

# **DRAFT ENVIRONMENTAL DOCUMENT**

Sections 365, 366, 367.5, 401, 708  
Title 14, California Code of Regulations

Regarding



FEBRUARY 3, 2011

STATE OF CALIFORNIA  
THE NATURAL RESOURCES AGENCY  
DEPARTMENT OF FISH AND GAME

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## CHAPTER 1

### SUMMARY

#### PROPOSED PROJECT AND ALTERNATIVES

The proposed regulatory package Initial Statement of Reasons for Regulatory Action (ISOR, Pre-publication of Notice) describes the proposed project and options, alternatives or exemptions that the Fish and Game Commission (Commission) will consider in their regulatory decision process. This Environmental Document (ED) categorizes those options, alternatives and exemptions into alternatives that may be considered by the Commission. The primary objective sought by the proposed action is to maintain the State's black bear population in a healthy and viable condition for the enjoyment and use of all Californians and to continue providing limited public sport hunting opportunities.

##### Proposed Actions

The proposed actions being considered by the Commission is to modify Title 14, California Code of Regulations (CCR), Section 365 to increase the number of bears that could be harvested to 2,000 animals before the early-season closure occurs; and modify Section 366 to open the bear archery season concurrent with deer archery season in respective hunt zones as described in Appendix 1.

##### Alternatives

The California Department of Fish and Game (Department) is providing the Commission a range of alternatives to the proposed project that could feasibly attain the basic objectives of the project. In addition to the range of alternatives which could feasibly attain the basic objectives of the project, the no project alternative, which would allow the Commission to maintain the 2010 bear hunting regulations, is also considered.

1. Alternative 1: No Project would maintain existing bear hunting and bear archery hunting regulations in Title 14, CCR, Sections 365 and 366, respectively, without change.
2. Alternative 2: Increase the in-season closure bear harvest cap from 1,700 to 2,500 would modify Section 365, Title 14, CCR to increase the number of bears that could be harvested to 2,500 animals before the early-season closure occurs.

## SUMMARY OF IMPACTS

In light of the evidence presented before the Department at the date of this draft, the Department concludes that the actions pursuant to the proposed project will not result in a significant adverse impact to the statewide black bear population as analyzed in this document and as previously analyzed in the 1990, 1996, 1998, 1999, 2000, 2001, 2002 and 2004 Final Environmental Documents Regarding Bear Hunting (FED). This is primarily because the Department monitors the bear population relative to a decision matrix (see Appendix 2) which provides specific safeguards to prevent any unforeseen adverse impacts to the bear resource as part of an adaptive management process (Walters 1986). Moreover, the regulatory process as followed by the Commission provides mechanisms to adjust harvest quotas and/or hunter opportunity as needed to protect the statewide bear resource. No mitigation measures or alternatives to the proposed project are required, since the Department manages the bear resource at a statewide level. Table 1-1 summarizes Department findings associated with the proposed project and alternatives.



Table 1-1. Summary of Impacts

Alternative	Description	Significant Impact	Nature of Impact
<b>Project as Proposed</b>	<p>Modify the black bear hunting season by increasing the number of bears that could be harvested to 2,000 animals before the early-season closure occurs.</p> <p>Modify the bear archery season by opening the season concurrent with deer archery in respective hunt zones.</p>	NO	NONE
<b>Alternative 1:</b> No Project	No change from the 2010-2011 bear hunting regulations	NO	NONE
<b>Alternative 2:</b> Increase Bear Harvest Cap to 2,500 Animals	Modify the black bear hunting season by increasing the number of bears that could be harvested to 2,500 animals before the early-season closure occurs.	NO	NONE

## 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 13, 2010, the NOP was provided to the State Clearinghouse for distribution, and to land management agencies in California that have an interest, or play a key role, in bear 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 was also provided to individuals and organizations which expressed an interest in bear management in the past. 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, CCR). 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 21, 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. In addition to that meeting, the Department has received letters both supporting and opposing various aspects of the proposed project (Department files). The following area of controversy has been identified relating to the proposed actions and is addressed by this document:

1. Statewide bear populations are declining and harvest should be lowered.

Furthermore, additional areas of controversy have been identified related to bear hunting in general. These items have been specifically addressed in the 2004 Final Environmental Document Regarding Bear Hunting and are made reference to therein. These items include:

1. Loss of individual bears is a significant environmental impact;
2. Loss of individual bears may have an impact on the social structure of bear populations;
3. Bear hunting is intrinsically cruel and inhumane;
4. The use of archery equipment to hunt bears is cruel and inhumane;
5. The use of dogs while hunting bears is cruel, inhumane, and unethical;
6. Hunting adversely affects the genetic integrity of bear populations;
7. The illegal take of bears is increasing and a major factor regulating bear populations;
8. Total bear numbers are declining and hunting is contributing to this decline;
9. Providing additional areas for dog training/exercising or reducing the period of the dog training closure will have no effect on the bear population;
10. Bear hunting is unsafe and public safety warrants closure of the bear hunting season;
11. Allowing night hunting during bear season predisposes bears to illegal harvest by making existing regulations harder to enforce;
12. The use of electronic equipment (radio-telemetry devices on dogs) for bear hunting gives the hunter an unfair advantage and is, therefore, unethical;
13. Increases in season length will result in impacts to bear populations;
14. Pursuit of bears by dogs results in physiological stresses to bears which impacts individual bears and bear populations;
15. Opening bear season earlier restricts hunting opportunity for bear hunters using dogs;

16. The majority of California oppose hunting of black bears, and bear hunting has a negative effect on non-consumptive wildlife use activities;
17. Defining cubs as bears weighing less than 50 pounds will still result in the killing of cubs-of-the-year during the hunting season;
18. Wildfire effects on bear populations;
19. Black bear populations in California do not exhibit compensatory mortality; and
20. Lead from hunters causes lead poisoning in California Condors.

The 2004 Final Environmental Document Regarding Bear Hunting has been distributed to California State Document Depositories; a list of depositories is available from the California State Library, or online at: [http://www.library.ca.gov/gps/gps\\_cal3.html](http://www.library.ca.gov/gps/gps_cal3.html).

## ISSUES TO BE RESOLVED

The primary issue for the Commission to resolve is whether or not to change public hunting of black bears as an element of bear management in California. If such a change is authorized, decisions are needed to specify the areas, seasons, bag and possession limits, number of bears taken, and other appropriate special conditions. This document includes a review and discussion of the proposed project as well as alternatives.

## INTENDED USES OF THE ENVIRONMENTAL DOCUMENT

This environmental document has been prepared to assess the potential impacts of altering the regulations governing sport hunting of bears in California. It has been prepared pursuant to the CEQA (Section 21080.5, Public Resource Code) and the CEQA Guidelines (Section 15250, Title 14, CCR). This document is an informational item to aid the Commission in the decision making process and to inform the public of the potential effects of the proposed action of sport hunting of bears. Although the analysis of the proposed project and the alternatives to the proposed project address a wide range of bear management issues, this document is intended to act as the environmental document analyzing the potential effects of the proposed project, the existing bear hunting regulations, as well as related factors.

Analysis of future bear hunting projects may refer to, and incorporate by reference, information contained in this document. Future proposed bear hunting regulations may not involve the preparation of environmental documents similar to this,

but may include updates to this document. If substantial changes occur in the project itself or in the environmental conditions affected by the regulations, a supplemental or subsequent environmental document would be prepared (*Wildlife Alive et al. v. Chickering et al.* (1976) 18 Cal.3d 190 [132 Cal. Rptr. 377, 553 P.2d 537]).

## THE FUNCTIONAL EQUIVALENT

CEQA requires all public agencies in the State to evaluate the environmental impacts of projects that they approve or carry out that may have a potential to significantly impact the environment. Most agencies satisfy this requirement by preparing an environmental impact report (EIR) or negative declaration (ND). However, an alternative to the EIR/ND requirement has been created for State agencies whose activities include the protection of the environment within their regulatory programs. Under this alternative, an agency may request certification of its regulatory program from the Secretary for Resources, after which the agency may prepare functionally equivalent environmental documents in lieu of EIRs or NDs.

The regulatory program of the Commission has been certified by the Secretary of Resources. Therefore, the Commission is eligible to submit this environmental document in lieu of an EIR or ND (Section 15252, CEQA Guidelines).

This environmental document contains a description and potential effects of the proposed project (Chapter 2), cumulative impacts of the proposed project (Chapter 2), reasonable alternatives to the proposal (Chapter 3), and a discussion of adverse environmental effects related to the proposal and alternatives (Chapters 2 and 3). In addition, it considers relevant policies of the Legislature and Commission (Chapter 1). This environmental document presents information to allow a comparison of the potential effects of various actions considered by the Commission relative to the proposed project, as well as a range of alternatives. Although a given alternative may not achieve the project's objectives, it is considered to provide the Commission and the public with additional information related to the options available. Both the full project and no project alternatives are considered.

## POLICY CONSIDERATIONS

Existing State law (Section 3950, FGC) designates black bear as a game mammal in California. Section 203, FGC provides the Fish and Game Commission (Commission) authority to alter hunting seasons, areas, bag and possession limits and methods, and restrictions based on physical distinction pursuant to game mammal regulations. Section 203.1, FGC, requires the Commission to consider populations, habitat, food supplies, the welfare of individual animals, and other pertinent facts when establishing hunting regulations for black bear. State law (Section 207, FGC) requires the Commission to review regulations and the Department of Fish and Game (Department) to present recommendations for regulatory changes to the Commission at a public meeting. Existing mammal hunting regulations adopted by the Commission provide for hunting black bear in specific areas of the State (Sections 365 & 366, Title 14, CCR).

The proposed project will make changes to the current regulations that provide for limited hunting of black bears in designated areas of the State. In adopting regulations providing for limited sport hunting of black bears, the Commission would be acting pursuant to Sections 203, 203.1, 3950, FGC. The proposed project would also be consistent with the wildlife conservation policy adopted by the Legislature (Section 1801, FGC), which, among other things, contains an objective of providing hunting opportunities when such use is consistent with maintaining healthy wildlife populations. An adaptive management approach, as described by Walters (1986), is the basis for any Departmental recommendation regarding black bear hunting. It involves analyzing available information and applying a management action, followed by a thorough evaluation and adjustment of management programs as needed. The project being considered is described as a proposal to alter the regulations governing sport hunting of bears in California. The objectives of the proposal are to maintain the State's black bear population in a healthy and viable condition for the enjoyment and use of all Californians, and to provide public sport hunting opportunities as an element of black bear management.

Periodically, the Commission reviews the mammal hunting regulations pursuant to Section 207, FGC. During any year, the Commission may receive proposals from the Department for changes in the mammal hunting regulations where take quotas are based on population performance, changes of an urgent nature for the good of the resources, and changes for clarity. Following receipt of public input, the Commission utilizes the authority of Section 220, FGC, to adopt the regulations.

## CHAPTER 2

### PROPOSED ACTION

The proposed actions being considered by the Commission is to modify Title 14, California Code of Regulations (CCR), Section 365 to increase the number of bears that could be harvested to 2,000 animals before the early-season closure occurs; and modify Section 366 to open the bear archery season concurrent with deer archery season in respective hunt zones as described in Appendix 1.

Existing subsection 365 (b), Title 14, California Code of Regulations, requires the general bear season to close prior to the season ending date if the Department receives notification that 1,700 bears have been taken. In addition, the Department is required to send a letter to each bear hunter when this early closure occurs. The bear season has closed early due to achieving the harvest cap four times in the past eight years. The proposed change modifies this regulatory subsection by increasing the number of bears that could be harvested to 2,000 animals before the early-season closure occurs. Bear populations continue to increase, up from an estimated 4,080 bears in 1984 to 40,005 bears in 2009. The proposed regulation would permit increased recreational opportunity without detriment to the statewide black bear population because modeling supports a sustainable harvest of 3100 bears/year.

Existing black bear hunting regulations (Section 366, Title 14, CCR) define season dates for archery bear hunting. The proposed changes, as detailed in Appendix 1, will open the bear archery season concurrently with the opening of the deer archery season in respective hunt zones. This action is intended to reduce confusion about method of take permissible while hunting either bear or deer. Based upon method of take reports (Table 2-6), this proposed action is expected to result in the additional annual harvest of 10-20 bears, statewide. Furthermore, this action is expected to allow additional hunting opportunity.

### SUMMARY OF PROPOSED REGULATIONS

A summary of the proposed regulations are as follows: the general bear season would open concurrently with the opening day of the general deer season in the A, B, C, D, X-8, X9a, X-9b, X-10 and X-12 deer hunting zones. In the remaining portions of the State where bear hunting is allowed, the general bear season would open on the second Saturday in October. The general bear season will close when the Department receives report of 2,000 bears taken, or on the last Sunday in December, whichever occurs first. Additionally, persons possessing a valid bear tag would be able to hunt



during a 23-day archery-only season beginning concurrently with the opening day of deer archery season in the respective deer hunt zone. There would be no limit on bear tag sales. The use of more than one dog to take bear would be prohibited in areas where the general deer season is open. The use of dogs to take bear would be closed during the bear archery season. The bag and possession limit would be one bear per hunter per license year. Bear cubs (less than 50 pounds) and females with cubs would be prohibited from harvest. Dogs used for trailing bears during the general season may be equipped with VHF collars but not GPS-enabled collars.

## PROJECT OBJECTIVES

The objectives of the proposed action are to maintain the State's black bear population in a healthy and viable condition for the enjoyment and use of all Californians and to continue providing limited public sport hunting opportunities. The health and viability of both hunted and unhunted (e.g., Redwood and Yosemite National Parks) populations have been assessed by monitoring trends in bear numbers, sex ratios, age class structure, and reproductive rates. These objectives are consistent with those contained in the Black Bear Management Plan (Appendix 2), developed in 1998.

## BACKGROUND AND EXISTING CONDITIONS

### Early Management and Regulations

Prior to 1948, black bears were unprotected or classified as furbearers under State law. During this period, bears could be killed by any means and in any number, at any time. In 1948, the black bear was classified as a game mammal by the Legislature. In order to manage this resource according to goals established by the Legislature, seasons and bag limits were instituted and hunters were required to possess a hunting license. In 1957, hunters were required to purchase bear tags as a means of monitoring the hunting kill through a report card system. The take of bears by trapping was prohibited in 1961. The statewide bag limit was reduced from two bears per year per hunter to one bear per year per hunter in 1968. The take of bears weighing less than 50 pounds or females accompanied by bears weighing less than 50 pounds was prohibited beginning in 1972.

The initiation of a bear tag reporting system in 1957 enabled the Department to monitor the number of bears killed by hunters, the sex of the bears taken, date of kill, and location of kill. Table 2-1 displays the reported bear harvest in California since the initiation of the bear tag law in 1957. The increase in reported take of black bears in



1985 was primarily the result of changes in the hunting regulations which prevented the pursuit of bears with dogs during spring and summer. This activity formerly resulted in the illegal and unreported take of bears. Therefore, the 1985 regulation change did not increase total bear kill but merely directed it into legal reported take.

Reported take, to a degree, has been used as an indicator of the bear population status and hunting effort. However, as indicated in Table 2-1, there have been significant changes in bag limits, season lengths, methods of take, and the reporting system. Because these changes have had a major effect on the numbers of bears reported taken, it is not appropriate to rely on reported take as the sole measure of long-term trends in bear populations.

In order to provide an additional source of information regarding bear kill and hunting effort, the Department developed and implemented the Game Take Hunter Survey in 1962. The survey samples approximately four percent of hunting license buyers. Questions are asked regarding the species of wildlife hunted, the number taken, the areas of the State hunted, and the amount of hunting effort (time hunted).

Table 2-1. Reported Black Bear Take in California (1957 - 2009)

Year	Total Harvest	Males	Females	Gender Unknown	Tags Sold	Percent female
1957	920	551	359	10	20,158	39.02%
1958	653	371	280	2	23,057	42.88%
1959	1,016	583	427	6	25,594	42.03%
1960	925	472	442	11	28,643	47.78%
1961	841	409	425	7	27,246	50.54%
1962	594	322	268	4	26,635	45.12%
1963	685	357	328	0	25,618	47.88%
1964	670	361	307	2	27,408	45.82%
1965	1,281	692	580	9	30,461	45.28%
1966	1,054	608	441	5	35,424	41.84%
1967	935	537	396	2	34,485	42.35%
1968 <sup>a</sup>	638	347	289	2	32,838	45.30%
1969	871	482	383	6	35,335	43.97%
1970	555	305	248	2	32,437	44.68%
1971	559	343	214	2	24,735	38.28%

Year	Total Harvest	Males	Females	Gender Unknown	Tags Sold	Percent female
1972 <sup>b</sup>	626	373	251	2	25,126	40.10%
1973	767	471	292	4	30,585	38.07%
1974	632	373	256	3	29,677	40.51%
1975	553	n/a	n/a	n/a	26,950	
1976	486	260	223	3	26,232	45.88%
1977	451	271	179	1	26,273	39.69%
1978	655	412	243	0	19,537	37.10%
1979	731	460	265	6	22,557	36.25%
1980	592	324	268	0	27,366	45.27%
1981	767	469	297	1	31,777	38.72%
1982 <sup>c</sup>	783	527	256	0	27,745	32.69%
1983	601	377	222	2	14,401	36.94%
1984	770	475	293	2	11,064	38.05%
1985 <sup>d</sup>	1,138	688	448	2	11,875	39.37%
1986	1,040	592	428	20	10,176	41.15%
1987	1,448	947	486	15	12,235	33.56%
1988	1,359	829	508	22	13,016	37.38%
1989 <sup>e</sup>	0				561	
1990 <sup>f</sup>	1,187	730	444	13	8,530	37.41%
1991	1,493	944	531	18	12,160	35.57%
1992	1,266	775	457	34	11,918	36.10%
1993	1,426	860	536	30	11,175	37.59%
1994 <sup>g</sup>	1,607	986	609	12	12,089	37.90%
1995	1,484	892	585	7	12,003	39.42%
1996	1,714	978	727	9	14,799	42.42%
1997	1,677	1,006	670	1	15,045	39.95%
1998 <sup>h</sup>	1,676	940	734	2	18,706	43.79%
1999	1,838	1,095	742	1	18,170	40.37%
2000 <sup>i</sup>	1,796	1,052	738	6	20,325	41.09%
2001	1,667	971	696	0	20,993	41.75%
2002 <sup>j</sup>	1,768	1068	696	4	21,483	39.37%
2003	1,397	837	558	2	22,325	39.94%
2004	1,848	1,166	681	1	22,653	36.85%

Year	Total Harvest	Males	Females	Gender Unknown	Tags Sold	Percent female
2005	1,418	847	566	5	23,771	39.92%
2006	1,822	1,109	708	5	24,602	38.86%
2007	1,861	1,086	756	19	25,133	40.62%
2008	2,028	1,202	758	68	22,906	37.38%
2009	1,905	1,087	770	48	24,730	40.42%

a = one bear bag limit instituted

b = 50 pound weight limit instituted

c = mandatory tag return and premolar tooth collection instituted

d = spring/summer dog pursuit season eliminated

e = no season

f = archery equipment not a legal method of take

g = in-season closure quota increased from 1,250 to 1,700 bears

h = tag sale quota increased from 15,000 to 18,000

i = tag sale quota eliminated

j = in-season closure cap increased from 1,500 to 1,700 bears

By comparing the reported bear kill obtained from the Game Take Hunter Survey with the number of bear tags returned to the Department by successful hunters, an estimate of nonreported bear kill was obtained. The estimate of the rate of nonreporting by successful hunters was as high as 65 percent in some years, prior to 1982. The relatively high rate of nonreporting by successful hunters tended to increase the variability in reported kill from year to year (Table 2-1) and, hence, reduced the reliability of those data. In order to increase the reliability of the data, the Department recommended that the Commission require both successful and unsuccessful bear hunters to return their bear tags to the Department. As a result of the Commission adopting a mandatory bear tag return regulation in 1982. Subsequently, the rate of nonreported legal bear kill has declined significantly.

In the early 1970s, the development of safe and reliable bear immobilization drugs, as well as advances in sophisticated radio-telemetry equipment, resulted in a tremendous increase in the amount of black bear research in North America, particularly in the western United States. This increase in black bear research has resulted in a vast amount of information in the scientific literature regarding black bears.

The scientific literature includes black bear research conducted in California regarding bear population dynamics, food habits, physical characteristics, habitat requirements and utilization, denning behavior, and physiological characteristics. Moss (1972), Boyer (1976), Novick (1979), Siperek (1979), Novick and Stewart (1982), Stubblefield (1992), Braden (1991), and Brinkhaus (2000) gathered information on black

bear populations in southern California. Piekielek and Burton (1975), Kellyhouse (1977), Sitton (1982), Schroeder (1986), Burton and Schmalenberger (1995), and Stafford (1995) studied bears in northwestern California. Harms (1980), Graber (1982,1989), Sitton (1982), Grenfell and Brody (1983), Koch (1983), Jessup and Koch (1984), Hastings and Gilbert (1987), and Keay (1990) collected information on black bears in the Sierra Nevada. The scientific literature plays an important role in bear management. The information presented in the scientific literature has provided wildlife biologists throughout North America with accepted techniques for collecting data on bear populations as well as accepted criteria by which to assess the health and condition of black bear populations.

Prior to 1982, the results (age class data, radio telemetry, bear tag return, and other information) of some of these California studies as well as information collected by law enforcement personnel related to illegal take of bears indicated that there were areas of the State where bear populations were experiencing a higher level of mortality than could be explained by reported hunting take. When data collected from the bear population regarding hunting mortality, and nonhunting mortality such as disease, depredation kill, and accidents were examined it was apparent that some other mortality factor was operating on the bear population. Evidence from law enforcement investigations as well as biological data from hunter-killed bears indicated that illegal take (poaching) was a major mortality factor. These studies indicated that a more reliable system for reporting hunter take and monitoring the age structure of the bear population was needed.

As noted previously, in 1982 the Commission adopted regulations that required all bear hunters to return their bear tags to the Department whether they were successful or not. This regulation resulted in more reliable data regarding legal black bear take. It also corresponded with a reduction in the number of bear tags sold annually (Table 2-1). At that same time, the Commission also adopted regulations that required all successful bear hunters to retain the skull of the bear they killed so the Department could collect a premolar tooth from the bear. The premolar tooth can be sectioned and the cementum rings counted with the aid of a microscope to determine the bear's age. This technique is analogous to counting the "growth rings" on a tree that has been cut down to determine its age. The procedure, referred to as dental cementum analysis, is a proven and accepted technique for accurately determining the age of black bears (Stoneberg and Jonkel 1966, Johnston et al. 1987, McLaughlin et al. 1989, Keay 1990).

Since 1982, the Department has collected bear teeth, which are then sent to a commercial laboratory in Montana for age determination. The same laboratory is used by the majority of the western states (those states that do not use this laboratory usually do their analyses "in-house"). Information collected from bears killed in some areas of California prior to 1985 indicated that the median age of the population, especially the female portion, was lower than desired. For example, in 1983, the median age of female bears killed was 2.5 years, which means that one-half of the bears killed were older than 2.5 years and one-half were younger than 2.5 years. In California, female black bears normally are successful in producing cubs for the first time at 4.5 years of age. A bear population with a low female median age could lead to a situation where more bears in the population die than can be replaced by the reproducing females.

During the period 1980-1984, law enforcement efforts demonstrated that there was a significant illegal take of black bears in California. The concerns of the law enforcement officers were substantiated by information collected during radio-telemetry studies where bears were being "lost" from the population which could not be accounted for in the bear hunting season. The Department conducted an analysis of the status of the State's bear population in late 1984, in an effort to assemble information collected from field studies in California, results reported in the scientific literature, information collected from bears taken by hunters, and information collected from law enforcement efforts. The analysis relied in part on computer simulation modeling that was developed by an independent researcher (Barrett, 2000). In summary, the results of this analysis indicated that prior to 1985, approximately four to seven percent of the statewide bear population was killed annually by sport hunters.

Based on computer simulation, all nonhunting mortality ranged from six percent for cubs to eight percent for adults and illegal kill approximately equaled the reported hunting take (four to seven percent). When modeled, this scenario most closely approximated the conditions being observed in the bear population prior to 1985. The analysis also indicated that the majority of illegal take was occurring during the period from April through September. This period corresponded with the time during which individuals could use dogs, primarily trailing hounds, to pursue mammals. Despite the intent that bears were not to be killed or injured during this period, evidence from law enforcement and biological investigations indicated that bears were being killed. It became obvious that the regulation was difficult to enforce. Although the total mortality the bear population was experiencing was relatively high, it was within the sustained-yield capabilities of the population. In terms of reducing the level of mortality, the 1984 evaluation indicated that shortening the bear season would not reduce the level of

hunting harvest. Data from California and other states indicate that shorter seasons result in an increase bear kill per day, and that increasing season length (within reason) resulted in a lower kill per day (Miller 1989). Additionally, information collected from bear hunters in California demonstrated that they are highly mobile and that restricting hunting pressure in one area would likely increase hunting pressure in other areas.

In 1985, the Department provided the Commission with a series of recommendations for changes in bear hunting regulations that were intended to improve the condition of the bear population and to increase reporting of hunter-killed bears. Specifically, the regulation proposals were designed to reduce the illegal take of black bears, improve the reliability and increase the amount of information collected from legally killed black bears, and improve the Department's ability to collect data on the age structure of the bear population (Burton et al. 1994).

As a result of the Department's evaluation and recommendations, the Commission adopted regulations in 1985 which included the following:

1. Prohibited the use of dogs for the pursuit and/or hunting of mammals in bear habitat from the first Saturday in April (time when bears are emerging from their dens) until the opening of the general deer season (Section 265, Title 14, CCR);
2. Required that all successful bear hunters present the skull of their bear to the Department within 10 days;
3. Required that only Department employees validate bear tags;
4. Required that additional information regarding the method of take be provided on the bear tag; and
5. Increased the length of the bear season and made the season later in some areas of the State.

Additionally, the Legislature added Section 12005 (1982) and amended Section 4758 (1988), FGC. Section 4758, prohibits the sale of any bear parts in California and provides that the possession of more than one bear gall bladder is prima facie evidence that the bear gall bladders are possessed for sale. Section 12005 provides that violation of Section 4758 is a felony under California law. This combination of laws and regulations (with a few minor editorial changes) has been in effect, except for the lack of a 1989 black bear hunting season, since 1985. As indicated in Table 2-1, the reported bear take increased after 1984. This increase can be explained primarily by a shift from illegal take (i.e., unreported take) into the legal reported take during the hunting season.

Changes in the median age of harvested bears, as well as other observed bear population trends since 1984, such as higher reported bear kill with fewer bear hunters expending less effort to be successful and no indication of a decrease in bear recruitment support this conclusion. However, based on a CEQA procedural challenge, Commission regulations providing for bear hunting were set aside by a superior court order in August 1989. In 1990, a black bear season was reinstated following a superior court ruling that the Department's environmental document related to a general hunting season for black bears was adequate (Koch 1994).

Beginning in 1994, several changes were enacted regarding black bear hunting and hunting in general. First, mammal hunting regulations, and the regulatory process, became a two year process, and public recommendations for regulation changes are considered biannually. The next regulation approval process, including public input, is being considered in 2011. The analysis that comprises this environmental document will still be conducted on an annual basis. The annual analysis on the status of the bear population will be utilized by the Department to make recommendations for emergency regulation changes if unforeseen circumstances result in significant changes to California's black bear population.

The most important regulation change specifically regarding black bear hunting in 1994 was the increase of the in-season closure mechanism cap from 1,250 to 1,500 bears. This level of harvest did not result in negative impacts to the black bear population (see Table 2-1.). Other changes adopted by the Commission in 1994 included prohibitions on the use of "tip switches" and GPS technology on dog radio collars. These restrictions were enacted in an effort to ease public concerns about potential unfair advantages that this equipment may provide.

The only change between regulations adopted in 1995 and those adopted in 1996 concerned the opening dates for the general bear season. In an effort to increase hunting opportunity, the Commission adopted regulations which opened the general bear season concurrently with deer season in the A, B, C, and D deer hunting zones. In the most extreme case (the deer hunting A zone), the general bear season opened in mid August. The use of multiple dogs for bear hunting remained prohibited until the close of the general deer season and bear season was still to be closed when 1,500 bears were reported taken.

In 1998, the Commission promulgated regulations to increase the maximum number of black bear hunting license sales from 15,000 to 18,000. The early season



closure mechanism remained in place, closing the season when 1,500 bears were reported taken by hunters. In 2000 the Commission eliminated the bear tag quota of 18,000. In 2002, the in-season closure mechanism cap was again increased from 1,500 to 1,700 bears. The most recent change to the bear hunting regulations occurred in 2004, when the Commission expanded the bear hunt area to include the area in Mono County east of Highway 395. None of these regulation changes resulted in a significant impact to the statewide black bear resource (see Table 2-1).

### Population Status (2009)

#### *Black Bear Population Monitoring Decision Matrix*

In 1995, the Department developed a decision matrix (Table 2-2, Appendix 2) for annually evaluating the status of California's statewide bear population. This matrix was based on the recommendation by Garshelis (1993) that several monitoring techniques be employed simultaneously for monitoring bear populations. The decision matrix details monitoring techniques and identifies thresholds of concern for each monitored attribute of the bear population (Table 2-2). When a "significant reduction" or "significant change" is listed as part of the "Threshold of Concern," the definition of significance is a biological determination which considers data obtained in a particular year as compared with the previous three years' average, which provides a better representation of trends. The Black Bear Management Plan commits the Department to recommend reducing hunter kill of bears in some manner when two or more of these thresholds of concern are exceeded. Requiring changes from two thresholds accounts for natural annual variation in the estimates used in this matrix. The use of a single threshold would be too sensitive and cause frequent regulatory changes unsupported by all the available scientific evidence, whereas exceeding three or all thresholds may not be sensitive enough to detect actual changes in the bear population. The results of the matrix using 2009 bear harvest data indicate no negative impacts to the population since less than two of the monitoring thresholds were exceeded (Table 2-2).

The median age of hunter-killed female bears has increased since 1983, when the median age of hunter-killed bears was 2.5 years. Furthermore, the present median age of hunter-killed bears in California is similar to the median age of bears trapped in unhunted areas of the State. For example, in northern California, the median age of bears trapped in Redwood National Park was 4.3 years (Hofstra 1989). In Yosemite National Park, in the central Sierra Nevada, the median age of trapped bears was 3.6 years, 4.9 years if cubs are excluded (Graber 1982, Keay 1990). The median age, in



years, of all California bears harvested in 2009 was 4.8 and 6.7 for females.

The sex ratio of the bear harvest is another important indicator of the health of the bear population. Male bears are killed at a higher rate than they occur in the population as a result of hunter selectivity (Litvaitis and Kane 1994) and because male bears have larger home ranges and a correspondingly higher probability of being encountered by hunters (Jonkel and Cowan 1971, Kemp 1976, Sitton 1982, Koch 1983, Elowe and Dodge 1989). Therefore, sex ratios will be biased towards males until fewer males are available for harvest. The threshold for concern in the monitoring matrix is greater than 40 percent females in the harvest. In 2009, females comprised 40.4 percent of the harvest (Table 2-2). This was the only monitoring threshold exceeded in 2009.

Table 2-2. Resulting Matrix for Monitoring California's 2009 Black Bear Population.

Monitoring Technique	Threshold of Concern	2009 Data	Threshold Exceeded
Median Ages of Hunter Killed Bears	Female ages <4.0 years old; <b>-or-</b> statistically significant reduction in median age for combined sexes.	Females 6.71  Total 4.75	NO
Percent Females in Harvest	>40 percent.	40.4 percent	YES
Total Harvest	<1,000 <b>or</b> statistically significant reduction; only if reduction is independent of administrative action.	1,905	NO
Kill per Hunter Effort and Population Index	Statistically significant decline in both kill per hunter effort and in population index.	No significant changes in kill per hunter effort and an increase in population index.	NO

The number of bears harvested in a season also reflects the condition of the bear population. Reductions in bear populations would make it more difficult to find bears and

hence to harvest a bear. However, year-to-year variability in the bear harvest is inevitable because of changes in weather may also effect bear harvest. For instance, an early winter would make it more difficult for hunters to kill a bear, especially hunters using dogs. Changes in regulations can artificially result in decreases in bear harvest. Reducing the number of bears at which the season is closed is an example. For this reason, the threshold identified in the matrix will not be considered in years following regulation changes which restrict harvest or hunter opportunity. The matrix threshold for this criterion is a harvest of less than 1,000 or a significant reduction compared to the previous three years. As demonstrated in Figure 2-1 and Table 2-2, the harvest threshold has not been exceeded.

The fourth monitoring technique and threshold is a significant change in both the kill per hunter effort and the population index. According to the Black Bear Management Plan (Appendix 2), the Department may monitor the kill per hunter effort from either the Game Take Hunter Survey or from information obtained from the mandatory return of bear tags. The Game Take Hunter Survey is a questionnaire administered to a random sample of sportspersons in California regarding hunter success and effort. While bear hunters are included in this sample, the primary focus of the survey is to summarize hunter effort for all hunted species. The Game Take Hunter Survey had been administered annually from 1948 until 2008. Because of insufficient Department funding, there was no survey conducted in 2009.

However, the Department has required successful bear hunters to indicate the days spent hunting bear on returned portions of bear tags since 1993. Both the Game Take Hunter Survey and the information obtained from returned bear tags provide an estimate of hunter effort, measured in bears killed per days hunted. Because the Black Bear Management Plan requires the Department to monitor the trend in hunter effort, since the current year's data are compared to the previous three years' average, and because the Game Take Hunter Survey was not completed in 2009, this report examines the trend in hunter effort derived from data obtained from returned portions of bear tags.

To test for a significant change in the kill per hunter effort index according to the Black Bear Management Plan, kill per hunter effort was calculated for the years 2006 – 2009 (Table 2-3) by dividing the total number of days spend afield by successful bear hunters who responded to the question on the bear tag by the number of bears harvested by those same individuals. To test for significance, the plan calls to compare the current year's data to the previous three years' average. The 2009 data indicate that

0.243 bears were killed per day hunted, and the 2006-2008 average was 0.247 bears killed per day hunted. The difference between the 2009 data and the 2006-2008 average is not significant ( $t = 1.268$ ,  $P = 0.205$ ,  $df = 7145$ ).

Table 2-3. Bear Take Reports (2005 - 2009; Bear Tag Returns)

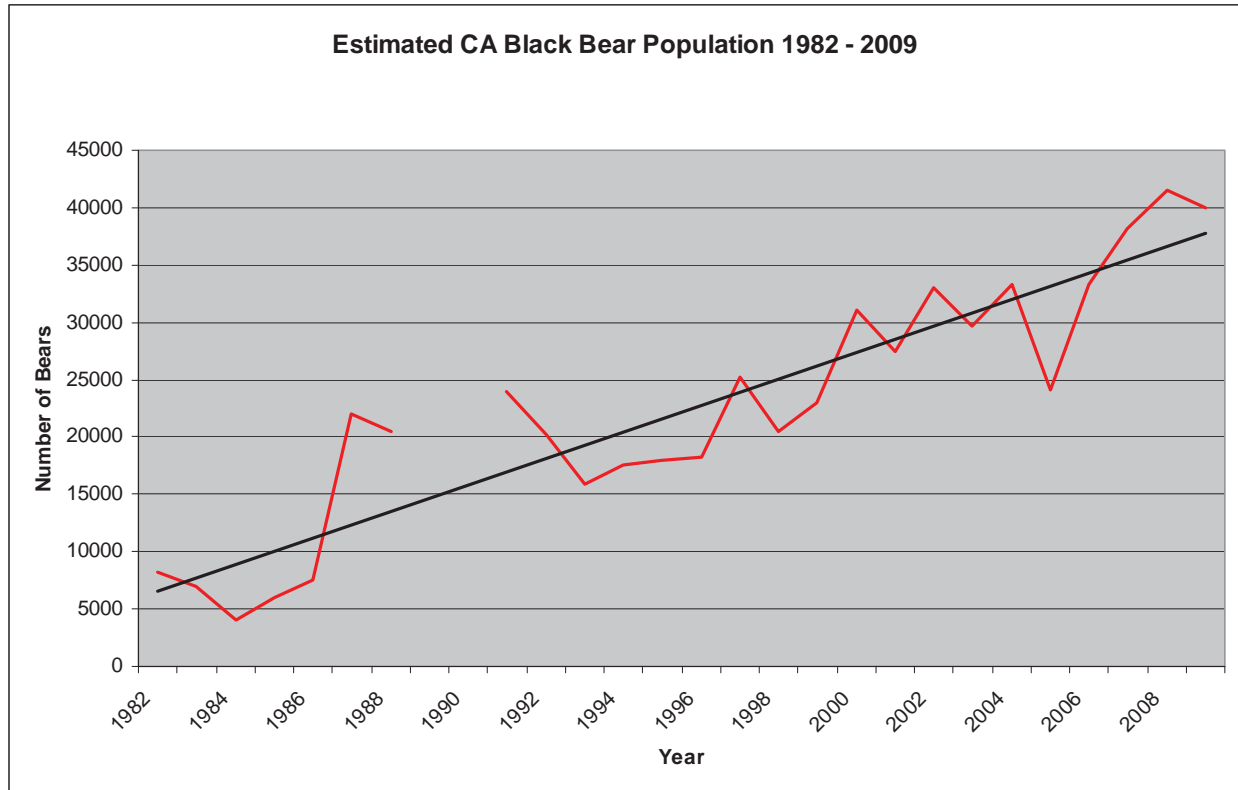
Year	Bear Kill per Hunter Effort
2006	0.226
2007	0.237
2008	0.278
2009	0.243

California's statewide bear population has been exhibiting positive growth since 1984 (Figure 2-1). Statewide bear population estimates have been determined since 1982 following Fraser (1982 et. al., 1984) using tooth cementum annuli analyses. Lack of harvest data from 1989 and 1990 (Table 2-1) preempted the Department from estimating population sizes during those years. The threshold for the kill per hunter effort/population index category was not met because there was an insignificant increase in the population index and no significant difference in the average hunter effort index.

#### *Black Bear Population Age Distribution*

California's statewide bear population approximates a stable age distribution. The number of individuals in each age class in a population at a given point in time determines the population's age distribution. Wildlife populations are considered stable if the age class proportions remain unchanged through time (Lotka 1925, p .110). As mentioned previously, the age of harvested black bears have been determined by examining cementum annuli of extracted teeth since 1982. When plotted by year, California's bear population nearly approximates a stable age distribution (Figure 2-2). Since survival and reproduction rates are highly unlikely to remain constant through time, natural populations rarely exhibit purely stable age distributions (see Caughley 1977 and Eberhardt 1988 for discussion). This is reflected in California's statewide black bear population by annual variation in age distribution.

Figure 2-1. California Black Bear Population Estimates (1982 - 2009)



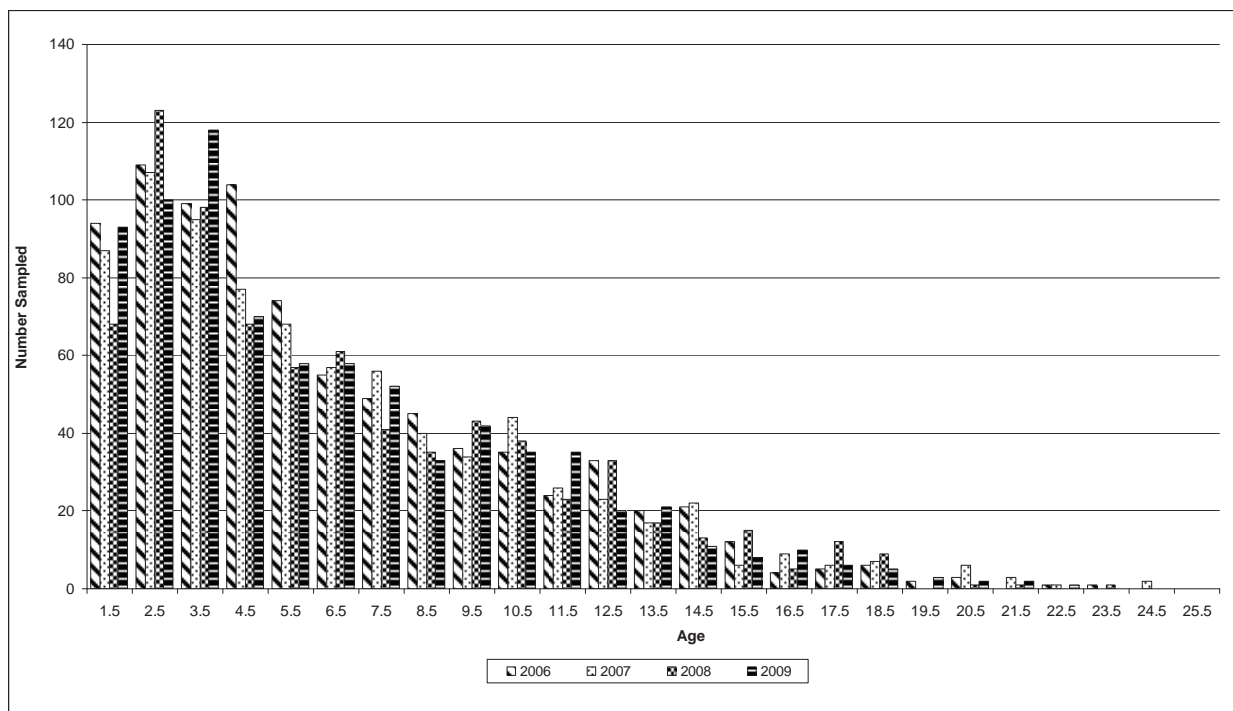
### Modeling the statewide black bear resource

Wildlife management techniques often incorporate models to analyze, understand, and predict the outcomes and complex interactions of the natural environment. Like many other technical fields that affect everyday life, such as chemical engineering, aerospace technology, and climatology, the science of wildlife management has found that the use of models is invaluable for predicting the effects of man-caused and natural events on wildlife and their habitat.

Models can be as simple as word association or as complex as abstract mathematical expressions. Nevertheless, the goal of a model is to aid in analyzing known facts and relationships that would be too cumbersome or time consuming to analyze manually. Some of these models describe specific systems in a very detailed way, and others deal with general questions in a relatively abstract fashion. All share the common purpose of helping to construct a broad framework within which to assemble an otherwise complex mass of field and laboratory observations. Though we often think of models in terms of equations and computers, they can be defined more generally as any physical or abstract concept of the structure and function of "real

systems” or natural occurrences.

Figure 2-2. Age Structure of Hunter-Harvested Black Bears (2006 – 2009)



The models used in this document have been developed based on field observation, published literature, and/or expert opinion. Ideally, they are tested against known results and, therefore, represent reality. In the case of California black bears, data from previous and ongoing field studies, hunter-killed bears, and observations of both hunted and unhunted populations have been used to construct habitat, population and climate change models (Appendices 3 and 4) to understand the current state of and the potential effects of proposed projects to the statewide black bear resource.

#### *Computer Simulated Population Model*

The potential effects of the proposed project on the dynamics of the State's bear population were analyzed with the aid of a computer model (Appendix 3). Computer modeling has become an important tool for wildlife managers as well as for wildlife researchers. The dynamics of large mammal populations such as deer, black bears, pronghorn antelope, and elk exhibit many similarities. For example, all large mammals have a minimum breeding age and each species has measurable reproductive rates. These observed rates of recruitment and survival can be used to model how a given population will behave under a given set of circumstances. Numerical values for these parameters are species, sex, and age specific. As an example, it is common for female

black bears to come into estrus at 2.5 to 3.5 years of age, however, they generally do not successfully reproduce until they are 4.5 years old (Piekielek and Burton 1975, Sitton 1982, Department of Fish and Game 1996). Bears four years and older normally produce an average of 1.6 cubs in alternate years. Thus, a black bear population model would assign reproductive values and survival patterns that would reflect these unique capabilities.

For a population model to provide reliable predictions, it must account for significant biological phenomena. Users of simulation models must recognize the assumptions made in developing the model and the mechanical structures used in the model must not violate those assumptions (Conely 1978). As an example, black bears suffer differential hunting mortality because males are larger and more desirable to hunters. Males also move over larger areas than females and have a higher chance of encountering a hunter (Beecham and Reynolds 1977, Koch 1983, Rogers 1987, Litvaitis and Kane 1994). Therefore, it is important that survival coefficients (the number of young that survive) be developed for males and females in any model used for analyzing hunted black bear populations. In 1986, the Department contracted with Dr. Reginald Barrett, Associate Professor in Wildlife Management at the University of California at Berkeley, to develop a black bear population simulation model. In 2000, Dr. Barrett reworked the original model to remove the assumption of compensatory mortality in an effort to provide a conservative model of the State's black bear population. Dr. Barrett's credentials and qualifications can be obtained through the College of Natural Resources, Department of Forestry and Resource Management, 145 Mulford Hall, University of California, Berkeley, California 94720. Dr. Barrett was selected to develop the model because he is a nationally recognized expert in large mammal ecology and in the use of microcomputer simulation models for analyzing wildlife populations.

### *Population Modeling Results*

Empirical data collected during the past five years suggest California's bear population structure is stable, and its size is increasing. These data were incorporated as inputs to the model to determine "benchmark" population parameters for analyzing the impacts of the proposed project and the alternatives (Appendix 3). The model output that most closely approximated the empirical data collected on the State's bear population was used as the starting point for future analysis. Using this "benchmark model", various levels of hunter take provided by the proposed project and alternatives were evaluated relative to its effect on population size and structure. Individual model

outputs of these various scenarios are provided in Appendix 3.

As indicated in the model description (Barrett 1986), the model requires that estimated illegal kill be input as a percentage of legal take. While ascertaining the benchmark population parameters, model results indicate that some bear mortality cannot be explained by biological parameters to the model. This unexplained mortality equaled nearly 12 percent of the legal sport-hunting take. For purposes of these population analyses, this unaccounted mortality is considered by the model as illegal kill. However, in order to be biologically conservative, all model iterations assume that the illegal kill (e.g., unexplained mortality) approximates 25 percent of the annual legal take.

Results of computer modeling efforts indicate that in California, bear populations greater than or equal to the 2010 bear population can sustain a statewide hunter harvest of 3,100 (Appendix 3) with illegal take equal to 25 percent of legal harvest (775 bears), without causing the bear population to decline. With a combined legal and illegal harvest of 3,875 bears, total hunting mortality will be approximately 10 percent of the statewide population. This is below its maximum-sustained yield level of 14.2 percent. These modeling results, which are based on actual observed data, indicate that with any level of legal harvest below 3,100 bears, the proposed project will not have significant negative effects on the State's bear resource (Appendix 3).

#### *Habitat Suitability Index Model*

Wildlife Habitat Suitability Index (HSI) models are commonly used for resource planning, mitigation modeling, and environmental impact assessments (Schamberger and Krohn 1982, Cole and Smith 1983, Morrison et al. 1992). They are widespread and among the most influential tools available to resource managers (Morrison et al. 1992). These models categorize habitats relative to species' annual or seasonal life requisites, such as food production and cover availability (U.S. Fish and Wildlife Service 1981). Furthermore, these models provide a cost-effective and efficient approach to assessing wildlife populations.

To help understand California's black bear distribution, the Department's Biogeographic Data Branch recently developed a Geographic Information System (GIS) HSI model (Donovan et al. 1987) for black bears using an expanded dataset of the California Wildlife Habitat Relationships (CWHR) model (Appendix 4). Habitats were categorized as unsuitable, low, medium and high relative to black bear life requisites. The results of this model estimate 56,110 square miles of suitable or better habitat



occurring throughout the 2010 black bear hunt zone. This model has been validated with observed data (Appendix 4) and therefore may serve as a benchmark for future modeling efforts, such as modeling the distribution of bear habitat relative to predicted global climate change.

#### *Habitat Climate Change Model*

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, 2003). Although many wildlife habitats in North America have become progressively warmer and drier in the last 12,000 years, 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 replacements of biotic communities. These changes are expected to affect abundance, distribution and structure of animal and vegetative communities.

Local and specific regional changes in climate and associated changes in vegetative communities will be the determining factors regarding the distribution and abundance of black bear in California. Although research specific to bear responses to climate change is limited, what information does exist indicates that both adverse and beneficial effects - depending on a variety of local/regional factors such as latitude, elevation, topography, and aspect – can be expected to result.

To better understand the effects of climate change on California black bear distribution, the Department partnered with researchers from the University of California, Berkeley to predict changes in bear habitat distribution over the next 100 years (Appendix 4). Six plant species were selected to represent current HSI categories. Distribution changes for these species were predicted using the Geophysical Fluids Dynamic Laboratory Climate Model 2.1 (GFDL\_CM2\_1.1) by researchers from the Ackerly Lab at UC Berkeley. This model assumes a 100-year mean temperature increase of 3.3 °C and an 18 percent reduction in precipitation in California. The predicted plant distributions were cross-referenced with the HSI model to predict changes in statewide distribution of HSI categories.

Results indicate a shift in oak woodlands and riparian woodlands away from the valleys and foothills towards the coast. There would be significant constriction of upper elevation montane conifer forests (indicated by *Abies magnifica*) throughout the state.



These would be extreme in the southern California mountains and in the north coast ranges. There would be a significant northward shift of southern California coastal scrub habitat (*Malosma laurina*) to central coastal California, and there would be major upward shifts in chaparral (*Q. wislizeni* var. *frutescens*) away from lower foothill areas. Cool temperate forests like coastal redwood, would diminish, but would likely maintain some relict populations as far south as Monterey County - its' current southern range limit (T. Keeler-Wolf pers. com.). Although optimal bear habitat is predicted to shift toward the coast ranges, much of the current bear range will still be considered suitable habitat and may support a viable and healthy bear population (Appendix 4).

## PROPOSED CHANGES AND ANALYSIS

### Section 365, Title 14, CCR:

1. Modify the black bear hunting season by increasing the number of bears that could be harvested to 2,000 animals before the early-season closure occurs.

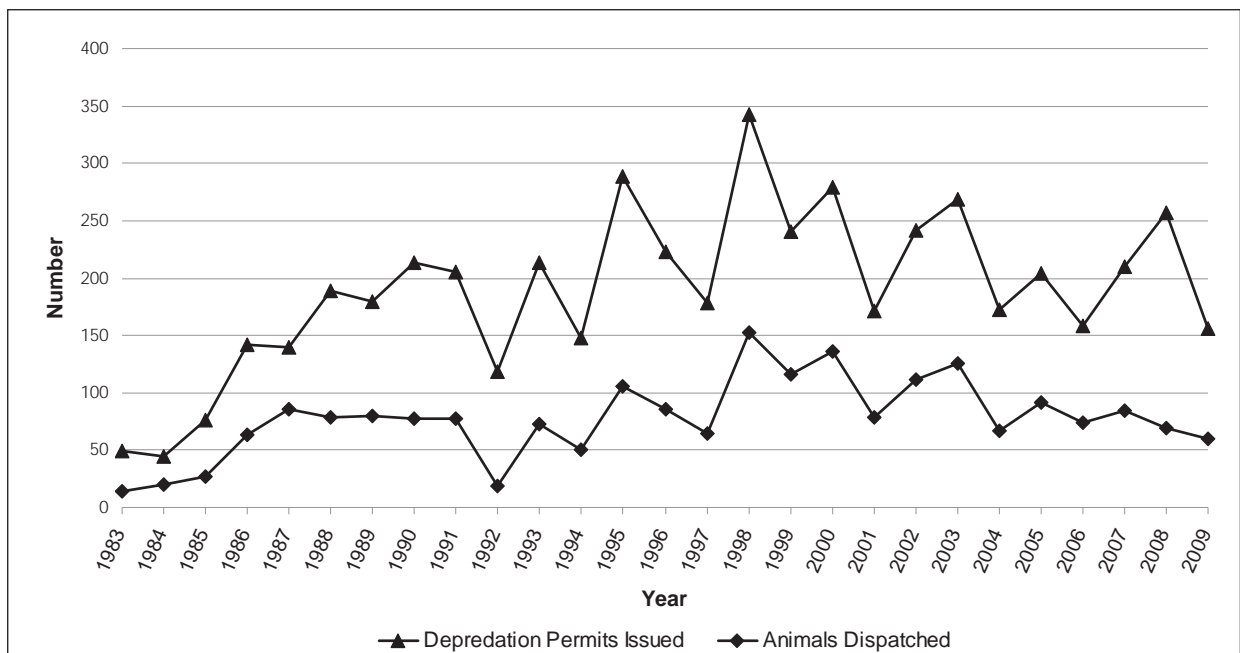
Existing black bear hunting regulations (Section 365, Title 14, CCR) require the Department to close the hunting season on the last Sunday in December or when 1,700 bears have been reported harvested, whichever occurs first. Existing bear hunting regulations do not specify a maximum number of bear tags to be issued. The Department has sold an average of 23,200 bear tags annually since 2002, which was the year that the harvest cap was established at 1,700 bears. The bear hunting season has been closed early three times since then (2007, 2008 and 2009). During each of these seasons, the total bear harvest exceeded the number established to trigger the bear season closure. However, this mechanism was designed to stop the bear season before the harvest reached damaging levels and not to limit the harvest to a specific number. Despite these early closures, statewide population estimates have continued to increase (Figure 2-1), the age structure of harvested black bears is stable (Figure 2-2), the genetic variation in the statewide population is stable (Brown et al 2009), black bear depredation issues have remained stable (Figure 2-3), and the bear population has not been negatively impacted according to the black bear monitoring matrix.

Since the bear harvest cap was increased from 1,500 in 2001 to 1,700 in 2002, annual bear harvest averages 1,756 and ranges between 1,397 and 2,028 (Table 2-1). The maximum positive deviation from the current harvest cap is 328 (2,028 – 1,700 = 328). Hence, a conservative estimate of the maximum number of bears that could be harvested resulting from increasing the harvest cap to 2,000 is

approximately 2,350 bears, which incorporates unforeseen error. This harvest level is below the modeled maximum sustained annual hunter harvest (3,100 bears; Appendix 3).

The Black Bear Management Plan prepared by the California Department of Fish and Game contains a matrix for evaluating the health of California's bear resource (Appendix 2). This matrix is based on the recommendation by Garshelis (1993) that several monitoring techniques be employed together for monitoring bear populations. The use of a matrix lessens the effects of biases which may manifest themselves on a technique used singly and to detect actual changes in the bear population. The bear population would be considered to be negatively impacted if the threshold for concern was met or exceeded in two or more of the monitoring categories. If two or more of the thresholds for concern were met or exceeded resulting from this option, the Commission maintains the option to reduce the season length or alter tag quotas. The hunting bag limit of one bear per season restricts the take of bears and equitably allocates the take among the interested public. The prohibition against the take of cubs and females accompanied by cubs insures recruitment of young into the population and protects reproductive females from hunting mortality.

Figure 2-3. Black Bear Depredation in California (1983 - 2009)



## Advantages of This Proposal

This action would be expected to provide additional public recreational opportunities.

#### Disadvantages of This Proposal

Black bear hunting regulations are inherently complicated. Changes to hunting regulations may result in confusion by some members of the public.

#### Conclusions Regarding This Proposal

This action, as proposed, has been determined to have no significant adverse effects to the statewide black bear population or the environment because the threshold [s?] of significance would not be met... This is because all indices available to the Department suggest the statewide black bear population is robust enough to sustain this level of harvest, and the statewide bear genetic structure is not decreasing in heterozygosity and exhibits recent range expansion (Brown et al. 2009). Furthermore, the Department and the Commission maintain the ability to rapidly respond to population fluctuations (positive or negative) by annually increasing or decreasing hunter opportunity in accordance with guidelines established by the black bear management plan (Appendix 2).

#### Summary

Existing black bear hunting regulations (Section 365, Title 14, CCR) require the Department to close the hunting season on the last Sunday in December or when 1,700 bears have been reported harvested, whichever occurs first. The Department recommends increasing the black bear harvest cap to 2,000 bears, as detailed in Appendix 1. This action will result in an annual black bear harvest less than the maximum sustained harvest of 3,100 bears, which was ascertained by modeling the black bear population. Furthermore, the population indices available to the Department suggest the statewide black bear population is robust enough to withstand this level of harvest. Lastly, the Department and the Commission maintain the ability to rapidly respond to population fluctuations (positive or negative) by annually increasing or decreasing hunter opportunity in accordance with guidelines established by the black bear management plan (Appendix 2). As such, this action has been determined to have no significant adverse effects to the statewide black bear population or the environment.

#### Section 366, Title 14, CCR:

1. Modify the bear archery season by opening the season concurrent with deer archery in respective hunt zones.

This proposed change would modify Section 366, Title 14, CCR to open bear archery season concurrently with the opening of the deer archery season in the area of the state known as the deer A-zone (Appendix 1). Currently, the deer A-zone archery season opens the second Saturday in July and extends for 23 days. The deer A-zone general season opens the second Saturday in August and extends for 44 consecutive days. Conversely, the bear archery season in the same geographic location opens the third Saturday in August and extends for 23 consecutive days. As such, the current regulations open the general bear season before the archery bear season. This proposed change would alleviate these potential problems by aligning the archery hunt dates.

The Department monitors the annual harvest of black bears by mandating the return of all bear tags issued during the hunting season (Section 708(e)(6), Title 14, CCR). The mandatory return of bear tags was initiated in 1982. These returned tags provide the department a count of hunter harvested bears by county, as well as the method of take. Over the past seven years, approximately nine bears have been harvested annually by archers in the counties that would be affected by this action (Table 2-4). Although the bear hunting season may be extended in this area, any additional harvest in this location resulting from this action will subsequently reduce harvest in other areas of the state, since bear hunting regulations will maintain a harvest cap that, when reported to the Department, results in the early closure of the bear hunting season. As stated previously, all demographic factors monitored by the Department indicate the statewide bear population is healthy, genetically diverse, increasing, and therefore robust enough to sustain this level of harvest.

Table 2-4. Archery Harvested Black Bears in Counties Encompassed by Deer A-Zone (2002 - 2009)

County	Year								Average
	2002	2003	2004	2005	2006	2007	2008	2009	
Colusa	0	0	0	0	0	0	0	0	0.00
Lake	0	0	0	0	0	1	1	0	0.25
Marin	0	0	0	0	0	0	0	0	0.00
Mendocino	3	5	8	2	8	4	7	4	5.13
Napa	0	0	0	0	0	0	0	0	0.00

Sacramento	0	0	0	0	0	0	0	0	0.00
Solano	0	0	0	0	0	0	0	0	0.00
Sonoma	0	0	0	0	0	0	0	0	0.00
Yolo	0	0	0	0	0	0	0	1	0.13
Los Angeles	1	1	4	2	3	6	7	3	3.38
Santa Barbara	0	0	0	0	0	0	1	0	0.13
Ventura	0	0	0	0	0	0	1	2	0.38
<b>Total</b>	<b>4.00</b>	<b>6.00</b>	<b>12.00</b>	<b>4.00</b>	<b>11.00</b>	<b>11.00</b>	<b>17.00</b>	<b>10.00</b>	<b>9.38</b>

### Advantages of This Action

Black bear hunting regulations are inherently complicated. This action is expected to reduce long-term confusion regarding season dates. Furthermore, this action is expected to provide additional hunting opportunity.

### Disadvantages of This Action

Black bear hunting regulations are inherently complicated. Changes to black bear archery regulations may result in short-term confusion by some members of the public until they understand the changes.

### Conclusions Regarding This Action

The action as proposed has been determined to have no significant adverse effects to the statewide black bear population or the environment. This is because all indices available to the Department suggest the statewide black bear population is robust enough to sustain this level of harvest, and the statewide bear genetic structure is not decreasing in heterozygosity and exhibits recent range expansion (Brown et al. 2009). Furthermore, the Department and the Commission maintain the ability to rapidly respond to population fluctuations (positive or negative) by annually increasing or decreasing hunter opportunity in accordance with guidelines established by the black bear management plan (Appendix 2).

## CUMULATIVE EFFECTS

### Impacts on the Gene Pool

The black bear in California has experienced sport hunting removal as a game mammal since 1948. In these hunted areas, black bears display high levels of

genetic diversity (Brown, et al, 2009). Evidence suggests that sport hunters tend to select for larger male bears, and the harvested segment of the population is male biased in most years. It is reasonable to conclude that large male bears, typically older than 10 years, have had adequate opportunity to pass their genetic material prior to such animals being taken by sport hunters. In addition, State and Federal parks as well as remote wilderness areas, where sport hunting has little or no influence on the bear population, comprise over 10 percent of the best bear habitat in the State. In these un hunted populations, there would be no impact on the gene pool thereby retaining all the naturally occurring genetic variability. In the remainder of the State which is open to hunting, the season, bag limit, and access limitations prevent sport hunting from producing a negative effect on the genetic diversity in the black bear population.

### Impacts on the Social Structure

Interactions with other bears (intraspecific competition) are probably a major source of nonhunting mortality, especially for subadult males. Black bears live solitary lives. Cubs are born in the winter den and remain with the mother through the first year of their life. They generally den with the female as yearlings. When they emerge from the den in spring, they disperse to new areas. Usually subadult females will remain in the general area, but do not associate with other bears. However, subadult males tend to disperse over large areas (Lee and Vaughan 2003). During this time, they are vulnerable to numerous mortality factors, including aggressive behavior by adult bears (primarily males). Numerous researchers have documented adult males killing subadult males as they disperse (Swenson 2003, Swenson, et al 1997, Wielgus and Bunnell 1994, Jonkel and Cowan 1971, Poelker and Hartwell 1973, Kemp 1976, Rogers 1987). Intraspecific predation has also been found to be a significant mortality source for adult females (Garshelis 1994, Department of Fish and Game 1997, Stafford 1995). LeCount (1986) indicated that adult male bears were a significant source of mortality to young cubs in Arizona. However, other studies suggest that this is not the case (Graber 1982, Elowe and Dodge 1989). As Elowe and Dodge point out "social order was once thought to limit bear densities through establishment of territories, but it now appears to play a minor role." This also is the case in California and other western states where investigators have determined that bears do not establish and defend territories (Koch 1983).

LeCount (1993) and McLellan (1993) suggested that dispersing subadult bears may be responsible for infanticide. Therefore, killing larger resident male black

bears may retard recruitment of cubs into the population because immigrating subadult male bears, which would normally be killed or run off by resident males, will kill more cubs. While this situation may occur in some populations, other studies have shown that black bear populations increased after the removal of adult males when subadult bears immigrated into the area (Kemp 1976, 1972, Ruff 1982, Young and Ruff 1982). The increase in the presence of subadult bears did not appear to effect cub survival. In a retrospective study of brown bears in Sweden, researchers (Swenson, et al. 1997) suggested that killing one adult male had a population effect of killing 0.5 to 1 adult female. This was suggested to be the result of immigrating males replacing those killed by hunters. A study of brown bears in Canada concluded that increased hunting mortality of older adult males coincided with an influx of younger immigrant males (Stringham, 1980, Wielgus and Bunnell, 1994). This apparently contributed to low reproductive rates and a population decline. However, Miller, et al (2003) showed increased cub survival in hunted brown bear populations compared to unhunted populations. McLellan (2005) concluded that the immigrant male hypothesis was not supported in brown bears.

The interval of breeding for brown bears in this study was three years, compared to two years in black bears in California. Also, the total reproductive rate of brown bears in this study (0.46 cubs /adult female/yr.) was about half that of California black bears (0.8 cubs/adult female/ yr.). The reduced reproductive rate of brown bears in the study made them more susceptible to population declines than California black bears. If the removal of adult bears through regulated hunting was acting to limit California black bear populations, age cohorts would be expected to be missing in heavily hunted areas. Since all age cohorts are present at predictable levels, there is no evidence to suggest that this is occurring in California. If subadults are more responsible for cub killing, it is also important to recognize that almost half of the male black bears killed by hunters each year are nonbreeding subadults (less than four years old) thereby limiting any impacts.

#### Impacts on Habitat

No significant impacts on habitat are expected from the hunting of black bears in California. Hunter impacts on the habitat are reduced by the large range and solitary habits of the black bear as well as a defined maximum harvest and short hunting season. Although several hunting strategies exist, many hunters utilize existing roads to determine location of fresh bear signs, before initiating the hunt. Some hunters utilize dogs to assist in taking bears. Low intensity hunting strategies



may reduce the impact on the habitat by decreasing the hunter's effort in a given area.

The harvest of up to 2,350 black bears from 53,000 square mile bear range has the potential to reduce the black bear population over a large area for less than one year. The reduction in the black bear population has the potential to provide for some improvement in black bear habitat. The black bear's diverse and seasonal forage preferences further reduce impacts of specific environmental changes. Furthermore, black bears are readily able to adjust to new food sources as alternate sources become available.

#### Effects on Recreational Opportunities

Hunting affects public recreational opportunities in a variety of ways. Many hunters plan their annual vacation times to correspond with bear hunting season, while other recreationalists plan their vacations to avoid being in the "woods" during hunting season.

Based on information from the Bear Take Report and the Game Take Hunter Survey, over 100,000 hunter-days of recreation are expended annually on bear hunting in California. Based on past bear tag sales and information from the Game Take Hunter Survey, the proposed project will provide approximately 100,000 days of recreational hunting opportunities for the expected 27,000 bear tag purchasers.

The proposed project also affects nonconsumptive-use of bears. Although black bears are shy and elusive by nature, the fact that bears will be hunted in the proposed project area may make them more wary of humans. It should be recognized that not all bear habitat is proposed to be available for bear hunting, and that large blocks of prime bear habitat exist in State parks and private land where hunting may be prohibited. Black bears have been hunted as game mammals annually in California since 1948 and there is still ample opportunity to observe black bears. Therefore, existing viewing opportunities are not expected to be affected by the proposed project.

In cases where people feel threatened as a result of bear hunting, there are potentials for conflict with nonhunting activities in hunt areas. This effect is expected to be insignificant since the majority of bear hunting will occur after Labor Day, well past the peak summer months when most nonhunting activities occur on public land. Additionally, there are large blocks of bear habitat that are closed to bear hunting



(State and local parks, National Parks, etc.) nonhunters could use to view bears during the bear hunting season if they do not wish to use areas open to bear hunting.

## Effects on Other Wildlife Species

### Listed Species

The Commission has listed a number of plant and animal species as endangered, threatened, or rare. These species are listed in sections 670.2 and 670.5, Title 14, CCR. Based on the following information, no significant negative effect on any listed species or their habitat is expected from the proposed project. This includes the effects of using dogs for the pursuit and take of bear.

The black bear's range overlaps with several threatened and endangered species, including: the great grey owl, willow flycatcher, Sierra Nevada red fox, wolverine, and northern spotted owl. The black bear is a native omnivore with a large home range and diverse forage preferences and has evolved with other native species. Specific impacts by the black bear on threatened and endangered species in the proposed project area have not been identified.

The area proposed to be open to bear hunting is currently used for other outdoor recreational activities including, but not limited to, fishing, photography, hiking, camping, hunting, bird watching, and general nature viewing. Additionally, the hunt area receives varying degrees of grazing by livestock. Due to the existing human- and livestock-use levels in the proposed project area, it is unlikely that the presence of bear hunters will individually or cumulatively have significant negative impacts on plants and/or wildlife in the project area.

Lead poisoning has been a chronic and significant cause of migratory bird (primarily waterfowl) mortality associated with hunting in some areas of North America. Birds ingest spent lead shotgun pellets and scavengers may ingest fragments of lead bullets in carcasses or gut piles (Fry 2003). The ingested lead is converted to soluble form and absorbed into tissues, which can have lethal effects. Secondary poisoning of predatory birds can also occur when they feed on birds carrying lead pellets embedded in body tissues (Fry 2003). The use of nonlead projectiles is required for the hunting of bears in specific areas of the state designated as condor range (see Section 353(h), Title 14, CCR and Section 3004.5, Fish and Game Code).

### Other Species

The proposed regulation change is not expected to result in a change in statewide black bear population levels and, therefore, there are no expected impacts on other wildlife species. As indicated previously, regulated black bear hunting has occurred annually since 1948. Predator/prey relationships involving bears have remained intact since then. There is no available evidence to indicate that the proposed project will have any measurable impact (either negative or positive) on either bear prey species or other predators within the project area. Analysis of the proposed project does not indicate a potential to affect any threatened or endangered species or their habitats.

## CHAPTER 3

### CONSIDERATION OF ALTERNATIVES

The project alternatives evaluated herein are: 1) no project – no change from the 2010 bear hunting and bear archery hunting regulations; and 2) increase the in-season closure bear harvest cap from 1,700 to 2,500.

Alternative 1. No Project – no change from the 2010 bear hunting and bear archery hunting regulations

This alternative provides a continuation of the 2010 bear hunting and dog use regulations. Under this alternative, the in-season closure mechanism would remain and provide a statewide harvest of 1,700 bears, and the bear archery hunting season dates would remain unchanged.

#### Advantages of This Alternative

Black bear hunting and dog use regulations are inherently complicated and changes may result in confusion for some members of the public. Maintaining the 2010 regulations for the 2011 hunting season may result in less confusion to some members of the public.

#### Disadvantages of This Alternative

The no project alternative unnecessarily restricts public recreational opportunities and would not provide bear hunting opportunities based on current resources.

#### Conclusions Regarding This Alternative

It is unlikely that significant irreversible impacts would occur as a result of selecting the no project alternative. However, the no project alternative is not recommended because it does not provide hunting opportunities based on current bear resources.

Alternative 2. Increase the in-season closure bear harvest cap from 1,700 to 2,500

This alternative would modify Section 365, Title 14, CCR, to increase the number of bears that could be harvested to 2,500 animals before the early-season closure occurs. Existing black bear hunting regulations (Section 365, Title 14, CCR)

require the Department to close the hunting season on the last Sunday in December or when 1,700 bears have been reported harvested, whichever occurs first. Existing bear hunting regulations do not specify a maximum number of bear tags to be issued. The Department has sold an average of 23,200 bear tags annually since 2002, which was the year that the harvest cap was established at 1,700 bears. The bear hunting season has been closed early three times since then (2007, 2008 and 2009). During each of these seasons, the total bear harvest exceeded the number established to trigger the bear season closure. However, this mechanism was designed to stop the bear season before the harvest reached damaging levels and not to limit the harvest to a specific number. Despite these early closures, statewide population estimates have continued to increase (Figure 2-1), the age structure of harvested black bears is stable (Figure 2-2), the genetic variation in the statewide population is stable (Brown et al 2009), black bear depredation issues have remained stable (Figure 2-3), and the bear population has not been negatively impacted according to the black bear monitoring matrix.

Since the bear harvest cap was increased from 1,500 in 2001 to 1,700 in 2002, annual bear harvest averages 1,756 and ranges between 1,397 and 2,028 (Table 2-1). The maximum positive deviation from the current harvest cap is 328 ( $2,028 - 1,700 = 328$ ). Hence, a conservative estimate of the maximum number of bears that could be harvested resulting from increasing the harvest cap to 2,500 is approximately 2,850 bears, which incorporates unforeseen error. This harvest level is below the modeled maximum sustained annual hunter harvest (3,100 bears; Appendix 3).

The Black Bear Management Plan prepared by the California Department of Fish and Game contains a matrix for evaluating the health of California's bear resource (Appendix 2). This matrix is based on the recommendation by Garshelis (1993) that several monitoring techniques be employed together for monitoring bear populations. The use of a matrix lessens the effects of biases which may manifest themselves on a technique used singly and to detect actual changes in the bear population. The bear population would be considered to be negatively impacted if the threshold for concern was met or exceeded in two or more of the monitoring categories. If two or more of the thresholds for concern were met or exceeded resulting from this option, the Commission maintains the option to reduce the season length or alter tag quotas. The hunting bag limit of one bear per season restricts the take of bears and equitably allocates the take among the interested public. The prohibition against the take of cubs and females accompanied by cubs insures

recruitment of young into the population and protects reproductive females from hunting mortality.

#### Advantages of This Alternative

Adoption of this alternative would provide additional public recreational opportunities.

#### Disadvantages of This Alternative

Black bear hunting regulations are inherently complicated. Changes to hunting regulations may result in confusion by some members of the public.

#### Conclusions Regarding This Alternative

This alternative has been determined to have no significant adverse effects to the statewide black bear population or the environment. This is because all indices available to the Department suggest the statewide black bear population is robust enough to sustain this level of harvest, and the statewide bear genetic structure is not decreasing in heterozygosity and exhibits recent range expansion (Brown et al. 2009). Furthermore, the Department and the Commission maintain the ability to rapidly respond to population fluctuations (positive or negative) by annually increasing or decreasing hunter opportunity in accordance with guidelines established by the black bear management plan (Appendix 2).

Although this alternative has no potential significant adverse effects to the statewide bear population, the Department does not recommend this alternative. The Department suggests a more conservative increase to the bear harvest cap as identified in the original project proposal and as detailed in Appendix 1. The Department will continue to monitor the statewide black bear population in accordance with the black bear management plan and will make recommendations to the Commission accordingly.

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## **APPENDIX 1**

### **REGULATORY LANGUAGE FOR PROPOSED PROJECT**

Appendix 1 contains the 2011 proposed project regulatory language for Sections 365 and 366, Title 14, California Code of Regulations. Recommended changes are provided in strikeout/underline format.

### **§365. Bear.**

Except as provided in Section 366, bear may be taken only as follows: (Note: See subsection 265(c)(1) for restrictions on the use of dogs.)

(a) Areas:

(1) Northern California: In the counties of Del Norte, Humboldt, Plumas, Shasta, Siskiyou, Tehama and Trinity; and those portions of Lassen and Modoc counties west of the following line: Beginning at Highway 395 and the Sierra-Lassen county line; north on Highway 395 to the junction of Highway 36; west on Highway 36 to the junction of Highway 139; north on Highway 139 to Highway 299; north on Highway 299 to County Road 87; west on County Road 87 to Lookout-Hackamore Road; north on Lookout-Hackamore Road to Highway 139; north on Highway 139 to the Modoc-Siskiyou county line; north on the Modoc-Siskiyou county line to the Oregon border.

(2) Central California: In the counties of Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lake, Mendocino, Nevada, Placer, Sacramento, Sierra, Sutter, Yolo and Yuba and those portions of Napa and Sonoma counties northeast of Highway 128.

(3) Southern Sierra: That portion of Kern County west of Highway 14 and east of the following line: Beginning at the intersection of Highway 99 and the Kern-Tulare county line; south on Highway 99 to Highway 166; west and south on Highway 166 to the Kern-Santa Barbara county line; and those portions of Fresno, Madera, Mariposa, Merced, Stanislaus, Tulare and Tuolumne counties east of Highway 99.

(4) Southern California: In the counties of Los Angeles, Santa Barbara and Ventura; that portion of Riverside County north of Interstate 10 and west of Highway 62; and that portion of San Bernardino County south and west of the following line: Beginning at the intersection of Highway 18 and the Los Angeles-San Bernardino county line; east along Highway 18 to Highway 247; southeast on Highway 247 to Highway 62; southwest along Highway 62 to the Riverside-San Bernardino county line.

(5) Southeastern Sierra: Those portions of Inyo and Mono counties west of Highway 395; and that portion of Madera County within the following line: Beginning at the junction of the Fresno-Madera-Mono county lines; north and west along the Madera-Mono county line to the boundary of the Inyo-Sierra National Forest; south along the Inyo-Sierra National Forest boundary to the Fresno-Madera county line; north and east on the Fresno-Madera county line to the point of beginning. Also, that portion of Inyo county west of Highway 395; and that portion of Mono county beginning at the intersection of Highway 6 and the Mono county line; north along Highway 6 to the

Nevada state line; north along the Nevada state line to the Alpine county line; south along the Mono-Alpine county line to the Mono-Tuolumne county line and the Inyo National Forest Boundary; south along the Inyo National Forest Boundary to the Inyo-Sierra Forest boundary; south along the Inyo-Sierra Forest boundary to the Fresno-Madera county line; north and east along the Fresno-Madera county line to the junction of the Fresno-Madera-Mono county line; south along the Mono-Fresno county line to the Mono-Inyo County line; east along the Mono-Inyo county line to the point of beginning.

(b) Seasons: Except in the deer hunt areas designated as zones X-1 through X-7b in subsection 360(b), the bear season shall open on the opening day of the general deer season as described in subsections 360(a) and (b) and extend until the last Sunday in December in the areas described in subsections 365(a)(1), (2), (3) (4) and (5) above. In those areas designated as deer hunting zones X-1 through X-7b, the bear season shall open on the second Saturday in October and extend for 79 consecutive days. The bear season shall be closed when the department determines that ~~4,700~~ 2,000 bears have been taken pursuant to the reporting requirement in section 708(e). The department shall notify the commission, the public via the news media and bear tag holders via the U.S. mail and the news media when implementing this closure.

(c) Bag and Possession Limit: One adult bear per ~~season~~ hunting license year. Cubs and females accompanied by cubs may not be taken. (Cubs are defined as bears less than one year of age or bears weighing less than 50 pounds.)

(d) No open season for bear in the balance of the state not included in subsection (a) above.

(e) Bait: No feed, bait or other materials capable of attracting a bear shall be placed or used for the purpose of taking or pursuing a bear. No bear shall be taken over such bait. No person may take a bear within a 400-yard radius of a garbage dump or bait.

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

## **§ 366. Archery Bear Hunting.**

Bear may be taken with bow and arrow during the bear season as specified in section 365 and as follows:

- (a) Areas: Those portions of the state as described in subsection (a) of section 365.
- (b) Season: The archery bear season shall open ~~on the third Saturday in August~~ concurrent with the deer archery season in respective deer hunt zones and extend for 23 consecutive days. There is no open season for taking bear with bow and arrow in the balance of the state.
- (c) Bag and Possession Limit: One adult bear per season hunting license year. Cubs and female accompanied by cubs may not be taken. (Cubs are defined as bears less than one year of age or bears weighing less than 50 pounds.)
- (d) The use of dogs is prohibited during the archery season for bear.
- (e) Bait. No feed, bait or other materials capable of attracting a bear to a feeding area shall be placed or used for the purpose of taking or pursuing a bear. No bear shall be taken over such bait. No person may take a bear within a 400 yard radius of a garbage dump or bait.
- ~~(f) No more than 15,000 bear tags shall be issued pursuant to section 367 (see subsection 365(b)).~~

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

## **APPENDIX 2**

### **Black Bear Management Plan July 1998**



# Black Bear Management Plan

July 1998





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*During the summer portion of the Department's black bear survival and production study, bears are captured with snares. Each snare is hidden in the dirt and surrounded by logs so that it can be approached from only one angle. A strategically-placed can of sardines lures the bear into the trap. Traps are checked each day.*

*Captured bears are tranquilized, weighed, and measured; blood is drawn; a tooth is extracted; and the bears are fitted with radio telemetry collars so their activities can be monitored. Photos by William Grenfell.*



# Introduction

Black bears (*Ursus americanus*) are recognized as an important component of California's ecosystems and as a valuable resource for the people of California. The black bear has been classified as a game mammal since 1948. Since that time, hunting regulations have become more restrictive, prohibiting trapping, killing of cubs or sows with cubs, and reducing the bag limit from two to one bear per license year. Before the early 1980's, regulation changes were infrequent. However, in 1982, the Department began recommending regulatory and legislative changes to reduce poaching and increase the Department's ability to monitor bear populations.

Data indicates that California's bear population has increased in recent years. Black bears are being observed in areas where they were not seen 50 years ago along the Central Coast and Transverse mountain ranges of Southern California. Between 17,000 and 23,000 black bears are now estimated to occupy 52,000 square miles in California.

Wildlife laws and regulations are established in a two tiered fashion. Laws are established by the state legislature, supersede regulations, and are listed in the Fish and Game Code. Regulations are established by the Fish and Game Commission (Commission), which is responsible for regulating the noncommercial taking and possession of wildlife (Section 200, Fish and Game Code). The Commission is made up of 5 commissioners who are appointed by the Governor. Hunting and fishing regulations are detailed in Title 14 of the California Code of Regulations (CCR).

Section 1801 of the Fish and Game Code establishes state policy regarding wildlife resources. The ultimate goal of this policy is to maintain sufficient wildlife populations (including black bear) to accomplish the following goals:

- a) to provide for the beneficial use and enjoyment of wildlife by all citizens of the state;
- b) to perpetuate all species for their intrinsic and ecological values;
- c) to provide for aesthetic, educational, and nonappropriative uses;
- d) to maintain diversified recreational uses of wildlife including sport hunting;
- e) to provide for economic contributions to the citizens of the state through the recognition that wildlife is a renewable resource, and;
- f) to alleviate economic losses or public health and safety problems caused by wildlife.

Each year, the Department of Fish and Game prepares a Draft Environmental Document (DED) for the proposed project of a bear hunting season. After a 45-day public review period, the DED is finalized and certified by the Commission. The Commission then adopts a preferred alternative within the range of alternatives analyzed within the DED. The black bear management plan (BBMP) is not intended to circumvent or replace this process. Instead, the management plan is intended to provide guidance and measurable goals for bear management within the state. The goals established within the BBMP will be addressed in future DED's. In summary, the DED is the annual analysis of black bear hunting regulations and the BBMP provides multi year guidance for black bear management.

The primary goal of the Department's black bear management program is to maintain a viable and healthy black bear population. Within this goal, the BBMP provides the guidance for balancing the needs of this species with the diverse economic and recreational needs of the people of California.





*During the winter portion of the Department's black bear survival and production study, bear dens are located. Some bears den high, inside large coniferous trees, while others den in caves or large logs and stumps on the ground. A look inside one den reveals a sow nursing her cub while hibernating. Photos by Bob Stafford.*

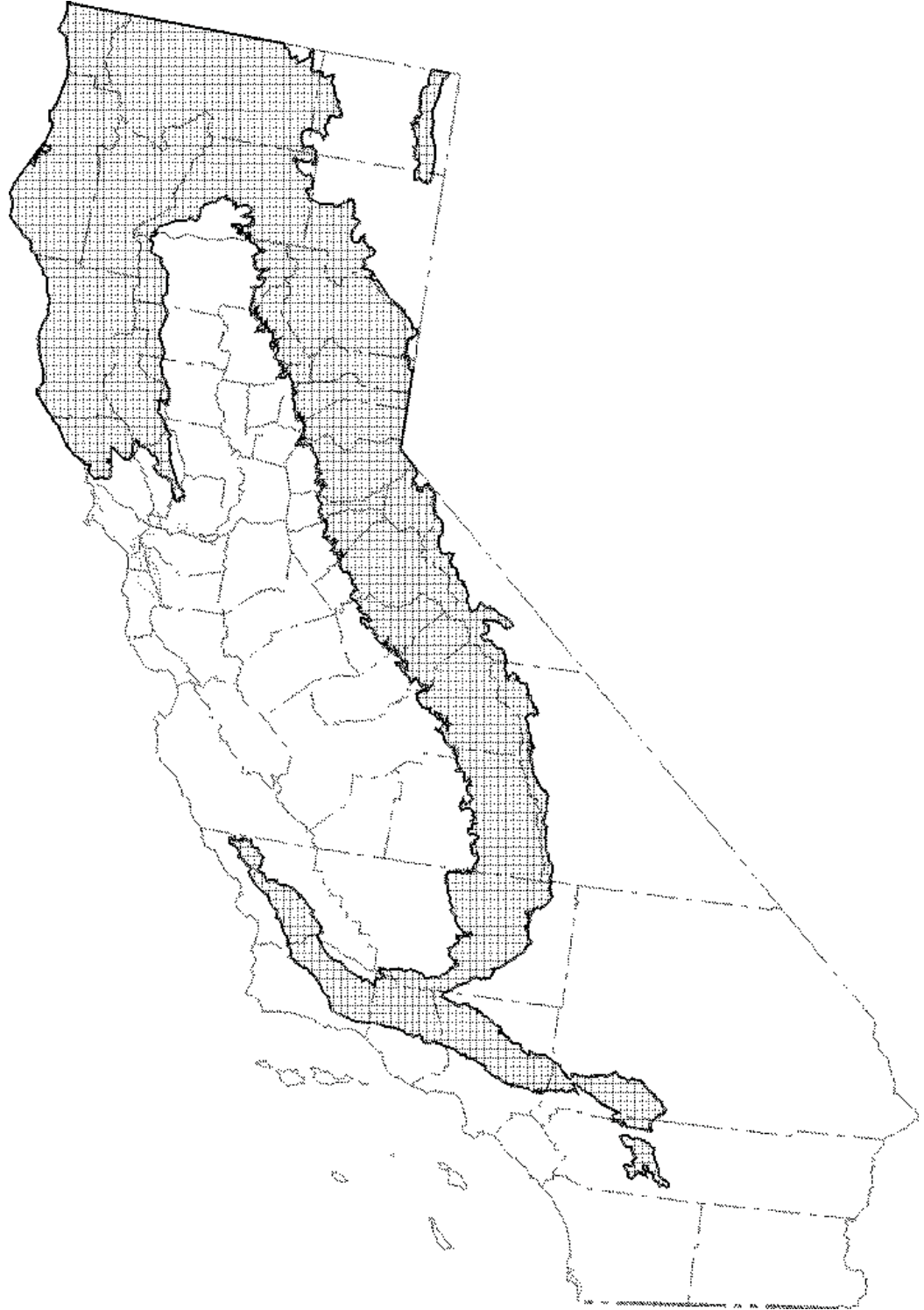


## 1.0 Current Status





**Figure 1: Black Bear Range in California**





# 1.1 Population

California's black bear population has increased over the past 15 years. Sitton (1982) estimated the statewide bear population to be between 10,000 and 15,000 in the early 1980's. Presently, the statewide black bear population is conservatively estimated to be between 17,000 and 23,000.

Two subspecies of black bear are recognized in California (Hall 1981), the northwestern black bear (*Ursus americana altifrontalis*) and the California black bear (*U. a. californiensis*). The subspecies are thought to be geographically distinguished by the crest of the Klamath Mountains. Differentiation between distinct black bear "populations" is difficult in California, even at subspecies level, because there are no significant barriers restricting bear movement between occupied habitat. However, differences in vegetation, water availability, and bear density, allow biologists to differentiate three regional "subpopulations" of black bears in California—North Coast/Cascade, Sierra, and Central Western/Southwestern (Figure 1).

The North Coast/Cascade subpopulation occurs north and west of the Sierra Nevada Mountains and includes both the Northwestern and Cascade floristic provinces (Jepson 1993). Roughly half of the statewide black bear population resides in this portion of the state. Previous and ongoing studies indicate that bear densities range from 1.0 to 2.5 bears per square mile (Department of Fish and Game 1993, Kellyhouse 1977, Piekielek and Burton 1972). Almost all of the bear habitat in this area is publicly owned or used for timber production. Large wilderness areas are located in each of the National Forests of this region.

The Sierra Nevada subpopulation encompasses the Sierra floristic province (Jepson 1993) and extends from Plumas County south to Kern County. Black bears inhabit the entire region. Forty percent of the statewide black bear population inhabits the Sierra Nevada Mountains. Bear populations are less dense in the Sierra with between 0.5 and 1.0 bears per square mile (Grenfell and Brody 1983, Koch 1983, Sitton 1982). Over two-thirds of the bear habitat is administered by the U.S. Forest Service and two large National Parks are located within this region.

The Western/Southwestern subpopulation extends south and east from Monterey County to Riverside County. Prior to 1950, black bears were not believed to inhabit the Central Coast or Transition Ranges (Storer and Tevis 1978, Hall and Kelson 1959, Grinnell et al 1937) where black bears were believed to be excluded or limited by the larger California grizzly bear (*Ursus arctos californicus*). After the California grizzly became extinct around the turn of the century, black bears started to appear in Ventura and Santa Barbara Counties (Grinnell et al 1937). The Department of Fish and Game supplemented this natural range expansion by moving 28 black bears into southern California during the early 1930's (Burgduff 1935). The current black bear population in the San Gabriel and San Bernardino Mountains is believed to be at least partially descended from this supplemental introduction.

Probably less than 10 percent of the statewide black bear population inhabits the Central Western/Southwestern California bioregion and bears are restricted to the Central Coast and Transverse Mountain Ranges. In the Central Western province, bears were detected by bait stations with decreasing frequency as latitude increased (Schultz 1994). Based on studies of black bears in chaparral habitats in Arizona (LeCount 1982) and southern California (Stubblefield 1992, Novick 1981, Moss 1972) bear density is probably less than 0.25 bears per square mile.

## 1.2 Habitat

Black bears occupy a variety of habitats; however, bear populations are densest in forested areas with a wide variety of seral stages. Habitats with both vegetative and structural diversity provide alternate food resources when other foods are in short supply. Food availability for black bears has been strongly correlated to reproductive success in female black bears (Rogers 1987, Piekielek and Burton 1975, Jonkel and Cowan 1971). Vegetation and structure diversity not only allow for greater survival of existing bears, they also provide for increased reproduction.

As with all wildlife, black bears have specific preferences for reproduction, cover, and feeding. With respect to reproduction, secure, dry den sites are needed for female bears giving birth or raising cubs. Many studies have indicated that female black bears selected the most secure den locations (Mack 1989, Alt and Gruttadauria 1984, LeCount 1983, Johnson and Pelton 1981, Lindzey and Meslow 1976). While black bears have been found to den in slash piles, under large rocks, and even on open ground, the most secure and thermally protective den sites are associated with large trees.

On a regional basis, black bears “thrive” in some habitats while other habitat types are marginal. For instance, black bears are known to use annual grasslands sporadically during the year. However, self sustaining bear populations are not found in this habitat type. In contrast, montane hardwood, montane chaparral, and mixed conifer forests sustain high bear populations because they supply sufficient food, cover, and water. Other habitat types, such as valley foothill hardwood, provide seasonally important habitat. Similarly, some habitat types vary in importance depending on the composition of surrounding areas.

Habitat loss is the leading threat to wildlife populations in California. Over half of the suitable black bear habitat in California is in public ownership of which an estimated 10 percent is managed as either a wilderness or park. Current ownership patterns allow large blocks of habitat to remain undeveloped and core areas within these blocks where bears encounter few humans. Furthermore, black bears typically inhabit rugged lands and conversion projections indicate that only 1 percent of existing black bear habitat is expected to be lost each decade (FFRAP 1989).

Land management activities can effect the capability of an area to support bear populations. For instance, many of the important food plants (manzanita, oaks) only grow in forest openings. Therefore, controlled burns or other management strategies aimed at creating a mosaic of forest openings can be especially beneficial for black bears by providing abundant food resources in close proximity to cover. Additionally, retention and recruitment of snags and large woody debris provide den sites and potential food sources (colonial insects). Conversely, management practices (i.e.—fire suppression) which result in even aged stands without structural and vegetational diversity decrease habitat value for black bears. Often attendant activities such as road construction, which do not directly reduce habitat, adversely effect bear populations by increasing hunting vulnerability.

**Table 1: Black bear habitat evaluation in percent (based on Forest and Range-land Resources Assessment Program (FFRAP) database run December 1993).**

Bioregion	High Value	Medium Value	Low Value	TOTAL
North Coast/Cascade	37%	5%	1%	43%
Sierra	17%	16%	5%	38%
Central Western/ Southwestern Calif.	2%	7%	10%	19%
<b>TOTALS</b>	<b>56%</b>	<b>28%</b>	<b>16%</b>	<b>100%</b>

## 1.3. Hunting Recreation

Existing regulations provide for a 23-day archery only season beginning in August and a separate general bear season which opens concurrently with the general deer season in the A,B,C, and D deer hunting zones. Bear season is closed when 1,500 bears are reported taken or on the last Sunday in December. Dogs can only be used for the pursuit and take of bears during the general bear season and hunters are limited to using one dog per hunter in areas where the general deer season is open. There is not a separate dog training season and bait cannot be used. The current level of harvest is considered biologically conservative and allows for diverse hunting activities. Bear hunting presently provides recreation for 15,000 people in California. Bear hunters typically spend over 100,000 days hunting bears each year.

Hunting can contribute significant income for to local economies, especially in rural areas. In 1991, hunting for all species was estimated to generate over \$530 million in California (Southwick Associates 1993). During a recent survey, it was determined that bear hunters spend over \$8 million to hunt bears each year (California Department of Fish and Game 1995). In comparison, deer hunting and viewing were shown to contribute \$230 million per year to the California economy (Loomis et al 1989).

Bears range throughout almost all of the mountainous regions and legal bear hunting is allowed in almost every portion of the state. Most hunters have the opportunity to hunt bears within 100 miles of their homes. Access to bear hunting areas can be gained through a variety of roads ranging from interstate highways to unpaved logging roads.

## 1.4 Wildlife Viewing Opportunities

Wildlife viewing recreation (direct observation and photography) has become increasingly popular. By nature, black bears are solitary and reclusive. The best bear viewing opportunities exist in areas with dense bear populations and where bears are less threatened by humans, such as State or National Parks. Regardless of location, black bear observations in the wild are sporadic and unpredictable.

Approximately 10 percent of the most productive bear habitat in California is either managed as a park or wilderness area where bears encounter large numbers of people. In general, these bears are less timid when compared to bears in heavily hunted populations. However, even in Yosemite National Park, where black bears are completely protected and commonly observed, nuisance black bears altered their foraging patterns to avoid human contact (Graber 1982). Additional bear viewing opportunities exist in areas with naturally high bear densities such as portions of northwestern California. The likelihood of viewing a black bear in these areas is correspondingly greater.

Under natural conditions, bears are most predictably encountered when they are seasonally attracted to limited seasonal resources such as meadows or berry patches. However, in some cases bears are lured into dumps or other unnatural food sources. The Department has emphasized, and will continue to emphasize, that bears not be baited in any manner for public viewing. This premise was reinforced in 1997 when the Commission adopted regulations prohibiting the feeding of bears and other large mammals. Bears which become habituated to humans are more likely to damage private property in the future or become public safety hazards. Furthermore, artificial food sources create unnatural conditions which are often detrimental to the species.

## 1.5 Research

Almost all of the research on black bears in California has been conducted during the past 30 years. Over this period, the Department has funded or conducted bear research in each of the three previously described subpopulations. Population, home range, diet, range expansions, denning, and habitat preferences have all been studied. Similar studies have been conducted independently in Redwood, Yosemite, and Sequoia National Parks.

The Department has funded or participated in long term studies in three areas; Trinity County, Placer/El Dorado County, and San Bernardino/Los Angeles County (Figure 2). The Trinity County study was conducted in the 1970s and 1980s while the bulk of research in the Placer/El Dorado and San Bernardino studies was conducted during the early 1980s. Currently, the Department is midway through a 10 year study on the Klamath National Forest in Siskiyou County. The data obtained in these studies is important for validating some of the assumptions in population models and for determining the status, distribution, and needs of California's black bear population.



**Figure 2: Locations of Black Bear Studies in California (1970-1998)**

## 1.6 Law Enforcement

The illegal killing of black bears has been a problem in California as well as other western states. In the early 1980s, population modeling indicated that poaching was almost equal to the legal harvest in some areas (Sitton 1982). A demand for bear parts, particularly gallbladders, for use in traditional Asian medicines was thought to have contributed to illegal activity. Field investigations and computer modeling further suggested that poaching was occurring during spring and summer when bear hunting was illegal. Data indicated that the combination of poaching, natural mortality, road kills, and hunting mortality may have been approaching the level where the bear population could no longer perpetuate itself. Evidence which suggested that poaching was impacting bear populations in California included declines in harvest, hunter success, and median ages of hunter-killed bears; detection of bear poaching by undercover operations; and the killing of radio collared bears when bear season was closed.

In response to this problem, the Department recommended the adoption of several regulations and laws to reduce illegal bear hunting in California. One of the most important changes was the prohibition of the use of dogs in bear habitat from early April until the opening of deer season. Other effective changes which occurred at this time included upgrading the penalty for selling bear parts to a felony, considering the possession of more than one bear gall bladder evidence that bear parts were being offered for sale, mandatory skull presentation, and mandatory tag return for both successful and unsuccessful bear hunters. The implementation of these laws and regulations appears to be one of the factors which lowered combined mortality to a sustainable level and has resulted in the current health of California's black bear population. While black bears have been, and will continue to be, killed illegally, it appears this activity is not limiting statewide black bear populations anywhere in the western United States (McCracken et al 1995).

In 1992, the American black bear was listed under Appendix 2 of the Convention for International Trade in Endangered Species (CITES). The listing occurred because the gallbladder of the North American black bear is very difficult to distinguish from the gallbladders of several endangered Asian bear species. Under the authority of this listing, American black bear parts can only be legally transported over international borders with an appropriate permit. In the two years following the CITES listing, there were only three permit applications and no seizures of illegal gallbladders (McCracken et al 1995). Chemical analysis of bear bile from Asia further indicates that while bear gallbladders from North America do end up on domestic markets, they rarely end up on overseas markets (Espinoza et al 1995). Therefore, demand for exported bear parts appears to be negligible at this time.

The illegal trade in bear parts has been documented for almost 20 years in California. Over this period, black bear populations have flourished. If poaching rates were as high as those presented in the press, California's black bear resource would have been eliminated. After extensive study, McCracken et al (1995) concluded that under current conditions, it is unlikely that "large-scale harvest of black bears would be prompted by demand for gallbladders alone". Given the potential demand within California and Asia, the Department recognizes that the illegal take of bears could increase. This situation warrants continued monitoring of both bear populations and illegal activity.







## 1.7 Depredation

Black bears cause thousands of dollars in property damage each year and occasionally injure people. Bear/human conflicts can be expected to increase as more people move into bear habitat. Between 1987 and 1997, personal property and structure damage were the reasons indicated in almost 40 percent of the depredation permits issued. Depredation in this category has risen significantly since the early 1980s when property damage accounted for only 10 percent of depredation cases.

Black bears are being observed more frequently in suburban areas creating potentially dangerous situations. To help alleviate these situations, the Department has developed a black bear depredation policy which emphasizes the removal of bear attractants prior to issuing a depredation permit. Each reported depredation incident is investigated by Department employees and corrective measures are urged before a depredation permit is issued. In some cases, permits are not issued until artificial food sources are removed or secured. Removing bear attractants (garbage, compost piles), securing residences, and storing garbage properly, are usually encouraged. Other successful methods for alleviating bear damage include adverse conditioning and electric fencing. However, these methods are only successful when attractants are made unavailable.

Trapping and relocating bears, which has been shown to be largely unsuccessful, is rarely attempted. If killing a bear is necessary, responsibility for killing a problem bear is placed with the land owner. A notable exception exists if a bear becomes a public safety hazard. In this situation, the bear may be killed immediately by a Department employee or public safety officer.

## 1.8 Public Information

The Department publishes two periodicals, *Outdoor California* and *Tracks*. *Outdoor California* is a bimonthly magazine. Black bear stories are occasionally featured in this magazine. *Tracks* is published annually and is specifically oriented towards large mammal hunting. Black bear hunting prospects and stories are featured in each edition.

The Department's brochure "Living With California Black Bears" was first printed in 1996. The brochure provides the general public with some basic black bear ecology and gives helpful suggestions about avoiding depredation problems and unwanted visits by bears.

Information regarding black bears is provided to the media upon request or when warranted by specific incidents. Press releases on methods for avoiding conflicts with bears, bear hunting season, and season closures are issued annually. Black bears are a high profile species and Department officials are available to answer the public's questions.

The environmental impact of hunting is analyzed and alternatives are presented in the DED which is prepared annually by the Department. Specifically, the impacts of bear hunting on bear populations, human recreation, the general environment, and the effects of hunting on individual bears are examined. After completion, the DED is made available to each library in a county seat for a 45 day public review. At the end of this period, the Department responds to public comments and the Fish and Game Commission certifies the document.

## 2.0 Monitoring Procedures

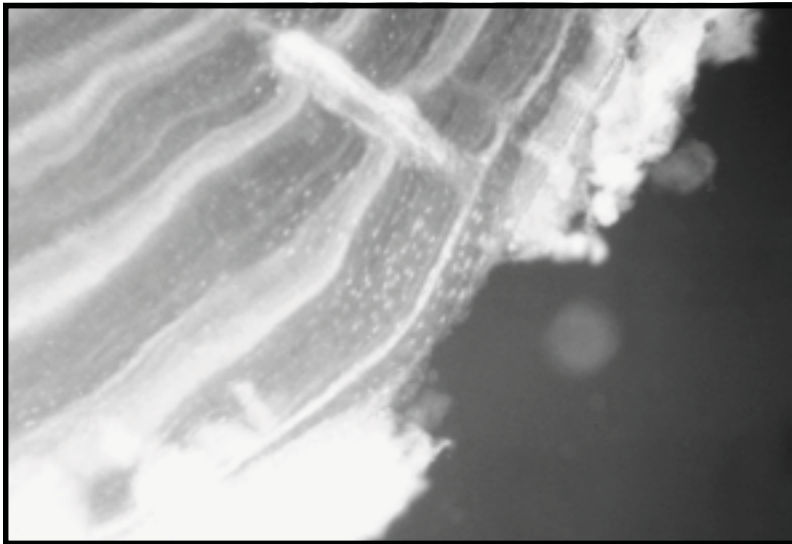


## 2.1 Population

Black bears are relatively secretive and solitary. Therefore, it is difficult to detect trends in their populations. All of the methods used to derive population estimates and trends have an inherent bias or limitation. Therefore, it is important to use several population monitoring techniques to evaluate population trends (Garshelis 1993). The Department monitors black bear population trends using cementum annuli analysis, hunter surveys, and harvest data. The use of bait station surveys to monitor population trends is currently being evaluated.

### 2.1.1 Cementum Annuli Analysis

Successful bear hunters are required to present the skull of their harvested bear to a Department employee so that a premolar tooth can be removed. Premolars are also collected from live trapped bears during ongoing studies. These teeth are then processed for cementum annuli analysis to determine age and reconstruct female reproductive histories. Ultimately, this data is used to verify models, to determine the age structure of harvested bears, and to provide course estimates of population trends.



***The ages of bears are determined by sectioning and staining a premolar. Annular rings are counted under a microscope to determine the age of the animal. DFG file photo.***

### 2.1.2 Sex Ratio

Successful bear hunters are required to return a "report card" after their hunt. The report card includes requests for information regarding the hunter's name and address, the date, time and location of kill, sex of the harvested bear, and hunting method. The number of days spent hunting (hunter effort) and whether or not the bear was killed on private or public land were recently added to the report card. Unsuccessful bear hunters have been required to return their unused bear tags at the end of each bear season since 1985.

Although sex ratios for black bears are approximately equal at birth (Department of Fish and Game 1993, Koch 1983, Graber 1982, Sitton 1982, Piekielek and Burton 1975), male bears are typically more susceptible to hunting mortality because they move over larger areas and are generally preferred by hunters (Litvaitis and Kane 1994, Kane 1989). Harvest data over the past 40 years indicate that males typically constitute approximately 60 percent of the reported kill.



## 2.1.3 Hunter Take Survey

Over the past 35 years, a random sample of sportsmen have been selected to participate in an annual survey regarding hunter success and effort. While bear hunters are included in this sample, the primary focus of this survey is to summarize hunter effort for all hunted species. These data, used in conjunction with other trend data, provide valuable long term information on black bear population trends. The recent addition of the hunter effort question on the bear take report card will be used, in part, for comparison with data from the hunter take survey.

## 2.1.4 Population Trend Estimates

Population estimates are derived by a method which projects the percent of the population harvested from the sex and age composition of harvested bears (Frasier 1982, 1984). This analysis is based on differential hunting pressure and hunter selectivity by sex. These estimates have been determined to be conservative (Miller 1989). Determining population trends from changes in these estimates can be suspect because relatively minute changes in a single age cohort can result in major changes to population estimates. Therefore, these estimates should only be used in conjunction with other trend analysis methods for making management decisions.



## 2.1.5 Decision Matrix

The following decision matrix (Table 2) is based on a wide array of methods used to monitor black bear population trends. When the threshold is exceeded for two or more monitoring techniques, the Department will recommend that hunter kill of bears be reduced in some manner. When significant changes are listed as part of the "threshold for concern", data obtained in a particular year will be compared to data from the previous three year average. This analysis will be used on a statewide basis.

Kill per hunter effort and population estimates have been combined as a single monitoring category. Both of these methods, considered individually, are susceptible to dramatic fluctuations in results based on small changes at a single data point. Used in combination, these data sources provide valuable information on the status of the bear population.

Administrative actions (i.e.-regulation changes, season closures) have the potential for biasing data in particular categories. For example, reducing the in season closure mechanism from 1,500 to 1,250 bears would probably result in a significant reduction in bear harvest. This reduction in harvest would reflect a regulation change, not a decline in the bear population. Therefore, data trends influenced largely on administrative actions will not be considered when making recommendations for regulation changes.

While the above criteria are intended for statewide application, data can be compiled and examined at the level of subpopulations. However, small sample sizes in some areas make definitive conclusions about that population suspect. Therefore, the above matrix will be used as a general monitoring technique and will not be used as the sole source for making decisions on a regional basis.

The effects of different harvest levels are modeled using a computer program, POPMOD (Barrett 1986). Changes in population, sex ratio, and age structure can be predicted using different harvest scenarios. The results of the model run are then compared to existing data to determine which scenario best reflects actual conditions. The assumptions contained in this model are based on previous studies or the scientific literature. However, any model is only as good as the data it is based upon and efforts should be made to validate the assumptions in the model. This model is used as one tool in determining harvest levels and for estimating the number of bears poached each year.

**Table 2. Decision Matrix for Monitoring the Black Bear Population.**

Monitoring Technique	Threshold of Concern
Median Ages of Hunter-Killed Bears	Female ages < 4.0 years old; or significant reduction in median age for combined sexes
Percent Females in Harvest	> 40 percent
Total Harvest	< 1,000 or significant reduction; Only if reduction is independent from administrative action.
Kill Per Hunter Effort & Population Trend	Significant change in both kill per hunter effort and population index.

## 2.2 Habitat

Black bear habitat is monitored by estimating habitat conversion trends derived from the Forest and Rangeland Resources Assessment Program (FFRAP). Another computer model, the California Wildlife Habitat Relationships Program (CWHR), is used to predict the overall value of a habitat type and the potential effects of habitat changes on each species. It is anticipated that both of these programs will be refined over the next few years making them more valuable. Local biologists consistently review proposed projects in their area which have the potential to impact wildlife habitat. Timber allotments, grazing allotments, and housing developments are examples of typically reviewed projects.

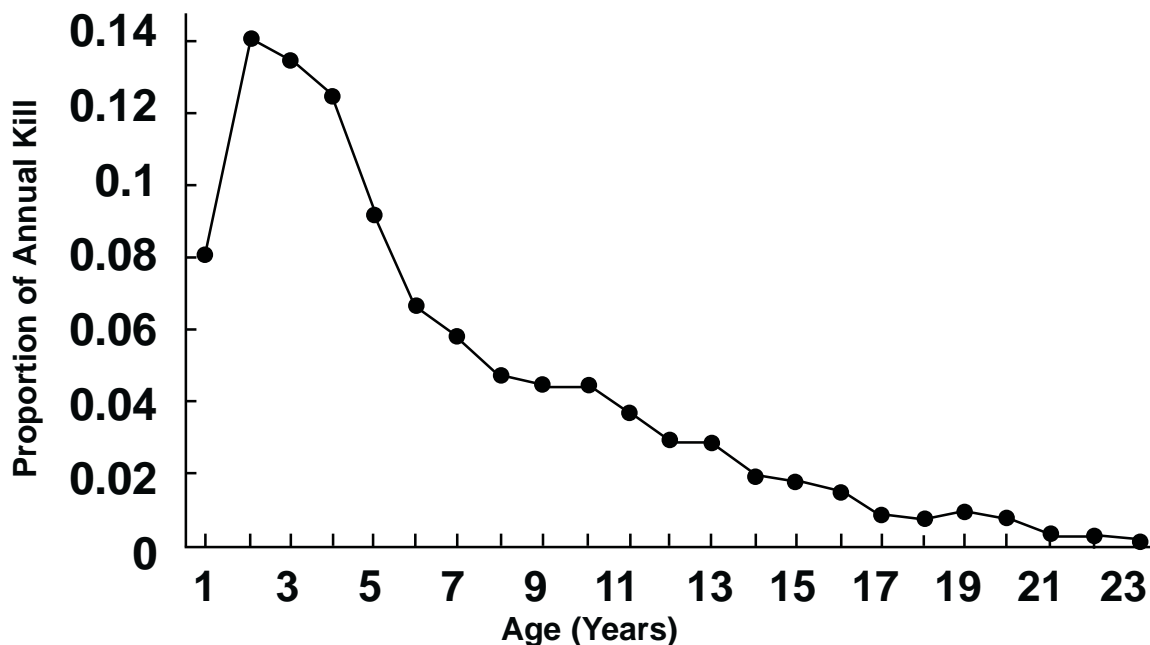
## 2.3 Hunting Recreation

The Department uses bear tag sales, bear tags, and the Game Take Hunter Survey to monitor bear hunting trends on a statewide and regional basis. The number of tags sold in combination with the number of bears taken is used to determine the overall success rate. In addition, bear tags from successful hunters provide valuable information concerning hunting method, location of kill and hunter effort (days spent hunting). All of these variables, either singly or in combination, are used to evaluate hunter opportunity.

Tags from successful bear hunters provide valuable information on hunting success in localized areas. However, the sole use of bear tag information from successful hunters is problematic because over 80 percent of all bear hunters are unsuccessful and data from these individuals is not obtained from tags. The Game Take Hunter Survey provides county specific data on hunting effort and includes results from unsuccessful bear hunters. These data are used to determine long term hunting trends.

In addition to the Game Take Hunter Survey, the Department surveyed bear hunters in 1994 and 1997 to determine trends in hunting methods and hunter effort. Questions were aimed at providing information which was not available from bear tags or the Game Take Hunter Survey. These data have been valuable in assessing regulation changes over recent years.

**Average Age of Harvested Bears  
(1992 - 1997)**



## 2.4 Wildlife Viewing Opportunities

Black bear viewing opportunities are currently maintained by urging land owners and managers (see Section 2.2) to preserve bear habitat as well as by ensuring that bear populations are stable. To this extent, bear viewing opportunities are monitored by continuously evaluating changes in the aforementioned criteria. The monitoring techniques for both habitat and the population have been detailed in the previous sections. Department biologists, at both the local and state level, further monitor changes in viewing opportunities by coordinating with representatives and biologists from the State and National Parks.

## 2.5 Research

Most of the data used to assess population trends in California are obtained from hunter killed bears. These data alone are sufficient for monitoring bear populations. However, predicting the effects of future harvest scenarios is accomplished through the use of the computer program, POPMOD (Barrett 1986). Several assumptions within this population model were based on data from other states. While the use of published scientific data from other states has been extremely valuable, within state studies are needed to confirm the assumptions made in the computer model.

In 1992, the Department initiated a 9-year study of juvenile recruitment and age specific reproductive rates for female black bears on the Klamath National Forest. Black bears are captured, tagged, and sometimes radio collared. The radio collared bears (females and subadults) are being followed to determine mortality and natality rates. The results of this study have, and will be, used to model California bear populations.

An evaluation of the use of bait stations for detecting changes in black bear populations was initiated on the Central Coast in 1994. This study was initiated with the objectives of identifying potential problems in the use of this technique and for documenting the extent of black bear range expansions in the Central Coast and Transition Mountain ranges. Ultimately, the evaluation of this technique will be based on utility and cost effectiveness.





## 2.6 Law Enforcement

The Department's Wildlife Protection Branch (WPB) is responsible for enforcing fish and game laws. Even though numerous factors effect bear associated violations, general trends in illegal activity are determined by comparing the number of bear associated violations against the number in previous years. WPB personnel are also consulted to provide input on trends in the illegal killing of black bears.

The impacts of bear poaching on California's black bear population are estimated by using a predictive computer model. Under this model, both legal and illegal harvest are input as separate variables and the model predicts demographic and population changes over a fixed year period. These results are then measured against actual data.

Symposia on the trade in bear parts were held in 1994 and 1997. Perspectives and data on the extent and impact of the trade were presented from across the United States, Canada, and several Asian countries. The diverse efforts to combat this problem were also profiled. Quantifiable data on the extent of the gall trade in California are not available. However, the results of studies from other states and countries have allowed the Department to better estimate the illegal bear trade in California.

## 2.7 Depredation

If a black bear damages private property, the property owner may request a depredation permit for killing the bear. In these cases, a Department employee, usually the local warden or biologist, reviews the event to determine if a bear was responsible for the damage and whether or not the property owner had taken reasonable precautions to prevent the damage. The land owner is given recommendations on how to avoid further damage and often, a depredation permit is not needed after appropriate actions are taken. If reasonable efforts are taken and property damage continues, a depredation permit shall be issued for the property owner, or his agent, to kill the bear within a specified time period. A Department employee or public safety officer can kill a black bear threatening public safety at any time.

The property location, date, method of kill, method of carcass disposal, reason for issuing the permit, and measures taken to avoid damage, are all documented on the permit. If and when the bear is killed (roughly 3 permits are issued for every bear killed), a separate kill card is filled out and submitted to the Department. Both the permit and kill card are correspondingly numbered and therefore easily traced. The sex of the bear, date of kill, and the person killing the bear are indicated on the separate kill card. Black bear depredation trends are determined from these permits and cards.

In addition to the depredation process, the Department also uses a Wildlife Incident Report Form for cases when depredation permits were not issued (i.e. garbage was left out or measures were not taken to prevent damage). Since public safety bears are technically not depredation bears, incidents regarding black bears endangering public safety are usually recorded in this manner.

## 2.8 Public Information

Public information on black bears is usually released for three basic reasons; public requests, ongoing incidents, and public need. With the exception of press releases on preventative measures to avoid human/bear conflicts and hunting season details, most information is disseminated through public requests and/or specific incidents. The Department's ultimate goal concerning black bear information will be to increase the information flow for public need. To accomplish this goal, the Department recently produced a pamphlet aimed at reducing bear/human conflicts. While the Department annually examines black bear issues in the DED on bear hunting, this document is cumbersome and therefore not a good candidate for large scale public education activities.

# Camper survives encounter with bear

## Bloodied at Lake Shasta

By Larry D. Hatfield  
OF THE EXAMINER STAFF

Like a lot of hungry teen-agers, this one was looking for junk food and poking around where he wasn't supposed to be.

Problem was, this teen-ager was a 600-pound bear and his potential food was 32-year-old camper David Marc Semenero.

The encounter scared the bejabbers out of both of them.

"It may sound funny, but my life pretty much flashed in front of me," Semenero said of his Tuesday morning encounter with the bear at the Holiday Harbor Campground at Lake Shasta.

The bear skedaddled just as fast as Semenero wanted to.

Semenero, a union carpenter, escaped with a head wound.

"It's fine," he said Wednesday morning from his Belmont home. "It's just a big gash from his claw. There's six staples in it. There was a lot of blood but I didn't know that until later (because) my head was

just numb like when you get slapped real hard."

Semenero was camping without a tent about 2:30 a.m. when he "felt like a drop on the back of my neck."

"I thought it was rain, but I put my head up and it was this bear, drooling on me. I kind of startled

[ See BEAR, A-12 ]

*The black bear's interaction with humans ranges from a regular trip to the local dump (photo below) to a close encounter with a camper (newspaper story, left). All have one thing in common: the bear's desire for food.*



## THE GRIZZWELLS

ON MONDAYS I RAID THE RANGER'S GARBAGE CANS.



TUESDAYS I SNATCH THE CAMPER'S TRASH BAGS... AND WEDNESDAY I CHOW-DOWN AT THE PARK DUMP.



THAT'S WHAT I LIKE ABOUT BEING A BEAR...



CAREER OPTIONS...



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# Bears again savor civilization's fruits

By Tori Richards  
STAFF WRITER

**MONROVIA** — If you see your trash can knocked over, it could mean the bears are back in town.

Fruit trees in the foothills of Monrovia and Arcadia have been attracting a family of bears in recent weeks, the latest sighting being Thursday night, police said.

So far there is no cause for alarm — the bears haven't attacked any animals or humans, said Monrovia police Sgt. Bill Crawford.

"You know a bear is around when you drive up the street and trash cans are knocked over," Crawford said. "Almost all the officers who have worked at night have seen them. It's kinda spooky, you keep your windows up."

The Thursday sightings happened about 10:30 p.m. in the 1200 block of North Canyon Boulevard and then half an hour later in the 800 block of Norumbega Road. The first bear was an adult, the second a cub, Crawford said.

"I was up there a few weeks ago around Cloverleaf and one ran right in front of my car," Crawford said. "I think it was as scared of me as I

was of it. It ran up into the mountains."

The new family unit has moved into the old stomping grounds of Monrovia's most famous ursine celebrity — Samson — who fed off avocado trees and took dips in hot tubs before he was captured by state officials a year ago.

Originally slated for death, Sam-

Please turn to BEARS / A8



## 3.0 Recommendations





## 3.1 Population

Due to the large number of bears killed by hunters in California, some of the most reliable information for monitoring bear populations comes from hunter killed bears. Black bear populations should be monitored to determine their status. The following recommendations are intended to insure that the data regarding bear populations in California continue to be sufficient.

1. Mandatory tag return should be continued. Data gathered from these tags should include sex, location of kill, date of kill, and hunter effort.
2. Mandatory presentation of hunter killed bears should be continued to allow collection of a premolar for determining the bear's age.
3. The decision matrix should be used to monitor the statewide black bear population and to recommend regulation changes when necessary.
4. Data from the Game Take Hunter Survey should continue to be utilized for hunter trend information. Survey results should be compared with hunter effort data collected from bear tags.
5. Populations should be estimated annually for comparison purposes.
6. Population modeling should continue to be conducted with POPMOD (Barrett 1986).
7. The use of bait stations for monitoring population trends should be continued.

## 3.2 Habitat

The following recommendations should be implemented to decrease habitat loss and degradation in bear habitat.

1. The Department should continue to provide input for land management and lead agencies concerning activities which may be detrimental to black bears or their habitat. This input should include analysis of the size of logging operations as well as recommendations on ways to reduce or eliminate impacts to high quality bear habitat such as wet meadows and riparian zones.
2. The Department should encourage land management agencies to maintain or improve existing foraging and denning sites for black bears. Where appropriate, land management practices which enhance the quantity and quality of mast producing vegetation should be encouraged. Mast producing vegetation areas should be protected from extensive conversion to other vegetation types.
3. The Department should continue to recommend that open road densities be managed.



### 3.3 Hunting Recreation

Bear hunting has been found to be valuable in both an economic and recreational sense. As long as bear populations are determined to be healthy, bear hunting opportunities should be provided. The following recommendations are intended to accomplish this goal.

1. Increases in bag limits, season lengths and hunting methods should be considered if these changes are supported by biological data and a reasonable demand exists.
2. Bear hunters should be surveyed at least once every five years to determine trends in hunting methods and to evaluate hunter opportunity.

### 3.4 Wildlife Viewing Opportunities

Black bear viewing opportunities will be maintained by following the recommendations for population and habitat monitoring. Department personnel should continue to consult with National and State Park officials regarding black bear viewing opportunities.





## 3.5 Research

Research on black bear production and survival in California will be needed to evaluate model assumptions. Available data suggest that black bear ecology and population dynamics differ according to subpopulation. Data from the Sierra Nevada, which receives significant hunting pressure, is also needed for evaluating the assumptions in POPMOD.

The secretive nature and long life of black bears necessitates long term studies for determining population parameters. These studies can be expensive and permanent funding sources are necessary for continued study of this valuable resource.

1. The Klamath juvenile recruitment study should be continued. The overall duration of the study will be nine years, or two bear generations.
2. A parallel study of juvenile recruitment should be initiated in the Sierra Nevada. The duration of this study should also be nine years.
3. Recently developed techniques for monitoring bear populations with DNA from hair or scats should be investigated.
4. Black bear habitat needs to be assessed and preferences should be tested and used to update the Department's CWHR model. High resolution, statewide habitat assessment and mapping is needed.
5. The use of bait station surveys as an indicator of population trends should be investigated in an area with a denser bear population.
6. The bait station survey of the Central Coast should be continued with reduced effort.

## 3.6 Law Enforcement

Efforts to prevent and monitor black bear poaching should be continued. The following recommendations should be implemented to increase the effectiveness of law enforcement activities.

1. The number of citations issued for violations regarding bear hunting should be summarized each year. These figures should be compared with the parameters described in Section 2.1 to determine the scope and magnitude of illegal activity.
2. Wardens and deputies should receive periodic training on the status of bears, illegal hunting practices and new law enforcement techniques. Enforcement efforts should be directed towards illegal bear kill including the use of baits and night hunting.
3. If current regulations are found to be ineffective in preventing significant impacts to California's black bear resource, regulation changes should be considered to make these regulations more effective.
4. Personnel from both WPB and Wildlife Management should attend any further conferences in the illegal trade of bear parts.
5. The Department should develop an effective program to communicate with bear hunters about the biological information used to establish laws and regulations. The Department should provide opportunities for bear hunters to prevent illegal activities.
6. WPB should continue to include detection and prevention of bear related violations in annual priority enforcement plans.

## 3.7 Depredation

The Department's ultimate goal regarding black bear depredation is to minimize these conflicts and to take actions which will benefit both black bears and property owners. The following recommendations will help to achieve this goal.

1. The current black bear depredation policy should be continued.
2. Coordinated efforts between the Department and the land management agencies should be conducted to establish uniform practices concerning bear depredation. If, after appropriate measures have been taken, situations exist where black bears are a chronic problem, the Department should consider recommending that the land management agency close the facility.
3. Public education on black bear depredation, as described in the next section, should be implemented as soon as possible.



***Above: People who leave food and bear attractants out can unintentionally cause conflicts with bears. Photo by Jon Kinney.***

***Right: Bear-proof trash containers can alleviate bear depredation, but only if there is public awareness of the problem. Public education is a necessity wherever bears and humans coexist. Photo by Bob Stafford.***



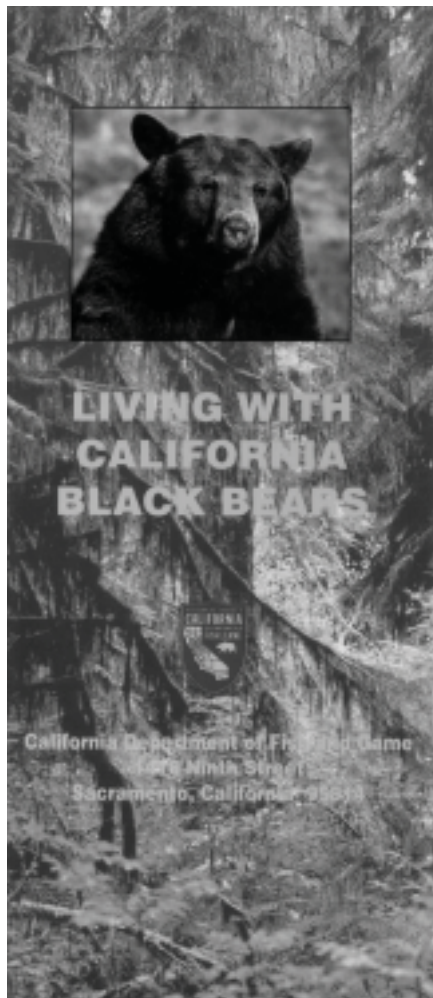


## 3.8 Public Information

Currently, information on black bears is distributed indiscriminately by individual Department employees and a standardized program has not yet been developed. Thus far, providing information in this manner has been sufficient. However, as more people come into contact with black bears, a mass media approach will be necessary to provide public information.

To meet this challenge, the following recommendations are offered.

1. A standardized program, including a brochure, should be developed to educate the public on how to avoid conflicts with bears.
2. The Department should develop a video regarding ways to avoid conflict with bears. This video should then be made available to Department employees, land management agencies, schools and homeowner associations.
3. The Department should produce a poster aimed at reducing bear/human conflicts. The poster would be displayed on rental properties in rural communities.
4. The Department should develop a brochure on black bear management in California including general life history and hunting and viewing opportunities.
5. The Department should routinely inform the public on black bear population trends.



***The brochure “Living With California Black Bears” was first printed in 1996. More than 250,000 copies have been distributed. The brochure is intended to provide the general public with some basic black bear ecology and give helpful suggestions about how to avoid unwanted visits by bears.***

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## **APPENDIX 3**

### **2011 Black Bear Computer Simulated Population Analysis**

**2011 Computer Simulation Analysis**

The potential effects of the proposed project on the dynamics of the State's bear population were analyzed with the aid of a computer model. Computer modeling has become an important tool for wildlife managers as well as for wildlife researchers. The dynamics of large mammal populations such as deer, black bears, pronghorn antelope, and elk exhibit many similarities. For example, all large mammals have a minimum breeding age and each species has measurable reproductive rates. These observed rates of recruitment and survival can be used to model how a given population will behave under a given set of circumstances. Numerical values for these parameters are species, sex, and age specific. As an example, it is common for female black bears to come into estrus at 2.5 to 3.5 years of age, however, they generally do not successfully reproduce until they are 4.5 years old (Piekielek and Burton 1975, Sitton 1982, Department of Fish and Game 1996). Bears four years and older normally produce an average of 1.6 cubs in alternate years. Thus, a black bear population model would assign reproductive values and survival patterns that would reflect these unique capabilities.

For a population model to provide reliable predictions, it must account for significant biological phenomena. Users of simulation models must recognize the assumptions made in developing the model and the mechanical structures used in the model must not violate those assumptions (Conely 1978). As an example, black bears suffer differential hunting mortality because males are larger and more desirable to hunters. Males also move over larger areas than females and have a higher chance of encountering a hunter (Beecham and Reynolds 1977, Koch 1983, Rogers 1987, Litvaitis and Kane 1994). Therefore, it is important that survival coefficients (the number of young that survive) be developed for males and females in any model used for analyzing hunted black bear populations. In 1986, the Department contracted with Dr. Reginald Barrett, Associate Professor in Wildlife Management at the University of California at Berkeley, to develop a black bear population simulation model. In 2000, Dr. Barrett reworked the original model to remove the assumption of compensatory mortality. Dr. Barrett's credentials and qualifications can be obtained through the College of Natural Resources, Department of Forestry and Resource Management, 145 Mulford Hall, University of California, Berkeley, California 94720. Dr. Barrett was selected to develop the model because he is a nationally recognized expert in large mammal ecology and in the use of microcomputer simulation models for analyzing wildlife populations.

## Model Assumptions

The model Dr. Barrett developed was used by the Department to assess the performance of the State's bear population as well as the potential effects of the proposed project and alternatives to the proposed project. Thirteen assumptions were made in developing the model and in interpreting the results obtained from completing simulation runs. The assumptions are as follows:

1. Black bears are long-lived seasonal breeders. This assumption was based on information collected from both live-trapped and hunter-killed bears in California (Piekielek and Burton 1975, Graber 1982, Sitton 1982, Koch 1983, Stafford 1996) which indicated black bears can live to over 20 years of age and that they breed in the summertime (July);
2. Females first successfully breed at four years of age, then every other year unless a litter is lost. This assumption is based on information obtained in studies completed in California (Piekielek and Burton 1975, Graber 1982, Sitton 1982, Koch 1983, Keay 1990) as well as information obtained in the scientific literature (Jonkel and Cowan 1971, Beecham and Reynolds 1977, LeCount 1977, Rogers 1987). This is also supported by reproductive data gathered from the teeth of hunter killed bears since 1993 (California Department of Fish and Game 1996);
3. Recruitment of a seven-month old cub is primarily a function of the age of the female (maternal skill) and essentially independent of bear density. This assumption is based on studies completed by Jonkel and Cowan (1971), Beecham and Reynolds (1977), Rogers (1987), and Elowe and Dodge (1989). The recruitment rate used in Dr. Barrett's model for younger mothers is lower than for older mothers (maternal skill);
4. The sex ratio of recruits is equally divided between males and females. This assumption is based on observed data in California (Piekielek and Burton 1975, Graber 1982, Sitton 1982, Koch 1983) as well as information collected in other states (Jonkel and Cowan 1971, Rogers 1987, Elowe and Dodge 1989);
5. Bear densities are limited primarily by food availability. This assumption is based on data reported in the scientific literature from studies completed in California and other states (Rogers 1976, LeCount 1977, Graber 1982, Grenfell and Brody 1983, Elowe 1989);
6. Adult males tend to kill subadults (recruits) in dense populations. This assumption has been well documented in the scientific literature (Jonkel and

Cowan 1971, Kemp 1972, Poelker and Hartwell 1973, Kemp 1976, Rogers 1987, LeCount 1993, Stafford 1995);

7. Natural mortality of adult bears occurs primarily in the winter. This assumption is based on the fact that if bears cannot put on enough fat to survive the winter, they generally will not den and hence, will not survive because there is little if any bear food available during the winter months;
8. Natural mortality is curvilinearly related to the ratio of bear density to available food. This assumption is based on information presented in the scientific literature. Essentially, researchers found that black bear reproduction declines in years of mast crop failures (Jonkel and Cowan 1971, Rogers 1977, Elowe and Dodge 1989);
9. There are age specific survival rates with very young (yearling) and very old bears having the lowest survival rates. This assumption is based on information reported by Kemp (1972 and 1976), Beecham and Reynolds (1977), Bunnell and Tait (1981), and Frasier (1982);
10. Young males have lower survival rates than young females. This assumption is based on the evidence presented by Jonkel and Cowan (1971), Koch (1983), Rogers (1987), and Elowe and Dodge (1989). These researchers found that young males tend to disperse farther from their mother's home range and thus have a significantly higher chance of encountering hunters or other factors which may increase mortality rates;
11. Hunting losses occur in the fall. This assumption is based on past bear hunting regulations adopted by the Commission which established fall hunting seasons;
12. Hunters select for bears based on live weight, and young of the year are not harvested. This assumption is based on past bear hunting regulations adopted by the Commission which prevented the take of cubs or females accompanied by cubs. The fact that hunters select for large bears is well documented in both the popular and scientific literature. Hunters using dogs tend to be particularly selective (Litvaitis and Kane 1994); and
13. Hunting mortality is additive to natural mortality. While evidence indicates that, up to a point, hunting mortality subtracts from rather than adds to nonhunting mortality (Kemp 1972 and 1976, Bunnell and Tait 1981, Miller 1990, Schwartz and Franzmann 1991), the Department is making the assumption (in the computer simulations) that hunting mortality adds to natural mortality. This is a very conservative approach because in California bear populations less than 10

percent of the total bear population is killed by hunters annually and the total mortality for the bear population appears to be less than 20 percent.

## METHODS

Population changes were simulated under varying harvest scenarios utilizing the program POPMODBB-ADD (Barrett, 2000). The model was used to provide predictions of the potential effect of various options, alternatives or hunting strategies on the bear population. Those outcomes are discussed in Chapter 2 of the 2010 Environmental Document Regarding Bear Hunting. The model was tested by attempting to mimic observed data including age structure, sex ratios and hunter kill as determined from direct field observations and hunter reports (bear tag return, bear premolar tooth analysis and the Game Take Hunter Survey). The model approximates the observed age structure of the bear population.

Seven variables are required to be input to run this program: 1) number of years for the run; 2) beginning year; 3) average carrying capacity; 4) range of the carrying capacity; 5) legal harvest; 6) legal harvest variance; and 7) estimated illegal harvest. For this analysis, the program was run for 50 years periods beginning in 2010. Statewide carrying capacity was estimated from intrinsic population growth rates (e.g. population growth rates plotted against time – the upper sigmoidal asymptote approximates carrying capacity). The carrying capacity range was equated to the variance associated with prior years' population estimates, which were derived from the sex and age structure of the harvested population (Fraser et al. 1982, Fraser 1984) and from direct field observations. Carrying capacity was estimated at 40,005 plus or minus 5,347. The random carrying capacity function within POPMODBB-ADD was used for simulations because it better represents field conditions wherein resources become more or less available annually. Legal harvest variance was approximated by the average deviation from the mean harvest over the last nineteen years. Illegal harvest was calculated as a percentage of the legal harvest and was determined by running multiple iterations of the model with varying levels of illegal harvest; the model that resulted in sex and age ratios that most closely represented the observed population was selected. The resultant annual illegal harvest estimate was calculated to be 12% of the legal harvest, or 216 bears at the current level of legal harvest. However, some members of the general public have expressed concern regarding the level of illegal harvest. To address this issue, the Department conservatively doubled this percentage of illegal harvest in the model iterations for this analysis.

A "benchmark" model was developed using these input parameters in

conjunction with the current legal harvest (Figure A-1). This model most closely mimics observed conditions (except illegal harvest rates) and was used to compare the anticipated effects of various actions (mortality levels) on the bear population. It is important to realize that the cause of mortality is not the important issue when assessing the effects on the bear population. The total mortality level experienced by the population is the key factor in determining the health and condition of the statewide bear population.

## RESULTS

The Department estimates bear population size from sex and age ratios of the hunter-harvested bears (Fraser et al. 1982, Fraser 1984). This number is analogous to the pre-harvest population number as depicted in the population model. Furthermore, carrying capacity in this population model influences the pre-recruitment population number. As it is more biologically meaningful, this analysis reports the latter.

The options and alternatives presented within the proposed project involve varying levels of statewide harvest. As such, the Department has examined three scenarios to address the level of harvest resulting from any possible combination of options or alternatives selection. The no project alternative would maintain the statewide black bear harvest at the level resulting from the 2010 hunting season, and is analogous to the baseline model (Figure A3-1). Under existing hunting regulations, the statewide black bear pre-recruitment population is expected continue to increase for approximately five years and then stabilize around 38,000 individuals.

The current project under review (increase bear harvest cap to 2,000) would likely result in an annual harvest of up to 2,350 bears. The results of the model simulating this level of harvest are presented in Figure A3-2. When the statewide bear population is subjected to a harvest level of 2,350 bears, the pre-recruitment population, as modeled, is expected to continue increasing for approximately nine years and then stabilize around 37,000 individuals.

Lastly, the Department has determined the maximum level of harvest the statewide bear population can sustain. This threshold was ascertained by exposing the model to multiple iterations of varying levels of harvest while maintaining other input variables constant. The bear population begins to crash (mortality exceeds recruitment) at harvest levels greater than 3,100 bears (Figure A3-3). Given that illegal harvest mortality was conservatively doubled in the model relative to the observed mortality in the population, the statewide bear population is likely to withstand a level of harvest greater than 3,100 bears.



Figure A3-1. Population Model results reflecting baseline conditions (Harvest = 1700) bears.

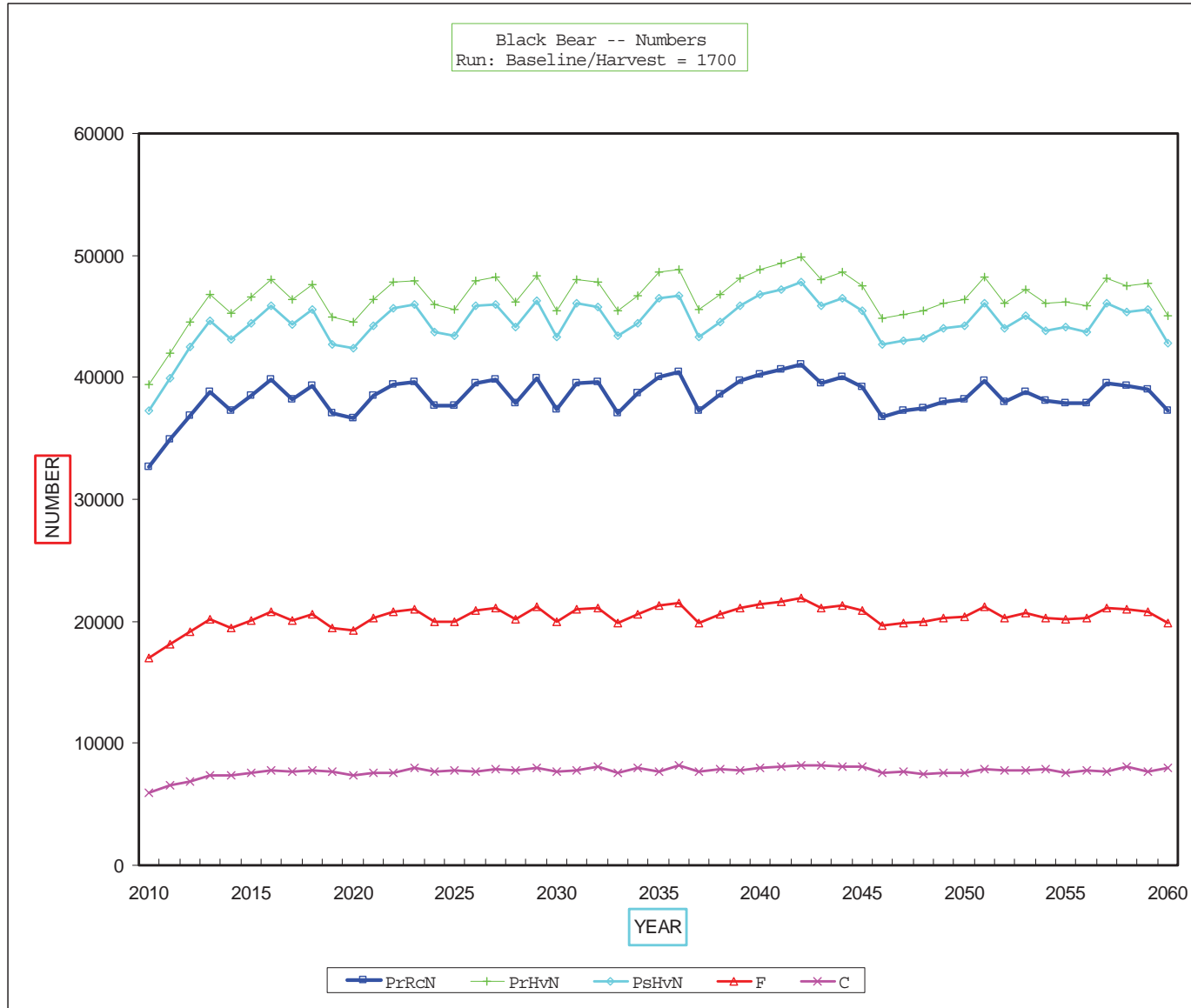


Figure A3-2. Population Model results reflecting statewide harvest of 2350 bears.

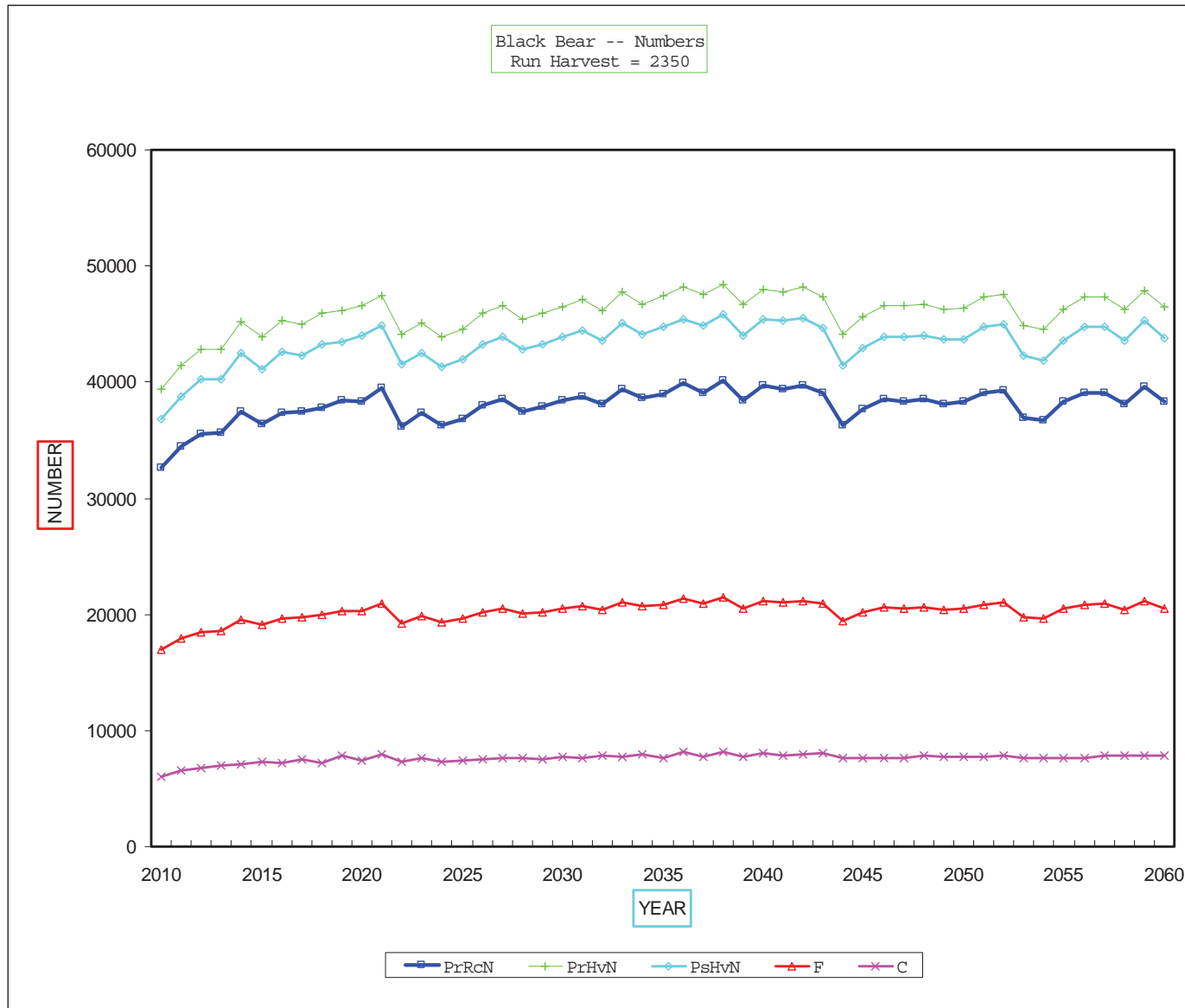
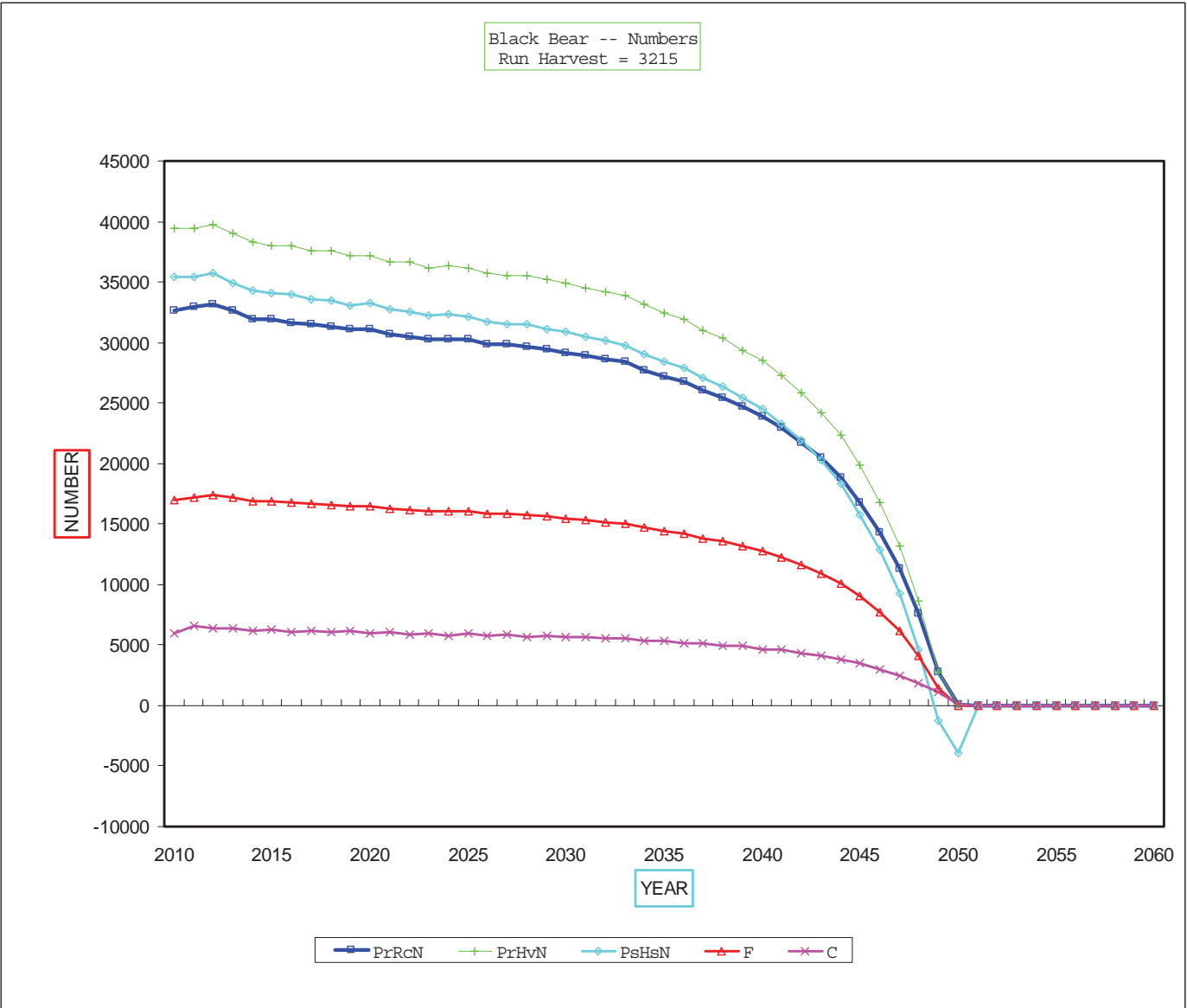


Figure A3-3. Population Model results reflecting statewide harvest of 3215 bears.



## **APPENDIX 4**

### **2010 Black Bear Habitat and Climate Change Models**

## **Habitat Suitability Index Model Development**

### **BACKGROUND**

Species-habitat relationship models relate occurrences of wildlife species to habitats. The architecture for these models was first developed by Patton (1978) and Thomas (1979). Three levels of these models have been described by Mayer (1986) for use by wildlife managers as tools to strengthen management decisions. The most widely used species-habitat relationship model is called Level 1, where a relative value is established for a habitat, based on a species' life activities in relation to the conditions (structure) of the habitat. The California Wildlife Habitat Relationships (CWHR) system is based on Level 1 models.

There are approximately 650 terrestrial (land based) wildlife species residing in or regularly migrating to California. Their use of habitats is varied and complex. In order to understand these relationships, wildlife biologists in California, through an interagency effort (government and private), have created species habitat relationship models for all 650 terrestrial species. These models simply rate the species preference for a habitat and successional stage (stage of growth) based on research, published literature, and expert opinion. A species' preference for each habitat is rated as optimum, suitable, marginal, or not used for life sustaining activities such as reproduction, foraging, and cover (Airola 1988). Each of these models has been thoroughly reviewed by experts familiar with each species.

The CWHR system organizes existing wildlife-habitat information. The models relate four ratings of habitat suitability (unsuitable, marginal, suitable, or optimal) for an array of habitat successional stages for reproduction, foraging, and cover. These models have been developed for all terrestrial vertebrate species residing in or regularly migrating to California (Airola 1988).

The CWHR Level 1 models are one component of an information system that describes California habitats, species management status, distribution, life history, and habitat requirements of all California's wildlife species (Airola 1988, Mayer and Laudenslayer 1988). The system represents a state-of-the-art tool for wildlife management, teaching, and research throughout the State. Much of the assessment of the cumulative effects of the State's changing environment on bears has been based on the CWHR bear-habitat relationship model.

As described above, the CWHR system is an extensive compilation of species-habitat interactions as well as natural history information about individual species. The CWHR system (Mayer and Laudenslayer 1988) was used to classify suitable black bear habitat in the State. The distribution and abundance of suitable habitat was determined using data from the Forest and Rangeland Resource Assessment Program (FRRAP 1988).

A number of publications have been prepared which describe the CWHR system. This published information has been used as references for analyses in previous environmental documents. These publications are: *Guide to the California Wildlife Habitat Relationships System* (Airola 1988), *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988), and *Microcomputer User's Manual for the California Habitat Relationships Database* (Timossi et al. 1989).

Major habitats used by black bears in California include coniferous forest types, montane and foothill hardwood types, and mixed and montane chaparral types. Coniferous forests provide year-round habitat and are preferred denning areas. Forested types such as the mixed coniferous forest which provide mixtures of vegetative types such as chaparral, hardwoods, and conifers tend to support greater numbers of bears than do less diverse coniferous types such as pure stands of true firs.

Black bears utilize hardwood habitats mainly as foraging areas. If sufficient structural diversity such as dead trees and down woody material exists, this habitat is also used for denning and security cover. Because of the food items they provide, chaparral habitats are generally most used by black bears during the fall as mast crops (acorns and fruit) become available. In some areas of the State, these vegetative types are important for reproductive success and cub survival.

The CWHR system describes fifty nine habitats with up to seventeen combinations of tree size class and canopy closure class per habitat. Habitat suitability ratings are defined for each of three life requisites, reproduction, cover and feeding. An evaluation for each habitat was created by ranking a combination of habitat, tree size and canopy closure as high, medium or low for the life requisites (California Wildlife Habitat Relationships System 2000).

## HSI REVISION

In 2009, the CWHR bear habitat evaluation was expanded to include additional habitat combinations not previously considered. A total of 992 combinations were found



within the study area, which was defined as likely black bear habitat in California (Figure A4-1). All possible vegetative combinations were ranked a. priori for year-round relevance to breeding, feeding and cover based on expert opinion and scientific literature. Geometric mean was calculated to develop a Habitat Suitability Index (HSI), with values ranging between 0.000 and 1.000.

The HSI results were then applied to detail vegetation datasets, primarily EVeg (Existing Vegetation - CALVEG) made available by the USDA Forest Service. A second dataset, Wildlife Habitat Type Map and Database, Central Coast (DFG Region 3) from Humboldt State University was used to represent portions of the central coast in Santa Clara, San Benito and San Luis Obispo counties not currently mapped by Eveg. Model results are displayed in Figure A4-1.

Model results were compared with bear occurrence data from two different locations within subsets of the range. We examined scent station data collected in 2007 and 2008, and we compared results with an occurrence data set provided by staff biologist. These data consisted of a variety of occurrence types, from road killed animals to trapped animals. Some of these locations included public sightings and depredation permits. The scent station data survey sites were specifically selected based on the potential of identifying bears and therefore were placed in high quality habitat. The second dataset represented more random data throughout and provided good representation across habitat types. Results of these data showed that 56% of occurrences were located in areas defined as high suitability, 9% in medium and 36% in the low category (n=102).

A second dataset contained radio telemetry locations for seven collared bears (3 female and 4 male) collected between 1987 and 1988. These data show movement patterns across habitat and between animals. The 735 locations cover an area of approximately 50,000 acres. Results of these records indicate more occurrences in highly suitable areas, 71%, 1 % in medium, and 28% in low. More detailed examination of the low-category data result in 70 – 94% of these location records are nested within mixed chaparral. This suggests that the mixed chaparral may have been ranked lower than it is being used.

Lastly, habitat availability in select study areas were compared with documented bear use to examine bear habitat preference. Seventy-one percent of observed bear locations were recorded in the modeled highly suitable habitat which comprises only 16% of the habitat within the range. Only 28% of bear observations were located in the

low suitability category which comprises approximately 80% of the available habitat. From these descriptive statistics it appears the model is valid. Additional examination of the mixed chaparral category could improve the strength of the model.

### CLIMATE CHANGE MODEL

To guide statewide black bear resource planning efforts, the Department worked in partnership with researchers from the University of California, Berkeley to predict changes in black bear habitat distribution over the next 100 years, given the potential effects of global climate change.

The Department was provided a list of plant species previously modeled and worked with plant ecologists to identify plants that would best represent CHWR habitats within the black bear range. Colleagues at UC Berkeley graciously updated the models and provided results in a GIS format. Six species were used to represent eight of the CWHR habitat types occurring throughout bear range (Table A4-1, Figure A4-2). Plant disruptions were predicted using the Geophysical Fluids Dynamic Laboratory Climate Model 2.1 (GFDL\_CM2\_1.1) by researchers from the Ackerly Lab (UC Berkeley). Climate Model parameters consider a temperature increase of 3.3 °C , and an 18% percent reduction in precipitation within California. Source input data for the model consists of PRISM climate data (temperature and precipitation), and California herbarium records for each of the species considered.

### CLIMATE CHANGE MODEL RESULTS

In order to assess how these vegetation shifts may affect bear habitat suitability, plant disruption data were compiled into a single layer of predicted habitat. Suitability codes for the WHR types above were then cross-referenced with the HSI model by averaging across cover and tree size classes to develop an average HSI rank for each code. The averaged ranks were then applied to the extent of each habitat to come up with a predicted 2070 – 2099 habitat suitability layer (Figure A4-3).

Distributions of the predicted ranges were reviewed by Todd Keeler-Wolf, a respected and published plant ecologist. He summarized that predictions indicate a major shift in oak woodlands and riparian woodlands away from the valleys and foothills towards the coast. There would be significant constriction of upper elevation montane conifer forests (indicated by *Abies magnifica*) throughout the state. These would be extreme in the southern California mountains and in the north coast ranges. There would be a significant northward shift of southern California coastal scrub habitat

(*Malosma laurina*) to central coastal California (assuming there was any non-built up habitat there), and there would be major upward shifts in chaparral (*Q. wislizeni* var. *frutescens*) away from lower foothill areas. Cool temperate forests like coastal redwood, would shrink even more, but would likely maintain some relict populations even down into Monterey County - its' current southern range limit (T. Keeler-Wolf pers. com.). Although optimal bear habitat is predicted to shift toward the coast ranges, much of the current bear range will still be considered suitable habitat and should support a viable and healthy bear population.

Table A4-1. Species Analyzed in Climate Change Model

Species Modeled	Common Name	Associated CWHR Habitat	HSI Rank
<i>Quercus douglasii</i>	Blue oak	Blue oak woodland (BOW) and Blue oak-foothill pine woodland (BOP)	High
<i>Malosma laurina</i>	Laurel sumac	Coastal scrub (CSC)	Low
<i>Quercus wislizeni</i> var. <i>frutescens</i>	Live oak	Mixed Chaparral (MCH)	Medium
<i>Acer negundo</i> var. <i>californicum</i>	Box elder	Montane Hardwood-Conifer (MHC) and Montane Hardwood (MHW)	High
<i>Sequoia sempervirens</i>	Redwood	Redwood (RDW)	Medium
<i>Abies magnifica</i> var. <i>shastensis</i>	Shasta red fir	Red Fir (RFR)	Medium

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Figure A4-1. Black Bear Habitat Suitability Index Model Results.

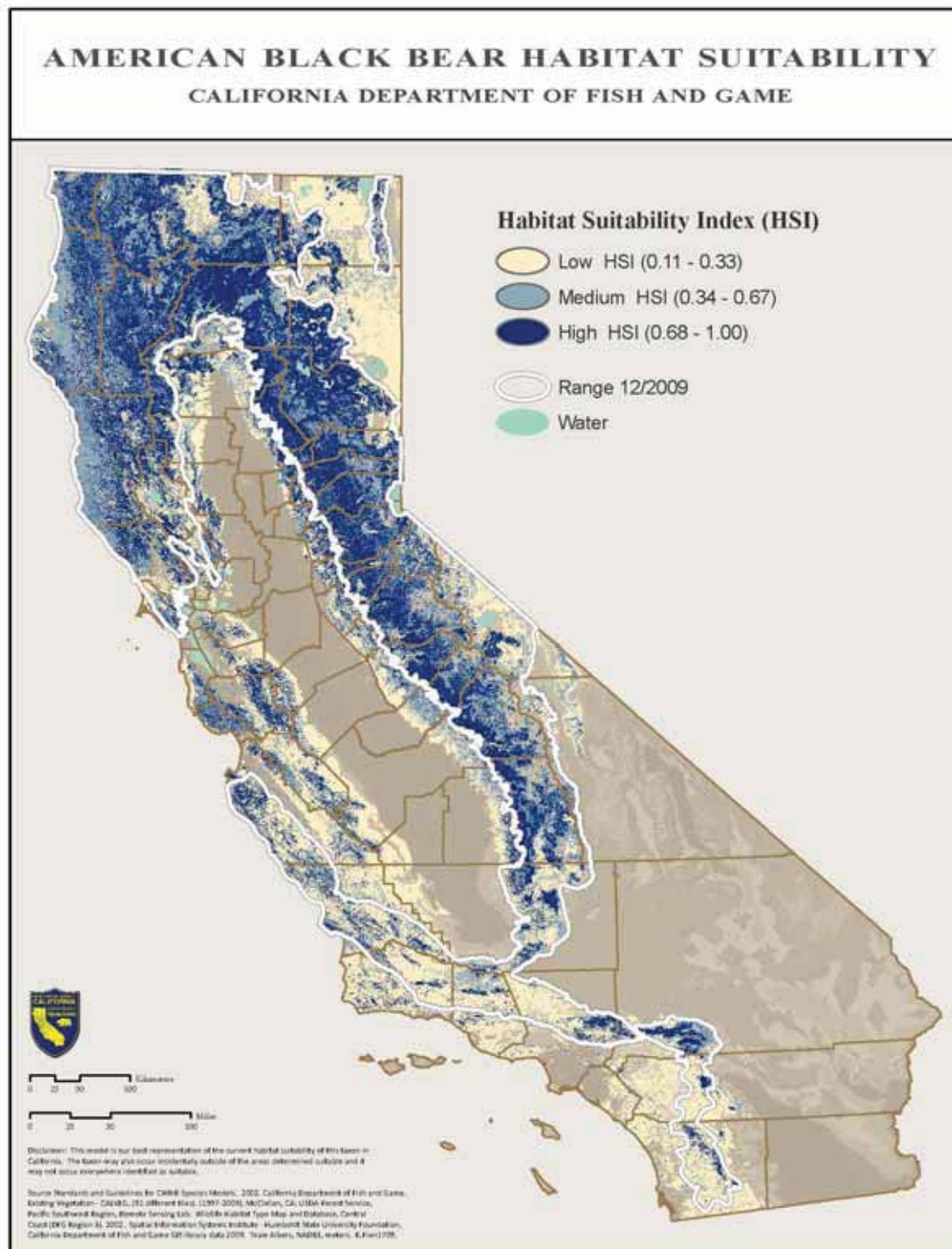


Figure A4-2. Selected Vegetative Species' Distributions as of 2009.

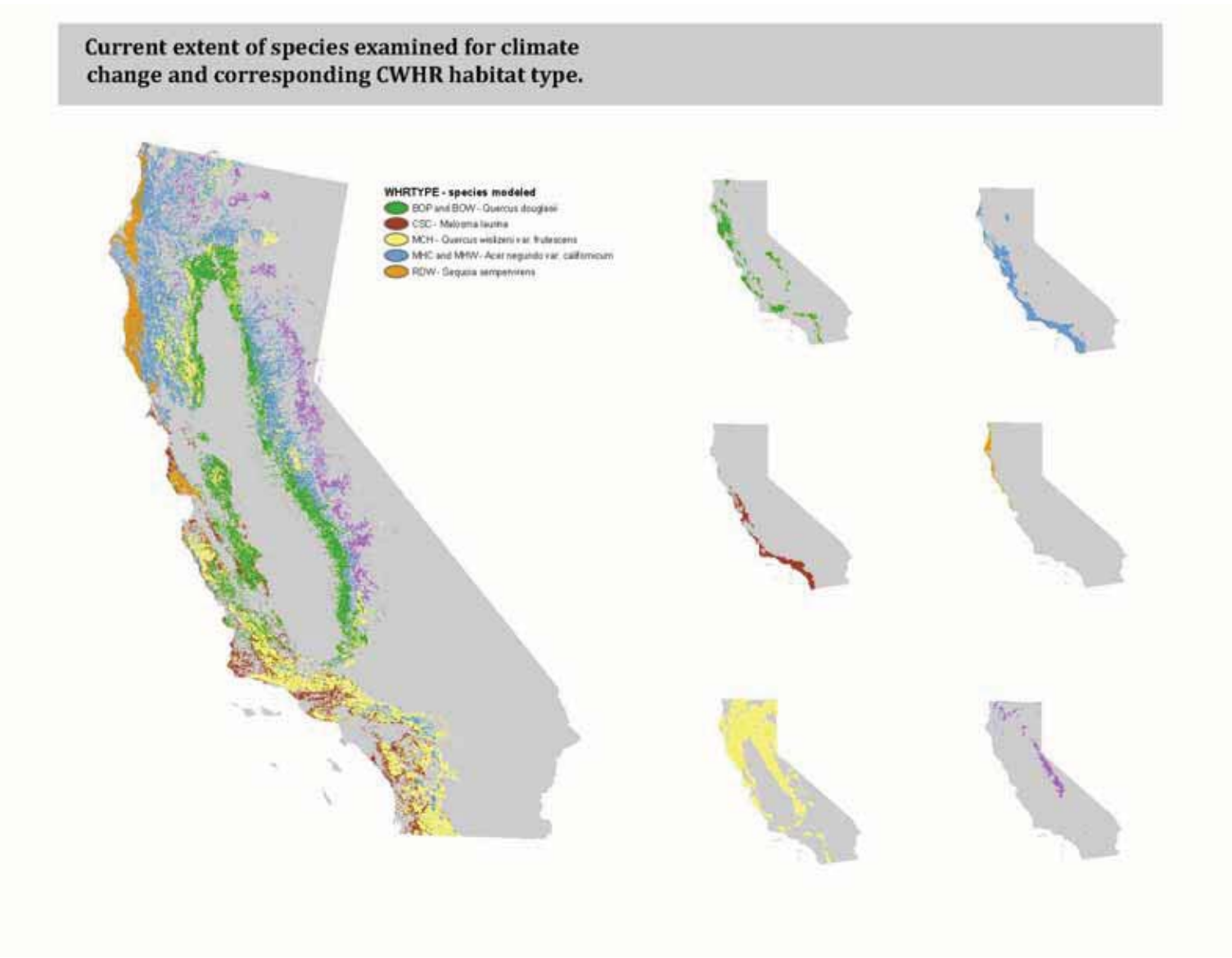




Figure A4-3. Black Bear Habitat Climate Change Model Results

