DRAFT
ENVIRONMENTAL DOCUMENT

Section 362, Title 14, California Code of Regulations

Regarding

Bighorn Sheep Hunting

February 3, 2011

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

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CHAPTER 1. SUMMARY

Existing law (Section 4902, California Fish and Game Code) allows the Commission to authorize sport hunting of mature Nelson bighorn rams in geographic areas for which management plans have been developed. Section 4901 of the California Fish and Game Code provides the Commission to authorize the take of a limited number of mature Nelson bighorn rams by establishing the areas, seasons and hours, bag and possession limits, and the number of Nelson bighorn sheep rams that may be taken pursuant to its regulations.

State law (Section 207 of the Fish and Game Code) requires that the Commission review the mammal hunting regulations, and the Department to present its recommendations for changes to the mammal hunting regulations to the Commission at a public meeting. Mammal hunting regulations adopted by the Commission provide for hunting bighorn sheep in specific areas of the State (Section 362, Title 14, California Code of Regulations).

In adopting regulations providing for limited hunting of mature Nelson bighorn sheep rams, the Commission would be implementing section 4902 of the Fish and Game Code, which is consistent with the wildlife conservation policy adopted by the California Legislature (Section 1801, Fish and Game Code). The State's wildlife conservation policy, among other things, contains an objective of providing hunting opportunities when such use is consistent with maintaining healthy wildlife populations.

PROPOSED PROJECT AND ALTERNATIVES

The project discussed in this document (proposed project) involves hunting of mature male Nelson bighorn sheep (Sections 4900-4904, California Fish and Game Code). Specifically, the Department is proposing to adjust tag quotas, establish 2 additional hunt zones, modify hunt zone boundaries, and establish the zones in which tags for fund-raising purposes are valid. Because final hunter quotas cannot be established until harvest and survey results are completed and analyzed, the Commission is provided with a range of proposed hunting tag quotas (Appendix 1). Upon completion of the aforementioned analyses, the Department will determine and recommend to the Commission final hunting tag quotas.

The Department is also providing the Commission with a range of alternatives to the proposed project that could feasibly attain the basic objectives of the project. It is anticipated that the proposed project would fall around the upper end of the proposed tag ranges. Alternative 1 (no change) would maintain quotas and seasons for each existing hunt zone without change. Alternative 2 (increased harvest) would involve issuing tag quotas at a rate greater than the proposed project, and would necessarily involve legislative changes to the Fish and Game Code.

Table 1-1: Proposed 2011 Tag Allocation

HUNT ZONE	2010 Tag allocation	2011 Tag allocation (proposed)
Zone 1 - Marble/Clipper Mountains	4	3-4
Zone 2 - Kelso Peak/Old Dad Mountains	4	3-4
Zone 3 - Clark/Kingston Mountain Ranges	2	2
Zone 4 - Orocopia Mountains	1	1-2
Zone 5 - San Gorgonio Wilderness	2	2-3
Zone 6 - Sheep Hole Mountains	2	1-2
Zone 7 – White Mountains	4	3-5
Zone 8 - South Bristol Mountains	-	2-3
Zone 9 – Cady Mountains	-	3-4
Open Zone Fund-raising Tag	1	1
Marble/Clipper/Sheep Hole Mountains Fund-raising Tag	1	-
Marble/Clipper/South Bristol Mountains Fund-raising Tag	-	1
Kelso Peak/Old Dad Mountains Fund-raising Tag	1	1
TOTAL	22	23-32

SUMMARY OF IMPACTS AND MITIGATION

Table 1-2 summarizes Department findings that there are not significant long-term adverse impacts associated with the proposed project or any of the project alternatives considered for the 2011 bighorn sheep hunting regulations.

Table 1-2: Effects on the Environment of Limited Public Hunting of Bighorn Sheep

Alternative	Significant Impact	Nature of Impact	Mitigation Available	Nature of Mitigation
Proposed Project: Adding new hunt areas and modifying number of tags and zone boundaries	No	None	N/A	N/A
Alternative 1: No change	No	None	N/A	N/A
Alternative 2*: Increased harvest of mature rams	No	None	N/A	N/A

It is anticipated that the number of tags issued will fall near the upper end of the proposed ranges (Table 1-1). On a zone basis, the resulting harvest for 2011 will likely be similar to that which occurred in 2010, because hunter success generally approaches 100%. On a statewide basis, the total hunter harvest will likely exceed that of previous years because of the allocation of tags in 2 newly established hunt zones. Based on success rates from previous years, it is anticipated that the actual harvest will be approximately 95% of the bighorn sheep tags allocated for 2011.

PUBLIC INPUT AND AGENCY CONSULTATION

The Legislature has delegated authority to the Commission, whose members are appointed by the Governor, to regulate the take and possession of wildlife. The Legislature has further directed the Commission to hold no fewer than three public meetings for the purpose of considering and adopting revisions to regulations relating to hunting and trapping of mammals (Section 207, Fish and Game Code [FGC]).

Recommendations and comments from the Department, other agencies, and the public are to be received and considered at these meetings. The Commission may then, after considering public input, adopt regulations relating to any recommendations received at the initial meeting it deems necessary to preserve, properly utilize, and maintain each species or subspecies.

The California Environmental Quality Act (CEQA) encourages public input. One of the primary purposes of the environmental document review process is to obtain public comment, as well as to inform the public and decision makers. It is the intent of the Department to encourage public participation in this environmental review process.

Prior to preparing this environmental document, the Department developed a Notice of Preparation (NOP). On December 8, 2010, the NOP was provided to the State Clearinghouse for distribution, as well as to land management agencies in California that have an interest, or play a key role, in Nelson bighorn sheep management [including the U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), National Park Service (NPS) and U.S. Forest Service (USFS)]. The NOP requested that any comments regarding input to this environmental document be submitted to the Department within 30 days of receipt of the NOP.

In addition, this environmental document is available for public review for 45 days (Section 15087, Title 14, California Code of Regulations). During the review period, the public is encouraged to provide written comments regarding the document to the Department of Fish and Game, Wildlife Branch, 1812 Ninth Street, Sacramento, California 95811. Comments must be received by the Department no later than 5:00 pm on March 14, 2011.

AREAS OF CONTROVERSY

The Department has encouraged public input into the environmental document by holding a scoping session to discuss documents prepared in support of mammal hunting and trapping regulations. This scoping session was held in Sacramento, CA on November 18, 2010. No areas of controversy were identified.

ISSUES TO BE RESOLVED

As provided by existing law, the Commission is the decision-making body (lead agency)

considering the proposed project, while the Department has the responsibility for management activities, such as hunting, translocating bighorn sheep to historical range(s), and preparing management strategies. The primary issue for the Commission to resolve is whether to change bighorn sheep hunting regulations as an element of bighorn sheep management. If such changes are authorized, the Commission will specify the areas, seasons, methods of take, number of bighorn sheep tags to be allocated, and other special conditions as appropriate.

FUNCTIONAL EQUIVALENCY

California Environmental Quality Act (CEQA) review of the proposed project will be conducted in accordance with the Commission's certified regulatory program (CRP) approved by the Secretary for the California Resources Agency pursuant to Public Resources Code Section 21080.5. The California Environmental Quality Act requires all public agencies in the State to evaluate the environmental impacts of projects they approve, including regulations, which may have a potential to significantly affect the environment. The Department has prepared this Environmental Document (ED), which is the functional equivalent of an Environmental Impact Report, on behalf of the Commission in compliance with this requirement. The ED provides the Commission, other agencies, and the general public with an objective assessment of the potential effects of the proposed action.

CHAPTER 2. THE PROPOSED ACTION

1. Number of Tags

In order to maintain management goals and objectives, it is periodically necessary to adjust quotas in response to dynamic environmental and biological conditions. This proposed project adjusts bighorn sheep tag ranges to account for fluctuations in populations of bighorn sheep (Appendix 1).

Fish and Game Code Section 4902 limits the number of hunting tags for mature Nelson bighorn sheep rams to no more than 15% of the number of such males estimated to occur in each geographic area for which an approved management plan has been prepared. Annual population estimates are based on aerial surveys carried out by Department biologists, or on models developed from data obtained during those aerial

surveys. Annual survey data or resulting models of population size upon which tag allocations are based are available from the Wildlife Branch, California Department of Fish and Game, Sacramento, California.

2. Establish New Hunts

a. Establish a new bighorn sheep hunt in the South Bristol Mountains, San Bernardino County. Bighorn sheep are widespread in southeastern California, and the proposal would increase the total number of geographic areas, or hunt zones from 7 to 8. The proposal will add one new bighorn sheep hunt, termed the South Bristol Mountains bighorn sheep hunt, to the list of areas open to hunting of bighorn sheep (Figure 2-1). The number of tags (range 2 to 3) to be issued would be restricted to no more than 15% of the number of mature Nelson bighorn rams estimated to occur in the hunt zone, as stipulated by state law. Tags would be available to the general public during a season beginning on the first Saturday in December 2011, and continuing through the first Sunday in February 2012 (Appendix 1). This opportunity complies with Sections 4900-4904 of the California Fish and Game Code (Appendix 2) and recommendations provided in the approved management plan for the South Bristol Mountains Bighorn Sheep Management Unit (Bleich et al. 2010)

b. Establish a new bighorn sheep hunt in the Cady Mountains, San Bernardino County. Bighorn sheep are widespread in southeastern California, and the proposal would increase the total number of geographic areas from 8 to 9. The proposal will add one new bighorn sheep hunt, termed the Cady Mountains bighorn sheep hunt, to the list of areas open to hunting of bighorn sheep (Figure 2-1). The number of tags (range 3 to 4) to be issued would be restricted to no more than 15% of the number of mature Nelson bighorn rams estimated to occur in the hunt zone, as stipulated by state law. Tags would be available to the general public during a season beginning on the first Saturday in December 2011, and continuing through the first Sunday in February 2012 (Appendix 1). This opportunity complies with Sections 4900—4904 of the California Fish and Game Code and recommendations provided in the approved management plan for the Cady Mountains Bighorn Sheep Management Unit (Bleich et al. 2010).

3. Modify One Existing Hunt Boundary

a. Existing regulations specify the boundary for the Old Dad/Kelso bighorn sheep hunt. A small number of bighorn sheep now occupy the South Soda Mountains, near the west end of the Old Dad Peak-Kelso Mountains bighorn sheep hunt zone. Additionally, proposed regulatory changes will establish the Cady Mountains bighorn sheep hunt zone. The proposal to modify the existing boundary for the Old Dad/Kelso bighorn sheep makes the western boundary contiguous with the Cady Mountains bighorn sheep hunt zone while simultaneously encouraging continued expansion of the population of bighorn sheep now established in the South Soda Mountains (Appendix 1).

4. Establish Valid Areas and Dates for Three Fund-Raising Tags

a. Allocate one open zone fund-raising tag that shall be valid in any zone open to the hunting of mature Nelson bighorn sheep rams. In the White Mountains bighorn sheep hunt, this tag shall be valid from the first Saturday in August 2011 and continue through the last Sunday of September 2011. In the San Gorgonio Wilderness, this tag shall be valid from the third Saturday in November 2011 to the third Sunday of February 2012. In all other zones open to the hunting of mature Nelson bighorn sheep rams, this tag shall be valid from the first Saturday of November 2011 through the first Sunday of February 2012.

b. Allocate one fund-raising tag that shall be valid only in the Marbles and Clipper Mountains and the South Bristol Mountains hunt zones. This tag shall be valid from the first Saturday of November 2011 through the first Sunday of February 2012.

c. Allocate one fundraising tag that shall be valid only in the Kelso Peak /Old Dad Mountains hunt zone. This tag shall be valid from the first Saturday of November 2011 through the first Sunday of February 2012.

The Department is recommending that the Commission adopt regulations that will provide for taking no more than 15 percent of the mature Nelson bighorn rams from each management unit, the establishment of 2 additional hunt zones, a modification to existing hunt zone boundaries, and establish the zones and season dates in which tags for fund-raising purposes are valid.

Figure 2-1: Location of Nelson Bighorn Sheep Hunt Zones

BACKGROUND AND EXISTING CONDITIONS

Historical Perspective of Bighorn Sheep Management in California

Bighorn sheep existing today probably are the descendants of similar animals that entered North America via the Bering land bridge during the Illinoisan glaciation, at least 150,000 years ago (Cowan 1940, Geist 1970). Wild sheep spread across the glaciated mountains of western North America during the Sangamon interglacial period. The Wisconsin glaciation, 10,000-125,000 years ago, then separated the animals into two populations that persisted in unglaciated areas. Subsequently, Dall's sheep (*Ovis dalli*) evolved from populations in the Alaska-Yukon region, and bighorn sheep (*Ovis canadensis*) evolved in a region south of glaciated mountains and forests in what is now the continental United States (as summarized by Bailey 1980). Following the Wisconsin glaciation, wild sheep radiated into dry, mountainous terrain.

Geist (1971) tied the evolution of Asiatic and North American sheep to the expanding availability of favorable habitat, an occurrence concomitant with receding glaciers. The races, or subspecies, of *Ovis canadensis* currently recognized as desert bighorn sheep evolved from wild sheep that persisted in the southern region despite climatic changes. In part, they may have persisted because of the lack of competition

with other large, native herbivores (Bailey 1980).

In California, bighorn sheep are found primarily in the southeastern part of the State in numerous Mojave and Sonoran desert mountain ranges. They also occur in several populations in the eastern Sierra Nevada; and, in three populations, in the Transverse Ranges of Ventura, Los Angeles, and San Bernardino counties. The probable historical and current distributions of bighorn sheep in California are illustrated in Figure 2-2.

Until recently, taxonomists have recognized three subspecies of mountain sheep in the state, including *O. c. californiana* (which was thought to occur throughout the Sierra Nevada and historically in northeastern California), *O. c. nelsoni* (which occurs throughout the majority of the Mojave and Sonoran deserts and in the transverse ranges of southwest California), and *O. c. cremnobates* (which occupied the peninsular ranges located primarily near the border with Mexico) (Cowan 1940). There have, however, been recent changes in nomenclature with respect to bighorn sheep inhabiting the Sierra Nevada and the peninsular ranges. Indeed, bighorn sheep occupying the Sierra Nevada were designated *O. c. californiana* and are the only representative of that taxon; at the same time, all other wild sheep formerly designated as *O. c. californiana* were synonymized with *O. c. canadensis*, and are now recognized as the Rocky Mountain subspecies (Wehausen and Ramey 2000). Moreover, bighorn sheep inhabiting the peninsular ranges and formerly recognized as the subspecies *cremnobates*, were synonymized with *O. c. nelsoni*, and no longer are considered a distinct subspecies (Wehausen and Ramey 1993).

To further complicate nomenclature, Joseph Grinnell (1912) had assigned the subspecific epithet *sierrae* to those animals he described from the Sierra Nevada before Cowan (1940) published his revision of the taxonomy of North American mountain sheep and, obviously, before Wehausen and Ramey (2000) synonymized *californiana* with *canadensis*. Because sheep in the Sierra Nevada warrant subspecific recognition (Wehausen and Ramey 2000), judicious application of the rule of priority as it appears in the International Code of Zoological Nomenclature dictates that those animals are once again assigned to the subspecies *sierrae* (Wehausen et al. 2005).

Throughout much of the range occupied by bighorn sheep, the downward trend in numbers began with the human settlement of vast, uninhabited areas (Buechner

1960). Although a great deal of attention has been paid to the potential impacts of unregulated market hunting associated with the influx of gold mining during the 1850s (Buechner 1960) another likely factor was the introduction of livestock, primarily domestic sheep, throughout much of the range of bighorn sheep (Buechner 1960). Indeed, Francisco Garces, who chronicled the expeditions of Father Anza as he traveled from what is now Arizona north and west toward the Pacific coast of California, described dead and dying bighorn sheep in the Santa Rosa Mountains of southern California as early as 1776 (Bolton 1930). Garces described dead and moribund animals in association with livestock being herded northward by the Anza Expedition (Bolton 1930). Further evidence persists in the form of a legend among the Kaliwa Indians of Baja California, which describes a pestilence that killed many wild sheep in northern Mexico following the arrival of Spaniards and their livestock (Tinker 1978).

Historically, bighorn sheep were more numerous than they are today (Buechner 1960); a reasonable estimate for California is about 10,000 individuals in 1800 (Bleich 2006). These animals were distributed among approximately 100 populations at that time (Wehausen et al. 1987a).

In the decades immediately following the discovery of gold in California, several populations of bighorn sheep in the Sierra Nevada were eliminated, likely as a result of diseases contracted from domestic sheep that were grazed in that mountain range. The reduction in bighorn sheep, and wildlife populations in general, resulted in the first legal protection for bighorn sheep and other species of large mammals in California. At that time, it was believed that wildlife populations protected from hunting would flourish and recolonize former ranges and, in 1872, the California Legislature passed a law protecting deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and pronghorn (*Antilocapra americana*) for eight months of the year. In 1878, the Legislature amended the act to establish a four-year moratorium on the taking of any elk, pronghorn antelope, bighorn sheep, or female deer and, in 1883, the moratorium on taking bighorn sheep was extended indefinitely. In 1933, bighorn sheep became the first species in California to be classified as "fully protected" by the California Legislature (California Department of Fish and Game 2005a).

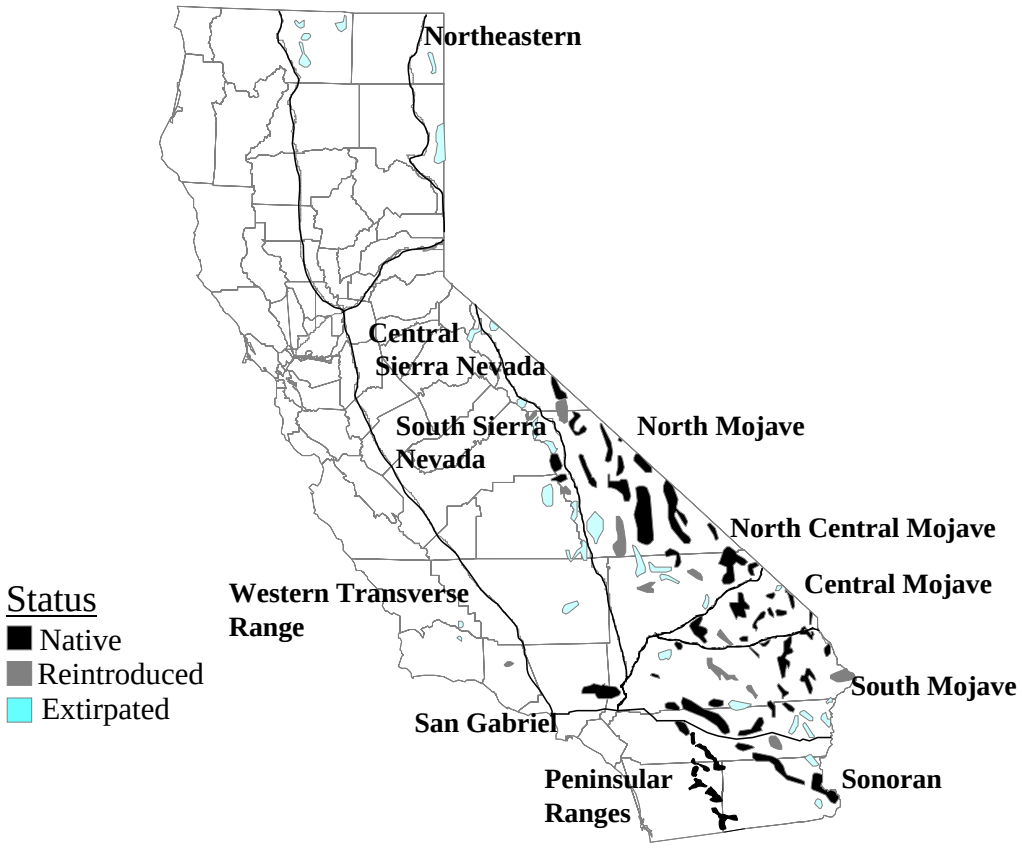
Despite the well-intentioned efforts of the California Legislature, total protection did not halt the loss of bighorn sheep in California (Wehausen et al. 1987a, Bleich 2006), and populations of bighorn sheep continued to disappear (Epps et al. 2003).

Historic surveys and population estimates suggest that diseases, habitat changes, and competition for forage, rather than illegal take, resulted in the elimination of bighorn sheep in some areas, of which the most recent examples were the losses of translocated populations of bighorn sheep at Lava Beds National Monument in Siskiyou County (Weaver 1983), and in the Warner Mountains of Modoc County (Weaver and Clark 1988), both of which are thought to have resulted from respiratory disease contracted from domestic sheep in those areas (Foreyt and Jessup 1982, Weaver and Clark 1988).

Contemporary Management of Bighorn Sheep in California

Currently, bighorn sheep occupy about 60 mountain ranges in California (Wehausen et al. 1987a); these populations are distributed primarily in the Sierra Nevada and desert regions of eastern and southern California (Epps et al. 2003). About 400 bighorn sheep occupy the Sierra Nevada, 950 occupy the peninsular ranges, and the remainder (about 3,850) occurs in the transverse ranges, the Mojave Desert, and the Sonoran Desert. There are more populations than there are mountain ranges supporting bighorn sheep, because some larger mountain ranges contain multiple populations based on distinct ranges of females (Bleich et al. 1996).

Figure 2-2: Bighorn sheep distribution



As a result of the aforementioned taxonomic and nomenclatural revisions, two subspecies of bighorn sheep currently are recognized in California. *Ovis canadensis nelsoni* occurs in suitable habitat in the Transverse Ranges, the Mojave Desert, and the Sonoran Desert; *O. c. sierrae* is restricted to the Sierra Nevada. Since 1998, bighorn sheep occupying the peninsular ranges have been afforded protection under the federal Endangered Species Act (U.S. Fish and Wildlife Service 2000), and bighorn sheep occupying the Sierra Nevada have been afforded similar protection since 2000 (U.S. Fish and Wildlife Service 2008). The California Fish and Game Commission has classified bighorn sheep inhabiting the peninsular ranges as threatened, and those inhabiting the Sierra Nevada are classified by the Commission as endangered.

Although the Department has supported an active management program for many years, contemporary management of bighorn sheep began with the passage of Senate Resolution 43 in 1963 (Bleich 2006). Input from interested conservation groups was instrumental in the passage of that resolution, which resulted in funding for the most detailed survey of bighorn sheep yet conducted in California; until that time, basic

inventory data consisted only of cursory surveys that occurred in 1940, 1946, and 1957. Survey work completed during 1968-1972 as a result of Senate Resolution 43 yielded an estimate of 3,700 bighorn sheep in California (Weaver 1972). More importantly, however, was the fact that for the first time ever the management needs of bighorn sheep, including land-use conflicts, water developments, and re-introductions, were addressed.

As a result of management recommendations resulting from implementation of Senate Resolution 43, the Department of Fish and Game implemented an ambitious program to acquire habitat for bighorn sheep occupying the peninsular ranges. Additionally, the Volunteer Desert Water and Wildlife Survey (VDWWS) was founded to help carry out recommendations for water developments put forth by Weaver (1972), and to assist the Department with census efforts and other work related to bighorn sheep and other desert wildlife. Since 1970, volunteers have contributed thousands of hours of labor to the program, resulting in dozens of habitat enhancement projects directed specifically at conserving populations of bighorn sheep (Bleich et al. 1982, Bleich 1990).

An effort to reestablish bighorn sheep on historical ranges also occurred as a result of Senate Resolution 43. The first such effort took place in 1971 at Lava Beds National Monument, and in 1980 a similar effort was initiated in the Warner Mountains. As described previously, both of those attempts ultimately were unsuccessful.

In 1979, translocation of California bighorn sheep from the Mount Baxter herd in the Sierra Nevada was initiated, largely as a result of research conducted by Wehausen (1979) in combination with recommendations by the Department (Leach 1974) that the subspecies be introduced to areas from which it had been eliminated. Since then, a total of 118 animals have been translocated, 108 of which were used to reestablish bighorn sheep populations in three areas of the Sierra Nevada: Wheeler Crest, Mount Langley, and Lee Vining Canyon or to augment other extant populations in that range, and 10 of which were translocated to the Warner Mountains of Modoc County, California. These translocations took place in 1979, 1980, 1982, 1986, 1987, 1988, 2001, 2005, and 2009.

In 1981, Assembly Concurrent Resolution 41 was passed and directed the Department to prepare a study plan to investigate population status, competition,

diseases, and the potential to introduce bighorn sheep to historically occupied areas in California. Funding was allocated from the California Environmental License Plate Fund for the purpose of carrying out the investigations outlined by the Department's study plan (Weaver 1983).

In 1983, the Department completed a statewide management plan for bighorn sheep (California Department of Fish and Game 1983). A number of specific management programs, designed to help meet statewide goals for the management and restoration of bighorn sheep populations, were contained in that plan. Goals specifically listed in the statewide plan are to: (1) maintain, improve, and expand bighorn sheep habitat where possible or feasible; (2) reestablish bighorn sheep populations on historic ranges where feasible; (3) increase bighorn sheep populations so that all races become numerous enough to no longer require classification as threatened or fully protected; and (4) provide for aesthetic, educational, and recreational uses of bighorn sheep. Aside from the specific recommendations of Leach et al. (1974) regarding California bighorn sheep, this was the first official Department document to advocate the reintroduction of all subspecies of bighorn sheep in California.

Subsequently, in 1983 a series of translocation projects involving Nelson bighorn sheep (*O. c. nelsoni*) from two large Mojave Desert mountain ranges began. To date, 230 animals have been removed from Old Dad Peak for translocation to the Whipple Mountains, Sheep Hole Mountains, Eagle Crags, Argus Mountains, Avawatz Mountains, Chuckwalla Mountains, Bristol Mountains, and Bullion Mountains. A total of 55 animals have been removed from the Marble Mountains for translocation to the Whipple Mountains and Eagle Crags (Bleich et al. 1990, Torres et al. 1994).

By 1983, it was determined that the population of Nelson bighorn sheep in the San Gabriel Mountains was large enough to support removals for translocation (Holl and Bleich 1983), and in 1983, 1985, and 1987, a total of 71 animals were removed from winter ranges in the South Fork of Lytle Creek and Cattle Canyon. Those animals were translocated to a vacant, historical winter range in the Prairie Fork of the San Gabriel River (within the San Gabriel Mountains) and to historical habitat near San Rafael Peak, in Ventura County (Bleich et al. 1990). In 1988, 10 sheep were captured in Lone Tree Canyon of the White Mountains, Mono County, and translocated to Silver Canyon, also in the White Mountains, Inyo County. Since 1979, the Department has reestablished 11 new populations and augmented four small populations through

translocation projects.

In 1986, the enactment of Assembly Bill 3117 (Chapter 745) created a series of laws which comprised the most significant legislation affecting bighorn sheep management in California since the 1878 legislation that established the initial moratorium on the taking of bighorn sheep. This law contained language that directed the Department to prepare management plans for each population of bighorn sheep in California. In addition, Assembly Bill 3117 differed from previous legislation that would have authorized hunting in that it: (1) made bighorn sheep a game mammal in only two areas (Old Dad Peak and the Marble Mountains); (2) provided for one hunting tag to be available for fund-raising purposes each year, with the revenues from bighorn sheep hunting to be put in an account set aside solely for the benefit of bighorn sheep; (3) set a biologically conservative limit on the number of tags which could be offered each year, not to exceed 15 percent of the mature males counted annually in each population; and (4) contained an expiration date of December 31, 1992, unless the Legislature extended it beyond that date. In 1990, the Legislature removed the expiration date.

Implementation of Section 4902 of the California Fish and Game Code (Appendix 2) has included hunting of a limited number of mature Nelson bighorn rams since 1987, when specific regulations similar to the proposed action were initially adopted by the Commission. Hunts have been conducted annually since then, pursuant to Section 362 of Title 14, CCR.

Assembly Bill 977 amended sections 4902 and 4903, Fish and Game Code, and thereby (1) permitted the Commission to authorize hunting of Nelson bighorn rams in management units for which plans have been developed pursuant to Section 4901, Fish and Game Code; (2) increased to three the permissible number of fund-raising license tags to be available for programs and projects to benefit bighorn sheep (the number of these authorized, if more than one, would not be permitted to exceed 15 percent of the total number of tags authorized generally); and (3) specified that any use of those revenues for the Department's administrative overhead shall be limited to the reasonable costs associated with direct administration of the program.

The Department's Bighorn Sheep Management Program is currently revising the statewide management plan or bighorn sheep in California. This planning effort will identify and prioritize activities to ensure the long-term viability of bighorn sheep

populations, consistent with existing State policy. Protection of important habitats and inter-mountain movement corridors, identification of future introduction sites, and habitat enhancements will be addressed. This planning effort is occurring in cooperation with the Bureau of Land Management, California Department of Parks and Recreation), Department of Defense (Military), and National Park Service (NPS).

Intensive data collection continues to provide basic information for updating and preparing additional management plans, as required by the California Fish and Game Code. These efforts include assessing habitat and potential movement corridors, and surveys to estimate population sizes, age class structure, sex ratios, sampling individual animals for the prevalence of diseases and parasites, and implementing strategies to stabilize or enhance individual populations of bighorn sheep.

EXISTING REGULATIONS REGARDING BIGHORN SHEEP HUNTING

Regulated public hunting for Nelson's bighorn sheep began in 1987 in California with passage of AB 3117, and has occurred without interruption since that date. Additional public hunts for Nelson's bighorn sheep have been established subsequent to 1987, annual hunts for Nelson's bighorn sheep have been part of the existing conditions in California for the last 24 years. Appendix 1 lists the verbatim for the current and proposed conditions for hunting Nelson's bighorn sheep in California.

POLICY CONSIDERATIONS

The Legislature formulates laws and policies regulating the management of fish and wildlife in California. The general wildlife conservation policy of the State is to encourage the conservation and maintenance of wildlife resources under the jurisdiction and influence of the State (Section 1801 of the California Fish and Game Code). The policy includes the following objectives:

1. To provide for the beneficial use and enjoyment of wildlife by all citizens of the State;
2. To perpetuate all species of wildlife for their intrinsic and ecological values, as well as for their direct benefits to man;
3. To provide for aesthetic, educational, and non-appropriative uses of the various wildlife species;

4. To maintain diversified recreational uses of wildlife, including hunting, as proper uses of certain designated species of wildlife, subject to regulations consistent with the maintenance of healthy, viable wildlife resources, the public safety, and a quality outdoor experience;
5. To provide for economic contributions so the citizens of the State through the recognition that wildlife is a renewable resource of the land by which economic return can accrue to the citizens of the State, individually and collectively, through regulated management. Such management shall be consistent with the maintenance of healthy and thriving wildlife resources and the public ownership status of the wildlife resource;
6. To alleviate economic losses or public health and safety problems caused by wildlife; and
7. To maintain sufficient populations of all species of wildlife and the habitat necessary to achieve the above-stated objectives.

With respect to Nelson's bighorn sheep, the Legislature has established the State's policy regarding management in sections 4900-4904 of the California Fish and Game Code (Appendix 2). Section 4900 declares that bighorn sheep are an important wildlife resource of the state that are to be managed and maintained at sound biological levels, and that it is the policy of the state to encourage the preservation, restoration, utilization, and management of California's bighorn sheep population, and that such management shall be in accordance with the policy set forth in Section 1801 of the Fish and Game Code. Section 4901 directs the Department to determine the status and trend of bighorn sheep populations by management units, and to prepare plans for each of the management units. Each plan is to address (a) the numbers, age, sex ratios, and distribution of bighorn sheep within the management unit; (b) range conditions and any competition that may exist as a result of human, livestock, wild burro, or any other mammal encroachment; (c) the need to relocate or reestablish bighorn populations; (d) the prevalence of disease or parasites within the population; and (e) recommendations for achieving the policy objective of Section 4900.

Section 4902 provides that the Commission (a) may adopt all regulations pertaining to biologically sound management of Nelson bighorn sheep (O. c. nelsoni), including sport hunting of mature Nelson bighorn rams; (b) may not authorize permits in a single year within a single management unit in excess of the Department's annual estimate of the population in that management unit; (c) may determine the fee for a tag

to take a Nelson bighorn ram, but restricts that amount to five hundred dollars; (d) shall annually direct the department to authorize not more than three of the tags available for issuance that year to take Nelson bighorn rams for the purpose of raising funds for programs and projects to benefit Nelson bighorn sheep, that those tags may be sold to residents or nonresidents for fund-raising purposes and shall not be subject to any fee limitation as described in Section 4902(c), specifies certain non-profit organization(s) as the seller(s) of not less than one of those tags if more than one fund-raising tag is authorized, restricts the number of fund-raising tags, if more than one, to no more than 15 percent of the total number of tags authorized to hunt Nelson bighorn rams in any given year, and mandates that all successful applicants complete a hunter familiarization and orientation conducted by the Department prior to hunting.

Section 4903 establishes a special bighorn sheep account into which funds generated from the sale of tags for hunting Nelson bighorn sheep rams shall be deposited and made available solely for programs and projects to benefit bighorn sheep and for the direct costs and administrative overhead incurred solely in carrying out the Department's bighorn sheep activities.

Section 4904 mandates that the Department prepare and submit a biennial report that includes information on any management plans prepared, losses of bighorn sheep, a summary of data used to prepare recommendations pursuant to Section 4902 of the Fish and Game Code, and an assessment of the environmental impacts of hunting mature Nelson bighorn rams on the various herds.

CHAPTER 3. POTENTIAL FOR SIGNIFICANT IMPACTS

Hunting of bighorn sheep will result in the deaths of individual animals. The removal of individual male animals from only 9 populations (Marble Mountains, Old Dad Peak/Kelso Mountains, Clark/Kingston Mountains, Orocopia Mountains, San Gorgonio Wilderness, Sheep Hole Mountains, White Mountains, South Bullion Mountains, and Cady Mountains) is not expected to significantly reduce herd size, or to affect the reproductive base of the population. The proposed action (modification of hunting tag numbers in 7 existing hunt zones and the addition of two hunt zones) will result in maintaining these herds at or above the approved management plan objectives and will maintain the ratio of male to female bighorn sheep at levels adequate to insure reproduction.

The approximately 60 herds of bighorn sheep in California occur from Mono County in the north, to the Mexican border in the south (Torres et al. 1996). These populations are widely distributed, primarily throughout the southeastern part of the State and in the Sierra Nevada. Nelson bighorn sheep, the subspecies currently being considered in the proposed action, number about 4,800 and occur in Mono, Inyo, San Bernardino, San Diego, Riverside, Ventura, Imperial, and Los Angeles counties. Only nine populations of Nelson bighorn sheep are proposed to be hunted. Therefore, the other populations will not be influenced by that activity.

Assuming that all holders of bighorn sheep tags are successful, as many as 32 mature Nelson bighorn rams could be removed in 2011 from the statewide estimated population of 4,800 Nelson bighorn sheep. This short-term reduction of less than one percent of the total statewide population of Nelson bighorn sheep is well within the ability of the statewide population to maintain or increase in size over the long-term. The ability of bighorn sheep populations to experience a given level of hunting mortality without decreasing in health or vitality is described by Savidge and Ziesenis (1980) as sustained-yield management. It is reasonable that a removal of less than one percent of the statewide population is compatible with the long-term conservation of the subspecies. Thus, the removal of up to 32 male bighorn sheep is not expected to have a measurable impact on regional or statewide populations.

Pursuant to Section 4902, Fish and Game Code, the number of tags allocated will not exceed more than 15 percent of the mature rams estimated in any management unit. Depending on the management unit, assessment of aerial or ground survey data will ensure that harvest will not exceed 15 percent of the mature rams in each management unit, as provided for by State law.

Before taking action regarding this proposal, the Commission will consider bighorn sheep populations, habitat, food supplies, the welfare of individual animals, and other pertinent facts and testimony.

THE SPECIES

Population

Under the proposed hunting programs, it is expected that a segment of the mortality previously identified as "natural" mortality will be shifted to hunting mortality. To a degree, hunting mortality will be substituted for, rather than added to, natural mortality. This follows the concept of compensatory mortality as described by Peek (1986) who noted that, "If hunting is a compensatory form of mortality then populations may be presumed to fluctuate in response to other factors, and stocks are little affected by exploitation. However, if hunting is additive to other forms of mortality then it serves as a depressant."

According to the concept of compensatory mortality, the production and survival of young animals within each population are ultimately expected to replace the animals removed by hunting. At the low level of proposed harvest, when combined with differential use of habitats by males and females during the birthing season (Bleich et al. 1997), influences of compensatory mortality are not expected to be measurable. Ongoing long-term demographic research on bighorn sheep populations has been funded to identify the primary factors influencing the abundance of those specialized herbivores. Given the importance and significant variation in annual precipitation in these desert ecosystems, and the associated variation in diet quality, density-dependent mechanisms are difficult to observe (Wehausen 1992), but increased recruitment of young should compensate for increased rates of death resulting from harvest.

Since the hunting of bighorn sheep will occur, at most, in only nine of the State's approximately 60 populations of bighorn sheep under the alternatives considered, the removal of individual animals is not expected to have a significant effect on the statewide population of bighorn sheep. The existing populations of bighorn sheep in California are geographically separated and widely distributed, yet capable of moving among and between mountain ranges (Bleich et al. 1996). Therefore, the proposed action of providing opportunities to harvest no more than 4 male bighorn sheep in the South Bristol Mountains, where a minimum of 32 mature males are estimated to occur, and 5 male bighorn sheep in the Cady Mountains, where a minimum of 61 mature males are estimated to occur, and the total potential statewide harvest of 32 mature Nelson bighorn rams from an estimated population of 4,800 total Nelson bighorn sheep

will not have a significant adverse impact on any specific population to be hunted or on the statewide population of bighorn sheep.

The Department is committed to long-term demographic investigations of bighorn sheep populations. This research is particularly important in management units for which individual bighorn sheep are removed for translocation or harvest. To facilitate this research, animals have been telemetered and monitored in each proposed hunt zone.

The Department annually conducts fall/winter aerial surveys that involve counting bighorn sheep within the majority of the management units being considered in this assessment, and ground counts are conducted during summer in the White Mountains Management Unit. These surveys result in minimum population estimates, because many animals are missed during such surveys. Several published articles (Caughley 1974, Samuel et al. 1987, Graham and Bell 1989, Bodie et al. 1995, Bleich et al. 2001, Bernatas and Nelson 2004) have demonstrated that significant portions of populations being surveyed using aerial census techniques are not observed because of "visibility bias".

In some of the proposed hunt zones, aerial survey data are supplemented with independent ground surveys to record numbers of marked and unmarked sheep, which are used to generate additional information on population size. This synthesis of data has made it possible to accurately assess the changes in bighorn sheep numbers, ratios of males to females or young to females, and to monitor the impacts of hunting and relocation (Wehausen 1992). Additionally, these aerial and ground survey results are used for determining tag allocations, and to ensure that the proposed harvest does not exceed 15 percent of the mature rams in any of the respective management units.

Tag allocations have historically been determined by computing 15 percent of the mature rams observed during the annual surveys. These data are used to adjust the range of tags to be allocated to ensure that tags for no more than 15% of the minimum number of mature males known to be present are harvested. The results of such surveys represent the minimum number of bighorn sheep, including mature males, present in a given population, and result in under-estimates the true population of males and the total population. This procedure will continue to be used to generally assign tag allocations.

Independent estimates of population size and demographic parameters of bighorn sheep populations are derived using a combination of aerial census and ground observations of marked and unmarked animals in the hunt zones, and intensive ground surveys are conducted in the White Mountains. Wehausen (1990) and Jaeger et al. (1992) refer to this method as Multiple Direct Sampling (MDS). This method estimates population parameters from cumulative (or repeated) surveys that record the number of marked and unmarked animals observed, and assumes binomial sampling probabilities with replacement (Wehausen 1992).

The herd plan objectives include maintaining a 40 ram: 100 ewe ratio to provide a reasonable opportunity to view mature rams and insure reproductive success.

Social Structure

Bighorn sheep demonstrate pronounced sexual segregation (rams and ewes separate) during the majority of the year (Bleich et al. 1997). During periods of segregation, competition between the sexes for food and water is limited or nonexistent. In order for density-dependent responses to occur, a reduction in competition between males and females and the offspring of those females must occur if the population size is limited by the habitat. The removal of so few rams, that likely do not compete with females and young to any appreciable extent, is unlikely to result in substantial increases in recruitment of young animals into any population. Nevertheless, enhanced body condition among males, decreased consumption of available resources by bighorn sheep throughout the management unit, and decreased energetic costs resulting from fewer potential interactions among mature males, would be among the compensatory responses expected to occur as a result of the removal of < 15% of mature Nelson bighorn rams from any particular hunt zone, as specified by State law.

The proposed action has the potential to increase the current hunter harvest by one ram each in the Orocopia Mountains, San Gorgonio Wilderness, and White Mountains, thereby altering rate of change of the ratio of males to females in each of those zones. It is unlikely, however, that the proposed action will increase the survivorship of young in those populations, given that males and females live separately for the majority of the year. Moreover, removal of 55 bighorn sheep from the Marble Mountains for translocation during 1983-85 did not result in measurable responses in

recruitment rates (Wehausen 1988). Thus, it is unlikely that the removal of a small number of males from the proposed hunt zones will result in a detectable increase in recruitment rates of young.

Although 230 animals have been removed from Old Dad Peak for translocation purposes since the early 1980s, the population has continued to expand. Recruitment rates have been very high in that population (Wehausen et al. 1987a, 1987b, 1992; Bleich 1986) and the population remains one of the largest in California. Further, the possibility exists that improved habitat conditions, resulting from an aggressive water development program, have produced the high recruitment rates in that population (Bleich 1983). The removal of less than fifteen percent of the total number of rams present in the population is not expected to result in an appreciable increase in recruitment rate.

Genetics

Apollonio et al. (1989) reported that the removal of the majority of successfully breeding males from a population of lek-breeding fallow deer (*Dama dama*) resulted in a decrease of the overall productivity of the lek. Byers and Kitchen (1988) reported that in pronghorn (*Antilocapra americana*), the deaths of all mature males during a severe winter storm was followed by a mating system change from territoriality to harem defense, apparently because no males were sufficiently dominant to exclude other males from a territory. Speculation regarding the removal of large, old males of bighorn sheep, a species in which males form a tending bond with estrous females, thus warrants some consideration (Festa-Bianchet 1989).

It has been hypothesized that harvesting older males may remove the “best genes” from populations of bighorn sheep subject to “trophy hunting”. Fitzsimmons et al. (1995) reported that horn growth was higher males with greater genetic diversity, or heterozygosity, than less heterozygous rams for the 6^{th}, 7^{th}, and 8^{th} years of life, and that by the end of the 8^{th} year males exhibiting the greatest heterozygosity had higher horn volumes than males exhibiting lower heterozygosity.

The unregulated harvest of male bighorn sheep from a small, isolated population of Rocky Mountain bighorn sheep reportedly resulted in significant declines in body size and horn size (Coltman et al. 2003). Moreover, severe rates of selective harvesting that

are unlikely to be implemented by management agencies, potentially elicit an undesired evolutionary response when the targeted trait is heritable, as are size of horns or antlers (Hartl et al. 1991, 1995; Williams et al. 1994, Lukefar and Jacobson 1998, Kruuk et al. 2002). Nevertheless, the only example demonstrating the negative effects of selective harvest of ungulates in North America is that of Coltman et al. (2003), who investigated this phenomenon at Ram Mountain, Alberta, Canada. That population of Rocky Mountain bighorn sheep was small and isolated, but harvest was regulated only by a 4/5 curl regulation, and hunter opportunity essentially was unlimited. As a result, nearly every male was harvested upon attaining legal size, thereby allowing males with slow-growing horns to reach older age classes and do a disproportionate amount of the breeding. As a result, Coltman et al. (2003) concluded that the harvest rate in their study population resulted in selection against the fastest growing males before they reached their reproductive peak, and thereby reduced their genetic contribution to the population. Conversely, Coltman (2008) recognized that the selective effect reported by Coltman et al. (2003) may have been overestimated because it was not possible to account for the confounding effects of changes in population density during their study, a phenomenon that affected nutrient availability among animals in that population. Garel et al. (2007) concluded that selective harvest in a bottlenecked and genetically mixed population of mouflon (*Ovis* spp.) reduced the reproductive contribution of males that possessed a horn conformation desirable to hunters, which ultimately resulted in a selective advantage for smaller-horned males in that population. Neither of the situations described by Coltman et al. (2003) or Garel et al. (2007) are applicable to the harvest of bighorn sheep in California because of the very limited (< 15%) potential harvest of mature males resulting from carefully regulated hunting opportunities.

Despite these observations, selection of large males by hunters may facilitate copulations by younger, smaller-horned males that may not encounter breeding opportunities in the presence of larger males (Hogg 1984). Resultant breeding by subdominant, smaller-horned males has the potential to increase the ratio of effective population size to census population size and, thereby, the potential to increase total genetic diversity within some populations (Singer and Zeigenfuss 2002). The effect of an increase in the ratio of effective population size to census population size would, thus, offset the potential effects of the removal of some dominant males.

The consequences of declines in genetic diversity have also been questioned with respect to their demographic influences. Nevertheless, bighorn sheep that have

been severely impacted by population bottlenecks and have resultant low genetic diversity appear not to be impacting the potential of those populations to recover in size (Wehausen and Ramey 2004). In contrast to the essentially unlimited harvest rates described by Coltman et al. (2003), harvest proposals considered in this document are extremely restricted, and remove but a very small proportion (≤ 15%) of the minimum number of mature males from any single population, and < 1% of the statewide population as a whole. As a result, the limited harvests proposed by the Department will not result in the small population sizes described by Wehausen and Ramey (2004).

Geist (1971) suggested that, if mortality of older males was related to rutting activity, younger males should be expected to suffer greater mortality if allowed to participate in the rut because of the absence of older males. Indeed, Heimer (1980), Heimer et al. (1984), and Heimer and Watson (1986) suggested that the removal of older and larger males by hunters would result in lowered survival of young males. Moreover, Heimer et al. (1984) reported that natural survival of Dall's sheep (*Ovis dalli*) males aged four to eight years was lower in areas with greater hunting pressure and a less restrictive definition of legal males.

In a specific test of Heimer's predictions, Murphy et al. (1990) reported no support for the hypothesis that reducing the number of older males had an adverse effect on the survival rate of young males. Similarly, other studies of *Ovis spp*. (Stewart 1980, Hoefs and Barichello 1984) have failed to demonstrate evidence of depressed survival of young rams in heavily hunted populations. The strongest support for the hypothesis is Heimer et al.'s (1984) study of the high rate of disappearance of young rams that had been trapped and marked, and were part of a hunted population. Murphy et al. (1990) concluded, however, that the disappearance of those young rams could be explained by dispersal and reduced sightability, rather than by reduced survivorship. Males tend to move over larger areas than do females, and their absence in areas they occupied as lambs does not mean they died. Further, Whitten (2001) concluded that sheep harvest trends were driven largely by weather patterns that affected sheep productivity, survival, and abundance, rather than by horn curl regulations. Moreover, in populations of Rocky Mountain bighorn sheep and desert bighorn sheep in which removal rates were carefully regulated and very low, Singer and Zeigenfuss (2002) concluded that young rams did not expend greater energy than young rams in non-hunted populations. Those authors concluded that there was no detectable affect on survivorship of those young rams and that harvesting of mature males did not lower

survivorship of young males.

The nine populations under consideration in this proposed project are dominated by old, large rams. Indeed, in 2009 and 2010, the majority of rams observed were three-quarter curl in all of the proposed hunt zones. Moreover, the low harvest rates proposed to be implemented should not disrupt the age structure and, hence, the social structure of these populations. An analysis of the hunter harvest to date indicates that the average age of all rams taken as of 2009 was about 8.5 years. This mean age is lower than the life expectancy of a desert bighorn sheep, suggesting that harvests are not particularly concentrated on the oldest or largest males; hence, selective removal of the fastest growing males is an unlikely consequence of the limited opportunities being proposed.

The extremely conservative harvest rates in populations dominated by large, mature males have likely precluded any shift in the age structures or genetic diversity of these populations. Even with the combined removal of up to 32 mature Nelson bighorn sheep rams from nine proposed hunt zones, and with a maximum potential of 6 in any single zone, no changes in the age structure of the populations are anticipated, nor are any other adverse effects.

Habitat

The removal of one additional ram from the Orocopia Mountains, San Gorgonio Wilderness, and White Mountains, combined with the removal of up to 3 mature males from the South Bristol Mountains and up to 4 from the Cady Mountains will slightly reduce the total number of bighorn sheep in each of the hunt zones, as well as the statewide population, until the birth of young the following spring. Under the proposed regulations, the maximum number of bighorn sheep that could be removed from any single zone is 6, and that take would be limited to the White Mountains. The maximum number of mature male bighorn sheep that could be removed from any other zone is 5 (Old Dad Peak-Kelso Mountains, Marble/Clipper Mountains, and Cady Mountains). Those rates of harvest could yield some slight improvement in habitat conditions, particularly in areas of those hunt zones that are utilized primarily by adult males. It is unlikely, however, that any substantial improvement in habitat conditions will result, nor that any increase in recruitment rate, will be realized. The maximum number of mature Nelson bighorn rams that would be removed during the 2011 hunting season is 32. The

proposed removal rate and the distribution of animals to be removed among 9 separate hunt zones is again expected to be too low to result in any measurable change in habitat conditions.

Wehausen et al. (1987b) demonstrated a strong relationship between precipitation and recruitment rates in a Sonoran Desert bighorn sheep population. Similarly, Monson (1960) noted the relationship between precipitation and bighorn sheep populations. Beatley (1974) emphasized the relationship between precipitation and phenological events in Mojave Desert ecosystems, and Wehausen (1988, 1990) noted the apparent relationship between high recruitment in the Marble Mountains in the late 1970s and early 1980s and levels of precipitation. Thus, it is likely that timing and amount of precipitation, rather than population levels of bighorn sheep, are the primary factors determining habitat conditions in the proposed hunt zones.

OTHER WILDLIFE AND PLANT SPECIES

The results of the Department's previous determination that no significant impacts would be incurred by other wildlife or plant species as a result of bighorn sheep hunting, as published in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) are hereby incorporated by reference and can be found online at http://dfg.ca.gov/wildlife/hunting/sheep/dates.html.

RECREATIONAL OPPORTUNITIES

Hunting Opportunities

The proposed action would authorize up to 10 additional hunting opportunities for taking Nelson bighorn sheep rams, resulting in a maximum of 10 additional hunters participating in this unique outdoor experience. This will be the 25th such hunt in as many years. The demand for bighorn sheep hunting opportunities in California, and worldwide, is extremely high, as described in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b), and hereby incorporated by reference.

In 2010, all applicants for bighorn sheep tags paid a $7.50 nonrefundable application fee just to enter the drawing, and they must possess a California hunting

license. Additionally, a total of approximately $ 3.6 million has been received through the auction of fundraising tags from 1987 – 2010. The proposed action will positively impact the hunting public of the State by providing hunting opportunities consistent with sections 203.1 and 4902, Fish and Game Code, and the State's wildlife conservation policy, contained in Section 1801 of the Fish and Game Code, and will provide funds specifically for the conservation and restoration of bighorn sheep in California, consistent with Sections 4902 and 4903 of the Fish and Game Code.

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, there will be overlap of upland game (quail and chukar), rabbit, predator, and deer hunting seasons in two additional hunt areas for a portion of the year. However, due to the low numbers of sheep hunters in each area, coupled with the large areas open to hunting, it is unlikely that sheep hunters will affect hunters of other species of wildlife in terms of hunter success or quality of experience.

Nonhunting Opportunities

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005) and incorporated herein by reference, the non-hunting users of the bighorn sheep resource (viewing, nature study, research, photography) are not expected to be significantly impacted by the take of up to 32 mature bighorn sheep rams from a statewide population of that now numbers approximately 5,200 animals. No populations of bighorn sheep occurring in 52 other mountain ranges will be exposed to hunting as a result of this project and, as a result, opportunities for non-hunting uses of those populations will not be affected.

ECONOMICS

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the proposed action has the potential to result in an insignificant positive economic effects on communities located near the proposed sheep hunting areas.

Under the proposed alternative, hunters from outside the local areas would continue to visit the region and purchase goods and services from local merchants.

This additional spending will generate retail sales, income, and possibly employment in businesses such as motels, restaurants, and retail stores. Spending effects would be minor, because of the small number of tags sold. Any potential effects would likely be distributed among those communities located nearest to the sheep hunt areas, including Barstow, Baker, Blythe, Cadiz, Ludlow, Indio, Morongo Valley, Desert Center, Needles, Twenty-Nine Palms, and Amboy, in Riverside, San Bernardino, Inyo, and Imperial counties.

PUBLIC SAFETY

Since 1987, the Department has not received any reports of bighorn sheep hunting related casualties in California, as discussed in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The proposed project allows an increase of up to 10 successful bighorn sheep hunters, bringing the potential harvest to a total of 32 animals distributed across 9 hunt zones, assuming that the maximum number of tags is allocated. As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, this short-term use could enhance long-term productivity by reducing competition for forage but, given the extremely limited harvest, any reduction in intraspecific competition would be negligible and likely undetectable.

If the proposed project were delayed, no significant long-term impact on the population would be expected. However, this delay would eliminate the proposed allocation of additional hunting opportunities as per the Department's bighorn sheep management program, and would not address the high demand for more recreational hunting opportunities involving bighorn sheep or be consistent with State policy regarding bighorn sheep management.

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the proposed action of removing a maximum of 32 mature Nelson bighorn sheep rams by

hunting will not have a significant long-term adverse impact on either the specific populations to be hunted or on the statewide population of bighorn sheep.

CHAPTER 4. CUMULATIVE IMPACTS

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the Commission could consider and may approve additional hunts in the future, and the Department has concluded that there will be no significant adverse cumulative effects on the State's bighorn sheep resource is the proposed project is implemented. The statutorily mandated regulation process involves review at least once every three years, and data are collected by the Department during each year, appropriate, biologically sound recommendations would be presented by the Department to the Commission prior to consideration of any future hunt. Existing law requires that the Commission receive recommendations regarding mammal hunting regulations from Commission members, its staff, the Department, other public agencies and the public. The process is comparable to the Commission establishing specific harvest quotas or regulations for deer, elk, and pronghorn antelope seasons annually, and has worked well over time in adjusting the hunting program to maintain healthy populations of the aforementioned species.

HABITAT LOSS OR DEGRADATION

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the proposed project, in combination with current bighorn hunts and other factors, is not likely to cause habitat loss and degradation. A maximum of 32 hunters, their guides, and selected individuals will participate in the bighorn sheep hunt. Given the low densities of human use, any habitat loss and degradation attributable to the proposed project would be negligible. Therefore, the cumulative environmental impact of habitat loss and the proposed project will not be significant.

DROUGHT

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, drought

can have an impact on local populations of bighorn sheep, and droughts are a natural occurrence with which bighorn sheep have been faced throughout their evolutionary history. Further, drought conditions are generally localized, both spatially and temporally. The removal of no more than 32 mature Nelson bighorn sheep rams would, in fact, decrease competition among males for available forage within hunt zones, but the effects of such a reduction in competition would be difficult to detect. Further, the possibility of drought impairing the bighorn sheep population on a statewide basis is unlikely. It is anticipated that the statewide population will remain in a healthy, viable condition, even though dynamic weather patterns may affect some populations in some years.

WILDFIRES

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the sparse vegetation and lack of fuel makes it unlikely that wildfires have the potential to adversely affect bighorn sheep in the majority of the hunt zones. However, the San Gorgonio Wilderness occurs in an area of potential wildfires, and a wildfire burned portions of the Hackberry Mountains and Providence Range during recent years. Most research has shown burning, especially prescribed burning, to be favorable to bighorn sheep and deer. These fires maintain movement corridors, escape terrain, and provide new herbaceous vegetation, which is higher in nutrition than decadent vegetation and, ultimately, enhance nutrient availability to animals foraging in newly burned areas.

DISEASE, ROAD KILLS AND OTHER MORTALITY

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, there are no data available to indicate that road kills, disease, predation, or natural mortality factors will act as additive impacts which, along with the mortalities associated with the limited hunting program, will have significant adverse cumulative impacts on local, regional or statewide bighorn sheep populations. The Department does not anticipate any significant impacts resulting from disease in combination with the proposed hunting project.

ILLEGAL HARVEST

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the Department has documented annually approximately one to three cases of bighorn sheep being killed illegally statewide; four such incidents currently are being investigated. The verified illegal take involves an extremely low proportion of the State's approximately 5,200 bighorn sheep and is widely distributed. Illegal take does not appear to be a significant factor affecting the population and, even with the potential harvest of up to 32 bighorn sheep statewide, the cumulative impacts of illegal harvest are not expected to be significant. Since the bighorn sheep outside the hunt zones are either fully protected or State-listed species, detecting and preventing illegal take is a high priority for the Department.

DEPREDATION

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the Department does not have the authority to issue kill permits for bighorn sheep causing property damage (Section 4181, Fish and Game Code).

THE INDIVIDUAL ANIMAL

As noted in the Environmental Document for Bighorn Sheep Hunting (California Department of Fish and Game 2005b) and incorporated herein by reference, the preferred project will result in the deaths of individual bighorn sheep, and wounding losses could occur as a result of implementation of the proposed project. However, the Department is aware of only one animal having been lost after being wounded in 24 hunting seasons. Thus, the rate of wounding is extremely low, and the cumulative impacts of the potential harvest of 32 bighorn sheep statewide, combined with the exceedingly low rate of wounding, would not result in an impact that could be considered to significantly impact the population of bighorn sheep inhabiting any hunt zone, or the state of California as a whole.

GLOBAL CLIMATE CHANGE

Climate changes caused by increasing atmospheric concentrations of greenhouse gases are expected to result in marked changes in climate throughout the world (deVos and McKinney 2007). Although many wildlife habitats in North America have become progressively warmer and drier in the last 12,000 years (Lane et al. 1994, Ball et al. 1998), the greatest rate of change has occurred during the last 150 years (Fredrickson et al. 1998). Predicted changes due to continued warming include increased frequency and severity of wildfires, increased frequency of extreme weather events, regional variation in precipitation, northward and upward shifts in vegetative communities, and modifications to existing biotic communities (Bachelet et al. 2001, McCarty 2001, Walther et al. 2002). These changes are expected to affect abundance, distribution, and structure of vegetative and animal communities (Kapelle et al. 1999).

Local and specific regional changes in climate and associated changes in vegetative communities will be the determining factors regarding the distribution and abundance of bighorn sheep in California and elsewhere. Although research specific to bighorn sheep responses to climate change is limited, what information that is available indicates that those populations inhabiting the hottest, low-lying mountain ranges will be among the first to be impacted (Epps et al. 2004), but those populations inhabiting the highest and most botanically diverse desert ranges may be less affected, and serve as refugia for the species (Epps et al. 2006). Moreover, some areas occupied by bighorn sheep may experience increases in the quality of habitat (Epps et al. 2006).

Populations of bighorn sheep in California are vulnerable to any decrease in habitat quality as mediated by climate change (Epps et al. 2006) For example, higher spring and summer temperatures will result in reduced diet quality for bighorn sheep (Epps 2004), and extended droughts and drying of water sources may produce die-offs of adult animals (Allen 1980). Among bighorn sheep inhabiting desert environments, diet quality or forage availability influence body condition, which affects reproduction and recruitment rates (Wehausen 2005) and, ultimately, population size. Thus, future changes in climate that result in warmer temperatures or greater aridity have the potential to result in fewer bighorn sheep in desert ecosystems (Epps et al. 2006). Nevertheless, habitat conditions in some areas that currently are occupied by bighorn sheep, for example the San Gabriel Mountains and other transverse ranges of

California, may experience changes that will be of benefit to bighorn sheep (Epps et al. 2006) as a result of lower densities of vegetation (Epps et al. 2006). Thus, information that currently is available indicates that global climate change portends both adverse and beneficial effects to bighorn sheep habitat and, ultimately, bighorn sheep populations.

Bighorn sheep hunting in California is regulated by the California Fish and Game Commission. Hunting seasons and tag quotas are proposed to the Commission for adoption on an annual basis. These seasons and quotas are based on annual population estimates as dictated by the California Legislature (Fish and Game Code Section 4902), and are adjusted each year. Although the impacts of climate change on bighorn sheep in California could be positive in some instances, they most certainly will be negative in others. Nevertheless, the Department and the Commission have the ability to quickly respond to population fluctuations by increasing or decreasing hunter opportunity in accordance with current and future management objectives for this species. Reducing one mortality factor, for example sport hunting, will not alone mitigate for impacts associated with global climate change; the ability to manage and provide adequate amounts of resources, both nutritional and otherwise, will be the factor that ultimately dictates which populations persist, and which do not.

CHAPTER 5. ALTERNATIVES TO THE PROJECT

The Department considered two alternatives to the proposed project, which would create two additional zones in which the hunting of bighorn sheep will be legal, place constraints on the way that hunting effort would be distributed among holders of special fund-raising tags, and change the boundary of one existing hunt zone.

ALTERNATIVE 1 – NO CHANGE

The "no-change" alternative would continue to provide hunting opportunities for mature Nelson bighorn rams in the 7 hunt zones that currently are open to that activity, the range of tags available to hunt bighorn sheep in each of those zones would remain the same, and would not be subject to adjustment as determined by the Department's annual population estimates as specified in Section 4901 of the Fish and Game Code. In short, there would be no change from the 2010 bighorn sheep hunting regulations.

ALTERNATIVE 2 – NO HUNTING

This alternative would continue to provide 2 special bighorn sheep tags for fund-raising purposes, and distribution of hunting effort by hunters holding those fund-raising tags would remain unrestricted. The "no-change" alternative would preclude any adjustments to hunting opportunities associated with the fund-raising tags, and could result in the harvest of more than 15% of mature Nelson bighorn rams estimated to be present in any of the 7 open hunt zones if individuals holding fund-raising tags all elected to hunt in the same open zone along with other hunters drawn for that zone, an outcome inconsistent with existing State law as specified in Section 4902 of the Fish and Game Code.

Bighorn sheep now occupy the South Soda Mountains, which is included within the existing boundary of the Old Dad Peak - Kelso Mountains Hunt Zone, and currently is open to hunting. The Department's goal of allowing the population of bighorn sheep in the South Soda Mountains to increase in size at its maximum potential rate would not be realized, and would be inconsistent with the Department's overall strategy of encouraging natural colonizations of historical ranges.

On a statewide basis, the total number of mature Nelson bighorn sheep rams potentially harvested would remain unchanged, but opportunities to provide additional recreational hunting opportunity, consistent with the approved management plans for the Cady Mountains and South Bristol Mountains bighorn sheep hunts, would not be realized. Under this alternative, it is possible that support for bighorn sheep management programs by interested conservation groups and hunters would decline. This decline could result from reducing the value of bighorn sheep to a segment of the public by unnecessarily preventing the hunting of an additional, albeit very limited, number of mature rams. These groups have provided support, both politically and financially (Bleich et al. 1982), for bighorn sheep management in California and have been the primary supporters of habitat protection and improvement projects (Bleich 1990). Without the continuing support of these individuals and organizations, it is possible that activities associated with the protection and enhancement of bighorn sheep habitat and the political support for the Department's conservation and restoration program would be reduced.

ALTERNATIVE 2 – INCREASED HARVEST

The ranges of potential hunting tags available for each zone is intentionally conservative, and is based on the number of mature rams that are known to exist in any given zone, or on the number of mature rams estimated to be present following application of an extremely conservative correction factor (N/0.80) that assumed aerial surveys resulted in observations of 80% of the animals present; Wehausen and Bleich (2007) reported that aerial surveys in an ecologically similar mountain range produced observations of < 50% of the total number estimated to be present using mark-resight methods. To increase the harvest beyond the range of tags proposed by the Department (Appendix 1) could result in a violation of state law if the end result exceeded more than 15% of the total number of mature Nelson bighorn sheep rams known to be, or estimated to be, present in any single hunt zone. Even if the very conservative proposed rates of harvest could be increased, and yet the total harvest remained at or below 15% of the total number of mature Nelson bighorn rams known to be, or estimated to be, present in each of the hunt zones, the potential for negative interactions among participants would increase, resulting in a decline in the quality of this special hunting experience. Under the ”increased harvest” alternative, it is possible that support for bighorn sheep management programs among interested conservation groups and hunters would decline, because conservation has been at the forefront of issues affecting bighorn sheep. An increased rate of harvest would not have unanimous support among bighorn sheep advocacy groups.

The Department has concluded that the proposed project will not have a significant adverse effect on the environment. No mitigation measures or alternatives to the proposed project are needed.

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Appendix 1.
Regulatory Language for 2010 Bighorn Sheep Hunting with Proposed Changes

§362. Nelson Bighorn Sheep.

(a) Areas:

(1) Zone 1 -Marble/Clipper Mountains: That portion of San Bernardino County beginning at the intersection of Kelbaker Road and the National Trails Highway; north on Kelbaker Road to the junction with Interstate Highway 40; east on Interstate Highway 40 to the intersection with National Trails Highway; southwest on National Trails Highway to junction with Kelbaker Road.

(2) Zone 2 -Kelso Peak and Old Dad Mountains: That portion of San Bernardino County beginning at the intersection of Kelbaker Road and the Union Pacific Railroad in Kelso; southwest along the Union Pacific Railroad to intersection with unnamed road at Crucero; north on unnamed road to the ~~junction~~ merging with ~~Rasor~~ Mojave Road; north~~west~~east ~~on~~ on ~~Rasor~~ Mojave Road to the junction with Zzyzx Road; north on Zzyzx Road to intersection with Interstate Highway 15; northeast on Interstate Highway 15 to the intersection with Cima Road; south on Cima Road to the intersection with the Union Pacific Railroad in Cima; southwest on the Union Pacific Railroad to the intersection with Kelbaker Road in Kelso.

(3) Zone 3 -Clark and Kingston Mountain Ranges: That portion of San Bernardino and Inyo counties beginning at the intersection of Interstate Highway 15 and California State Highway 127 in Baker; north on California State Highway 127 to the junction with Old Spanish Gentry Road ~~on~~at Tecopa; southeast on Old Spanish Gentry Road to the junction with Furnace Creek Road; southeast on Furnace Creek Road to the junction with Mesquite Valley Road; north on Mesquite Valley Road to Old Spanish Trail Highway; north and east on Old Spanish Trail Highway to California/Nevada state line; southeast on California/Nevada state line to the intersection with Interstate Highway 15; southwest on Interstate Highway 15 to the junction with California State Highway 127.

(4) Zone 4 -Orocopia Mountains: That portion of Riverside County beginning at the intersection of Interstate Highway 10 and Cottonwood Springs Road; east on Interstate Highway 10 to the junction with Red Cloud Mine Road; south on Red Cloud Mine Road to the junction with the Eagle Mountain Mining Railroad; southwest on the Eagle Mountain Mining Railroad to the junction with the Bradshaw Trail; southwest on the Bradshaw Trail to the Intersection with the Coachella Canal; west along the Coachella Canal to the junction with Box Canyon Road; northeast on Box Canyon Road to the junction with Cottonwood Springs Road; north on Cottonwood Springs Road to the intersection with Interstate Highway 10.

(5) Zone 5 -San Gorgonio Wilderness: That portion of Riverside and San Bernardino counties beginning at the intersection of Interstate Highway 10 and California State

Highway 62, west on Interstate Highway 10 to the junction with California State Highway 30; north on California State Highway 30 to the junction with California State Highway 38; east and north on California State Highway 38 to the junction with Forest Service Route 1N01; east on Forest Service Route 1N01 to its joining with Pipes Road; east on Pipes Road to the junction with Pioneertown Road; southeast on Pioneertown Road to the junction with California State Highway 62; southwest on California State Highway 62 to the intersection with Interstate Highway 10.

(6) Zone 6 -Sheep Hole Mountains: That portion of San Bernardino County beginning at the junction of California State Highway 62 and Ironage Road; northwest on Ironage Road to the intersection with Amboy Road; north on Amboy Road to the intersection with National Trails Highway; east on National Trails Highway to the junction with Saltus Road; southeast on Saltus Road to the junction with unnamed road in Saltus that runs through Cadiz Valley; southeast on unnamed road to the intersection with California State Highway 62; west on California State Highway 62 to the junction with Ironage Road.

(7) Zone 7 -White Mountains: That portion of Mono County within a line beginning at U.S. Highway 6 and the Mono-Inyo county line; northward on Highway 6 to the California-Nevada State Line; southeasterly along the California-Nevada State Line to the Mono-Inyo County Line; westward along the Mono-Inyo County Line to the point of beginning.

(8) Zone 8 –South Bristol Mountains: That portion of San Bernardino County beginning at the junction of Kelbaker Road and the National Trails Highway; west on the National Trails Highway to the intersection with Interstate Highway 40; east on Interstate Highway 40 to the junction with Kelbaker Road; south on Kelbaker Road to the point of beginning.

(9) Zone 9 –Cady Mountains: That portion of San Bernardino County beginning at the junction of Interstate Highway 40 and Newberry Road; north on Newberry Road to intersection with Riverside Road; East on Riverside Road to junction with Harvard Road; north on Harvard Road to junction with Interstate Highway 15; northeast on Interstate Highway 15 to junction with Basin Road; south on Basin Road to intersection with Union Pacific Railroad; east on Union Pacific Railroad to intersection with Crucero Road; south on Crucero Road to intersection with Interstate Highway 40; west on Interstate Highway 40 to the point of beginning.

(b) Seasons:

(1) Open Zone Fund-raising Tag: The holder of the fund-raising license tag issued pursuant to subsection 4902(d) of the Fish and Game Code may hunt:

(A) Zones 1 through 4, ~~and~~ 6, 8 and 9: Beginning the first Saturday in November and extending through the first Sunday in February.
(B) Zone 5: Beginning the third Saturday in November and extending through the third Sunday in February.
(C) Zone 7: Beginning the first Saturday in August and extending through the last Sunday in September.
(2) Marble/Clipper/~~Sheep Hole~~South Bristol Mountains Fund-raising Tag: The holder of the fund-raising license tag issued pursuant to subsection 4902(d) of the Fish and Game Code may hunt:
(A) Zones 1 and ~~6~~8: Beginning the first Saturday in November and extending through the first Sunday in February.
(3) Kelso Peak and Old Dad Mountains Fund-raising Tag: The holder of the fund-raising license tag issued pursuant to subsection 4902(d) of the Fish and Game Code may hunt:
(A) Zone 2: Beginning the first Saturday in November and extending through the first Sunday in February.
(4) Except as provided in subsection 362(b)(1), the Nelson bighorn sheep season in the areas described in subsection 362(a) shall be defined as follows:
(A) Zones 1 through 4, ~~and~~ 6, 8 and 9: The first Saturday in December and extend through the first Sunday in February.
(B) Zone 5: The third Saturday in December and extend through the third Sunday in February.
(C) Zone 7: Beginning the third Saturday in August and extending through the last Sunday in September.
(5) Except as specifically provided in section 362, the take of bighorn sheep is prohibited.
(c) Bag and possession Limit: One mature ram defined as follows: a male Nelson bighorn sheep (Ovis canadensis nelsoni) having at least one horn, the tip of which extends beyond a point in a straight line beginning at the front (anterior) edge of the horn base, and extending downward through the rear (posterior) edge of the visible portion of the eye and continuing downward through the horn. All reference points are based on viewing the ram directly from a 90 degree angle from which the head is facing. A diagram showing the correct viewing procedure shall be distributed by the department to each successful applicant.
(d) Number of License Tags:

Nelson Bighorn Sheep Hunt Zones for 201~~0~~1

Tag	Allocation
Zone 1 - Marble/Clipper Mountains	3-4
Zone 2 - Kelso Peak/Old Dad Mountains	3-4
Zone 3 - Clark/Kingston Mountain Ranges	2
Zone 4 - Orocopia Mountains	1-2
Zone 5 - San Gorgonio Wilderness	2-3
Zone 6 - Sheep Hole Mountains	1-2
Zone 7 - White Mountains	3-4~~5~~
Zone 8 - South Bristol Mountains	2-3
Zone 9 - Cady Mountains	3-4
Open Zone Fund-Raising Tag	1
Marble/Clipper/~~Sheep Hole~~South Bristol Mountains Fund-Raising Tag	1
Kelso Peak/Old Dad Mountains Fund-Raising Tag	1
Total: 23~~2~~-32	

(e) Conditions:

(1) Nelson bighorn rams shall only be taken between one-half hour before sunrise and one-half hour after sunset.

(2) Only methods specified in sections 353 and 354, Title 14, CCR, for taking bighorn sheep may be used.

(3) Each tagholder shall possess a spotting telescope capable of magnification of 15 power (15X), which is not affixed to a rifle, while hunting.

(4) Successful general tagholders shall present the head and edible portion of the carcass of a bighorn ram to the department's checking station within 48 hours after killing the animal. All successful tagholders shall notify the department's Bishop office by telephone at (760) 872-1171 or (760) ~~240~~413~~-137~~29596 within 24 hours of killing the animal and arrange for the head and carcass to be examined.

(5) All successful bighorn sheep tagholders shall make the horns of each ram available to the department to be permanently marked in the manner prescribed by the department for identification purposes within 48 hours of killing the animal. The purpose of the permanent marking shall be to identify Nelson bighorn rams which were legally taken and which may be transported and possessed outside the areas described in subsection 362(a).

(6) The department reserves the right to take and use any part of the tagholder's bighorn ram, except the horns, for biological analysis as long as no more than one pound of edible meat is removed.

Note: Authority cited: Sections 200, 202, 203, 220, 1050 and 4902, Fish and Game Code. Reference: Sections 200, 202, 203, 203.1, 207, 1050, 3950 and 4902, Fish and Game Code.

Appendix 2.
California Fish and Game Code
Chapter 11. Bighorn Sheep

4900. The Legislature declares that bighorn sheep are an important wildlife resource of the state to be managed and maintained at sound biological levels. Therefore, it is hereby declared to be the policy of the state to encourage the preservation, restoration, utilization, and management of California's bighorn sheep population. The management shall be in accordance with the policy set forth in Section 1801.

4901. The department shall determine the status and the trend of bighorn sheep populations by management units. A plan shall be developed for each of the management units. The plan for each management unit shall include all of the following:

(a) Data on the numbers, age, sex ratios, and distribution of bighorn sheep within the management unit.

(b) A survey of range conditions and a report on the competition that may exist as a result of human, livestock, wild burro, or any other mammal encroachment.

(c) An assessment of the need to relocate or reestablish bighorn populations.

(d) A statement on the prevalence of disease or parasites within the population.

(e) Recommendations for achieving the policy objective of Section 4900.

4902. (a) The commission may adopt all regulations necessary to provide for biologically sound management of Nelson bighorn sheep (subspecies Ovis canadensis nelsoni).

(b) (1) After the plans developed by the department pursuant to Section 4901 for the management units have been submitted, the commission may authorize sport hunting of mature Nelson bighorn rams. Before authorizing the sport hunting, the commission shall take into account the Nelson bighorn sheep population statewide, including the population in the management units designated for hunting.

(2) Notwithstanding Section 219, the commission shall not,

however, adopt regulations authorizing the sport hunting in a single year of more than 15 percent of the mature Nelson bighorn rams in a single management unit, based on the department's annual estimate of the population in each management unit.

(c) The fee for a tag to take a Nelson bighorn ram may be determined by the commission, but shall not exceed five hundred dollars ($500).

(d) The commission shall annually direct the department to authorize not more than three of the tags available for issuance that year to take Nelson bighorn rams for the purpose of raising funds for programs and projects to benefit Nelson bighorn sheep. These tags may be sold to residents or nonresidents of the State of California at auction or by another method and shall not be subject to the fee limitation prescribed in subdivision (c). Commencing with tags sold for the 1993 hunting season, if more than one tag is authorized, the department shall designate a nonprofit organization organized pursuant to the laws of this state, or the California chapter of a nonprofit organization organized pursuant to the laws of another state, as the seller of not less than one of these tags. The number of tags authorized for the purpose of raising funds pursuant to this subdivision, if more than one, shall not exceed 15 percent of the total number of tags authorized pursuant to subdivision (b).

(e) No tag issued pursuant to this section shall be valid unless and until the licensee has successfully completed a prehunt hunter familiarization and orientation and has demonstrated to the department that he or she is familiar with the requisite equipment for participating in the hunting of Nelson bighorn rams, as determined by the commission. The orientation shall be conducted by the department at convenient locations and times preceding each season, as determined by the commission.

4903. Revenue from the fees authorized by this chapter shall be deposited in the Fish and Game Preservation Fund and shall be expended solely for purposes of the bighorn sheep program. Notwithstanding Sections 711 and 13004, this revenue, upon appropriation by the Legislature, shall be available for expenditure

by the department solely for programs and projects to benefit bighorn sheep and for the direct costs and administrative overhead incurred solely in carrying out the department's bighorn sheep activities. Administrative overhead shall be limited to the reasonable costs associated with the direct administration of the program. These funds shall be used to augment, and not to replace, moneys appropriated from existing funds available to the department for the preservation, restoration, utilization, and management of bighorn sheep. The department shall maintain internal accountability necessary to ensure that all restrictions on the expenditure of these funds are met.

4904. (a) The department shall biennially report the following to the Legislature:

(1) The management units for which plans have been developed pursuant to Section 4901.

(2) A summary of the data from the annual count conducted by the department for the purposes of subdivision (b) of Section 4902.

(3) The number of tags issued in the preceding season, and the number of mature Nelson bighorn rams taken under valid tags in the preceding season.

(4) Any instance known to the department of the unlawful or unlicensed taking of a Nelson bighorn sheep in this state and the disposition of any prosecution therefor.

(5) The number of Nelson bighorn sheep relocated during the previous year, the area where reintroduced, a statement on the success of the reintroduction, and a brief description of any reintroduction planned for the following year.

(b) The report shall consist of a compilation of the results of the ongoing study conducted pursuant to this section each year since the enactment of this chapter and an assessment of the environmental impact of the hunting of Nelson bighorn sheep on the herds.

Appendix 3
Biennial Report to the Legislature

State of California
THE RESOURCES AGENCY
Department of Fish and Game

Biennial Report to the Legislature

Regarding Bighorn Sheep Management

December 2010

Submitted in compliance with Fish and Game Code Section 4904

INTRODUCTION

This report was prepared pursuant to Section 4904 of the Fish and Game Code, and is the most recent in a series of biennial reports to the Legislature summarizing activities and information related to bighorn sheep management. Through legislation enacted in 1986, it was declared to be the policy of the State to encourage the preservation, restoration, utilization, and management of California's bighorn sheep population in accordance with Section 1801 of the Fish and Game Code. In addition, the Fish and Game Commission was authorized to adopt all necessary regulations to provide for biologically sound management of Nelson bighorn sheep, including sport hunting of rams. However, sport hunting regulations shall not authorize hunting in a single year of more than 15 percent of the estimated mature Nelson bighorn rams in the management units.

The results for the period 2009 – 2010 are presented in this report as required by law. Requisite elements of this report include: status of unit management plans; summary of bighorn sheep counts in specified units; numbers of hunting license tags issued; summary of unlawful take of bighorn sheep; number of bighorn sheep translocated; and environmental impacts of hunting bighorn sheep.

The California Department of Fish and Game's (CDFG) Bighorn Sheep Conservation Program maintains an inventory of the distribution of bighorn sheep in California. This assessment of bighorn sheep populations is conducted as part of a long-term management strategy for bighorn sheep in California. We have grouped the populations of bighorn sheep in California into metapopulations, or regional systems of subpopulations, that represent the most logical geographic areas for managing for the long-term viability of this species. This approach recognizes the importance of intermountain areas that allow movement and exchange of individuals among populations, the recolonization of vacant habitats, and the interagency coordination of land management activities. Our definition of regional populations considers not only vegetative and geographic boundaries, but also man-made barriers such as freeways that define distributions, and that have resulted in the fragmentation of bighorn sheep habitat.

Although a metapopulation approach is an important biological principle for management and long-term survival of bighorn sheep populations, it is equally important as a management concept that emphasizes the importance of the regional coordination of bighorn sheep population and habitat management. Several investigations have emphasized the importance of population size and genetic diversity to the long-term survival of bighorn sheep populations. Although

population size is important, the number of populations, the maintenance of genetic diversity, and the ability to recolonize vacant areas are equally important aspects of metapopulation function.

Ten metapopulations of bighorn sheep have been defined within California; distributed among these were 3 subspecies defined by early scientists, but recent taxonomic revisions indicate that only two subspecies occur in California. The majority of bighorn sheep in the state currently are recognized as belonging to the Nelson subspecies (*Ovis canadensis nelsoni*), and inhabit the Sonoran Desert, the Mojave Desert, portions of the Great Basin Desert, and the transverse ranges of Ventura, Los Angeles, and San Bernardino counties. Sierra Nevada bighorn sheep (*O. c. sierrae*) are restricted in distribution to the Sierra Nevada of eastern California. Bighorn sheep inhabiting the peninsular ranges of Riverside, San Diego, and Imperial counties (and designated as the peninsular metapopulation) have been classified as endangered by the Federal Government since 1998, and are classified as threatened by the State of California. Bighorn sheep comprising the Sierra Nevada metapopulation are listed as endangered by the State, and were classified as endangered by the Federal Government in 1999. All bighorn sheep are fully protected, although limited harvest occurs in selected areas as a result of state law that provides for the biologically sound management of bighorn sheep, including the sport hunting of mature male Nelson bighorn sheep.

Given the need to understand the status and dynamics of regional populations of bighorn sheep, we have categorized all known populations by the numbers of animals (size class) within each. The Department continues to utilize historical and current data from ground, waterhole, and aerial surveys to categorize these populations. Although population estimates vary in precision, we believe the size classes are adequate to provide an accurate and conservative assessment of each population.

Our defined metapopulations are summarized by size classes, and population estimates are subsequently computed by totaling the median interval estimates. At the close of 2010, we estimate that there are about 5,200 bighorn sheep distributed across 61 mountain ranges in California. Of these, the metapopulations of Nelson bighorn sheep total approximately 4,800 individuals and, based on the most recent information available (June 2009), the Sierra Nevada metapopulation was estimated to number nearly 400 individuals. A survey conducted by CDFG in 1972 resulted in a statewide estimate of 3,737 bighorn sheep; a similar estimate in 2003 was about 4,500 bighorn sheep. These data indicate that the total number of bighorn sheep in California has increased over the past 40 years. Although the overall statewide trend has been

upward, conditions vary among local populations. Declining local populations have been, and will continue to be, a high priority for research and management programs.

Nelson Bighorn Sheep

Nelson bighorn sheep numbers continue to remain stable, but continue to fluctuate around long-term means. In general, populations of bighorn sheep in the Mojave Desert have been increasing slowly, but population dynamics are influenced strongly by the amount and timing of precipitation, which varies widely across southern and eastern California. Our helicopter surveys indicate that the recruitment of rates of lambs was quite variable in 2009 and 2010, reflecting the influences of localized rainfall as well as population density.

During 2009 and 2010, a rangewide survey of the peninsular ranges metapopulation was conducted and an analysis of those data resulted in an estimate of about 950 adult bighorn sheep and recruited lambs distributed among nine distinct subpopulations as of December 2010. Thus, the number of bighorn sheep inhabiting the Peninsular Ranges has been on an upward trend since the mid-1990s, and the population of bighorn sheep in the Peninsular Ranges currently approaches the highest previous estimate (1,070), which was reported in 1974. The U.S. Fish and Wildlife Service completed and published the recovery plan for bighorn sheep in the Peninsular Ranges in 2000.

Sierra Nevada Bighorn Sheep

Emergency action was taken in 1999 by the California Fish and Game Commission to uplist Sierra Nevada bighorn sheep from threatened to endangered, and the taxon received emergency listing as endangered in 1999 by the Federal Government, a classification that was formalized in 2000. These actions were in response to a substantial decline from an estimated 310 in 1985 to about 100 individuals in 1999, potentially the result of a combination of predation, severe winter weather, and accidental deaths. The U.S. Fish and Wildlife Service completed and published the recovery plan for Sierra Nevada bighorn sheep in 2007.

Sierra Nevada bighorn sheep are among the rarest and most endangered mammals in North America, and have been the object of an intensive recovery program directed by the California Department of Fish and Game since 2000. Elements of the recovery program include intensive population monitoring, reducing mortality, reestablishing additional populations in historic range, maintaining genetic diversity, and increasing population size. The most recent data

available indicate that about 400 bighorn sheep currently inhabit the Sierra Nevada, and that the population is on an upward trend.

MANAGEMENT PLANS

Intensive data collection continued during this report period and provided basic information for preparing additional population management plans. These efforts addressed range conditions, population sizes, age class structure, and sex ratios, as well as sampling individual animals for the prevalence of diseases and parasites.

Pursuant to Section 4901 of the Fish and Game Code, management plans have been completed for a number of major herds of bighorn sheep in California. The CDFG Bighorn Sheep Management Program currently is preparing a rangewide management plan that will inventory and evaluate the population status of all bighorn sheep populations and subpopulations within the State, and establish an overall strategy to conserve bighorn sheep in California. This planning effort will identify and set priorities for management activities to ensure the long-term viability of bighorn sheep populations. Protection of important habitats and inter-mountain movement corridors, identification of future reintroduction sites, and the maintenance, improvement, and development of wildlife water developments will be addressed as part of the overall conservation strategy. Separate recovery plans have been prepared for bighorn sheep inhabiting the Peninsular Ranges and the Sierra Nevada, and are being implemented. During 2010, drafts of two regional management plans (Cady Mountains Management Unit and South Bristol Mountains Management Unit) were completed and have been submitted for final approval.

SUMMARY OF ANNUAL SURVEYS

During 2009, aerial surveys were conducted in the Marble Mountains, Clipper Mountains, Old Dad and Kelso Peaks, Clark, Kingston, and Mesquite mountains, Orocopia Mountains, San Gorgonio Wilderness, Sheephole Mountains, and White Mountains management units. Aerial surveys were conducted during both 2009 and 2010 in the Cady Mountains and South Bristol Mountains management units. Although results obtained during 2009 in the Cady Mountains and South Bristol Mountains are shown, only survey results from 2010 contributed to the total numbers presented in the following table. These results were used to establish the 2010 hunting tag allocations, and form the basis of preliminary tag allocations for the 2011 hunting season.

Mountain Range	Survey Date	Ewes	Lambs	Rams	Total
Marble Mountains	October 2009	88	34	65	187
Clipper Mountains	October 2009	13	4	16	33
Kelso Peak and Old Dad Peak	October 2009	95	15	69	179
Clark, Kingston, and Mesquite Mountains	October 2009	45	6	28	79
Orocopia Mountains	September 2009	39	7	21	67
Sheephole Mountains	May 2009	22	3	17	42
South Bristol Mountains	October 2009	44	13	26	83
South Bristol Mountains	October 2010	33	9	30	72
Cady Mountains	September 2009	92	37	38	167
Cady Mountains	October 2010	102	23	49	174
White Mountains	March 2009	59	16	31	106
San Gorgonio Wilderness	May 2009	48	15	20	83
TOTALS		544	132	346	1,022

These data represent minimum population sizes, since they involve only animals actually observed and classified; experience indicates that actual populations are much larger. Conservative population estimates (as derived from the above results and corrected for an average visibility bias of 0.80) for the Marble Mountains, Clipper Mountains, Kelso Peak and Old Dad Peak, Clark, Kingston, and Mesquite Mountains, Orocopia Mountains, Sheephole Mountains, South Bristol Mountains, Cady Mountains, White Mountains, and San Gorgonio Wilderness management units are 270, 50, 250, 110, 100, 60, 100, 250, 150, and 120 adults and recruited young, respectively.

NUMBER OF HUNTING TAGS

After 22 successful hunting seasons since 1987, a 23rd hunt was approved by the Fish and Game Commission in 2009, and a 24th hunt was approved in 2010. A total of 19 Nelson bighorn ram hunting tags were authorized for the season in 2009. Four tags were allocated in the Marble Mountains Management Unit, 6 tags were allocated in the Kelso Peak-Old Dad Peak Management Unit, 2 tags were allocated in the Clark-Kingston Mountains Management Unit, 1 tag was allocated in the Sheephole Mountains Management Unit, 3 tags were allocated in the

White Mountains Management Unit, and 1 tag was allocated in the San Gorgonio Wilderness Management Unit. In addition, two fund-raising tags were valid in any open unit; each of these fund-raising tags was provided pursuant to Section 4902 of the Fish and Game Code. During the 2009 hunting season, hunters harvested a total of 19 mature rams, ranging from 5-11 years-of-age.

In 2010, a total of 22 Nelson bighorn ram hunting tags were authorized by the Fish and Game Commission. Four tags were allocated in the Marble Mountains Management Unit, 4 tags were allocated in the Kelso Peak/Old Dad Mountains Management Unit, 2 tags were allocated in the Clark/Kingston Mountains Management Unit, 1 tag was allocated in the Orocopia Mountains Management Unit, 2 tags were allocated in the Sheephole Mountains Management Unit, 4 tags were allocated in the White Mountains Management Unit, and 2 tags were allocated in the San Gorgonio Wilderness Management Unit. Additionally, one fund-raising hunting license tag was valid in any open unit, a second fund-raising tag was valid in both the Marble-Clipper Mountains Management Unit and Sheephole Mountains Management Unit, and a third fund-raising tag was valid in only the Old Dad Peak-Kelso Peak Management Unit; each of these fund-raising tags was provided pursuant to Section 4902 of the Fish and Game Code. As of 31 December 2010, 15 of 22 hunters had been successful in taking mature rams ranging from 3 to 13 years-of-age. A total of 7 hunters will remain eligible to hunt until termination of the 2010 hunting season during February 2011.

The 2009 open-zone fundraising tag produced a high bid of $55,000, and the second fund-raising tag produced a high bid of $50,000; thus, a total of $105,000 was raised through the sale of these special tags. A total of 8,219 applications with a $ 7.50 non-refundable application fee were received for the drawing for 17 general tags, which were distributed by computerized random selection. Each of the 15 successful resident applicants paid an additional $ 357.50 hunting license tag fee. Total revenue generated from the sale of applications, permits, and special fund-raising tags for the 2009 hunting season was $ 173,378. As specified by law, this revenue was deposited in the bighorn sheep account and shall be used to augment, and not replace, existing funds available to the Department for the preservation, restoration, utilization, and management of bighorn sheep.

The 2010 the open zone fund-raising hunting license tag produced a high bid of $ 80,000, the second fund-raising tag produced a high bid of $ 60,000, and the third fund-raising tag produced a high bid of $ 50,000; thus, a total of $190,000 was raised through the sale of these special tags A total of 11417applications with a $7.50 non-refundable application fee were received for the

drawing for 19 general tags, which were distributed by computerized random selection. Each of 18 successful resident applicants paid an additional $367.50 hunting license tag fee. One nonresident applicant was drawn in 2010, and that individual paid an additional $500 in hunting license tag fees. Total revenue generated from the sale of applications, permits, and special fund-raising tags, up to and including the 2010 hunting season, is approximately $3.6 million. As specified by law, this revenue was deposited in the bighorn sheep account and shall be used to augment, and not replace, existing funds available to the Department for the preservation, restoration, utilization, and management of bighorn sheep.

UNLAWFUL TAKING

California Department of Fish and Game Law Enforcement Division personnel reported 4 confirmed incidents involving the illegal killing of bighorn sheep during 2010; there were no known violations by hunters during either the 2009 or 2010 bighorn sheep hunt.

POPULATION RECOVERY AND REINTRODUCTION PROJECTS

The two primary management objectives of the Mountain Sheep Conservation Program are to (1) maintain, improve, and expand bighorn sheep habitat; and (2) re-establish bighorn sheep populations on historic ranges. Population reintroduction projects are a major activity used by management agencies to restore historic populations. Since 1983 the Department has captured and moved nearly 500 bighorn sheep from native ranges to restore or augment populations of *O. c. nelsoni* and *O. c. sierrae*. It is anticipated that bighorn sheep will be translocated within the Sierra Nevada during the next report period (2011-2012), but at the present time no other plans for translocation have been formulated.

During 2009, 6 bighorn sheep were translocated within the Sierra Nevada to augment existing populations in that mountain range. As the result of an aerial accident that resulted in the tragic deaths of 4 individuals early in 2010, all scheduled translocations were cancelled; hence, no bighorn sheep were captured and moved in 2010. Nevertheless, detailed demographic assessments have continued, and ensure the recovery of bighorn sheep populations from which animals previously have been removed for translocation. Comprehensive long-term demographic studies are underway in populations throughout California, and have been designed to monitor and direct management activities.

During 2010, a very limited number of bighorn sheep were captured for research purposes. A total of only 10 individuals were captured, sampled, collared, and released, all of them in the

peninsular ranges. Capture activities in 2010 were constrained substantially as the result of the helicopter accident. The following capture, sample, radio-collar, and release projects occurred in 2010:

Population	County	# Rams	# Ewes	Total
Santa Rosa Mountains	Riverside and San Diego	0	8	8
Vallecito Mountains	San Diego	1	1	2
Total		1	9	10

ASSESSMENT OF ENVIRONMENTAL IMPACT OF HUNTING ON NELSON BIGHORN SHEEP

A detailed discussion of the environmental impact of regulatory changes affecting the hunting Nelson bighorn sheep on the herds is contained in the Final Environmental Document regarding bighorn sheep hunting prepared by CDFG in 2005.

Bighorn sheep exist in approximately 61 populations (herds), with 5,200 individual animals estimated statewide. Nelson bighorn sheep occur in Mono, Inyo, San Bernardino, Riverside, Imperial, San Diego, Ventura, and Los Angeles counties. In 2010, a total of only 7 herds were hunted: the Marble Mountains, Kelso Peak/Old Dad Peak, Clark and Kingston ranges of San Bernardino and Inyo counties, Orocopia Mountains, Sheephole Mountains, San Gorgonio Wilderness (Riverside and San Bernardino counties), and the White Mountains (Mono County). Therefore, the remaining populations of bighorn sheep were not influenced by hunting activity. The potential harvest of 22 bighorn rams during the 2010 hunting season will represent less than 0.5 percent of the total number of bighorn sheep estimated to occur in California.

The proportion of legal rams in the Marble Mountains, Kelso Peak-Old Dad Peak, Clark-Kingston-Mesquite Mountains, Orocopia Mountains, Sheephole Mountains, White Mountains, and San Gorgonio Wilderness populations has been relatively stable from 1987 to present. This indicates that the removal of the limited number of mature rams from the herds has no adverse impact on the age structures of the herds. The number of males removed has been too small to

result in a measurable increase in lamb recruitment when compared to unhunted herds. Because the age structure is not impacted, the social structure of the herds is maintained. No impacts are expected in the future to adversely affect genetic variability or diversity due to changes in the social structure of the herds.