DRAFT
ENVIRONMENTAL DOCUMENT

Sections 265, 460-467, and 472-480,
Title 14, California Code of Regulations

Regarding

Furbearing and Nongame Mammal Hunting and Trapping

JUNE 18, 2004

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

TABLE OF CONTENTS

TABLE OF CONTENTS i

LIST OF FIGURES v

LIST OF TABLES v

LIST OF APPENDICES vi

SUMMARY 1
- SUMMARY OF PROPOSED ACTIONS 1
- COMBINATION OF SPECIES 1
- EXISTING STATUTES AND REGULATIONS 1
- EFFECTS ON THE ENVIRONMENT 2
- PUBLIC INPUT AND AGENCY CONSULTATION 3
- AREAS OF CONTROVERSY 4
- ISSUES TO BE RESOLVED 5

CHAPTER 1. PROJECT DESCRIPTION 7
- PROPOSED PROJECT 7
- EXISTING REGULATIONS 9
  - SEASON AND AREA FOR FURBEARING MAMMALS 9
    - Badger and Gray Fox 9
      - Use of Dogs in Pursuit of Gray Fox 9
    - Muskrat and Mink 10
    - Beaver 11
    - Raccoon 11
      - Use of Dogs in Pursuit of Raccoon 11
  - SEASON AND AREA FOR NONGAME MAMMALS 14
    - Bobcat 14
      - Trapping 14
      - Hunting 14
      - Use of Dogs in Pursuit of Bobcat 14
    - Other Nongame Mammals 14
  - SPECIAL TRAPPING ZONE FOR THE PROTECTION OF THE SIERRA NEVADA RED FOX AND THE SAN JOAQUIN KIT FOX 14
  - METHODS OF TAKE 19
    - Furbearing Mammals 19
    - Nongame Mammals 19
    - Description of Methods of Take 20
      - Conibear-Type Traps 20
      - Leghold Traps 20
      - Snares 20

Deadfall Traps 21
Cage Traps 21
Firearms 21
Archery Equipment and Crossbow 21
Use of Dogs 22
PROPOSED REGULATIONS 22
PROJECT LOCATION 24
PROJECT OBJECTIVES 24

CHAPTER 2. THE MANAGEMENT OF FURBEARING AND NONGAME MAMMAL IN CALIFORNIA 26
RESPONSIBILITIES OF THE DEPARTMENT AND COMMISSION PURSUANT TO STATUTES AND REGULATIONS 26
HISTORICAL PERSPECTIVE OF HUNTING AND TRAPPING FURBEARING AND NONGAME MAMMALS IN CALIFORNIA 27
CURRENT MANAGEMENT ACTIVITIES 31
Law Enforcement 31
Trapping Proficiency 32
METHODOLOGY 32
Harvest Data 32
California Statewide Wildlife Habitat Relationships System 33
Data Analysis 34
Population Estimation 34
Mathematical Modeling 34
INTENDED USE AND SCOPE OF ENVIRONMENTAL DOCUMENT 36
FUNCTIONALLY EQUIVALENT ENVIRONMENTAL DOCUMENTS 37

CHAPTER 3. ENVIRONMENTAL SETTING OF THE PROJECT 38
SPECIES ACCOUNTS 38
BADGER 38
BEAVER 39
BOBCAT 39
COYOTE 40
GRAY FOX 41
MINK 41
MUSKRAT 42
RACCOON 43
SPOTTED SKUNK 43
STRIPED SKUNK 44
VIRGINIA OPOSSUM 45
WEASELS 45
Long-Tailed Weasel 46
Ermine 46
WILDLIFE SERVICES 47

CHAPTER 4. THE ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT 48
INFLUENCE OF HUNTING AND TRAPPING ON NATURAL MORTALITY 48
HARVEST MANAGEMENT 48
COMPENSATORY MORTALITY 50
ADDITIVE MORTALITY 51
SUSTAINABILITY OF REGULATED HARVESTS 51
EFFECTS OF HARVEST ON INDIVIDUAL SPECIES 52
BADGER 53
BEAVER 55
BOBCAT 57
COYOTE 59
GRAY FOX 62
MINK 63
MUSKRAT 64
RACCOON 66
SPOTTED SKUNK 67
STRIPED SKUNK 69
VIRGINIA OPOSSUM 71
WEASELS 72
IMPACTS ON HABITAT 74
EFFECTS ON RECREATIONAL OPPORTUNITIES 74
HUNTING OPPORTUNITIES 74
OTHER RECREATIONAL OPPORTUNITIES 74
EFFECTS ON OTHER WILDLIFE SPECIES 76
EFFECTS ON THREATENED AND ENDANGERED SPECIES 76
EFFECTS OF INCIDENTAL TAKE FROM TRAPPING 77
SURVIVAL RATES OF RELEASED ANIMALS 77
USE OF DOGS IN PURSUIT AND/OR HUNTING 77
WELFARE OF THE INDIVIDUAL ANIMAL 78
INTRODUCTION 78
EFFECTS OF VARIOUS METHODS OF TAKE ON PAIN AND SUFFERING 78
Effects of Being Shot with a Bullet 81
Effects of Being Shot with Archery Equipment 81
Effects of Being Trapped 82
Effects of Being Killed by Dogs 83
EFFECTS OF ANIMAL DEATH 83
EFFECTS OF WOUNDING 84
Effects of Wounding by Firearms 85
Effects of Wounding by Archery Equipment 85
Effects of Wounding by Trapping 86
Cage Traps 86

CHASE-RELATED EFFECTS 88
EFFECTS ON PUBLIC SAFETY 89
EFFECTS ON ECONOMICS 90
IMPACTS ON THE GENE POOL 92
EFFECTS OF ANIMAL MOVEMENTS 93
EFFECTS OF CHANGES IN HUNTING REGULATIONS BY ADJOINING STATES 93
RELATIONSHIPS BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 94

CHAPTER 5. CUMULATIVE EFFECTS 95
EFFECTS OF WILDFIRES 95
EFFECTS OF DROUGHT AND FLOODS 98
EFFECTS OF DISEASES 102
EFFECTS OF ILLEGAL HARVEST (POACHING) 103
EFFECTS OF VEHICLE-CAUSED MORTALITY (ROAD KILLS) 105
EFFECTS OF HABITAT LOSS AND DEGRADATION 105
THE CALPLAN MODEL 106
HABITAT QUALITY AND QUANTITY 107
ANALYSIS OF HABITAT LOSS 108
EFFECTS OF MAJOR DEVELOPMENT PROJECTS 111

CHAPTER 6. ANALYSIS OF ALTERNATIVES TO THE PROJECT 131
INTRODUCTION 131
ALTERNATIVE 1 - PROHIBIT THE COMMERCIAL HUNTING AND TRAPPING OF BOBCATS IN CALIFORNIA 132
ALTERNATIVE 2 - ADJUSTING LENGTH OF BOBCAT SEASON 133
ALTERNATIVE 3 - ADJUSTING TRAPPING SEASON LENGTH FOR BADGER AND GRAY FOX 135
ALTERNATIVE 4 - ADJUSTING TRAPPING SEASON LENGTH FOR MINK AND MUSKRAT 135
ALTERNATIVE 5 - ADJUSTING TRAPPING SEASON LENGTH FOR RACCOON 136
ALTERNATIVE 6 - PROPOSAL TO INCREASE TRAP VISITATION BY 24 HOURS 136
ALTERNATIVE 7 - PROPOSAL TO ESTABLISH A TRAPPING SEASON FOR RIVER OTTERS 137
ALTERNATIVE 8 - NONNATIVE RED FOX 137
ALTERNATIVE 9 - NO PROJECT 138

CHAPTER 7. CONSULTATION 140

LITERATURE CITED 142

PERSONAL COMMUNICATIONS 158

LIST OF FIGURES

Figure 1. Season and Zones for Beaver 12

Figure 2. Seasons and Zones for Raccoons 13

Figure 3. Sierra Nevada Red Fox and San Joaquin Kit Fox Protection Zones - Effective September 4, 1992 18

LIST OF TABLES

Table 1. Impact Summary: Proposed Project and Alternatives for the 2001-2002 Furbearing and Nongame Mammal Hunting and Trapping Regulations 6

Table 2. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Badger 112

Table 3. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Bobcat 114

Table 4. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Coyote 116

Table 5. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Gray Fox 118

Table 6. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Raccoon 120

Table 7. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Spotted Skunk 122

Table 8. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Striped Skunk 124

Table 9. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Virginia Opossum 126

Table 10. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Long-Tailed Weasel 128

Table 11. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Ermine 130

LIST OF APPENDICES

Appendix 1 - 2004 Badger Population Model A-1

Appendix 2 - 2004 Beaver Population Model A-2

Appendix 3 - 2004 Bobcat Population Model A-3

Appendix 4 - 2004 Coyote Population Model A-4

Appendix 5 - 2004 Gray Fox Population Model A-5

Appendix 6 - 2004 Mink Population Model A-6

Appendix 7 - 2004 Muskrat Population Model A-7

Appendix 8 - 2004 Raccoon Population Model A-8

Appendix 9 - 2004 Spotted Skunk Population Model A-9

Appendix 10 - 2004 Striped Skunk Population Model A-10

Appendix 11 - 2004 Virginia Opossum Population Model A-11

Appendix 12 - 2004 Long-Tailed Weasel Population Model A-12

Appendix 13 - 2004 Ermine Population Model A-13

SUMMARY

SUMMARY OF PROPOSED ACTIONS

The existing furbearing and nongame mammal regulations, which are reviewed at least once every three years by the Fish and Game Commission (Commission), provide for hunting and trapping of six furbearing mammals (badger, beaver, gray fox, mink, muskrat, and raccoon) and seven nongame mammals (bobcat, coyote, opossum, spotted skunk, striped skunk, long-tailed weasel, and ermine). All 13 species are technically (biologically) furbearers, but the Fish and Game Code specifies some as furbearing (Section 4000) and others as nongame (Section 4150) mammals. The proposed project will allow limited hunting and trapping of nonnative red fox and limited extension of the bobcat trapping season. In adopting regulations providing for the take of furbearing and nongame mammals, the Commission would be acting pursuant to sections 203, 203.1, 4000, and 4150, Fish and Game Code.

In adopting the proposed regulations, the Commission would be acting consistent with one of the objectives of the wildlife conservation policy enacted by the Legislature (Section 1801, Fish and Game Code). The State's wildlife conservation policy is to provide for the harvesting of wildlife resources where such use is consistent with maintaining healthy wildlife populations.

COMBINATION OF SPECIES

The 13 above-mentioned species are included in a single environmental document because they are mammals, their pelts have commercial value, they may cause property damage, are trapped by Nuisance Wildlife Control Operators (NWCO), and regulations pertaining to their take are similar. Also, hunting and trapping, depending on the degree of intensity, has the potential to cause a shift in the sex and age structure of furbearing and nongame mammal populations.

EXISTING STATUTES AND REGULATIONS

Existing laws contained in sections 200-207, 1801, 3003.1, 4000-4043, and 4150 of the Fish and Game Code specifically pertain to the commercial and sport take of furbearing and nongame mammals. These laws are implemented, interpreted, and made specific by regulations contained in sections 460-467 and 472-480, Title 14, California Code of Regulations (CCR). State law requires that the Commission review these furbearing and nongame mammal hunting and trapping regulations at least once every three years and that the Department present its recommendations for changes to

these regulations to the Commission at a public meeting. Based on the Department's recommendations and comments from other agencies and the general public, the Commission may adopt mammal hunting and trapping regulations.

Senate Bill 1645 approved by the Governor on September 14, 2002, requires persons trapping furbearers and non-game mammals found to be injuring crops or other property to obtain a trapping license, if they are providing trapping services for profit. It also prohibits the sale of pelts of these animals trapped under such circumstances.

The environmental impacts of the existing furbearing and nongame mammal hunting and trapping regulations, and the proposed project, are analyzed in this document pursuant to the California Environmental Quality Act (CEQA, Public Resources Code sections 21000 et seq.).

EFFECTS ON THE ENVIRONMENT

The following types of environmental effects of the existing regulations and of the proposed action are identified and analyzed in this document:

1. Influence of hunting and trapping on natural mortality;
2. Effects of harvest on the 13 individual mammal species identified in this document;
3. Impacts on habitat;
4. Effects on recreational opportunities;
5. Effects on other wildlife species;
6. Effects on the welfare of individual animals;
7. Effects on public safety;
8. Effects on economics;
9. Impacts on the gene pool;
10. Effects of animal movements;
11. Cumulative effects, including wildfires, droughts, diseases, vehicle-caused mortality, illegal take, and habitat loss.

An analysis of these potential impacts is discussed in chapters 4 and 5. No significant environmental effects are expected to result from existing regulations, or from the proposed project.

PUBLIC INPUT AND AGENCY CONSULTATION

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). The NOP was provided to the State Clearinghouse in early November for distribution, as well as to land management agencies in California that have an interest, or play a key role, in furbearing and nongame mammal 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)]. This NOP was also provided to individuals and/or organizations which expressed an interest in furbearing and nongame mammal management in the past. The NOP requested that any comments regarding input to the environmental document be submitted to the Department within 30 days of receipt of the NOP.

The Department has also encouraged public input into the environmental document by scheduling a scoping session to discuss documents prepared in support of mammal hunting and trapping regulations. This scoping session was held in Sacramento on December 11, 2003.

During the scoping meeting, the following comments or recommendations were made:

1. The Department should determine what the effect is, if any, of regulation changes in neighboring states.
2. The Department should determine the effects of having less enforcement personnel.
3. The Department should determine the effects of recent southern California wildfires.
4. Will the document discuss methods of killing trapped animals?

In addition, pursuant to Section 15087 of the CEQA Guidelines, this environmental document is available for public review for 45 days. During the review period, the public is encouraged to provide written comments regarding the document to the Department of Fish and Game, Wildlife Programs Branch, 1812 Ninth Street, Sacramento, California, 95814. Comments must be received by the Department by 5:00 p.m. on August 2, 2004.

AREAS OF CONTROVERSY

Trapping, more so than hunting, has been the subject of controversy for decades. Opponents of trapping argue that some traps cause undue suffering to animals and that it is inappropriate for an animal's life to be taken for its pelt (fur). Also, nontarget animals, including threatened, endangered, and protected species, as well as pets, are killed or injured by some traps. Furthermore, it is argued that trapping negatively impacts sex and age ratios of target species and that trapping may be additive or only partially compensatory to populations rather than compensatory. The terms "additive" and "compensatory" are more fully discussed in Chapter 4. In addition, critics of trapping fear that the removal of animals by trapping may cause an imbalance in the ecosystem. Critics of trapping also maintain that random trapping has no value in the control of disease or depredation.

Proponents of trapping argue that harvest data from trappers help wildlife managers monitor furbearer populations; that trapping permits use by humans of an annual crop of furs that would otherwise be lost to other forms of mortality; that the economic welfare of local areas and individuals is enhanced by the sale of furs; that diseases, such as rabies and distemper, are suppressed by trapping; that depredation control is maintained; and that death, may be less traumatic for a trapped animal than death by natural causes, such as disease, predation, or starvation.

Opponents to hunting argue that management agencies lack sufficient information to ensure maintenance of healthy wildlife populations, and that hunting is contrary to human social values and is a deliberate infliction of pain and death without reason. Furthermore, it is argued that hunting negatively impacts sex and age ratios of target species and that hunting may be additive or only partially compensatory to populations rather than compensatory. In addition, critics fear that the removal of animals by hunting may cause an imbalance in the ecosystem. It is also maintained that hunting has no value in the control of disease or depredation.

Proponents of hunting state that far fewer animals are removed by hunting than die each year of natural causes; that, in most cases, hunting mortality is compensatory, not additive; that hunting offers recreational opportunities; and that it provides income to wildlife conservation agencies through the sale of licenses, tags, and other forms of revenue.

Although the activity of hunting and trapping will result in the death of certain individual furbearing and nongame mammal species, it is projected that specific

regulations, such as harvest limits, special zones, methods of take, seasons, and close monitoring of hunter and trapper activity in the field, will result in the maintenance of viable populations.

ISSUES TO BE RESOLVED

Issues to be resolved primarily relate to the decision whether or not to amend existing trapping regulations and adopt new trapping regulations.

The Department is providing the Commission with nine alternatives to the proposed action for their consideration. One alternative would be to prohibit the commercial hunting and trapping of bobcats in California. A second alternative considers change in season length for hunting of bobcats. The third alternative considers adjusting the length of the badger and gray fox season. The fourth alternative reviews any adjustment to the season length for mink and muskrat. Alternative 5 evaluates a change in season length for raccoon. Alternative 6 considers extending the trap visitation requirement. Alternative 7 evaluates a proposal for a river otter trapping season. Alternative 8 is a no-hunting or trapping alternative. Alternative 9 is a no project alternative. These alternatives are reviewed and evaluated in Chapter 6. Table 1 provides a summary analysis of the proposed project and alternatives.

Table 1. Impact Summary: Proposed Project and Alternatives for the Furbearing and Nongame Mammal Hunting and Trapping Regulations				
Alternatives	**Significant Impact**	**Nature of Impact**	**Mitigation Available**	**Nature of Mitigation**
Proposed Project	No	None	N/A	N/A
Alternative 1 Prohibit Commercial Take of Bobcats	No	None	N/A	N/A
Alternative 2 Change the Length of Hunting Season for Bobcats	No	Potential Overharvest	Yes	Quotas, Season Lengths
Alternative 3 Adjusts season length for badger and gray fox	No	None	N/A	N/A
Alternative 4 Adjusts seasonal length for mink and muskrat	No	None	N/A	N/A
Alternative 5 Adjust season length for raccoon	No	None	N/A	N/A
Alternative 6 Extend the trap visitation requirement	Yes	Over exposure to weather	Yes	Retain current regulations
Alternative 7 Trapping season for river otter	Yes	Public disapproval	Yes	Retain current regulations
Alternative 8 No hunting or trapping	No	None	N/A	N/A
Alternative 9 No Project	No	None	N/A	N/A
COMMENT: Alternative 8 would not result in any significant environmental impact. However, it may result in impacts associated with depredation and economics for livestock and poultry producers, as well as commercial trappers and water managers.				

CHAPTER 1. PROJECT DESCRIPTION

PROPOSED PROJECT

The proposed project will allow limited hunting and trapping of nonnative red fox and limited extension of the bobcat trapping season. Specifically, the non-native red fox season would be from November 16 through the day before the last day of February. The new area is defines as within the area enclosed by the line beginning at the mouth of the Mad River and the Pacific Ocean in Humboldt County; east to the Mad River's intersection with state Highway 299; east on state Highway 299 to the Sacramento River; south along the Sacramento River to state Highway 99; south on state Highway 99 to Highway 149; south on Highway 149 to Highway 70; south on Highway 70 to Highway 20; east on Highway 20 to Highway 49; south on Highway 49 to the intersection of state Highway 41; south on Highway 41 to Highway 145; east on Highway 145 to Road 206; south on Road 206 to Millerton Road; east on Millerton Road to the Friant-Kern Canal; south along the Friant-Kern Canal to Highway 198; west on Highway 198 to Highway 65; south on Highway 65 to Highway 99; south on Highway 99 to Interstate 5; south on Interstate 5 to Highway 14; east on Highway 14 to Highway 138; east and south on Highway 138 to Interstate 15; south on Interstate 15 to Lake Hodges; west along the northern boundary of Lake Hodges to the San Dieguito River; west along the San Dieguito River to the Pacific Ocean; north along the California coastline to the mouth of the Mad River in Humboldt County.

Additionally, the bobcat trapping season would be extended an additional 51 days from the current 69 day season to 121 days. The new season would be from November 1 through the last day of February.

The proposed project also would match the zones of protection for the San Joaquin kit fox and Sierra Nevada red fox with their current ranges. A summary of the current regulations are as follows:

1. Every person involved in trapping must obtain a current year's trapping license;

2. No person shall be issued a trapping license until he or she has passed a test of knowledge and skill in trapping, which ensures that the licensee meets Department-established standards of competency and proficiency in trapping;

3. No trapping license will be issued to any applicant if an inventory of the previous season's take was not submitted to the Department by July 1;

4. Furbearers that may be taken by hunting and trapping include: badger, beaver, gray fox, mink, muskrat, and raccoon;

5. Nongame species that may be taken by hunting and trapping include: bobcat, coyote, opossum, spotted skunk, striped skunk, and weasel (long-tailed weasel and ermine);

6. Fisher, marten, river otter, wolverine, kit fox, red fox, island fox, and ringtail may not be taken at any time;

7. Specific requirements regarding the use of traps, such as type, size, offsets, registration of, visitation frequency, use of exposed baits, location, disturbance, and other special conditions;

8. Specific seasons, bag limits, and methods of take for hunting and trapping;

9. A trapping license is required for the sale of any pelts, even though the pelts may have been acquired through hunting;

10. Zones for beaver and raccoon (figures 1 and 2);

11. Kill traps are not permitted in areas occupied by the Sierra Nevada red fox and San Joaquin kit fox (Figure3);

12. A special closure for night hunting in a portion of the San Joaquin Valley;

13. Hunting and shipping tag requirements for bobcats;

14. Use of dogs for hunting of furbearing and nongame mammals;

15. Use of dogs for pursuit only of bobcat, gray fox, and raccoon; and

16. Prohibits the use of any body-gripping trap to take any furbearing or nongame mammal for purposes of recreation or commerce in fur, in accordance with Fish and Game Code Section 3003.1(a). A body-gripping trap is one that grips an animal's body or body part, including, but not limited to, steel-jawed leghold traps, padded-jaw leghold traps, conibear traps and snares.

17. Prohibits the purchase, sale, barter or exchange of the raw fur of any furbearing or nongame mammal trapped in California with a body-gripping trap, in accordance with Fish and Game Code Section 3003.1(b).

18. California fur dealers are required to purchase a license and report their fur purchases each year.

19. Requires trappers to kill trapped animals with firearms so long as local ordinances and property owners permit.

EXISTING REGULATIONS

The following is a summary of the existing regulations:

SEASON AND AREA FOR FURBEARING MAMMALS

Section 461 - Badger and Gray Fox

Badger - November 16 through the last day of February, statewide.

Gray Fox - November 24 through the last day of February, statewide.

Subsection 265(b)(6)(F) - Use of Dogs in Pursuit of Gray Fox

Gray fox may be taken with the aid of dogs during the open season; and for training purposes only pursued from March 1 through the day preceding the opening of the gray fox season, except for closures and restrictions described in subsections 265(a) and (b).

Section 462 - Muskrat and Mink

November 16 through March 31, statewide.

Section 463 - Beaver

November 1 through March 31 in the counties of Alameda, Alpine, Amador, Butte, Calaveras, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Imperial, Inyo, Kern, Kings, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Mono, Monterey, Nevada (except Sagehen Creek), Placer, Plumas, Sacramento, San Joaquin, San Luis Obispo, Shasta, Sierra, Siskiyou, Solano, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba and those portions of Riverside and San Bernardino counties within 10 miles of the California-Arizona border.

Beaver may not be taken in the balance of the State, including the counties of Los Angeles, Marin, Mendocino, Napa, Orange, San Benito, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, and Ventura and in those portions of Riverside and San Bernardino counties further than 10 miles from the California-Arizona border (see Figure 1).

Section 464 - Raccoon

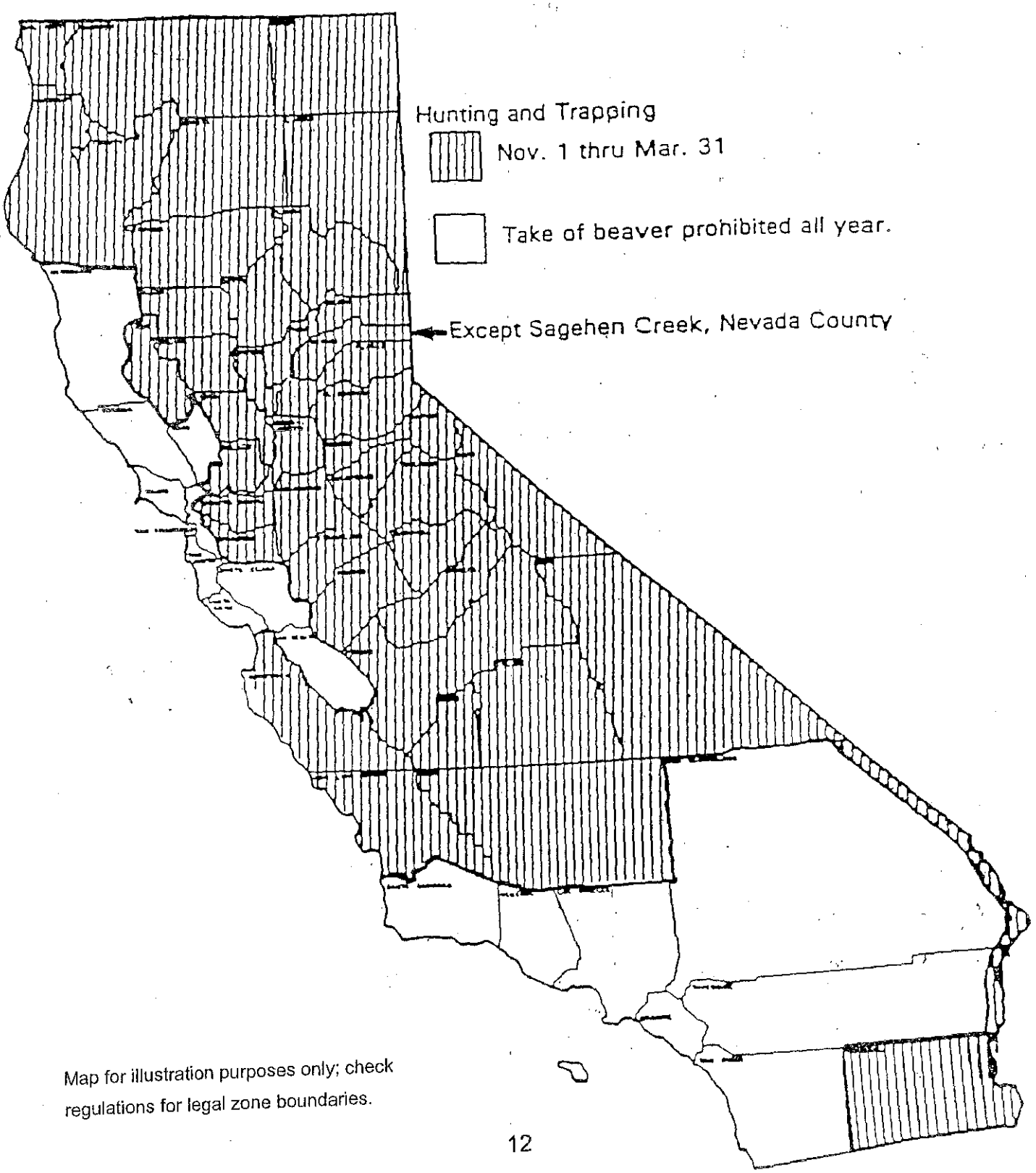
Raccoon may be taken from July 1 to March 31 in the following area: All of Imperial County and those portions of Riverside and San Bernardino counties lying south and east of the following line: Beginning at the intersection of Highway 86 with the north boundary of Imperial County; north along Highway 86 to its intersection with Interstate 10; east along Interstate 10 to its intersection with the Cottonwood Springs Road in Section 9, T6S, R11E, S.B.B.M.; north along the Cottonwood Springs Road and the Mecca Dale Road to Amboy; east along Highway 66 to its intersection with Highway 95; north along Highway 95 to the California-Nevada state line (see Figure 2).

Raccoon may be taken from November 16 to March 31 in the balance of the State.

Subsection 265(b)(6)(F) - Use of Dogs in Pursuit of Raccoon

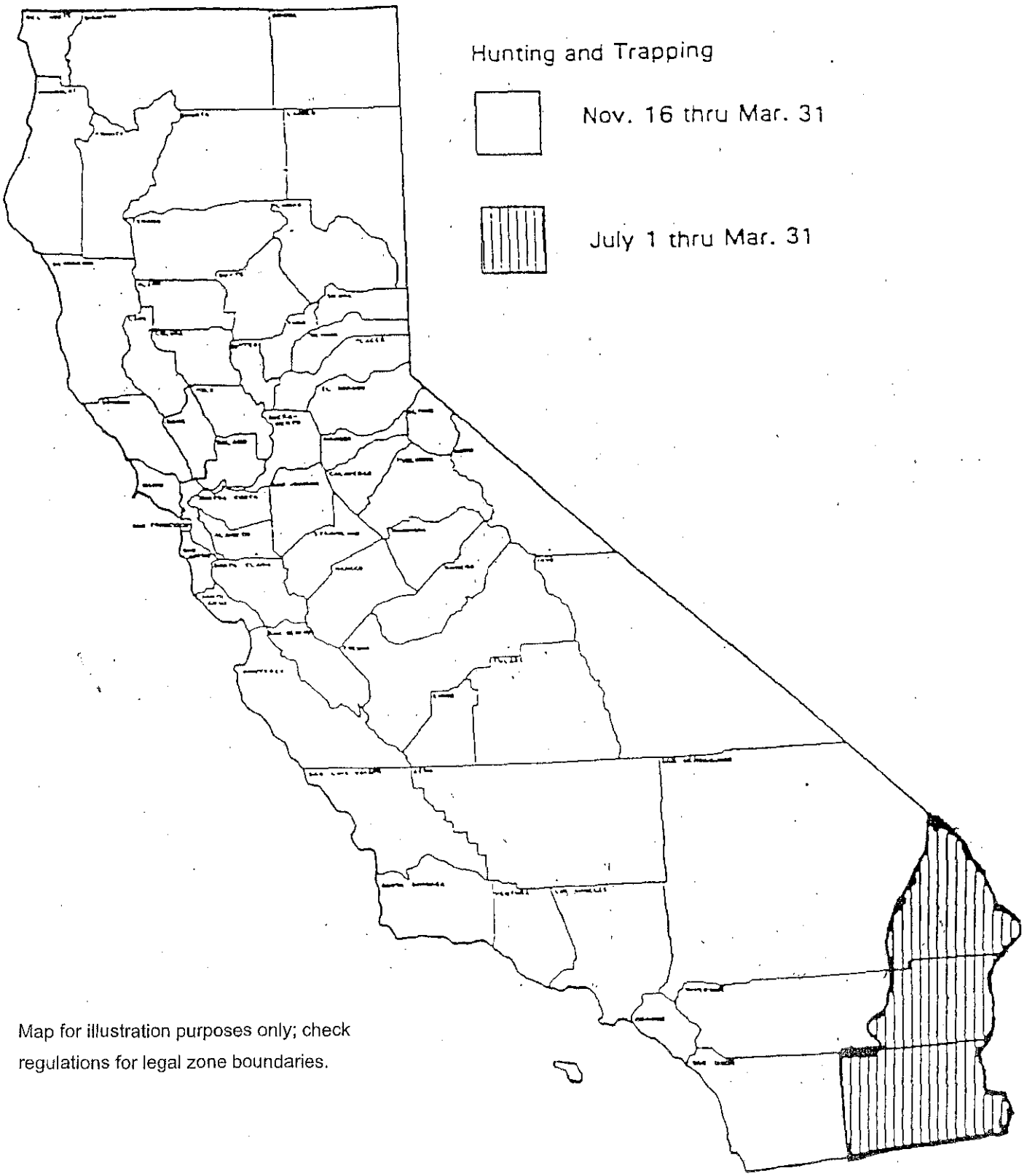
Raccoon may be taken with the aid of dogs during the open season; and for training purposes only pursued from April 1 through the day preceding the opening of the raccoon season, except for closures and restrictions described in subsections 265(a) and (b).

Figure 1. Season and Zones for Beaver



Map for illustration purposes only; check regulations for legal zone boundaries.

Figure 2. Seasons and Zones for Raccoon



Map for illustration purposes only; check regulations for legal zone boundaries.

SEASON AND AREA FOR NONGAME MAMMALS

Section 478 - Bobcat

Trapping

Bobcat may be taken only under the authority of a trapping license as follows: November 24 through January 31, statewide (69-day season).

Hunting

Bobcat may be taken only under the authority of a hunting license and bobcat hunting tags as follows: October 15 through February 28, statewide (137-day season).

Subsection 265(b)(6)(F) - Use of Dogs in Pursuit of Bobcat

Bobcat may be taken with the aid of dogs during the open season; and for training purposes only pursued from the day following the close of bobcat season through the day preceding the opening of the bobcat season, except for closures and restrictions described in subsections 265(a) and (b).

Other Nongame Mammals

There is no closed season for nongame mammals other than bobcat. The other nongame mammals may be taken at any time and in any place where hunting and trapping are permitted. However, written permission must be obtained from landowners before entering private property (Fish and Game Code Section 2016). Other nongame animals that are subject of this document include coyote, weasels, skunks, and Virginia opossum.

SPECIAL TRAPPING ZONE FOR THE PROTECTION OF THE SIERRA NEVADA RED FOX AND THE SAN JOAQUIN KIT FOX

Conibear-type traps and snares, except those totally submerged, and deadfall traps are prohibited in the following zones:

Zone 1: Beginning at Interstate 5 and Highway 89, east on Highway 89 to Harris Springs Road near Bartle, north on Harris Springs Road (primary U.S. Forest Service Road 15) to Powder Hill Road (primary U.S. Forest Service Road 49), northeast on Powder Hill Road to Road 42N56, east on Road 42N56 to the Siskiyou/Modoc county line, north on the Siskiyou/Modoc county line to the boundary of the Lava Beds National

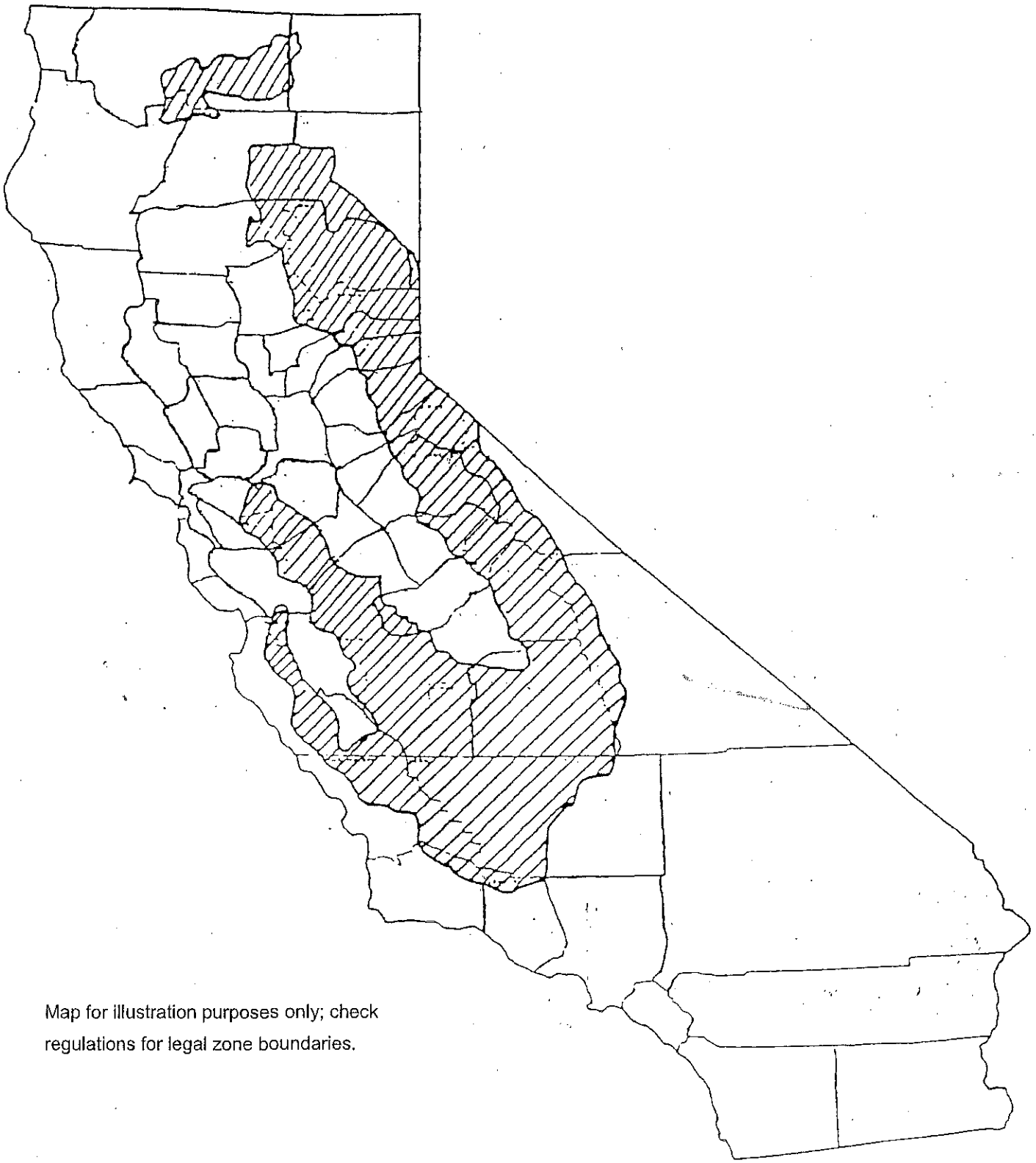
Monument, north along the eastern boundary of the Lava Beds National Monument, then west then south along the western boundary of the Lava Beds National Monument to Road 46N21, west along Road 46N21 over Gold Digger Pass to the western boundary of the Modoc National Forest, south along the western boundary of the Modoc National Forest to the boundary of the Shasta National Forest, west along the northern boundary of the Shasta National Forest to Highway 97, southwest on Highway 97 to Interstate 5, northwest on Interstate 5 to Old Highway 99, northwest on Old Highway 99 to Stewart Springs Road, southwest on Stewart Springs Road to the Yreka Ditch, west along the Yreka Ditch to the Gazelle/Callahan Road, southwest on the Gazelle/Callahan Road to Highway 3, south on Highway 3 to Ramshorn Road, east on Ramshorn Road to Castle Creek Road, east on Castle Creek Road to Interstate 5, north on Interstate 5 to the point of beginning.

Zone 2: Beginning in Tehama County at the intersection of Highway 36 and the western boundary of the Lassen National Forest, south along the western boundary of the Lassen National Forest to the boundary of the Plumas National Forest, south along the western boundary of the Plumas National Forest to the boundary of the Tahoe National Forest, south along the western boundary of the Tahoe National Forest to the boundary of the El Dorado National Forest, south along the western boundary of the El Dorado National Forest to the boundary of the Stanislaus National Forest, south along the western boundary of the Stanislaus National Forest to the boundary of the Sierra National Forest, south along the western boundary of the Sierra National Forest to the boundary of the Sequoia National Forest, south along the western boundary of the Sequoia National Forest to Highway 245, southwest on Highway 245 to Road 168, southwest on Road 168 to County Road J40, west on County Road J40 to Henderson Road, northwest on Henderson Road to Lincoln Avenue, west on Lincoln Avenue to Highway 145, north on Highway 145 to Avenue 7, west on Avenue 7 to Road 21, north on Road 21 to Avenue 12, west on Avenue 12 to Road 16, north on Road 16 to Avenue 18 1/2, west on Avenue 18 1/2 to Road 9, north on Road 9 to Highway 152, west on Highway 152 to Highway 59, north on Highway 59 to Highway 99, northwest on Highway 99 to Highway 140, west on Highway 140 to Highway 33, north on Highway 33 to Interstate 5, north on Interstate 5 to County Road J4, west on County Road J4 to County Road J2, north on County Road J2 to Highway 4, west on Highway 4 to Lone Tree Way, west on Lone Tree Way to James Donlon Boulevard, west on James Donlon Boulevard to Somersville Road, south on Somersville Road to Nortonville Road, north on Nortonville Road to Kirker Pass Road, southwest on Kirker Pass Road to Clayton Road, southeast on Clayton Road to Mitchell Canyon Road, south on Mitchell Canyon Road to the boundary of Mount Diablo State Park, south along the western boundary of Mount Diablo State Park to Mt. Diablo Scenic Boulevard, south on Mt. Diablo Scenic Boulevard to Blackhawk Road, southeast on Blackhawk Road to Camino Tassajara, west on Camino Tassajara to Dougherty Road, south on Dougherty Road to

Interstate 580, west on Interstate 580 to Interstate 680, south on Interstate 680 to Highway 84, northeast on Highway 84 to Holmes Street, south on Holmes Street to Wetmore Road, east on Wetmore Road to Arroyo Road, south on Arroyo Road to Del Valle Regional Park, southeast along the western boundary of Del Valle Regional Park to Arroyo Del Valle Creek, southeast on Arroyo Del Valle Creek to the Alameda/Santa Clara county line, east on the Alameda/Santa Clara county line to San Antonio Valley Road, south on San Antonio Valley Road to Del Puerto Canyon Road, east on Del Puerto Canyon Road to the Santa Clara/Stanislaus county line, south along the Santa Clara/Stanislaus county line to the Santa Clara/Merced county line, south along the Santa Clara/Merced county line to the San Benito/Merced county line, south along the San Benito/Merced county line to Little Panoche Road, south on Little Panoche Road to Panoche Road, east on Panoche Road to New Idria Road, south along New Idria Road to Clear Creek Road, southwest on Clear Creek Road to Coalinga Road, southeast on Coalinga Road to Coalinga-Mineral Springs Road, south on Coalinga-Mineral Springs Road to Highway 198, east on Highway 198 to Parkfield Grade, south on Parkfield Grade to Vineyard Canyon Road, west on Vineyard Canyon Road to Highway 101, north on Highway 101 to Bradley Road, north on Bradley Road to Sargents Road, north on Sargents Road to Pancho Rico Road, west on Pancho Rico Road to Cattleman's Road, north on Cattleman's Road to Highway 198, west on Highway 198 to Highway 101, north on Highway 101 to County Road G13, northeast on County Road G13 to Highway 25, north on Highway 25 to Browns Valley Road, north on Browns Valley Road to Santa Anita Road, northwest on Santa Anita Road to Santa Ana Valley Road, north on Santa Ana Valley Road to Fairview Road, north on Fairview Road to Highway 156, north on Highway 156 to Highway 152, southwest on Highway 152 to County Road G7, southwest on County Road G7 to Highway 25, west on Highway 25 to Highway 101, south on Highway 101 to the San Benito/Monterey county line, south on the San Benito/Monterey county line to Highway 146, west on Highway 146 to Highway 101, south on Highway 101 to Paraiso Springs Road, south on Paraiso Springs Road to County Road G17, south on County Road G17 to County Road 16, northeast on County Road 16 to Central Avenue, southeast on Central Avenue to Highway 101, south on Highway 101 to County Road G14, south on County Road G14 to Milpitas Road, west on Milpitas Road to the boundary of Fort Hunter Liggett, south along the western boundary of Fort Hunter Liggett to the Nacimiento River, southeast along the Nacimiento River to Nacimiento Reservoir, southeast along the western boundary of Nacimiento Reservoir to Lakeview Drive, south on Lakeview Drive to Cypress Mountain Drive, south on Cypress Mountain Drive to Chimney Rock Road, east on Chimney Rock Road to Klau Mine Road, south on Klau Mine Road to Adelaide Road, east on Adelaide Road to Vineyard Road, southeast on Vineyard Road to Highway 101, south on Highway 101 to Highway 41, east on Highway 41 to Highway 229, south on Highway 229 to Creston O'Donovan Road, southeast on Creston O'Donovan Road to Highway 58, east on Highway 58 to the boundary of the

Los Padres National Forest, south and east along the eastern boundary of the Los Padres National Forest to Highway 33, south on Highway 33 to Quatal Canyon Road, east on Quatal Canyon Road to Cerro Noroeste Road, east on Cerro Noroeste Road to Cuddy Valley Road, east on Cuddy Valley Road to Interstate 5, north on Interstate 5 to Wheeler Ridge Road, east on Wheeler Ridge Road to Laval Road, east on Laval Road to Rancho Road, north on Rancho Road to Sycamore Road, east on Sycamore Road to Tejon Highway, north on Tejon Highway to Highway 223, northeast on Highway 223 to Highway 58, east on Highway 58 to Caliente Bodfish Road, north on Caliente Bodfish Road to Highway 155, northeast then west on Highway 155 to the eastern boundary of the Sequoia National Forest, north and east along the southern boundary of the Sequoia National Forest to the Dome Land Wilderness, north along the eastern boundary of the Dome Land Wilderness to the boundary of the Inyo National Forest, north along the eastern boundary of the Inyo National Forest west of Highway 395 to the intersection of the Inyo National Forest and Highway 395 near Sherwin Summit in Mono County, north on Highway 395 to the California/Nevada state line, north on the California/Nevada state line to Highway 395 in Sierra County, north on Highway 395 to Long Valley Road, south on Long Valley Road to the boundary of the Toiyabe National Forest, west along the Toiyabe National Forest boundary to the Tahoe National Forest boundary, west then south then west then north along the Tahoe National Forest boundary to the Plumas National Forest boundary, north then east then north along the eastern boundary of the Plumas National Forest to the Lassen National Forest boundary, north along the eastern boundary of the Lassen National Forest to the northern boundary of the Lassen National Forest, west along the northern boundary of the Lassen National Forest to the western boundary of the Lassen National Forest, south along the western boundary of the Lassen National Forest to the point of beginning (see Figure 3).

Figure 3. Sierra Nevada Red Fox and San Joaquin Kit Fox Protection Zones - Effective September 4, 1992



Map for illustration purposes only; check regulations for legal zone boundaries.

METHODS OF TAKE

Furbearing Mammals

Section 465, Title 14, CCR, describes the methods authorized for taking furbearing mammals. The Commission has authorized the use of firearms, bow and arrow, or the use of dogs or traps. Traps are defined (in Section 465.5, Title 14, CCR) to include padded-jaw leghold, steel-jawed leghold, any conibear traps, snares, deadfalls, cage traps and other devices designed to confine, hold, grasp, grip, clamp or crush animals' bodies or body parts. Conibear-type traps and snares, except those totally submerged, and deadfall traps are prohibited in areas occupied by the Sierra Nevada red fox and San Joaquin kit fox (see Figure 3).

Furbearing animals may be trapped in any manner except as follows: In accordance with Section 3003.1(a) of the Fish and Game Code, body gripping traps may not be used to take furbearing mammals for the purposes of recreation or commerce in fur.

Section 464, Title 14, CCR, places a restriction on the type of firearms that can be used after dark to take raccoons. Only pistols and rifles not larger than .22 caliber rimfire and shotguns using shot no larger than No. BB can be used.

Nongame Mammals

Section 475, Title 14, CCR, defines the methods of take for nongame mammals. Nongame mammals may be taken in any manner except as follows:

1. Poison may not be used.

2. Recorded or electrically amplified calls or sounds may only be used for bobcats and coyotes.

3. In accordance with Section 3003.1(a) of the Fish and Game Code, body gripping traps may not be used to take nongame mammals for the purposes of recreation or commerce in fur.

Description of Methods of Take

Conibear-Type Traps

Conibear-type traps (thus named after the developer of the prototype) are body-gripping or "instant kill" traps, which consist of two metal rectangles hinged together midway to open and close like scissors. This type of trap is designed to strike the animal in the spinal column for an instant kill. However, instant kills may not occur because of the size and species of the animal involved and the position of the animal as the trap closes. A disadvantage of conibear-type traps is that non-target animals typically cannot be released, and often will be killed.

As of November 4, 1998, conibear-type traps are no longer legal to use in California to trap furbearing and nongame mammals for the purposes of recreation or commerce in fur. However, conibear-type traps may be used to take authorized mammals for the protection of property, in accordance with Section 465.5, Title 14, CCR.

Leghold Traps

As of November 4, 1998, leghold traps are no longer legal in California to trap furbearing and nongame mammals except for the purpose to protect human health or safety.

Snares

Snares are categorized as either body or foot snares. They are made of either light wire or cable looped through a locking device or of a small nylon cord tied so that it will tighten as the animal pulls against it. The body snare is designed to kill the animal by strangulation or crushing of the vital organs. Because body snares are not selective, they sometimes kill non-target animals, including pets.

The foot snare is spring activated. When the animal steps on the trigger the spring is released, lifting the noose and tightening it around the foot.

As of November 4, 1998, snares are no longer legal in California to trap furbearing and nongame mammals for the purposes of recreation or commerce in fur. However, snares may be used to take authorized mammals for the protection of property, in accordance with the Section 465.5, Title 14, CCR.

Deadfall Traps

Deadfall traps are usually constructed on site with available material, usually logs or rocks. The trap is designed so that when an animal trips the trigger it is killed by a falling object, usually a log or rock. Deadfall traps are probably not used much today because other traps are more easily set.

Deadfall traps are currently prohibited in a zone roughly equivalent to the areas occupied by the Sierra Nevada red fox and the San Joaquin kit fox (see Figure 3).

Cage Traps

These traps are available from several manufacturers in various sizes. When an animal enters, a door closes behind it. Cage traps prevent killing and serious injury to both target and nontarget animals. Coyotes and foxes are difficult to capture with cage traps because of their caution and reluctance to enter the confined area of the trap. For this reason, cage traps are not an efficient means of capturing these animals. Cage traps are a disadvantage to the trapper because of their weight, bulk, and cost, although Tomahawk Traps of Wisconsin does manufacture a collapsible cage trap. Also, there is a problem with the theft of cage traps. There can be some injury to the bridge of the nose and feet of animals trying to escape cage traps, but those injuries are minor (Professor G. Trapp, Ph.D., California State University, Sacramento, California, pers. comm.). Because of their size and bulk, cage traps are used most often in capturing depredating animals. They can be effective in taking most species, with the exception of coyotes and red foxes.

Firearms

Furbearing and nongame mammals may be taken with rifle, shotgun, or pistol. Dogs may be used to track the target species, but some hunters use a technique referred to as predator calling. Predator calling is a technique that involves a hunter attempting to imitate the cry of an injured prey species, such as a rabbit or mouse, with the intent of luring the predator (furbearing or nongame mammal) within shooting range. Bobcats, coyotes, and gray foxes are sometimes hunted using this method.

Archery Equipment and Crossbow

For the taking of furbearing and nongame mammals, any arrow or crossbow bolt may be used, except that explosive heads or substances that would tranquilize or poison may not be used. Depending on the size of the animal, arrows or bolts can kill by shock and/or hemorrhage (bleeding).

Archery hunting is becoming increasingly popular, but the take is very low compared to hunting with firearms. Archery hunts, therefore, are a useful means of increasing the hunting opportunity without appreciably affecting the harvest, but the wounding rate by bow hunters may be higher than that for gun hunters (Peek 1986, p. 321).

Use of Dogs

Trailing dogs may be used to aid the hunter in the take of furbearing and nongame mammals. Dogs use their sense of smell to track the target animal. Trained dogs are used to locate or pursue animals. Species that are usually hunted with dogs include bobcat, gray fox, raccoon, and Virginia opossum. During the 2002-2003 trapping year, 15 percent of the bobcats harvested were taken with the aid of dogs. If the dog locates the animal, the results can range anywhere from the dog killing the animal to the dog "treeing" or "baying" the animal. Treed animals are often left unharmed (not taken by the hunter). Although dogs are usually trained to follow only the scents of certain target species, it is possible that nontarget species might be chased. All dog pursuits are not necessarily successful.

The use of dogs for the pursuit and/or hunting of mammals is a controversial issue. A segment of the public contends that the use of dogs provides hunters with an unfair advantage, that it causes stress to wildlife, and that the pursuit and/or hunting of mammals with the use of dogs should be prohibited. Conversely, another segment of the public contends that the use of dogs is a legitimate method of assisting in locating mammals while hunting and that the pursuit-only provisions provided in existing regulations do not cause significant negative impacts on mammal populations. Another segment of the public is concerned about the potential abuse of and injury to dogs that may occur.

PROPOSED REGULATIONS

The following is a summary of the proposed project:

- Establish a nonnative red fox hunting and trapping season and area to provide additional hunting and trapping opportunity and to control the spread of and possibly reduce the nonnative red fox population. The proposed regulation will also make unlawful the take of red fox for any profit making purposes, which is consistent with Fish and Game Code Section 4012. The existing regulation in Section 460, Title 14, CCR, was

established to protect the native Sierra Nevada red fox (*Vulpes vulpes necator*), a high-elevation subspecies now classified as threatened in California. The nonnative red fox (*Vulpes vulpes regalis*) was introduced decades ago for fur farming and hunting. It has proliferated in low elevation habitats to the extent that it is now considered an agricultural pest, and threat to some wildlife species. This proposal adds Section 460.1, Title 14, CCR, in an effort to permit hunting and trapping for nonnative red foxes in an area of lower elevations that is far removed from the range of the native Sierra Nevada red fox. Controlling and/or reducing the nonnative red fox population in California is desirable, as these mammals prey on rodents, rabbits, reptiles, shorebirds, waterfowl, and other ground-nesting bird species, including some threatened and endangered species;

- Extend the bobcat trapping season an additional 51 days. Existing Section 478, Title 14, provides a 69-day trapping season. Inclement weather typically restricts or prevents trapping activity during portions of this period. In an effort to offset trapping time lost during these events and to increase trapping opportunity, while assuring bobcat harvest levels remain well below allowable thresholds, the proposed regulation change expands the season to 121 days, and;

- Match the zones of protection for the Sierra Nevada red fox and San Joaquin kit fox with their current ranges.

PROJECT LOCATION

The hunting and trapping of furbearing and nongame mammals now occurs in designated areas throughout the State, except where prohibited by appropriate laws, such as city and county ordinances; and in national, State, and local parks. The proposed project would not change the project location, except for the locations of protection zones for listed foxes (discussed below). Public participation and California field studies have resulted in zones being established for beaver and raccoon (figures 1 and 2). Protection zones have also been established for two threatened species, the Sierra Nevada red fox and the San Joaquin kit fox (Figure 3). The proposed project would change the boundaries of these zones to more accurately reflect occupied habitat of these listed species. A more detailed description of the project area and zones can be found in sections 461-465.5, 472-475, and 478, Title 14, CCR, and later in this chapter.

California is approximately 158,693 square miles or 101,000,000 acres in size, ranging from about 200 feet below sea level in Death Valley National Monument to over 14,000 feet in the Sierra Nevada. Based on the dominant form of vegetation, California's wildlands can be grouped into five major classes: conifer, woodland, shrub, grass, and desert. Each class is made up of numerous cover types dominated by different species of plants. There are 48 cover types of terrestrial wildlife habitats consisting of various size/age classes in California (Mayer and Laudenslayer 1988).

Slightly more than half of the land in the State, 51 million acres, is privately owned. Over 36 million acres of these private lands are forest and range cover types. The remaining 50 million acres in the State are publicly held. The Federal government administers about 45.9 million acres, State government about 2.5 million acres, and local governments about 1.7 million acres. About 48 of 50 million acres of public land are forest and rangeland, including desert (Forest and Rangeland Resources Assessment Program 1988).

Commercial trapping and recreational hunting is currently authorized for six furbearing and seven nongame species in designated areas of the State. Hunting and trapping season lengths and locations vary with individual species.

PROJECT OBJECTIVES

The objectives of the existing regulations and of the proposed action are to maintain healthy furbearing and nongame mammal populations and to provide public hunting and trapping opportunities as an element of furbearing and nongame mammal management.

Although hunting and trapping remains controversial, many national conservation organizations, such as the National Wildlife Federation, The Wildlife Society, the Wildlife Management Institute, The Nature Conservancy, and the National Audubon Society, recognize hunting and trapping as an effective tool in achieving the goals of wildlife management. Hunting and trapping can help maintain healthy wildlife populations and help protect the integrity of the ecosystem itself, "because thinning of numbers improves the health, welfare and productivity of the survivors. Thrifty breeding stocks and maximum wildlife crops will nearly always be found in favorable environments that are not overstocked" (Allen 1962).

Other organizations that support trapping for its economic benefit to the State are the: AFL-CIO, California Farm Bureau Federation, California Cattlemens Association, and California Woolgrowers (California Trappers Association 1998).

"Competition for land (because of habitat destruction and degradation) is by far the most dangerous threat to wildlife all over the world. Hunting, at least on land, is a relatively minor threat, regardless of whether it is legal or illegal, since as long as a species' habitat is protected, the survivors can almost always replace the killed individuals" (Rensberger 1977).

The number of animals taken by hunters and trappers is controlled through restrictions on lengths of seasons, bag limits, zones, methods of take (including types and sizes of traps), and other regulations.

"Trapping is often important in reducing landowners' losses to depredating wildlife. Examples of losses which can be controlled are coyotes depredating livestock and poultry, or beavers girdling orchard trees. Muskrats will tunnel through dams and dikes, beavers will often cause severe flooding problems and some predators kill farm animals. When such problems occur, trappers are often called upon to help a farmer protect his or her property and livelihood" (National Wildlife Federation 1979).

However, it is not known whether or not random hunting or commercial, nuisance wildlife control, or recreational trapping actually play an important role in reducing depredation problems to land and livestock owners. Because harvest management is intended to deal with the removal of only surplus animals, it is possible that the benefit to depredation control is only temporary until the next breeding season. It is also possible that intensive trapping for species such as coyote and muskrat will stimulate reproduction and may even increase those populations and related depredation (Connolly and Longhurst 1975; Russell, no date).

CHAPTER 2. THE MANAGEMENT OF FURBEARING AND NONGAME MAMMAL IN CALIFORNIA

RESPONSIBILITIES OF THE DEPARTMENT AND COMMISSION PURSUANT TO STATUTES AND REGULATIONS

The management of furbearing and nongame mammals in California is guided by State law and policies of the Commission and the Department. The laws directing this management are contained in the Fish and Game Code. Section 3003.1 and Sections 4000-4043 contain provisions for trapping, fur dealer licenses, and the take of some furbearing mammals. Section 4150 of the Fish and Game Code contains provisions for the take of certain nongame mammals.

The taking of furbearing and nongame mammals is consistent with the State's wildlife conservation policy of providing the public a recreational and economic benefit so long as the populations of those species involved are not reduced below their ability to sustain themselves in the available habitat (Fish and Game Code Section 1801). Harvest impacts for furbearing and nongame mammals are generally regulated by adjusting the timing and length of the seasons. Where appropriate, based on biological information, bag limits have been imposed. Authorized methods of take include certain firearms, archery equipment, and crossbows for hunting. Authorized traps include cage traps, boxtraps, nets, suitcase-type beaver traps and common rat and mouse traps when the furbearing or nongame mammal is trapped for the purposes of recreation or commerce in fur.

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

1. To provide for the beneficial use and enjoyment of wildlife by all citizens of the State;
2. To perpetuate all species of wildlife for their intrinsic and ecological values, as well as for their direct benefits to man;
3. To provide for aesthetic, educational, and nonappropriative use of the various wildlife species;
4. To maintain diversified recreational uses of wildlife, including the sport of hunting, as proper uses of certain designated species of wildlife, subject to regulations consistent with the maintenance of healthy, viable wildlife resources, the public safety, and a quality outdoor experience;

5. To provide for economic contributions to the citizens of the State through the recognition that wildlife is a renewable resource of the land by which economic return can accrue to the citizens of the State, individually and collectively, through regulated management. Such management shall be consistent with the maintenance of healthy and thriving wildlife resources and the public ownership status of the wildlife resource;
6. To alleviate economic losses or public health and safety problems caused by wildlife; and
7. To maintain sufficient populations of all species of wildlife and the habitat necessary to achieve the above-stated objectives.

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 public meetings in February, March, and April at least every three years for the purpose of considering and adopting revisions to regulations relating to hunting and trapping of mammals (sections 200-207, Fish and Game Code). Recommendations and comments from the Department, other agencies, and the public are received at all three of these public meetings.

HISTORICAL PERSPECTIVE OF HUNTING AND TRAPPING FURBEARING AND NONGAME MAMMALS IN CALIFORNIA

The following historical narrative was excerpted from a series of four articles prepared by George Seymour for Outdoor California (a Department publication) in 1979 and 1980. George Seymour, a former conservation education supervisor, now deceased, was well known and respected for his knowledge of hunting and trapping game and nongame species. He was the author of *Furbearers of California*, as well as 110 wildlife leaflets that are still in great demand by Federal and State agencies and public schools.

> The fur trade along the Pacific Coast of North America began to develop in the 1700s. What is now San Francisco became a trading center for furs from California and other areas from Alaska to Mexico. In the early 1800s, Russian hunters and trappers were the main force exploiting the coastal fur resources. They also influenced the early history of California by establishing settlements at Fort Ross, Bodega and the Farallon Islands.

The coastal fur resource consisted of sea otters and fur seals. Hundreds of thousands of pelts of these animals were shipped from the west coast between 1800 and 1835. The sea otter was a valuable resource, with its pelts selling for

$80 to $100 in China and up to $1,700 at London auctions. In 1801, more than 18,000 sea otters were shipped to Chinese markets on American ships alone.

By 1840, the fur trade began to deteriorate; the resource had been depleted, as there were no seasons, bag limits or controlling regulations. By the time of the Gold Rush in 1849, the coastal furbearer populations had almost disappeared.

While the unchecked harvest of sea otters and fur seals was occurring along the coast, English, French and then American hunters and trappers were busy inland. The rivers and valleys were hunted and trapped. Beavers, river otters, minks, deer and elk were taken. Their hides and furs also were shipped out of San Francisco. In 1841, one company alone reported shipping the hides of 2,000 beavers, 500 sea otters and 3,000 deer and elk.

Like the coastal fur resources, the inland fur resources were not protected by seasons, bag limits or any other regulations. By the time of the Gold Rush, the inland fur resources were so depleted that they were no longer of economic importance to Californians. The additional influx of `49'ers' further pushed much of California's fur resources to a point in 1885 from which it has not completely recovered.

In 1911 and 1914 laws were enacted which gave complete protection to fur seals, sea otters and beavers. All three species have made a comeback, but their present populations are far below their peak historical numbers. However, beaver have thrived to a point where they are now management problems in many areas of the State.

In 1917, the California Legislature required that anyone trapping furbearing animals must have a trapping license and report their take annually. This allowed the Department to monitor the harvest of these animals and eventually resulted in closed seasons on wolverines, fishers, martens and river otters. The rarity of these species was a result of the naturally low populations of some of these species, the unrestricted hunting and trapping of the 1800's and the encroachment into their habitat by an ever-increasing human population.

Since the Department was given the responsibility to manage furbearers by the Legislature, the furbearer populations have stabilized, although the fur industry has gone through some highs and lows. Fur prices were exceptionally high during the 1920s and were greatly depressed during the 1950s and 1960s. However, they have been much higher during the late 1970s and early 1980s."

In 1976-77, California licensed 1,692 trappers. The value of the fur harvest was estimated to be in excess of $1.6 million, based on the reported and unreported take of furs. The retail value of processed furs in California exceed $39 million.

In the last year for which records are complete (2002-03), there were 133 licensed trappers in California, compared to 76 and 211 in the two previous years. Fluctuations of fur prices are affected more by social and economic conditions (public demand for furs) than species' abundance.

Another historical perspective is the anti-trapping movement, which has a long history in the United States. The following excerpts were taken from a publication titled *Changing U.S. Trapping Policy. A Handbook for Activists* published by the Defenders of Wildlife in 1984.

"Opposition to trapping during the 1920s allegedly was spearheaded by hunters. Reiger (1978) quotes E. J. Daily, first president of the American Trapping Association, as saying the anti-trapping movement was led `by rich fox and coon hunters organizations' angered by accidental trapping of hunting dogs and competition with trappers for fox and raccoon.

"By the 1920s the growing humane movement was on the offensive against trapping. The Anti-Steel Trap League, founded in 1925, was one of the first organizations to focus specifically on the trapping of wild animals. The League's early newsletters were mild by today's standards, but at the same time were considered graphic and shocking. These publications contain ample evidence of legislative involvement. The humane movement clearly played a part in decisive, if fleeting, State legislative victories against trapping during the late 1920s and early 1930s.

"Bills banning or restricting the leghold trap were passed in several states, including South Carolina, Georgia, Massachusetts, New York and Kentucky. These statutes were repealed during the Depression, most likely because of compelling arguments about human need. Fur prices fell, but trapping could provide food and a supplemental, if meager, income.

"In 1973, the Florida Game and Fresh Water Fish Commission banned use of the leghold and Conibear trap. The use or possession of any steel trap is prohibited in any area where wildlife might be found. Individual problem animals, however, may be taken by special permit.

"In 1974, the Massachusetts Legislature prohibited the use of leghold traps on land, except in or under buildings owned by the person trapping or the individual authorizing the trapping. The law allows the use of leghold traps in underwater sets if `all reasonable care is taken to insure the mammal dies by drowning in a minimum length of time' (Chapter 131. Section 80A). Conibear traps are also prohibited on land.

"In 1977, Rhode Island passed a bill banning leghold trap use, although landowners may obtain a special permit to trap nuisance animals on their own property when no other method will work.

"In 1984, New Jersey passed a bill that banned the leghold trap effective on or about October 1, 1985.

The approval of Proposition 4 on November 3, 1998, in California makes it unlawful for any person to trap for the purposes of recreation or commerce in fur any furbearing or nongame mammal with any body-gripping trap. Body-gripping traps include, but are not limited to, steel-jawed leghold traps, padded-jaw leghold traps, conibear traps and snares.

Senate Bill 1645, approved by the Governor on September 14, 2002, requires persons trapping furbearers and non-game mammals found to be injuring crops, or other property to obtain a trapping license, if they are providing trapping services for profit. It also prohibits the sale of pelts of these animals trapped under such circumstances.

According to the California Trappers Association:

"Fur harvesting has provided a continuous, sustainable, economic benefit throughout California for well over 130 years. The use of traps to harvest predators and furbearers in California has been regulated for the last 70 years, since 1925. Along with regulation of the use of traps, came the requirement for trappers to collect data on the annual fur bearer harvest."

"The value of California's annual fur harvest is dependent on three factors: the number of pelts taken of each species, the dollar value of the pelts, and the number of trappers in the field for the season. These three factors operate in an interrelated manner in their effect on annual fur harvest. The higher the dollar value of the pelts, the more trappers usually are in the field and the more pelts they harvest."

"Over the past 70 years, these three factors have worked together to creat cycles in the value of the harvest. The data shows that the recorded peak number of animals harvested, peak average pelt values and peak number of licensed trappers tend to coincide within a couple of years of each other. Cyclic peaks occurred in 1927-28, 1941-42, 1954-55, 1963-64 and 1977-78. These peaks occur about every 10 to 15 years, and on the average about every 12 years. The value of the 1977-78 fur harvest was over 3 million dollars."

CURRENT MANAGEMENT ACTIVITIES

Several important differences exist between management of furbearing and nongame mammals and game animals hunted for sport. Harvest of furbearers usually involves commercial motives, because the pelts of these animals, unlike the meat from game species, can legally be sold in California on the free market if the furbearing or nongame mammal is trapped with a non-body-gripping trap for the purpose of commerce or recreation in fur. Changes in market prices of pelts can be substantial and occur quite independently of the availability of the animals from which they come. Trapping pressure for many species shifts roughly in accordance with changes in market prices. This shifting makes it difficult to protect the populations adequately when numbers are low and prices are high (Shaw 1985). The Department addressed a high demand for bobcat pelts by imposing strict regulations in 1977-78 in northeastern California and a large portion of the balance of the State (Section 478, Title 14, CCR) before the bobcat population became too low. Conversely, it makes it virtually impossible for wildlife managers to use harvests to reduce populations of abundant (and sometimes destructive) species when prices are low (Shaw 1985, p. 165). A current example in California is the beaver.

Law Enforcement

The Department employs about 339 full-time patrol officers (wardens, lieutenants, captains), as of December 2003, throughout the State. They are responsible for the protection of game and nongame fish and wildlife resources and habitat from willful or negligent destruction. Some of the most difficult enforcement is associated with poaching. Poaching generally occurs in isolated areas at night. The effects of illegal harvest will be discussed later in this document in Chapter 5. The following table shows the number of warden, lieutenant, captain, and chief positions listed by region, headquarters, and the Office of Oil Spill Prevention and Response.

Class	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	OSPR	HQ	Total
Patrol Chief	1	1	1	1	1	1	1	1	2	10
Patrol Captain	2	4	2	4	2	2	3	2	5	26
Patrol Lieutenant	6	9	8	5	8	3	13	4	3	59
Game Warden	26	34	38	28	33	21	34	13	17	244
Total	35	48	49	38	44	27	51	20	27	339

Trapping Proficiency

Fish and Game Code Section 4005 has required trapping proficiency tests for all trappers since January 1, 1983. Trappers must demonstrate their knowledge of trapping regulations, trapping ethics, principles of wildlife management, natural history, trapping equipment, trap types, and setting traps. A copy of the Department's trapping manual *Get Set to Trap* is available to those wanting to study for the proficiency test (California Department of Fish and Game 1986). This manual is in the process of revision to make it more consistent with current regulations.

METHODOLOGY

Harvest Data

The Department uses various types of harvest data to monitor furbearing and nongame mammal populations. The Department requires annual reports from fur buyers and also requires all trappers to file catch reports which provide data on the number of species taken in each county. These furnish some estimate of the yearly harvests. The annual take by the United States Department of Agriculture (USDA) Wildlife Services Program is also taken into account. Anyone wishing to sell or transport a bobcat fur must have it tagged by the Department. As part of the tagging process, the trapper must provide the Department with information on place, method of take, sex, and date.

The five species that are currently monitored for hunting are badger, bobcat, coyote, gray fox, and raccoon. Each hunter is allowed five bobcat tags per year. Each time a bobcat is killed; a tag must be filled out and returned to the Department. The hunting take of the other furbearing and nongame mammals is considered to be low and is not monitored. However, the sale of any pelts from furbearing and nongame mammals taken by hunting must be reported and will appear in the annual fur trapping report. Pelts from trapped animals cannot be sold unless the seller (even if the seller

has a hunting license) has a trapper's license and the furbearing or nongame mammal was trapped with a non-body-gripping trap for the purpose of recreation or commerce in fur.

California Statewide Wildlife Habitat Relationships System

The Wildlife Habitat Relationships (WHR) System represents the best and most extensive compilation of wildlife habitat information existing in California today. It summarizes in a single source all available information on habitat requirements of terrestrial vertebrates and, in the absence of established data, substitutes the best estimate of the most qualified experts. The system is computerized and designed to be improved through updating as new information becomes available.

Species-habitat relationship models relate wildlife species to habitats. There are approximately 650 terrestrial (land based) wildlife species residing in or regularly migrating to and from 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 species. These models 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 high, medium, low, or not used for life-sustaining activities, such as reproduction, foraging, and cover (Airola 1988). Each of these models has been thoroughly reviewed by recognized experts on specific species.

The architecture for these models was first developed by Patton (1978) and Thomas (1979). The Department maintains these computer models as part of the California statewide WHR System.

The WHR species-habitat relationship models (species information reports) are one component of an overall information system that describes California habitats, species management status, distribution, life history, and habitat requirements of all of California's wildlife species. The system represents a state-of-the-art tool for wildlife habitat management, teaching, and research throughout the State. Much of the assessment of the cumulative effects of the State's changing environment on furbearing and nongame mammals has been based on the WHR species information reports. Habitat classifications, as described by Mayer and Laudenslayer (1988), were used to classify furbearing and nongame mammal habitat in the State.

A number of documents have been published which describe the WHR System and have been used as references for this environmental document. 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 the *User's Manual for Version 6.0 of the California Wildlife Habitat Relationships System Database (Garrison and Sernka 1997).*

Data Analysis

Population Estimation

The types of habitats occupied by each species were determined from the species information reports (California Statewide Wildlife Habitat Relationships Database 1988). The current acreages (decade 1990) for each of those habitats were derived from the California Department of Forestry and Fire Protection (Forest and Rangeland Resources Assessment Program 1988). Furbearing and nongame mammal densities (expressed as individuals per square mile) were obtained from various sources in the wildlife research literature. When California data were not available, out-of-state studies were used. The total square miles of all habitats for a particular species were divided by the density of that species to calculate low and high range population estimates. Generally, the lowest and highest densities that could be found in the literature were used. These low and high variations in population size account for the annual differences in densities due to habitat type, food availability, weather, and other factors. For environmental impact analysis, the lowest population estimates were used.

Estimates for the three aquatic animals were calculated differently. Density estimates for beaver, mink, and muskrat are expressed in numbers of animals per mile or kilometer of stream. Information on the mileages of stream occupied by these animals was obtained on a county-by-county basis from the California Fish and Wildlife Plan that was published by the Department in 1965. Density estimates for wetland and lake miles are not available.

Mathematical Modeling

Modern wildlife management techniques include the use of models to analyze, understand, and predict outcomes of complex interactions of the natural environment. Mathematical models were developed for 13 species that are the subject of this document. Mortality and reproduction rates were incorporated with harvest data to estimate the adult population in the spring season and follow it throughout the annual cycle, including birth rates and death rates, to the next spring season. For these

species, the low end range of the population estimate was used in order to permit analysis on a conservative basis. Models for each species are discussed in Chapter 4 and can be found in appendices 1 (badger), 2 (beaver), 3 (bobcat), 4 (coyote), 5 (gray fox), 6 (mink), 7 (muskrat), 8 (raccoon), 9 (spotted skunk), 10 (striped skunk), 11 (Virginia opossum), 12 (long-tailed weasel), and 13 (ermine).

In many cases, biological data used in these models were taken from studies in other states, because information was not available from California research. Critics of the 1990-91 environmental document have stated that the most recent California studies are more than a decade old and that the reference pertaining to general furbearers is 54 years old. CEQA requires that the best information available be used. The Department has attempted to do that. Depredation take data are available only for the 36 counties that have contracts with the USDA Wildlife Services Program (depredation control does not occur in four of the 58 counties). The Wildlife Services take then represents only 36/54, or about 67 percent of the counties. Information from the other 18 counties is not readily available. It is assumed that depredation take in the other 18 counties is at the same level as the 36. For harvest analysis in the models, then, 33 percent is added to the Wildlife Services depredation take.

The models include analysis of the annual population cycle, considering both additive as well as compensatory mortality, and the relative changes to the populations caused by each. The concept of partial compensatory mortality is not illustrated. However, figures for this type of mortality would fall between those levels attributed to additive and compensatory mortality. Additive and compensatory mortality are defined on pages 59 and 58 respectively.

One public comment on the 1990-91 environmental document indicated concern that the declines in furbearer harvest were not matched with the data presented in the models located in the appendices. Those models were designed to simulate a typical annual cycle for each species, based on population estimates that were calculated using the habitat acreages from CALPLAN for the decade and density data from the literature (the CALPLAN model is explained in Chapter 5). The declines in harvest are not relevant to a one-year annual cycle, so the average annual trapping take for 10 years was used in the models.

Another concern expressed by the public relative to the 1990-91 environmental document is that "[the models] consider all available habitat as prime, and capable of maximum reproduction rates, and the models fail to consider the highs and lows of natural cycles." Low and high population density data was used to specifically avoid considering all habitat as prime. In fact, for the density studies that were used by the Department, the degree of primeness of habitat types in those studies was not known.

The reproductive rates used in the literature do not necessarily represent the highest reproduction rates known, as is the case with muskrat and coyote. The models do reflect the highs and lows of annual cycles, because the lowest and highest densities that could be found in the literature were used. Furthermore, in the analysis of annual cycles, usually the lowest densities reported in the literature were considered. This was done intentionally to provide for a large margin of error on the conservative side.

INTENDED USE AND SCOPE OF ENVIRONMENTAL DOCUMENT

This environmental document has been prepared to provide background information regarding hunting and trapping of furbearing and nongame mammals in California; and to describe proposed changes in trapping and hunting regulations. The Department prepared this draft (DED) on behalf of the Commission in accordance with CEQA and the "CEQA Guidelines," and as consistent with the Commission's certified regulatory program under CEQA (see generally CCR., Title 14, § 781.5; see also Public Resources Code, § 21080.5; CEQA Guidelines, § 15251, subd. (b). The document is an informational item to aid the Commission in the decision making process and to inform the public of effects of existing regulations regarding hunting and trapping of furbearing and nongame mammals and the proposed regulation changes. In this regard, this DED analyzes and describes the prospect of environmental impacts that might result from the Department's recommendation and alternatives to that proposal, including analysis of issues such as effects on wildlife populations, habitat loss, and other related environmental issues.

As discussed previously, the Commission has approved hunting and trapping of furbearing and nongame mammals in California since the early 1900's, and since 1990, has done so with the benefit of an environmental document prepared on its behalf according to CEQA by the Department. From a biological perspective, annual hunting and trapping is part of the existing condition for many nongame and furbearing mammal populations. Adoption of regulations proposed by the Department will result in the harvest of approximately the same number of nongame and furbearing mammals annually as now occurs. A more detailed discussion of the Department's recommendation can be found in Chapter 1.

Finally, where appropriate, the environmental impact analysis that follows may refer to and incorporate by reference information contained in previous environmental documents. Any future recommendations to the Commission by the Department regarding furbearing and nongame mammal hunting and trapping may also take the same approach. In addition, if substantial changes occur in the project itself, or if new information reveals new or substantially more severe environmental impacts than

previously disclosed or analyzed, a subsequent DED or supplement to a previously adopted DED will be prepared. (see generally Wildlife Alive v. Chickering (1976) 18 cal. 3d 190; Pub. Resources Code, § 21166.)

This environmental document contains a description of the proposed action, potential effects of the proposed action, reasonable alternatives to the proposal, and cumulative impacts. Mitigation of potentially significant impacts is made a part of the proposed project and is not treated in a separate section of the document. In addition, this environmental document considers relevant policies of the Legislature and the Commission. These standards are contained in Section 781.5, Title 14, CCR. This environmental document presents information to allow a comparison of the potential effects of various levels of hunting and trapping. Although certain alternatives, such as the no-hunting or trapping alternative, may not achieve the project's objectives, they are considered to provide the Commission and the public with additional information related to the options available and to fulfill the Commission's statutory obligation. Both hunting/trapping and nonhunting/nontrapping alternatives are considered.

FUNCTIONALLY EQUIVALENT ENVIRONMENTAL DOCUMENTS

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 EIR's or ND's.

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

CHAPTER 3. ENVIRONMENTAL SETTING OF THE PROJECT

During 2001, a literature search was conducted to update the biological information contained in the following species accounts. The main concern was density information because of its importance to population estimation in the models in appendices 1 through 13. Nothing significant was found.

The 13 species that are subject to this document occupy a variety of habitats throughout the State. A brief description of those habitats and life histories follows:

SPECIES ACCOUNTS

BADGER

The badger is an uncommon, permanent resident found throughout most of the State, except in the northwest area. It is most abundant in drier open stages of most shrub, forest, and herbaceous habitats (Zeiner *et al.* 1990).

Badgers occupy 41 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988). These habitats total 61,671,608 acres statewide (Forest and Rangeland Resources Assessment Program 1988). Little research has been done on badger densities. Lindzey estimated that Curlew Valley on the Utah-Idaho border supported one badger per square mile. Messick and Hornocker believed that the Snake River Birds of Prey Natural Area and adjacent habitat in southwestern Idaho supported a remarkable density of 13 resident badgers per square mile (Messick 1987, p. 591).

Using a home range of one badger per square mile (the most conservative number), it is estimated that the low range end of the adult badger population in California is 96,362 badgers. The estimated population ranges between 96,362 and 1,252,705 animals. The low population estimate was used for harvest analysis (Appendix 1).

Other badger research indicates that average litter size ranges between one and four, with an average of 2.5 (Zeiner *et al.* 1990). The adult sex ratio is 50 percent males and 50 percent females, and most adult badgers breed every year. Three studies show a differential breeding success for adult females of 90 percent, 52 percent, and 72 percent (Messick 1987). The total annual mortality rate (including hunting and trapping) is 45 percent (Messick 1987).

The badger has been added to the Department's list of Species of Special Concern, because they have declined or disappeared in large sections of the State, particularly areas west of the Cascade-Sierra Nevada mountain axis and in coastal basins of southern California (Williams 1986). Species of Special Concern is not a formal or legal designation; but, nevertheless, the species on that list are vulnerable and should be closely monitored to ensure that they do not become threatened or endangered.

BEAVER

Beaver are found in streams, ponds, and lake margins in the eastern Sierra Nevada and Cascade Mountains from Modoc County south to Inyo County, in the northern mountains west to Del Norte County, and in the Central Valley south to Fresno County. Isolated populations occur in San Bernardino, Riverside, Imperial, San Diego, San Luis Obispo, Monterey, Mendocino, Lake, and Napa counties. Once native to the Central Valley and the drainages of the Colorado, Pit, and Klamath rivers, the beaver was decimated by unregulated trapping. It has subsequently recovered, and introductions have extended its original range (Zeiner *et al.* 1990).

Beavers are found in three of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of about 6,473 stream miles (California Fish and Wildlife Plan 1965).

Beaver densities range between 0.2 and 2.5 adults per kilometer of stream (Novak 1987a). Using this information, it is estimated that the adult beaver population ranges between 10,789 and 26,971 animals. This estimate is considered very conservative, because there are no data on lakeshore miles and wetland acres where beavers also occur. The low population estimate was used for harvest analysis (Appendix 2).

The adult sex ratio is 49 percent males and 51 percent females (Novak 1987a). The litter size averages 3.5 kits (Zeiner *et al.* 1990). Female breeding success is estimated to be 80 percent, and total annual mortality is 30 percent (Gunson 1970). The allowable harvest level is 30 percent (Novak 1987a).

BOBCAT

The bobcat is a common-to-uncommon, permanent resident throughout most of California. It is found in nearly all habitat types and successional stages. Optimal habitats are brushy stages of low and mid-elevation conifer, oak, riparian, and pine-juniper forests, and all stages of chaparral (Zeiner *et al.* 1990).

Bobcats are found in 42 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of 81,695,757 acres (Forest and Rangeland Resources Assessment Program 1988).

Bobcat densities in various habitats have been estimated at 0.55 and 0.58 per square mile (Gould 1982). Using this information, the Department estimates there are between 70,207 and 74,037 adult bobcats in California. The low population estimate was used for harvest analysis (Appendix 3).

Research has shown that bobcats produce one litter per year, litters average 2.7 kittens, and adults are sexually mature at one year of age (Knick et al. 1985, Rolley 1985). The sex ratio is typically 50 percent males to 50 percent females. Adult mortality is 41 percent (Rolley 1987, p. 673), and juvenile mortality is estimated to be 20 percent. Female breeding success is 53 percent (Knick 1985, Rolley 1985). The allowable harvest level is 20 percent (Rolley 1985).

COYOTE

The coyote is an abundant, permanent resident throughout the State. It occurs in almost all habitats and successional stages, including agricultural and residential areas.

Coyotes are found in 45 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of 99,034,628 acres (Forest and Rangeland Resources Assessment Program 1988).

Coyote densities in various habitats have been estimated to range between one and five per square mile (Voight and Berg 1987). Using this information, the Department estimates there are between 154,742 and 773,708 adult coyotes in California. The low population estimate was used for harvest analysis (Appendix 4).

Research has shown that coyotes produce one litter per year, litters average 5.5 pups and adults are sexually mature at one year of age (Zeiner *et al.* 1990). The sex ratio is typically 50 percent males to 50 percent females. Adult mortality is 35 percent (Dow 1974), and juvenile mortality is 54 percent (Voight and Berg 1987). Female breeding success ranges between 48 and 81 percent (Knowlton 1972). The allowable harvest level is 70 percent (Connolly and Longhurst 1975).

GRAY FOX

The gray fox is an uncommon-to-common, permanent resident of low-to-middle elevations throughout much of the State, except northeastern California. It frequents most shrub types, and riparian and brush stages of conifer and woodland habitats. Gray foxes are also found in meadows and agricultural areas (Zeiner *et al.* 1990).

Gray foxes occupy 39 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of 76,601,717 acres (Forest and Rangeland Resources Assessment Program 1988).

Gray fox densities in various habitats have been estimated at 2.54 and 3.04 per square mile (Gould 1980), three and four per square mile (Lord 1961) and one per square mile (Grinnell *et al.* 1937). Using this information, the Department estimates there are between 119,690 and 363,858 adult gray foxes in California. The low population estimate was used for harvest analysis (Appendix 5).

Research has shown that gray foxes produce one litter per year, litters average 3.8 pups, and adults are sexually mature at one year of age (Fritzell and Haroldson 1982). The sex ratio is typically 53 percent males to 47 percent females. Adult mortality is 62 percent, and juvenile mortality is 45 percent (Lord 1961). Female breeding success is 95 percent (Layne and McKeon 1956, Wood 1958). The allowable harvest is 25 percent (Fritzell 1987).

MINK

The mink is an uncommon, permanent resident, generally occurring in the northern half of the State. They are semiaquatic, inhabiting most aquatic habitats, including some coastal areas (Zeiner *et al.* 1990).

Mink are found in seven of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of about 18,963 stream miles (California Fish and Wildlife Plan 1965).

Mink densities range between 1.25 and 2.5 adults per mile of stream (Hatler 1976). Using this information, it is estimated that the adult mink population ranges between 23,704 and 47,408 animals. This estimate is considered very conservative,

because only stream miles were used. Mink density data for lakeshore miles and wetland acres are not available. The low population estimate was used for harvest analysis (Appendix 6).

The adult sex ratio is 50 percent males and 50 percent females (Marshall 1936). The litter size averages 4.5 kits (Hansson 1947, Enders 1952). Female breeding success is estimated to be 80 percent. Total annual mortality is 50 percent (Askin and Chapman 1984).

MUSKRAT

The muskrat is native to the drainage east of the Sierra from Modoc County south to Mono County. It was introduced into northern California from the east in the late 1920's for fur farming. Some escaped and others were deliberately planted in the Pit and Klamath rivers. Now, muskrats are scattered in California but are continuously distributed along the Colorado River, in wetlands south of the Salton Sea, the Sacramento and San Joaquin valleys, the San Francisco Bay area, and in the northern interior counties. They are abundant in fresh emergent wetland habitats. Muskrats are common to abundant in riparian, aspen, lake, river, and estuary habitats. They are also found in human-made habitats, such as roadside and irrigation ditches (Zeiner *et al.* 1990).

Muskrats are found in five of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988), consisting of about 4,482 stream miles (California Fish and Wildlife Plan 1965).

Muskrat densities range between three and 15 adults per kilometer of stream (Messa 1980). Using this information, it is estimated that the adult muskrat population ranges between 22,410 and 112,050 animals. This estimate is considered very conservative, because there are no data on lakeshore miles and wetland acres. The low population estimate was used for harvest analysis (Appendix 7).

The adult sex ratio is 55 percent males and 45 percent females (Messa 1980). The muskrat is a highly prolific rodent, where each female gives birth to an average of 2.8 litters, totaling over 18 young per year (Smith *et al.* 1981). One study in California showed that the annual litter rate is 19.3 young per year. Female breeding success is estimated to be 80 percent. Total annual mortality is 56 percent (Boutin and Berkenholz 1987). The allowable harvest level is 60 percent (Boutin and Berkenholz 1987).

RACCOON

The raccoon is a widespread, common-to-uncommon, permanent resident throughout most of the State, except alpine and desert habitats. It is most abundant in riparian and wetland areas, as well as some suburban areas, such as Marin and Alameda counties (Zeiner *et al.* 1990).

Raccoons are found in 42 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships Database 1988). Raccoons also occur in agricultural habitats, as well as in suburban areas. These habitats comprise 78,977,984 acres (123,403 square miles) (Forest and Rangeland Resources Assessment Program 1988).

Raccoon reproduction research indicates that the sex ratio is 48 percent females and 52 percent males and that 86 percent of the females breed each year (Sanderson 1987). The average litter size is 3.5 (Zeiner *et al.* 1990). Total annual mortality is estimated to be 49 percent (Cowan 1973). The allowable harvest level is 49 percent (Sanderson 1987).

Raccoon density estimates range from nine to 56 per square mile in several eastern and midwestern United States studies (Sanderson 1987). Two studies in California resulted in comparatively low density estimates of 0.24 and 0.7 per square mile in Alameda and Contra Costa counties, respectively (Orloff 1980), and an under-representation of the State's true raccoon population. Using these California data, a very conservative spring population estimate for adult raccoons in California ranges between 29,617 and 86,382. The low population estimate was used for harvest analysis (Appendix 8). If low density estimates from other states were used, the California population would be about one million animals (123,403 square miles divided by nine raccoons per square mile = 1,110,627).

SPOTTED SKUNK

The spotted skunk is a common-to-uncommon, permanent resident in a major part of the State, except the high Sierra and portions of the southeast deserts (Zeiner *et al.* 1990). It occurs in shrub habitats with moderate canopy closure, in open forest and woodland types with scattered openings, and in riparian habitats (Zeiner *et al.* 1990).

They occupy 35 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships System 1988), totaling 56,139,438 acres (Forest and Rangeland Resources Assessment Program 1988).

Spotted skunk densities in various habitats have been estimated to range between one and 5.7 per square mile (Crabb 1948). Using this information, the Department estimates there are between 87,718 and 499,992 adult spotted skunks in California. The low population estimate was used for harvest analysis (Appendix 9). Research has shown that spotted skunks produce one litter per year, litters average four young, and adults are sexually mature at one year of age (Howard and Marsh 1982). The sex ratio is estimated to be 54 percent males to 46 percent females. Total annual mortality is 55 percent (Casey and Webster 1975). Female breeding success is estimated at 80 percent.

STRIPED SKUNK

The striped skunk is a common resident in California, except for the high Sierra and xeric (dry) areas of the Mojave and Colorado deserts. It is found in nearly all habitats, but frequents earlier seral (successional) stages of conifers and woodlands, intermediate-canopy stages of shrub types, and is a well-known urban dweller (Zeiner *et al.* 1990).

They occupy 38 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships System 1988), consisting of 51,179,453 acres (Forest and Rangeland Resources Assessment Program 1988).

Striped skunk densities in various habitats have been estimated to range between 1.3 and 6.2 per square mile (Bjorge 1977). Using this information, the Department estimates there are between 103,958 and 495,801 adult striped skunks in California. This is a very conservative estimate, because agricultural and residential habitats were not included. The low population estimate was used for harvest analysis (Appendix 10).

Research has shown that striped skunks produce one litter per year, litters average 5.6 young, and adults are sexually mature at one year of age (Rosatte 1987).

The sex ratio is 54 percent males to 46 percent females (Casey and Webster 1975). Total annual mortality is 55 percent (Linduska 1947, Verts 1967). Female breeding success is estimated at 80 percent.

VIRGINIA OPOSSUM

The Virginia opossum, an introduced species, is found from the Oregon border to the Mexican border west of the Cascade, Sierra, Transverse, and Peninsular mountain ranges. It is a common-to-abundant inhabitant of woodlands, shrub habitats, riparian, agricultural, and residential areas at low elevations (Zeiner *et al.* 1990).

They occupy 21 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships System 1988), consisting of 16,405,681 acres (Forest and Rangeland Resources Assessment Program 1988).

Opossum densities in various habitats have been estimated to range between 1.3 and 20.2 per square mile (Stout and Sonenshine 1974). Using this information, the Department estimates there are between 33,324 and 517,804 opossums in California. This is a very conservative estimate, because agricultural and residential habitats were not included. The low population estimate was used for harvest analysis (Appendix 11).

Research has shown that opossums produce two litters per year (Zeiner *et al.* 1990), and litters average 7.2 young (Reynolds 1952). The sex ratio is 56 percent males to 44 percent females (Seidensticker *et al.* 1987). Total annual mortality is 80 percent (Seidensticker *et al.* 1987). Female breeding success is estimated at 80 percent.

WEASELS

There are two species of weasels in California, the long-tailed weasel (*Mustela frenata*) and ermine (*Mustela erminea*), sometimes called the short-tailed weasel. However, the Fish and Game Code and other regulatory documents refer to weasels collectively.

Long-Tailed Weasel

The long-tailed weasel is a common-to-uncommon, permanent resident of most habitats, except dry shrub types in the Mojave and Colorado deserts. It is found in intermediate cover stages of conifer and woodland habitats, interspersed with lower seral stages, open forest, woodland, and shrub types from sea level to alpine meadows (Zeiner *et al.* 1990).

The long-tailed weasel is found in 40 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships System 1988), consisting of 58,783,640 acres (Forest and Rangeland Resources Assessment Program 1988).

Long-tailed weasel density estimates range from 2.6 to 18 per square mile (Zeiner *et al.* 1990). Using this information, it is estimated that the adult long-tailed weasel population in California ranges between 238,809 and 1,653,290 animals. The low population estimate was used for harvest analysis (Appendix 12).

Research has shown that long-tailed weasels produce one litter per year, and litters average 6.5 young (Zeiner *et al.* 1990). The sex ratio is estimated to be 55 percent males to 45 percent females. Total annual mortality is estimated to be 60 percent. Female breeding success is estimated at 95 percent.

Ermine

The ermine is an uncommon-to-common resident of the Sierra Nevada, Klamath, and North Coast ranges. They are found from sea level to 3,800 meters (12,500 feet). Ermine are found primarily in conifer habitats (Zeiner *et al.* 1990).

The ermine is found in 17 of the 48 WHR habitat types in California (California Statewide Wildlife Habitat Relationships System 1988), consisting of 18,635,871 acres (Forest and Rangeland Resources Assessment Program 1988).

Ermine density estimates range from 10 to 28 per square mile (Fagerstone 1987). Using this information, it is estimated that the adult ermine population in California ranges between 291,185 and 815,319 animals. The low population estimate was used for harvest analysis (Appendix 13).

Research has shown that ermine produce one litter per year, and litters average five young (Zeiner *et al.* 1990). The sex ratio is estimated to be 55 percent males to 45 percent females. Total annual mortality is estimated to be 60 percent. Female breeding success is estimated at 95 percent.

WILDLIFE SERVICES

The USDA Wildlife Services Program in California is directed toward the reduction of animal damage to agricultural resources and other property; and the surveillance and suppression of wildlife-borne diseases, such as plague and rabies. The program is administered by the USDA, Animal and Plant Health and Inspection Service (APHIS), Wildlife Services. This is an integrated program carried out in cooperation with the California Department of Health Services, California Department of Food and Agriculture, California Department of Fish and Game, U.S. Department of Energy, U.S. Department of Defense, U.S. Fish and Wildlife Service, and 36 to 38 contract counties, depending on the time of year (United States Department of Agriculture 1989). The program is funded by the USDA and participating State and county agencies. The Wildlife Services take is included in the harvest analysis for all species. Wildlife Services also conducts trapping to protect endangered species and has been doing so for more than 14 years.

CHAPTER 4. THE ENVIRONMENTAL EFFECTS OF EXISTING HUNTING AND TRAPPING

Historical population and harvest trends with regulations similar to those that currently exist suggest that the removal, by hunting and trapping, of individual animals from furbearer and nongame mammal populations statewide will not significantly reduce those populations. The annual production and survival of young will more than replace animals removed by hunting and trapping. An additional safeguard is that hunting and trapping is not permitted in national, State, and county parks and State game refuges.

The approval of Proposition 4 on November 3, 1998 makes it unlawful for any person to trap for the purposes of recreation or commerce in fur any furbearing or nongame mammal with any body-gripping trap. Body-gripping traps are ones that grip animals' bodies or body parts, including, but not limited to, steel-jawed leghold traps, padded-jaw leghold traps, conibear traps and snares.

The trapping regulation changes proposed by the Department will have no significant effects on the level of trapping occurring presently.

INFLUENCE OF HUNTING AND TRAPPING ON NATURAL MORTALITY

HARVEST MANAGEMENT

The general theory applying to the hunting and trapping of furbearing and nongame mammals is based on the premise that when animals are not harvested at all (the term "harvest" is used to describe the removal by humans of a portion of any renewable natural resource), survival rates and population sizes are balanced by natality (birth rate) and natural mortality. The average growth rate of a population at its carrying capacity is zero (Dixon and Swift 1981). Harvesting reduces the population size temporarily, but this reduction results in an increase in the growth rate of the population. This increase in growth rate is brought about because of higher birth rates and lower death rates resulting from decreased competition for available resources (food, cover, and water). This increased growth rate provides a surplus of individuals above the number required to replace the population, and this surplus can be harvested annually (Robinson and Bolen 1984).

The long-term effects of annually removing animals from a natural ecosystem are unknown or poorly understood (Favre and Olsen 1982). A dead animal in the wild feeds countless organisms vital to a balanced ecosystem, including mammalian and avian scavengers, insects, and microscopic organisms. Its body enriches the soil, nourishing plant life in the area (Defenders of Wildlife 1984).

The balance of natural ecosystems is also affected by such things as air pollution, water pollution, livestock production, timber harvest, mining, agriculture, urban development, water development, etc.

"Many furbearers now occupy environments altered by man, and such modified environments have changed both the distribution and densities of many furbearers. A 'no-use' policy thus seems inappropriate as wildlife managers strive to achieve a balance between the economic and aesthetic values associated with furbearers and their management" (Linhart 1986).

Trapping may also harmfully alter the age structure of a furbearer population by removing primarily young, inexperienced individuals. Further, since male animals frequently have larger home ranges than females, they are more likely to be trapped. Harvest statistics often show a preponderance of males. It is not known how this may affect a population's reproduction success (Defenders of Wildlife 1984).

An example of alteration of the age class structure of a population occurred in the northeast portion of California. Monitoring (age and sex) of the bobcat population revealed that intensive trapping pressure during a time of high pelt prices had reduced the mean life expectancy of female bobcats. Reduced mean life expectancy in females could suppress reproduction potential. To correct this situation, the Department requested that the Commission reduce the take in that area. Consequently, the trapping season was reduced to 21 days in 1980-81 and 1981-82 and to 30 days for that area for the 1982-83 season. If the commercial take in northeastern California exceeds 425 bobcats per year for more than two successive seasons, the age and sex monitoring program should be reinstated for eastern Siskiyou, Modoc, Lassen, and Plumas counties. The take in northeastern California is as follows:

Year	Harvest
1993-94	124
1994-95	236
1995-96	122
1996-97	221
1997-98	307
1998-99	83
1999-00	69
2000-01	95
2001-02	104
2002-03	199

In 1994-95, the Commission extended the season to 69 days in northeastern California. The Department will continue to monitor harvest to ensure that the 425 quota is not exceeded.

COMPENSATORY MORTALITY

The term "harvestable surplus" is that proportion of the game population that would inevitably die of other causes if not taken by hunters and trappers. Implicit in this definition is that the mortality inflicted by hunters and trappers is compensatory, not additive, to natural mortality (Shaw 1985). The concept of compensatory mortality often has been used to justify annual harvests (Fritzell 1987). Although empirically untested (Romesburg 1981), comparable mortality rates in exploited and unexploited populations lend support to the hypothesis of compensatory mortality in muskrats (Errington 1946, Clay and Clark 1985), beavers (Payne 1984), and coyotes (Davison 1980). Both natural mortality and reproduction of bobcats in California appear to respond in a compensatory manner to harvest (Lembeck and Gould 1979, Zezulak and Schwab 1979). Storm and Tzilkowski (1982) reviewed evidence for compensatory changes in fox populations, and Keith (1974) concluded that compensation in timber wolves may be more clear cut and of greater magnitude than in coyotes and foxes. Studies of bobwhite (Baumgartner 1944), ruffed grouse (Palmer 1956), waterfowl (Anderson and

Burnham 1976, Nichols and Hines 1983, and others) and white-tailed deer (McCullough 1979) also have demonstrated that natural mortality and hunting mortality are compensatory.

ADDITIVE MORTALITY

In some cases, the harvest of wildlife species may be additive rather than compensatory. That is, the harvest causes a reduction in the population rather than no change. Whether or not hunting and trapping is additive depends in each individual case upon the intensity of the harvest in relation to the ability of the population to compensate. Up to a certain point or threshold, hunting can be expected to be compensatory. Once that threshold is exceeded, however, any more hunting mortality becomes additive. According to Shaw (1985), "Properly regulated, this additive mortality can reduce a population to a more productive level, thus assuring a higher yield (the portion of a harvestable surplus that is actually removed due to hunting or trapping) while assuring the long-term survival of the population" (Shaw 1985).

It has also been suggested that additive mortality has contributed to declines in some wildlife populations, particularly in waterfowl (Grandy 1983, Conroy and Krementz 1990, and others).

All population models used in harvest analysis (appendices 1-13) consider both additive and compensatory mortality.

SUSTAINABILITY OF REGULATED HARVESTS

The sustainability of regulated harvests has been demonstrated by the generally increasing populations and harvests of most (North American) furbearer species in this century (Obbard *et al.* 1987). Populations of muskrats, nutria, raccoons, coyotes, red foxes, and others are quite resilient (Errington 1946, Connolly and Longhurst 1975, Kinler *et al.* 1987, Sanderson 1987, Voight 1987), and management often is directed at increasing harvests to increase economic and recreational benefits or to reduce damage to property or habitats. Other species, such as fisher, marten, beaver, otter, lynx, and bobcat, can be less resilient (Brand and Keith 1979, Powell 1982, Douglas and Strickland 1987, Melquist and Dronkert 1987, Novak 1987c, Rolley 1987); and more restrictive regulations are often required to maintain sustained harvests and prevent overharvest (Gill 1990). The lynx does not occur in California. The fisher,

marten, and river otter are fully protected by statute in California. Beaver and bobcat, as well as others, are closely monitored through hunting surveys and trapping harvest reports.

The following paragraph is excerpted from page 200 of a publication titled *Analysis of Vertebrate Populations* written by Graeme Caughley:

> "Most wildlife populations extinguished by humans were eliminated by accident, often in spite of vigorous attempts to avert the extinction. In contrast, most premeditated attempts to destroy a population have been unsuccessful. The paradox is less puzzling when it is realized that unplanned exterminations are usually caused by a change in the animals' habitat, whereas the planned attempts are usually aimed at the animals themselves. The message is clear: populations are more vulnerable to a manipulation of their habitat than they are to the direct manipulation of their numbers. An environmental change tends to affect one or more of the habitat components (food, cover, water and space); and, when this change is deleterious, the population cannot necessarily adjust to it by lowering density, as it can when the change affects only the quantity of the resource. A population attacked frontally by shooting or trapping does not have to contend with deteriorating habitat but, in fact, is favored by improved habitat. The reduction in density caused by the control measures improves the quality of the habitat while increasing the quantity available to each surviving animal. The harvesting of individual animals automatically increases the potential rate of growth. This is precisely the aim of a harvesting program" (Caughley 1978).

EFFECTS OF HARVEST ON INDIVIDUAL SPECIES

State regulations governing hunting and trapping of furbearing and nongame mammals have been in effect since 1917. Since that time, certain animals, because of declining populations or public concern, have been afforded complete legal protection. These include: fisher, marten, wolverine, river otter, kit fox, red fox, and ringtail.

The goal of harvest regulations is to provide an opportunity to take surplus animals and make certain that the removal by hunting and trapping does not reduce the population below its sustained-yield capabilities.

Furbearers that may be taken by hunting and trapping include: badger, beaver, gray fox, mink, muskrat, and raccoon. Nongame mammals that may be taken by

hunting and trapping include: bobcat, coyote, spotted skunk, striped skunk, Virginia opossum, long-tailed weasel, and ermine. In the following paragraphs, each species will be discussed separately (long-tailed weasel and ermine are discussed collectively under weasels). Discussion points will include: harvest totals, pelt values, habitat use, reproduction potential, population estimates, and potential impacts.

The take of furbearing and nongame mammals has increased slightly during the year 2002-03 but remains much lower than in the recent past. The following table illustrates the trend in past years.

Year	Licensed Trappers	Animals Taken
2002-03	133	8,501
2001-02	211	8,109
2000-01	76	10,363
1999-00	79	6,256
1998-99	170	9,500
1997-98	292	24,366
1996-97	282	24,136
1995-96	257	15,011
1994-95	313	14,545
1993-94	300	16,332
1992-93	338	13,769
1991-92	371	16,255

BADGER (*Taxidea taxus*)

Historically, badgers have been relatively unimportant in the fur market. Most badgers were, and possibly still are, taken incidentally to trapping for other animals, mainly coyotes (Messick 1987). Most of the badger take by trapping is due to USDA Wildlife Services, not commercial trapping. The following is a 10-year summary of the badger trapping take in California obtained from the Department's annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	2	Not available	0
2001-02	5	Not available	0
2000-01	18	Not available	0
1999-00	2	Not available	0
1998-99	5	$11.01	0
1997-98	50	10.08	181
1996-97	49	6.87	337
1995-96	23	2.15	11
1994-95	22	Not available	Not available
1993-94	42	4.37	48
Average	22		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for badgers in California using the low end population estimation. It is presented in Appendix 1. It demonstrates that the badger population beginning its annual cycle in the spring season with 96,362 adults will produce 85,521 young during spring and summer and experience a 45 percent total annual mortality of 81,847 animals (81,423 from natural causes and 424 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 3,674 badgers to the adult population by the next spring season if the harvests considered compensatory or 3,250 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 45 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The annual harvest of 424 badgers (including hunting, trapping, and depredation take) is less than one percent of the total annual mortality. Based on this analysis, the proposed project is not expected to have a significant impact on the badger population in California.

BEAVER (*Castor canadensis*)

Because of their low reproductive rate and vulnerability to trapping, beaver populations can sometimes be controlled by trapper harvests (Parsons 1975, and Parsons and Brown 1978). This is fortunate because it allows a favorable balance to be maintained between costs and benefits of beaver occurrence (Bishop 1990). Research conducted in New York has demonstrated that the long-term carrying capacity of beaver habitat is reached when 30-40 percent of the available habitat is occupied (Parsons and Brown 1979). When beaver populations grow too large and exceed long-term carrying capacity, serious habitat degradation results. Ultimately, the habitat becomes unavailable to beaver. This also adversely affects waterfowl and other species associated with beaver impoundments (Bishop 1990).

For several years now, the demand for beaver pelts has been low, and pelt prices have been depressed, resulting in a reduced take. In recent years, the beaver population has been stable to increasing. There may be an increased need for water control agencies to compensate commercial trappers to assist in controlling beaver damage.

The following is a summary of the beaver trapping harvest for the last 10 years obtained from the Department's annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	98	$9.38	$563
2001-02	184	13.12	866
2000-01	172	11.51	633
1999-00	272	10.64	2,894
1998-99	313	13.06	1,646
1997-98	542	13.92	2,575
1996-97	526	13.31	7,001
1995-96	299	5.80	597
1994-95	257	9.96	2,022
1993-94	509	8.21	1,954
Average	317		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for beavers in California using the low end population estimation. It is presented in Appendix 2. It demonstrates that the beaver population beginning its annual cycle in the spring season with 10,789 adults will produce 15,406 young during spring and summer and experience a 30 percent total annual mortality of 7,858 animals (6,515 from natural causes and 1,343 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,548 beavers to the adult population by the next spring season if the harvest is considered compensatory or 6,205 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 30 percent that was used in the model, and the adult population in the next spring season would probably be

closer to the preceding spring adult population, not higher. Based on this analysis, the proposed project is not expected to have a significant impact on the beaver population.

Concern has been expressed that the model used to depict the beaver annual cycle is not accurate because: (1) beavers seldom occupy 100 percent of their available habitat, (2) the model uses a constant "average" litter size, (3) the model does not allow for adjusted reproduction declines during dry seasons, (4) the model does not increase mortality rates with increased density, and (5) the model does not allow for still further declines in reproduction as lower quality sites are used. The Department's response is as follows: The beaver population density data used were taken from the literature. Therefore, if beaver seldom occupy 100 percent of their available habitat because of some self-regulation mechanism, that characteristic would be reflected in the density data found in the literature and in the data the Department subsequently used in the model. Also, as was explained in Chapter 3, the Department's beaver population estimate is very conservative, because of all the beaver habitat in California: streams, lakes, marshes, irrigation ditches, etc., only the stream miles were used. The analysis of the beaver annual population cycle was based on this very conservative estimate in combination with the lowest density data to ensure that any errors would be on the conservative side.

BOBCAT (*Felis rufus*)

The bobcat is a highly valued nongame species, sought by both trappers and hunters primarily for its fur. The Department has been engaged in an extensive bobcat harvest monitoring program since 1978. As a result of this program, a bobcat population estimate was developed by the Department, and harvest thresholds were established that have been acknowledged by the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). In 1973, the United States became a party to CITES. This treaty restricted trade in endangered species and established procedures to monitor the trade of other species that might be faced with endangerment in the future. The bobcat was one of the species deemed by the parties to the treaty as a candidate for future endangerment, primarily due to concern for the Mexican bobcat. Under CITES, export tags are required for bobcat pelts offered for sale. Tags are also required for hunting of bobcats. Collectively, the tagging procedures and reports from the USDA Wildlife Services Program provide the Department the information needed to calculate the total annual bobcat harvest. Management guidelines provide that no more than 14,400 bobcats may be taken in California annually from hunting, trapping, and USDA Wildlife Services programs.

A summary of the most recent 10 years' harvest information taken from the Department's annual Licensed Fur Trappers and Dealers Reports follows.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	394	$186	$62,773
2001-02	214	66	12,408
2000-01	220	38	6,809
1999-00	178	32	3,847
1998-99	190	31	4,650
1997-98	1038	31	26,039
1996-97	984	75	74,036
1995-96	719	37	18,446
1994-95	1,018	25	19,059
1993-94	1,105	40	38,661
Average	606		

Data on the bobcat harvest were gathered through the process of tagging bobcat furs for export, the annual trapping report and hunter survey, and USDA Wildlife Services records.

The statewide bobcat population estimate is 70,000-74,000 breeding adults (Gould 1982). Since the 1982-83 season, total annual harvest has remained below the 14,400 statewide harvest threshold limit and below the limits established for each of the three bobcat trapping zones.

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for bobcats in California using the low end population estimation. It is presented in Appendix 3. It demonstrates that the bobcat population beginning its annual cycle in the spring season with 70,207 adults will produce 50,233 young during spring and summer and experience a total annual mortality of 38,832 animals (37,800 from natural causes and 1,032 from harvest) during

the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 11,402 bobcats to the adult population by the next spring season if the harvest is considered compensatory or 10,370 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than that used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. Based on this analysis, the proposed project is not expected to have a significant adverse impact on the bobcat population in California. Concern has been expressed that trapping of bobcats occurs at a time when the kittens are still completely dependent on the mother. The trapping season as exists for bobcat ends on January 31, and the hunting season ends on February 28. Most bobcat kittens are usually born in the spring (March-May) in California, thus the risk of hunting or trapping females during the critical point in the life of their young is expected to be negligible.

Based on 2002-03 harvest data (394 bobcats trapped), if the 69-day bobcat trapping season was extended by 51 days, an increased harvest would be expected. In northeastern California, the increased season length is expected to result in an additional 148 bobcats trapped. Adding this to the 2002-03 northeastern California bobcat trapping harvest of 199 totals 347. This is well below the allowable quota of 425 bobcats that may be trapped in northeastern California. The total statewide take would increase by 291 bobcats for a total expected statewide harvest of 685 bobcats. However, pelt price has more influence on harvest than season length.

Under this scenario, a larger window of opportunity would be open to trappers, and would provide them with more potential income for the year. The harvest would still be expected to remain well under the established quota of 14,400 animals per year. The actual harvest would amount to about one percent of the adult bobcat population.

COYOTE (*Canis latrans*)

The coyote is most frequently the target of animal damage control efforts, as distinguished from random hunting and trapping, mainly because of depredation problems with livestock and poultry. The estimated loss of livestock and poultry in

California due to coyotes in 1996-97 was $2,678,210 (USDA 1997). In 2002-03 in California, Federal Wildlife Services personnel took an estimated 8,172 coyotes, hunters took 52,947 (2002 game take estimate), and trappers took 776 (10-year average). Intensive control efforts or increased harvests resulting from higher pelt prices may increase recruitment rates through compensatory reproduction. (Recruitment is defined as the number of young of the year that survive to breed. Compensatory reproduction is defined as the occurrence of higher-than-average litter rates stimulated by unusually high annual mortality.) Tests of varying levels of control kills showed that a coyote population can maintain itself and even increase, except at the very highest levels of control (harvest) (Connolly and Longhurst 1975).

A summary of the most recent 10 years' harvest information taken from the Department's annual Licensed Fur Trappers and Dealers Reports follows:

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	396	None reported sold	None reported sold
2001-02	290	$10.83	$780
2000-01	296	9.29	399
1999-00	201	6.95	174
1998-99	301	10.80	151
1997-98	1,377	10.49	5,612
1996-97	1367	11.00	15,037
1995-96	1,209	6.13	1,808
1994-95	1,054	8.32	5,158
1993-94	1,264	15.29	7,202
Average	776		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for coyotes in California using the low end population estimation. It is presented in Appendix 4. It demonstrates that the coyote population beginning its annual cycle in the spring season with 154,742 adults will produce 276,601 young during spring and summer and experience an annual mortality of 203,524 animals (141,629 from natural causes and 61,895 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 73,077 coyotes to the adult population by the next spring season if the harvest is considered compensatory or an increase of 11,182 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the percentage that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest level of 61,895 coyotes is far below the estimated number of young animals produced each year (276,601) and is not expected to have a significant impact on the coyote population in California.

GRAY FOX (*Urocyon cinereoargenteus*)

Department trapping records for the past 10 years indicate that an average of 623 gray foxes are taken by trappers annually. The following data were obtained from the Department's annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	266	$9.81	$775
2001-02	203	7.74	519
2000-01	178	7.44	580
1999-00	260	5.63	484
1998-99	232	7.17	316
1997-98	825	7.46	4,245
1996-97	822	9.98	8,204
1995-96	851	8.01	4,061
1994-95	1,182	8.10	8,230
1993-94	1,406	9.53	10,912
Average	623		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for gray foxes in California using the low end population estimation. It is presented in Appendix 5. It demonstrates that the gray fox population beginning its annual cycle in the spring season with 119,690 adults will produce 203,078 young during spring and summer and experience a total annual mortality of 165,593 animals (162,078 from natural causes and 3,515 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 37,485 to the adult population by the next spring season if the harvest is considered compensatory or 33,970 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the percentage that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest of 3,515 animals is far below the estimated number (203,078) of young animals produced each year and is not expected to have a significant impact on the gray fox population.

MINK (*Mustela vison*)

The highest annual recorded take of mink was 5,854 animals in 1927-28. Between 1921-22 and 1963-64, the annual take averaged about 1,500. Since then, the annual take has been below 1,000. A summary of the most recent 10 years' harvest information taken from the Department's annual Licensed Fur Trappers and Dealers Reports follows.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	7	$5.00	$35
2001-02	1	No Sales	No Sales
2000-01	2	4.40	No Sales
1999-00	4	5.00	5
1998-99	13	No Sales	No Sales
1997-98	76	6.15	781
1996-97	119	7.63	908
1995-96	42	3.00	697
1994-95	26	.75	11
1993-94	73	9.15	576
Average	36		

The decline in the number of wild mink taken has followed the growth of ranch mink production. During the period of 1953-66, ranch mink production in North America increased from 1,000,000 to 11,000,000 pelts. Between 1967 and 1976, North America's ranch mink production decreased by 65 percent because of the increased world supply of ranch mink and lower production costs in the Soviet Union and Europe (Chapman and Feldhamer 1982).

Hunting for this species is almost nonexistent, and Wildlife Services personnel did not take any mink in the 2001-02 year. Undoubtedly more important than regulations for the well being of the species is the maintenance of mink habitat. It is expected that mink, as well as many other animal species, will benefit from the Department's Comprehensive Wetland Habitat Program and the Central Valley Joint

Venture segment of the North American Waterfowl Management Plan, which both seek to increase wetland habitat in the State, as well as the Federal government's recent policies to protect and increase wetlands.

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for mink in California using the low end population estimation. It is presented in Appendix 6. It demonstrates that the mink population beginning its annual cycle in the spring season with 23,704 adults will produce 42,667 young during spring and summer and experience a 50 percent total annual mortality of 33,185 animals (33,049 from natural causes and 136 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 9,482 mink to the adult population by the next spring season if the harvest is considered compensatory or 9,346 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 50 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest of 136 animals is far less than the 42,667 animals produced each year and is not expected to have a significant impact on the mink population.

MUSKRAT (*Ondatra zibethica*)

The 5,419 muskrats taken by trappers during the 2002-03 season represented 64 percent of the total furbearer take for the year. Muskrats also were taken by Wildlife Services personnel during the 2002-03 year. The annual take of muskrats has been as high as 105,000 in 1954-55.

In irrigated farmlands in California, the muskrat is considered a nuisance due to its habit of burrowing into levees. Reported muskrat damage occurs in 28 of California's 58 counties, with a minimum annual loss of $1,000,000 reported (Belluomini 1978). Commercial trapping assists in the reduction of damage to agricultural land water delivery systems. Should this type of harvest be reduced appreciably, killing of muskrats by other means, including poison, may be increased.

Another point of view regarding muskrat depredation is a quote from Dr. Paul Errington, respected zoologist and widely recognized as one of the world's

leading authorities on muskrats: "Muskrats are a prolific species, and neither disease, or natural predation, or trapping will effectively lower their numbers. They simply reproduce faster when more are killed (Russell, no date)."

A summary of the most recent 10 years' harvest information taken from the Department's annual Licensed Fur Trappers and Dealers Reports follows.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	5,419	Not reported	Not reported
2001-02	5,774	$2.56	$1,695
2000-01	7190	1.89	7,656
1999-00	2,820	1.67	4,701
1998-99	6,633	1.81	6,375
1997-98	17,666	1.96	33,475
1996-97	17,557	3.15	55,305
1995-96	8,690	1.50	10,718
1994-95	10,096	1.09	10,654
1993-94	10,129	1.91	15,465
Average	9,197		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for muskrats in California using the low end population estimation. It is presented in Appendix 7. It demonstrates that the muskrat population beginning its annual cycle in the spring season with 22,410 adults will produce 155,705 young during spring and summer and experience a 56 percent total annual mortality of 99,744 animals (88,212 from natural causes and 11,532 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 55,960 muskrats to the adult population by the next spring season if the harvest is considered compensatory or 44,428 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore,

the total annual mortality in reality is probably higher than the 56 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest of 11,532 animals is far below the 155,705 young produced and is not expected to have a significant impact on the muskrat population.

RACCOON (*Procyon lotor*)

Trapper take, pelt price, and overall revenue for raccoons has declined substantially in the past decade. At this time, the demand for raccoon pelts is increasing. The following data were obtained from the Department's annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	709	$8.00	$232
2001-02	539	5.66	153
2000-01	841	8.11	551
1999-00	1,245	4.08	139
1998-99	459	$9.22	$572
1997-98	1,073	8.51	4,187
1996-97	1,057	11.20	11,838
1995-96	1,012	6.17	703
1994-95	355	4.72	1,166
1993-94	786	5.47	2,724
Average	808		

Using biological data and population estimates described in Chapter 3, a population model was constructed for adult raccoons in California using the low range population estimate. It is presented in Appendix 8. It demonstrates that the raccoon population beginning its annual cycle with 29,617 adults in the spring will produce 42,790 young during spring and summer and experience a 49 percent total mortality of 35,479 animals (25,628 from natural causes and 9,851 from harvest) during the annual

cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,311 raccoons to the adult population in the next spring season if the harvest is considered compensatory or an increase of -2,540 if the harvest is considered additive.

The harvest of 9,851 raccoons (including hunting, trapping and depredation take) represents about 28 percent of the total annual mortality of 35,479 and is not judged to be a significant impact to the raccoon population, particularly because population estimates are considered to be well below the true population size, as discussed in Chapter 3.

The raccoon is one of the species most favored by hunters who pursue their quarry with trailing hounds.

SPOTTED SKUNK (*Spilogale putorius*)

The harvest of spotted skunks in the past 10 years is somewhat related to pelt value. Skunk pelts have a lower value than most other furs. It would take only 100 female spotted skunks to produce enough offspring to offset those taken by trapping. Based on the low annual take, the Department has determined that the proposed action will not jeopardize California's spotted skunk population. USDA Wildlife Services personnel also took 4 spotted skunks during the 2002-03 year.

A summary of the most recent 10 years' harvest information taken from the Department's annual Licensed Fur Trappers and Dealers Reports follows.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	64	None reported sold	No Sales
2001-02	18	No Sales	No Sales
2000-01	25	No Sales	No Sales
1999-00	27	No Sales	No Sales
1998-99	11	No Sales	No Sales
1997-98	14	No Sales	No Sales
1996-97	14	No Sales	No Sales
1995-96	33	$2.59	$13
1994-95	24	No Sales	No Sales
1993-94	46	1.38	25
Average	28		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for spotted skunk in California using the low end population estimation. It is presented in Appendix 9. It demonstrates that the spotted skunk population beginning its annual cycle in the spring season with 87,718 adults will produce 129,121 young during spring and summer and experience a 55 percent total annual mortality of 119,261 animals (119,128 from natural causes and 133 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 9,859 spotted skunks to the adult population by the next spring season if the harvest is considered compensatory or 9,726 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 55 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest of 133 animals is far below the 129,121 young produced each year and is not expected to have a significant impact on the spotted skunk population.

STRIPED SKUNK (*Mephitis mephitis*)

Most of the striped skunk take is attributed to citizen complaints. In this connection, USDA Wildlife Services personnel took 4,000 skunks in 2002-03, compared to 966 by trappers. The pelt value is low, and the highest value in the last 10 years was $5.02 in 2000-01. Harvest by commercial trapping constitutes a very minor portion of annual mortality.

The following is a summary of the striped skunk trapping harvest for the last 10 years obtained from the Department's annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	735	Not Reported	$0
2001-02	667	$4.04	32
2000-01	1083	5.02	15
1999-00	914	No Sales	No Sales
1998-99	1050	$2.30	$9
1997-98	1123	2.20	92
1996-97	1,113	2.00	2,226
1995-96	1,877	2.15	41
1994-95	382	2.00	48
1993-94	712	1.39	85
Average	966		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for striped skunk in California using the low end population estimation. It is presented in Appendix 10. It demonstrates that the striped skunk population beginning its annual cycle in the spring season with 103,958 adults will produce 214,237 young during spring and summer and experience a 55 percent total annual mortality of 175,007 animals (168,521 from natural causes and 6,486 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 39,230 striped skunks to the adult population by the next spring season if the harvest is considered compensatory or an increase of 32,744 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 55 percent that was used in the model, and the adult population in the next spring season would

probably be closer to the preceding spring adult population, not higher. The current annual harvest of 6,486 animals is far less than the 214,237 young produced and is not expected to have a significant impact on the striped skunk population.

VIRGINIA OPOSSUM (*Didelphis virginianus*)

The Virginia opossum has limited food and sport value. Some night hunting, with or without dogs, occurs in California. Although there is no supporting documentation, due to casual conversations with hunters, hunting of this species is judged to be low. The average price per pelt is usually lower than any other California furbearing or nongame mammal. The annual trapping take was highest (2,208) in 1927-28.

Take for the past 10 years, according to the Department's Licensed Fur Trappers and Dealers Reports, is as follows.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	411	Not Reported	$0
2001-02	214	$1.00	$3
2000-01	338	1.50	5
1999-00	333	1.15	No Sales
1998-99	292	2.39	21
1997-98	529	2.61	65
1996-97	526	1.37	172
1995-96	243	1.53	40
1994-95	127	.88	17
1993-94	247	.65	18
Average	326		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for Virginia opossum in California using the low end population estimation. It is presented in Appendix 11. It demonstrates that the opossum population beginning its annual cycle in the spring season with 33,324 adults will produce 168,913 young during spring and summer and experience an 80 percent

total annual mortality of 161,790 animals (158,906 from natural causes and 2,884 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,123 opossums to the adult population by the next spring season if the harvest is considered compensatory or an increase of 4,239 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 80 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher. The current annual harvest of 2,884 animals is far below the 168,913 young produced and is not expected to have a significant impact on the opossum population.

WEASELS

Economically, weasels are relatively unimportant as furbearers. As a group, they rank last among furbearers in revenue produced. The value of weasel pelts varies throughout the United States and Canada, but pelt prices for the past few years in California have ranged between $.76 and $1 each. Harvest by trapping constitutes a very minor portion of annual mortality. No appreciable hunting of these species occurs. The following data were obtained from the Department's Annual Licensed Fur Trappers and Dealers Reports.

Year	Harvest	Average Pelt Price	Estimated Revenue From Pelts Sold
2002-03	0	No Sales	No Sales
2001-02	0	No Sales	No Sales
2000-01	0	No Sales	No Sales
1999-00	1	No Sales	No Sales
1998-99	1	No Sales	No Sales
1997-98	2	No Sales	No Sales
1996-97	2	No Sales	No Sales
1995-96	13	No Sales	No Sales
1994-95	2	No Sales	No Sales
1993-94	13	No Sales	No Sales
Average	3		

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for long-tailed weasels in California using the low end population estimation. It is presented in Appendix 12. It demonstrates that the long-tailed weasel population beginning its annual cycle in the spring season with 238,809 adults will produce 663,589 young during spring and summer and experience a 60 percent total annual mortality of 541,439 animals (541,432 from natural causes and 7 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 122,151 weasels to the adult population by the next spring season if the harvest is considered compensatory or 122,144 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 60 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher.

Using biological data and population estimates described in Chapter 3, a mathematical model was constructed for ermine in California using the low end population estimation. It is presented in Appendix 13. It demonstrates that the ermine population beginning its annual cycle in the spring season with 291,185 adults will produce 622,409 young during spring and summer and experience a 60 percent total annual mortality of 548,157 animals (548,150 from natural causes and 7 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 74,252 ermine to the adult population by the next spring season if the harvest is considered compensatory or 74,245 if the harvest is considered additive. If the population is assumed to be at carrying capacity, it would not be expected to increase. Therefore, the total annual mortality in reality is probably higher than the 60 percent that was used in the model, and the adult population in the next spring season would probably be closer to the preceding spring adult population, not higher.

In the case of both species of weasels, the current annual harvest of 7 is substantially lower than the number of young produced each year and is not expected to have a significant impact on the weasel population.

IMPACTS ON HABITAT

Hunting and trapping occurs on both private and public lands. However, some private landowners, particularly in the Coast Range and Sierra foothills, are reluctant (for a variety of reasons) to allow the hunters and trappers on their property. Hunting and trapping is prohibited on some public lands, such as national, State, and county parks, and State game refuges. Much of the remaining land available to licensed hunters and trappers is also used all year for other outdoor activities, including, but not limited to, fishing, hunting, hiking, birding, nature study, skiing, swimming, picnicking, off-road vehicles, and camping. Also, much of the public land, about 50 percent of the State's land mass, is grazed by livestock and used for timber production. It is the Department's opinion that neither the existing hunting and trapping regulations, nor the proposed project will not significantly alter or adversely impact the habitat of any wildlife species because of the relatively small number of licensed hunters and trappers. Other habitat considerations are discussed in the Cumulative Impacts section in Chapter 5.

EFFECTS ON RECREATIONAL OPPORTUNITIES

HUNTING OPPORTUNITIES

The outside dates of the existing trapping seasons are November 1 and March 31, except for a zone in southern California where the take of raccoon is permitted beginning July 1. Hunting occurs before, during and after these dates. There is potential for conflict between these user groups during the period when both groups are active in the same area. In practice, conflicts have been minor and limited primarily to those situations where heavy trapping and trail hound use occur simultaneously. A satisfactory solution to this type of conflict is based on each user group being aware of the other's activities and taking appropriate evasive action agreed to by both parties. To date, the Department has been able to resolve any conflicts that were serious enough to have adversely affected hunter success or quality of experience. Finally, the proposed project will result in additional hunting and trapping opportunities for nonnative red fox and additional trapping opportunities for bobcat.

OTHER RECREATIONAL OPPORTUNITIES

The nonconsumptive users (those people who enjoy observing wildlife) of furbearing and nongame mammals have not been and are not expected to be

significantly affected by hunting and trapping of furbearing and nongame mammals. The bulk of the consumptive uses occur in the late fall and early winter in situations where conflicts from the overlap of the two user groups are less likely to occur. Historically, conflicts have been avoided by various user groups recognizing preferred periods and areas of concentrated use by consumptive and nonconsumptive users and separating the two groups. In some situations, exclusive use by one or the other of these groups may be warranted. In other situations, certain restrictions on the activities of one or the other user group may apply. For example, trapping can be prohibited in the immediate proximity of high-use campgrounds and allowed in adjacent areas where potential for conflict with other users is minimal. Likewise, trapping can be given preference over other uses during a period when animals are harvested for depredation or management purposes. The pattern in which these two user groups react to each other and utilize wildlife resources has been influenced by years of coexistence. This relationship has tended to minimize those situations where direct conflicts are unsolvable or difficult to resolve. The majority of trappers seek out private lands to minimize conflicts and trap theft. Trappers who work duck clubs are often restricted to nonshooting hours. The Department cannot say with assurance that there will be no conflicts between user groups in the future or predict when and where such conflicts might be expected to occur.

Some people feel that the best hiking trails and the areas around them should be placed off-limits to hunters and trappers so that hikers would have a better opportunity to observe wildlife. However, a large share of the most popular hiking and viewing spots are off limits to hunting and trapping. These areas are in national parks, national seashores, national monuments, State parks, county parks, ecological reserves, and urban areas where wild animals are more or less tolerant of humans and where hunting and trapping does not occur. Most furbearing and nongame animals are shy, secretive, and nocturnal; and a glimpse of one often requires knowledge of habitat requirements and behavior, along with patience and luck. Although trapping and hunting may make these mammals more wary in some circumstances, such action does not adversely affect population status or distribution, as long as the habitat requirements of the species are met.

EFFECTS ON OTHER WILDLIFE SPECIES

EFFECTS ON THREATENED AND ENDANGERED SPECIES

The Fish and Game Commission has listed a number of plant species as rare, threatened, or endangered and a number of animal species as threatened or endangered which occur in California. These are contained in sections 670.2 and 670.5 of Title 14, CCR.

The approval of Proposition 4 on November 3, 1998 makes it unlawful for any person to trap for the purposes of recreation or commerce in fur any furbearing or nongame mammal with any body-gripping trap. Body-gripping traps are ones that grip animals' bodies or body parts, including, but not limited to, steel-jawed leghold traps, padded-jaw leghold traps, conibear traps and snares.

Existing regulations permit only the use of cage traps, box traps, nets, and suit-case type live beaver traps to capture furbearer and nongame mammals for the purpose of recreation or commerce in fur. The use of these traps eliminates most of the perceived negative impacts of trapping for these purposes. If caught, non-target species and threatened and endangered species can be released. Some injuries have been reported with the use of cage traps, but in comparison to other traps, they are much less severe.

Although body-gripping traps may not be used while trapping for recreation or commerce in fur, conibear traps and snares may be used when trapping to protect crops or property. Consequently, it is not impossible that a threatened or endangered species could inadvertently be killed, although the likelihood of this occurring probably is remote. No deadfall traps or conibear traps (except those completely submerged) or snares may be used for any purpose within the range of the Sierra Nevada red fox or San Joaquin kit fox.

Though not significant, there is a potential for isolated local impacts to threatened, endangered, and rare plants. It is possible that a hunter or trapper may step or drive on one of these plants. However, hunting and trapping has not been identified as one of the causative agents for threatened and endangered plants (Ken Berg, Department Endangered Plant Coordinator, pers. comm.).

EFFECTS OF INCIDENTAL TAKE FROM TRAPPING

The Department acknowledges that incidental take of nontarget species occurs and that intensity can vary with trapper skill, trap, type of set, type and presentation of bait, time of year, and habitat type. As a result of special conditions imposed on trappers, nontarget animals can generally be avoided. If nontarget animals area caught by recreational or commercial fur trappers, typically they can be released unharmed since body-gripping traps may not lawfully be used for these purposes. However, because conibear traps and snares may be used when trapping to protect crops or property, non-target animals, including pets, may be killed. The number of non-target animals so killed is unknown.

SURVIVAL RATES OF RELEASED ANIMALS

This year's proposed project permits only the use of cage traps, box traps, nets, and suit-case type live beaver traps to capture furbearing and nongame mammals for the purposes of recreation or commerce in fur. The use of these traps would eliminate most of the perceived negative impacts of trapping. If caught, non-target species and threatened and endangered species can be released. Some injuries have been reported with the use of cage traps, but in comparison to other traps, they are much less severe.

USE OF DOGS IN PURSUIT AND/OR HUNTING

The use of dogs for pursuit and/or hunting of mammals generally involves having the dogs assist in locating the fresh scent of the animal to be pursued. The dogs are then able to follow the scent to locate the target animal. Although dogs are usually trained to only follow the scent of certain species and existing regulations prohibit any person or his/her dog(s) from killing, capturing, or injuring any animal during the pursuit-only seasons, it is possible that dogs may pursue nontarget species. The effect of a dog pursuing a nontarget species depends on the success of the dog in locating the animal it is pursuing. If the dog locates the animal, the results can be anywhere from the dog killing the animal to the dog "treeing" (baying) the animal and no harm coming to the pursued mammal. Although there are no comprehensive data available on the number of pursuits started versus the number of successful pursuits, it is unreasonable

to assume all pursuits are successful. If this were the case, hunter success would be 100 percent when dogs were used. That is obviously not the case. Bear hunters, who, for the most part use dogs, average approximately 14-15 percent hunter success (Department of Fish and Game 1991).

Although the regulated use of dogs for the pursuit and/or hunting of mammals may result in the occasional death of nontarget species of wildlife, there is no data available to indicate that the regulated use of dogs is having a significant negative effect on nontarget species of wildlife.

WELFARE OF THE INDIVIDUAL ANIMAL

INTRODUCTION

Fish and Game Code Section 203.1 provides as follows: "When adopting regulations pursuant to Section 203, the Commission shall consider populations, habitat, food supplies, the welfare of individual animals, and other pertinent facts and testimony."

Consideration of furbearing and nongame mammal populations, habitats, food supply, and other facts pertinent to the anticipated effects of existing hunting and trapping regulations on furbearing and nongame mammals are contained in this environmental document prepared by the Department in compliance with CEQA. This section deals only with considerations of individual animal welfare. This subject is discrete and distinct from those included in the CEQA-mandated environmental analysis. It is an additional obligation imposed on the Department by the Fish and Game Code. This section is included in this document for convenience and to permit the public and interested persons to consult a single document in order to read and evaluate the Department's analysis.

EFFECTS OF VARIOUS METHODS OF TAKE ON PAIN AND SUFFERING

Few premises are more obvious than that animals can feel pain [Journal of the American Veterinary Medical Association (JAVMA 1987, p. 1,186)]. Determining whether an animal is experiencing pain or suffering is difficult. Despite this difficulty, many manifestations of pain are shared by many animal species (JAVMA 1987,

p. 1,186). The intensity of pain perceived by animals could be judged by the same criteria that apply to its recognition and to its physiologic and behavioral observations in human beings. If a condition causes pain in a human being, it probably causes pain in other animals (JAVMA 1987, p. 1,188).

Suffering is a much used and abused colloquial term that is not defined in most medical dictionaries. Neither medical nor veterinary curricula explicitly address suffering or its relief. Therefore, there are many problems in attempting a definition. Nevertheless, suffering may be defined as a highly unpleasant emotional response usually associated with pain and distress. Suffering is not a modality, such as pain or temperature. Thus, suffering can occur without pain; and, although it might seem counter-intuitive, pain can occur without suffering (JAVMA 1987, p. 1,188).

Pain and stress experienced by trapped animals are matters of controversy. The fact that trapped animals struggle is relatively easy to document, but the capacities of animals to feel significant pain and stress and to suffer are disputed. In recent years, scientific research has demonstrated that animals react to pain. Some evidence indicates that animals may be at least as sensitive, and perhaps more sensitive, to pain than are humans (Peacock 1980).

Sensory pathways in the spinal cord which lead to the brain are identical in man and in all other mammals, according to Dr. Samuel Peacock, past Director of the Division of Electroencephalography and Clinical Neurophysiology at the Eastern Pennsylvania Psychiatric Institute in Philadelphia. Dr. Charles J. Vierk, of the Department of Neuroscience at the University of Florida, notes that a common peripheral system possessed by all mammals generates pain sensations (Vierk 1976). Animals' legs are structurally similar to ours. Arteries and nerves are near the surface.

Finally, all mammals have a thalamus, that portion of the brain where pain perception is centered. Given this evidence, it is not illogical to presume that all mammals can feel pain.

According to Soma (1978):

"It is not unusual for many to consider pain perception in animals less intense than that of man. It is worth bearing in mind that the threshold of pain perception

is very constant across species lines, but the tolerance of painful stimuli is very variable, even within a given species. Many times excitement, distress can enhance the reaction to a painful stimulus. The tolerance to a painful stimulus can be modified by the circumstances surrounding the infliction of pain."

A study in an Australian veterinary medical journal on anesthesia reported, "...pain in animals should be regarded as an essentially comparable experience to pain in human patients..." (Rex 1972).

A comparison between human and animal data shows that animals attempt to escape escalating pain levels at about the same level as humans first report perception of pain. These findings indicate that humans and animals feel pain at fundamentally similar levels of intensity (Vierk 1976).

In fact, according to Dr. Samuel Peacock (1980), a recognized authority on pain, "the area devoted to pain and sensation perception in man relative to his total brain size is significantly smaller than that of any other mammal." Con Hoyt, Sr. (1981), President of the National Trappers Association, in his pamphlet, *A Trapper Tells the Truth* states, "It is very common to find an animal sound asleep in a trap."

Roger Latham, outdoor editor for the Pittsburgh Press, in his *Great Outdoors* column on November 6, 1977, wrote, "Today's traps are leghold traps which hold the animal securely with comparatively little pain. Often the animal has made a 'nest' and is asleep when the trapper arrives." This state of "sleep" may not be sleep at all, but instead a response to pain and stress.

Typical responses to pain, i.e., physiological reactions, such as muscle tension, elevated blood pressure, and increased respiration, usually are associated with a perception of pain in both humans and animals. The absence of an emotional response is not an assurance that the animal has not perceived pain (Breazile and Kitchell 1969). Yoxal (1978) observed that, after extended periods of pain, animals may not exhibit the reactions normally associated with pain perception. For example, instead of being energized, animals in pain could become quiet and withdrawn and give little overt behavioral evidence of pain (Vierk 1976). Felids, for instance, typically withdraw in response to pain and stress. Foxes and skunks also display withdrawal reactions to pain rather than agitation. Their reaction may be akin to a state of shock.

Potential effects on individual animal welfare include:

1. Furbearing and nongame mammals may experience pain and suffering as follows:
   a. Effects of being shot with a bullet;
   b. Effects of being shot with archery equipment;
   c. Effects of being trapped; and
   d. Effects of being killed by dogs;
2. Effects of animal death;
3. Effects of wounding on animal welfare; and
4. Chase-related effects.

Each of these effects are discussed in greater detail as follows:

Effects of Being Shot with a Bullet

In the case of bullets, it has been determined that bullets transfer sufficient energy to the animal to cause fatal wounds and traumatic shock adequate to bring about quick death. Despite these performance standards, time to death is affected by shot placement. An animal shot with a gun in the heart-lung area or a critical portion of the central nervous system, such as the brain or spinal cord, will generally die in less than 27 seconds (Ludbrook and Tomkinson 1985, p. 13). An animal shot in a less vital area may not die for a considerably longer period of time, ranging from 240 to 360 seconds, depending on the location (Ludbrook and Tomkinson 1985, p. 13). Some shots in nonvital areas wound but do not kill the animal (Benke 1989).

Effects of Being Shot with Archery Equipment

It has been determined that bows transfer sufficient energy to an arrow (fitted with a razor-sharp broadhead) to cause a fatal wound by cutting arteries and veins, resulting in blood loss. In addition to severing the blood supply, arrows shot through the lungs cause the lungs to collapse, causing rapid death. Broadheads can also cut through softer bones, such as ribs. However, arrows shot from even a very heavy bow (draw weight) will rarely penetrate large bones found in the shoulders, hips, head, and neck.

Despite these performance standards, time to death is affected by shot placement. An animal shot with an arrow in the heart-lung area or spinal cord will generally die in less than 29.7 seconds, with a range from one to 36.2 seconds (Ludbrook and Tomkinson 1985, p. 13). An animal shot in a less vital area may not die for a considerably longer period of time, ranging from 233.2 to 600 seconds, depending on the location (Ludbrook and Tomkinson 1985, p. 13). Some shots in nonvital areas wound but do not kill the animal (Benke 1989). Archery wounding is discussed in more detail later in this section.

Effects of Being Trapped

There is some debate over the humaneness of drowning sets. In a study called *Terminal Dives in Mink, Muskrat and Beaver*, Frederick Gilbert and N. Grofton of the University of Guelph, Ontario, Canada, (1982) monitored the EEG, EKG, and overt behavior of mink, muskrat, and beaver caught in leghold traps in aquatic tanks. *The Skin Trade Primer* published by the Friends of Animals reports the following excerpts from that study:

> "Response was quite similar in all animals. An initial struggle period lasted 2-5 minutes post submersion after which periods of quiescence and struggle decreasing until only weak swimming motions occurred. The intensity of the initial struggle was correlated with the amount of damage sustained by the trapped appendages. A gasping (gaping) was seen in a number of animals pulled from the water. The average time to loss of EEG was about 9 minutes 30 seconds and to loss of EKG about 16 minutes."

Another report on the same study was reported in *Wild Furbearer Management and Conservation in North America* and states:

> "Death in beavers was caused by carbon dioxide induced narcosis (submersion asphyxia or anoxia). Nine of 16 muskrats and 3-4 of thirteen mink "wet" drowned, but it is not known if these took in water before or after unconsciousness. Thirteen mink ceased struggling in 2:03 + or - 1:32 minutes, 11 muskrats in 3:34 + or - 0:52 minutes, and 20 beavers in 8:11 + or - 4:50

minutes. Because death in beavers was by anoxia, sensory perception in beavers may have been absent 5-7 minutes post submersion (Novak 1987b)."

In still another report on the same *Terminal Dive* study authored by Bob Noonan for *The Trapper Predator Caller* magazine (August 1990), the following comments appear:

> "Autopsy revealed that a thick mucous plug formed in the trachea of the seven muskrats that did not "wet" drown that prevented water from entering the lungs. What killed them is the build up of carbon dioxide in the bloodstream. Carbon dioxide is a waste product of the body's use of oxygen. The technical term for this condition is CO2 induced narcosis. The interesting thing about it is its apparent lack of discomfort. As the carbon dioxide builds up in the bloodstream, the victim becomes dazed and confused, and becomes quiet and ceases to struggle. In effect, they are anesthetized, drugged, by the carbon dioxide. Human divers refer to it as 'rapture in the deep', and people surviving it remember a calm, detached, almost euphoric state before passing out. Dr. Gilbert observed that CO2 narcosis seems to be an easier death than drowning, as there was much less struggling."

Effects of Being Killed by Dogs

Furbearing and nongame mammals may occasionally be killed by pursuing dogs before the animal is "treed." The effects on the individual animal of death in this manner may be different than death resulting from being shot by a bullet or arrow. Time to death may be significantly longer than death from archery equipment or bullets, or it could be instantaneous. The Department could not locate any information on the frequency or severity of this type of occurrence.

EFFECTS OF ANIMAL DEATH

The successful hunting or trapping of an animal results in the death of that individual. Obviously, this is an adverse effect on the animal's welfare. Although animals die as a result of natural causes, it is not accurate to assume that individual animals killed as a result of the project may not otherwise have died because of the compensatory nature of mortality (Shaw 1985). Experience indicates that some

animals killed as a result of the project would have died from other nonhunt-related causes (see section titled Compensatory Mortality in Chapter 4). Nevertheless, in order to adequately analyze the effects that the project will have on an individual animal's welfare, the assumption has been made that all animals killed by the project would have survived in its absence.

Subsection 465.5(d) of Title 14, CCR, states that all furbearing and nongame animals that are legal to trap must be immediately killed or released. Animals that are caught in live traps for the purpose of taking their pelts must be killed. As stated in the Department of Fish and Game's trapper education guide, the most humane way to kill a trapped animal is to shoot it or strike it in the head. Sometimes a strike on the head may only stun the animal. If that happens, the Department recommends that the trapper stand on the animal's chest until it is dead (suffocation).

Some segments of the public feel that striking a blow to the head and/or suffocation is inhumane. The Department prefers shooting, but that is not always possible, because some counties have ordinances that restrict the use of firearms in certain areas. Conversations with trappers indicate that most California trappers prefer to use a small caliber firearm to kill trapped animals, mainly because they do not have to get as close as they would otherwise. The California trapper education guide also recommends that young trappers and beginners seek help, particularly with large animals, if stunning is necessary.

Some citizens feel that striking a blow to the head of an animal in a live trap should be banned. However, most kill traps that are considered humane kill by rendering a blow to the head or the back of the neck. While the Department would prefer to see all animals killed by a shot to the head or the heart, that is not always possible. Now that leg hold traps and snares are prohibited, stunning is not an option.

EFFECTS OF WOUNDING

Wounding is the most significant adverse effect that the project will have on the welfare of the individual animal. As a result of the project, individual animals may be wounded.

Wounding is a generic term that refers to any nonlethal injury (McCaffery 1985). The nature of the specific wounds ranges from superficial to seriously disabling (Burke *et al.* 1976, Nettles *et al.* 1976, and Lohfeld 1979). In many cases, a seriously disabling wound may lead to the animal's death from secondary causes, such as infection or disability that prevents the animal from successfully foraging for food, evading natural predators, or performing other functions necessary to its survival (Nettles *et al.* 1976).

Effects of Wounding by Firearms

The extent of wounding for furbearing and nongame mammals from firearms is not known. However, various studies indicate that wounding losses to waterfowl range between 21 and 37 percent, and wounding losses for upland game birds range between 15 and 25 percent. Wounding losses in deer in central Texas were estimated at 15 percent (Peek 1986).

Effects of Wounding by Archery Equipment

Concern has been expressed that animals taken with archery equipment experience undue suffering. Section 354, Title 14, CCR, contains provisions for the use of archery equipment for the take of furbearing and nongame mammals. Bows used for hunting must be of sufficient strength to cast a legal hunting arrow, except flu-flu (a type of fletching that slows arrow speed) arrows, a horizontal distance of 130 yards. These restrictions are designed to ensure that animals are taken with equipment capable of killing efficiently.

Some studies indicate that bow hunting is an ineffective method of take, results in high wounding rates, and inflicts tremendous pain and suffering as a result of infection, thus causing slow death. Numerous studies and observations have been published relating high wounding rates (Croft 1963; Nettles *et al.* 1976; Causey *et al.* 1978; Lohfeld 1979; Stormer *et al.* 1979; Aho 1984; Herron 1984; Ludbrook and Tomkinson 1985; Boydston and Gore 1987; Samuel 1988, 1989; Benke 1989; Brooke 1989; Hansen and Olson 1989; McKee 1990; and others).

Bow hunting is controversial, as indicated by the results of these studies, and observations suggest wide differences in the effectiveness and/or lethality of archery equipment. For example, studies by Lohfeld (1979), Stormer *et al.* (1979), and Ludbrook and Tomkinson (1985) show that archery equipment is an effective method of take. Moreover, while the wounding rate appears to be higher than for guns, deaths as a result of these archery wounds are lower. Conversely, work by Boydston and Gore (1987) suggests that archery wounding levels are unacceptably high and cause serious additional losses.

Additional comments on the ineffectiveness of archery equipment can be found in *The Bowhunting Alternative* by Adrian Benke (1989). Benke (1989) makes two main points in his assessment of modern archery. These are: (1) the ineffectiveness of broadheads for hunting purposes, and (2) that the solution is the proper use of succinylcholine chloride (SCC) as a tool to eliminate or lessen wounding loss. Benke states that archery hunting results in high wounding rates and death from infection and peritonitis. The use of SCC as a tool for hunters to reduce wounding losses raises important considerations. First, SCC is a controlled drug and is not currently available to the general public without a prescription. Secondly, death as a result of SCC is traumatic, increasing an animal's misery, and is not recommended for euthanasia (Physician Desk Reference 1990:767). Thirdly, SCC doses carried by the broadhead "pod" are two to three times the lethal dose for humans (Dr. D. Jessup, Department DVM, pers. comm.), creating the potential for serious human injury or death.

Because SCC is a controlled substance and has the potential to be inhumane and to cause human death as a result of an accident, its use was not considered as a viable alternative to bowhunting in this document.

Effects of Wounding by Trapping

Cage Traps

The following four paragraphs are taken from Novak (1987b):

"Cage traps are gaining popularity in many areas. The 1940's and 1950's saw the beginning of programs to transplant furbearers into previously depleted areas

and hence the need for efficient live traps that caused minimal injury. Martens and fishers were two mustelids commonly live trapped in National live traps. Yet such traps are not perfect. Swanstrom (1962) and Swift (1966) remarked how sometimes martens damaged their teeth in these live traps--something that occurs with fishers as well if they are disturbed while in the wire cages. Butterfield (1954) felt that a modification of the Ohio rabbit box trap was the most successful trap (using sardine bait) for raccoons. Today the National live trap is used almost universally to live trap raccoons.

"Mink and coyotes can also be difficult to live trap uninjured. McCabe (1949) devised a live trap with a metal door and a lock, and Ritcey and Edwards (1956) successfully used the National live traps to live trap mink. Foreyt and Rubenser (1980) inserted a large live trap with a one-way door into coyote den entrances. Over a two-year period, they caught 114 pups from 20 dens using only two traps. Baited box traps have been used to live trap kit foxes without injury (Egoscue 1962, 1975), but trap efficiency was 1-9 percent (Zoellick and Smith 1986). The researchers increased their success to 36-64 percent by enclosing the den area with a fence and then inserting a box trap with two gates in the fence. They also placed Clover-type traps (Clover 1956) over some den entrances and blocked other entrances.

"Several approaches have been used to live trap small weasels with box traps, as leghold traps and foot snares cannot be used to live trap such small animals. Simms (1979) used wooden live traps with a drop door, whereas Marsh and Clark (1968) used a large starling trap with one live starling (*sturnus vulgaris*) as bait. The trap had two funnel openings. Rust (1968) used the small Havahart live trap, as weasels often slipped by the closed National live trap doors. Although the traps were checked frequently, mortality was 10-40 percent in the trap and a further 10 percent of the animals died during the 2-3 days of captivity after removal from the trap. Also, many animals had broken teeth, inflamed snouts and skinned pads. Sheets (1972) made a simple funnel trap (5 x 36 inches) of hardware cloth covered with plumbing tape on which dirt was dusted to simulate a burrow. He used this to trap black-footed ferrets (*Mustela nigripes*) without injury.

"River otters and beavers can be difficult to live trap uninjured. For otters, the Hancock trap proved the most efficient and least injurious (Melquist and

Hornocker 1979, 1983). Two of nine otters captured with leghold traps suffered broken legs, and 35 otters escaped. Taber and Cowan (1969) and Hodgdon (1978) used Bailey and Hancock beaver live traps to live trap beavers in good condition."

CHASE-RELATED EFFECTS

Existing regulations may result in individual animals being chased. During the majority of the furbearing and nongame mammal seasons, individual hunters may be accompanied by dogs. Particularly those that are hunting bobcat, gray fox, raccoon, and opossum.

It is possible that an individual animal will be chased by dogs. Such a chase would probably cause the animal to suffer anxiety, fear, and stress. Anxiety is generally defined as an unfocused response to the unknown (JAVMA 1987). Fear is a focused response to a known object or previous experience (JAVMA 1987, p. 1,187). Stress is commonly defined as the effect of physical, physiologic, or emotional factors that induce an alteration in an animal's homeostasis or adaptive state.

Stress and its subsequent responses may be categorized in three ways. These are: (1) neutral stress - this form of stress is not intrinsically harmful and evokes responses that neither improve nor threaten the animal's well being; (2) eustress - stress that involves environmental alterations that in themselves are not harmful to the animal but which initiate responses that may in turn have potentially beneficial effects; and (3) distress - stress that creates a state in which the animal is unable to adapt to an altered environment or to altered internal stimuli (JAVMA 1987, pp. 1,187-1,188).

It is assumed that animals, if given a choice, would choose not to be pursued. In this sense, chasing may be viewed as having an adverse affect on individual animal welfare.

The three recognized forms of stress (JAVMA 1987, pp. 1,186-1,187) have different manifestations. Eustress is not applicable. The project will not alter the environment. Consequently, pursuit by hunters does not represent a change to an animal's natural environment sufficient to prompt further evolutionary responses.

Neutral stress and distress are both potentially relevant and adverse. Neutral stress would be exhibited by an animal fleeing from hunters and would probably continue up to the point at which the pursuit ended. Presumably, the pursuit would end

when the animal evaded its pursuers or was shot by the hunter. Effects of wounding are discussed separately.

A pursued animal could experience some degree of distress. The distress could become more acute if the animal were cornered or otherwise became unable to successfully flee. If the stress-inducing stimuli are short-term, the animal's responses should not result in long-term harmful effects. Prolonged or excessive stress may result in harmful responses, such as abnormal feeding and social interaction behavior and lowered reproductive success. It has been reported that long-term distress in animals can result in pathologic conditions, such as gastric and intestinal lesions, hypertension, and immunosuppression (JAVMA 1987, p. 1,188).

Both neutral stress and distress may be viewed as adverse effects on the welfare of individual animals. Neutral stress resulting from the project may be different from naturally occurring neutral stress because of the possibility of pursuit by hunters. However, this potential stress is not expected to have any long-lasting effects, because each chase presumably terminates with the animal's escape or death. Although distress is capable of producing long-term adverse effects, the project is not expected to have that result, because the hunting season is of limited duration, and any distress-inducing conditions will be temporary.

Existing regulations have been designed to limit wounding through the specification of minimum performance requirements for firearms, archery equipment, and traps. It is expected that some wounding will nevertheless occur. The methods of take are not one hundred percent lethal. Lethality is largely a function of hunter skill and accuracy. Because of specification of minimum performance requirements for archery equipment, firearms, and traps in the existing mammal regulations, the Department concludes that impacts related to the welfare of individual animals are minimal and not significant.

EFFECTS ON PUBLIC SAFETY

The Department was provided with several examples nationwide of injuries to people that resulted from coming into contact with set traps. Three of these incidents occurred in California.

In 1989, California hunters were involved in 27 hunting casualties, which included five fatalities. None of these casualties were related to the hunting or trapping of furbearing and nongame mammals. In an effort to reduce the number of hunting-

related casualties, the Department maintains a Hunter Education Program throughout the State. Twenty-four to twenty-five thousand students participate in the program each year. The classes are taught by a volunteer force of about 1,300 instructors, along with 284 game wardens. The volunteers are trained by Department personnel. About 1.3 million students have participated in the program since its inception in 1955 (Edwards 1990).

In 1990, there were 24 hunting casualties, two of which were fatal. In 1991, there were 16 hunting casualties, three of which were fatal. In 1992, there were 14 hunting casualties, but no fatalities. In 1993, there were no fatalities, but there were 15 casualties. In 1994 there were no fatalities, but there were 12 casualties. In 1995, there were 14 casualties from hunting. In 1996 there were two fatalities and 11 casualties. None of these were related to the hunting and trapping of furbearing and nongame mammals. In 1996, there were 14 casualties with one of those related to the hunting of gray fox. In 1997, there was one injury related to the hunting of gray fox. In 1998, and 2001 there were no injuries or fatalities reported.

Some citizens feel that children may be at risk when approaching large live animals that are caught in traps. Section 4005 of the Fish and Game Code specifies that no person shall be issued a trapper's license until he/she has passed a test of his/her knowledge and skill in the field. In that connection, the Department published a manual *Get Set to Trap*, a California trapper education guide. This manual was designed to help people study for the trapper certification examination that is required. Page 43 of the Department's trapper education guide states that some larger animals, such as raccoon, coyote, and bobcat, may be too large for some beginners to safely kill by striking a blow to the head. In this case, the manual recommends that beginners seek assistance in killing these animals.

Also, the parents of young trappers, and hunters for that matter, have a responsibility to teach their children proper behavior and judgment relative to these activities. For license years 1996-97 through 2002-03, 16 junior trapping licenses have been issued. The Department is not aware of any injuries to juniors or adults from attempting to kill animals in traps.

EFFECTS ON ECONOMICS

Economic effect of existing non-game and furbearing mammal hunting and trapping regulations is not considered substantial.

In a statement to the Indiana State Legislature Agricultural and Natural Resources Committee on February 17, 1979, John Grandy of the Humane Society of the United States stated the following: "Of the 1.2 billion dollars reported by the fur industry (in the United States), approximately 30 percent resulted from the sale of imported goods. Ranch-reared animals accounted for 55 percent of the domestic production. Thus, trapping actually accounted for only one third of retail dollar sales. When financial data is adjusted to reflect the use of instant kill traps, we find that a national ban on the steel-jawed trap would affect only 12 percent of the fur industry's gross income."

In California, practically all revenue from pelts going into the fur industry comes from animals that are not ranch reared, such as muskrat, gray fox, bobcat, and coyote. Raccoons were the most economically important furbearer during the 1920's. Striped skunks were more important in the early 1930's. Muskrats were the most dominant furbearer in both value and number taken from 1937 until the mid-1970's. Then, the high value of bobcat pelts pushed that species to the forefront. In 1978-79, the value of raw bobcat furs was over $1,130,000. In 1987-88, raw bobcat fur was valued at $1,039,931 in California, and the total fur revenue for that trapping year was estimated to be $1,513,803. The following table shows the estimated fur revenue in California in recent years.

Year	Estimated Fur Revenue
2002-03	$64,378
2001-02	16,455
2000-01	16,649
1999-00	10,031
1998-99	13,685
1997-98	76,970
1996-97	136,830
1995-96	36,507
1994-95	46,435
1993-94	77,699
1992-93	60,525
1991-92	99,800
1990-91	48,082
1989-90	47,670

For most California trappers, the income derived from trapping is supplementary. The 2002-03 annual revenue from trapping licenses was about $10,341.

Economic effects of new licensing requirements resulting from Senate Bill 1645, and the Department's proposed regulations to provide consistency with this legislation, are unknown. An unknown number of nuisance wildlife trappers are now required to purchase trapping licenses. The current fee is $77.75.

IMPACTS ON THE GENE POOL

There are many examples of species recovering from very low population numbers. The southern sea otter has recovered from an all time population low of 30-50 animals. The American bison has recovered from a low of about 900 animals. The tule elk population in California was reduced to between two and 20 animals, and is now thriving. At the turn of the century, the northern elephant seal was reduced to

about 20 individuals. Today that population off the coast of Mexico and California numbers into the tens of thousands (O'Brien *et al.* 1986). There are many other examples of species recovering from population lows, some of which are mentioned earlier in this document. All these species have survived and have retained enough genetic variation to allow them to find food, avoid predators, and reproduce.

Theory and practice demonstrate that a population that passes through a "genetic bottleneck" of a mere seven individuals can still retain about 95 percent of its original variation, and the five percent that may be lost is insignificant (Dr. Stephen J. O'Brien, pers. comm.). A population can retain that variety if the survivors expand their numbers quickly and geometrically (O'Brien *et al.* 1986). As our population estimates indicate, none of the 13 species that are the subject of this document are threatened with genetic bottleneck. Therefore, no significant impact to the gene pool is expected as a result of the existing regulations, on the proposed minor changes.

EFFECTS OF ANIMAL MOVEMENTS

Some furbearing and nongame mammal species that occur within protected areas, such as national parks, may cross park boundaries. Others that occur outside of protected areas may move into protected areas. This is particularly true where the animals' home range is near the protected boundary. It is assumed that movement probably occurs equally in both directions and that no significant impact from hunting or trapping occurs as a result of these movements.

Two zones were established to protect the Sierra Nevada red fox and San Joaquin kit fox (see Figure 3). These zones were thought to include the entire known ranges of both species. Therefore, no movement of either species is expected beyond these zone boundaries. Modifying these zone boundaries is part of the proposed project to match these zones with their current ranges.

EFFECTS OF CHANGES IN HUNTING REGULATIONS BY ADJOINING STATES

Very few non-residents choose California as a hunting destination. In fact the five-year average (1998-2002) for out-of-state license sales was merely 2.3% of total sales (Department files). Accordingly, the Department believes that any changes in hunting regulations by adjoining states would need to be drastic (e.g., closure of an entire season for a particular species) in order to produce a potentially significant increase in non-resident license sales and any associated potential increase in harvest. A survey of 2003 game laws for Oregon, Nevada, and Arizona revealed no major

changes in trapping regulations for these states. Consequently, the Department concludes that the hunting regulations of adjoining states will have no significant impact on California's furbearing and nongame mammal populations.

RELATIONSHIPS BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Limited recreational, commercial fur, and nuisance wildlife control operator trapping and hunting of furbearing and nongame mammals does not have a long-term negative effect on the population. Under controlled/regulated conditions as contained in the proposed project, hunting and trapping mortality in the short-term will result in a slight reduction of population. However, due to young being born in the late spring/early summer (after fall hunting season), the population will exceed the pre-hunt population size. Thus, hunting does not have a negative effect on the population as a whole providing an opportunity for increased survival of young animals.

CHAPTER 5. CUMULATIVE EFFECTS

After a thorough evaluation of the existing hunting and trapping regulations and minor proposed changes, and in conjunction with other related past, present, and reasonably foreseeable future projects, the Department has concluded that there will be no significant adverse cumulative impacts on the State's furbearing and nongame mammal populations. This determination was based upon analysis of the potential environmental impacts of existing regulations and the minor proposed changes, together with other projects and/or actions. A discussion of major factors which could influence furbearing and nongame mammal species, in addition to hunting and trapping, is provided in this chapter.

EFFECTS OF WILDFIRES

Although the literature is limited and somewhat divided on the magnitude of wildlife mortality resulting directly from fire, the consensus is that this mortality is insignificant in terms of the number of animals killed and the impact on affected populations (Bendell 1974, Wright and Bailey 1982).

Medium-to-large mammals usually move rapidly enough to escape fire. Members of a raccoon family left a 24-acre prescribed burn, returning afterward to resume normal activities (Sunquist 1967).

Fires can cause high mortality among small mammals, but recolonization of burned areas can be very rapid. Recolonization of vacant land by dispersing individuals where intraspecific competition is low is a possible reason for this rapid invasion. Also, small islands of unburned habitat provide refuges where individuals can survive. The longer-term population response is related to vegetative change and is variable. Changes in species composition in chaparral are well correlated with habitat change. Arboreal species, such as Douglas squirrels, gray squirrels, and flying squirrels, will decrease when crown fires reduce or eliminate crown canopies (Peek 1986, p. 144).

Red-backed voles have generally decreased after fires, as have voles of the genus Microtus. Conversely, deer mice have generally increased. The decrease of voles is related to decrease in cover, while the increase in deer mice is related to increase in seed production for forage species. Increased predation due to cover reduction is also involved (Peek 1986, p. 144). Small mammals are an important food source for carnivorous furbearers.

Response of predators to fire involves the effect on prey and prey habitat. Wolves and deer have occurred more frequently in cutover and burned areas than in unmodified areas in northeastern Minnesota. Earlier investigations cited fire as being detrimental to martens, but more recent research indicates that a mosaic of vegetation created after burning in the Selway-Bitterroot Wilderness supported a diversity of cover and foods favorable to marten. Items in the marten diet included small mammals that occur in meadows and burns and were important in summer and fall (Peek 1986, p. 156).

Wildfires have always been a natural phenomenon in California wildlife habitats. Many plant species require fire to reproduce. Even though certain individual wildlife species may be killed on a local level, there is no evidence to indicate that fire has negative, long-term effects on wildlife populations. As soon as the habitat regenerates after a fire, wildlife will occupy it. The possibility of wildfires permanently impacting wildlife populations is highly unlikely. The Yellowstone National Park fire of 1988 is a good example. The recovery of wildlife habitat in that area is remarkable (Wyoming Wildlife, October 1989). Consequently, the plant and animal communities are well adapted to the occurrence of fire, and many species fare better in the months and years following a burn (Shaw 1985, Peek 1986.)

Although the data is preliminary, wildfires destroyed 117,967 acres of California wildlife habitat during the 2002 fire season. This is substantially lower than the five year average of 333,251 acres.

The following table lists the total acres of wildfires in California for 1981-2003. Although California experienced an unusually elevated fire season in 2003, the preliminary estimate of 736,146 acres accounts for less than one percent of California's acreage. The five-year average for 1998-02 is 378,545 acres burned (California Department of Forestry data).

Total Acres of Wildfires in California , 1981-2003	
YEAR	ACRES
1981	322,000
1982	160,000
1983	128,000
1984	251,000
1985	595,000
1986	119,000
1987	873,000
1988	345,000
1989	173,400
1990	365,200
1991	44,200
1992	282,745
1993	309,779
1994	526,219
1995	209,815
1996	752,372
1997	283,885
1998	215,412
1999	499,425
2000	295,026
2001	372,506
2002	510,356
2003	*736,146

Based on its analysis, the Department has determined that wildfires, together with the proposed project, will not have an adverse cumulative effect.

EFFECTS OF DROUGHT AND FLOODS

The six furbearers and seven nongame mammals considered in this document have life histories that separate them into two groups, based on their association with water. The striped skunk, opossum, raccoon, mink, muskrat, and beaver are listed in increasing order of their dependence on water (Burt and Grossenheider 1964, Ingles 1965, and Zeiner *et al.* 1990). These wetland species are closely tied to habitats which include open water sources, such as marshes, wetlands, riparian rivers and streams, and estuaries. Badgers, gray foxes, nonnative red foxes, coyotes, bobcats, spotted skunks, long-tailed weasels, and ermine can exist in habitats that have no free available water. Species adapted to dry environments may live near streams or lakes, but this is a result of the juxtaposition of their home range and not a requirement for free water (Ingles 1965, Bailey 1974). The complex geography of California exhibits elevations ranging from more than 14,000 feet to below sea level and spanning from 33° to 42° latitude, comprising numerous valleys and mountain ranges. This topographic variation presents a broad range of different temperature and precipitation regimes throughout the State. Distributions and numbers of furbearing mammals are affected by their specific requirements and reflect both regional and temporal variation in water availability.

In pristine times, the availability of water was solely a function of precipitation. Today, however, water in California is regulated by precipitation and a complex of human-controlled water systems. California recently completed a seven year drought cycle that began in 1987. The Sacramento River Index of "water year classifications" was as follows: 1986 - wet, 1987 - critical, 1988 - critical, 1989 - dry, 1990 - critical, 1991 - critical, 1992 - critical, 1993 - above normal, 1994 - critical, 1995 - wet, 1996 - wet, 1997 - wet, and 1998 - wet. These water year designations are used to determine instream flow requirements and outflow through the Sacramento-San Joaquin Delta (J. Cox and B. Helms, California Department of Water Resources, pers. comm.). For the 2000 water year the precipitation statewide is 100 percent of normal. The current water year in the Sacramento Valley floor in 2003-04 is about 111% of normal (as of 1/15/04).

Water year designations are an important factor in water and wetland management in California, because they are used to determine contractual deliveries of water from the Federal Central Valley Water Project (CVP) and the State Water Project (SWP). Approximately 85 percent of the water used to manage marshlands in the Central Valley is obtained from these two major water projects (USDI 1989). Additionally, the vast majority of small grain crops, hay, row crops, and many orchards are irrigated via water from these sources.

The five million acres of historic wetlands in California have been reduced to approximately 450,000 acres (California Department of Parks and Recreation 1988). These wetland acres are supplemented by the rivers, canals, and reservoirs that serve as domestic and agricultural water supplies. In addition, agricultural crops, such as rice, provide a source of water for furbearing mammals. Nevertheless, California's pristine habitat base, and hence maximum potential carrying capacity for resident wildlife, has been severely reduced.

Agricultural water use and California's extensive system of water delivery assure a more constant flow rate and water level than would naturally occur. Agricultural deliveries are only reduced by 50 percent during critically dry years because of the stability provided by the reservoir systems. As a result, "drought" is an extreme rarity in the Central Valley, where most populations of water-dependent furbearers exist. Conversely, dams reduce flooding in the Central Valley and dampen the fluctuations in water levels of major tributaries. Thus, water availability and habitats important to furbearing mammals are likely to be much more predictable in recent years than during pristine times.

Beavers suffer higher mortality when water is too shallow, particularly during freezing weather (Payne 1984, Broschart *et al.* 1989). Muskrats and beavers build houses and burrow into river banks, depending on water conditions (Brooks and Dodge 1981, McCabe and Wolfe 1981). The stability of muskrat population levels is negatively influenced by fluctuating water levels (Errington 1937, 1941, 1961; McDonnel and Gilbert 1981). High water levels and cold temperatures also reduce trapper activity, thereby reducing harvest of muskrats (Clark 1986) and other furbearers, like raccoons (Clark *et al.* 1989). Low water levels or dried out ponds and ditches also reduce trapper activity. In summary, water control systems in California have likely ameliorated the dynamic effects of precipitation which must have affected populations of furbearing

mammals in pristine times. Relative to available habitat, recent population levels are probably more stable and are maintained at high densities compared to pristine population levels (Allen 1987). The furbearing and nongame mammals that do not depend on water are more frequently found in the mountain and desert regions of California than in the Central Valley. Woodrats, cottontail rabbits, black-tailed jackrabbits, and small rodents are common prey for predators (McLean 1934, Bailey 1974, Messick *et al.* 1981, Rolley 1985). Cottontail rabbits and black-tailed jackrabbits suffer increased mortality in severely cold weather and when snow depths are high (Trent and Rongstad 1974, Stoddart 1985).

Cottontail rabbits, black-tailed jackrabbits, and many small rodents are adapted to desert environments and exist without free water in mountainous habitats (Ingles 1965, Vaughn 1972). These prey species are herbivores and/or granivores. The plant species upon which they depend are usually drought- and fire-adapted species existing in the Great Basin, chaparral, or desert regions of California (Barbour and Major 1977). Plant species respond to drought or other weather conditions variably, and abundant food is usually provided by one or more plant species at different times, either within or among years (Goodrum *et al.* 1971; Wolgast 1977, 1979; Burk 1982). All species of furbearing and nongame mammals considered in this project have evolved to withstand both drought and flood extremes within their ranges. Before man's intervention, these ranges likely shrunk and expanded during periods that produced prolonged drought or moisture. Presently, however, remaining habitats are to a large extent managed by man. This has produced greater stability in modern furbearer populations that are adapted to these habitats. Their food, both plant and animal, have coevolved. As a result, drought, floods, and other weather conditions have little effect on year-to-year abundance of most species. This is true of furbearers in the Central Valley, where water is regulated; and in desert, chaparral, and Great Basin regions, where drought-tolerant species have coevolved. In mountainous regions, topographic irregularities produce highly variable weather patterns. These cause localized population fluctuations but are seldom so severe and encompassing as to affect widespread population declines. Thus, the Department believes that the variation in precipitation does not have significant long-term effects on furbearing or nongame mammals in California.

Since about 1800, the Hudson's Bay Company of Canada has kept records of pelts of furbearers trapped each year. When plotted, these records show that the lynx,

for example, has reached a population peak every 9-10 years. Peaks of abundance are often followed by "crashes" or rapid declines, the lynx becoming exceedingly scarce for several years. The snowshoe hare, a prey species that the lynx is largely dependent on for food, follows the same cycle (Odum 1971, pp. 191-192). This suggests that when lynx numbers are low, because of reduced food supplies, trapping success is also low. Similarly, if furbearers in California are being reduced to lower numbers because of drought and subsequent prey shortages, it would be expected that trapper success would be lower as well.

An important phenomenon in the annual harvest of resident small game mammals is the "law of diminishing returns" (Leopold 1977). It has been frequently noted that the actual level of harvest depends upon the abundance of the game species and not so much the number of hunters or regulations (Leopold 1977, Brown 1989). Basically, when populations of a particular game species are high, hunters are more successful and spend more time hunting them. When the populations are low, hunters are less successful and spend less time hunting. The "law of diminishing returns" appears to work even during years of high game abundance. Department data on game bagged per hunter per day hunted indicates that during "abundant game" years hunters do not significantly increase the number of days they hunt during the season or the number of birds they kill. Instead, the number of people hunting the particular game species increases when the game is abundant and declines when they are not (California Department of Fish and Game 1988). The number of hunters and their harvest in any particular year will not approach damaging harvest levels, because scarcity is relative; and hunters will become discouraged before game populations decline to very low levels, because the game becomes relatively scarcer and increasingly more difficult to harvest each hunting trip (Gallizioli and Webb 1958, Gallizioli 1965, Leopold 1977). This phenomenon thus acts as a natural regulator of hunter effort and kill, and conservatively parallels the Department's management efforts through regulations.

It is the Department's opinion that this same phenomenon would also apply to trappers. That, in combination with very low pelt prices currently in effect, will reduce the take below the normal harvest levels depicted in the models contained in appendices 1 (badger), 2 (beaver), 3 (bobcat), 4 (coyote), 5 (gray fox), 6 (mink), 7 (muskrat), 8 (raccoon), 9 (spotted skunk), 10 (striped skunk), 11 (Virginia opossum), 12 (long-tailed weasel), and 13 (ermine). As of January, 2004, 171 trappers have purchased licenses for the current trapping year (2003-04).

Muskrat populations are very sensitive to drought, which, of course, shrinks the marshes and shallow lakes that constitute their habitat. After several years of drought, six marshes in northwest Iowa were closed for a year to muskrat trapping. Five shallow lakes within the same general area remained open to trapping. The number of muskrat harvested yearly was recorded for both areas following the closed seasons in an effort to measure the effects of the closed season on subsequent harvests. Harvests per hectare remained nearly the same on both areas for four successive years after the closure (Shaw 1985, p. 166).

The Department is aware of two instances where a flood may have impacted endangered species, the Fresno kangaroo rat and the riparian brush rabbit. However, we found no examples documenting losses to floods of furbearing or nongame mammals in the literature. Wildlife losses from drowning are associated with all major floods. However, the impact of the losses, even when substantial, are short lived, as populations have the potential for quick recovery. The key to the degree and speed of recovery rests with recovery of habitat, including water, to normal.

Based on its analysis, the Department has determined that droughts and floods, together with existing regulations and proposed minor changes, will not have a significant adverse cumulative effect.

EFFECTS OF DISEASES

Many furbearing and nongame mammals are subject to a variety of diseases and parasites. These include mange, distemper, rabies, heartworm, tapeworm, roundworm, hookworm, pamleukopenia, mycoplasma, rhinotracheitis, brucellosis, vesicular stomatitis, salmonellosis, infectious peritonitis, tularemia, sylvatic plague, toxoplasmosis, parvovirus, pseudorabies, and others (Chapman and Feldhamer 1982). Many diseases seem density dependent, affecting larger proportions of animals at high densities than at low densities. Regulation of wildlife populations by disease agents nonetheless is difficult to demonstrate conclusively. Disease has sometimes been cited as controlling natality (birth rate), as a causative agent in population cycles, or as affecting age structure in wildlife populations. Exotic diseases (those to which native wildlife have not been historically exposed) may have devastating results on the viability of isolated, native wildlife, as illustrated by avian malaria on some species of Hawaiian birds (Robinson and Bolen 1984).

The Department is aware of occasional, localized, and relatively self-limiting diseases that have occurred in California. There has been tularemia in beaver; distemper in badgers; rabies in skunks; and parvovirus, pseudorabies, and distemper in raccoons (Dr. David A. Jessup, DVM, pers. comm.). However, the Department is unaware of any epizootics (diseases that affect many individuals at one time) that have severely impacted furbearing and nongame mammals. Based on its analysis, the Department has determined that diseases and parasites, together with existing regulations and proposed minor changes, will not have a significant adverse cumulative effect.

EFFECTS OF ILLEGAL HARVEST (POACHING)

The following table shows the number of trapping-related citations issued by Department wardens in recent years.

Trapping-Related Citations Issued by the Department of Fish and Game	
Year	**Number**
2002	3
2001	1
2000	No data available
1999	16
1998	3
1997	3
1996	28
1995	6
1994	14
1993	1
1992	1
1991	28
1990	35

The large number of citations issued in certain years was usually a result of undercover operations where several perpetrators and violations are involved. In 1995, the one citation was issued for: (1) the use of unpadded traps, (2) no identification number on the traps, and (3) not checking traps every 24 hours.

This seemingly low number of citations does not necessarily indicate that the trapping violations are low compared to other types of citations issued. Trapping activities usually occur in remote areas and in many cases are very difficult to monitor. Because of this, annual mortality is studied collectively and, therefore, includes all forms of death, including poaching. Mortality data obtained from research was included in the population models. Therefore, the influence of illegal take is assumed to be reflected in the harvest analysis contained in those models. Based on this analysis, the Department has determined that illegal harvest, together with existing regulations and the proposed minor changes, will not have a significant adverse cumulative effect.

A special undercover operation in 1987 and 1988 (operation Rube), resulted in the arrest and conviction of 21 people for 25 violations, including alteration of bobcat tags (one), selling sport-caught bobcats without a trapping license (13), selling sport-caught foxes without a trapping license (one), possession of untagged bobcats (two), possession of a ringtail (one), and sale of furs without a trapping license (seven).

Another undercover operation (Operation Rufus) was conducted in 1988 and 1989. Department personnel made several arrests for 30 violations, including sale of raw fur without a license (16), sale of untagged bobcat pelts (12), buying raw furs without a dealer's license (one), and unlawful take of river otter (one).

The Operation Rufus summary of citations for 1990 is as follows: take of ringtail (one), take of river otter (one), sale of bobcats without tags (13), sale of furs without a trapping license (17), illegal transfer of trapping license (seven), and purchase of furs without a dealer's permit (one).

The purpose of such undercover operations, as well as having wardens in the field, is to serve as a deterrent to those who may be tempted to break the law. Budget constraints limit the number of wardens on patrol. The Department does not know the extent of poaching of furbearers in California. Most of the violations cited above

involved the sale of pelts without a trapping license, even though many of the animals were taken legally with a hunting license. The Department's estimate of the illegal take of river otters is between 10 and 25 animals per year.

The previous enforcement personnel table (Chapter 2) shows the number of warden and lieutenant positions in 2003 listed by selected Fish and Game divisions/regions. These numbers represent an 11% decrease in enforcement staff over the prior year, due primarily to budgetary reductions. However, this reduction is not expected to have a significant impact on enforcement procedures. For comparison, the same numbers of wardens were on staff in 1976, but the number of hunters was 88% greater. Therefore, the project is not likely to have a significant effect on furbearing and nongame mammal populations when combined with the effects of poaching and fewer wardens in the field.

EFFECTS OF VEHICLE-CAUSED MORTALITY (ROAD KILLS)

Furbearing and nongame mammals are killed by vehicles on a continuing basis. Opossums and striped skunks are probably the two species most affected, followed by raccoons. However, the Department does not have data on the number and frequency of road kills. The population models found in appendices 1 (badger), 2 (beaver), 3 (bobcat), 4 (coyote), 5 (gray fox), 6 (mink), 7 (muskrat), 8 (raccoon), 9 (spotted skunk), 10 (striped skunk), 11 (Virginia opossum), 12 (long-tailed weasel), and 13 (ermine) include an estimate of annual mortality based on research. It is difficult to break down mortality causes other than hunting and trapping. For this reason, annual mortality is studied collectively and includes all forms of death, including road kills. By applying mortality data to the population models, road kill data is automatically included.

Based on its analysis, the Department has determined that vehicle-caused mortality, together with existing regulations and proposed minor revisions will not have a significant adverse cumulative effect.

EFFECTS OF HABITAT LOSS AND DEGRADATION

The most important consideration in the maintenance of furbearing and nongame mammals is the protection of their habitat. With respect to habitat, an analysis was conducted by the Department to determine what habitat changes could be expected to affect furbearing and nongame mammals in the future. This cumulative

impact analysis was based upon the Forest and Rangeland Resources Assessment Program CALPLAN simulation model (Davis *et al.* 1987, Forest and Rangeland Resources Assessment Program 1988). The model was developed to forecast future changes in vegetation and habitat productivity. CALPLAN recognizes interactions between landowner management objectives; resource supply and condition; available markets; and large-scale social, political, economic, and demographic trends. The underlying premise of the model is that these trends shape the objectives and constraints of landowners (private and public), affecting how they manage their land. Hence, CALPLAN can be used to produce estimates of future resource condition and production.

THE CALPLAN MODEL

The model is initially calibrated by deriving a behavior class (landowners that share similar views regarding their land as an economic asset, have similar management objectives, face similar constraints that affect ability to invest, and therefore utilize similar management practices) structure that corresponds with current management patterns and resource production rates. A scenario is generated by predicting how owners of land that provide wildlife habitat might respond to future political and economic conditions in terms of changes in objectives and investment patterns. Acres are shifted between behavior classes to simulate owner responses leading to new patterns of land management. Associated with each management regime are yields of various resource outputs and their environmental effects.

Important features of the model for this analysis include:

1. Resource production is projected by land ownership classes;
2. Projections can be summarized at the county level;
3. A wide range of activities that have the most potential for significant impact on wildlife habitat are simulated, including various timber harvest and regeneration regimes; wildfire; grazing; fuelwood cutting; conversion to urban and agricultural uses; and range management practices, such as controlled burning, fertilizing, seeding, and oak removal;
4. Multiple resources are projected. Particular interests for this analysis are acres by WHR cover type and seral stage (Mayer and Laudenslayer 1988). Because each behavior class has a unique set of management practices,

each class generates a unique habitat (WHR type/seral stage) structure over time; and

5. The model relies on the best available data sources, including results of projects initiated by the Forest and Rangeland Resources Assessment Program, related to range management practices, forest succession, oak regeneration, fuelwood harvesting, and timber management strategies. For each national forest, projected resource production was obtained from the preferred alternative available in the 1988 land management plans. These lands were not simulated using the CALPLAN behavior class approach.

A CALPLAN simulation approach generates acres by WHR habitat type and seral (successional) stage for each county and owner class at 10-year intervals. For the purpose of this analysis, the results are summed across owner behavior classes for the decades 1990 and 2000.

This information provided by the CALPLAN model permits an analysis of the expected availability of various habitats which will support furbearing and nongame mammals in the future.

HABITAT QUALITY AND QUANTITY

In order to reflect varying quality and quantity of furbearer and nongame mammal habitats, all 10 terrestrial species were analyzed. Three aquatic species, beaver, mink and muskrat, will be discussed later in this section. The known habitat acreages for each species were converted to "habitat value units" by multiplying the habitat/seral stage projections from CALPLAN by the relative habitat values for reproduction, food, and cover. The habitat values were derived from the WHR species information reports produced by the Department's WHR computer database. The HSM ratings of high (optimum), medium (suitable), low (marginal), and not used were converted to habitat value coefficients of 1.0, .66, .33, and 0, respectively (Ohmann and Mayer 1987). The multiplication of these coefficients by habitat/seral stage acres produced habitat value units for decade 1990 and decade 2000 for each of the 10 species of furbearers. These habitat value units reflect the overall quality of habitat to the 10 terrestrial species during those decades, considering an array of natural and man-caused effects that were programmed into the CALPLAN model.

ANALYSIS OF HABITAT LOSS

The comparative analysis of habitat value units (quality) for the above 10 species are displayed in tables in the following pages. A comparison of the decade 1990 to the decade 2000 indicates very little change in total habitat value to these species, even though there are substantial changes (+ and -) among some habitat types on a county basis.

Each of the 10 tables at the end of this chapter displays the results of this analysis. The cumulative effects are expressed as a percent change in habitat value. This change was established by comparing the simulated habitat values for decade 1990 and decade 2000. The difference in habitat value between decade 1990 and decade 2000 is expressed as a percentage of change. Although each of the 10 species used in this analysis occur in many different habitat types throughout their ranges, the six most important habitat types for each were used in this analysis. These were determined by evaluating the number of low, medium, and high ratings for each habitat as shown in the Species Information Reports (WHR computer database). Analysis of changes in habitat values is shown not only for the entire State, but for each county occupied by the species in question. Generally, large percentages of increases or decreases in habitat value are a function of low amounts of a particular habitat type in a particular county and do not necessarily indicate a great gain or loss. This is most evident in the gray fox table for the montane hardwood habitat.

Table 2 shows the results of this analysis for badger. The statewide value (quality and quantity) of badger habitat will decline slightly over the next 10 years. It is projected that five habitats will decline in value to badgers from one to three percent by the decade 2000. The value of one habitat, perennial grass, is not expected to change.

The cumulative effects analysis shows a greater than 10 percent decline in six of 56 counties for annual grass. Three of the counties are Kings, Madera, and San Joaquin in the San Joaquin Valley, where badgers are already scarce, mainly because of agricultural development. The other three counties are Butte, Yolo, and Yuba. The statewide value loss of annual grass is expected to be three percent over the next decade.

Table 3 shows the results of this analysis for bobcat. The greatest decline (- four percent) over the next decade is expected to occur in the coast scrub habitat type,

particularly in San Diego and Santa Clara counties. The 300 percent increase in montane chaparral habitat in Alpine county is misleading, because only a few acres of this habitat type are involved. All other habitats indicate little or no change.

Table 4 shows the results of cumulative impacts analysis for coyote. Again, the greatest decline in value over the next decade is in coast scrub (- three percent). The impact is expected to be the greatest in San Bernardino and Santa Clara counties.

Although an 11 percent decline is expected for chamise-redshank chaparral and mixed chaparral in Santa Clara County, the overall statewide loss is not expected to be greater than a one percent decline.

Table 5 shows the cumulative impacts analysis results for gray fox. Again, the coast scrub habitat is projected to experience the greatest loss of value (- five percent) over the next decade. The remaining habitats, in spite of losses and gains in particular counties, are expected to decline from two percent to less than one percent.

Table 6 shows the cumulative analysis results for raccoon. A three percent decline in habitat value for mixed conifer is expected, as well as an increase of five percent for montane hardwood conifer. The change in the other four habitats ranges from a less than one percent decrease to a one percent increase. Significant fluctuations in habitat value are expected on a county basis.

Table 7 shows the cumulative impacts analysis results for spotted skunk. Coast scrub is expected to decline by four percent in value over the next decade. Many fluctuations are expected county by county for montane hardwood, with a statewide increase over the next decade. The other four habitats are projected to remain relatively stable.

Table 8 shows the cumulative impacts analysis results for striped skunk. A nine percent decline in the value of chamise-redshank chaparral and six percent decline in coast scrub value is expected. The other four habitats are projected to remain relatively unchanged in habitat value.

Table 9 shows the cumulative impacts analysis results for Virginia opossum. A three percent decline in the value of coast scrub is predicted to occur over the next decade. The other five habitats will remain relatively unchanged.

Table 10 shows the results of the cumulative impacts analysis for long-tailed weasel. Annual grass value is expected to decline by three percent, with substantial losses indicated for Kings, Madera, San Joaquin, Yolo, and Yuba counties. The value of the other five habitats is essentially unchanged over the next decade.

Table 11 shows the results of the cumulative impacts analysis for ermine. Statewide, no significant changes in the value of ermine habitat are expected to occur over the next decade.

Based on CALPLAN projections, the value of habitat in various areas for furbearing and nongame mammals will change over time. In response to these changes, wildlife numbers will fluctuate locally. However, it is the Department's opinion that the slight reduction in habitat value will not significantly affect the stability of the statewide populations in combination with the effects of hunting and trapping pursuant to the proposed project.

The Department could not evaluate habitat value change over time for beaver, mink, and muskrat in the same way as it did for the terrestrial furbearing and nongame mammals, because the CALPLAN model does not address aquatic habitats. However the acreage of aquatic habitats is expected to increase by the year 2000. These three species, as well as many other wetland-dependent wildlife species, are expected to benefit from the Department's Comprehensive Wetland Habitat Program and the Central Valley Joint Venture segment of the North American Waterfowl Management Plan, which both seek to increase wetland habitat in the State, as well as the Federal government's recent policies to protect and increase wetlands.

Therefore, the Department has concluded that the cumulative effects of hunting, commercial trapping, Federal animal damage control, wildfire, drought, flood, timber harvest, livestock grazing, disease, fuelwood harvest, and urban development will not significantly impact the environment of the 13 species of furbearing and nongame mammals over the next decade.

EFFECTS OF MAJOR DEVELOPMENT PROJECTS

Furbearing and nongame mammal habitat will continue to be lost or altered in California. The scope of habitat loss from projects involving land use changes can be locally significant. However, losses or significant reduction of habitat values for species covered by this project are not expected to be significant over a major portion of their ranges.

In an ongoing effort to address the effects of individual projects on all wildlife, the Department provides input on wildlife habitat protection measures in county general plans and planning documents of the USFS, BLM, and other land management agencies. The Department has significantly affected county land use planning throughout the State. Counties, such as Sierra, Plumas, and Shasta, have modified development plans in favor of wildlife.

In addition, the Department provides comments on the adequacy and accuracy of documents prepared prior to construction of various types of projects, as required by CEQA and the National Environmental Policy Act. These comments are directed at making certain these documents adequately describe effects of a proposed project on the affected wildlife populations and that alternatives that mitigate these effects are presented. Each year, the Department provides comments on approximately 16,000 environmental documents for planned projects or permits.

The Department has played an active role in the USFS planning process by providing wildlife input (e.g., hardwood retention standards) on each land management plan. Moreover, when the Department has identified situations where management objectives have not been implemented as agreed to by the approved plan, the Department has filed official appeals. The first appeal of this kind occurred in 1988, concerning the Sierra National Forest. This process has led to modifications to the plans and land management activities to the benefit of many wildlife species.

Based on its analysis, the Department has determined that major development projects, together with the proposed project, will not have a significant adverse cumulative effect.

Table 2. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Badger						
County	Alkali Scrub	Annual Grass	Desert	Juniper	Perennial Grass	Pinyon-Juniper
Alameda		-5%				
Alpine		0%		-1%		-1%
Amador		0%				
Butte		-10%				0%
Calaveras		0%				
Colusa		-2%			0%	
Contra Costa		-7%				
El Dorado		0%				
Fresno		0%				
Glenn		-3%			0%	
Humboldt		0%			0%	
Imperial	0%		0%			-1%
Inyo	0%		0%	-1%	0%	-1%
Kern		-1%				-1%
Kings		-30%				1%
Lake		3%			0%	
Lassen		-4%		-1%	0%	0%
Los Angeles	-3%	-2%	-3%			-1%
Madera		-14%				
Marin		-1%				
Mariposa		0%				-1%
Mendocino		0%			0%	
Merced		-8%				
Modoc		0%		0%		
Mono	0%		0%	-1%		0%
Monterey		0%				0%
Napa		1%				
Nevada		0%			0%	
Orange		0%				
Placer		-7%			0%	
Plumas		-1%		-1%	0%	0%

Table 2. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Badger						
County	Alkali Scrub	Annual Grass	Desert	Juniper	Perennial Grass	Pinyon-Juniper
Riverside	-2%	-1%	-2%	0%		-1%
Sacramento		-4%				
San Benito		2%				0%
San Bernardino	0%	0%	0%			-3%
San Diego		-4%	0%			-1%
San Joaquin		-14%				
San Luis Obispo		-2%				0%
San Mateo		-9%				
Santa Barbara		-1%				0%
Santa Clara		0%				
Santa Cruz		-2%				
Shasta		0%		-1%	0%	0%
Sierra		0%			0%	0%
Siskiyou		0%		-1%	0%	0%
Solano		-2%			0%	
Sonoma		0%				
Stanislaus		-8%				
Sutter		0%				
Tehama		1%			0%	0%
Trinity		0%		-1%	0%	
Tulare		-3%	0%			-1%
Tuolumne		0%	0%			
Ventura		-1%				0%
Yolo		-16%				
Yuba		-19%				
Statewide Loss/Gain of Habitat	<-1%	-3%	-1%	-1%	0%	-1%

Table 3. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Bobcat						
County	Chamise Redshank Chaparral	Coast Scrub	Low Sage-brush	Mixed Chaparral	Montane Chaparral	Sage-brush
Alameda	0%			0%		
Alpine					0%	-1%
Amador	-2%			-2%	300%	
Butte	0%			0%	0%	0%
Calaveras	-1%			0%	1%	0%
Colusa	0%			0%	-1%	
Contra Costa	0%			-1%		
Del Norte					0%	
El Dorado	-1%			-1%	-2%	
Fresno	-1%			-1%	-1%	-2%
Glenn	0%			0%	-1%	
Humboldt	0%	-2%		0%	0%	
Imperial	-1%			0%		
Inyo			0%		0%	0%
Kern	0%	0%		0%	-2%	-2%
Kings	-1%			-2%		-7%
Lake	-2%			-1%	-2%	
Lassen	0%		0%	0%	0%	0%
Los Angeles	0%	-1%		0%		
Madera	-2%			-2%	0%	-2%
Marin	0%	0%		0%		
Mariposa	0%			0%	0%	-1%
Mendocino	-1%	0%		0%	-1%	
Merced	0%			0%		
Modoc	0%		0%	0%	0%	-1%
Mono			0%			0%
Monterey	-1%	-1%		-1%	0%	-1%
Napa	0%			-1%		
Nevada	-5%			-4%	-6%	0%
Orange	-1%	-9%		0%		
Placer	0%			0%	0%	
Plumas	0%		0%	0%	0%	0%
Riverside	0%	-7%		0%		

Table 3. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Bobcat						
County	Chamise Redshank Chaparral	Coast Scrub	Low Sage-brush	Mixed Chaparral	Montane Chaparral	Sage-brush
Sacramento	0%			0%		0%
San Benito	0%	0%		-1%		
San Bernardino	-1%	-12%		0%		0%
San Diego	-2%	-9%		-2%		
San Joaquin	0%			-1%		
San Luis Obispo	0%	-1%		0%		
San Mateo	0%	-2%		0%		
Santa Barbara	0%	-1%		-2%	-2%	
Santa Clara	-12%	-11%		-12%		
Santa Cruz	-2%	0%		-2%		
Shasta	-1%		0%	-1%	0%	0%
Sierra	0%			0%	0%	0%
Siskiyou	-1%		0%	0%	0%	0%
Solano	0%			0%		
Sonoma	-1%	0%		-1%		
Stanislaus	0%			0%		
Sutter	0%			0%		
Tehama	0%			0%	0%	0%
Trinity	0%		0%	0%	0%	0%
Tulare	0%			-2%	0%	0%
Tuolumne	0%			0%	0%	-1%
Ventura	0%	-6%		-1%	-1%	
Yolo	0%			-1%		
Yuba	0%			0%		
Statewide Loss/Gain of Habitat	-1%	-4%	<-1%	-1%	<-1%	<-1%

Table 4. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Coyote						
County	Bitter-brush	Chamise Redshank Chaparral	Coast Scrub	Mixed Chaparral	Montane Chaparral	Sage-brush
Alameda		0%		0%		
Alpine					0%	0%
Amador		-1%		-1%	150%	
Butte		0%		0%	0%	0%
Calaveras		0%		0%	1%	0%
Colusa		0%		0%	0%	
Contra Costa		0%		0%		
Del Norte					0%	
El Dorado		-1%		-1%	-1%	
Fresno		0%		0%	0%	0%
Glenn		0%		0%	0%	
Humboldt		0%	-2%	0%	0%	
Imperial		0%		0%		
Inyo	0%				0%	0%
Kern		0%	0%	0%	0%	-2%
Kings		0%		-1%	0%	-7%
Lake		-1%		0%	-1%	
Lassen	0%	0%		0%	0%	0%
Los Angeles		0%	-1%	0%		
Madera		-1%		-1%	0%	0%
Marin		0%	0%	0%		
Mariposa		0%		0%	0%	0%
Mendocino		-1%	0%	0%	-1%	
Merced		0%		0%		
Modoc	0%	0%		0%	0%	0%
Mono	0%				0%	0%
Monterey		-1%	-1%	-1%	0%	0%
Napa		0%		0%		
Nevada		-4%		-3%	-4%	0%
Orange		0%	-9%	0%		
Placer	0%	0%		0%	0%	
Plumas		0%		0%	0%	0%

Table 4. Percentage Increase/Decrease of Decade 1990 Versus 2000 In the Values of the Six Most Important Habitats for Coyote						
County	**Bitter-brush**	**Chamise Redshank Chaparral**	**Coast Scrub**	**Mixed Chaparral**	**Montane Chaparral**	**Sage-brush**
Riverside		0%	-7%	0%		
Sacramento		0%		0%		
San Benito		0%	0%	0%		
San Bernardino		-1%	-12%	0%		0%
San Diego		-2%	-8%	-1%		
San Joaquin	0%	0%	0%	0%	0%	0%
San Luis Obispo		0%	0%	0%		
San Mateo		0%	-2%	0%		
Santa Barbara		0%	-1%	-1%	-1%	
Santa Clara		-11%	-11%	-11%		
Santa Cruz		-2%	0%	-2%		
Shasta	0%	0%		0%	0%	0%
Sierra		0%		0%	0%	0%
Siskiyou	0%	-1%		0%	0%	0%
Solano		0%		0%		
Sonoma		0%	0%	0%		
Stanislaus		0%		0%		
Sutter		0%		0%		
Tehama		0%		0%	0%	0%
Trinity	0%	0%		0%	0%	0%
Tulare		0%		0%	0%	0%
Tuolumne		0%		0%	0%	0%
Ventura		0%	-6%	0%	0%	
Yolo		0%		0%		
Yuba		0%		0%	1%	
Statewide Loss/Gain of Habitat	<1%	-1%	-3%	-1%	<-1%	<-1%

Table 5. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Gray Fox						
County	Bitter-brush	Chamise Redshank Chaparral	Coast Scrub	Montane Hardwood	Montane Chaparral	Valley Foothill Hardwood
Alameda		0%				-2%
Alpine				24%	0%	0%
Amador		-3%		-4%	200%	-1%
Butte		1%		-3%	0%	0%
Calaveras		-1%		-3%	1%	-2%
Colusa		-1%		0%	-6%	-2%
Contra Costa		-2%				-4%
Del Norte				2%	0%	-5%
El Dorado		-1%		-2%	-2%	-4%
Fresno		-2%		14%	-1%	0%
Glenn		0%		-4%	-5%	-2%
Humboldt		2%	-13%	27%	2%	-3%
Imperial		2%				
Inyo	0%				0%	
Kern		0%	-7%	0%	-4%	-1%
Kings		-3%		0%	0%	-1%
Lake		-3%		-1%	-2%	-5%
Lassen	0%	1%		-13%	0%	9%
Los Angeles		0%	-2%	0%		-1%
Madera		-3%		-16%	0%	-1%
Marin		2%	-29%	0%		-4%
Mariposa		1%		0%	-1%	-1%
Mendocino		-2%	-26%	15%	-2%	-2%
Merced		-1%				-1%
Modoc	-1%	1%		465%	0%	0%
Mono	0%			1,400%	0%	
Monterey		-1%	-4%	0%	-1%	-2%
Napa		0%		-1%		-1%
Nevada		-4%		0%	-6%	-6%
Orange		-3%	-18%	0%		1%
Placer	0%	1%		-2%	0%	-21%
Plumas		4%		-4%	1%	0%

Table 5. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Gray Fox						
County	Bitter-brush	Chamise Redshank Chaparral	Coast Scrub	Montane Hardwood	Montane Chaparral	Valley Foothill Hardwood
Riverside	0%	0%	-4%	0%		0%
Sacramento		3%				0%
San Benito		-2%	-6%	0%		-3%
San Bernardino		-1%	-7%	0%		0%
San Diego		-2%	-3%	0%		-5%
San Joaquin		-2%				0%
San Luis Obispo		0%	-6%	0%		-4%
San Mateo		2%	-24%	0%		-3%
Santa Barbara		0%	-4%	0%	-2%	1%
Santa Clara		-14%	-5%	-1%		-3%
Santa Cruz		0%	-18%	0%		-2%
Shasta	0%	0%		-11%	-1%	-1%
Sierra		3%		0%	1%	
Siskiyou	0%	1%		9%	0%	0%
Solano		2%	0%			0%
Sonoma		-1%	-30%	2%		-7%
Stanislaus		0%				-1%
Sutter		4%				0%
Tehama		0%		3%	-1%	-3%
Trinity	-1%	0%		-1%	0%	0%
Tulare		1%		0%	1%	-1%
Tuolumne		0%		24%	0%	-2%
Ventura		0%	-5%	0%	-1%	-9%
Yolo		0%				-1%
Yuba		3%		-2%	0%	-5%
Statewide Loss/Gain of Habitat	<1%	-1%	-5%	2%	<-1%	-2%

Table 6. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Raccoon						
County	Mixed Conifer	Montane Hardwood Conifer	Montane Riparian	Montane Hardwood	Valley Riparian	Valley Foothill Hardwood
Alameda						1%
Alpine	0%	-44%	0%	24%		0%
Amador	-5%	18%	0%	-3%		1%
Butte	-6%	6%		0%	0%	-1%
Calaveras	-5%	84%	0%	-2%		-1%
Colusa	-1%	0%	0%	0%	0%	-1%
Contra Costa						2%
Del Norte	0%	122%		2%	0%	1%
El Dorado	-4%	11%	0%	-1%	0%	-3%
Fresno	-1%	-4%	0%	7%	0%	0%
Glenn	-4%	25%		-3%	0%	0%
Humboldt	-4%	4%		21%		
Imperial		-100%				
Inyo		-100%	0%			
Kern	0%	-88%	0%	0%	0%	-1%
Kings				0%	0%	2%
Lake	-1%	-6%		2%		-2%
Lassen	-4%	111%	0%	-17%		10%
Los Angeles	0%	0%		0%		1%
Madera	-1%	4%	0%	-10%	0%	1%
Marin	0%	0%		0%	0%	2%
Mariposa	-3%	-56%	0%	0%		1%
Mendocino	-8%	-7%		13%		0%
Merced					0%	1%
Modoc	5%	8%	0%	465%		2%
Mono	0%	-88%	0%	800%		
Monterey	-2%	-4%		0%	0%	1%
Napa	26%	-1%		1%		1%
Nevada	-5%	-9%		1%		-3%
Orange			0%	0%	0%	0%
Placer	-4%	-5%	0%	-2%		-21%
Plumas	-2%	7%	0%	-3%		0%

Table 6. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Raccoon						
County	Mixed Conifer	Montane Hardwood Conifer	Montane Riparian	Montane Hardwood	Valley Riparian	Valley Foothill Hardwood
Riverside	0%	-100%		0%	0%	0%
Sacramento						1%
San Benito	0%	0%		0%		-1%
San Bernardino	0%	-7%	0%	0%		0%
San Diego	0%	0%	0%	0%	0%	-2%
San Joaquin					0%	1%
San Luis Obispo	0%	-9%		0%		1%
San Mateo	0%	3%		0%		2%
Santa Barbara	0%	0%		0%		1%
Santa Clara	0%	0%		-1%		1%
Santa Cruz	0%	5%		0%		-1%
Shasta	-6%	273%		-14%	0%	0%
Sierra	-2%	-4%	0%	2%		
Siskiyou	-2%	20%	0%	6%		0%
Solano		0%				2%
Sonoma	-17%	5%		2%		-6%
Stanislaus					0%	-2%
Sutter						1%
Tehama	-4%	44%		3%	0%	-2%
Trinity	-2%	-1%		2%		2%
Tulare	0%	-93%	0%	0%	0%	-1%
Tuolumne	-2%	2%	0%	17%	0%	0%
Ventura	0%	0%		0%		-4%
Yolo	-1%	0%				1%
Yuba	-5%	5%	0%	0%	0%	-2%
Statewide Loss/Gain of Habitat	-3%	5%	0%	1%	0%	<-1%

Table 7. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Spotted Skunk						
County	Chamise Redshank Chaparral	Coast Scrub	Mixed Chaparral	Montane Riparian	Montane Hardwood	Montane Chaparral
Alameda	0%		0%			
Alpine				0%	24%	-1%
Amador	-2%		-2%	0%	-4%	167%
Butte	0%		0%		-6%	0%
Calaveras	-1%		0%	0%	-4%	1%
Colusa	-1%		0%		0%	-1%
Contra Costa	-1%		-1%			
Del Norte					0%	0%
El Dorado	-1%		-1%	0%	-2%	-2%
Fresno	-1%		-1%	0%	21%	-1%
Glenn	0%		0%		-4%	-1%
Humboldt	0%	-2%	0%		30%	0%
Imperial	0%		0%			
Inyo				0%		0%
Kern	0%	0%	0%	0%	0%	-2%
Kings	-1%		-1%			
Lake	-2%		-1%		-2%	-2%
Lassen	0%		0%	0%	-8%	0%
Los Angeles	0%	-1%	0%		0%	
Madera	-2%		-2%	0%	-20%	0%
Marin	0%	0%	0%		0%	
Mariposa	0%		0%	0%	0%	0%
Mendocino	-1%	0%	0%		15%	-1%
Merced	0%		0%			
Modoc			0%	0%	465%	0%
Mono				0%	150%	0%
Monterey	-2%	-1%	-1%		0%	-1%
Napa	-1%		-1%		-4%	
Nevada	-5%		-4%		0%	-6%
Orange	-1%	-9%	0%	0%	0%	
Placer	0%		0%	0%	-2%	0%
Plumas	0%		0%	0%	-5%	0%

Table 7. Percentage Increase/Decrease of Decade 1990 Versus 2000 In the Values of the Six Most Important Habitats for Spotted Skunk						
County	**Chamise Redshank Chaparral**	**Coast Scrub**	**Mixed Chaparral**	**Montane Riparian**	**Montane Hardwood**	**Montane Chaparral**
Riverside	-1%	-7%	0%	0%	0%	
Sacramento	0%		0%			
San Benito	-1%	0%	-1%		0%	
San Bernardino	-2%	-12%	0%	0%	0%	
San Diego	-2%	-9%	-2%	0%	0%	
San Joaquin	-1%		-1%			
San Luis Obispo	0%	-1%	0%		0%	
San Mateo	0%	-2%	0%		0%	
Santa Barbara	-1%	-1%	-2%		0%	-2%
Santa Clara	-12%	-11%	-12%		-1%	
Santa Cruz	-2%	0%	-2%		0%	
Shasta	-1%		-1%		-9%	0%
Sierra	0%		0%	0%	-1%	0%
Siskiyou	-1%		0%	0%	11%	0%
Solano	0%		0%			
Sonoma	-1%	0%	-1%		2%	
Stanislaus	0%		0%			
Sutter	0%		1%			
Tehama	0%		0%		4%	0%
Trinity	0%		0%		-1%	0%
Tulare	0%		-1%	0%	0%	0%
Tuolumne	0%		0%	0%	28%	0%
Ventura	0%	-6%	-1%		0%	-1%
Yolo	0%		-1%			
Yuba	0%		0%	0%	-4%	1%
Statewide Loss/Gain of Habitat	-1%	-4%	-1%	0%	2%	<-1%

Table 8. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Striped Skunk						
County	Chamise Redshank Chaparral	Coast Scrub	Mixed Chaparral	Montane Riparian	Montane Chaparral	Valley Riparian
Alameda	-27%		0%			
Alpine				0%	-2%	
Amador	-27%		-1%	-1%	13%	
Butte	-27%		0%		-2%	-1%
Calaveras	-28%		0%	0%	-3%	
Colusa	-24%		0%	-5%	-11%	-1%
Contra Costa	-23%		0%			
Del Norte				0%	-16%	-1%
El Dorado	-29%		-1%	0%	-5%	-1%
Fresno	-26%		0%	0%	-3%	0%
Glenn	-29%		0%		-10%	0%
Humboldt	-31%	-22%	0%		-4%	0%
Imperial	-35%		0%			
Inyo					-4%	
Kern	-29%	-19%	0%	0%	-3%	0%
Kings	-24%		-3%			0%
Lake	-26%		0%		-7%	
Lassen	-33%		0%	0%	-2%	
Los Angeles	-24%	-21%	0%			
Madera	0%		-1%	0%	0%	0%
Marin	0%	0%	0%			0%
Mariposa	0%		0%	0%	-1%	
Mendocino	0%	0%	0%		-2%	
Merced	1%		0%			0%
Modoc	0%		0%	0%	0%	
Mono				0%	0%	
Monterey	-1%	0%	-1%	0%		0%
Napa	0%		0%			
Nevada	-2%		-3%		-4%	
Orange	1%	-9%	0%	0%		0%
Placer	0%		0%	0%	1%	
Plumas	0%		0%	0%	1%	

Table 8. Percentage Increase/Decrease of Decade 1990 Versus 2000 In the Values of the Six Most Important Habitats for Striped Skunk						
County	Chamise Redshank Chaparral	Coast Scrub	Mixed Chaparral	Montane Riparian	Montane Chaparral	Valley Riparian
Riverside	0%	-6%	0%	0%		0%
Sacramento	0%		0%			0%
San Benito	1%	0%	0%			
San Bernardino	-1%	-11%	0%	0%		
San Diego	-1%	-8%	-1%	0%		0%
San Joaquin	1%		0%			0%
San Luis Obispo	0%	0%	0%			
San Mateo	0%	-2%	0%			
Santa Barbara	0%	-1%	-1%		1%	
Santa Clara	-9%	-10%	-11%			
Santa Cruz	-2%	0%	-2%			
Shasta	0%		0%		-1%	0%
Sierra	0%		0%	0%	2%	
Siskiyou	-1%		0%	0%	1%	
Solano	0%		0%			
Sonoma	1%	0%	0%			
Stanislaus	0%		0%			0%
Sutter	0%		0%			
Tehama	1%		0%		-1%	0%
Trinity	0%		0%		0%	
Tulare	0%		0%	0%	2%	0%
Tuolumne	0%		0%	0%	0%	0%
Ventura	0%	-5%	0%		0%	
Yolo	0%		0%			
Yuba	0%		0%	0%	1%	0%
Statewide Loss/Gain of Habitat	-9%	-6%	-1%	<-1%	-1%	<-1%

Table 9. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Virginia Opossum						
County	Coast Scrub	Mixed Chaparral	Montane Riparian	Montane Hardwood	Valley Riparian	Valley Foothill Hardwood
Alameda		2%				-1%
Amador		3%	0%	-4%		0%
Butte		-1%		-2%	0%	-1%
Calaveras		-1%	0%	-3%		-2%
Colusa		0%	0%	0%	0%	-2%
Contra Costa		10%				0%
Del Norte				-7%	0%	0%
El Dorado		-2%	0%	-1%	0%	-4%
Fresno		8%	0%	15%	0%	0%
Glenn		1%		-3%		-1%
Humboldt	-2%	-5%		21%	0%	0%
Kern	0%	0%	0%	0%	0%	-1%
Kings		11%			0%	1%
Lake		2%		0%		-3%
Los Angeles	-1%	-1%		0%		0%
Madera		3%	0%	-17%	0%	0%
Marin	0%	-11%		0%	0%	-1%
Mariposa		-3%	0%	0%		0%
Mendocino	0%	1%		11%		-1%
Merced		4%			0%	0%
Monterey	0%	-1%		0%	0%	-1%
Napa		3%		0%		-1%
Nevada		-5%		1%		-4%
Orange	-9%	0%	0%	0%	0%	0%
Placer		-4%	0%	-1%		-21%
Plumas		-12%	0%	-4%		0%
Riverside	-5%	0%	0%	0%	0%	0%
Sacramento		-7%			0%	0%
San Benito	0%	8%		0%		-2%
San Bernardino	-11%	-1%	0%	0%		0%

Table 9. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Virginia Opossum						
County	Coast Scrub	Mixed Chaparral	Montane Riparian	Montane Hardwood	Valley Riparian	Valley Foothill Hardwood
San Diego	-7%	0%	0%	0%	0%	-2%
San Joaquin		9%			0%	0%
San Luis Obispo	0%	0%		0%		-1%
San Mateo	-2%	-11%		0%		0%
Santa Barbara	-1%	0%		0%		-1%
Santa Clara	-9%	-2%		-1%		-1%
Santa Cruz	0%	-10%		0%		-2%
Shasta		0%		-16%	0%	-1%
Sierra		-2%		2%		
Siskiyou		-6%	0%	8%		0%
Solano		-6%				0%
Sonoma	0%	0%		1%		-7%
Stanislaus		-2%				-2%
Sutter		-13%				0%
Tehama		5%		3%	0%	-3%
Trinity		-1%		1%		0%
Tulare		3%	0%	0%	0%	-1%
Tuolumne		-4%	0%	27%	0%	-1%
Ventura	-5%	1%		0%		-7%
Yolo		7%				0%
Yuba		-8%	0%	-2%	0%	-3%
Statewide Loss/Gain of Habitat	-3%	<-1%	0%	-1%	0%	-1%

Table 10. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Long-Tailed Weasel						
County	Annual Grass	Juniper	Mixed Chaparral	Montane Chaparral	Perennial Grass	Pinyon-Juniper
Alameda	-5%		0%			
Alpine	0%	-1%		0%		0%
Amador	0%		0%	125%		
Butte	-10%		0%	0%	0%	0%
Calaveras	0%		0%	1%		
Colusa	-2%		0%	1%	0%	
Contra Costa	-7%		1%			
Del Norte	0%				0%	
El Dorado	0%		-1%	0%		
Fresno	0%		1%	1%		
Glenn	-3%		0%	3%	0%	
Humboldt	0%		0%	0%	0%	
Inyo		-1%		0%	0%	0%
Kern	-1%	0%	0%	2%		0%
Kings	-30%		0%			2%
Lake	3%		0%	0%	0%	
Lassen	-4%	0%	0%	0%	0%	0%
Los Angeles	-2%		-1%			-1%
Madera	-14%		-1%	0%		
Marin	-1%		-1%			
Mariposa	0%		0%	0%		
Mendocino	0%		0%	0%	0%	
Merced	-8%		0%			
Modoc	0%	0%	0%	0%		
Mono	0%	0%		0%	0%	0%
Monterey	0%		0%	1%		0%
Napa	1%		0%			
Nevada	0%		-2%	-2%	0%	
Orange	0%		0%			
Placer	-7%		0%	0%	0%	
Plumas	-1%	0%	0%	4%	0%	0%

Table 10. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Long-Tailed Weasel						
County	Annual Grass	Juniper	Mixed Chaparral	Montane Chaparral	Perennial Grass	Pinyon-Juniper
Riverside	-1%	0%	0%			0%
Sacramento	-4%		0%			
San Benito	2%		1%			0%
San Bernardino	0%		0%			-2%
San Diego	-4%		-1%			-1%
San Joaquin	-14%		0%			
San Luis Obispo	-2%		1%			0%
San Mateo	-9%		-1%			
Santa Barbara	-1%		0%	0%		0%
Santa Clara	0%		-9%			
Santa Cruz	-2%		-2%			
Shasta	0%	0%	0%	-1%	0%	0%
Sierra	0%		0%	0%	0%	0%
Siskiyou	0%	0%	-1%	-1%	0%	0%
Solano	-2%		0%			
Sonoma	0%		1%			
Stanislaus	-8%		0%			
Sutter	0%		-1%			
Tehama	1%		0%	0%	0%	0%
Trinity	0%	0%	0%	0%	0%	
Tulare	-3%		1%	0%		0%
Tuolumne	0%		-1%	0%		
Ventura	-1%		1%	1%		0%
Yolo	-16%		1%			
Yuba	-19%		0%	2%		
Statewide Loss/Gain of Habitat	-3%	<-1%	<-1%	<-1%	0%	-1%

Table 11. Percentage Increase/Decrease of Decade 1990 Versus 2000 in the Values of the Six Most Important Habitats for Ermine						
County	Alpine Scrub	Douglas Fir	Lodgepole Pine	Mixed Conifer	Red Fir	Subalpine Conifer
Alpine			0%	0%	0%	
Amador			0%	-1%	0%	-1%
Butte			1%	-2%	6%	0%
Calaveras			1%	-3%	-1%	0%
Del Norte		-2%	0%	0%	0%	
El Dorado			0%	0%	0%	-1%
Fresno			0%	-1%	-2%	0%
Glenn		0%	800%	-4%	0%	0%
Humboldt		-6%		-12%	0%	
Lake		0%	200%	2%	0%	
Lassen	0%	0%	0%	1%	11%	
Madera	0%		0%	-2%	-2%	0%
Mariposa	0%		0%	-4%	-1%	0%
Mendocino		25%		-26%	0%	
Modoc	0%	0%	-1%	6%	10%	0%
Mono	0%		0%	0%	0%	0%
Nevada	0%		1%	-2%	0%	0%
Placer			-1%	-2%	-1%	-3%
Plumas	0%		1%	0%	-1%	-2%
Sierra	0%		0%	-4%	1%	0%
Siskiyou	0%	3%	-1%	2%	-3%	
Sonoma		-6%		-50%		0%
Tehama			0%	-2%	4%	0%
Trinity		-1%		-3%	-3%	0%
Tulare	0%		0%	0%	0%	0%
Tuolumne	0%		0%	0%	0%	0%
Yuba			750%	-3%	-8%	
Statewide Loss/Gain of Habitat	<-1%	-1%	<-1%	-1%	<-1%	<-1%

CHAPTER 6. ANALYSIS OF ALTERNATIVES TO THE PROJECT

INTRODUCTION

Although the activity of hunting and trapping certain furbearing and nongame mammals will result in the death of individual animals, specific safeguards included in the proposed action are intended to avoid or lessen potential significant effects and are not expected to result in a take that is above each species' sustained-yield capabilities.

In 1990, the Department recognized that the project of authorizing the hunting and trapping of furbearing and nongame mammals had the potential to significantly impact the environment by resulting in the trappisng of nontarget threatened and endangered species. Therefore, the Department made a detailed analysis of modifications to the project which would avoid or lessen the impacts. Based on a review of the hunting and trapping of furbearing and nongame mammal regulations in 1990, the Department recommended and the Commission adopted mitigation measures related to the use of padded leghold traps and the prohibition of Conibear-type traps, snares, and deadfall traps to avoid potential significant impacts on the two State-listed species (Sierra Nevada red fox and San Joaquin kit fox). As a result of further review and analysis of information contained in Chapter 4, the 1991-92 regulations were further modified to provide additional consideration to the welfare of individual animals, as required by Fish and Game Code Section 203.1. The Commission adopted regulations that required the use of commercially manufactured, padded leghold traps statewide, except for certain aquatic sets. On November 3, 1998, Proposition 4 was passed which prohibits the use of body-gripping traps to capture furbearing and nongame mammals for the purposes of recreation or commerce in fur. These changes are reflected in existing regulations. In addition, senate Bill 1645, which requires people trapping nuisance wildlife for hire to obtain trapping licenses, was passed in 2002. The Department's proposed project is to allow limited hunting and trapping of non-native red foxes, to extend the bobcat trapping season, and to match the zones of protection for the Sierra Nevada red fox and San Joaquin kit fox with their current ranges.

In addition to the proposed project, the Department is also providing the Commission with nine alternatives for consideration.

One alternative would be to prohibit the commercial hunting and trapping of bobcats. A second alternative discusses changes in season lengths for bobcats. The third alternative discusses changes in season lengths for badger and gray fox.

Alternative 4 discusses adjusting trapping season length for mink and muskrat. Alternative 5 discusses adjusting season length for raccoon. Alternative 6 discusses extending the trap visitation requirement. Alternative 7 proposes to establish a trapping season for river otter. Alternative 8 is a no hunting or trapping alternative. Alternative 9 is a no-project alternative.

ALTERNATIVE 1 - PROHIBIT THE COMMERCIAL HUNTING AND TRAPPING OF BOBCATS IN CALIFORNIA

The bobcat is one of two spotted cats that can be taken legally worldwide. A segment of the public believes that the take of furbearing mammals for wearing apparel is unnecessary and inhumane. It is also argued that the trapping, hunting, and sale of bobcats contributes relatively little ($62,773 in 2002-03) to the economy of California. Even though the biologically based sustained yield has not been exceeded since 1977-78, some people are concerned that trapping and hunting pressure in some areas may extirpate some local populations.

The estimated revenue generated from the sale of bobcat pelts was $62,773 last year. However, in 1986-87 it was estimated as high as $1,419,460. That revenue, while not a significant part of the State's economy, is important to a few California hunters and trappers. There is an additional economic value from the production and sale of garments made from bobcat fur.

Thirty-four trappers took bobcats during the 2002-03 trapping year. In past years, 1980-81 for example, as many as 1,007 trappers took bobcats. The allowable annual bobcat take in California is 20 percent (sustained yield) of the estimated population. The State population estimate is about 72,000 animals. The allowable harvest, then, equals about 14,400 bobcats annually. For the past 10 years, the average annual harvest, reported in the Department's annual bobcat harvest assessments, has been only 606 bobcats. The bobcat harvest is subject to the influences of supply and demand. The Department has monitoring mechanisms in place to ensure that the 14,400 allowable harvest is not exceeded in any year. Specific geographical areas of the State, such as the northeastern part (Modoc, Lassen, Plumas, and eastern Siskiyou counties), are also monitored every year.

The use of furs for wearing apparel takes advantage of a renewable natural resource. Individuals that are born into the population each year are more than enough to replace those animals removed by hunting and trapping. Synthetic furs are derived from petroleum products. Petroleum is not a renewable resource.

As the bobcat hunting/trapping harvest decreases, it would be expected that depredation problems caused by bobcats might increase. To confirm this theory, a correlation analysis was conducted by the Department. Ten years of USDA Wildlife Services take data were correlated and compared to hunter/trapper take for a similar period. During this 10-year period, the hunting and trapping regulations were similar. There was a very strong negative correlation, indicating that the Wildlife Services take increased when the hunting/trapping take decreased. Therefore, if the commercial harvest of bobcats is prohibited, the Wildlife Services program may experience an increased workload of bobcat depredation complaints. In addition, owners of private property (primarily livestock and poultry producers) may suffer damage and losses which, to a degree, would have been avoided if commercial hunting and trapping were permitted. Livestock and poultry loss from California bobcats in 1996-97 was valued at $23,939 (USDA 1998 pers. comm.).

ALTERNATIVE 2 - ADJUSTING LENGTH OF BOBCAT HUNTING SEASON

The bobcat population in California is estimated to contain about 72,000 adults. The allowable bobcat harvest is 20 percent per year or about 14,400 animals. This harvest quota has been approved by the United States Fish and Wildlife Service, Office of Scientific Authority under CITES (see Chapter 7, Consultation, page 133). Bobcat seasons can be adjusted provided that the quota (which includes hunting, trapping, and USDA Wildlife Services) of 14,400 animals is not exceeded. The 2002-03 total bobcat harvest was 1,032 animals, or less than two percent of the adult population, and is well under the 20 percent allowed under the CITES agreement.

The seasons for the hunting and trapping of bobcats were the same from 1982-83 through 1993-94. However, for 1994-95 the Fish and Game Commission approved one trapping season statewide from November 24 to January 31 (69 days). The Commission also approved a statewide bobcat hunting season from October 15 to February 28 (137 days).

Unlike hunting, season length for trapping (for commercial purposes) does not correlate to take. Take of pelts is primarily affected by pelt price. The Department estimates that 89 percent of the change in commercial bobcat harvest can be attributed to pelt price. Therefore, simple correlation analysis (pelt price vs. take) can be used to estimate harvest under various pelt prices. For example, if the bobcat pelt price was $50 in any given year, the take would be estimated to be 2,774 animals. If the pelt price was $100, the estimated harvest would be 6,374. If the pelt price increased to

$200, the estimated take would be 13,574 animals. In reality during 2002-03, the pelt price approached $200 yet the harvest dropped to 1,032. This is possibly due to a reduced trapper turnout of 133 licensees. In the 2000-01season, the average pelt price was $38. The pelt price was not expected to increase beyond about $50 for 2001-2002, so the estimated take was expected to be 2,774 or less. In reality, the total bobcat harvest was 1,273 and the pelt price averaged $66.00.

Bobcat take can also be estimated for different season lengths by calculating the take per day for the existing season and using that figure times the number of days that the season will be increased or decreased.

Based on 2002-03 harvest data (394 bobcats trapped), if the 69-day bobcat trapping season was extended by 51 days, as previously discussed, an increased harvest would be expected. The total take would increase by 291 bobcats for a total expected harvest of 685 bobcats. However, pelt price has more influence on harvest than season length.

Under this scenario, a larger window of opportunity would be open to trappers, and would provide them with more potential income for the year. The harvest would still be expected to remain well under the established quota of 14,400 animals per year. The actual harvest would amount to about one percent of the adult bobcat population.

Extending the bobcat hunting season beyond its 137-day limit also can be analyzed. There were 342 bobcats taken by hunting during the 2002-03 season. This represents about two bobcats per day. If the hunting season was expanded by 60 days, the increased harvest would be estimated at 150 animals for a total annual kill of 492. Extending the seasons as described above, the combined trapping, depredation, and hunting take would increase to about 1,261. This is a harvest rate of about three percent, well below the 20 percent rate agreed to under the provisions of CITES.

Based on the 2001-02 harvest data, if the bobcat hunting and trapping seasons were reduced by 30 days, it is estimated that the harvest would be reduced by 171 animals for trapping and by about 75 animals for hunting. The total reduction in estimated bobcat harvest would then be about 246 bobcats, from a harvest of 799 animals in 2002-03. The expected harvest would be 553 bobcats.

A shortened season would reduce opportunity for hunters and commercial trappers. A shorter season over several years may shift the bobcat population to more

animals in older age classes, although the take is so low now that it may not make any difference. A shorter season may satisfy those who are opposed to bobcat trapping. However, it would not satisfy those who benefit from trapping and hunting.

However, the current take, as discussed above, is well below established bobcat management objectives. In the 2001-2002 license year, it is estimated that 29,121 hunter days were spent during the 137-day bobcat hunting season. It is estimated that 6,377 hunter days would be lost if the season was shortened by 30 days.

ALTERNATIVE 3 - ADJUSTING TRAPPING SEASON LENGTH FOR BADGER AND GRAY FOX

The low end estimate of the adult badger population in California is 96,362 animals (Appendix 1). The 2002-03 badger trapping harvest was 2 animals (Chapter 4). The current season is November 16 through the last day of February, statewide, or 105 days. The average take per day is 2 badgers/105 days = 0.02 badgers trapped per day. If the season was extended 15 days, the estimated take would be 2.4 (120 days x 0.02 badgers/day). The annual badger production is 85, 521 (Appendix 1). A season increase of 15 days is not expected to have a significant effect on the badger population. If the season was cut by 15 days, the take would be reduced to 1.8 badgers (90 days x 0.02 badgers/day).

The low end estimate of the adult gray fox population in California is 119,690 (Appendix 5). The 2002-03 gray fox trapping harvest was 266 (Chapter 4). The current season is November 16 through the last day of February, statewide, or 105 days. The average take per day is 266 gray fox/105 days = 2.53 gray fox trapped per day. If the season were extended 15 days the take would be estimated to be 304 (120 days x 2.53 gray fox trapped per day). The annual gray fox production is 203,079 young. A season increase of 15 days is not expected to have a significant effect on the gray fox population. If the season was reduced by 15 days, the estimated harvest would be 228 (90 days X 2.53 gray fox/day).

ALTERNATIVE 4 - ADJUSTING TRAPPING SEASON LENGTH FOR MINK AND MUSKRAT

The low end estimate of the adult mink population in California is 23,704 animals (Appendix 6). The 2002-03 mink trapping harvest was 7 animals (Chapter 4). The current season is November 16 through March 31, statewide, or 136 days. The average take per day is 7 mink/136 days=0.05 mink. If the season was extended 15

days, the estimated take would be 7.6 (151 days x 0.05 mink trapped per day). The annual mink production is estimated to be 42, 667 (Appendix 6). A season increase of 15 days would not have a significant effect on the mink population. If the season was cut by 15 days, the take would be reduced to 6.05 mink (121 days x 0.05 mink/day).

The low end estimate of the adult muskrat population in California is 22,410 (Appendix 7). The 2002-03 muskrat trapping harvest was 5,419 (Chapter 4). The current season is November 16 through March 31, statewide, or 136 days. The average take per day is 5,419 muskrats/136 days=40 muskrats trapped per day. If the season were extended 15 days the take would be estimated to be 6,040 (151 days x 40 muskrat trapped per day). The annual muskrat production is 155,705 young. A season increase of 15 days is not expected to have a significant effect on the muskrat population. If the season was reduced by 15 days, the estimated harvest would be 4,840 (121 days x 42 muskrats/day).

ALTERNATIVE 5 - ADJUSTING TRAPPING SEASON LENGTH FOR RACCOON

The low end estimate of the adult raccoon population in California is 29,617 animals (Appendix 8.) The 2002-03 raccoon trapping harvest was 709 animals (Chapter 4). The current season is November 16 through March 31, in the balance of the state, or 136 days. The average take per day is 709 raccoon/136 days=5.2 raccoons trapped per day. If the season was extended 15 days, the estimated take would be 785.2 (151 days x 5.2 raccoons/day). The annual raccoon production is estimated to be 42,790 (Appendix 8.) A season increase of 15 days would not have a significant effect on the raccoon population. If the season was cut by 15 days, the take would be reduced to 629.2 raccoons (121 days x 5.2 raccoons/day).

ALTERNATIVE 6 - PROPOSAL TO INCREASE TRAP VISITATION BY 24 HOURS

The California Trapping Association has proposed that traps be checked every 48 hours rather than the existing regulation that requires a daily inspection as specified in Section 465.5 (g) (2), Title 14, CCR. The Department feels that trapped animals should not be exposed to the elements any longer than necessary, and the daily inspection requirement should be maintained.

ALTERNATIVE 7 - PROPOSAL TO ESTABLISH A TRAPPING SEASON FOR RIVER OTTERS

The California Trapping Association has proposed that the Department and the Commission consider establishing a trapping season for river otters. The river otter season has been closed sine 1962. The Department does not have precise data relating to otter density or square miles of occupied habitat. Therefore no reliable population estimates can be calculated. In addition the Department is not aware of significant depredation problems caused by river otters. Therefore, the Department recommends that existing regulations (Section 460, Title 14, CCR) pertaining to river otter remain in effect.

ALTERNATIVE 8 - NO HUNTING OR TRAPPING

Under this alternative, hunting and trapping of furbearing and nongame mammals would be eliminated. A total of 8,501 animals were reported trapped during 2002-03.

If it is assumed that hunting and trapping have a negative effect on the sex and age ratios of furbearing and nongame mammals, that negative effect would be eliminated. If it is assumed that hunting and trapping is additive, rather than compensatory, those potential effects would be avoided.

Trappers (133 in 2002-03) would not be able to enjoy the recreational and economic advantages afforded by trapping, and an unknown number of hunters would be denied a recreational opportunity, as well.

The current cost of a trapper's license (2002-03 year) is $77.75. Therefore, based on the number of trappers purchasing licenses for the 2002-03 trapping year (133), a loss of revenue to the Department of about $10,340.75 would result. An additional $21,832.50 in sales of bobcat tags would also be lost.

Discussion of effects on individual species in Chapter 4 and the population models contained in the appendices indicate that none of the 13 furbearing and nongame mammals are in jeopardy. All 13 species have the ability to reproduce well enough to more than sustain the current hunting and trapping take.

The elimination of hunting and trapping may lead to additional depredation problems, particularly with coyotes and bobcats with livestock, and beavers and

muskrats with water control systems. The cost of additional depredation control to both public and private interests could be greater than if some of the animals were removed without expense by sport hunting and commercial trapping. Another point of view on this issue is that random hunting and trapping is ineffective in depredation and disease control, particularly as they relate to muskrats and coyotes. Intensive trapping pressure may result in compensatory reproduction caused by earlier age at first breeding and increased litter sizes.

This alternative would not result in any significant environmental impact. However, it would have a negative economic effect on commercial trappers and might cause increased depredation problems for livestock, poultry producers, and water managers.

ALTERNATIVE 9 – NO PROJECT

Under this alternative, the existing regulations governing the take of furbearing and nongame mammals would remain unchanged and continue to provide for their hunting and trapping. A total minimum of 8,501 animals could potentially be reportedly trapped.

If it is assumed that hunting and trapping have a negative effect on the sex and age ratios of furbearing and nongame mammals, that negative effect would continue. If it is assumed that hunting and trapping is additive, rather than compensatory, those potential effects would continue.

Trappers (133 in 2002-03) would continue to enjoy the recreational and economic advantages afforded by trapping, and an unknown number of hunters would continue to have a recreational opportunity, as well.

The current cost of trapper's license (2002-03 year) is $77.75. Therefore, based on the number of trappers purchasing licenses for the 2002-03 trapping year (133), a gain of revenue to the Department of about $10, 340.75 would result. An additional $21,832.50 in sales of bobcat tags would also be gained.

Discussion of effects on individual species in Chapter 4 and the population model contained in the appendices indicate that none of the 13 furbearing and nongame mammals are in jeopardy. All 13 species have the ability to reproduce well enough to more than sustain the current hunting and trapping take.

The continuation of hunting and trapping may alleviate additional depredation problems, particularly with coyotes and bobcats with livestock, and beavers and muskrats with water control systems. The cost of additional depredation control to both public and private interests could be lesser since some of the animals will be removed without expense by sport hunting and commercial trapping. Another point of view on this issue is that random hunting and trapping is ineffective in depredation and disease control, particularly as they relate to muskrats and coyotes. Intensive trapping pressure may result in compensatory reproduction caused by earlier age at first breeding and increased litter size.

This alternative would not result in any significant environmental impact. However, it would have a positive economic effect on commercial trappers and might cause reduced depredation problems for livestock, poultry producers, and water managers.

CHAPTER 7. CONSULTATION

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 an NOP. In late November, the NOP was provided to the State Clearinghouse for distribution, as well as to land management agencies in California that have an interest, or play a key role, in furbearing and nongame mammal management (the BLM, NPS, and USFS). This NOP was also provided to individuals and/or organizations which expressed an interest in furbearing and nongame mammal management in the past. The NOP requested that any comments regarding input to the environmental document be submitted to the Department within 30 days of receipt of the NOP.

An integral part of all of the Department's wildlife management programs is consultation with other agencies and qualified professionals in the wildlife management field. To this end, Department personnel are continually in contact with other agencies, professional biologists, and researchers involved with wildlife management.

In 1973, the United States became a party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This treaty restricted trade in endangered species and established procedures to monitor the trade of other species that might be faced with endangerment in the future. The bobcat was one of the species deemed by the parties to the treaty a candidate for future endangerment. The Endangered Species Scientific Authority (ESSA) was established as the scientific body to monitor the species status in the United States, and the U.S. Fish and Wildlife Service was given the authority over trade, as provided by the treaty. ESSA evaluated data to justify harvest and export of bobcat furs for three years. ESSA eventually was dissolved, and the responsibility was given to the U.S. Fish and Wildlife Service, whose Office of the Scientific Authority (OSA) now has the responsibility for scientific monitoring. The Department has been cooperating and consulting with OSA annually on the framework regarding the bobcat harvest. This consultation resulted in establishing a limit for the annual take of bobcat in California to 14,400 animals.

The Department also consults with the USFS on a regular basis on matters concerning protected furbearers, such as marten, fisher, and wolverine. In addition,

other Federal agencies have annual input to hunting and trapping regulations, and the Department continuously reviews land management plans and development projects with the intent of protecting habitat for furbearing and nongame mammals.

The Department, through its affiliation with the International Association of Fish and Wildlife Agencies, participates in the preparation of scientific documents on the subjects of trapping and furbearers. It also participates in annual review of a variety of matters associated with these subjects, including developments in trapping methods and techniques; furbearer management programs of other wildlife agencies, both national and international; and state-of-the-art research on various furbearing species.

The Department utilizes information from other wildlife agencies in updating its knowledge and understanding of furbearer and nongame species biology and in evaluating and adjusting management of these species. An example of this is the California Interagency Wildlife Task Group (Airola 1988).

One of the steps necessary in the completion of this document was the preparation of a biological opinion, as required by CESA. The necessary internal consultation was conducted. The biological opinion is no longer relevant because of the approval of Proposition 4 on November 3, 1998.

The Department has also been in consultation with USDA Wildlife Services personnel. The Department has been supplied with the current Draft Environmental Impact Statement for the USDA Wildlife Services Program and the most recent annual report.

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Appendix 1 - 2004 Badger Population Model

Total Acres of Habitat		61,671,608
Total Square Miles		96,362
Low Density		1.00/square mile
High Density		13.00/square mile
Sex Ratio		0.50
Female Breeding Success		0.71
Litter Size		2.50
Total Mortality		0.45
	Low	High
Total Adults	96,362	1,252,705
Breeding Females	34,208	444,710
Young at Den	85,521	1,111,775
Population Before Mortality	181,883	2,364,480
Total Mortality (including harvest)	81,847	1,064,016
Population After Mortality	100,036	1,300,464
Increase if Harvest Compensatory	3,674	47,759
Increase if Harvest Additive	3,250	47,335
Trapping (10-year average)		22
Wildlife Services + 33% (2002-03)		98
Hunting (estimate*)		304
Annual Harvest Mortality		424

**2002 Game Take Hunter Survey*

This model demonstrates that the badger population, beginning its annual cycle in the spring season with 96,362 adults, will produce 85,521 young during spring and summer and experience an annual mortality of 81,847 animals (81,423 from natural causes and 424 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 3,674 badgers to the adult population if the harvest is considered compensatory, or an increase of 3,250 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the badger population was at carrying capacity.

Appendix 2 - 2004 Beaver Population Model

Total Stream Miles of Habitat		6,473*
Total Stream Kilometers		10,788
Low Density		0.20 adults/km of stream*
High Density		2.50 adults/km of stream*
Sex Ratio		0.51
Female Breeding Success (estimate)		0.80
Litter Size		3.50
Total Mortality		0.30
	Low	High
Total Adults	10,789	26,971
Breeding Females	4,402	11,004
Young at Den	15,406	38,514
Population Before Mortality	26,195	65,485
Total Mortality (including harvest)	7,858	19,646
Population After Mortality	18,336	45,840
Increase if Harvest Compensatory	7,548	18,869
Increase if Harvest Additive	6,205	17,526
Trapping (10-year average)		317
Wildlife Services + 33% (2002-03)		826
Hunting (estimate)		200
Annual Harvest Mortality		1,343

**Conservative estimate of total habitat, because density data for lakefront miles and marsh acres were not available.*

This model demonstrates that the beaver population, beginning its annual cycle in the spring season with 10,789 adults, will produce 15,406 young during spring and summer and experience an annual mortality of 7,858 animals (6,515 from natural causes and 1,343 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,548 beavers to the adult population if the harvest is considered compensatory, or an increase of 6,205 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the beaver population was at carrying capacity.

Appendix 3 - 2004 Bobcat Population Model

Total Acres of Habitat	81,695,757	
Total Square Miles	127,650	
Low Density	0.55/square mile	
High Density	0.58/square mile	
Sex Ratio	0.50	
Female Breeding Success	0.53	
Litter Size	2.70	
Adult Mortality	0.41	
Juvenile Mortality (estimate)	0.20	
	Low	High
Total Adults	70,207	74,037
Breeding Females	18,605	19,620
Young at Den	50,233	52,973
Population Before Mortality	120,441	127,010
Juvenile Mortality	10,047	10,595
Adult Mortality	28,785	30,355
Total Mortality (including harvest)	38,832	40,950
Population After Mortality	81,609	86,060
Increase if Harvest Compensatory	11,402	12,024
Increase if Harvest Additive	10,370	10,992
Trapping (10-year average)	606	
Wildlife Services + 33% (2002-03)	84	
Hunting (2002-03)	342	
Annual Harvest Mortality	1,032	

This model demonstrates that the bobcat population, beginning its annual cycle in the spring season with 70,207 adults, will produce 50,233 young during spring and summer and experience an annual mortality of 38,832 animals (37,800 from natural causes and 1,032 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 11,402 bobcats to the adult population if the harvest is considered compensatory, or an increase of 10,370 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the bobcat population was at carrying capacity.

Appendix 4 - 2004 Coyote Population Model

Total Acres of Habitat		99,034,628*
Total Square Miles		154,742
Low Density		1.00/square mile
High Density		5.00/square mile
Sex Ratio		0.50
Female Breeding Success		0.65
Litter Size		5.50
Adult Mortality		0.35
Juvenile Mortality		0.54
	Low	High
Total Adults	154,742	773,708
Breeding Females	50,291	251,455
Young at Den	276,601	1,383,003
Population Before Mortality	431,342	2,156,711
Juvenile Mortality	149,364	746,822
Adult Mortality	54,160	270,798
Total Mortality (including harvest)	203,524	1,017,619
Population After Mortality	227,818	1,139,092
Increase if Harvest Compensatory	73,077	365,384
Increase if Harvest Additive	11,182	303,489
Trapping (10-year average)		776
Wildlife Services + 33% (2002-03)		8,172
Hunting (estimate**)		52,947
Annual Harvest Mortality		61,895

**Does not include urban and agricultural acres.*
***2002 Game Take Hunter Survey*

This model demonstrates that the coyote population, beginning its annual cycle in the spring season with 154,742 adults, will produce 276,601 young during spring and summer and experience an annual mortality of 203,524 animals (141,629 from natural causes and 61,895 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 73,077 coyotes to the adult population if the harvest is considered compensatory, or an increase of 11,182 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the coyote population was at carrying capacity.

Appendix 5 - 2004 Gray Fox Population Model

Total Acres of Habitat		76,601,717
Total Square Miles		119,690
Low Density		1.00/square mile
High Density		3.04/square mile
Sex Ratio		0.47
Female Breeding Success		0.95
Litter Size		3.80
Adult Mortality		0.62
Juvenile Mortality (estimate)		0.45
	Low	High
Total Adults	119,690	363,858
Breeding Females	53,442	162,463
Young at Den	203,078	617,358
Population Before Mortality	332,769	981,216
Juvenile Mortality	91,385	277,811
Adult Mortality	74,208	225,592
Total Mortality (including harvest)	165,593	503,403
Population After Mortality	157,175	477,813
Increase if Harvest Compensatory	37,485	113,955
Increase if Harvest Additive	33,970	110,440
Trapping (10-year average)		623
Wildlife Services + 33% (2002-03)		214
Hunting (estimate*)		2,678
Annual Harvest Mortality		3,515

**2002 Game Take Hunter Survey*

This model demonstrates that the gray fox population, beginning its annual cycle in the spring season with 119,690 adults, will produce 203,078 young during spring and summer and experience an annual mortality of 165,593 animals (162,078 from natural causes and 3,515 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 37,485 gray foxes to the adult population if the harvest is considered compensatory, or an increase of 33,970 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the gray fox population was at carrying capacity.

Appendix 6 - 2004 Mink Population Model

Total Stream Miles of Habitat		18,963*
Low Density		1.25 mink/stream mile*
High Density		2.50 mink/stream mile*
Sex Ratio		0.50
Female Breeding Success (estimate)		0.80
Litter Size		4.50
Total Mortality		0.50
	Low	High
Total Adults	23,704	47,408
Breeding Females	9,482	18,963
Young at Den	42,667	85,334
Population Before Mortality	66,371	132,741
Total Mortality (including harvest)	33,185	66,371
Population After Mortality	33,185	66,371
Increase if Harvest Compensatory	9,482	18,963
Increase if Harvest Additive	9,346	18,827
Trapping (10-year average)		36
Wildlife Services + 33% (2002-03)		0
Hunting (estimate)		100
Annual Harvest Mortality		136

**Conservative estimate of total habitat, because density data for lakefront miles and marsh acres were not available.*

This model demonstrates that the mink population, beginning its annual cycle in the spring season with 23,704 adults, will produce 42,667 young during spring and summer and experience an annual mortality of 33,185 animals (33,049 from natural causes and 136 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 9,482 mink to the adult population if the harvest is considered compensatory, or an increase of 9,346 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the mink population was at carrying capacity.

Appendix 7 - 2004 Muskrat Population Model

Total Stream Miles of Habitat		4,482*
Total Stream Kilometers		7,470
Low Density		3.00 muskrats/km of stream
High Density		15.00 muskrats/km of stream
Sex Ratio		0.45
Female Breeding Success (estimate)		0.80
Litter Size		19.30
Total Mortality		0.56
	Low	High
Total Adults	22,410	112,050
Breeding Females	8,068	40,338
Young at Den	155,705	778,523
Population Before Mortality	178,115	890,573
Total Mortality (including harvest)	99,744	498,721
Population After Mortality	78,370	391,852
Increase if Harvest Compensatory	55,960	279,802
Increase if Harvest Additive	44,428	268,270
Trapping (10-year average)		9,197
Wildlife Services + 33% (2002-03)		1,835
Hunting (estimate)		500
Annual Harvest Mortality		11,532

**Conservative estimate of total habitat, because density data for lakefront miles and marsh acres were not available.*

This model demonstrates that the muskrat population, beginning its annual cycle in the spring season with 22,410 adults, will produce 155,705 young during spring and summer and experience an annual mortality of 99,744 animals (88,212 from natural causes and 11,532 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 55,960 muskrats to the adult population if the harvest is considered compensatory, or an increase of 44,428 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the muskrat population was at carrying capacity.

Appendix 8 - 2004 Raccoon Population Model

Total Acres of Habitat		78,977,984
Total Square Miles		123,403
Low Density		0.24/square mile
High Density		0.70/square mile
Sex Ratio		0.48
Female Breeding Success		0.86
Litter Size		3.50
Total Mortality		0.49
	Low	High
Total Adults	29,617	86,382
Breeding Females	12,226	35,659
Young at Den	42,790	124,805
Population Before Mortality	72,407	211,187
Total Mortality (including harvest)	35,479	103,482
Population After Mortality	36,928	107,705
Increase if Harvest Compensatory	7,311	21,323
Increase if Harvest Additive	-2,540	11,472
Trapping (10-year average)		808
Wildlife Services + 33% (2002-03)		2,866
Hunting (estimate*)		6,177
Annual Harvest Mortality		9,851

**2002 Game Take Hunter Survey*

This model demonstrates that the raccoon population, beginning its annual cycle in the spring season with 29,617 adults, will produce 42,790 young during spring and summer and experience an annual mortality of 35,479 animals (25,628 from natural causes and 9,851 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,311 raccoons to the adult population if the harvest is considered compensatory, or an increase of -2,540 if the harvest is considered additive. These figures are an expression of biotic potential only, and would not be expected to occur if the raccoon population was at carrying capacity.

Appendix 9 - 2004 Spotted Skunk Population Model

Total Acres of Habitat		56,139,438
Total Square Miles		87,718
Low Density		1.00/square mile
High Density		5.70/square mile
Sex Ratio (estimate)		0.46
Female Breeding Success (estimate)		0.80
Litter Size		4.00
Total Mortality		0.55
	Low	High
Total Adults	87,718	499,992
Breeding Females	32,280	183,997
Young at Den	129,121	735,988
Population Before Mortality	216,839	1,235,980
Total Mortality (including harvest)	119,261	679,789
Population After Mortality	97,577	556,191
Increase if Harvest Compensatory	9,859	56,199
Increase if Harvest Additive	9,726	56,066
Trapping (10-year average)		28
Wildlife Services + 33% (2002-03)		5
Hunting (estimate)		100
Annual Harvest Mortality		133

This model demonstrates that the spotted skunk population, beginning its annual cycle in the spring season with 87,718 adults, will produce 129,121 young during spring and summer and experience an annual mortality of 119,261 animals (119,128 from natural causes and 133 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 9,859 skunks to the adult population if the harvest is considered compensatory, or an increase of 9,726 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the spotted skunk population was at carrying capacity.

Appendix 10 - 2004 Striped Skunk Population Model

Total Acres of Habitat		51,179,453
Total Square Miles		79,968
Low Density		1.30/square mile
High Density		6.20/square mile
Sex Ratio		0.46
Female Breeding Success (estimate)		0.80
Litter Size		5.60
Total Mortality		0.55
	Low	High
Total Adults	103,958	495,801
Breeding Females	38,257	182,455
Young at Den	214,237	1,021,747
Population Before Mortality	318,195	1,517,548
Total Mortality (including harvest)	175,007	834,651
Population After Mortality	143,188	682,896
Increase if Harvest Compensatory	39,230	187,095
Increase if Harvest Additive	32,744	180,609
Trapping (10-year average)		966
Wildlife Services + 33% (2002-03)		5,320
Hunting (estimate)		200
Annual Harvest Mortality		6,486

This model demonstrates that the skunk population, beginning its annual cycle in the spring season with 103,958 adults, will produce 214,237 young during spring and summer and experience an annual mortality of 175,007 animals (168,521 from natural causes and 6,486 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 39,230 skunks to the adult population if the harvest is considered compensatory, or an increase of 32,744 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the striped skunk population was at carrying capacity.

Appendix 11 - 2004 Virginia Opossum Population Model

Total Acres of Habitat		16,405,681
Total Square Miles		25,634
Low Density		1.30/square mile
High Density		20.20/square mile
Sex Ratio		0.44
Female Breeding Success (estimate)		0.80
Litter Size (two/year)		14.40
Total Mortality		0.80
	Low	High
Total Adults	33,324	517,804
Breeding Females	11,730	182,267
Young at Den	168,913	2,624,646
Population Before Mortality	202,237	3,142,451
Total Mortality (including harvest)	161,790	2,513,961
Population After Mortality	40,447	628,490
Increase if Harvest Compensatory	7,123	110,686
Increase if Harvest Additive	4,239	107,802
Trapping (10-year average)		326
Wildlife Services + 33% (2002-03)		2,058
Hunting (estimate)		500
Annual Harvest Mortality		2,884

This model demonstrates that the opossum population, beginning its annual cycle in the spring season with 33,324 adults, will produce 168,913 young during spring and summer and experience an annual mortality of 161,790 animals (158,906 from natural causes and 2,884 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 7,123 opossums to the adult population if the harvest is considered compensatory, or an increase of 4,239 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the opossum population was at carrying capacity.

Appendix 12 - 2004 Long-Tailed Weasel Population Model

Total Acres of Habitat		58,783,640
Total Square Miles		91,849
Low Density		2.60/square mile
High Density		18.00/square mile
Sex Ratio (estimate)		0.45
Female Breeding Success (estimate)		0.95
Litter Size		6.50
Total Mortality (estimate)		0.60
	Low	High
Total Adults	238,809	1,653,290
Breeding Females	102,091	706,781
Young at Den	663,589	4,594,079
Population Before Mortality	902,398	6,247,369
Total Mortality (including harvest)	541,439	3,748,421
Population After Mortality	360,959	2,498,948
Increase if Harvest Compensatory	122,151	845,658
Increase if Harvest Additive	122,144	845,651
Trapping* (10-year average)		3
Wildlife Services + 33% (2002-03)		4
Hunting (estimate)		0
Annual Harvest Mortality		7

**The same harvest data were used for long-tailed weasel and ermine, because trapping information for weasels is reported collectively.*

This model demonstrates that the long-tailed weasel population, beginning its annual cycle in the spring season with 238,809 adults, will produce 663,589 young during spring and summer and experience an annual mortality of 541,439 animals (541,432 from natural causes and 7 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 122,151 weasels to the adult population by the next spring season if the harvest is considered compensatory or an increase of 122,144 if the harvest is considered additive. These increases are expressions of biotic potential only, and would not be expected to occur if the weasel population was at carrying capacity.

Appendix 13 - 2004 Ermine Population Model

Total Acres of Habitat		18,635,871
Total Square Miles		29,119
Low Density		10.00/square mile
High Density		28.00/square mile
Sex Ratio (estimate)		0.45
Female Breeding Success (estimate)		0.95
Litter Size		5.00
Total Mortality (estimate)		0.60
	Low	High
Total Adults	291,185	815,319
Breeding Females	124,482	348,549
Young at Den	622,409	1,742,745
Population Before Mortality	913,594	2,558,064
Total Mortality (including harvest)	548,157	1,534,839
Population After Mortality	365,438	1,023,226
Increase if Harvest Compensatory	74,252	207,906
Increase if Harvest Additive	74,245	207,899
Trapping* (10-year average)		3
Wildlife Services + 33% (2002-03)		4
Hunting (estimate)		0
Annual Harvest Mortality		7

**The same harvest data were used for long-tailed weasel and ermine, because trapping information for weasels is reported collectively.*

This model demonstrates that the ermine population, beginning its annual cycle in the spring season with 291,185 adults, will produce 622,409 young during spring and summer and experience an annual mortality of 548,157 animals (548,150 from natural causes and 7 from harvest) during the annual cycle. There are also an unknown number of animals taken for damage control purposes by nuisance wildlife control operators, private property owners, and other entities or persons. There will be an increase of 74,252 ermine to the adult population if the harvest is considered compensatory, or an increase of 74,245 if the harvest is considered additive. These increases are an expression of biotic potential only, and would not be expected to occur if the ermine population was at carrying capacity.