

TABLE OF CONTENTS

SUMMARY.....	4
NEED FOR ACTION	4
PURPOSE AND OBJECTIVES	5
ALTERNATIVES	5
Alternative A: No Action	5
Alternative B: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal	5
Alternative C: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal and Fertility Control.....	6
Alternative D: Removal of All Non-Native Deer by Agency Personnel	6
Alternative E (Preferred Alternative): Removal of All Non-Native Deer by a Combination of Agency Removal and Fertility Control.....	7
IMPACTS.....	8
Water Quality and Water Resources.....	8
Soil	8
Vegetation	8
Wildlife.....	9
Species of Special Concern	10
Northern spotted owl- Threatened.....	10
Western snowy plover- Threatened	10
California Red-legged frog- Threatened.....	10
Coho salmon and steelhead trout- Threatened.....	10
California Freshwater Shrimp- Endangered	11
Myrtle's silverspot butterfly- Endangered.....	11
Bird species of concern (not federally listed)	11
Plant Species of Special Concern	12
Human Health and Safety	12
Visitor Experience	12
Park Operations	12
Regional Economy	13
CHAPTER 1: PURPOSE AND NEED	24
INTRODUCTION.....	24
NEED.....	24
PURPOSE AND OBJECTIVES	25
BACKGROUND	26
Management of Axis and Fallow Deer	26
Regulatory Background	27
Relationship to Other Federal Laws, Plans, and Policies	29
Relationship to State Laws and Other Agencies, Laws, Policies and Plans	31
SCOPING PROCESS AND PUBLIC PARTICIPATION	32
ISSUES AND IMPACT TOPICS	32
Water Resources and Water Quality.....	32
Soils	32
Vegetation	32
Wildlife.....	33
Special status species.....	33
Human health and safety	33
Visitor experience.....	33
Park operations	33
Regional economy	34
ISSUES CONSIDERED AND REJECTED	34

Management of Native Deer at PRNS	34
Management of Non-Native Deer Outside of NPS Boundaries	34
Livestock Management at PRNS	34
REQUIRED IMPACT TOPICS	35
Conflicts between the alternatives and any state or local land use plans or policies	35
Wetlands and Floodplains	35
Prime and unique agricultural lands	35
Important scientific or cultural resources	35
CHAPTER 2: ALTERNATIVES.....	36
INTRODUCTION.....	36
THE PROCESS FOR FORMULATING ALTERNATIVES.....	36
ACTIONS COMMON TO ALL ALTERNATIVES.....	37
ALTERNATIVE A: NO ACTION	38
ALTERNATIVE B: CONTROL OF NON-NATIVE DEER AT PRE-DETERMINED LEVELS BY AGENCY REMOVAL	39
ALTERNATIVE C: CONTROL OF NON-NATIVE DEER AT PRE-DETERMINED LEVELS BY AGENCY REMOVAL AND FERTILITY CONTROL	42
Contraceptives:	43
Sterilants and Long-Acting Contraceptives.....	44
Modeling Results Using Lethal Controls and Contraception	44
Axis Deer.....	44
Fallow Deer	44
ALTERNATIVE D: REMOVAL OF ALL NON-NATIVE DEER BY AGENCY PERSONNEL	45
ALTERNATIVE E (PREFERRED ALTERNATIVE): REMOVAL OF ALL NON-NATIVE DEER BY A COMBINATION OF AGENCY REMOVAL AND FERTILITY CONTROL	47
Modeling Results	48
Fallow Deer	48
Axis Deer.....	48
ALTERNATIVES AND ACTIONS CONSIDERED BUT REJECTED	49
Public Hunting to Control or to Eliminate all Non-Native Deer	49
Control or Extirpation Using Only Contraceptives	50
Control by Yearly Contraception.....	50
Extirpation by Yearly Contraception.....	52
Control with Long-Acting Contraceptives (“Sterilants”)	52
Extirpation Using Long-Acting Contraceptive Administration (“Sterilants”).....	53
Surgical Sterilization	54
Relocation.....	55
Restricting Deer to a Fenced Area.....	56
Trapping and Euthanasia by Lethal Injection	56
ALTERNATIVE SUMMARY MATRICES	57
ENVIRONMENTALLY PREFERABLE ALTERNATIVE	63
Section 101 of NEPA	63
PARK’S PREFERRED ALTERNATIVE	64
CHAPTER 3. Affected Environment	76
INTRODUCTION.....	76
PROJECT SITE DESCRIPTION	76
REGIONAL CONTEXT AND SURROUNDING COMMUNITIES	76
PARK MANAGEMENT ZONING	78
NATURAL RESOURCE ZONES.....	78
WILDERNESS	78
OTHER SIGNIFICANT AREA DESIGNATIONS	79
CLIMATE	80
AIR RESOURCES	80
GEOLOGY AND TOPOGRAPHY.....	81

RESOURCES THAT MAY BE AFFECTED.....	82
Water Resources	82
Impoundments, Natural Lakes, and Sag Ponds	84
Soils	84
Vegetation	85
Forest/Woodland Types.....	86
Scrub Types.....	87
Herbaceous Types	88
Wildlife.....	89
Ungulate Biology.....	90
History of Research on Non-Native Fallow and Axis Deer at Point Reyes National Seashore and Golden Gates National Recreation Area.....	103
Population Studies	103
Disease Studies	105
Ecological Studies	106
Species and Habitats of Management Concern	106
Species of Management Concern	106
Northern Spotted Owl (<i>Strix occidentalis caurina</i>) – Federal Threatened Species.....	107
Western snowy plover (<i>Charadrius alexandrinus nivosus</i>) – Threatened	107
Red-legged Frog (<i>Rana aurora draytonii</i>) – Threatened	107
Central California Coast Coho Salmon (<i>Oncorhynchus kisutch</i>) – Threatened and Central California Steelhead (<i>Oncorhynchus mykiss</i>) - Threatened	108
California Freshwater Shrimp (<i>Syncaris pacifica</i>) – Federal Endangered Species.....	109
Myrtle's Silverspot Butterfly (<i>Speyeria zerene myrtleae</i>) – Endangered	109
Habitats of Management Concern	110
HUMAN HEALTH AND SAFETY	110
VISITOR EXPERIENCE	111
SOCIAL VALUES	112
REGIONAL ECONOMY (SOCIOECONOMICS).....	114
Commercial Operations within the Pastoral (Agricultural) Zone	114
PARK OPERATIONS.....	116
CHAPTER 4: ENVIRONMENTAL CONSEQUENCES	118
INTRODUCTION.....	118
IMPACT TOPICS AND THEIR DERIVATION	118
DEFINITION OF TERMS.....	118
METHODOLOGY	120
WATER RESOURCES AND WATER QUALITY	120
Policies, Regulations, and Assumptions	120
Assessment Methodology.....	120
Type of Impact	121
Duration of Impact	121
Intensity of Impact.....	121
SOILS.....	121
Policies, Regulations, and Assumptions	122
Assessment Methodology.....	122
Type of Impact	122
Duration of Impact	122
Intensity of Impact.....	122
VEGETATION	123
Policies and Regulations.....	123
Assessment Methodology.....	123
Type of Impact	124
Duration of Impact	124
Intensity of Impact.....	124
WILDLIFE	125

Policies and Regulations.....	125
Assessment Methodology.....	125
Type of Impact	126
Duration of Impact	126
Intensity of Impact.....	126
SPECIES AND HABITS OF MANAGEMENT CONCERN.....	126
Policies and Regulations.....	127
Assessment Methodology.....	128
Type of Impact	128
Duration of Impact	129
Intensity of Impact.....	129
HUMAN HEALTH AND SAFETY	129
Policies and Regulations.....	129
Assessment Methodology.....	130
Type of Impact	131
Duration of Impact	131
Intensity of Impact.....	131
VISITOR EXPERIENCE	131
Policies and Regulations.....	132
Assessment Methodology.....	133
Type of Impact	133
Duration of Impact	133
Intensity of Impact.....	133
NPS MANAGEMENT AND OPERATIONS	133
Policies and Regulations.....	134
Assessment Methodology.....	134
Type of Impact	135
Duration of Impact	135
Intensity of Impact.....	135
REGIONAL ECONOMY.....	135
Policies and Regulations.....	135
Assessment Methodology.....	136
Type of Impact	136
Duration of Impact	136
Intensity of Impact.....	136
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE A – NO ACTION	137
Impacts on Water Resources and Water Quality	137
Analysis	137
Cumulative Impacts.....	140
Conclusion.....	140
Impacts on Soil	141
Analysis.....	141
Cumulative Impacts.....	143
Conclusion.....	143
Impacts on Vegetation	143
Analysis	144
Cumulative Impacts.....	148
Conclusion.....	148
Impacts on Wildlife	149
Analysis	150
Non-Native Cervids.....	150
Native Cervids	150
Small Mammals.....	153
Mammalian and Avian Predators	154
Other Birds	155
Reptiles and Amphibians.....	157

Cumulative Impacts.....	157
Conclusion.....	158
Impacts on Special Status Species.....	158
Analysis.....	159
Northern spotted owl	159
Western snowy plover	159
California Red-legged frog	159
Coho salmon and steelhead trout.....	160
California Freshwater Shrimp.....	160
Myrtle's silverspot butterfly	160
Bird species of concern.....	161
Plant Species of Special Concern	162
Analysis	162
Cumulative Impacts.....	164
Conclusion.....	167
Impacts on Human Health and Safety	167
Analysis.....	167
Cumulative Impacts.....	167
Conclusion.....	167
Impacts on Visitor Experience	168
Analysis.....	168
Cumulative Impacts.....	168
Conclusion.....	168
Impacts on Park Operations.....	168
Analysis.....	169
Cumulative Impacts.....	171
Conclusions	172
Impacts on the Regional Economy	172
Analysis.....	172
Cumulative Impacts.....	173
Conclusion.....	173
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE B – CONTROL OF NON-NATIVE DEER AT PRE-DETERMINED LEVELS BY AGENCY REMOVAL.....	174
Impacts on Water Resources and Water Quality	174
Analysis	174
Cumulative Impacts.....	175
Conclusion.....	175
Impacts on Soil	176
Analysis.....	176
Cumulative Impacts.....	176
Conclusion.....	177
Impacts on Vegetation	177
Analysis.....	177
Cumulative Impacts.....	178
Conclusion.....	178
Impacts on Wildlife	179
Analysis	179
Non-Native Cervids.....	179
Native Cervids	179
Small Mammals.....	182
Mammalian and Avian Predators	183
Other Birds	184
Reptiles and Amphibians.....	186
Cumulative Impacts.....	186
Conclusion.....	187
Impacts on Special Status Species	187

Analysis	187
Northern spotted owl	187
Western snowy plover	188
California Red-legged frog	188
Coho salmon and steelhead trout.....	188
California Freshwater Shrimp.....	189
Myrtle's silverspot butterfly	189
Bird species of concern.....	190
Plant Species of Special Concern	190
Cumulative Impacts.....	192
Conclusion.....	192
Impacts on Human Health and Safety	192
Analysis	192
Cumulative Impacts	193
Conclusion	193
Impacts on Visitor Experience	193
Analysis	193
Cumulative Impacts	194
Conclusions	194
Impacts on Park Operations.....	195
Analysis	195
Cumulative Impacts	196
Conclusion.....	196
Impacts on Regional Economy.....	196
Analysis	196
Cumulative Impacts	197
Conclusion	197
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE C – CONTROL OF NON-NATIVE DEER AT PRE-DETERMINED LEVELS BY AGENCY REMOVAL AND FERTILITY CONTROL	198
Impacts on Water Resources and Water Quality	198
Analysis	198
Impacts on Soil	198
Analysis	198
Impact on Vegetation	199
Analysis	199
Impact on Wildlife.....	199
Analysis	199
Impact on Special Status Species	199
Analysis	199
Impact on Human Health and Safety.....	199
Analysis	199
Cumulative Impacts	200
Conclusions	200
Impact on Visitor Experience	200
Analysis	200
Cumulative Impacts	201
Conclusions	201
Impacts on Park Operations.....	202
Cumulative Impacts	203
Conclusions	203
Impacts on Regional Economy.....	203
Analysis	203
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE D: REMOVAL OF ALL NON-NATIVE DEER BY AGENCY PERSONNEL	204
Impacts on Water Resources and Water Quality	204
Analysis	204

Cumulative Impacts.....	205
Conclusion.....	205
Impacts on Soil	205
Analysis.....	205
Cumulative Impacts.....	206
Conclusion.....	206
Impacts on Vegetation	206
Analysis.....	206
Cumulative Impacts.....	207
Conclusion.....	207
Impacts on Wildlife	208
Analysis	208
Non-Native Cervids.....	208
Native Cervids	208
Small Mammals.....	210
Mammalian and Avian Predators	211
Other Birds	212
Reptiles and Amphibians.....	213
Cumulative Impacts.....	214
Conclusion.....	214
Impacts on Special Status Species.....	214
Analysis	215
Northern spotted owl	215
Western snowy plover	215
California Red-legged frog	215
Coho salmon and steelhead trout.....	216
California Freshwater Shrimp.....	216
Myrtle's silverspot butterfly	216
Bird species of concern.....	217
Plant Species of Special Concern	218
Cumulative Impacts	219
Conclusion.....	219
Impacts on Human Health and Safety	219
Analysis.....	219
Cumulative Impacts.....	220
Conclusion.....	220
Impacts on Visitor Experience	220
Analysis	220
Cumulative Impacts.....	221
Conclusions	221
Impacts on Park Operations.....	221
Analysis.....	221
Cumulative Impacts.....	222
Conclusions	222
Impacts on the Regional Economy	222
Cumulative Impacts.....	223
Conclusions	223
ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE E (PREFERRED ALTERNATIVE): REMOVAL OF ALL NON-NATIVE DEER BY A COMBINATION OF AGENCY REMOVAL AND FERTILITY CONTROL	224
Impacts on Water Resources and Water Quality	224
Analysis.....	224
Impacts on Soil	224
Analysis.....	224
Impacts on Vegetation	225
Analysis	225
Impacts on Wildlife	225

Analysis	225
Impacts on Special Status Species.....	225
Analysis.....	225
Impacts on Human Health and Safety	225
Cumulative Impacts.....	226
Conclusion.....	226
Impacts on Visitor Experience	226
Analysis.....	226
Cumulative Impacts.....	227
Conclusions	227
Impacts on Park Operations.....	227
Cumulative Impacts.....	228
Conclusions	228
Impacts on Regional Economy.....	229
Analysis.....	229
UNAVOIDABLE ADVERSE IMPACTS	229
Alternative A: No Action	229
Alternative B: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal	229
Alternative C: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal and Fertility Control.....	229
Alternative D: Removal of All Non-Native Deer by Agency Personnel	230
Alternative E (Preferred Alternative): Removal of All Non-Native Deer by a Combination of Agency Removal and Fertility control.....	230
RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY	230
Alternative A: No Action	230
Alternative B: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal	230
Alternative C: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal and Fertility Control.....	230
Alternative D: Removal of All Non-Native Deer by Agency Personnel	230
Alternative E (Preferred Alternative): Removal of All Non-Native Deer by a Combination of Agency Removal and Fertility control.....	231
IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES	231
Alternative A: No Action	231
Alternative B: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal	231
Alternative C: Control of Non-Native Deer at Pre-Determined Levels by Agency Removal and Fertility Control.....	231
Alternative D: Removal of All Non-Native Deer by Agency Personnel	231
Alternative E (Preferred Alternative): Removal of All Non-Native Deer by a Combination of Agency Removal and Fertility control.....	231
CHAPTER 5: CONSULTATION AND COORDINATION	232
HISTORY OF PUBLIC INVOLVEMENT	232
HISTORY OF AGENCY INVOLVEMENT	234
LIST OF PREPARERS	236
LIST OF AGENCIES AND ORGANIZATIONS TO WHOM COPIES OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ARE BEING SENT	237
APPENDIX A. NON-NATIVE DEER POPULATION MODEL (BARRETT).....	240
APPENDIX B. FINAL REPORT POINT REYES FALLOW DEER MODELING	250
APPENDIX C. WILDERNESS MINIMUM REQUIREMENT GUIDE.....	271
REFERENCES	278
GLOSSARY OF TERMS	289

INDEX.....	293
-------------------	------------

FIGURES

Figure 1. Estimated cumulative total deer removal for Alternative A-E (based on populations models by Barrett 2000 and Hobbs 2003).....	62
Figure 2. Map of the project area.....	77
Figure 3. Map of the watersheds located within the project area.	82
Figure 4. Tule Elk (<i>Cervis elaphus nannodes</i>), Photograph.....	92
Figure 5. Range Map, Tule Elk at PRNS (2003).....	93
Figure 6. Columbian Black-Tailed Deer (<i>Odocoileus hemionus columbianus</i>), Photograph.....	95
Figure 7. Range Map, Black-Tailed Deer at PRNS (2003).....	96
Figure 8. Axis Deer (<i>Axis axis</i>), Photograph.....	98
Figure 9. Range Map, Axis Deer at PRNS (2003).....	99
Figure 10. Fallow Deer (<i>Dama dama</i>), Photograph.....	101
Figure 11. Range Map, Fallow Deer at PRNS (2003).....	102
Figure 12: Comparison of Costs, Alternatives A-E.....	170

TABLES

Table 1. Summary of Alternatives.....	58
Table 2. Estimated cumulative total deer removals for Alternatives A-E.....	61
Table 3. Summary of Impacts of each Alternative.....	65
Table 4. Summary of exotic deer population estimates from introduction to 2003..	105
Table 5. Perceptions of animals in American society.....	113
Table 6. Current economic costs of non-native deer to Seashore.....	116
Table 7. Vegetation communities utilized by fallow deer at PRNS.....	144
Table 8. Vegetation communities utilized by Axis deer at PRNS.....	144

Table 9. Bird species likely to be adversely impacted by Alternative A.....	156
Table 10. Bird species likely to be adversely impacted by Alternative B.....	185
Table 11. Bird species likely to benefit from Alternative D.....	213