

## Table of Contents

<b>EXECUTIVE SUMMARY</b>	1
<b>INTRODUCTION</b>	1
<b>CHAPTER 1: GREATER SAGE-GROUSE SPECIES DESCRIPTION</b>	3
<b>Taxonomy</b>	3
<b>Habitat</b>	3
<i>Sagebrush Ecosystem</i>	3
<b>Seasonal Habitat Selection and Life History Characteristics</b>	6
<b>Seasonal Movements and Dispersal</b>	9
<b>Population Connectivity and Landscape Genetics</b>	10
<b>CHAPTER 2: HISTORICAL AND CURRENT RANGE AND DISTRIBUTION</b>	13
<b>Management Zones</b>	16
<b>Populations</b>	17
<b>Priority Areas for Conservation</b>	19
<b>CHAPTER 3: POPULATION ESTIMATES AND TRENDS</b>	21
<b>Historic Population Trends</b>	22
<b>Recent Population Trends</b>	22
<b>Population Summary</b>	25
<b>Breeding Habitat Distribution and Population Index Models</b>	25
<b>CHAPTER 4: LAND OWNERSHIP AND MANAGEMENT</b>	30
<b>Federal Lands</b>	30
<i>Bureau of Land Management</i>	32
<i>U.S. Forest Service</i>	34
<i>U.S. Fish and Wildlife Service</i>	35
<i>Department of Defense</i>	35
<i>Department of Energy</i>	35
<i>National Park Service</i>	36
<i>Wilderness and Protected Areas</i>	36
<b>Tribal Lands</b>	37
<b>State Lands</b>	38
<b>Private Lands</b>	38

<b>IMPACTS ANALYSIS</b>	39
<b><u>Habitat Loss and Fragmentation</u></b>	39
<b>CHAPTER 5: FIRE</b>	39
<b>Current Impacts</b>	42
<b>Location and Extent</b>	44
<b>Projected Future Impacts</b>	47
<b>Timescale for Projecting this Impact</b>	49
<b>Likelihood of Future Impacts</b>	50
<b>Anticipated Changes from Present</b>	50
<b>Threat Amelioration</b>	50
<i>Conservation Efforts Database Projects</i>	50
<i>Candidate Conservation Agreements with Assurances and</i>	
<i>Candidate Conservation Agreements</i>	51
<i>State Plans</i>	51
<i>BLM Resource Management Plans and USFS Land and Resource</i>	
<i>Management Plans</i>	52
<i>Wildland Fire Management</i>	53
<i>State Fire Management Programs</i>	55
<i>Local Fire Management Programs</i>	55
<i>Post-fire Rehabilitation and Restoration</i>	55
<b>Assessment of Potential Threat</b>	56
<b>CHAPTER 6: INVASIVE PLANTS (ANNUAL GRASSES</b>	
<b>AND OTHER NOXIOUS WEEDS)</b>	59
<b>Current Impacts</b>	61
<b>Location and Extent</b>	63
<b>Projected Future Impacts (Timescale, Likelihood of Future</b>	
<b>Impacts and Anticipated Changes from Present)</b>	70
<b>Threat Amelioration</b>	71
<i>Conservation Efforts Database Projects</i>	71
<i>Candidate Conservation Agreements with Assurances and</i>	
<i>Candidate Conservation Agreements</i>	72
<i>State Plans</i>	72
<i>BLM Resource Management Plans and USFS Land and Resource</i>	
<i>Management Plans</i>	73
<i>Threat Amelioration Summary</i>	73
<b>Assessment of Potential Threat</b>	76
<b>CHAPTER 7: CONIFER ENCROACHMENT</b>	78

<b>Current Impacts</b>	78
<b>Location and Extent</b>	80
<b>Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)</b>	82
<b>Threat Amelioration</b>	83
<i>Conservation Efforts Database Projects</i>	83
<i>Candidate Conservation Agreements with Assurances and Candidate Conservation Agreements</i>	84
<i>State Plans</i>	84
<i>BLM Resource Management Plans and USFS Land and Resource Management Plans</i>	85
<i>Other Conservation Efforts (e.g. Data Call, SGI)</i>	85
<i>Threat Amelioration Summary</i>	86
<b>Assessment of Potential Threat</b>	87
 <b>CHAPTER 8: AGRICULTURAL CONVERSION</b>	 88
<b>Current Impacts</b>	88
<b>Location and Extent</b>	89
<b>Future Impacts</b>	90
<b>Threat Amelioration</b>	91
<b>Timescale for Projecting Impacts from Agricultural Conversion</b>	95
<b>Likelihood of Future Impacts</b>	95
<b>Assessment of Potential Threat</b>	X
 <b>CHAPTER 9: NONRENEWABLE ENERGY DEVELOPMENT</b>	 99
<b>Current Impacts</b>	99
<b>Results of Impacts</b>	100
<b>Location and Extent</b>	104
<b>Projected Future Impacts</b>	105
<b>Anticipated Changes from Present</b>	112
<b>Threat Amelioration</b>	112
<i>Conservation Efforts Database Projects</i>	112
<i>Candidate Conservation Agreements with Assurances and Candidate Conservation Agreements</i>	113
<i>State Plans</i>	113
<i>BLM Resource Management Plans and USFS Land and Resource Management Plans</i>	114
<b>Threat Summary</b>	115
 <b>CHAPTER 10: MINING</b>	 118

<b>Current Impacts</b>	118
<b>Location and Extent</b>	120
<b>Likelihood of Future Impacts</b>	120
<b>Threat Amelioration</b>	121
<i>Conservation Efforts Database Projects</i>	121
<i>Candidate Conservation Agreements with Assurances and         Candidate Conservation Agreements</i>	121
<i>State Plans</i>	122
<i>BLM Resource Management Plans and USFS Land and Resource         Management Plans</i>	122
<b>Threat Summary</b>	123
 <b>CHAPTER 11: RENEWABLE ENERGY</b>	125
<i>Wind</i>	125
<i>Solar</i>	129
<i>Geothermal</i>	130
<b>Current Impacts</b>	133
<i>Wind</i>	133
<i>Solar</i>	134
<i>Geothermal</i>	134
<b>Location and Extent</b>	135
<i>Wind</i>	135
<i>Solar</i>	136
<i>Geothermal</i>	136
<b>Threat Amelioration</b>	137
<i>Candidate Conservation Agreements with Assurances and             Candidate Conservation Agreements</i>	137
<i>BLM Resource Management Plans and USFS Land and Resource             Management Plans</i>	138
<b>Time Scale of Threat</b>	138
<b>Assessment of Potential Threat</b>	138
 <b>CHAPTER 12: INFRASTRUCTURE</b>	140
<b>Current Impacts</b>	140
<i>Roads</i>	140
<i>Railroads</i>	141
<i>Power lines</i>	141
<i>Communication Towers</i>	142
<b>Results of Impacts</b>	143
<i>Roads and Railroads</i>	143

<i>Power lines and Communication Towers</i> .....	144
<b>Location and Extent</b> .....	145
<i>Roads</i> .....	147
<i>Railroads</i> .....	150
<i>Power lines</i> .....	152
<i>Communication Towers</i> .....	155
<b>Projected Future Impacts</b> .....	157
<b>Threat Amelioration</b> .....	158
<i>Conservation Efforts Database Projects</i> .....	158
<i>Candidate Conservation Agreements with Assurances and</i> <i>Candidate Conservation Agreements</i> .....	159
<i>State Plans</i> .....	159
<i>BLM Resource Management Plans and USFS Land and Resource</i> <i>Management Plans</i> .....	160
<b>Threat Summary</b> .....	160
 <b>CHAPTER 13: FENCES</b> .....	162
<b>Current Impacts</b> .....	163
<b>Projected Future Impacts</b> .....	164
<b>Timescale for Projecting this Threat</b> .....	164
<b>Anticipated Changes from Present</b> .....	164
<b>Threat Amelioration</b> .....	165
<i>Threat Amelioration Summary</i> .....	166
<b>Assessment of Potential Threat</b> .....	166
 <b>CHAPTER 14: GRAZING AND RANGELAND MANAGEMENT</b> .....	168
<b>Current Impacts</b> .....	172
<i>Grazing by Wild Ungulates</i> .....	177
<b>Timescale for Projecting this Threat</b> .....	177
<b>Threat Amelioration</b> .....	177
<i>Conservation Efforts Database Projects</i> .....	177
<i>Candidate Conservation Agreements with Assurances and</i> <i>Candidate Conservation Agreements</i> .....	177
<i>State Plans</i> .....	178
<i>BLM Resource Management Plans and USFS Land and Resource</i> <i>Management Plans</i> .....	178
<i>Other Conservation Efforts (e.g., Data Call, SGI)</i> .....	178
<i>Threat Amelioration Summary</i> .....	179
<b>Assessment of Potential Threat</b> .....	179

<b>CHAPTER 15: FREE-ROAMING EQUIDS</b>	181
<b>Current Impacts</b>	181
<b>Results of Impacts</b>	182
<b>Location and Extent</b>	183
<b>Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)</b>	187
<b>Threat Amelioration</b>	187
<i>Conservation Efforts Database Projects</i>	187
<i>Candidate Conservation Agreements with Assurances and Candidate Conservation Agreements</i>	187
<i>State Plans</i>	188
<i>BLM Resource Management Plans and USFS Land and Resource Management Plans</i>	188
<i>Threat Amelioration Summary</i>	189
<b>Assessment of Potential Threat</b>	189
 <b>CHAPTER 16: URBAN AND EXURBAN DEVELOPMENT</b>	 191
<b>Current Impacts</b>	191
<b>Location and Extent</b>	191
<b>Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)</b>	196
<b>Threat Amelioration</b>	196
<b>Threat Summary</b>	198
 <b>CHAPTER 17: RECREATION</b>	 199
<b>Current Impacts</b>	199
<b>Location and Extent</b>	201
<b>Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)</b>	202
<b>Threat Amelioration</b>	202
<i>Conservation Efforts Database Projects</i>	203
<i>State Plans</i>	203
<i>BLM Resource Management Plans and USFS Land and Resource Management Plans</i>	204
<b>Threat Summary</b>	204
 <b>CHAPTER 18: CLIMATE CHANGE</b>	 205
<b>Current Impacts</b>	205
<b>Timescale for Projecting Future Impacts</b>	205
<b>Likelihood of Future Impacts</b>	206

Mechanisms .....	207
Anticipated Impacts, Location, and Extent .....	207
Threat Amelioration .....	209
<i>Threat Amelioration Summary</i> .....	210
Assessment of Potential Threat .....	210
 <b>CHAPTER 19: DROUGHT</b> .....	212
Current Impacts .....	212
Location and Extent .....	213
Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present) .....	215
Threat Amelioration .....	219
Threat Summary .....	219
 <b><u>Overutilization</u></b> .....	220
 <b>CHAPTER 20: RECREATIONAL HUNTING</b> .....	220
Current Impacts .....	221
Location and Extent .....	223
Projected Future Impacts (Timescale, Likelihood of Future Impacts) .....	225
Threat Amelioration .....	226
Threat Summary .....	226
 <b>CHAPTER 21: SCIENTIFIC AND EDUCATIONAL PURPOSES</b> .....	227
Scientific Research and Monitoring .....	227
Translocations .....	228
Use for Educational Purposes .....	229
 <b><u>Disease and Predation</u></b> .....	230
 <b>CHAPTER 22: DISEASE</b> .....	230
Current Impacts .....	231
Location and Extent .....	233
Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present) .....	234
Threat Amelioration .....	236
Actions and Effectiveness .....	237
Assessment of Potential Threat .....	237

<b>CHAPTER 23: PREDATION</b>	239
Current Impacts	241
Location and Extent	243
Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)	244
Threat Amelioration	245
Assessment of Potential Threat	246
<b><u>Other Threat Factors</u></b>	248
 <b>CHAPTER 24: SMALL POPULATION AND LIFE HISTORY TRAITS AFFECTING POPULATION VIABILITY</b>	248
Current Impacts	248
Location and Extent	248
Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)	248
Threat Amelioration	248
Assessment of Potential Threat	249
 <b>CHAPTER 25: CONTAMINANTS</b>	250
Current Impacts	250
Location and Extent	253
Projected Future Impacts (Timescale, Likelihood of Future Impacts and Anticipated Changes from Present)	250
Threat Amelioration	254
Assessment of Potential Threat	254
 <b>CHAPTER 26: MILITARY ACTIVITY</b>	255
Current Impacts	255
Location and Extent	255
Assessment of Potential Threat	258
 <b>REGULATORY MECHANISMS AND CONSERVATION EFFORTS</b>	256
 <b>CHAPTER 27: REGULATORY MECHANISMS</b>	256
Local Laws and Regulations	256
State Laws and Regulations	256
<i>State General Wildlife Protection Laws</i>	256
<i>State Sage-grouse Hunting Regulations</i>	257
<i>State Noxious Weed Laws</i>	257



<i>State Sage-grouse Conservation Plans</i> .....	257
<u>Wyoming</u> .....	259
<u>Utah</u> .....	262
<u>Colorado</u> .....	263
<u>South Dakota</u> .....	264
<u>Washington</u> .....	264
<u>Idaho</u> .....	264
<u>Montana</u> .....	266
<u>North Dakota</u> .....	266
<u>Nevada</u> .....	266
<u>Oregon</u> .....	267
<u>California</u> .....	268
<b>Federal Laws and Regulations</b> .....	270
<i>Bureau of Land Management and U.S. Forest Service</i> .....	270
<u>Land Use Allocations</u> .....	273
<u>Land Tenure</u> .....	275
<u>Solar/Wind</u> .....	276
<u>Right-of-Ways</u> .....	278
<u>Fluid Minerals (Including Geothermal)</u> .....	279
<u>Non-Energy Leasable Minerals</u> .....	282
<u>Locatable Minerals</u> .....	283
<u>Mineral Materials</u> .....	283
<u>Trails and Travel Management</u> .....	284
<u>Livestock</u> .....	285
<u>Vegetation Objectives</u> .....	286
<u>Monitoring</u> .....	287
<u>Disturbance Caps</u> .....	288
<u>Lek Buffers</u> .....	289
<u>Adaptive Management</u> .....	290
<u>Mitigation</u> .....	291
<i>U.S. Fish and Wildlife Service</i> .....	292
<u>Sheldon-Hart NWRC</u> .....	292
<u>Charles M. Russell NWR</u> .....	293
<i>Department of Defense</i> .....	293
<i>Department of Energy</i> .....	294
<i>National Park Service</i> .....	294
<u>Grand Teton National Park</u> .....	294
<u>Craters of the Moon National Monument and Preserve</u> .....	295

Tribal Laws and Regulations .....	296
Canadian Federal and Provincial Laws and Regulations .....	297
<b>CHAPTER 28: NON-REGULATORY CONSERVATION EFFORTS .....</b>	<b>301</b>
WAFWA Conservation Strategy and Local Working Groups .....	301
Conservation Efforts to Address the Fire and Invasives .....	302
<i>Fire and Invasives Assessment Tool (FIAT)</i>	
<i>Step-down Assessments</i> .....	306
WAFWA Wildfire and Invasive Working Group .....	306
<i>Draft National Seed Strategy for Rehabilitation</i>	
<i>and Restoration 2015-2020</i> .....	308
Conservation Efforts Database .....	308
Farm Bill Conservation Programs .....	314
<i>Sage Grouse Initiative</i> .....	314
<i>Conservation Reserve Program</i> .....	319
<i>CSP Enhancement Activities</i> .....	320
<i>Regional Conservation Partnership Program</i> .....	321
<i>Sodsaver Provisions</i> .....	322
Candidate Conservation Agreements .....	322
Mitigation Banking .....	328
WY – Sweetwater River Conservancy (SRC) Bank .....	329
NV – Barrick Bank Enabling Agreement (BEA) .....	329
CO Habitat Exchange, NV Conservation Credit System,	
OR Mitigation Program, WY Conservation Exchange .....	329
Canadian Non-Regulatory Conservation Efforts .....	330
Summary of Non-Regulatory Conservation Efforts .....	331
<b>CUMULATIVE AND SYNERGISTIC IMPACTS .....</b>	<b>333</b>
<b>CHAPTER 29: THREAT ACCUMULATION AND INTERACTION .....</b>	<b>333</b>
MZ I – Northern Great Plains .....	333
MZ II – Wyoming Basin .....	333
MZ III – Southern Great Plains .....	333
MZ IV – Snake River Plain .....	333
MZ V – Northern Great Basin .....	333
MZ VI – Columbia Basin .....	333
MZ VII – Colorado Plateau .....	333

## TABLES

<b>TABLE 1-1.</b> Summary of petitions and responses for greater sage-grouse, including the eastern and western sub-species, and Columbia Basin.....	1
<b>TABLE 3-1. [PLACEHOLDER – NEED WAFWA TREND ANALYSIS]</b> Summary of population trends by State and Province since 2010.....	24
<b>TABLE 4-1.</b> Percent of the occupied range within MZ, by surface managing agency.....	31
<b>TABLE 4-2.</b> Percent of modeled breeding habitat distribution within MZ, by surface management agency.....	31
<b>TABLE 4-3.</b> Percent of the population index within MZ, by surface managing agency.....	32
<b>TABLE 5-1.</b> Percent of the Great Basin Greater Sage-grouse Management Zone Populations which occur within the three classes of Resiliency and Resistance to Invasive species and Fire.....	48
<b>TABLE 5-2.</b> Percent of the Great Basin Greater Sage-grouse Management Zone Breeding Habitat Area which occur within the three classes of Resiliency and Resistance to Invasive species and Fire.....	48
<b>TABLE 5-3.</b> Summary of completed and effective projects entered into the CED that were evaluated and deemed effective by the Service in addressing the fire.....	51
<b>TABLE 6-1.</b> Acreage statistics for upland herbaceous invasive vegetation within greater sage-grouse occupied range by Management Zone.....	66
<b>TABLE 6-2.</b> Acreage statistics for upland herbaceous invasive vegetation within the modeled breeding habitat distribution for greater sage-grouse.....	67
<b>TABLE 6-3.</b> Percentage of the relative population index located within upland herbaceous invasive vegetation across the occupied range of the greater sage-grouse.....	68
<b>TABLE 6-4.</b> Highest average ( $\pm$ standard error, or SE) ranks for relative invasion risk of priority plants and average abundance estimates grouped by management zone (MZ).....	69
<b>TABLE 6-5.</b> Summary of completed and effective projects evaluated by the Service and deemed effective in addressing invasive plants.....	71
<b>TABLE 7-2.</b> Summary of projects determined to be effective in the Service evaluation of completed CED projects addressing conifer encroachment.....	83

<b>TABLE 8-1.</b> Summary of impacts to greater sage-grouse from agricultural conversion by Management Zone (Knick <i>et al.</i> 2011; USFWS 2013, pp. 16–26).....	90
<b>TABLE 8-2.</b> Summary of completed projects and agreements determined to be effective in the Service. review of CED projects addressing agricultural conversion .....	94
<b>TABLE 9-1.</b> Detailed oil and gas modeled population index exposure to risk and exposure with regulatory conservation applied .....	110
<b>TABLE 9-2.</b> Detailed oil and gas modeled breeding habitat distribution exposure to risk and exposure with regulatory conservation applied.....	110
<b>TABLE 9-3.</b> Summary of projects determined to be effective in the Service review of completed CED projects addressing energy development.....	112
<b>TABLE 10-1.</b> Summary of projects determined to be as effective in the Service review of completed CED projects addressing mining.....	121
<b>TABLE 11-1.</b> Area of sagebrush habitat with wind energy development potential by management zone.....	125
<b>TABLE 11-2.</b> Area of BLM wind (ROWs) within the occupied range of greater sage-grouse .....	126
<b>TABLE 11-3.</b> Direct disturbance of wind turbine footprint on sage-grouse habitat.....	127
<b>TABLE 11-4.</b> Indirect area of influence of wind turbines on sage-grouse habitat.....	127
<b>TABLE 11-5.</b> Geothermal power plants within occupied habitat by management zone.....	131
<b>TABLE 11-6.</b> NREL Wind potential within greater sage-grouse occupied range.....	135
<b>TABLE 11-7.</b> Direct disturbance footprint associated with wind energy development, and its intersect with occupied range, breeding habitat distribution, and the population index .....	136
<b>TABLE 11-8.</b> BLM-approved geothermal leases within the greater sage-grouse occupied range.....	137

<b>TABLE 11-9.</b> Acres of geothermal resource potential within occupied range of greater sage-grouse (Manier <i>et al.</i> 2013, p. 71) .....	137
<b>TABLE 12-1.</b> Summary of the direct influences of infrastructure across Management Zones .....	146
<b>TABLE 12-2:</b> (A) Direct disturbance calculation and (B) quantification of indirect areas of influence associated with Interstate Highways in occupied greater sage-grouse habitat, by Management Zone .....	147
<b>TABLE 12-3.</b> (A) Direct disturbance calculation and (B) quantification of indirect areas of influence associated with Federal and State Highways in occupied greater sage-grouse habitat, by Management Zone .....	148
<b>TABLE 12-4.</b> Impacts of major railroads in occupied greater sage-grouse range, by Management Zone .....	150
<b>TABLE 12-5.</b> Impacts of power lines by Management Zone .....	152
<b>TABLE 12-6.</b> Impacts of communication towers and non-wind vertical structures in occupied range of greater sage-grouse, by Management Zone .....	155
<b>TABLE 12-7.</b> Summary of completed and effective projects evaluated by the Service at addressing the threat of infrastructure .....	158
<b>TABLE 14-1.</b> Acres of grazing allotments authorized by the BLM within the occupied range and breeding distribution of sage grouse, by management zone and rangewide .....	168
<b>TABLE 14-2.</b> Acres of grazing pastures and allotments billed by the BLM during the 2013 fee year by management zone and rangewide .....	170
<b>TABLE 14-3.</b> Acres of allotments evaluated by the BLM between 1998 and 2012 that did not meet land health standards due to grazing, by management zone and rangewide .....	175
<b>TABLE 15-1.</b> Percent of sage-grouse current range impacted by free-roaming equids by Management Zone .....	183
<b>TABLE 15-2.</b> Total BLM- and USFS-managed equids by State as of March 1, 2014; Maximum BLM- and USFS- allowable appropriate management levels (AML; the number of free-roaming equids that the Federal agencies determine can exist in balance with other public rangeland species .....	184

<b>TABLE 15-3.</b> BLM data, free-roaming equids gathered, administered fertility control, and adoptions 2009 through 2015 .....	187
<b>TABLE 16-1.</b> The extent of direct impact from urban and exurban development within the current occupied greater sage-grouse range (adapted from Theobald 2014, entire).....	192
<b>TABLE 16-2.</b> The extent of direct disturbance footprints of urban and exurban development within the current occupied range, modeled breeding habitat distribution, and population index .....	193
<b>TABLE 16-3.</b> The extent of the indirect area of influence related to urban and exurban development within the current occupied range, modeled breeding habitat distribution, and population index.....	194
<b>TABLE 16-4.</b> Summary of completed and effective projects evaluated by the Service that address urbanization .....	197
<b>TABLE 17-1.</b> The number of recreational visits to BLM lands by State in 2013 (ECONorthwest 2014, p. 13).....	201
<b>TABLE 19-1.</b> List of impacts associated with drought by management zone.....	215
<b>TABLE 19-2.</b> Projected change in seasonal precipitation for 2071 to 2099 (compared to 1970 to 1999) under an emissions scenario that assumes continued increases in emissions (from Walsh <i>et al.</i> 2014, p. 34/ NOAA NCDC / CICS-NC).....	218
<b>TABLE 20-1.</b> Estimated rangewide greater sage-grouse hunting mortality by decade (USFWS 2014, unpublished data).....	221
<b>TABLE 20-2.</b> Average percent of total rangewide harvest by State in recent decades (Service 2015).....	223
<b>TABLE 20-3.</b> Private land ownership in occupied range of greater sage-grouse.....	225
<b>TABLE 22-1.</b> Distribution by state/province and year of sage-grouse carcasses testing positive for West Nile virus .....	233
<b>TABLE 22-2.</b> Distribution by WAFWA Management Zone of sage-grouse carcasses testing positive for West Nile virus.....	234
<b>TABLE 26-1.</b> Military facilities that overlap portions of sage-grouse range.....	255
<b>TABLE 27-1.</b> Summary of State Conservation Plans and Regulations: Applicable lands, implementation status, and regulatory components.....	259

<b>TABLE 27-2.</b> Timeline of important events in the development of a rangewide sage-grouse conservation strategy on BLM and USFS lands .....	272
<b>TABLE 27-3.</b> Land tenure within modeled breeding distribution of greater sage-grouse.....	276
<b>TABLE 27-4.</b> Solar energy allocations within modeled breeding distribution of greater sage-grouse.....	277
<b>TABLE 27-5.</b> Wind energy allocations within modeled breeding distribution of greater sage-grouse.....	277
<b>TABLE 27-6.</b> Rights-of-way allocations within modeled breeding distribution of greater sage-grouse.....	278
<b>TABLE 27-7.</b> Oil and gas allocations within modeled breeding distribution of greater sage-grouse.....	280
<b>TABLE 27-8.</b> Geothermal allocations within modeled breeding distribution of greater sage-grouse.....	281
<b>TABLE 27-9.</b> Non-energy leasable mineral allocations within modeled breeding distribution of greater sage-grouse.....	282
<b>TABLE 27-10.</b> Locatable mineral allocations within modeled breeding distribution of greater sage-grouse.....	283
<b>TABLE 27-11.</b> Salable mineral allocations within modeled breeding distribution of greater sage- grouse.....	284
<b>TABLE 27-12.</b> Trails and travel management allocations within modeled breeding distribution of greater sage-grouse.....	285
<b>TABLE 27-13.</b> Livestock allocations within modeled breeding distribution of greater sage-grouse.....	286
<b>TABLE 27-14.</b> Lek buffer distances in LUPs .....	289
<b>TABLE 28-1.</b> Treatments Identified in the FIAT Assessments, by MZ and treatment type.....	305
<b>TABLE 28-2.</b> Proportion of States covered by CWMAs and county weed organizations within the range of greater sage-grouse.....	308
<b>TABLE 28-3.</b> Priority threats to sage-grouse and their habitat associated with each WAFWA Management Zone (MZ).....	310

<b>TABLE 28-4.</b> Summary of Phased Assessment process for CED projects.....	312
<b>TABLE 28-5.</b> Summary by threat of CED acres assessed as effective in Service review and entered as "completed" by data providers.....	313
<b>TABLE 28-6.</b> Acres of certified complete or contracted in SGI by population, 2010 to 2014.....	316
<b>TABLE 28-7.</b> Completed CCAAs for greater sage-grouse as of April 16, 2015.....	324
<b>TABLE 28-8.</b> Completed CCAs for greater sage-grouse as of April 16, 2015.....	327
<b>TABLE 28-9.</b> Summary and status of mitigation banks for greater sage-grouse (current as of April 23, 2015).....	328
<b>TABLE 29-1.</b> Extent of existing impacts in MZ I.....	333
<b>TABLE 29-2.</b> Extent of existing impacts in MZ II.....	333
<b>TABLE 29-3.</b> Extent of existing impacts in MZ III.....	333
<b>TABLE 29-4.</b> Extent of existing impacts in MZ IV.....	333
<b>TABLE 29-5.</b> Extent of existing impacts in MZ V.....	333
<b>TABLE 29-6.</b> Extent of existing impacts in MZ VI.....	333
<b>TABLE 29-7.</b> Extent of existing impacts in MZ VII.....	333

## FIGURES

<b>FIGURE 1-1.</b> Overlay of nuclear genetic cluster information (Oyler-McCance et al. 2005) with habitat connectivity analyses (Knick and Hanser 2011).....	12
<b>FIGURE 2-1.</b> Historical and current range of the greater sage-grouse (derived from Schroeder <i>et al.</i> 2004 and updated by the Service) and the WAFWA Sage-Grouse Management Zones (Stiver et al. 2006, p. 1- 6).....	14
<b>FIGURE 2-2.</b> Greater sage-grouse population densities rangewide.....	15
<b>FIGURE 2-3.</b> Percent of rangewide greater sage-grouse population by Management Zone.....	17



<b>FIGURE 2-4.</b> Greater sage-grouse population boundaries (updated by the Service in coordination with the Bureau of Land Management and WAFWA) .....	18
<b>FIGURE 2-5.</b> Greater sage-grouse Priority Areas for Conservation (PACs), modified to incorporate Important Priority Areas (IPAs) .....	20
<b>FIGURE 3-1.</b> Modeled distribution of greater sage-grouse breeding habitat .....	27
<b>FIGURE 3-2.</b> Modeled population index of greater sage-grouse, by Management Zone .....	29
<b>FIGURE 4-1.</b> Land ownership within the range of the greater sage-grouse .....	30
<b>FIGURE 4-2.</b> BLM and USFS RMP and LRMP planning areas .....	33
<b>FIGURE 4-3.</b> Priority and General Habitat Management Areas in BLMs RMPs and USFSs LRMPs. (Note: habitat management areas are shown covering more than just BLM and USFS land due to management of subsurface rights that may exist in other surface ownerships) .....	34
<b>FIGURE 4-4.</b> Wilderness and protected areas within the range of the greater sage-grouse .....	37
<b>FIGURE 5-1.</b> Fires from 2000 to 2014 in the Great Basin Management Zones (III, IV, V, VI) in occupied greater sage-grouse range .....	46
<b>FIGURE 6-1.</b> Distribution of upland, herbaceous invasive plants across the occupied range of greater sage-grouse .....	65
<b>FIGURE 7-1.</b> Conifer occurrence and potential encroachment within the Great Basin region of greater sage-grouse occupied range .....	81
<b>FIGURE 9-1.</b> Mean and maximum potential oil and gas development in Management Zones I and II .....	107
<b>FIGURE 9-2.</b> Population index for Management Zones I and II with Priority Areas for Conservation .....	107
<b>FIGURE 9-3.</b> Greater sage-grouse population exposed to baseline scenario for potential future oil and gas development (A) before conservation and (B) with conservation actions, including the BLM proposed land use plan allocations of: ‘closed’ and ‘open: major oil and gas stipulations’, as well as the Wyoming Core Area Strategy. ....	108

<b>FIGURE 9-4.</b> Greater sage-grouse population exposed to potential scenario for maximum future oil and gas development (A) without conservation, and (B) with conservation actions, including the BLM proposed land use plan allocations of: ‘closed’ and ‘open: major oil and gas stipulations’, as well as the Wyoming Core Area Strategy.....	109
<b>FIGURE 11-1.</b> Current wind developments, and potential areas of development based on NREL wind resource potential Wind Power Classes (WPC), and BLMs ‘open’ land use designation for wind development.....	128
<b>FIGURE 11-3:</b> Geothermal energy potential within the occupied range of greater sage-grouse.....	130
<b>FIGURE 11-4:</b> Geothermal facilities within the occupied range of greater sage-grouse.....	132
<b>FIGURE 12-1.</b> Interstates, Federal and State highways, and secondary roads within the occupied range of greater sage-grouse.....	149
<b>FIGURE 12-2.</b> Major railroads within the occupied range of greater sage-grouse.....	151
<b>FIGURE 12-3.</b> Major existing high (>115 kV) and low (<115 kV) voltage power lines, proposed high and low voltage power lines, and indirect areas of influence.....	154
<b>FIGURE 12-4.</b> Communication towers and other vertical structures within the occupied range of greater sage-grouse.....	156
<b>FIGURE 14-1.</b> Livestock grazing allotments authorized by the BLM as of October, 2014 within the occupied range of greater sage-grouse.....	169
<b>FIGURE 14-3.</b> BLM grazing pastures and allotments billed in 2013 within the occupied range of greater sage-grouse.....	171
<b>FIGURE 14-3.</b> BLM livestock grazing allotments within the occupied range of greater sage-grouse, which did not meet land health standards for habitat between 1998–2012, with grazing was identified as a casual factor.....	176
<b>FIGURE 15-1.</b> Free-roaming Equid Management Areas areas managed by BLM and USFS for free-roaming equids with the current greater sage-grouse range.....	186
<b>FIGURE 16-1.</b> Urban and exurban development within the current sage-grouse range.....	195

<b>FIGURE 19-1:</b> Drought conditions in United States as of January 27, 2015 (USDM 2015) .....	214
<b>FIGURE 19-2:</b> Annual total precipitation changes for 1991 to 2012 compared to the 1901 to 1960 average.....	214
<b>FIGURE 19-3:</b> Projected change in seasonal precipitation for 2071 to 2099 (compared to 1970 to 1999) under an emissions scenario that assumes continued increases in emissions .....	217
<b>FIGURE 20-1.</b> Possession limits for State managed sage-grouse hunting seasons in 1995 and 2013.....	224
<b>FIGURE 26-1.</b> Special Use Airspace in relation to the sage-grouse range.....	257
<b>FIGURE 27-1.</b> BLM and USFS RMP and LRMP planning areas.....	271
<b>FIGURE 27-2.</b> Priority and General Habitat Management Areas in BLMs RMPs and USFSs LRMPs.....	274
<b>FIGURE 27-3.</b> Greater sage-grouse strongholds.....	275
<b>FIGURE 27-4.</b> Biologically Significant Units (BSU) within BLM Field Offices and USFS Forests for use in disturbance monitoring as part of the new BLM and USFS LUPs.....	288
<b>FIGURE 27-5.</b> Map of the prohibitions associated with Canada’s emergency order for the protection of sage-grouse (from P.C. 2013-1245).....	298
<b>FIGURE 28-1.</b> SGI (EQIP and WHIP; 2010-2014) contract locations.....	319

## **APPENDICES**

**APPENDIX A:** DESCRIPTION OF GREATER SAGE-GROUSE MANAGEMENT ZONES.

**APPENDIX B:** BLM AND FOREST SERVICE LAND USE PLANS UNDERGOING AMENDMENTS OR REVISIONS TO INCORPORATE SAGE-GROUSE CONSERVATION MEASURES

**APPENDIX C:** SUMMARY OF LAND OWNERSHIP BY GREATER SAGE-GROUSE MANAGEMENT ZONE

**APPENDIX D:** SUMMARY OF CONSERVATION EFFORTS ENTERED INTO THE CONSERVATION EFFORTS DATABASE AND DEEMED COMPLETE BY THE PROJECT PROPONENT

**APPENDIX E: SUMMARY OF RECENT RESEARCH ON THE EFFECTS OF  
ENERGY DEVELOPMENT ON SAGE-GROUSE**

**APPENDIX F: DESCRIPTION OF OIL AND GAS MODEL**

**APPENDIX G: DEFINITIONS OF LAND USE ALLOCATION TERMS USED BY  
BLM AND FS.**