDFG has not observed any changes in foraging ability or changes in SNBS social behavior due to the placement of collars on SNBS (Murphy 2012).

3.2.1.1 Alternative 1 (No Action)

Under this alternative CDFG would conduct monitoring captures by drop-nets and drive-nets within wilderness boundaries. Population augmentations would be attempted in the Mt. Warren herd unit. No introductions would occur. The effectiveness of this alternative in reaching project objectives is discussed in Section 3.3.1.

Direct and Indirect Effects

Drop-net

Inside wilderness areas drop-nets would be used for monitoring captures of SNBS in January through the first week of April within the Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units. These herd units were chosen because SNBS in these herd units

still utilize low elevation winter ranges, which allows for a more feasible placement of net stations. Disturbances to SNBS may occur over a six week period when crews (one to twenty people) are establishing a station, placing bait, and hanging nets. SNBS have been known to become capture shy, avoiding areas where captures have occurred in the past, especially if captures are located in the same areas year after year (Appendix B). The placement of bait, especially in areas where predation by mountain lion already occurs, may increase the predation events in these areas, or increase the avoidance of SNBS into these areas. CDFG would continually monitor mountain lion occurrence and predation near drop-net stations and if predation events are occurring, would cease baiting in those areas.

Drop-nets are effective at capturing bighorn sheep, however, scientific literature and experienced CDFG biologists note that this method increases the likelihood of injury or mortality to bighorn sheep. Kock et al. found that 15% of captures lead to compromised sheep (24 out of 158 captures), the capture myopathy rate was 2% (3 of 158 captures), and an accidental mortality rate of 1% (2 of 158 captures). The time period from when capturing occurs to release may be longer than with helicopters, because it is dependent on the number of animals captured. Release of SNBS after capturing and processing cannot occur until all animals have been processed. The average capture time period for drop-nets is approximately 130 minutes and is based on having multiple animals caught at the same time. In order to reduce safety risks to SNBS during this capture method there needs to be adequate personnel available to handle larger groups of captured SNBS (Kock et al, 1987).

Habitat use changes can occur if capture events (using any capture method) occur continuously within low elevation winter ranges. To avoid these potential effects, CDFG would only conduct drop-net captures in each of the four herd units once every four years, over a ten-year period.

Drive-net

Drive-net captures would also occur in January through the first week of April, when SNBS are in lower elevations within the Wheeler Ridge, Sawmill Canyon, and Mt. Baxter herd units. These herd units were chosen because SNBS in these herd units still utilize low elevation winter ranges and would be accessible to helicopters for drive-netting purposes. Establishment of these capture locations occurs over a one-week period, when nets are set up below ridgelines or hills. A helicopter then drives the bighorn into the un-seen nets. SNBS become stressed while being pursued by the helicopter, but capture crews monitor bighorn sheep health once the animal is caught; observing body temperature and breathing rates to ensure the animal is not overheated.

CDFG has used drive-nets in the past (1979 to 1995) and of the 57 animals captured with this method only one mortality occurred (personal communication German 2011). This mortality rate is similar to what Kock et al found; an accidental mortality rate of 1% (2 out of 191 animals) (1987). The average time a SNBS is handled during this capture is similar to drop-nets (130 minutes).

To reduce the potential of winter habitat avoidance within these herd units, drive-net captures would only be conducted once every four years over a ten year period. Captures would not occur in continuous years within any given herd unit.

The duration (in minutes) of the time SNBS are handled in each capture method was used as a measure for the direct disturbance to SNBS. Table 12 displays the estimated amount of time each capture method would require handling SNBS, from the point of capture through release.

Table 12 Duration of time for drop-nets and drive-net capture methods.

Timeframe	**Capture Method**	
	Drop-Net	Drive-Net
Length of Capture	5 minutes (capture until hobbled)	5 minutes (capture until hobbled)
Length of Processing	30-120 minutes	30-120 minutes
Time until Release	5 minutes (to remove hobbles)	5 minutes (to remove hobbles)
Average Time Handled	**130 minutes**	**130 minutes**

Cumulative Effects

The Cumulative Effects Area (CEA) developed for this analysis includes the entire SNBS recovery area, approximately 555,000 acres. The temporal scope of past, present, and reasonably foreseeable future actions includes all those actions which would have the same effects as described under the direct and indirect effects section (short-term direct disturbance to bighorn sheep).

As described in the Cumulative Effects section above there are several past, current, and foreseeable future actions which occur in SNBS habitat in October and January through the first week of April. Impacts from these activities are discussed below.

Emergency landings – Information on search and rescue operations showed that over the last ten years, 69 search and rescue missions required landing of a helicopter and where conducted in October, January, February, March, and April. The majority of these missions occurred in the Mammoth Mountain and Mt. Whitney areas or in high elevation backcountry skiing areas, such as the Dana Plateau area. Of these, only two were located within occupied SNBS habitat (Mt. Gibbs and Mt. Warren herd units) and occurred during October. These operations may have led to short-term disturbances to SNBS as helicopters flew over occupied areas. These short-term impacts can be dependent upon how high the aircraft are flown over the ground, for example Krausman and Hervert (1983) found that bighorn sheep only mildly reacted to aircraft flown >100 meters above ground. It is expected that aircraft flown for search and rescue missions are located at higher altitudes when moving into a search area and then fly at lower altitudes when searches occur. These lower flights may lead to more reactive responses from bighorn sheep; such as moving into a new area or bedding for a few hours after disturbance (Krausman and Hervert 1983).

Over the next ten years it is assumed search and rescue operations would continue at the current, or slightly higher, rate. The areas in which the majority of these types of operations occur would continue to be the Mammoth Mountain and Mt. Whitney areas of the forest. Short-term impacts to SNBS, if search and rescue operations occur in occupied habitat, would continue to occur.

Administrative landings –Snow survey helicopter flights occur within the Gem Pass area which is located in the Mt. Gibbs herd unit. Disturbances to SNBS are not expected from this activity as SNBS use in the Gem Pass area does not occur.

Backcountry Recreation (Hiking, Skiing, and Snowshoeing) – Recreation uses such as hiking and backcountry skiing can lead to short-term disturbances to SNBS, as SNBS may temporarily move out of an area to avoid human presence. For example, Hicks (1978) found that summer recreation use in the Baxter Pass area caused some short-term impacts, but there was no permanent displacement of SNBS as a result of the presence of humans. The largest negative response by SNBS from the presence of humans was if humans were located above or at close range by SNBS (Hicks 1978).

Although winter recreational use does occur in portions of the project area, captures would occur in areas which typically do not receive use during these months (lower elevations of the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units). If recreational use is occurring at the same time as captures, it is assumed that SNBS responses would be the same as discussed in Hicks (1978). Furthermore, drive-

net stations would be placed in areas which are not readily accessible to visitors in order to avoid conflicts with capturing activities.

California Department of Fish and Game Sierra Nevada Bighorn Sheep Management – Management of SNBS has been delegated to CDFG by the U.S. Fish and Wildlife Service (USDI 1991). Management activities include the continuation of monitoring SNBS populations by overflights and ground surveys generally conducted once a month in at least one of the Recovery Herd Units (Northern, Central, or Southern)by overflights and at least twice during the summer months by ground crews in several herd units. Disturbances to SNBS are short-term (one to a few hours), only occurring if SNBS observe ground survey crews or if overflights produce noise which lead to SNBS moving from an area.

Sierra Nevada Bighorn Sheep Study and Translocation Project (SEKI) – This project proposes the placement of 40 GPS/VHF collars on SNBS for a habitat use study of high alpine meadows in Sequoia-Kings Canyon National Parks (SEKI). Captures conducted under the No Action alternative may increase the amount of collars in the Parks, but over-the long term, lead to a reduction in the number of functioning collars placed on SNBS in SEKI. This is due to the lack of feasibility in re-capturing the collared animals in high elevations when they are located on the Inyo NF, as drop-and drive-net captures would only occur in lower elevations. This project would also rely on translocation captures being conducted on the Inyo NF to have SNBS placed in the Big Arroyo and Laurel Creek herd units in SEKI. Under this alternative no introduction captures would occur, therefore SEKI would not be able to complete this portion of their project.

Sierra Nevada Bighorn Sheep Winter Habitat Enhancement Project – Habitat improvement projects utilizing helicopters occurred in 2010 in the Mt. Williamson herd unit. This project reduced the overstory cover within the project area, opening up suitable winter foraging habitat on approximately 35 acres. Long-term expected results include the reduction of overstory cover leading to a decrease in the potential for predation by mountain lions and increasing the suitable winter range of SNBS in the herd unit. No bighorn sheep were present in the project areas at the time of implementation, reducing impacts to this species. This project had long-term positive effects to SNBS winter range and these actions meet the recovery plan recommendations for improvements and expansion of winter range.

<u>Alternative 1 Effects Summary</u>

Alternative 1 (No Action) would lead to longer-term (one to six weeks) disturbance effects when drop-nets or drive-nets are used. Habitat use changes in lower elevation

winter ranges are not anticipated, as these captures would occur once every four years within the four herd units and would not occur in consecutive years.

Cumulative effects to SNBS are short term, as aerial flights over occupied habitat are limited as administrative or emergency flights do not generally overlap with occupied habitat. Disturbances by back-country recreationalists are also short-term and would not result in SNBS altering use patterns. Long-term cumulative effects would include the inability to translocate SNBS into the Taboose Creek and Olancha Peak herd units, resulting in not meeting recovery action goals of establishing SNBS populations in essential herd units (USDI 2007a).

3.2.1.2 Alternative 2 (Proposed Action)

Under this alternative CDFG would conduct monitoring and translocation captures of SNBS within wilderness boundaries with the use of helicopter net-guns. The effectiveness of this alternative in meeting project objectives is discussed in Section 3.3.2.

Under this alternative only one capture method would be used to conduct monitoring and translocation captures: helicopter net-guns. Monitoring captures would occur in the fall (October) or January through the first week of April (if SNBS occupy high elevations) in the Mt. Warren, Mt. Gibbs, Convict Creek, Wheeler Ridge, Coyote Ridge, Taboose Creek, Sawmill Canyon, Mt. Baxter, Mt. Williamson, Mt. Langley, and Olancha Peak herd units. Translocation captures would occur in March through the first week of April in the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, Mt. Langley, Mt. Warren, Mt. Gibbs, Convict Creek, Taboose Creek, and Olancha Peak herd units.

Direct and Indirect Effects

Effects of the proposed action were fully analyzed in the Biological Assessment (Murphy 2012) and are summarized below.

Helicopter net-gun captures can lead to short-term effects (a couple of hours) beginning from when the SNBS sees or hears the helicopter until the helicopter leaves the area after capturing has occurred. The presence of a helicopter generally causes SNBS to move into escape terrain and after exposure to a helicopter the animals often take shelter under trees or cliffs (CDFG 2011b). Avoidance of the helicopter causes an increase in body temperature in SNBS and a rise in heart rates (MacArthur et al 1982). To reduce this impact pursuit time with the helicopter is limited to five minutes (USDI 2007b). Captures during fall also reduce impacts to SNBS, as lambing season has ceased and the rut (breeding season) has not yet begun (November). Animals are in

their peak condition which reduces the risk of injury or mortality from captures. CDFG ground personnel and GPS collar data have shown that SNBS typically resume normal behavior within a matter of hours after the departure of the helicopter (CDFG 2011b). Data on nutritional status, health/disease status, and pregnancy status gathered during monitoring captures allows CDFG to identify animals in peak condition, which may be selected for translocation the following spring.

Translocation captures would occur in the spring (March to first week of April) and would not be conducted in consecutive years in the same herd unit. Translocations are based on the availability of source animals, which is determined from data gathered during monitoring captures. Translocating bighorn sheep in the spring prevents animals from experiencing prolonged, severe winter conditions in a new environment as they would if moved in the fall. Source herd units for translocation captures include the Wheeler Ridge, Sawmill Canyon, Mt. Baxter, and Mt. Langley herd units. SNBS captured in these herd units would be relocated to the Taboose Creek (25 bighorn sheep) and Olancha Peak (30 bighorn sheep) herd units, as well as two herd units in the Sequoia and Kings Canyon National Parks (Big Arroyo (30 bighorn sheep) and Laurel Creek (30 bighorn sheep) herd units) over the life of the project. This would lead to reductions in SNBS in the source herd units and increase the distribution of SNBS in the recovery area. The reduction of populations in the source herd units would not lead toward a reduction in population viability, as animals are only moved out of these herd units if the current population is self-sustaining. See section 3.3.2 for additional discussion of the effects of the Proposed Action relative to the project objectives.

Under this alternative a helicopter would be used to release SNBS into the Mt. Gibbs and Convict Creek herd units, with the use of a flight box. The flight box is designed to allow for proper airflow and prevent injury to SNBS. No more than five animals would be flown at one time and the animals would not be hobbled or tied in anyway while within the flight box. This further reduces risk of injury to bighorn sheep as they are allowed to move freely while inside (Foster 2005).

The average time a SNBS is handled by capture crews during a helicopter capture is approximately 70 minutes, starting from when the animal is captured, flown to the processing site, processed (collars put on, health information is collected), and flown back to the release site. Health conditions are monitored constantly while at the processing site and capture crews observe the animal for a few minutes after it is released.

Studies have shown that continuous helicopter over-flights can have negative results to desert bighorn sheep in the Grand Canyon National Park and southern California, with

foraging decreasing and some changes in habitat use (Stockwell et al. 1991 and Bleich et al 1994). CDFG has conducted net-gun captures for 12 years and has not recorded any habitat use changes by SNBS due to helicopter over-flighs (personal communication Stephenson 2011). This is due to several factors: 1) The helicopters that CDFG use can operate at higher elevations than in the past, allowing captures to occur in different areas of SNBS ranges (summer/fall habitat) and reducing the need to continuously capture in low elevation winter ranges (Wehausen 2011); 2) Because of equipment changes, captures can also occur in different times of the year (October or January through the first week of April) when SNBS occupy summer/fall habitats at higher elevations or when wintering at higher elevations (Wehausen 2011); 3) Because captures now occur at different times of year and in different habitat locations the need to conduct captures continuously in low elevation habitats is reduced and therefore there are no habitat use changes by SNBS in these areas.

Cumulative Effects

The Cumulative Effects Area (CEA) developed for this analysis includes the entire SNBS recovery area, approximately 555,000 acres. The temporal scope of past, present, and reasonably foreseeable future actions includes all those actions which would have the same effects as described under the direct and indirect effects section (short-term direct disturbance to bighorn sheep).

As described in the Cumulative Effects section above there are several past, current, and ongoing projects which occur in SNBS habitat in October and January through the first week of April. Impacts from these activities are discussed below.

Emergency helicopter landings – Information on search and rescue operations showed that over the last ten years, 69 search and rescue missions required landing of a helicopter and were conducted in October, January, February, March, and April. The majority of these missions occurred in the Mammoth Mountain or Mt. Whitney areas or in high elevation backcountry skiing areas, such as the Dana Plateau area. Of these, only two were located within occupied SNBS habitat (Mt. Gibbs and Mt. Warren herd units) and occurred during October. These operations may have lead to short-term disturbances to SNBS as helicopters flew over occupied areas. These short-term impacts can be dependent upon how high the aircraft are flown over the ground, for example Krausman and Hervert (1983) found that bighorn sheep only mildly reacted to aircraft flown >100 meters above ground. It is expected that aircraft flown for search and rescue missions are located at higher altitudes when moving into a search area and then fly at lower altitudes when searches occur. These lower flights may lead to more

reactive responses from bighorn sheep; such as moving into a new area or bedding for a few hours after disturbance (Krausman and Hervert 1983).

Over the next ten years it is assumed search and rescue operations would continue at the current, or slightly higher, rate. The areas in which the majority of these types of operations occur would continue to be the Mammoth Mountain and Mt. Whitney areas of the forest. Short-term impacts to SNBS, if search and rescue operations occur in occupied habitat, would continue to occur.

Administrative helicopter landings – Snow surveys occur within the Gem Pass area which is located in the Mt. Gibbs herd unit. Disturbances to SNBS are not expected from this activity as SNBS use in the Gem Pass area does not occur.

Backcountry Recreation (Skiing and Snowshoeing) – Recreational use does have the potential to occur within the CEA during the time of year proposed activities would occur. This includes fall hiking and backpacking use in the McGee and Hilton Creek areas (Convict Creek herd unit). However, impacts to SNBS from these activities are low, as SNBS occupy higher elevations in these areas, and generally do not come into contact with hikers in the lower elevations of these drainages.

Winter recreational use is limited in January through the first week of April (when monitoring captures occur), but opportunities for this use occur in the Mt. Warren and Mt. Gibbs herd units (Tioga Pass, Dana Plateau, and Mt. Gibbs areas). Winter recreational use for areas in which translocation captures may occur include the Mt. Baxter herd unit (Mt. Baxter area. Use is generally low during the week, but can increase over the weekend. Recreation uses can lead to short-term disturbances to SNBS, as SNBS may temporarily move out of an area to avoid human presence. Hicks (1978) found that in the Baxter Pass area summer recreation use caused some short-term impacts, but there was no permanent displacement of SNBS as a result of the presence of humans. The largest negative response by SNBS from the presence of humans was if humans were located above or within close range of SNBS (Hicks 1978). Although studies have not been conducted on the effects of winter recreation use, it is assumed that SNBS responses would be the same as discussed in Hicks (1978). Due to the limited use of backcountry areas in the fall and winter months disturbances to SNBS are unlikely and if they were to occur, would result in short-term impacts.

California Department of Fish and Game Sierra Nevada Bighorn Sheep Management – Management of SNBS has been delegated to CDFG by the U.S. Fish and Wildlife Service (USDI 1991). These activities would include the continuation of monitoring SNBS populations by overflights and ground surveys during the spring, summer, and fall months. Disturbances to SNBS are short-term (one to a few hours), only occurring if

SNBS observe ground survey crews or if overflights produce noise which lead to SNBS moving from an area.

Sierra Nevada Bighorn Sheep Study and Translocation Project (SEKI) – This project relies on 40 GPS/VHF collars being placed on SNBS to gain information on high elevation meadow habitat use in Sequoia-Kings Canyon National Parks (SEKI). Under this alternative, these collars would be placed over a two-year period, with captures occurring in the SEKI portions of the Mt. Baxter, Sawmill Canyon, Mt. Williamson, and Mt. Langley herd units. SEKI's project also relies on the capturing of approximately 70 SNBS on the Inyo National Forest to be re-introduced into the Big Arroyo and Laurel Creek herd units in SEKI. Under the proposed action, these captures would occur and SNBS would be introduced into these essential herd units.

Sierra Nevada Bighorn Sheep Winter Habitat Enhancement Projects – Habitat improvement projects utilizing helicopters have occurred in 2010. This project reduced the overstory cover within the project area, opening up suitable winter foraging habitat on approximately 35 acres. Long-term expected results include the reduction of overstory cover leading to a decrease in the potential for predation by mountain lions and increasing the suitable winter range of SNBS in the Mt. Williamson herd unit. No bighorn sheep were present in the project areas at the time of implementation, reducing impacts to this species. This project had long-term positive effects to SNBS winter range and these actions meet the recovery plan recommendations for improvements and expansion of winter range.

Alternative 2 Effects Summary

Under Alternative 2 (Proposed Action) the direct, indirect, and cumulative effects would lead to short-term (one to a few hours) impacts to SNBS as a helicopter approaches, flies, over, or captures a SNBS. Although there would be an increase in the number of landings during October and January through April, this increase would not result in additive impacts to SNBS, as helicopter flights have short-term effects on SNBS behavior, and once this disturbance has passed there are no remaining effects; SNBS return to normal foraging behavior (personal communication Stephenson 2011).

The potential for long-term effects (habitat use changes) is low because 1) Translocation captures would occur three or four times over the ten years of the project and they would not occur in consecutive years, and 2) Monitoring captures occurring in October or January through the first week of April would be conducted in high elevation habitat. In the 12 years it's been conducting helicopter net-gun captures in October or January through the first week of April, CDFG has not recorded any habitat use

changes because captures are conducted at higher elevations than possible with older equipment (CDFG 2011a, Wehausen 2011).

3.2.2 Issue 2: Effects to Wilderness Character

The project area is located within portions of the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wildernesses on the Inyo National Forest (Figures 2, 3, and 4). Within the potential capture areas (69,640 acres) approximately 68,620 acres occur within these wilderness boundaries. The four qualities of wilderness character were used when analyzing effects to wilderness. These include:

Natural Quality: A measure of intended and unintended effects of modern people on ecological systems.

Untrammeled Quality: A measure of human activities that directly control or manipulate the components or processes of ecological systems.

Undeveloped Quality: A measure of the presence of permanent improvements such as structures, installations, construction, habitations, and other evidence of modern human presence or occupation.

Opportunities for solitude or a primitive and unconfined type of recreation: A measure of conditions that affect the opportunity for people to experience solitude or primitive, unconfined recreation in a wilderness setting, rather than monitoring visitor experiences per se.

Many activities and uses occur within the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wildernesses. The current condition described below for these areas only focuses on the use of mechanical transport and motorized equipment (helicopters and helicopter landings).

The Forest Service Manual Policy 2326.03(3) discourages flights over wilderness within 2,000 feet off the ground surface, except in emergencies or for essential military missions. There are three known types of aircraft noise over these wilderness areas, but all three generally emanate from distances more than 2,000 feet above the ground. In the Golden Trout and South Sierra Wildernesses, the sound from overflights by military aircraft is at least a weekly occurrence over portions of these wilderness areas. In the Hoover and Ansel Adams Wildernesses, the sound from commercial jet overflights is also a common occurrence throughout the day.

CDFG conducts overflights, consistent with the Association of Fish and Wildlife Agencies (AFWA) Policies and Guidelines for Fish and Wildlife Management in National

Forest and Bureau of Land Management Wilderness (2006) and the 1995 Memorandum of Understanding between the State of California, Department of Fish and Game and the Forest Service, which state that CDFG must coordinate with the Forest Service when conducting aircraft overflights in wilderness areas.

As discussed in Section 3.1 (Cumulative Effects) authorized and emergency landings also occur in these wilderness areas. Administration of snow survey sites is one such authorized activity that includes helicopter landings. In the Ansel Adams and John Muir Wildernesses, one landing per month during January, February, March, and April is generally approved in each wilderness if avalanche conditions preclude safe access by skis over snow. In the five years since 2006, there have been several landings in the Ansel Adams and several landings in the John Muir Wilderness for snow surveys. In the Golden Trout and South Sierra Wildernesses in the last five years, there has been one administrative approval to land a helicopter to repair a Forest Service radio antenna.

Emergency landings consist of two types: search and rescue and response to wildfire. In the Ansel Adams Wilderness, most of the search and rescues involved one or two helicopter landings per year over the last five years. In the John Muir Wilderness, most of the responses have involved one or two helicopter landings in the Mt. Whitney area. In the last five years there have been three extended responses that involved more than two landings in one day. In 2010 only one emergency landing occurred in the Ansel Adams Wilderness. See tables 10 and 11 for the number of days authorized and emergency landings have occurred over the last several years.

Effects Analysis

The analysis area for direct and indirect effects is the approximately 279,270 acres of the project area located within the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wildernesses on the Inyo National Forest, with the majority of effects occurring in the potential capture areas, of which 68,620 acres are in wilderness. The MRDG (Novak 2011) worksheet displayed the necessity of administrative helicopter landings occurring within wilderness due to the following: 1) Essential activity which is impossible, because of such factors as time or season limitations, safety, or other material restrictions to accomplish by non-motorized means; 2) 90% of SNBS populations and 80% of SNBS habitat occurs within wilderness areas, therefore the majority of captures would need to occur within the wilderness; 3) Implementation of Recovery Plan actions, specifically captures relating to monitoring and translocations, is critical to perpetuating the species and thus protects the natural quality of wilderness; and 4) Capture actions would prevent the need for actions in the future that would be a pronounced trammeling of wilderness character (i.e., captive breeding).

The following effects terminology was used in the MRDG and for the wilderness effects analysis in this EA:

Intensity Terminology	
Negligible	Effects would be negligible in intensity and duration.
Minor	Effects on one or more qualities of wilderness character are detectable, but the effects would be highly localized and of limited spatial extent.
Moderate	Effects on one or more qualities of wilderness character are appreciable, occur in several herd units within a wilderness.
Major	Effects would substantially alter one or more qualities of wilderness character. Effects would be observed over a larger area (i.e. wilderness-wide).

Duration Terminology	
Temporary	Effects would not persist for more than one day.
Short-term	Effects would occur over more than one day but less than 1 month in a herd unit.
Medium-term	Effects would occur over the duration of the proposed Recovery Plan actions, i.e. 2011-2021.
Long-term	Effects would occur after project work is completed and would have lasting effects (more than 10 years) on wilderness character.

3.2.2.1 Alternative 1 (No Action)

Under this alternative CDFG would conduct monitoring captures and translocations through use of either drop-nets or drive-nets within wilderness boundaries. CDFG would capture for monitoring purposes up to forty six bighorn sheep over a ten year period. CDFG would augment the bighorn sheep population by six sheep in the Mt. Warren herd unit. No introductions of bighorn sheep into currently unoccupied herd units would occur. There would be no use of mechanical transport in wilderness areas.

Direct and Indirect Effects

Natural quality: The analysis indicator selected for the natural quality of wilderness character is the number of essential herd units occupied by bighorn sheep in ten years. This indicator is consistent with the Recovery Plan's goals and timeline for downlisting bighorn sheep from the endangered species list.

Under the No Action Alternative, there would be major adverse effects to the natural quality of wilderness character in the Ansel Adams, Hoover, Golden Trout and John Muir Wildernesses over the long-term because bighorn sheep would not occupy a sufficient portion of the essential herd units to assure survival of the species. SNBS

would still be listed as an endangered species, and there would be a risk that over the long term one or more herd units may become extirpated.

At the end of ten years, the bighorn sheep population would still be restricted to its current range; eight of twelve essential herd units. The distribution of bighorn sheep in the essential herd units would not meet the criteria for either downlisting or delisting because introductions into the Taboose Creek, Olancha Peak, Big Arroyo and Laurel Creek herd units would not occur under this Alternative. The Recovery Plan states that bighorn sheep are naturally slow to disperse and colonize new habitat, recovery of Sierra Nevada bighorn sheep within a reasonable period will ultimately depend on translocations or bighorn sheep into unoccupied herd units that are needed for recovery or to aid in the recovery of occupied herd units (USDI 2007a). Bighorn sheep would thus not sufficiently move towards more natural conditions in the John Muir, Golden Trout, and South Sierra Wildernesses by occupying a greater portion of their historic range within the ten year duration of this indicator of natural quality. Also, herd populations in the Mt. Gibbs and Convict Creek herd units (Ansel Adams and John Muir Wildernesses) would not be augmented and would remain vulnerable to a delay in recovery or localized extirpation due to a catastrophic event.

In the Hoover Wilderness, this Alternative would have a minor beneficial effect on the natural quality of the wilderness by augmenting the Mt. Warren herd unit with up to six animals over a ten year period. The bighorn sheep populations in the Mt. Warren herd unit (as well as Mt. Gibbs, and Convict Creek herd units; see Section 1.3) are low enough where a catastrophic event may lead to a delay in recovery in these areas or localized extirpation. Augmenting the Mt. Warren herd with up to six animals would increase the number of ewes in the herd unit (helping achieve downlisting criteria) and help stabilize the population of bighorn sheep in the Hoover Wilderness.

Vegetation pruning or removal would not be visually evident or result in an observable change to the natural quality of wilderness. This is because of the minimal amount of trimming and removal that would occur to allow for nets to safely and securely capture SNBS. The effects would be minor because they would be site-specific, only occurring where nets are established.

Untrammeled quality: Effects to the untrammeled quality are those that directly control or manipulate the components (i.e. SNBS) or processes of ecological systems. Therefore, the analysis indicator selected for the untrammeled quality of wilderness character is the duration of a capture event (time when net stations are assembled until a SNBS is caught) and the duration a bighorn sheep is handled after capture. The

duration of capture events and handling provides a quantifiable measure of how humans will manipulate the sheep.

Under the No Action Alternative two types of capture methods would be used, which directly control or manipulate SNBS.

Drop-Net: This method is described in Section 2.2.2. Activities associated with this capture method that manipulate or control components of the wilderness (i.e. SNBS) are:

- Baiting – Baiting consists of using an unnatural food source to draw SNBS to a specific area. Although these baiting areas are established in the vicinity of areas SNBS naturally use, the intent of baiting is to draw bighorn sheep into a specific area with an unnatural food supply. Bait would be placed in an area one to six weeks before the actual capture occurs.
- Duration of Handling – The duration of when a SNBS is handled is defined as when the net is dropped on bighorn sheep and they are then restrained, hobbled, and blindfolded. The timeframes can vary depending on the number of SNBS captured, but generally a bighorn sheep is restrained for approximately 130 minutes. Direct effects to SNBS are discussed in Section 3.2.1.1.

Drive-Net: This method is described in Section 2.2.2. Activities associated with the capture method that manipulate or control components of the wilderness (i.e. SNBS) are:

- Helicopter pursuit – A helicopter is used to move SNBS into the area where the drop net is located. The helicopter is only authorized to pursue SNBS for no more than five minutes (USDI 2007b). If the bighorn sheep is not successfully captured in that time then the helicopter must stop pursuing the animal. A helicopter moves bighorn sheep for a short period of time, over a one-day period.
- Duration of Handling – This is similar to the drop-net method, as SNBS are restrained, hobbled, and blindfolded for approximately 130 minutes.

Table 13 displays the activities included in trammeling of wilderness for each capture method, by wilderness, as described above.

Table 13 Duration of each capture method activity in each wilderness under the No Action Alternative.

Capture Method	Activity	Duration of Activity	Wilderness area where activities may occur				
			Hoover	Ansel Adams	John Muir	Golden Trout	South Sierra
Drop-net	Baiting	1-6 wks			X		
	Handling of SNBS	130 min					
Drive-net	Helicopter pursuit	1 day					
	Handling of SNBS	130 min					

Monitoring captures would have a minor adverse effect on untrammeled character. The duration of effects would be short-term, lasting from one to six weeks in the John Muir Wilderness. The context of effects would be site-specific, confined to individual sheep within a capture area where monitoring captures are conducted. There would be no captures to translocate bighorn sheep to unoccupied herd units under this Alternative.

The rationale for the minor, short-term, and site-specific effects on untrammeled quality from monitoring captures is based on six factors:

1. Effects are limited to selected bighorn sheep in the herd unit where captures would occur, and to the time period during which captures would take place in that herd unit. The CDFG biologists indicate that within a few hours to one day after capture, sheep resume normal behavior (CDFG 2011b). Unless captures are conducted repeatedly in the same location and in consecutive years, there would be no effects to SNBS behavior after captures (See Section 3.2.1.1).

2. There would be no additional manipulation of sheep after captures are completed. Tracking collars do not affect or control sheep behavior or movement (Murphy 2012).

3. Capture activities would take place in January through first week of April to avoid critical phases of the bighorn sheep's reproductive cycle (breeding in the fall months and lambing in the spring months).

4. The USFWS places limits on the number of sheep that can be incidentally injured or killed in any year without jeopardizing the species as well as places limits on the duration of pursuit times with helicopters (USDI 2007b).

5. Fewer SNBS would be captured or manipulated over a ten year period under this alternative than the Proposed Action Alternative.

6. Monitoring captures are not an action that impedes the free play of natural forces or interferes with natural processes in the ecosystem.

Under the No Action Alternative approximately six SNBS would be translocated to augment existing SNBS populations in the Mt. Warren herd unit (Hoover Wilderness). Although translocations would be made to conserve the species, moving SNBS from one herd unit to another intervenes in the free play of natural forces because humans are affecting the distribution of the population. However, the effect of these translocation captures on the untrammeled quality is considered to be minor because SNBS currently occupy the Mt. Warren herd unit. Assuming the translocated sheep survive and reproduce, the duration of effects from the translocations would last more than ten years.

Undeveloped quality: The analysis indicators selected for the undeveloped quality of wilderness character are: 1) the number of helicopter landings per year and 2) the duration of a capture event in an individual herd unit. The number of landings is the key measure of the use of mechanized transport in wilderness. The duration of a capture event measures the length of time CDFG would erect temporary net structures in wilderness.

- Number of helicopter landings per year: Under this alternative there would be no effects to the undeveloped quality of wilderness character because no helicopter landings would occur.

- Duration of the capture event: Under this Alternative, drop-net and drive-net stations would be located in the John Muir Wilderness. The net stations are temporary as they are removed after the capture has taken place, which would be completed in six weeks for drop-nets and one week for drive-nets. The net station would be a site-specific, minor, adverse effect to the undeveloped quality. The intensity of the effect would be minor because captures would be confined to one of the four herd units once every four years.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: The analysis indicators selected for the opportunities for solitude are: 1) the number of

days helicopter landings would occur each year and 2) the duration of a capture event in an individual herd unit. The number of days helicopter landings would occur measures the potential number of days that visitors' opportunities for solitude would be affected by helicopter noise. The duration of a capture event measures the number of days ground-based capture crews would be working in wilderness.

- Number of days helicopter landings would occur each year: Although no helicopter landings would occur under this alternative, a helicopter would be used for drive-netting; therefore, there would be minor, temporary effects to this quality of wilderness character within the John Muir Wilderness. This effect is minor because it is highly localized to the area where the capture would occur and is limited to where SNBS are located during the capture event. The effect is temporary because it would not persist for more than one day in any of the given four herd units where this method can be used.

- Duration of capture events: There would be minor, short-term adverse effects to the opportunities for solitude in the John Muir Wilderness under this alternative. All drop-net and drive-net stations would be located in the John Muir Wilderness. The net stations would be staffed by CDFG employees throughout each day (staff would not camp at the net stations) during the one to six week period the stations are established. The net stations and staff could have site-specific adverse effects on visitors' opportunities for solitude. The intensity of the effect would be minor because the net stations would be located in areas of the wilderness with little visitation during the months of January through early April.

Cumulative Effects

The Cumulative Effects Area (CEA) for this analysis includes the portions of the Recovery Area within Inyo National Forest wilderness (275,210 acres) and the portions of the Recovery Area within Sequoia and Kings Canyon National Park (SEKI) wilderness (93,174 acres). The fourteen herd units in the Inyo NF and SEKI wilderness would be the area in which effects of the proposed project plus the effects from past, present and reasonably foreseeable projects on wilderness character would occur. To better describe the cumulative effects to wilderness quality, this section is organized by the four qualities of wilderness character.

Natural Quality: The distribution of bighorn sheep is a key measure of the effects of human actions on this indigenous species inside wilderness. Only three herds occurred in the John Muir Wilderness in 1979 (Mt. Baxter, Sawmill Canyon, and Mt. Williamson) and after translocations this distribution increased into herds located in the Hoover,

Ansel Adams, John Muir, and Golden Trout Wildernesses (Mt. Warren, Mt. Gibbs, Wheeler Ridge, and Mt. Langley) (USDI 2007a). Since listing occurred in 2001, a number of bighorn sheep have been translocated and the population has since grown and is now distributed, on the Inyo National Forest, among nine herd units (eight of which are essential for recovery), throughout these wilderness areas.

According to the USFWS 5-year review of recovery actions (USDI 2008), on-going management actions (including monitoring, selective removal of predatory mountain lions, and changes in domestic sheep grazing) have led to increases in SNBS population size and distribution in some areas. It is likely that the combination of predator control and increased population size has aided the recent return of the Mt. Baxter, Mt. 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 and bighorn sheep.

SEKI would be conducting monitoring and translocation captures of SNBS under their Sierra Nevada Bighorn Study and Translocation Project; however the needed number of SNBS for the translocation portion of this project would not be met under this alternative (Appendix C). Therefore the portions of the Sequoia and Kings Canyon Wilderness areas where these two essential herd units occur would not be populated by SNBS.

Although the past and present actions have had a beneficial effect on the population and distribution of the bighorn sheep, these actions alone will not allow for recovery of SNBS within a reasonable time period and therefore would not meet recovery goals. Under this alternative SNBS would still be located within eight of the ten essential herd units in the Ansel Adams, Hoover, Golden Trout, and John Muir Wildernesses. SNBS would not be located within the South Sierra Wilderness under this alternative. Therefore there would be a cumulative, major adverse effect over the long-term under this alternative.

Untrammeled Quality: Past actions to manipulate the bighorn sheep population include monitoring captures and translocations between 1979 and 2009. These captures and translocations contributed to increase the population both before and after its listing as an endangered species occurred. As a reasonably foreseeable action, SEKI would be conducting monitoring and translocation captures of SNBS under their Sierra Nevada Bighorn Study and Translocation Project. Through SEKI's action, there would be temporary and site-specific adverse effects, confined to individuals within a herd unit where monitoring and translocation captures are occurring. Under this alternative translocations of SNBS into SEKI would not occur and far fewer monitoring captures

would occur (46 captures) compared to the Proposed action (327 captures). Therefore under this alternative, trammeling effects to SNBS would be lower than the Proposed Action, as fewer animals would be captured, cumulatively.

Past actions to manipulate SNBS habitat in the CEA include the 2010 Sierra Nevada Bighorn Sheep Winter Habitat Enhancement Project in Shepherd Creek (John Muir Wilderness). Although this project is considered an effect to the untrammeled quality, it was intended to counteract decades of fire suppression that had disrupted natural fire cycles and lead to pinyon pine expansion in low elevations, reducing the suitability of these areas for wintering SNBS.

Undeveloped quality: As stated above, the two indicators for this quality include the number of helicopter landings per year and the duration of the capture event in a given herd unit. Under the No Action Alternative there would not be any helicopter landings, but a helicopter would be used for drive-netting. This effect would be minor and temporary and therefore would be a slight cumulative effect to the existing minor, short-term and site-specific adverse effects to the undeveloped quality caused by the on-going administrative and emergency helicopter landings in wilderness, which is assumed as continuing to occur in the future.

The net stations are temporary structures that would be removed once a capture event is completed. They would have short-term, site-specific effects in the John Muir Wilderness compared to the permanent structures found in this wilderness area (i.e. historic cabins, snow survey cabins, snow survey courses and sensors, mine structures, dams, and drift fences).

Opportunities for solitude or a primitive and unconfined type of recreation: Under this alternative effects would be minor and temporary and therefore would be a slight cumulative effect to the existing minor, short-term and site-specific adverse effects to solitude caused by the on-going administrative and emergency helicopter landings in wilderness that will continue to occur in the future. A reasonable foreseeable action with helicopter landings in the Cumulative Effects Area is SEKI's Sierra Nevada Bighorn Sheep Research and Recovery Project. CDFG would conduct bighorn sheep captures in SEKI during October if the sheep are located inside the Parks' boundary

<u>Alternative 1 Effects Summary</u>

In summary, Alternative 1 would have:

- Major, long-term adverse effects on the natural quality of wilderness character because the distribution of SNBS would remain at current condition (8 of 12 essential herd units occupied).

- Minor, short-term, and site-specific effects on the untrammeled quality of wilderness character because the capture event averages one to six weeks with drop-and drive-nets and the duration of how long SNBS are handled is 130 minutes.
- Minor and short-term adverse effects to the undeveloped quality of wilderness character because there would be no helicopter landings and the duration of the capture event would average one to six weeks.
- Minor, temporary, and site-specific adverse effects on the outstanding opportunities for solitude or a primitive and unconfined type of recreation quality of wilderness character because there would be no helicopter landings and the duration of the capture event would average one to six weeks.

3.2.2.2 Alternative 2 (Proposed Action)

Under this alternative CDFG would use helicopter net-guns to conduct monitoring and translocation captures in designated wilderness.

Direct and Indirect Effects

Natural quality: Under this alternative, there would be major, long-term beneficial effects to the natural quality of wilderness character within the Ansel Adams, Hoover, John Muir, Golden Trout, and South Sierra Wildernesses (Novak 2011). The ten essential herd units on the Forest would be occupied after ten years through the translocation of bighorn sheep into the two currently unoccupied herd units on the Inyo NF (twenty five sheep in the Taboose herd unit and thirty sheep in the Olancha Peak herd unit). The occupation of these ten herd units would contribute to meeting one of the Recovery Plan's criteria for delisting bighorn sheep from the endangered species list (USDI 2007a). The natural qualities of the wilderness areas on the Inyo National Forest would be beneficially affected because a native species would be returned to a larger and self-sustaining portion of their historic range in these wilderness areas.

In the Hoover, Ansel Adams, and John Muir Wildernesses, the Proposed Action would also have major beneficial effects on the natural quality of the wilderness by augmenting the Mt. Warren, Mt. Gibbs, and Convict Creek herd units with up to a total of ten animals over a ten year period. SNBS population numbers in these herd units are low enough where a catastrophic event may lead to a delay in recovery in these areas or localized extirpation. Augmenting the Mt. Warren herd with up to three animals, Mt. Gibbs with two animals, and Convict Creek with five animals would increase the number of ewes in these herd units (helping achieve downlisting criteria) and help stabilize the populations of SNBS in the Hoover, Ansel Adams, and John Muir Wildernesses (Appendix C).

There would be no effect to the vegetation community under this alternative, as any sensitive or rare plant species that may be present within capture locations would have seeded or would be dormant during the time captures would occur (Weis 2012). SNBS populations would be monitored in the Olancha Peak area (Olancha Peak herd unit) to determine if there are any impacts to sensitive and rare plant populations found in this area.

Untrammeled quality: Effects to the untrammeled quality are those that directly control or manipulate the components (i.e. SNBS) or processes of ecological systems. Under the Proposed Action, the helicopter net-gun capture method would be used. This method directly controls or manipulates SNBS.

Helicopter Net-Gun: This method is described in Section 2.2.2. Activities that manipulate or control components (i.e. SNBS) of the wilderness are:

- Helicopter pursuit – A helicopter is used to locate and then pursue individual SNBS before capturing. The helicopter is only authorized to pursue SNBS for no more than five minutes (USDI 2007b). If the bighorn sheep is not successfully captured in that time then the helicopter must stop pursuing the animal. The helicopter may return to the capture area for 1 to 3 days while it pursues different individual SNBS.

- Handling of SNBS – This is defined as the time when the net-gun restrains the SNBS and crews then hobble and blindfold the animal. This time may vary, but generally only takes 70 minutes before the animal is released. Direct effects to SNBS are described in Section 3.2.1.2.

Table 14 displays the duration effects of each capture activity, by wilderness, as described above.

Table 14 Duration of each capture method activity in each wilderness under the Proposed Action Alternative.

Capture Method	Activity	Duration of Activity	Wilderness area where activities may occur				
			Hoover	Ansel Adams	John Muir	Golden Trout	South Sierra
Net-Gun	Helicopter pursuit	1-3 days	X	X	X	X	X
	Handling of SNBS	70 min					

Monitoring captures would have a minor adverse effect on untrammeled character. The duration of effects would be temporary, lasting from one to three days in each wilderness where monitoring captures are occurring (Novak 2011). The context of effects would be site-specific, confined to individuals within a herd unit where monitoring captures occur each year.

The rationale for the minor, temporary, and site-specific effects on untrammeled quality from monitoring captures is based on five factors:

1. Effects are limited to selected bighorn sheep in the herd unit where captures would occur, and to the specific days during which captures would take place in that herd unit. The CDFG biologists indicate that within one day after helicopter net-gun captures, sheep have been observed to resume normal behavior (CDFG 2011b).

2. Monitoring captures manipulate individual bighorn sheep by restraining them while data is being collected. There would be no additional manipulation of sheep after captures are completed. Tracking collars do not affect or control sheep behavior, foraging ability or movement (Murphy 2012).

3. Capture activities would be conducted in fall (October) and January through the first week of April to avoid critical phases of the bighorn sheep's reproductive cycle (i.e., lambing in the spring, rut in November).

4. The USFWS has determined that the proposed activities would not jeopardize the existence of bighorn sheep (USDI 2007. U.S. Fish and Wildlife Service Federal Fish and Wildlife Permit issued to CDFG on October 25, 2007). The USFWS places limits on the number of sheep that can be incidentally injured or killed in any year without jeopardizing the species. The permit states: "The number of individuals allowed to be incidentally injured or killed during performance of all permitted activities involving sheep is three in any calendar year." Over the past 10 years, eight mortalities have occurred out of 249 captures conducted by CDFG; this is a 3.33 percent mortality rate, which falls below the limits stated in the permit.

5. The monitoring captures would manipulate approximately 327 individual bighorn sheep over a ten year time period (Appendix C). Although individual sheep would be manipulated for about 70 minutes for each capture, they will return to normal behavior less than one day after capture, therefore captures are not an action that impedes the free play of natural forces or interferes with natural processes in the ecosystem.

Translocation captures to reintroduce SNBS to the currently unoccupied Taboose Creek and Olancha Peak herd units (portions of the John Muir, Golden Trout, and South Sierra Wildernesses) would have a long-term, moderate adverse effect. Although translocations would be made to conserve the species, the reintroduction of sheep into currently unoccupied habitat is considered a manipulation by humans that intervene in the free play of natural forces because humans are affecting the distribution of the population. However, SNBS was once indigenous to the Taboose Creek and Olancha Peak herd units and it is believed they were extirpated from these areas by over-hunting or disease transmission from domestic sheep (human induced events) (USDI 2007a). Reintroducing SNBS in areas of previous habitation would aid in the recovery of the species (see Section 3.3.2) and have major beneficial effects on the natural quality of wilderness as described above. Assuming the translocated sheep survive and reproduce, the duration of effects from the translocations would last more than ten years (Novak 2011).

SNBS would also be translocated to the Hoover, Ansel Adams, and John Muir Wildernesses (Mt. Warren, Mt. Gibbs and Convict Creek herd units) to augment the population of those herd units (Novak 2011). While actively moving SNBS from one herd unit to another intervenes in the free play of natural forces, effects of these translocation captures on the untrammeled quality are considered to be minor because SNBS currently occupy the areas.

Undeveloped Quality: Helicopter landings would have a minor effect on the undeveloped quality of wilderness character. The duration of effects would be temporary, because a helicopter would be on the ground in wilderness approximately five minutes for each capture. Once the capture is completed, there would be no observable effects on the undeveloped quality because there would be no structures remaining on the ground or any lingering evidence of mechanized access to that location in the wilderness. The context of effects would be site-specific for each landing, because effects would be confined to the specific location of each landing.

The Minimum Requirement Analysis (Novak 2011) and displayed the necessity of administrative helicopter landings occurring within wilderness due to the following:

1. Implementation of Recovery Plan actions, specifically captures relating to monitoring and translocations, is critical to perpetuating the species and thus protecting the natural quality of wilderness.
2. Ninety percent of SNBS populations and eighty percent of SNBS habitat occurs within wilderness areas. Therefore the majority of captures would need to occur within the wilderness.

3. As stated in Appendix C, helicopter landings are essential in meeting project objectives and these objectives cannot be feasibly met with non-motorized methods because:
    a. Capture areas by non-motorized methods are limited to only four herd units.
    b. The number of SNBS captured using non-motorized methods is estimated at 46 SNBS; an insufficient number for meeting the minimum necessary for monitoring (327) and translocations (125) of SNBS.
    c. SNBS cannot be introduced into the Taboose Creek, Olancha Peak, Laurel Creek or Big Arroyo herd units by non-motorized methods.
    d. Non-motorized methods can increase the risk of injury or mortality to those SNBS not specifically targeted for capture.
4. Proposed captures would prevent the need for further future actions that would be a pronounced trammeling of wilderness character (i.e., captive breeding).

As displayed in Appendix C, the minimum number of landings needed is 755. This number of landings would be the minimum number required to meet the Recovery Plan goals and Project objectives of maintaining collars on 35% of bighorn sheep ewes; increasing the number of collared SNBS rams in the Northern Recovery Unit; augmenting the Mt. Warren, Mt. Gibbs, and Convict Creek herd units with a total of ten sheep; and introducing 115 bighorn sheep into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units. The number of landings in each year across all the wilderness areas would not exceed 100 landings.

Table 15 outlines the maximum number of landings that would occur in each wilderness area in any given year for both monitoring and translocation captures. The majority of landings would occur in the John Muir wilderness because 1) the majority of herd units (eight) occur in this wilderness and 2) the majority of SNBS occupy this wilderness area.

Table 15 Maximum number of helicopter landings for monitoring and translocation captures conducted in any given year in wilderness areas

Wilderness Area	Maximum Number of Landings per Year	
	Monitoring Captures	Translocation Captures
Ansel Adams	10	2
Hoover	10	0
John Muir	70	30
Golden Trout*	---	---
South Sierra	6	0
Maximum combined # of landings/year	**70**	**30**
	100	

*****Portions of this Wilderness are located within the Mt. Langley herd unit. The majority of the SNBS, and where helicopter landings are most likely to occur, is in the John Muir Wilderness.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: Overall, helicopter landings would have a minor adverse effect on visitors' opportunities for solitude in most of the project area because landings would occur during a time of year and in a location with very few visitors (Novak 2011). However, visitors to eight Forest System Trails (and the surrounding mountains) during the months with helicopter landings may experience moderate adverse effects to their opportunities for solitude if their visit coincides with helicopter landings (Novak 2011). The adverse effects would be moderate in part because most landings would occur in areas within the John Muir Wildernesses termed "Recreation Category 1", where the desired social conditions are to maintain the highest opportunities for solitude and an area predominantly free from evidence of human activities (USDA 2001). The duration of the noise effects would be temporary, approximately ten minutes long for each approach, landing, and take-off from the ground. The duration of a landing's effects to the soundscape may be longer by several minutes if some portions of an overflight are less than 2,000 feet above the ground. The context of effects would be site-specific effects for each landing, confined to the area around the landing that is within hearing by visitors of the mechanical noise from a helicopter.

To analyze the potential for soundscape intrusion and effects to opportunities for solitude, the thirty six trailheads to the Forest Service trail system within the project area

were evaluated for whether they were likely to have visitors during the months with proposed landings. For this analysis, a trail was defined as likely to have visitors if either more than five visitors per month obtained an overnight wilderness permit or the trail is known to have appreciable amounts of day use.

The thirty six trails where analyzed to see if they received regular use during the months that landings are proposed. Eight trails in the John Muir Wilderness were identified as receiving regular use during the capture months (Table 16). Visitors hiking on these trails may experience soundscape intrusions from the proposed helicopter operations if their visit coincides with helicopter landings.

Table 16 Trails that receive regular use during the proposed capture periods.

Wilderness Area	Trail	Herd Unit	October total overnight visitors	October Regular day use	January-April total overnight visitors	January-April day use
John Muir Wilderness	Hilton Lakes	Convict Creek	5-20	Yes	<5	Yes
	McGee Creek		5-20	Yes	<5	No
	Bishop Pass	Coyote Ridge	>100	Yes	<5	No
	Golden Trout	Mt. Baxter	5-20	No	<5	April
	Kearsarge Pass		>100	Yes	5-20 in April	April
	Shepherd Pass	Mt. Williamson	5-20	No	5-20 in April	No
	Meysan Creek	Mt. Langley	5-20	Yes	5-20 in April	No
Golden Trout Wilderness	Cottonwood Lakes		>100	Yes	<5	No

'Yes' in a day use column indicates the public hikes the trail or skis on terrain near trails on a regular basis or only during month indicated.

To further refine the potential for effects, these eight trails were then evaluated for whether the trail and the terrain accessed by the trail was within or adjacent to a potential capture area (Section 1.2.3). Five trails (Table 17) were identified in this process as likely to have visitors when helicopter operations are proposed. For this analysis, noise from a helicopter is likely to be perceived as a soundscape intrusion if the helicopter is less than one mile from the person experiencing the noise.

Table 17 Trails which are located near or within potential capture areas and receive use during October or January through April

Wilderness Area	Trail	Herd unit	October potential capture location	Jan.-April potential capture location	Maximum annual days with landings
John Muir Wilderness	Hilton Creek	Convict Creek	Nevahbe Ridge	Nevahbe Ridge	2
	McGee Creek				
	Bishop Pass	Coyote Ridge	Inconsolable Range	Inconsolable Range	2
	Golden Trout	Mt. Baxter	Mt. Mary Austin	Mt. Mary Austin & Onion Valley	3
	Kearsarge Pass				
	Shepherd Pass	Mt. Williamson	Mt. Williamson & within winter capture area	Mt. Williamson & Shepherd Creek	2
	Meysan Creek	Mt. Langley	Between Mt. Langley & Lone Pine Peak	BetweenMt. Langley & Lone Pine Peak; escarpment	3
Golden Trout Wilderness	Cottonwood Lakes				

Monitoring captures may occur in October or January-early April. The number of days with landings in each herd unit would not exceed the maximum annual days with landings.

Based on these two factors, the proposed project may have temporary and site-specific effects on opportunities for solitude in five locations: Hilton Creek Trail; McGee Creek Trail; Mt. Williamson area; Mount Langley area; and Lone Pine Peak area. There is a low likelihood of effects on opportunities for solitude in the Golden Trout Trail and Kearsarge Pass Trail due to low visitor use during the capture seasons and that visitor use does not occur directly near the potential capture areas.

In the Convict Creek herd unit, the potential monitoring capture area is on Nevahbe Ridge. The captures would not likely occur near a destination typically frequented by visitors, but could occur less than .5 miles from the McGee Creek Trail or .3 miles from the Hilton Creek Trail**.** Both the Hilton Creek and McGee Creek Trails are likely to have visitors in October. Visitors to either of these trails during October may experience one to two days with soundscape intrusions because the landings would be a short distance from the two trails. The Hilton Lakes area is also likely to be visited by skiers on day

trips between January to early April. These winter visitors may experience one to two days with soundscape intrusions from either monitoring captures (which may occur during the winter months) or translocation releases. The McGee Creek area has very low numbers of visitors during January through early April, so the potential for soundscape intrusion in this area is low during the winter months.

In the Mt. Williamson herd unit, the potential monitoring capture area is mostly south of Mt. Williamson, with smaller potential capture areas in the South Fork of Shepherd Creek and on the slopes east of Junction Peak**.** The captures would not likely occur near the Shepherd Pass Trail, but the Mt. Williamson area is likely to have visitors in both October (hikers and climbers) and March and April (skiers). Visitors during October, March, or April may experience one to two days with soundscape intrusions because the landings would be a short distance from the peak. The potential translocation capture area along the lower elevations of Shepherd Creek is in an area with almost no visitation during January through early April, so the potential for soundscape intrusion in this area is low during the winter months.

In the Mt. Langley herd unit, the majority of the potential monitoring capture area is the terrain north of Cottonwood Lakes Basin and south of the ridge between Mt. McAdie and Lone Pine Peak. A small portion of the potential capture area extends into the Meyson Creek watershed. The potential capture area includes Mt. Langley and Lone Pine Peak, which are likely to have visitors in October. Visitors during October may experience one to three days with soundscape intrusions because the landings would be a short distance from the peaks. Visitors to the Cottonwood Lakes Trail and Meysan Lakes Trail (most Lone Pine Peak visitors will ascend the peak from this trail) during October may also experience soundscape intrusions if the helicopter flight paths are over these trails, but flight paths would be dependent upon the sheep's location. There is almost no visitation to either the two peaks or the two trails during January to early April, so the potential for soundscape intrusions is low during the winter months. The potential translocation capture area on the Sierra Escarpment is in an area with almost no visitation during January through early April, so the potential for soundscape intrusion along the escarpment is low during the winter months.

In the Mt. Baxter herd unit, the potential monitoring capture area is in the Mount Mary Austin area. The capture area is separated from the Golden Trout Trail & Kearsarge Pass Trail by the northeast ridge of Dragon Peak. Captures would not occur near these trails nor in a destination typically frequented by visitors in either October or January to early April. The potential winter capture area is in Onion Valley, and these captures would occur while the Onion Valley road is closed for the winter (prior to April) and visitation is very low. In this herd unit, the potential for soundscape intrusion is low.

CDFG has also identified a potential monitoring capture area on the Inconsolable Range in the Coyote Ridge herd unit. Sheep were spotted visually in this range once several years ago. If CDFG locates sheep in this area again, monitoring captures would likely occur within .4 miles of the Chocolate Lakes, a destination typically frequented by visitors, and within .2 miles of portions of the Bishop Pass Trail. Visitors during October may experience one to two days with soundscape intrusions because the landings in the Inconsolable Range would be a short distance from the Chocolate Lakes.

For the remaining twenty eight trails in the project area, soundscape intrusions would be unlikely because either the trail lies outside a potential capture area or there would be fewer than five overnight visitors per month during the proposed helicopter operations.

Cumulative Effects

The Cumulative Effects Area (CEA) for this analysis includes the portions of the Recovery Area within Inyo National Forest wilderness (275,210 acres) and the portions of the Recovery Area within Sequoia and Kings Canyon National Park (SEKI) wilderness (93,174 acres). The fourteen herd units in the Inyo NF and SEKI wilderness would be the area in which effects of the proposed project plus the effects from past, present and reasonably foreseeable projects on wilderness character would occur. To better describe the cumulative effects to wilderness quality, this section is organized by the four wilderness characteristics.

Natural Quality: The distribution of bighorn sheep is a key measure of the effects of human actions on this indigenous species inside wilderness. Only three herds occurred in the John Muir Wilderness in 1979 (Mt. Baxter, Sawmill Canyon, and Mt. Williamson) and after translocations this distribution increased into herds located in the Hoover, Ansel Adams, John Muir, and Golden Trout Wildernesses (Mt. Warren, Mt. Gibbs, Wheeler Ridge, and Mt. Langley) (USDI 2007a). Since listing occurred in 2001, the population has grown and is now distributed, on the Inyo National Forest, among nine herd units (eight of which are essential for recovery), throughout these wilderness areas. This alternative, in concert with the proposed action for the Sierra Nevada Bighorn Sheep Study and Translocation Project in SEKI would allow for the translocation of SNBS into four additional essential herd units located in the John Muir and South Sierra Wildernesses and reestablishing the species in areas of previous habitation.

Current actions to protect the SNBS population include monitoring, removal of mountain lions that prey on SNBS, and changes in domestic sheep grazing management. The cumulative effects from past, present, and future management is expected to result in populations (herd units) of SNBS that are closer to meeting the downlisting criteria than under current conditions (See Section 3.3.2). In the absence of an unforeseeable event

such as a major disease outbreak, this beneficial effect would persist in the long term as SNBS population and distribution would likely have the viability to continue to meet the criteria for down-listing and de-listing this species from the endangered species list.

Untrammeled Quality: The cumulative effect on the selected indicator for untrammeled quality (the duration of capture events that manipulate bighorn sheep) from past, present, and future management actions would be the continuation of temporary and site-specific effects, confined to individuals within a herd unit where monitoring and translocations are occurring.

Past actions that manipulated the SNBS population include monitoring captures and translocations between 1979 and 2009. The CDFG has not noted any clearly demonstrated changes to the behavior or use of habitat by approximately 180 individual bighorn sheep that have been captured by helicopter in the past. Past actions to manipulate SNBS habitat in the CEA include the 2010 Sierra Nevada Bighorn Sheep Winter Habitat Enhancement Project in Shepherd Creek (John Muir Wilderness). Although this project is considered an effect to the untrammeled quality, it was intended to counteract decades of fire suppression that had disrupted natural fire cycles and lead to pinyon pine expansion in low elevations, reducing the suitability of these areas for wintering SNBS.

The Proposed Action Effects on Wilderness Character section above concluded that the use of helicopters for monitoring captures and translocations would be a temporary trammeling of wilderness character. Current and reasonably foreseeable actions would be captures and translocations for the Sierra Nevada Bighorn Study and Translocation Project in SEKI. Captures in SEKI would be conducted with helicopter net-guns. Each year for the next ten years, monitoring and translocation captures would occur on the Inyo NF and SEKI at site-specific locations distributed primarily in the John Muir wilderness, where the Inyo NF and SEKI boarder each other. There would be temporary and site-specific effects, confined to individuals within a herd unit where monitoring and translocation captures are occurring. Monitoring capture activities for the SEKI project would co-inside with those on the Inyo NF; they would be conducted with the same helicopter, same crew and at the same time of year. Therefore there would not be any additive effects to solitude form helicopter landings associated with monitoring captures. Helicopter landings which may result in disturbances to solitude would occur in March when SNBS are being released into the Parks in the Sequoia and Kings Canyon Wilderness.

Undeveloped quality: Helicopter landings in wilderness are considered to have an effect on the undeveloped quality of wilderness character. Table 18 below displays both the maximum number of annual landings that would occur over the next ten years from: 1) the Proposed Action maximum number landings each year; 2) the average number of

administrative and emergency landings in both Inyo NF wilderness and SEKI wilderness each year; 3) reasonably foreseeable number of annual landings through the SEKI project; 4) the cumulative number of annual landings that would occur in the CEA.

Table 18 Cumulative Number of Helicopter Landing in the Inyo National Forest Wilderness and Sequoia and Kings Canyon National Parks Wilderness

Activity	Maximum or average # of landings per year	
	Inyo NF	SEKI
Inyo NF Proposed Action	100	0
SEKI Sierra Nevada Bighorn Sheep Study and Translocation Project	0	140
Administrative/Emergency Landings	72	300
Total	**612**	

Neither search and rescue operations nor wildfire responses typically occur during the months helicopter landings are proposed. Within the last five years, three search and rescue helicopter landings have occurred in the same area and month in which proposed activities would occur. Emergency search and rescue flights during the months of October or January through the first week in April are rare due in part to the low numbers of visitors. The snow survey flights in the Ansel Adams Wilderness are in Rush Creek drainage which does not contain any herd units. In the John Muir Wilderness, the use of helicopters for snow surveys rarely occurs.

The context of the cumulative effects would be site-specific for all types of landings, because the effects would be confined to the specific location of each landing (Novak 2011). The duration of effects would also be temporary for all types of landings (Novak 2011). Although helicopter landing resulting from the proposed action's and the SEKI action's landings are not likely to occur in the same time and place as other administratively approved or emergency landings, the effect of the two proposed actions would be a distinct contrast to the existing conditions across the CEA for the undeveloped quality of wilderness character (Novak 2011).

Outstanding opportunities for solitude or a primitive and unconfined type of recreation: Helicopter landings in wilderness are considered to have a moderate adverse effect along eight Forest System Trails under the proposed action (Section 3.2.2.2).

Table 19 below displays both the maximum number of days with helicopter landings that would occur each year for the next ten years from: 1) the Proposed Action maximum

number of days with landings each year; 2) the existing number of days with administrative and emergency landings in both Inyo NF wilderness and SEKI wilderness: 3) reasonably foreseeable number of days with landings through the SEKI project; 4) the cumulative number of days with landings that would occur in the CEA. SEKI managers do not record the number of days with flights for their annual reports, but from the average of 300 administrative/emergency landings each year, one can infer that landings occur on approximately 25 days per year. Together, the Inyo NF Proposed Action and SEKI reasonably foreseeable action would add approximately 30 days of flights during a time of year when there are few, if any administrative/emergency landings in wilderness. In general, administrative and search and rescue landings occur during the months when and in locations where there are few visitors to these wilderness areas, limiting the potential for effects to opportunities for solitude.

Table 19 Cumulative number of days with helicopter landings in Inyo National Forest Wilderness and Sequoia and Kings Canyon National Parks Wilderness

Cumulative Project	Total Days
Inyo NF proposed action max. days with landings each year	17
Inyo NF days with admin/Emergency landings	21
SEKI proposed action max. days with landings each year	14
SEKI days with admin/emergency landings	>25
Approximate cumulative number of days annually with landings	**77**

The SEKI Sierra Nevada Bighorn Sheep Research and Recovery Project would be implemented in March to the first week in April in the Big Arroyo and Laurel Creek herd units (John Muir Wilderness). In these herd units soundscape intrusions would be unlikely because the amount of visitation to these areas in the spring is very low (USDI 2011a).

The monitoring captures in SEKI would occur in areas within the Park along the Sierra crest that are adjacent to the Inyo NF. Visitors to these areas of SEKI in October would most likely utilize an Inyo NF trail to reach National Park lands. The Inyo NF wilderness permit data can be used to gauge the potential for soundscape intrusions. The terrain west of Mt. Langley and the Mt. Tyndall (John Muir Wilderness) area have both regular use and are adjacent to a potential capture area. The SEKI areas around Mt. Langley

and Mt. Tyndall would be added to the five Inyo locations where there could be adverse effects to the opportunities for solitude from intrusions on the natural soundscape.

The cumulative effect of helicopter landings on the natural soundscape is the addition of potential soundscape intrusions in seven locations during the month of October to the ongoing soundscape intrusions from administrative and search and rescue landings: Inyo NF area around Mt. Langley; SEKI area around Mt. Langley; Lone Pine Peak Area (Inyo NF); Mt. Williamson (Inyo NF); Mt. Tyndall (SEKI); McGee Creek Trail (Inyo NF); Hilton Creek Trail (Inyo NF). Inyo NF portions are within the John Muir Wilderness and the portions in SEKI are located in the Sequoia-Kings Canyon Wilderness.

Alternative 2 Effects Summary

In summary, Alternative 2 would have the following effects on wilderness character:

- Major, long-term beneficial effects to the natural quality because all 12 of the essential herd units would be occupied.
- Minor, temporary, and site-specific adverse effects for monitoring captures on the untrammeled quality because the capture event would average one to three days within any given herd unit over a ten year period and the average time a SNBS is handled is 70 minutes. There would be moderate, long-term adverse effects to the untrammeled quality due to introductions of SNBS into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units because this is considered a manipulation by humans that intervenes in the free play of natural forces because humans are affecting the distribution of the population.
- Moderate, temporary, and site-specific adverse effects on the outstanding opportunities for solitude or a primitive and unconfined type of recreation quality of wilderness along eight trails determined to be near areas where captures may occur.

3.3 Comparison of Alternatives: Meeting Project Objectives

This section provides a comparison of how each alternative analyzed would meet the project objectives established in the purpose and need (EA Section 1.3).

3.3.1 Alternative 1 (No Action)

Table 20 displays how Alternative 1 would meet project objectives, which are produced from downlisting and delisting criteria from the recovery plan (USFWS 2007a).

Table 20 Estimated progress under Alternative 1 (No Action) toward meeting project objectives within a 10-year time period

Project Objective	Alternative 1 –No Action
Maintaining collars on 35% of SNBS ewes.	
Percentage of ewes collared	0-5%
Augmentations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units	
Number of animals placed in each herd unit:	
Mt. Warren	6
Mt. Gibbs	0
Convict Creek	0
Introductions into the Taboose Creek, Olancha Peak, Big Arroyo and Laurel Creek herd units	
Total number of SNBS released over a ten-year period	0

Maintaining VHF/GPS collars on 35% of SNBS ewes and collar all SNBS rams within the Northern Recovery Unit over a 10-year period:

Currently 30% of SNBS ewes are collared. In order to maintain collars on the population two actions are needed: 1) increasing the amount of collars in the population by deploying them on un-collared SNBS ewes, and 2) conduct maintenance or replace old collars.

Increasing the amount of collars

Drop-net and drive-net capture methods allow for more flexibility in the number and sex of the animals captured (Kock et al. 1987). However, due to the habitat use changes

mentioned above, the ability to capture large numbers of SNBS at one time has decreased (personal communication Stephenson 2012). Under this alternative a higher number of SNBS ewes may be collared in four herd units, as compared to the Proposed Action. The 46 SNBS CDFG may be able to capture would all be collared and therefore the percentage of collared ewes may increase in these herd units, but decrease over-time within the remaining herd units in the recovery area.

Maintenance of collars

Under this alternative CDFG would attempt to capture SNBS to replace GPS/VHF collars. Ground crews would continue to monitor currently collared SNBS, but collar information is only transmitted for the life of the collar; VHF collars have a lifespan of at least four years and can be active for as long as 10 years, and GPS collars typically drop off the animal after two years. Once these collars become inactive or drop off CDFG would no longer be able to utilize information gathered from these collars (habitat use information, movement patterns, etc.). Under this alternative, drop-net and drive-net capture methods would allow for some SNBS to be re-captured for the purposes of replacing or maintaining collars; however, these methods reduce the ability to target specific individuals (Kock et. al 1987). Furthermore, collars may only be replaced in the four herd units were these captures are feasible, reducing the percentage of replacing collars through the entire recovery area. This would lead to a decrease in the percentage of SNBS ewes collared from 30% to 0-5% over the next ten years.

Augmenting SNBS populations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units and Introducing SNBS into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units:

Translocation captures rely on the ability to locate specific animals suited for translocation. Animals are suitable for translocation if they have: 1) high genetic diversity, 2) high reproductive rates and productivity, and 3) known habitat use patterns. These factors are determined when CDFG performs monitoring captures on individuals and then follows those individuals over several years. These suitability factors increase the potential for a successful translocation, meaning the animal can adapt to its new location and has potential to increase the overall genetic diversity and health of the population it is moved into. Translocations also consider the sex and age of the individual bighorn sheep moved. The following section summarized Appendix C and describes the limitations in the No Action Alternative's progress toward meeting the project objectives and recovery goals related to translocation.

Population Augmentations

Under the No Action Alternative, CDFG would attempt to capture SNBS with the use of drop-nets and drive-nets in for the purposes of moving bighorn sheep into the Mt. Warren herd unit. CDFG estimates that out of the 46 animals captured, six SNBS would be placed in the Mt. Warren herd unit only, as potential release sites are located along road systems and SNBS can be released by a vehicle. Populations of SNBS occur at higher elevations, and within wilderness, in the Mt. Gibbs and Convict Creek area and are not accessible by roads or trails; therefore no augmentations would occur within these herd units, as releases would need to be conducted by a helicopter. The objective of augmenting these three herd units would be partially met, as releases would occur in the Mt. Warren herd unit. Without augmentation into the Mt. Gibbs and Convict Creek herd units project objectives and downlisting criteria would not be met (Appendix C).

Introductions

The California Department of Fish and Game would not attempt introductions into the Taboose Creek and Olancha Peak herd units under this alternative. Although there is the ability to use drop- and drive-nets to capture SNBS, CDFG would not be able to capture the minimum number of SNBS necessary for successful introductions (Appendix C). Furthermore, due to CDFG not being able to conduct captures for introductions, SEKI's proposal to re-introduce SNBS into the Big Arroyo and Laurel Creek herd units would not be accomplished, as the needed bighorn sheep are located on the Inyo NF.

Under this alternative the distribution of SNBS needed in the essential herd units would not be achieved, as introductions into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units would not occur. Movement into these herd units is not expected to occur naturally, within a reasonable time period, due to the distances SNBS would have to travel and the low SNBS population numbers in adjacent herd units (USDI 2007a and USDI 2008). The distribution of collars would also decrease over time as CDFG would be limited in 1) their ability to re-capture SNBS for the purposes of replacing collars and to increase the number of collars throughout the population of ewes and 2) the areas in which these capture methods are feasible, which also reduces the numbers of SNBS which may be captured.

3.3.2 Alternative 2 (Proposed Action)

Under this alternative, CDFG would be able to achieve delisting and downlisting criteria for the recovery of SNBS. This includes maintaining a high percentage of collared SNBS ewes and rams; augment small populations in essential herd units, and introduce SNBS into four essential herd units. In order to accomplish these project objectives the use of a helicopter is necessary (Appendix C).

Table 21 Estimated progress under Alternative 2 (Proposed Action) toward meeting project objectives within a 10-year time period.

Project Objective	Alternative 2 – Proposed Action
Maintaining collars on 35% of SNBS ewes.	
Percentage of ewes collared	33%
Augmentations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units	
Number of animals placed in each herd unit:	
Mt. Warren	3
Mt. Gibbs	2
Convict Creek	5
Introductions into the Taboose Creek, Olancha Peak, Big Arroyo and Laurel Creek herd units	
Total number of SNBS released over a ten-year period	115

Maintaining VHF/GPS collars on 35% of SNBS ewes and collar all SNBS rams within the Northern Recovery Unit over a 10-year period:

Currently 30% of SNBS ewes are collared. In order to maintain collars on the population two actions are needed: 1) increase the amount of collars in the population by deploying them on un-collared SNBS ewes and 2) conduct maintenance, or replace old, collars.

Under this alternative CDFG would attempt to capture SNBS to replace or affix new GPS/VHF collars. Ground crews would continue to monitor currently collared SNBS, but collar information will only be transmitted for the life of the collar; VHF collars have a lifespan of at least four years and can be active for as long as 10 years. Therefore there is a need to replace and affix new collars on SNBS to help gather information needed to meet recovery goals.

Under this alternative, additional SNBS needing collars for the SEKI research and monitoring study would occur, as helicopter net-gun captures would allow for the needed amount of animals to be captured.

<u>Increasing the amount of collars</u>

CDFG estimates the ewe population in ten years would be approximately 300 and of that about 100 of these ewes would be collared. The estimate for the percent of SNBS

ewes collared within a ten-year period is approximately 33%, which is slightly lower than the project objective of 35%; however, the percentage would increase the amount of collared SNBS as opposed to decreasing the numbers as in Alternative 1. Increasing the amount of collars would allow for CDFG to continue gathering data on habitat use, populations, and health of bighorn sheep, all of which are needed for translocations to occur.

Maintenance of collars

CDFG can locate SNBS which have collars that need to be replaced or repaired. This type of capture involves locating the specific individual needing a replacement collar. Helicopter net-gunning allows for the specific individual to be targeted and then captured (Kock et a. 1987). Under this alternative, CDFG would have the ability to capture the animals needing replacement collars, regardless of their location. Maintenance of collars allows CDFG to continue to gather needed information on populations and habitat uses. Data gathered during these captures and subsequent monitoring activities would provide information needed to perform translocation captures.

Augmenting SNBS populations in the Mt. Warren, Mt. Gibbs, and Convict Creek herd units and Introducing SNBS into the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units:

Translocation captures rely on the ability to locate specific animals suited for translocation. Animals are suitable for translocation if they have: 1) high genetic diversity, 2) high reproductive rates and productivity, and 3) habitat use patterns are known. These factors are determined when CDFG performs monitoring captures on individuals and then follows those individuals over several years. These suitability factors increase the potential for a successful translocation, meaning the animal can adapt to its new location and has potential to increase the overall genetic diversity and health of the population, or area, it is moved into. Translocations also consider the sex and age of the individual bighorn sheep moved.

Under this alternative, CDFG would utilize a helicopter for all capture work conducted for the purposes of augmenting and introducing SNBS populations. This would allow CDFG to have the ability to capture the specific animals needed for translocation. Alternative 2 allows for greater flexibility in locating specific individuals in the source herd units and the opportunity not only to safely capture the number needed for translocation, but also release the animals into the Mt. Gibbs and Convict Creek herd units, where SNBS occur in higher elevations. Augmentations would occur within the

Mt. Warren, Mt. Gibbs, Convict Creek herd units and introductions would occur within the Taboose Creek, Olancha Peak, Big Arroyo, and Laurel Creek herd units.

Table 21 displays how Alternative 2 would meet project objectives, which are produced from downlisting and delisting criteria from the Recovery Plan (USFWS 2007a).

Under this alternative the distribution of SNBS into essential herd units would be met. The proposed action would not fully meet the needs of maintaining 35% of SNBS ewes collared, however, this would be an increase over the current number of ewes collared (30%) and be greater than under Alternative 1. The number of SNBS within the Northern and Central Recovery Units would also increase under this alternative, increasing the ability to achieve downlisting criteria which established a number of SNBS necessary in each herd unit for downlisting and delisting to occur.

3.4 Effects relative to significance factors

1. **Beneficial and adverse impacts.**

Effects to wildlife and wilderness resources can be found in Sections 3.2.1 and 3.2.2 of this EA.

Livestock Grazing

Domestic Sheep- The recovery plan listed disease transmission from domestic sheep is a threat to SNBS and established a preliminary risk assessment to assess the risk of all domestic sheep grazing allotments within SNBS habitat (USDI 2007a). Following this preliminary risk assessment a model was created by Clifford et al (2007), which modeled risk using SNBS location and habitat use information. A cooperative risk assessment team was developed following the publishing of the Clifford et al paper and developed the paper *A Process for Identifying and Managing Risk of Contact between Sierra Nevada bighorn sheep and Domestic Sheep* (Baumer et al 2009). This document identified management practices which would reduce the risk of contact between domestic sheep and determined a calculated risk value for domestic sheep allotments. A follow-up document (entitled *Application Document*, Croft et al 2009) was then created stating the threshold risk based on the calculated risk values from the Baumer et al document. The threshold risk was established that any allotments with a calculated risk value of 0.833 were considered high risk of contact and potential disease transmission between domestic and bighorn sheep.

Inyo National Forest domestic sheep grazing allotments located within this threshold include portions of the June Lake, Sherwin/Deadman, and Rock Creek allotments (Barron 2012). These allotments are within the proximity of the Convict Creek and Wheeler Ridge herd units, both of which are currently occupied by SNBS. Under both alternatives there would be no effects to domestic sheep grazing allotments as changes to the risk threshold line are not foreseeable at this time and therefore management of domestic sheep allotments would continue under current management direction (Barron 2012).

Cattle- Five cattle grazing allotments which are adjacent to the project area; Monache, Templeton, Whitney, Mulkey, Alabama Hills, and Tobacco Flat (Barron 2012). These allotments are located within or adjacent to the Olancha Peak, Mt. Langley, Mt. Williamson, Mt. Baxter, Sawmill Canyon, Coyote Ridge, and Convict Creek herd units. Management of cattle grazing on these allotments has not

been changed due to the presence, or anticipated presence, of SNBS in these herd units. Disease concerns between cattle and bighorn sheep have been observed (Robinson et al 1967, Noon et al 2002, Forety and Lagerquist 1996), however; the recovery plan did not recommend changes or exclusion of areas from cattle grazing in or near bighorn sheep habitat (USDI 2007a). Furthermore, the U.S. Fish and Wildlife Service issued a 5-year review which stated that disease transmission from cattle grazing in the eastern Sierra Nevada was not considered to be a major threat to SNBS at this time (USDI, 2008). Changes in cattle grazing management on these allotments are not foreseeable at this time; therefore there would be no impacts to cattle grazing under Alternatives 1 and 2 (Barron 2012) and no further analysis will be conducted.

2. **The degree to which the proposed action affects public health or 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 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.

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 SNBS captures. Inyo National Forest staff would not be involved with this component of the project; CDFG staff or 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, mitigation measures, and compliance with required policies serve to reduce these risks; however, they can never be completely eliminated.

Alternative 1 (No Action)
Under this alternative, capture activities would be conducted with the use of drop-nets and drive-nets. Helicopter flights associated with drive-nets would be limited to three areas on the forest which require approximately one to 24 hours of flight time over a period of one to three days annually. These operations are hazardous to CDFG and contracted staff because they involve flights <50 meters and up to 100 meters above ground over rugged terrain. However, CDFG has

safety standards which must be followed (CDFG 2010) and hire contractors who are experienced in operating helicopters in similar conditions (high elevation). Regardless, these types of operations involve risk to the health and safety of those participating in these actions. Impacts to visitor safety may occur during drop-netting and drive-netting activities if visitors approach and tamper with the net stations. The nets or poles holding up the nets may fall on visitors if they tamper with them. The risk of this is low, as most net stations are placed in non-popular travel areas.

Cumulative Impacts

Although not predictable or foreseeable, changes in weather conditions factor into the safety of the capture methods. Captures, regardless of capture method, would be conducted during October and January through the 1st week in April. At this time of year weather conditions in the eastern Sierra Nevada can be unpredictable and change suddenly. Crews in helicopters may have time to move out of a capture site as a storm approaches; captures may even be canceled due to bad weather conditions. Ground crews conducting captures by darting may not have the time needed to move out of an area before a storm occurs. Potential safety hazards to ground crews during these months include: snow blindness, frostbite, hypothermia, and avalanches. Furthermore, capture crews using drop-net, darting, or drive-net methods would be placed in these conditions every year and in some cases multiple times per year (if captures are occurring in multiple herd units); this may increase the chances of injury or illness.

Alternative 2 (Proposed Action)

Under this alternative capture activities would occur by the use of a helicopter. Safety effects with the use of helicopters are the same as under Alternative 1. Capture methods would not involve drop-nets, darting, or drive-nets, which reduce the safety risks to capture crews, as they would be able to move out of an area during incremental weather and would not be located in the backcountry for days to weeks at a time.

Cumulative Impacts

Although not predictable or foreseeable, changes in weather conditions factor into the safety of the capture methods. Captures, regardless of capture method, would be conducted during October and January through the 1st week in April. At this time of year weather conditions in the eastern Sierra Nevada can be unpredictable and change suddenly. Crews in helicopters may have time to move

out of a capture site as a storm approaches; captures may even be canceled due to bad weather conditions.

3. **Unique characteristics of the geographic area.**

Wetlands – The proposed activity would not have potential for any hydrologic or soil effects because: 1) helicopter landings would not occur within wetlands, streams, shallow lakes, or other bodies or wet areas; 2) refueling of helicopters would not occur within 300 feet of perennial water bodies or wetlands and 100 feet from intermittent streams, and 3) all Best Management Practices would be followed if refueling occurs outside of an airport or helipad (Lutrick 2012).

Wild and Scenic Rivers – There are no Wild and Scenic Rivers within potential capture areas of the project area, therefore there would be no direct, indirect, or cumulative effects on Wild and Scenic Rivers.

Wilderness – Effects to wilderness character are described in EA Section 3.2.2 of the EA.

4. **The degree to which the effects on the human environment are likely to be highly controversial.**

As discussed in Section 3.2.1 and Section 3.2.1.1 the effects of different capture methods on bighorn sheep have been studied and published. In summary all of these publications have shown that there is mortality associated with all capture methods, but helicopter net-gunning has the lowest mortality rate of any capture method (Kock et al 1987 and Jessup et al 1988) and is the most effective and most common method of capturing bighorn sheep (Kock et al 1987, Jessup et al 1988, Foster 2005). The effects from all capture methods have been thoroughly addressed in the literature and management guidelines have been created to allow these methods to continue to be used, therefore the scientific controversy over the methods for capturing bighorn sheep is low.

Studies have shown that continuous helicopter over-flights can have negative results to desert bighorn sheep in the Grand Canyon National Park and southern California, with foraging decreasing and some changes in habitat use (Stockwell et al. 1991 and Bleich et al 1994). CDFG has conducted net-gun captures for 12 years and has not recorded any habitat use changes by SNBS because of this capture method (CDFG 2011a). This is due to several factors: 1) The equipment

that CDFG now use can operate at higher elevations, allowing captures to occur in different areas of SNBS ranges (summer/fall habitat) and reducing the need to continuously capture in low elevation winter ranges (Wehausen 2011); 2) Because of equipment changes, captures can also occur in different times of the year (October or January through the first week of April when SNBS occupy) summer/fall habitats at higher elevations or are wintering at high elevations (Wehausen 2011); 3) Because captures now occur at different times of year and in different habitat locations the need to conduct captures continuously in low elevation habitats is reduced and therefore there are no habitat use changes by SNBS in these areas.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**

   The California Department of Fish and Game has been conducting helicopter operations for the purposes of SNBS captures and monitoring efforts over the past ten years. CDFG is required to follow their department's Helicopter Flight Crew Operational Requirements/Procedures (CDFG 2010). All helicopter operations are conducted by experienced and certified contracted helicopter crews. These crews have experience working in high altitudes and rough terrain SNBS occur in. Risks associated with the use of helicopters on the Inyo National Forest are well-understood.

   The risks associated with the use of helicopter net-gun captures on SNBS are similarly well-understood. Over the past ten years CDFG has conducted captures 249 times, on 180 individual SNBS. Of these captures, 240 were conducted with helicopter net-guns and only eight mortalities have occurred (CDFG 2011a). CDFG is authorized under their permit with the U.S. Fish and Wildlife Service to have no more than three mortalities per year while conducting captures (USDI 2007b). CDFG is required to report all injuries or mortalities to the U.S. Fish and Wildlife Service every year (USDI 2007b). The U.S. Fish and Wildlife Service found that helicopter net-gun captures are needed and are the safest method of capturing SNBS (USDI 2007b). Scientific literature has also shown helicopter net-gun capture methods are the most effective and safe method for use on bighorn sheep (Kock et al. 1987).

6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.**

The recovery plan outlines eight separate recovery actions; the purpose and need for this project addresses four of these actions (Increase population growth by enhancing survivorship and reproductive output of bighorn sheep, Increase the number of herds, and thereby the number of bighorn sheep, Monitor status and trends of bighorn sheep herds, their habitat, and threats to them, and Initiate or continue needed research). The remaining recovery actions (Protect bighorn sheep habitat; Implement a genetic management plan to maintain genetic diversity of SNBS; Engage in public outreach and sharing of information; and Establish an implementation advisory team for coordination and communication) would be analyzed and implemented separately from this analysis. This project would not establish a precedent for future actions or represent a decision in principle about a future action.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.**

   Potential cumulative effects are addressed in the following sections of the EA: 3.2.1.1, 3.2.1.2, 3.2.2.1, and 3.2.2.2.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historical resources.**

   Based on an analysis conducted by the Forest Archaeologist, Alternative 2 is considered a screened undertaking as defined by the Programmatic Agreement among the USDA Forest Service, Pacific Southwest Region, California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Identification, Evaluations and Treatment of Historic Properties managed by the National Forests of the Sierra Nevada, California (2002 as amended) and no further review or consultation is needed (Johnston 2012). There would be no adverse effects to districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places under either alternative.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.**

Effects on Sierra Nevada bighorn sheep are described in Sections 3.2.1.1 and 3.2.1.2 within this EA and in the Biological Assessment (Murphy 2012). The Biological Assessment determined that the project may effect, but would not adversely affect SNBS (Murphy 2012). The U.S. Fish and Wildlife Service found that no further consultation was necessary for the purposes of this project because consultation was completed following section 7(a)(2) during the process of issuing CDFG a Federal Fish and Wildlife Permit (USDI 2011b). The U.S. Fish and Wildlife Service found that capturing activities would not jeopardize the existence of SNBS and issued CDFG a Federal Fish and Wildlife Permit to conduct helicopter net-gun captures and other SNBS management activities (USDI 2002, USDI 2007, and USDI 2011b).

Impacts to Forest Service Pacific Southwest Region sensitive aquatic, plant, and wildlife species were also analyzed (Murphy and Sims 2012 and Weis 2012). The Biological Evaluation conducted on sensitive and watch list plant species determined that Alternative 2 (Proposed Action) may impact individuals but would not lead toward federal listing or a loss of viability for the following species: *Arabis tiehmii, Astragalus ravenii, Botrychium lineare, Botrychium lunaria, Botrychium minganense, Carex tiogana, Cordylanthus eremicus* var. *olanchense, Draba asterophora* var. *asterophora, Eriogonum wrightii* var. *olanchense, Lupinus padre-crowleyi, Monardella beneolens, Streptanthus gracilis, Trifolium dedeckerae,* and *Draba sharsmithii.* This is due to the timing of the helicopter capture flights, the limited number of landings, the short duration of the activities, the small number of animals to be translocated, and the normal use patterns of the sheep (Weis 2012).

The aquatic and terrestrial Biological Evaluation identified potential habitat for two sensitive species, Sierra Nevada red fox and wolverine (Murphy and Sims 2012). Due to the short duration of potential impacts from noise and the presence of a helicopter it was determined that Alternative 2 (Proposed Action) may impact individuals but not lead toward federal listing or a loss of viability to the species (Murphy and Sims 2012).

The noxious weed assessment determined that there was low potential for the spread of noxious or invasive weeds in the project area due to the high elevations at which helicopter landings would occur (Weis 2011).

10. **Whether the action threatens a violation of Federal, State, or local law or other requirements imposed for the protection of the environment.**

National Forest Management Act – Alternatives 1 and 2 are consistent with the National Forest Management Act (NFMA). The alternatives would not threaten the viability of any sensitive species (Murphy and Sims 2012 and Weis 2012) and there would be no impacts to habitat utilized by Management Indicator Species (MIS) (Murphy and Sims 2012).

Wilderness Act – Alternatives 1 and 2 are consistent with the Wilderness Act (EA Section 3.2.2 and Novak 2012)

Endangered Species Act – The Endangered Species Act states that: "All other Federal agencies shall, in consultation with and with the assistance of the Secretary [of the Department of the Interior], utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." The Forest Service is required to conserve bighorn sheep; conservation is defined by the Act as using all methods which are necessary to bring about the recovery of the species, including research, census, live trapping, and translocation. Under both alternatives the Forest Service's requirements to comply with ESA are met by cooperating with the CDFG in recovery of this species. As shown in Section 3.3, the implementation of the Proposed Action would make better progress towards meeting recovery criteria. Under the No Action Alternative meeting recovery criteria would be delayed substantially.

Migratory Bird Treaty Act – Alternatives 1 and 2 are consistent with the Migratory Bird Treaty Act. Activities proposed under each of these alternatives would not occur during peak nesting season for migratory birds, nor is the intent of this project to, or attempt to, pursue, hunt, shoot, wound, kill, trap, capture, or collect migratory bird species.

Clean Water Act – Alternatives 1 and 2 are consistent with the Clean Water Act as evaluated in the Hydrology/Soil Resources Input for the Helicopter Landing in Wilderness Project (Lutrick 2012). All fueling activities would be conducted outside wilderness areas, and fueling BMPs would be implemented if any accidental spills were to occur. No fueling would be conducted in Riparian Conservation Areas (RCAs), so there is no potential for surface water contamination.

National Historic Preservation Act – Alternatives 1 and 2 are consistent with the National Historic Preservation Act (Johnson 2012).

Inyo NF Land and Resource Management Plan – Alternatives 1 and 2 are consistent with the Inyo NF Land and Resource Management Plan (LRMP). The LRMP Standards and Guidelines state wildlife management should emphasize the protection and improvement of habitat for threatened or endangered wildlife and to manage for the protection and enhancement of all historically and potentially threatened or endangered species habitat as necessary to meet recovery levels (USDA 1988). Furthermore, the Inyo NF is to cooperate with the Fish and Wildlife Service and CDFG in the management of threatened and endangered species and the restoration of habitat (USDA 1988).

Chapter 4 Lists

4.1 Agencies and Persons Consulted

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Chapter 5 Appendices

Appendix A – Response to Comments

Appendix B – Sierra Nevada Bighorn Sheep Management Activities Conducted by the California Department of Fish and Game

Appendix C – Need and Justification for the Use of Helicopter Net-Guns to Capture Sierra Nevada Bighorn Sheep

Appendix D - Proposed Action Table: Number of Captures and Landings