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**APPENDICES\***

\*Note – two additional appendices will be included for the final report – one describing the population index and one describing the breeding habitat index. Both of these appendices will be referenced in the Introduction section.

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

### ***MZ I – NORTHERN GREAT PLAINS***

Management Zone I is within the Great Plains floristic province and encompasses the northeastern distribution of sage-grouse (Figure 2-3). This MZ has 12.4 percent of the birds across the range. This MZ has a high percentage of private lands (USFWS 2013, p. 63). The COT report (USFWS 2013, entire) identified the primary threats for this MZ as habitat loss, fragmentation, and degradation as a result of conversion of native areas to cropland and energy development with its associated infrastructure (USFWS 2013, pp. 16–17). Sage-grouse populations in this MZ also experienced significant negative population impacts from West Nile virus outbreaks beginning in the early 2000s.

Table A-1. Population descriptions for MZ I.

Population	Description	Status in 2010	Primary Threats (USFWS 2013)
<b>Dakotas</b>	Small population in southwest ND and northwest SD separated from adjacent populations by 30–40 km and habitat features.	ND had a total of 77 males on 18 leks in 2008 (NDGFD 2008, News Release). SD had a total of 339 males on 22 leks in 2008 (SDGFP 2008, p. 9)	Energy Development, Agricultural Conversion, Localized Overgrazing, Small Population Sizes, Disease
<b>Northern Montana</b>	Large population north of Missouri River in north central Montana, southeast Alberta, and southwest Saskatchewan; separated from adjacent populations by 20 km and Missouri River	Minimum male count of 2,700 (Garton <i>et al.</i> 2011, p.?), projected low risk of extirpation.	Energy Development, Localized Overgrazing, Infrastructure, Localized Agricultural Conversion,
<b>Powder River Basin</b>	Large population in southeast Montana and northeast Wyoming separated from adjacent populations by 20 km and habitat features.	In 2010, Northeast Wyoming has the lowest average male lek attendance in the state (WGFD 2010 JCR, p. 138); long-term population viability compromised (Taylor <i>et al.</i> 2012, p. ?)	Energy Development, Disease, Mining, Infrastructure, Recreation, Localized overgrazing, Invasive annual weeds

<b>Yellowstone watershed (MT)</b>	Large population in central and southeast Montana separated from adjacent populations by 20–30 km and topography.	Long-term(100 years) population viability compromised (Garton <i>et al.</i> 2011, p. ?)	Energy Development, Localized Overgrazing, Invasive annual weeds, Infrastructure
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## MZ II – WYOMING BASIN

Management Zone II is within the Wyoming Basin floristic province and contains the highest abundance of sage-grouse relative to all other MZs (36.8 percent; Figure 2-3). This MZ contains five separate populations, but is dominated by the expansive Wyoming Basin population. Primary threats identified in the COT report (USFWS 2013, pp. 17–19) for this MZ include habitat loss, fragmentation, and degradation as a result of energy development with its associated infrastructure.

Table A-2. Population descriptions for MZ II.

Population	Description	Status in 2010	Primary Threats (USFWS2013)
<b>Eagle–South Routt (CO)</b>	Small population north of the Colorado River separated from adjacent populations by 20–30 km and topography.	Proportion of active leks and male attendance declining, long-term persistence unlikely (Garton <i>et al.</i> 2011, p. 316).	Urbanization, Agricultural Conversion, Small Population Size, Invasive Weeds, Infrastructure, Localized Overgrazing, Small Population Size
<b>Middle Park (CO)</b>	Small population in Middle Park, Colorado, separated from adjacent populations by 20–30 km and terrain.	Population slowly decreasing from 2000 to 2007 (Garton <i>et al.</i> 2011, pp. 317-319).	Small Population Size, Sagebrush Elimination, Agricultural Conversion, Wildfire, Invasive Weeds, Energy Development, Mining, Infrastructure, Localized Overgrazing, Recreation, Urbanization

<b>Laramie (WY)</b>	Small isolated population southwest of Laramie, Wyoming.	Five leks know, only one routinely occupied.	Small Population Size, Fire, Conifers, Invasive Weeds, Energy Development, Infrastructure, Localized Overgrazing, Recreation, Urbanization
<b>Jackson Hole (WY)</b>	Small isolated population near Jackson Hole, Wyoming, separated from adjacent populations by 50 km and topography.	Population consists of 16 leks (13 active). Population is declining slightly (USFWS 2013, p. 67).	Small Population Size, Invasive Weeds, Recreation
<b>Wyoming basin</b>	Large population centered in Wyoming and extending into Montana, Idaho, Utah, and Colorado. Supports the highest number and density of sage-grouse across the range.	Supports the largest population within the species' range; experiencing long-term population declines	Energy Development, Infrastructure, Recreation, Localized Overgrazing, Fire, Conifers, Urbanization, Agricultural Conversion, Sagebrush Elimination, Invasive Weeds, Mining,

### ***MZ III – SOUTHERN GREAT BASIN***

Management Zone III is within the Southern Great Basin floristic province. This MZ contains five populations, and includes the Bi-State DPS (which is not discussed further). This MZ is home to approximately 12.2% of the entire sage-grouse population (Figure 2-3). Due to soil type and precipitation, this MZ is the driest of all MZ across the species' range. Therefore, habitat loss due to fire is a predominant threat.

Table A-3. Population descriptions for MZ III.

<b>Populations</b>	<b>Description</b>	<b>Status in 2010</b>	<b>Primary Threats (USFWS 2013)</b>
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<b>Southern Great Basin</b>	Occurs primarily in east-central NV, with small portions extending into Utah (Ibapah and Hamlin Valley)	Has the largest numbers in MZ III (concentrated in NV); Slightly declining population trends and portions of this population are considered at risk (USFWS 2013, pp. 73-75)	Small Population Size, Fire, Conifers, Invasive Weeds, Energy Development, Mining, Infrastructure, Free-roaming Equids, Recreation, Localized Overgrazing
<b>Northeast Interior Utah</b>	Consists of two management areas (Strawberry Valley and Carbon) in central Utah	Both management areas have small numbers of birds and are considered at risk (USFWS 2013, p. 71).	Small Population Size, Fire, Conifers, Invasive Weeds, Energy Development, Mining, Infrastructure, Recreation
<b>South-central Utah</b>	Located in south-central Utah and is the largest UT population in MZ III. Divided into 3 management areas: Parker Mountain, Panguitch, and Bald Hills	Population trends are stable to increasing (Garton <i>et al.</i> 2011, pp. 332-333).	Fire, Conifers, Invasive Weeds, Infrastructure, Recreation, Agricultural Conversion, Energy Development, Small Population Size, Mining, Urbanization, Free-roaming Equids
<b>Emery (UT)</b>	High elevation isolated population in central Utah	Estimated 30 males on leks in 2011, considered at risk due to small population size (USFWS2013, p. 71)	Small Population Size, Fire, Conifers, Invasive Weeds, Energy Development, Mining, Infrastructure, Recreation
<b>Northwest Interior (NV)</b>	Isolated area in northwest central NV	Lek count data suggest less than 500 birds within 2 subpopulations. Population considered at high risk (USFWS 2013, p. 73)	Small Population Size, Fire, Invasive Weeds, Mining, Infrastructure, Localized Overgrazing, Free-roaming Equids, Recreation
<b>Sheeprock</b>	Isolated population in north-central Utah	102 males estimated from lek counts in 2011 and is considered stable with potential for growth (USFWS 2013, p. 71)	Small Population Size, Fire, Energy Development, Mining, Free-Roaming Equids

<b>Quinn Canyon Range</b>	Isolated population in southeastern NV with very little sagebrush cover	Only 2 to 3 leks have been identified and populations are considered at risk (USFWS 2013, p. 75)	Small Population Size, Fire, Conifers, Invasive Weeds, Localized Overgrazing, Free-roaming Equids, Recreation, Infrastructure
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#### ***MZ IV – SNAKE RIVER PLAIN***

The MZ includes sage-grouse in parts of Montana, Utah, Nevada and Oregon, but most of the birds occur in Idaho (Garton *et al.* 2011, p. 340). It is one of the largest areas of connected sage-grouse habitats and supports the largest population of sage-grouse outside of MZ II (30.2 percent of total birds; Figure 2-3). Primary threats in this MZ are fire and invasive annual grasses.

Table A-4. Population descriptions for MZ IV.

<b>Populations</b>	<b>Description</b>	<b>Status in 2010</b>	<b>Primary Threats (USFWS 2013)</b>
<b>Baker (OR)</b>	This population occurs in eastern OR and is the smallest population completely contained within state borders (USFWS 2013, pp. 75-76)	Long-term population trends have been stable but lack of connectivity with other populations puts population at risk. Much of the habitat in this population is unused due to topography (USFWS 2013, p. 76)	Small Population Size, Sagebrush Elimination, Agricultural Conversion, Fire, Invasive weeds, Mining
<b>East Central Idaho</b>	This population lies between the Snake River in ID and the WY border (Garton <i>et al.</i> 2013, p. 346). A large part of this population is in private and state ownership	Lek count information is limited due to land ownership patterns and difficult access during the spring. Numbers are low and Garton <i>et al.</i> 2011 (p. 347) estimated a low probability of persistence.	Small Population Size, Agricultural Conversion, Conifers, Energy Development, Infrastructure, Localized Overgrazing,

<b>Southwest Montana</b>	Located in SW MT and some sub-populations seasonally migrate to ID. Some of this area is in conservation agreements (USFWS 2013, p. 77).	Population numbers and minimal threats to habitat suggest this population is at low risk (USFWS 2013, p. 77).	Invasive Weeds, Localized Overgrazing
<b>Salmon-Snake-Beaverhead</b>	This population is primarily located in central and eastern ID and extends into SW MT (Garton <i>et al.</i> 2011, p. 347; USFWS 2013, p. 77)	This population is considered stable to increasing (USFWS 2013, p. 77).	Fire, Invasive Weeds, Energy Development, Localized Overgrazing, Free-roaming Equids
<b>Belt Mountains</b>	Small isolated population in west central MT, separated from other population by at least 50 mi (USFWS 2013, p. 77).	Population numbers are low due to past habitat conversion and is considered at risk (USFWS 2013, p. 78).	Small Population Size, Agricultural Conversion, Invasive Weeds, Localized Overgrazing
<b>Weiser (ID)</b>	Small population in western ID and isolated due to surrounding non-habitat (USFWS 2013, p. 78). The population has a high proportion of private lands.	There are 14 occupied leks within the population and the population is considered at risk (USFWS 2013, p. 78).	Small Population Size, Invasive Weeds, Energy Development, Localized Overgrazing
<b>Northern Great Basin</b>	Large population that straddles several state borders and includes birds in OR, ID, NV and UT. This area is predominately under public ownership (USFWS 2013, p. 78).	Long-term population trend analysis is considered stable to increasing (USFWS 2013, p. 78), but long-term projections suggest that carrying capacity will decline (Garton <i>et al.</i> 2011, p. 350).	Fire, Conifers, Invasive Weeds, Infrastructure, Localized Overgrazing, Recreation, Urbanization, Agricultural Conversion, Mining,
<b>Sawtooth (ID)</b>	Small, isolated population in central ID.	No active leks known; site of previous translocations. Is considered at high risk (USFWS 2013, p. 80).	Small Population Size, Infrastructure, Localized Overgrazing

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***MZ V – NORTHERN GREAT BASIN***

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The MZ includes sage-grouse in parts of Oregon, Nevada and California (Garton *et al.* 2011, p. 351). The BLM is the primary landowner. This MZ is home to 7.4 percent of the population rangewide (Figure 2-3), and is considered part of a stronghold of birds in combination with the Snake River Plain to the east (USFWS 2013, p. 80). Primary threats in this MZ include habitat loss due to fire, invasive annual grasses, and conifers.

Table A-5. Population descriptions for MZ V.

Populations	Description	Status in 2010	Primary Threats (USFWS 2013)
<b>Central Oregon (OR)</b>	Population in central OR separated by distance and topography from other populations (Garton <i>et al.</i> 2011, p. 351).	Population has been declining since 1980 and population predictions suggest low persistence. However, recent work by SGI will help with reversing the declines (USFWS 2013, p. 81).	Fire, Conifers, Invasive Weeds, Mining, Localized Overgrazing
<b>Klamath</b>	Small population that straddles the OR/CA state borders (USFWS 2013, p. 81).	Small numbers of leks and birds are still present but the population is at risk for extirpation without continued augmentation (USFWS 2013, pp. 81-82).	Small Population Size, Fire, Conifer, Invasive Weeds
<b>Warm Springs Valley (NV)</b>	This is a small isolated population in NV, north of the Bi-State DPS (USFWS 2013, p. 82).	Only 2 confirmed active leks known, and there may be connectivity to the western Great Basin population to the north. This population is considered at risk (USFWS 2013, p. 82).	Small Population Size, Agricultural Conversion, Fire, Conifers, Invasive Weeds, Energy Development, Infrastructure, Localized Overgrazing, Free-roaming Equids, Recreation, Urbanization



<b>Western Great Basin</b>	This population occurs in southeastern OR, northeastern CA and northwestern NV. It contains expanses of intact sagebrush habitat (USFWS 2013, p. 82).	Likely the most resilient population in the MZ, but concerns persist for the CA and NV portions of this population. The population is considered potentially at risk (USFWS 2013, pp. 84-85).	Fire, Conifers, Invasive Weeds, Localized Overgrazing, Free-roaming Equids
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#### ***MZ VI – COLUMBIA BASIN***

Management Zone VI is contained entirely within Washington State and is comprised of 4 populations. Two of the populations were extirpated, but sage-grouse have been re-introduced within the last decade with uncertain long-term success (USFWS 2013, pp. 86–87). This MZ has 0.6 percent of the total sage-grouse population (Figure 2-3). The State of Washington has an active recovery program for sage-grouse, which is listed under state laws (pp. X–X). Primary threats to this MZ is small population sizes and agricultural conversion.

Table A-6. Population descriptions for MZ VI.

<b>Populations</b>	<b>Description</b>	<b>Status in 2010</b>	<b>Primary Threats (USFWS 2013)</b>
<b>Moses Coulee (WA)</b>	Located in north-central Washington and is separated by distance and topography from other populations in the state (Garton <i>et al.</i> 2011, p. 358)	Population has been stable for past 30 years but is still considered at risk (USFWS 2013, p. 86). Long-term models predict extirpation (Garton <i>et al.</i> 2011, p. 360).	Small Population Size, Sagebrush Elimination, Agricultural Conversion, Invasive Weeds, Energy Development, Infrastructure, Localized Overgrazing, Recreation, Urbanization

<b>Crab Creek (WA)</b>	Isolated population located in northeast central Washington.	Population extirpated; translocation occurred in 2008 and birds are still persisting. Long-term success is unknown (USFWS 2013, p. 87)	Small Population Size, Sagebrush Elimination, Agricultural Conversion, Fire, Invasive Weeds, Energy Development, Infrastructure, Localized Overgrazing, Recreation
<b>Yakama Indian Nation (WA)</b>	Isolated population in southwest central Montana	Population extirpated; translocations between 2006–2008 had poor success. Population at risk (USFWS 2013, p. 86)	Small Population Size, Fire, Invasive Weeds, Energy Development, Infrastructure, Localized Overgrazing, Recreation, Free-roaming Equids
<b>Yakima Training Center (WA)</b>	Population in south-central Washington, separated from other populations by Columbia River (Garton <i>et al.</i> 2011, p. 360). Most of population occurs on public land.	Total number of males counted in 2011 = 72. Due to intensive human use of the area population growth is not anticipated, and the population is at risk (USFWS 2013, p. 87)	Small Population Size, Fire, Invasive Weeds, Infrastructure, Localized Overgrazing, Recreation

## ***MZ VII – COLORADO PLATEAU***

This MZ is located in NW Colorado and consists of two populations. It contains 0.3% of the range-wide population (Figure 2-3). This MZ has no known connectivity with UT to the west, but appears to have some linkage to MZ II to the north. The primary concern for this MZ is the isolated nature of the populations and energy development (USFWS 2013, pp. 87-88).

Table A-7. Population descriptions for MZ VII.

<b>Populations</b>	<b>Description</b>	<b>Status in 2010</b>	<b>Primary Threats (USFWS 2013)</b>
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<b>Parachute-Piceance-Roan Basin (CO)</b>	Population in western CO located within the Piceance Basin.	Population fluctuates similiarly to larger populations in CO. Is considered to be at high risk due to small population size (USFWS 2013, p. 88)	Small Population Size, Fire, Conifers, Energy Development, Mining, Infrastructure, Localized Overgrazing, Free-roaming Equids
<b>Meeker-White River (CO)</b>	Population in western Colorado, northeast of the Parachute-Piceance-Roan Basin	Small population with one known lek. Lek attendance has been declining (USFWS 2013, p. 88).	Small Population Size, Sagebrush Elimination, Agricultural Conversion, Fire, Energy Development, Mining, Infrastructure, Localized Overgrazing, Urbanization

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

\* indicates plans that are in the process of an amendment or revision but which have an anticipated completion date after September 2015 because they were not part of the national planning effort.

**GREAT BASIN REGION**

*California*

- Alturas RMP (2008)
- Eagle Lake RMP (2008)
- Surprise RMP (2008)

*Idaho*

- Birds of Prey NCA RMP (2008)
- Bruneau RMP (1983 Bruneau MFP)
- Challis RMP (1999)
- Craters of the Moon NM RMP (2006)
- Four Rivers RMP (revising 1988 Cascade and 1983 Kuna and Bruneau MFPs)
- Jarbidge RMP (1987)
- Lemhi RMP (1987)
- Owyhee RMP (1999)
- Pocatello RMP revision
- Shoshone-Burley RMP revision (revising 1980 Bennett Hills/Timmerman Hills, 1985 Cassia, 1975 Magic, 1985 Monument, 1981 Sun Valley, and 1982 Twin Falls MFPs/RMPs)
- Upper Snake RMP revision (and existing 1983 Big Lost, 1985 Medicine Lodge, 1981 Big Desert, and 1981 Little Lost-Birch Creek MFPs/RMPs)
- Boise National Forest LRMP (2003)
- Curlew National Grassland Management Plan (2002)
- Caribou National Forest Revised LRMP (2003)
- Caribou-Targhee National Forest, Targhee National Forest LRMP (1997)
- Salmon-Challis National Forest, Challis National Forest LRMP (1987)
- Salmon-Challis National Forest, Salmon National Forest LRMP (1988)

133 • Sawtooth National Forest Revised LRMP (2003)

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135 *Montana*

136 • Dillon RMP (2006)

137 • Beaverhead-Deerlodge National Forest LRMP (2009)

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139 *Nevada*

140 • Battle Mountain RMP revision (and existing 1997 Tonopah and 1986 Shoshone-Eureka RMPs)

141 • Black Rock Desert-High Rock Canyon NCA RMP (2004)

142 • Carson City RMP revision (and existing 2001 Carson City Consolidated RMP)

143 • Elko RMP (1987)

144 • Ely RMP (2008)

145 • Wells RMP (1985)

146 • Winnemucca RMP revision (and existing 1982 Paradise-Denio MFP and 1982 Sonoma-Gerlach RMP)

147 • Humboldt National Forest LRMP (1986)

148 • Toiyabe National Forest LRMP (1986)

149

150 *Oregon*

151 • Andrews RMP (2005)

152 • Baker RMP revision (and existing 1989 Baker RMP)

153 • Brothers-LaPine RMP (1989)

154 • Lakeview RMP amendment (and existing 2003 Lakeview RMP)

155 • Southeastern Oregon RMP amendment (and existing 2003 Southeastern Oregon RMP)

156 • Steens RMP (2005)

157 • Three Rivers RMP (1992)

158 • Upper Deschutes RMP (2005)

159

160 *Washington*

161 • Eastern Washington RMP (revising 1987 Spokane RMP)\*

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163 *Utah*

164 • Box Elder RMP (1986)

165 • Cedar/Beaver/Garfield/ Antimony RMP (1986)

- 166 • Grand Staircase-Escalante National Monument Management Plan (2000)
- 167 • House Range RMP (1987)
- 168 • Kanab RMP (2008)
- 169 • Park City Management Framework Plan (MFP) (1975)
- 170 • Pinyon MFP (1978)
- 171 • Pony Express RMP (1990)
- 172 • Price RMP (2008)
- 173 • Randolph MFP (1980)
- 174 • Richfield RMP (2008)
- 175 • Salt Lake District Isolated Tracts Planning Analysis (1985)
- 176 • Vernal RMP (2008)
- 177 • Warm Springs RMP (1987)
- 178 • Dixie National Forest LRMP (1986)
- 179 • Fishlake National Forest LRMP (1986)
- 180 • Uinta National Forest Revised LRMP (2003)
- 181 • Wasatch-Cache National Forest Revised LRMP (2003)
- 182 • Ashley National Forest LRMP (1986)
- 183 • Manti-La Sal National Forest LRMP (1986)

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## 186 **ROCKY MOUNTAIN REGION**

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### 188 *Wyoming*

- 189 • Casper RMP (2007)
- 190 • Kemmerer RMP (2010)
- 191 • Newcastle RMP (2000)
- 192 • Pinedale RMP (2008)
- 193 • Rawlins RMP (2008)
- 194 • Green River RMP (1997) (being revised under the Rock Springs RMP)
- 195 • Bridger-Teton National Forest LRMP (1990)
- 196 • Medicine Bow National Forest LRMP (2003)
- 197 • Thunder Basin National Grassland LRMP (2002)
- 198 • Buffalo RMP (1985)

199 • Bighorn RMP (2011)

200 • Lander RMP (1987)

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202 *Colorado*

203 • Glenwood Springs RMP (1984)

204 • Grand Junction RMP (1987)

205 • Kremmling RMP (1984)

206 • Little Snake RMP (2011)

207 • White River RMP (1997)

208 • Routt National Forest LRMP (1997)

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210 *Montana*

211 • Lewiston RMP (amending Judith RMP (1994) and Headwaters RMP (1984))

212 • Billings and Pompeys Pillar National Monument RMP (amends Billings RMP (1984))

213 • HiLine RMP (amends Judith Valley Phillips RMP (1994) and West HiLine RMP (1988))

214 • Miles City RMP (amends Big Dry RMP (1996) and Powder River RMP (1985))

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216 *The Dakotas*

217 • North Dakota RMP (1988)

218 • South Dakota RMP (1986)

219 • Dakota Prairie Grassland LRMP (2001)\*

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

### *MZ I – NORTHERN GREAT PLAINS*

Management Zone I spans eastern Montana, NE Wyoming, the Dakotas, Alberta, and Saskatchewan and is almost 70 percent in private ownership (Figure C-1). Interspersed among the private lands are a checkerboard of state trust lands. Two large tribal reservations are present in the northern portion of the MZ, Fort Peck and Fort Belknap, making up almost 5 percent of the range of sage-grouse in the MZ; however, these reservations contain only about 0.05 percent of the modeled breeding distribution of sage-grouse within the MZ. BLM lands make up only 15 percent of the range of sage-grouse in the MZ, but accounts for 27 percent of the modeled breeding distribution in the MZ. The Charles M. Russell National Wildlife Refuge borders the Missouri River in this MZ, accounting for approximately 1 percent of the modeled breeding distribution in the MZ.

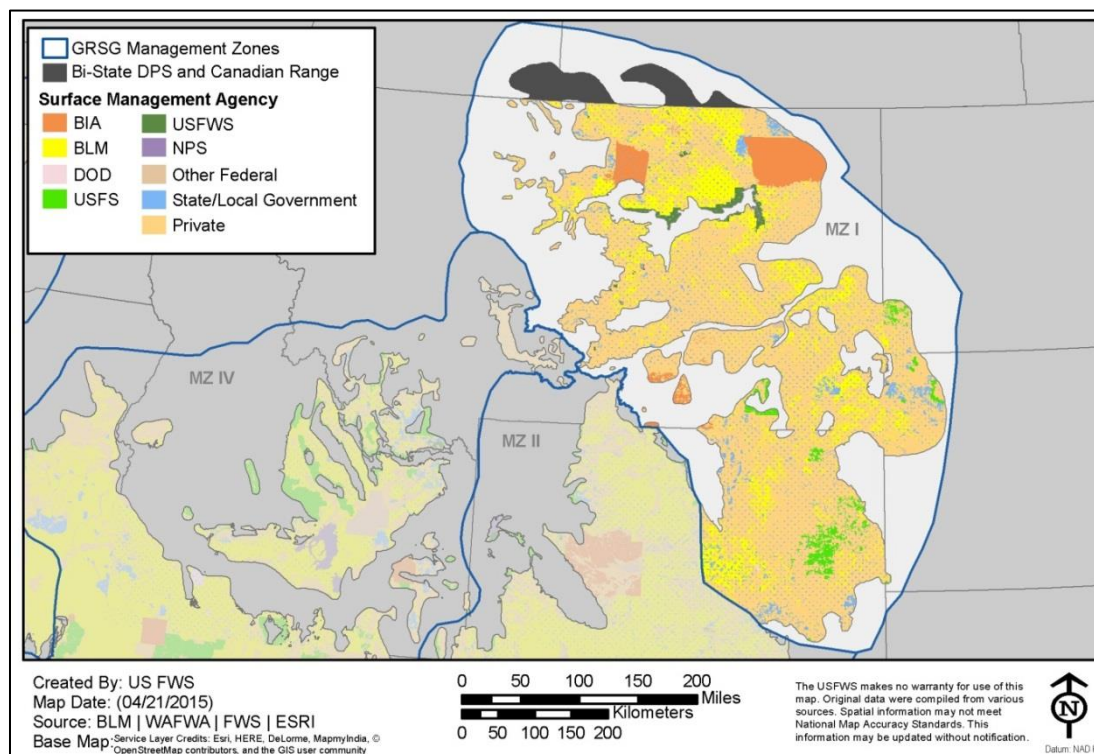


Figure C-1. Surface landownership in Management Zone I.



## MZ II – WYOMING BASIN

MZ II includes central and southwest Wyoming, a small portion of southern Montana, northeast Utah, and northwest Colorado, with almost half of the land owned by BLM (Figure C-2). Private lands predominate on the edges of this MZ and a checkerboard pattern of state trust lands is interspersed with BLM and private ownership. Along the Central Pacific Railroad corridor in southern Wyoming and northeast Utah, an even finer checkerboard pattern of private and BLM land is evident. The Wind River Indian Reservation, in central Wyoming, covers over 3 percent of the range of sage-grouse in the MZ, but encompasses less than 1 percent of the modeled breeding distribution of sage-grouse in the MZ. In west-central Wyoming, land occupied by the isolated Jackson Hole population is predominately within Grand Teton National Park, the Elk National Refuge (managed by the Service), and the Bridger-Teton National Forest.

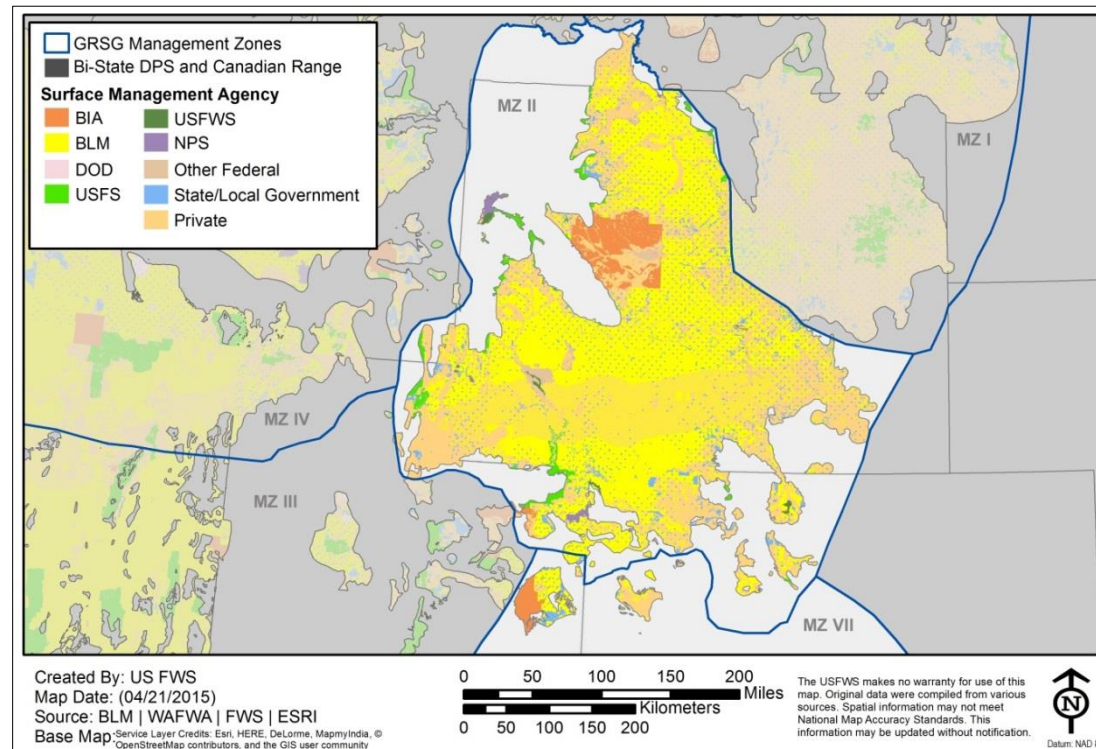


Figure C-2. Surface landownership in Management Zone II and VII.

### ***MZ III – SOUTHERN GREAT BASIN***

Management Zone III includes portions of Nevada and Utah with 83 percent of the range of sage-grouse in the MZ owned by BLM and USFS (Figure C-3). Private lands in the MZ are limited to checkerboard ownership along the Central Pacific Railroad corridor in northern Nevada, and a few larger blocks of private ownership in northern and eastern Utah. State trust lands are interspersed in a checkerboard pattern with BLM lands in Utah, but not in Nevada. In addition there is a relatively large tract of state trust land in south-central Utah, called Parker Mountain, that provides habitat and population connectivity to one of the largest populations of sage-grouse in southern Utah. One of the few DoD facilities that overlap sage-grouse range is located at the southern edge of the MZ in Nevada, but this area contains little modeled sage-grouse breeding habitat. There are also a few tribal reservations in this MZ, but these lands are at the edges of the species' range within the MZ and provide little modeled breeding habitat.

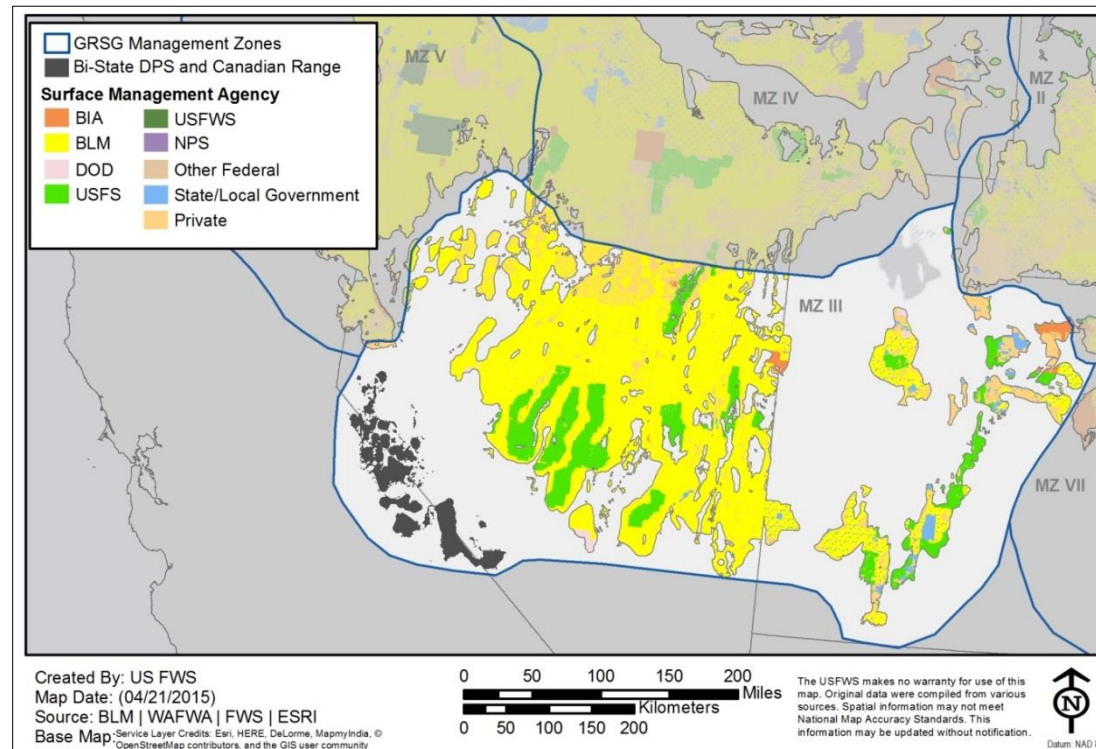


Figure C-3. Surface landownership in Management Zone III.

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264 ***MZ IV – SNAKE RIVER PLAIN***  
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266 Management Zone IV spans six states and arguably has the most complex pattern of ownership among the sage-grouse MZs (Figure  
267 C-4). Across the MZ, 63 percent of the range of sage-grouse in the MZ and 70 percent of the modeled breeding distribution in the MZ  
268 are in Federal ownership. However, the Belt Mountains, in the northeastern corner of the MZ (in Montana) are predominately  
269 privately owned, with State trust lands mixed in a checkerboard fashion. Southwest Montana and the Snake-Salmon Beaverhead  
270 populations (SW Montana and central Idaho) consist of a matrix of BLM lands mixed with some USFS and private lands with State  
271 trust lands checkerboarded throughout; In addition, the Idaho National Energy Laboratory and Craters of the Moon National Preserve  
272 and Monument are two large landowners within this portion of the MZ. The area occupied by the relatively isolated Sawtooth  
273 population is almost entirely part of the Sawtooth National Recreation Area, owned by the USFS. The East-central Idaho population,  
274 at the southeast corner of the MZ is a fragmented mix of private, State, tribal, and USFS lands. The Weiser and Baker populations,  
275 located in west-central Idaho and northeast Oregon, respectively, are primarily comprised of private ownership mixed with some BLM  
276 lands. The largest population in the MZ, the Northern Great Basin population, spans southern Idaho, southeast Oregon, northern  
277 Nevada, and northwest Utah; this population is primarily in BLM ownership, with a checkerboard of State ownership in southern  
278 Idaho and northwest Utah, and several large tracts of USFS lands. In addition this portion of the MZ also contains the Duck Valley  
279 Indian Reservation and a few large blocks of State ownership. The private/Federal checkerboard pattern of ownership along the  
280 Central Pacific Railroad corridor is also evident in Northern Nevada and northwest Utah.  
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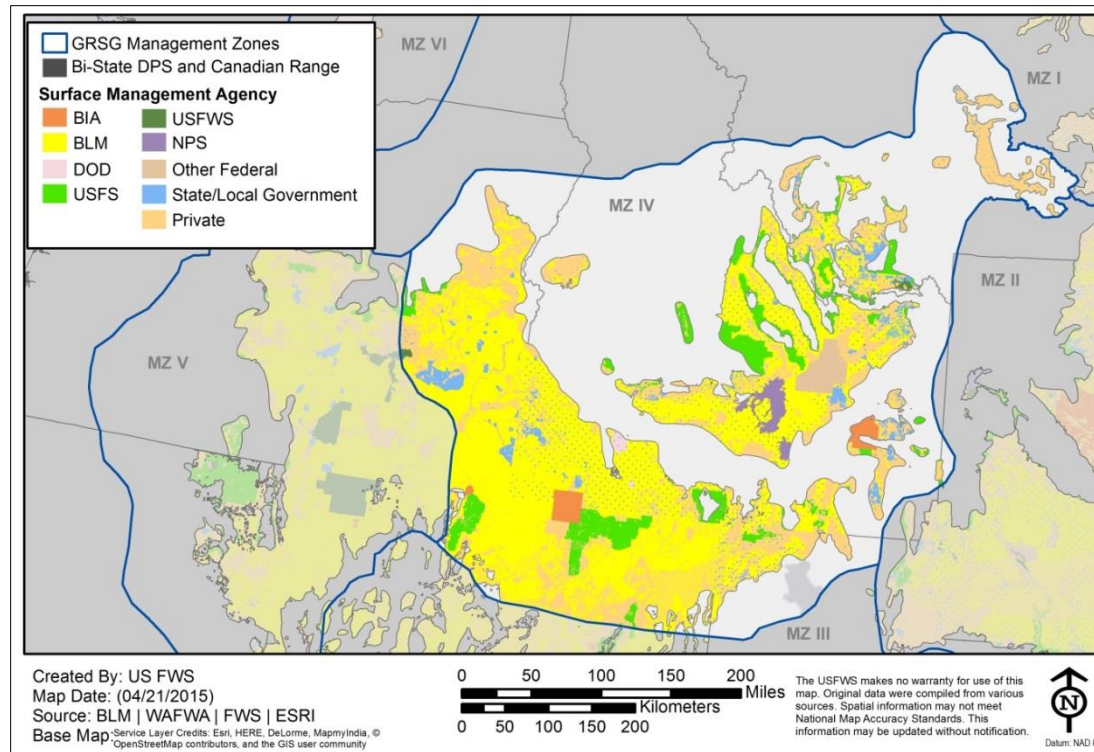


Figure C-4. Surface landownership in Management Zone IV

### ***MZ V – NORTHERN GREAT BASIN***

Management Zone IV includes portions of southeast Oregon, northeast California, and northwest Nevada (Figure C-5). It consists mostly of BLM and FS ownership, which covers almost 70% of the range of sage-grouse in the MZ and almost 80% of the modeled breeding distribution in the MZ. National Wildlife Refuge lands are an important and central components of this MZ, comprising approximately 5% of the range in the MZ and 9% of the modeled breeding distribution, most of which is due to Sheldon-Hart National Wildlife Refuge Complex. The Modoc National Forest, in northeast California, forms the most contiguous expanse of FS land in the MZ, with a few smaller and more fragmented patches of FS ownership located in Oregon. Private ownership is scattered throughout the MZ, with several large ranches in southeastern Oregon. State and Tribal lands collectively comprise less than 4 percent of the range of sage-grouse in the MZ and less than 2 percent of the breeding distribution.

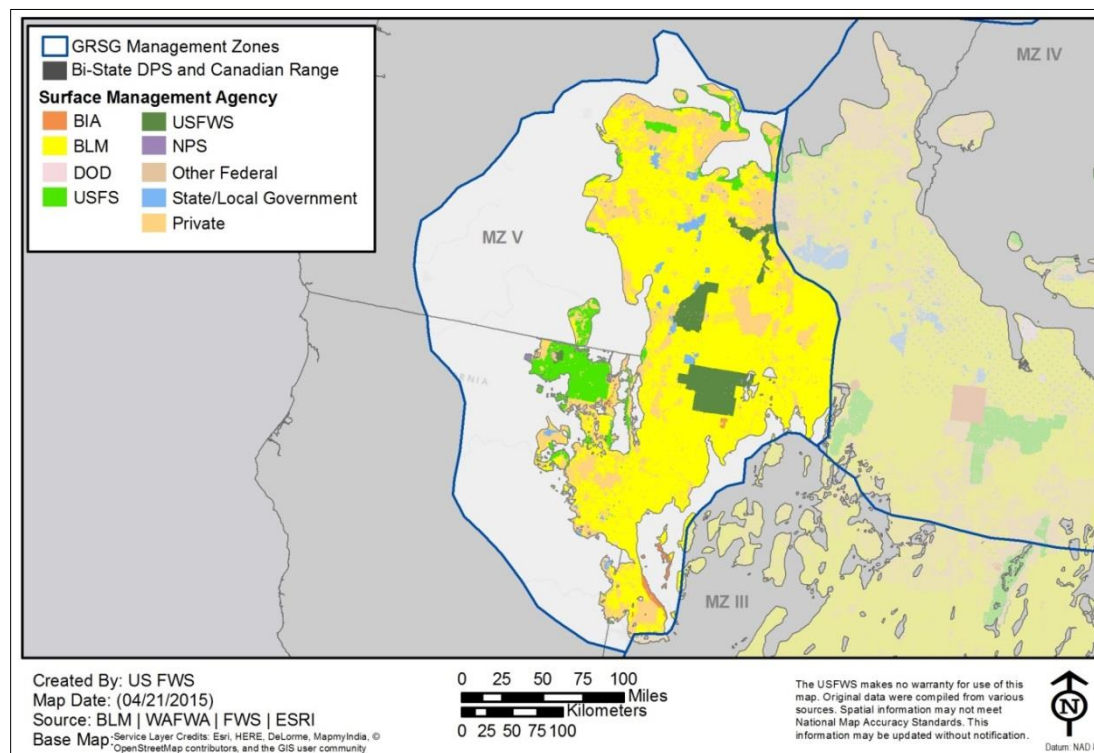


Figure C-5. Surface landownership in Management Zone V.

### ***MZ VI – COLUMBIA BASIN***

The range of sage-grouse in MZ VI is entirely within the state of Washington and is comprised of four units. The two northern units are predominately private land, with some state and BLM lands scattered throughout. The southern units consist almost entirely of the Yakima Training Center, owned by DoD, and the Yakima Indian Nation (Figure C-6).



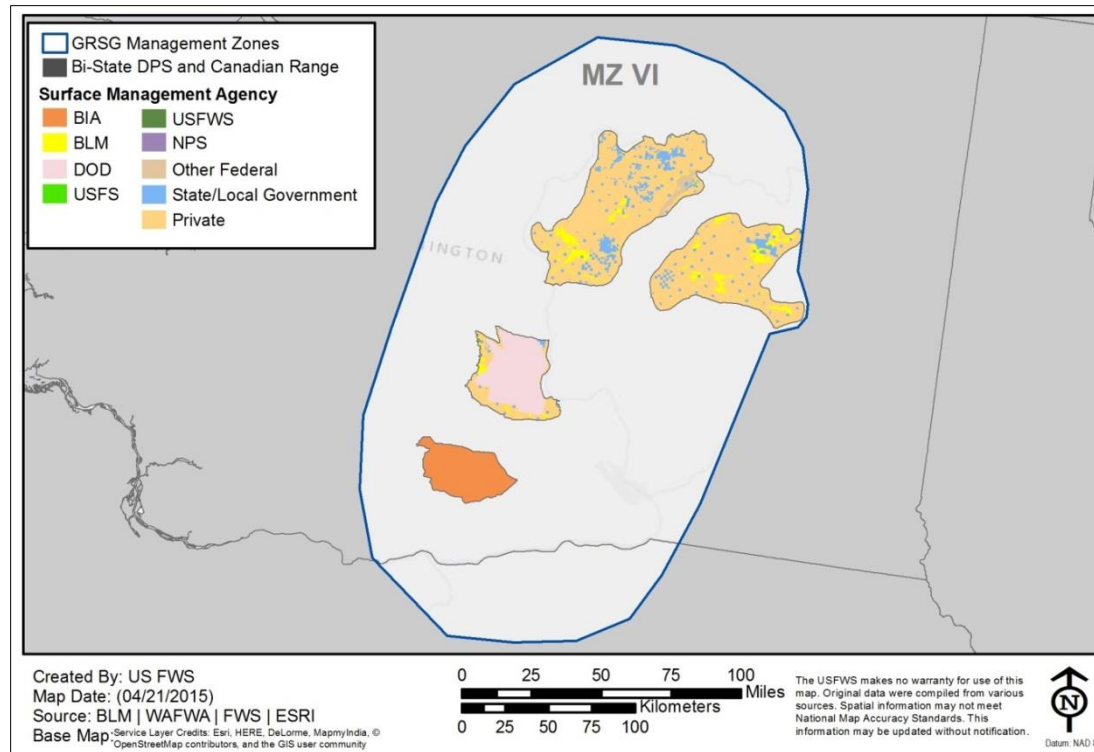


Figure C-6. Surface landownership in Management Zone VI.

### ***MZ VII – COLORADO PLATEAU***

Management Zone VII, located in eastern Utah and northwest Colorado, contains only a small amount of the sage-grouse range. In Utah, this MZ is almost entirely in Tribal (Uintah and Ouray Indian Reservation), BLM, and State ownership, whereas in Colorado, the MZ is mostly in private ownership, although BLM also owns some land in this portion of the MZ (Figure C-2). When viewed together, almost 70 percent of the modeled breeding distribution of sage-grouse in this MZ is in private ownership, and almost 20 percent is owned by BLM.

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

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323 The following tables and figures summarize the conservation efforts entered into the CED that were deemed complete and effective by the project  
324 proponent. Threat amelioration activities are only presented in the MZs that are the key areas in the sage-grouse range where this threat occurs, or  
325 is likely to occur. Incomplete projects (those deemed ‘planned’ or ‘in-progress’), or those not effective (deemed ‘highly likely’ or ‘not likely’)  
326 were not considered for this draft species report simply because they do not yet provide threat amelioration. Of the projects identified as  
327 ‘completed’ and ‘effective’, we completed an additional internal assessment of those efforts using the supplemental information supplied to us by  
328 the data provider and assessing the conservation benefit based on the best available information, and professional judgment (supported by peer-  
329 reviewed literature, etc.). The summary information for projects the Service deemed effective are presented in each individual threat chapter in the  
330 draft species report and are not included here.

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332 ***Threat: Wildfire***

333 **Table D-1:** Summary of projects addressing fire entered in CED as “completed” by data providers.

TOTAL PROJECTS		271
MZ	Ha/Ac	Km/Mi
I	2,153/5,319	0
II	12,338/30,488	1,120/696
III	18,961/46,854	0
IV	71,414/176,468	211/131
V	1,456/ 3,599	414/257
VI	28/ 70	0
VII	1,602/ 3,960	0
<b>TOTALS</b>	<b>111,607/275,788</b>	<b>1,745/1,084</b>

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343 ***Threat: Invasive Plants***

344 **Table D-2:** Summary of projects addressing invasive plants entered in CED as “completed” by data providers.

TOTAL PROJECTS		1,181
MZ	Ha/Acres	
I	85,092/210,268	68,797 ha (170,000 ac) duplicated
II	73,634/181,953	68,797 ha (170,000 ac) duplicated
III	6,322/15,621	
IV	201,126/519,232	68,797 ha (170,000 ac) duplicated
V	303,727/750,526	
VI	163/403	
VII	69/171	
TOTALS HA/AC		528,027/1,304,782

345 ***Threat: Conifer Encroachment***

346 **Table D-3.** Summary of projects addressing conifer encroachment entered in CED as “completed” by data providers.

TOTAL PROJECTS		556
MZ	Acres	
I	3,635/8,983	
II	11,962/29,559	
III	32,767/80,968	
IV	34,941/86,341	
V	54,016/133,476	
VI	0	
VII	10,372/25,629	
TOTAL HA/AC		117,024/363,303

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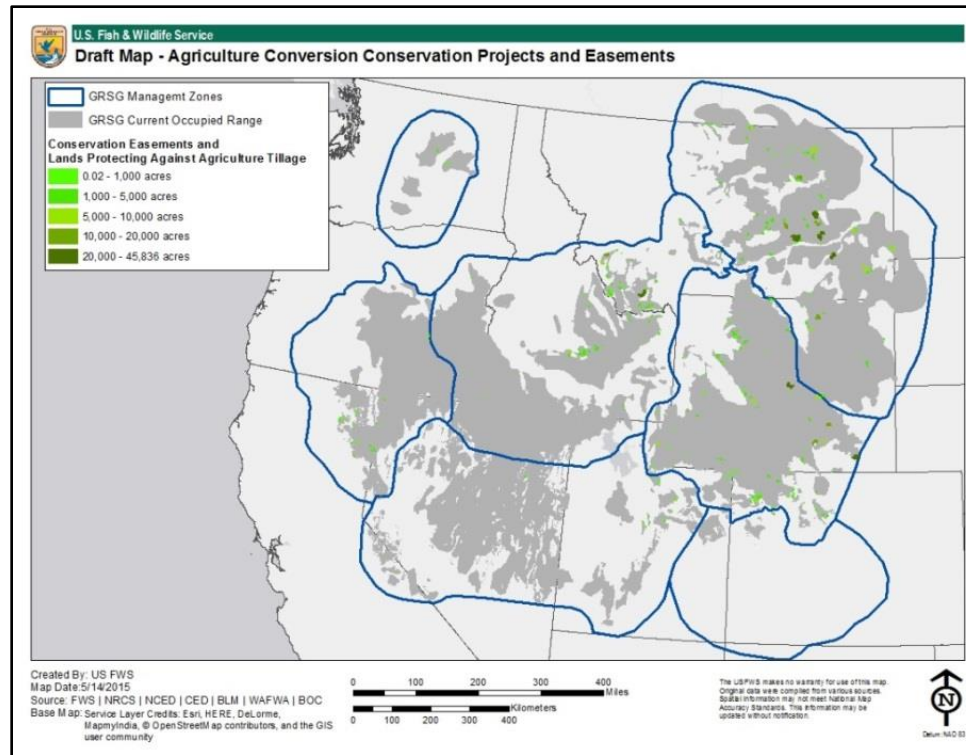


351 ***Threat: Agricultural Conversion***

352 **Table D-4:** Summary of projects addressing agricultural conversion entered in CED as “completed” by data providers.

TOTAL PROJECTS		30
MZ	Ha/Ac	
I	288,124/711,970	80937 ha (200,000 ac) duplicated w/II; 206,794 ha (511,000 ac) duplicated w/II & IV
II	317,966/785,771	80937 ha (200,000 ac) duplicated w/ I;206,794 ha (511,000 ac) duplicated w/I & IV
III	5,065/12,517	
IV	206,794/511,000	206,794 ha (511,000 ac) duplicated w/ I & II
V	0	
VI	0	
	4292/	
VII	10,606	
TOTAL HA/AC		325,427/804,149

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**Fig. 1.** Summary of projects (e.g. easements) addressing agricultural conversion, including those entered in CED as “completed” by data providers and project data provided by other means.

371 ***Threat: Energy Development***

372 **Table D-5:** Summary of projects addressing energy development entered in CED as “completed” by data providers.

<b>TOTAL PROJECTS</b>		<b>13</b>
MZ		Ha/Ac
I	157,926/390,244	
II	106,272/292,605	
III	782/1,799	
IV	404/1,000	
V	0	
VI	0	
VII	0	
<b>TOTAL HA/AC</b>		<b>276,663/683,648</b>

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375 ***Threat: Mining***

376 **Table D-6.** Summary of projects addressing mining entered in CED as “completed” by data providers.

<b>TOTAL PROJECTS</b>		<b>15</b>
MZ	Reported Ha/ Ac	
I	114,404/282,698	113,717 ha (281,000 ac) duplicated
II	124,847/308,503	113,717 ha (281,000 ac) duplicated
III	421/1,040	
IV	113,717/281,000	113,717 ha (281,000 ac) duplicated
V	0	
VI	0	
VII	0	
<b>TOTAL HA/ACRES</b>		<b>125,955/311,241</b>

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***Threat: Infrastructure***

**Table D-7.** Summary of projects addressing infrastructure entered in CED as “completed” by data providers.

	PROJECTS BY AREA	LINEAR PROJECTS	STRUCTURES REMOVED
	No. Projects 51	No. Projects 91	No. Projects 14
MZ	Ha/Ac	Km/Mi	Number of Structures Removed
I	114,274/282,378*	1,173/729	2
II	142,953/353,244*	26,268/16,322**	4
III	3,026/7,478	25,758/16,005**	37
IV	118,564/292,977*	1508/937	11
V	0	209/130	28
VI	0	164/102	0
VII	4292/10,606	25,235/15,680**	0
<b>TOTALS</b>	<b>153,371/378,988</b>	<b>28,600/17,771</b>	<b>53</b>

\*The total acres reported for MZs I, II, and IV each include 281,000 acres duplicated from the same two projects. A breakdown of the total acres by MZ is not currently available.

\*\*The total miles reported for MZs II, III, & VII each include 15,674 miles duplicated for the same project, which occurred in multiple states. A breakdown of the total mileage by state or MZ is not currently available.

399 ***Threat: Urbanization***  
 400 **Table D-8:** Summary of projects addressing urbanization entered in CED as “completed” by data providers.

<b>TOTAL PROJECTS</b>		<b>498</b>
MZ	ha/acres	
I	21736/53,710	206,794 ha (511,000 ac) duplicated
II	420,675/1,039,511	206,794 ha (511,000 ac) duplicated
III	5065/12,517	
IV	206,794/511,000	206,794 ha (511,000 ac) duplicated
V	4,292/10,606	
VI	0	
VII	0	
<b>TOTAL HA/AC</b>		<b>442,828/1,094,251</b>

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 403 ***Threat: Recreation***  
 404 **Table D-9.** Summary of projects addressing recreation entered in CED as “completed” by data providers.

<b>TOTAL PROJECTS</b>		<b>13</b>
MZ	Ha/Ac	
I	101,564/250,970	114,120 ha (250,000 ac) duplicated
II	110,987/274,254	114,120 ha (250,000 ac) duplicated
III	2,741/6,772	
IV	101,171/250,000	114,120 ha (250,000 ac) duplicated
V	0	
VI	0	
VII	0	
<b>TOTAL HA/AC</b>		<b>114,120/281,996</b>

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

**Table E-1:** Summary of recent research on the effects of energy development on sage-grouse (N/A = Study design did not allow detection of time lag)

Pub Yr	Location	Comparison	Covariate Investigated	Spatial Scale(s) Investigated	Sage-Grouse Biological Response	Source	Time lag
2015	Wyoming	Sage-grouse winter locations	Well pad density, and activity levels at wells (road traffic, drilling)	2.8 km from data logger stations	Sage-grouse avoided areas of high well density regardless of activity level at well pad.	Holloran <i>et al.</i> 2015	N/A
2014	Wyoming	Male lek attendance	Well pad density	Density of wells within 0.5, 1.0, 2.0, 5.0, and 10 km of leks	Increase in well density across the state (1991-2011) correlated with 24% decline in male lek attendance. Impacts were greatest for small leks in NE WY. 51 of 814 leks increased or remained stable under similar densities.	Gregory and Beck 2014	4-5 years
2014	Wyoming	Sage-grouse locations	oil and gas structure density	0.27, 0.54, 1.00, and 3.00 km buffers	Sage-grouse avoid oil and gas structures. Structures influenced habitat selection at 3 km spatial scale.	Dinkins <i>et al.</i> 2014	N/A
2013	NE Wyoming, E Montana, W Dakotas (most of MZ I)	Lek count comparison	Well pad densities and West Nile virus occurrence	Density of wells within 1.0, 3.2, 5.0, 10, and 15 km and 20 km of leks	km radius. Decline from West Nile virus was worse in areas high levels of oil and gas development.	Taylor <i>et al.</i> 2013	N/A
2012	Wyoming	Female nesting and brood-rearing locations	Distance to well pads; proportion of buffer disturbed by gas development	0.25, 1.0, and 5.0 km buffers	Females avoided nesting and brood-rearing in areas with increased numbers of visible wells within a 1 km <sup>2</sup> area; females avoided sites when the proportion of a 5 km <sup>2</sup> area disturbed by gas development exceeded 8 percent. Brood survival was negatively correlated with surface disturbance above 4 percent within a 1 km <sup>2</sup> area.	Kirol 2012	N/A
2012	Bighorn Basin, north-central Wyoming	Lek activity (occupied or unoccupied)	Well pad densities	5 scales (1.0, 3.2, 4.0, 5.0, and 6.4 km buffer of leks	Below 50 percent when well pad densities exceeded 2 wells/km <sup>2</sup> .	Hess and Beck 2012	N/A
2010	Wyoming	Lek count comparison	Well pad densities	3.2 km buffer around leks	Probability of lek persistence and abundance of males on leks declined with an increase in well density.	Doherty <i>et al.</i> 2010	4 years
2010	Wyoming	Lek count comparison	Well pad densities,	Well pad density within 8.5 km of	Proximity to leks. Negative effects of surface occupancy were present out to 4.8 km in some	Harju <i>et al.</i> 2010	2-10years

			infrastructure	each lek. Infrastructure in 0.4 km increments from 0.4 km to 4.8 km of leks	areas.		
2010	Wyoming	Sage-grouse female nesting occurrence	Distance to well pads	Infrastructure within 5 km of leks was mapped.	Yearling females avoided nesting within 950 m of well pads, had reduced survival. Yearling males had reduced survival and recruitment.	Holloran <i>et al.</i> 2010	N/A
2010	Alberta, Canada	Sage-grouse winter occurrence	Distance to well pads	N/A (study area)	Sage-grouse avoided habitats within 1.9 km of infrastructure during winter	Carpenter <i>et al.</i> 2010	N/A
2009	MZ I	Occurrence of large, small, and inactive leks	Well pad densities	12.3 km buffer of leks	Probability of occurrence of large leks reduced with increasing well density.	Tack 2009	N/A
2009	Management Zone I and II	Lek count comparison	Build out scenarios of well density based on BLM planning documents	Density of wells within 3.2 km buffer	Predict 7-19 percent population decline based on anticipated oil and gas development.	Copeland <i>et al.</i> 2009	N/A
2008	Powder River Basin, NE Wyoming and SE Montana	Sage-grouse female winter locations	Well pad densities	0.04, 0.65, and 4.0 km <sup>2</sup> buffer area	Sage-grouse avoided development (wells within a 4 km <sup>2</sup> area) in otherwise suitable habitat.	Doherty <i>et al.</i> 2008	N/A
2008	Wyoming	Lek count comparison	Well pad densities	Density of wells within 32.2 km <sup>2</sup> (3.2 km buffer)	At 1-12 wells per 32.2 km <sup>2</sup> impacts to leks were indiscernible. Development above this level resulted in steep declines and increased numbers of inactive leks.	Doherty 2008	4 years
2007	Alberta, Canada	Nest and brood occurrence.	Well pad densities	1 km <sup>2</sup> buffer around nest and brood locations	Chick survival decreased with increasing numbers of visible wells within 1 km of brood- rearing locations. Nest success was independent of well density.	Aldridge and Boyce 2007	N/A
2007	Powder River Basin, NE Wyoming and SE Montana	Lek count comparison	Well pad locations	3.2 km buffer around leks	negative effects (reduced male lek attendance and lek persistence) of energy development within 0.8 km and 3.2 km of the lek	Walker <i>et al.</i> 2007	3-4 years
2005	Upper Green River Basin, W Wyoming	Lek count comparison. Female nest	Distance to development, well and road	5 km buffer around known leks	Decline in male lek attendance and recruitment of juvenile males. Decreased female and male survival. Avoidance of nesting and brooding	Holloran 2005	Yes, data suggested time lag,

		and brood location.	densities, and traffic activity levels and timing.		females. Demonstrated lag period between development and sage-grouse response. Breeding population decline within 3-5km of development		specific time period not identified
<b>2006</b>	Upper Green River Basin, W Wyoming	Nest locations, survival, lek recruitment of yearling males and females	Drilling rigs, producing wells, and main haul roads	Within 10 km of study area, 5 km of drilling rigs, 3 km of producing wells, or 3 km of main haul roads	Avoidance, reduced recruitment, reduced chick survival	Kaiser 2006	N/A
<b>2003</b>	Near Pinedale, SW Wyoming	Female nest initiation and nest success	Distance to development	6 leks classified as disturbed or undisturbed based on development within 3km	Nest initiation higher near undisturbed leks compared with disturbed leks. Females moved further to nest at disturbed leks. Nest success was similar at disturbed and undisturbed sites.	Lyon and Anderson 2004	N/A



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

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**PLACEHOLDER FOR INSERTION OF MODEL DESCRIPTION/PUBLICATION**

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

### **Lands and Realty (Land Tenure, ROWs, Solar and Wind)**

Open areas: areas available for location of rights-of-ways.

Avoidance areas: areas to be avoided but may be available for location of rights-of-ways with special stipulations.

Exclusion areas: areas which are not available for location of rights-of-ways under any conditions.

Utility corridors: linear areas with the potential for at least one additional facility and thus can be considered a corridor (if not already designated) to minimize adverse environmental impacts and the proliferation of separate right-of-ways.

### **Fluids (Oil and Gas and Geothermal)**

Open: areas open to leasing with minor to no constraints, subject to existing laws and regulations, and formal orders; on the terms and conditions of the standard lease form.

Open with moderate constraints: areas open to leasing subject to moderate constraints. These are areas where it has been determined that moderately restrictive lease stipulations may be required to mitigate impacts. These stipulations include:

- Timing limitations: areas open to leasing but would be closed to surface disturbing activities during identified time frames. This stipulation would not apply to operation and maintenance activities, including associated vehicle travel, unless otherwise specified.
- Controlled Surface Use (CSU): areas that are open to leasing but would require proposals for surface disturbing activities to be authorized only according to the controls or constraints specified.

Open with major constraints: areas open to leasing, subject to major constraints. These are areas where it has been determined that highly restrictive lease stipulations are required to mitigate impacts.

- No Surface Occupancy (NSO): areas open to leasing but surface disturbing activities cannot be conducted on the surface of the land. Access to oil and gas deposits would require horizontal drilling from outside the boundaries of the NSO areas. The NSO areas are avoidance areas for rights of-way; no rights-of-ways would be granted in NSO areas unless there are no feasible alternatives.
- Major constraints could also include areas where overlapping moderate constraints would severely limit development of fluid mineral resources.

Closed: These are areas where it has been determined that other land uses or resource values cannot be adequately protected with even the most restrictive lease stipulations; appropriate protection can be ensured only by closing the lands to leasing.

### **Non-energy Leasables**

Open areas: areas open to non-energy leasables (these areas are still subject to mitigation and RMP objectives).

Closed areas: areas closed to non-energy leasables due to protection of natural resources within the planning area.

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452 **Mineral Materials**

453 Open areas: areas open to mineral material disposal (these areas are still subject to mitigation and RMP objectives).

454 Closed areas: areas closed to mineral material disposal due to protection of natural resources within the planning area.