Appendix A. Members of the Conservation Objectives Team.

Dave Budeau, Oregon Fish and Wildlife
Dr. Michael Schroeder, Washington Department of Wildlife
Scott Gardner, California Fish and Game Department
Shawn Espinosa, Nevada Department of Wildlife
Dr. John Connelly, Idaho Department of Fish and Game
Bob Budd, State of Wyoming
John Harja, State of Utah
Aaron Robinson, North Dakota Game and Fish
Rick Northrup, Montana Fish Wildlife and Parks
Dr. Kathy Griffin, Colorado Parks and Wildlife
Dr. Steve Knick, U.S. Geological Survey
Steve Abele, U.S. Fish and Wildlife Service
Jodie Delavan, U.S. Fish & Wildlife Service
Dr. Pat Deibert, U.S. Fish and Wildlife Service
Paul Souza, U.S. Fish & Wildlife Service

Appendix B. Management Zone and Population Risk Assessments. This information was used to inform the COT threat analyses.

Management Zone I: Great Plains

This management zone consists of four sage-grouse populations as identified by Garton et al. 2011, including the Dakotas, Northern Montana, Powder River Basin, and Yellowstone Watershed populations. All of these populations cross state or provincial boundaries. Garton et al. (2011) predicted an 11.1 percent chance this Management Zone will fall below 200 males by 2037, and a 24.0 percent chance it would fall below 200 males by 2107. Privately-owned lands are a major constituent of sagebrush landscapes in the Great Plains (66 percent), followed by BLM (17 percent), and then other ownerships (Knick 2011). After Management Zones II and IV, this zone contains some of the highest habitat connectivity in the range (Knick and Hanser 2011). On the other hand, sagebrush habitat in 37 percent of this zone is 75-100 percent similar to sagebrush habitat in areas where extirpation has occurred (Wisdom et al. 2011). Generally, areas in this zone that are least similar to extirpation parts of the range include the western portions of Northern Montana and Powder River populations and the southeast corner of the Yellowstone Watershed population (Wisdom et al. 2011, Figure 18.5).

Dakotas

The Dakotas's population occurs on the far eastern edge of the range of sage-grouse. Much of the population occurs in the Cedar Creek Anticline. Garton et al. (2011) reported the minimum male count for this population at 587 and predicted a 66 percent chance that this population would dip below 200 males in the next 100 years. Population counts in 2012 for North and

South Dakota were approximately 300, so this population as a whole very likely still exceeds 500 birds. Core areas between North and South Dakota are connected by general habitat consisting of limited sagebrush habitat. Sage-grouse movements generally occur east and west between the Dakotas's population and Montana. Connectivity between the sub-populations occurs through Montana's portion of the population (Knick and Hanser 2011). This area was identified as a core area in Montana due to historically high density of sage-grouse and for the seasonal habitat it provides for birds from North Dakota, a likely conduit for genetic connectivity. The area is heavily influenced by oil and gas development and conversion of native rangeland to cropland is a major threat to the persistence of sage-grouse. Over-grazing in localized areas has degraded the sagebrush habitat and can reduce nesting success. Nesting success was positively correlated to grass cover in North Dakota (Herman-Brunson 2007). Overall, this population is small and at high risk (C1).

Northern Montana

The Northern Montana Population is predominantly in northeast Montana but extends north into southern Saskatchewan and Alberta, making up these provinces' entire sage-grouse populations. Garton et al. (2011) reported a minimum male count for this population at over 2,700 males and projected a very low probability (i.e., 2 percent) of the population dipping below 200 males in the next 100 years. The southern portion of this area, south of the Milk River, has a high abundance of sage-grouse, has been designated a core area, and is predominately comprised of public land. Land use in this area is livestock grazing with limited dryland farming and irrigated hay production adjacent to creeks and rivers. In general, habitat in this core area is expansive and intact and faces few if any significant threats, particularly on the public lands. Grouse in this core area make up the majority of birds in this population. North of the Milk River, habitats comprise a relatively low density of silver sagebrush and a correspondingly low density of sage-grouse. The sage-grouse habitats in this area include more private lands and, in some portions of this area, have a long history of grain farming and low to moderate densities of natural gas production. A core area was designated in northern Valley County where relatively intact habitats provide for resident grouse as well as a conduit for spring and fall migrating sage-grouse between Saskatchewan and southern Valley County. This core area is adjacent to considerable farming to the east but is itself relatively stable and lacks significant threats. One or more large conservation easements are in place to protect habitat values on key private lands in northern Valley County. Given the extent and limited threats associated with this population, it is considered to be at low risk (C4).

Powder River Basin

The Powder River Basin occurs mostly in Northeast Wyoming, but Montana includes the extreme northern tip of this population. A recent sagebrush cover assessment estimated average cover of sagebrush in the Powder River Basin to be 35 percent, with an average sagebrush patch size less than 300 acres (Rowland et al. 2005). Sagebrush patch size in the Powder River Basin has decreased by more than 63 percent in forty years, down from 820 acre patches and an overall coverage of 41 percent in 1964. Most of the occupied sage-grouse habitat in northeast Wyoming is privately owned. Approximately 70 percent of known leks, or strutting grounds used during the breeding season, are found on private land; the remaining 30 percent are found on

U.S. Forest Service, Bureau of Land Management and State lands (The Northeast Wyoming Sage-grouse Working Group 2006).

Garton et al. (2011) reported a minimum male count for this population at 3,042 and projected a high probability (86.2 percent) probability of falling below 200 males by 2107. A recent viability study done for BLM (Taylor et al. 2012) indicates that sage-grouse viability in the Powder River Basin is being impacted by multiple stressors including West Nile virus and energy development. Their results suggest that if development continues, future viability of the already small sage-grouse populations in northeast Wyoming will be compromised. The Powder River Basin holds vast energy resources including oil, natural gas, and coal bed natural gas (The Northeast Wyoming Sage-grouse Working Group 2006). The state has a core area management strategy to help balance the priorities of retaining healthy sage-grouse population on the landscape and energy development.

Although the Montana piece of the Powder River Basin makes up a relatively small portion of the population, it may provide genetic connectivity with other Montana populations. Land use in Montana's portion of this population includes a mix of livestock grazing, coal mining, and shallow coal bed natural gas production. Montana identified relatively small but intact habitats that have limited energy development and may serve as remnant habitat for supporting small numbers of sage-grouse into the future. The expanding threat of energy development across the Powder River Basin and corresponding downward population index trends makes this overall an at risk (C2) population.

Yellowstone watershed

The Yellowstone Watershed Population is a large population covering an expansive area south of the Missouri River, making up the majority of sage-grouse habitats in southeast and south central Montana. Garton et al. (2011) reported a minimum male count of over 2,900 males. They further projected a 60 percent chance of this population dipping below 200 males in the next 100 years. Landownership is predominantly private with scattered tracts and blocks of public land. Livestock grazing and small grain farming are common in this area. Oil and gas developments are scattered across portions of this area. Extensive private lands have the potential for conversion of additional sagebrush habitats to farming and various forms of sagebrush eradication. Cropland conversion continues to take place in this area. Core areas have been identified both in the western and southeastern portions of this population, where sage-grouse densities are greatest and habitats remain relatively intact. The western and southeastern core areas are separated by about 70 miles of a mix of habitats, including an interstate highway, the Yellowstone river corridor, and a patchwork of cropland intermingled with occupied sage-grouse habitat. Some portion of this space between core areas may be identified as core habitat in the future as connectivity habitats become better understood and defined. Overall this is population is only potentially at risk (C3).

Management Zone II: Wyoming Basin

This management zone is made up of five sage-grouse populations as identified by Garton et al. 2011, including Jackson Hole, Laramie, Eagle-south Routt, Middle Park, and the Wyoming

Basin. Colorado and Utah's portions of the Wyoming Basin are described separately as the NWCO and North Park subpopulations in Colorado, and the Rich-Summit-Morgan and Uintah Management Areas in Utah. This management zone represents the highest abundance of sage-grouse relative to other management zones across the sage-grouse's range. Garton et al. (2011) predicted a small, 0.3 percent chance, that this zone will fall below 200 males by 2037, and a 16.2 percent chance it would fall below 200 males by 2107. The majority of this management zone is represented by the Wyoming Basin population. Montana's portion of the zone is very small, only including the northern tip of the Wyoming Basin population in a portion of Carbon County. BLM and privately-owned lands are major constituents of sagebrush landscapes in this zone, representing 49 percent and 35 percent of the ownership, respectively (Knick 2011). Management Zone II contains the highest habitat connectivity in the range (Knick and Hanser 2011). This zone is also a stronghold for sage-grouse because it contains the second largest area of habitat range-wide (and the largest in the eastern range) with low similarity to extirpated portions of the range (Wisdom et al. 2011).

The Colorado portion of this management zone appears to capture redundancy and representation in the priority mapped areas. Priority habitats represent 61 percent of the occupied range in Colorado and 84 percent of the breeding birds in the state. Being on the edge of the species range, the Colorado populations within this management zone are somewhat isolated. Linkage zones have been mapped between the Colorado populations. It is assumed the habitat linkages will allow for movement between populations and will decrease the probability of extinction of the subpopulations by stabilizing population dynamics. Connectivity between Wyoming core habitat and Colorado's priority habitats may be adequate in most areas, but there may be some areas to address in the northwest Colorado area.

Comment [DJD1]: Replace between with among if they have mapped linkages between more than 2 subpops/pops. Sent Kathy an email asking this question (and a couple others) 7/27

Eagle-south Routt

This population occurs in north-central Colorado and is separated from nearby populations by distance and mountainous terrain (Garton et al. 2011). Representation appears to be captured adequately in this population. Priority habitats capture 68 percent of the occupied range in this population and include 100 percent of all known active leks. Priority habitats also contain all habitats that were modeled "high probability of use" within four miles of leks that have been active in the last 10 years. Redundancy is not captured within this population because it is a fairly isolated population that is also fairly small (the three-year average number of males from 2010-2012 is 108). The greatest threat to this population is loss of habitat from subdivision and housing development as well as the associated infrastructure and roads. Pinyon-juniper encroachment has been, and continues to be, a significant threat to the population as well. This population is mostly resilient but, due to its fairly small population size and isolation, it has little lost resiliency. Populations (in terms of males only) in the late 1960s were likely in the high 200s. This population is high risk (C1) because, given its smaller population size and isolation, a stochastic event could greatly negatively affect this population.

Middle Park

The Middle Park population occurs east of Eagle-south Routt in north-central Colorado and is separated from adjacent populations by distance and mountainous terrain (Garton et al. 2011).

Representation and redundancy appear to be captured adequately in Middle Park. Priority habitats capture 79 percent of the occupied range in this population and also include 95 percent of all known active leks. Furthermore, priority habitats contain 95 percent of all habitats that were modeled "high probability of use." Redundancy is captured reasonably well within this population because, although it currently has a three year running average of 210 males, the priority habitats include most of the known distribution of birds and connectivity to the North Park population has been known to occur. Housing development has the most current and foreseeable threat. Grand County has experienced a high rate of human population growth in recent years. This high growth rate is projected to continue primarily due to its' proximity to major ski resorts and summer recreational activities. Although this is a relatively small population, we do not believe the population has ever been very large. Since the 1970's, the population counts have been roughly between 200 and 325 males. Connectivity to the North Park population has always been somewhat naturally limited over Muddy Pass although we have documented birds moving over the pass. Overall this population is considered at risk (C2).

Comment [DJD2]: Not sure if this means the priority habitat contains the habitat that connects middle park and n. park, or it this should be it's own thought, simply that connectivity occurs. Sent Kathy an email asking this question 7/27

Laramie

This population consists of five leks located southwest of Laramie, Wyoming. Few birds are seen on these leks although one is routinely occupied by a small number of birds, although the running average number of males per lek was 0 from 2004 to 2007 (WAFWA 2008). None of these leks are contained in a PCA and four of these leks are threatened by proposed wind energy development.

Jackson Hole

The Jackson Hole population is a small population located near Jackson Hole, Wyoming. This population is geographically isolated due to surrounding topography and limited habitat. This population consists of 16 leks (13 active in past 10 years and 3 inactive), of which only one is considered large (averaging over 40 birds). Population trend information indicates that this population is decreasing slightly, declining from an average of 20.5 males per active lek in 2005 to 14.9 males per active lek in 2011. Most of the breeding habitat in this population is contained within a state core area (PCA). However there are 3 small subpopulations that are isolated from Jackson Hole core area: Gros Ventre (2 leks); Star Valley/State Line (2 leks in Idaho) and Hoback Basin (1 lek). Threats to this population consist of internal habitat fragmentation resulting from wildfires, prescribed burns, herbivory of sagebrush by elk and bison winter feeding operations, urban development and recreational activities. Grand Teton National Park and the National Elk Refuge encompass most of the core area and protect much of the crucial habitat. This population exists in high mountain valleys with deep snowpack and the amount of available winter habitat is a limiting factor based on studies by Holloran and Anderson (2004 – greater sage-grouse habitat selection in Jackson hole) and Bedrosian and Craighead (2010 – Jackson hole sage-grouse project completion report for upper snake basin sagr lwg). This population is on the western edge of this population, and Yellowstone National Park is just to the north, making Jackson Hole a popular tourist destination. Skiing and snowmobiling are prime recreational activities during winter. Urban development is limited as a result of limited private lands within this population, but includes some of the crucial winter habitat. Recently, energy development has begun on in the southern edge of this population (Hoback Basin). Population estimates, based on male lek counts, indicate that the total population numbers fluctuate, with a

high of approximately 500 birds. Modeled population forecasts suggest that populations will decline, and long-term persistence is unlikely (Garton *et al*. 2011). Due to low population numbers, population isolation and a high degree of threats, this population is considered high risk (C1).

Wyoming Basin

This population is described in several smaller pieces, including the Wyoming portion of the population, Uintah and Rich-Morgan-Summit Management Areas in Utah, and North Park and NWCO subpopulations in Colorado.

Wyoming Portion

This large population covers approximately two-thirds of the State of Wyoming. It extends into Montana, Idaho, Utah and Colorado. The population is separated from adjacent populations by distance and topography (Garton *et al*. 2011). Sage-grouse habitats are expansive and relatively intact outside of energy development areas. This population is the largest population within the species' range (> 20,000 males attending leks annually), and is very robust. However, long-term population trends are slightly downward, although recent counts suggest an increase. Population modeling suggest that declines will continue (Garton *et al*. 2011); however implementation of the Wyoming Governor's Executive Order for sage-grouse may help alleviate these declines. The primary threats to this population are energy development and transfer, including both renewable and non-renewable resources, long-term drought, and brush eradication programs. Population declines of sage-grouse near oil and gas fields in this area have been well documented (Lyon 2000, Holloran 2005, Holloran and Anderson, Kaiser 2006). Residential development has also been identified as a threat. Recent conservation actions, including the Wyoming Governor's Executive Order designating protective stipulations for core areas (PCAs) and the implementation of conservation easements within these areas have reduced the threat risk to this area. Designated state core areas (PCAs) adequately capture redundancy and representation for the Wyoming portion of this population. Due to the large size of this population, the presence of large, contiguous habitats, and regulatory measures providing habitat protection, this population is considered low risk (C4).

Rich-Morgan-Summit

The Rich-Morgan-Summit Sage-grouse Management Area is located in Northeastern Utah, and is a part of the Wyoming Basin, a significant population center for grouse in Utah, Idaho, and Wyoming. This management area also includes part of what is mapped in Garton et al. 2011 as Summit Morgan Counties in Management Zone III. The area boundary was determined by consulting with adjacent states, DWR, the Morgan-Summit Adaptive Resources Management Local Sage-grouse Working Group, and the Rich County Coordinated Resource Management Sage-grouse Local Working Group and follows vegetation types usable by Sage-grouse. This population is regarded as stable with a potential for growth. Based on a ten year average count of males on leks, the area had an estimated 1,223 males as of 2011. Sage-grouse in this area show resiliency to known threats, and are not regarded as being in jeopardy. Key threats to Sage-grouse include invasive species, loss of agricultural operations, predation, residential

development, and habitat fragmentation through recreational development. In conjunction with populations in Wyoming, the management area is considered low risk (C4).

Uintah

The Uintah Sage-grouse Management Area is located in northeastern Utah. This management area had an estimated 452 males on leks as of 2011. Within the northern portion of this area is the Diamond Mountain and Browns Park population, a significant population center for sage-grouse in Utah, Colorado, and Wyoming. The central and southern portions of the management area contain fragmented populations with minimal connectivity and low potential for habitat improvement. The Management Area boundary was determined by consulting with Division of Wildlife Resources (DWR) and the Uinta Basin Adaptive Resource Management Local Working Group (UBARM) and follows vegetation types usable by sage-grouse. This population is regarded as stable with a potential for growth and also has strong connectivity with the tri-state regional sage-grouse population (i.e., Wyoming Basin). Sage-grouse in the Management Area show resiliency to known threats, and are not regarded as being in jeopardy. Key threats to Sage-grouse include predation, wildfire, invasive species, noxious weeds, disease, loss of agricultural operations, and habitat fragmentation (naturally occurring, but not topographical, and from existing and future anthropogenic uses). In contrast to populations in Colorado, but in concert with populations in Wyoming, the management area is considered low risk (C4).

North Park

This subpopulation is located north of Middle Park in Jackson County and is part of the Wyoming Basin. In North Park, representation and redundancy appear to be captured well. Priority habitats capture 91 percent of the occupied range in this population and include 100 percent of all known active leks and 100 percent of habitat that was modeled "high probability of use" within 4 miles of a lek that has been active within the last 10 years. Historically no significant threats were apparent to this population. However, there is renewed interest in oil development in NP. In addition, a large portion (29 percent) of public land in priority habitat has been leased for energy development. NP has overlapping energy and mineral resources and thus could experience natural gas, coalbed methane, and oil extraction. Although present, the other identified threats are less in NP than in other populations. Priority habitat is in fairly good condition, and a large portion of it is on public lands. This is likely Colorado's most resilient population. Long -term data trends (since the early 1970's) indicate this population has fluctuated roughly between 500 and 1,500 males. Priority habitat is in fairly good condition, and a large portion of it is on public lands.

NWCO

In the northwest Colorado portion of this population, representation and redundancy appear to be captured adequately. Priority habitats capture 56 percent of the occupied range in this population and also include 95 percent of all known active leks and 95 percent of habitat that was modeled "high probability of use" within 4 miles of a lek that has been active within the last 10 years. Most of the sub-management zones within this population have some connectivity with other sub-management zones in this population. This is Colorado's largest population and is

considered only a potential risk (C4). The northern portion is likely to be more resilient than the south eastern portions of this population because of habitat condition and connectivity. There is more habitat fragmentation in the south eastern portion of this population. According to lek count data, the long-term trend appears to be stable, but substantial population fluctuations have occurred regularly. Population peaks have occurred in 1960-70, 1978-80, and in the mid-2000s.

The majority of habitat that supports this population in Montana is identified as core area, both because of the relatively high density of sage-grouse in the area and the likely role this area plays connecting Montana's sage-grouse to Wyoming's birds. In Montana, this area is among the driest of sage-grouse habitats and has a higher prevalence of cheat-grass relative to other parts of Montana. Land use includes livestock grazing and a long history of oil limited production. This portion of the Wyoming Basin Population is relatively small but is within 20 miles of another core area in Wyoming.

Management Zone III: Southern Great Basin

This management zone includes populations in California, Nevada, and Utah. The California populations are described separately in the Bi-State DPS section and the Summit Morgan Counties population is described in Management Zone II as part of the Rich-Summit-Morgan Management Area. The populations described in this section include the Southern Great Basin, Northwest Interior, Quinn Canyon Range, South-central Utah, Northeast Interior Utah, Summit-Morgan Counties, and Tooele-Juab Counties, Sanpete-Emery Counties. In Utah, populations are broken further down and described as management areas (see below). Garton et al. (2011) predicted a 0.0 percent chance this Management Zone will fall below 200 males by 2037, and a 7.8 percent chance it would fall below 200 males by 2107. Landownership in this zone is predominately BLM (71 percent), followed by private (13 percent) and others (Knick 2011). This zone is part of a stronghold for sage-grouse (that includes Management Zones III, IV, and V) because the three zones contain the largest area of habitat range-wide with low similarity to extirpated portions of the range (Wisdom et al. 2011). Despite the fact this zone has large areas of sagebrush habitat in, Nevada this area is threatened by fire in the upper one-third of the Southern Great Basin population and in the Northwest Interior population. Since it is difficult to restore burned habitat (Pyke 2011), the management approach for this area should provide a cushion to deal with fire events that are expected to occur but are not predictable in their location, extent, and outcome.

Northeast interior Utah

This population was divided into the Strawberry Valley and Carbon Management Areas.

Strawberry Valley

The Strawberry Valley Sage-grouse Management Area is located in central Utah, and is a significant population center for sage-grouse in Utah. This management area had an estimated 82 males on leks as of 2011. The area boundary was determined by consulting with DWR and the Strawberry Valley Adaptive Resource Management Local Working Group, and follows vegetation types usable by sage-grouse. Significant restoration efforts have been conducted on this population and it is the most intensively managed in Utah. This population is regarded as

stable with a high potential for growth. Sage-grouse in this area had suffered significant reductions in populations, but these concentrated restoration efforts have significantly increased this population. Due to its smaller size, Strawberry Valley is considered at risk (C2). However, if based solely on threats other than small population size and isolation, or if Utah were to rank this area relative to other state management areas and not range-wide, this area would be only at potential risk (C3).

Carbon

The Carbon Sage-grouse Management Area is located in the northern portion of the Colorado Plateau in central Utah. This management area had an estimated 119 males on leks as of 2011. The area is characterized by highly broken terrain, with deep canyons and mid-elevation plateaus. Sage-grouse leks in this area are generally small, with birds moving between leks. Telemetry studies show bird movement in these areas is primarily by flight. Other studies in the area suggest that occasionally Sage-grouse migrate to and from adjoining populations in Strawberry Valley. The area boundary was determined by buffering active leks with topographic imagery, and adding areas of known winter use. Key threats include habitat loss and fragmentation due to a variety of factors including energy development, wildfire, invasive species, and predation. West Nile Virus has been reported in Carbon in the last 10 years. The management area is at risk (C2).

Emery

The Emery Sage-grouse Management Area is located in central Utah, and is also known as the Sanpete-Emery Counties population in Garton et al. 2011. This management area had an estimated 30 males on leks as of 2011. Small, mostly isolated Sage-grouse populations occupy high elevation sagebrush steppe on the eastern slope of the Wastach Plateau. These populations may be considered part of the Greater Parker Mountain sage-grouse complex, although no direct movement between these areas has been documented. The Emery Sage-grouse Management Area includes all currently used habitat and corridors connecting this habitat. Key threats to the population include woody species encroachment, wildfire, invasive species, predation, and habitat fragmentation. Due to its smaller size, Emery is considered at risk (C2). However, if based solely on threats other than small population size and isolation, or if Utah were to rank this area relative to other state management areas and not range-wide, this area would be only at low risk (C4).

Sheeprock

The Sheeprock Mountains Management Area is located in the Great Basin portion of central Utah, and is a relatively isolated population center for Utah. Garton et al. (2011) refers to this as the Toole-Juab Counties population. This management area had an estimated 102 males on leks as of 2011. The area boundary was determined by consulting with adjacent states, the West Desert Adaptive Resource Management local working group, and DWR, and follows vegetation types usable by Sage-grouse. This population is regarded as stable with a potential for growth. Sage-grouse in this area show resiliency to known threats, and are not regarded as being in jeopardy. Key threats to Sage-grouse include wildfire, invasive species (cheatgrass and knapweeds), potential loss of riparian areas due to water piping, predation, and habitat

fragmentation (dispersed recreation and pinyon/juniper encroachment). The management area has a risk ranking of C1 (high risk).

South Central Utah

Greater Parker Mountain

The Greater Parker Mountain Sage-grouse Management Area is located on the Awapa Plateau in the south central part of the state of Utah, and nearby environments. The Greater Parker Mountain LAWG was established in 1996 and is the longest operating LAWG in Utah. The Greater Parker Mountain boundaries were refined based on 15 years of greater sage-grouse radio telemetry studies which included research on species vital rates, survival, and seasonal movements. Boundary refinements included consultations with the Greater Parker Mountain LAWG and DWR. This management area had an estimated 821 males on leks as of 2011. Because of these long term research studies, more is known about the Parker Mountain Sage-grouse population dynamics, seasonal habitat use, population threats, and abatement strategies than other populations in Utah. The Greater Parker Mountain Sage-grouse Management Area includes all connected currently used habitats and the corridors connecting these habitats. Key sage-grouse threats identified by the LAWG include; 1) loss or degradation of habitat (primarily due to vegetation succession), 2) conversion of habitat (sagebrush to Pinyon and Juniper or cheat grass at the lower elevations), 3) increased risk of predation because of expanding or changes in the native predator community in response to anthropogenic factors, and 4) habitat fragmentation from loss or degradation of habitat that results in a loss of habitat connectivity in Sage-grouse habitat areas. The population has a risk ranking of C3 (potential risk).

Panguitch

The Panguitch Management Area is located in southern Utah, incorporating more than a dozen, often connected leks. This management area had an estimated 304 males on leks as of 2011. This population uses a series of leks throughout the habitat area, with some males visiting more than one lek per season. The population is distributed north-south in a series of linked valleys and benches, and constrained by mountains and canyons. There is a large range in the number of males in attendance among these leks. Movement of Sage-grouse from one valley or bench to another among seasons is necessary to meet their seasonal habitat requirements in the highly variable annual weather conditions of this region. Movements among valleys are not present in each group of Sage-grouse, and not all used areas are known to managers. This management area has the highest potential for increase of any in Utah in response to habitat treatments to remove pinyon-juniper that has extensively impacted habitat quantity and quality. Key threats to Sage-grouse in the Panguitch Management Area are enhanced native predator populations, vegetation management (conflicting or lack of), energy development, and residential/commercial development. The management area has a risk ranking of C3 (potential risk).

Bald Hills

The Bald Hills Management Area is located in southwestern Utah, and is considered a linkage population for this region of Utah. This management area had an estimated 68 males on leks as

of 2011. This population uses a series of leks throughout the habitat area, with males visiting more than one lek per season. Currently, the population is constrained to the Management Area by vegetation fragmentation and human development; however future improvements could connect this population to the Hamlin Valley Management Area to the west, and further north into Beaver County. This population is regarded as stable with a high potential for growth. Sage-grouse in this area show resiliency to known threats and are not considered as being in jeopardy. Key threats include wildfire, enhanced native predator populations, vegetation management (conflicting or lack of), and energy development. The management area has an at risk ranking (C2).

Northwest Interior

This population is largely within Pershing County, Nevada, but also incorporates a portion of western Lander County and southeastern Humboldt County. There is little priority or "core" habitat within this population other than some habitats within the Sonoma Range in southeastern Humboldt County, the Tobin Range in eastern Pershing County, and the Fish Creek Range in western Lander County. Priority habitats identified within these ranges largely cover all remaining suitable habitat for sage-grouse. There were not enough data for Garton et al. (2011) to conduct an analysis on population trends or persistence estimates. The largest sub-populations within this area are within the Sonoma-Tobin complex and the Fish Creek Range. Lek count information from both of these areas suggest that there is less than 500 birds in each one of these populations and the potential for connectivity appears low, but possible. Other sub-populations within this area (e.g. Eugene Mountains, East Range, Humboldt Range, Majuba Mountain, and Trinity Ranges) have extremely low populations (<50 birds) with some of these ranges having populations that are extirpated due to severe wildfire and inability of the habitat to recover. Much of these areas are now monotypic stands of cheatgrass and tansy mustard. Overall, this population is high risk (C1).

Southern Great Basin

Nevada Portion *add risk rank*

This population designation contains the largest population of sage-grouse within Management Zone 3 with the majority of the population existing in Nevada. Suitable habitats within this population area are somewhat uncharacteristic of sage-grouse habitats in that use areas are disjunct, but connected. This is due to the "basin and range" topography that is characteristic of this region. Lower elevation valley bottoms often are dominated by playas and salt desert shrub vegetation, but transcend quickly into sagebrush dominated benches, which often comprises the breeding and winter habitat. Moving up in elevation, pinyon and juniper dominates the mid-elevation and gives way to little sagebrush, mountain big sagebrush and mountain shrub communities utilized by sage-grouse as nesting and brood rearing habitat.

Preliminary priority or "core" habitats adequately capture important use areas for this population as all use areas were mapped to the greatest extent practical under the time constraints given to complete a map for the BLM's interim guidance. Redundancy and representation exist within this population, largely because it covers a large geographic area. Most populations appear to be connected as indicated through recent telemetry investigations and the availability of suitable

habitat available between sub-populations within this region. Resiliency of the habitat is in question due to threats, either projected or realized, in the lower elevation habitats as explained below.

Garton et al. (2011) determined that this population has declined by 19 percent from the period 1965-69 through 2000-2007 and that average rates of change were <1.0 for three of the eight analysis periods from 1965-2007. In addition, Garton et al. (2011) determined that this population has a 0 percent chance of declining below Ne=500 within the nest 30 years and a 0 percent chance of declining below Ne=50 within 100 years.

Some of the historic habitat available to sage-grouse within this population has transitioned to pinyon and juniper woodlands. Wisdom et al. (2005) determined that 35 percent of the sagebrush area in the eastern Great Basin is at high risk to displacement by pinyon-juniper woodlands and that mountain big sagebrush appeared to be most at risk which could have meaningful impacts to sage-grouse brood rearing habitats within the upper elevations of mountain ranges within this region. In addition to this threat, much of the Great Basin is also susceptible to displacement by cheatgrass. The most at risk vegetative community in this region is Wyoming-basin big sagebrush (Wisdom et al. 2005) located predominately within the lower elevation benches of mountain ranges. In some areas, this has been realized and the future risk for existing sagebrush habitats is moderate to high. This threatens both breeding and winter habitats for sage-grouse.

Ibapah

The Ibapah Management Area is located in northwestern Utah, and is part of a significant population center for grouse in two states, Utah and Nevada. This management area had an estimated 39 males on leks as of 2011. The management area includes Goshute Tribal lands. The area boundary was determined by consulting with Nevada, the West Desert Adaptive Resource Management Local Area Working Group, and DWR and follows vegetation types used by Sage-grouse. Sage-grouse in this area show resiliency to known threats, and are not regarded as being in jeopardy. Key threats to Sage-grouse are fire, invasive species (cheatgrass and knapweeds), potential loss of riparian areas due to water piping, predation, and habitat fragmentation (dispersed recreation and pinyon/juniper encroachment). Despite the unit having fewer than 200 males, when considered as a whole with the rest of the population in Nevada and the Hamlin Valley management area, this area has a risk ranking of C3 (potential risk).

Hamlin Valley

The Hamlin Valley Management Area is located in southwestern Utah, on the border of Utah and Nevada and is important due to its connection to a large population in Nevada. Although currently isolated from other habitat areas in Utah, habitat restoration could link this population to the Bald Hills Management Area. This management area consists of a relatively small number of birds (i.e., 89 males as of 2011) that uses less than 10 leks throughout the habitat area. Telemetry data has not shown that males use more than one lek per season, however this population of grouse is known to travel large distances within the Management Area. Additionally, this population spends a portion of its time in Nevada, usually during the summer months. This population is regarded as moderately stable with a high potential for growth. Key

threats to the population include wildfire, enhanced native predator populations, vegetation management (conflicting or lack of), wild horse management, and habitat fragmentation. Despite the unit having fewer than 200 males, when considered as a whole with the rest of the population in Nevada and the Ibapah management area, this area has a risk ranking of C3 (potential risk).

Quinn Canyon Range

This is a very small and isolated population located in southeastern Nevada. There were not enough data for Garton et al. (2011) to conduct an analysis on population trends or persistence. Two to three leks have been identified in this area, but there is very little information associated with these sites and most of this information is anecdotal. Habitat within this area has been compromised by pinyon-juniper encroachment. No priority or "core" habitat was identified for this population largely because the majority of vegetative associations are either salt desert shrub communities or pinyon and juniper stands. Very little sagebrush exists within this population. Overall this is a high risk (C1) population.

Management Zone IV: Snake River Plains

***needs similar opening paragraph as MZ I-III but ran out of time. Here is a start…YOU will see this is where the really detailed review ended. Will look this over closely on the final draft too)

This zone represents one of the largest areas of connectivity, as demonstrated by Knick et al. (2011), and supports the largest population of sage-grouse outside of the Wyoming Basin (Garton et al. 2011). The Snake River Plain management zone includes sage-grouse populations in Oregon, Idaho, Nevada, Utah and Montana. Many of these populations are small and found in SW Montana and in Idaho. Two Snake River Plain populations occur in Oregon, the Baker and the Northern Great Basin. The Baker population is entirely within the state's border and while the large Northern Great Basin population is shared with southern Idaho, NE Nevada, and NW Utah. Both of the populations that occur in all or part of Oregon had sufficient information for assessment by Garton et al. (2011). *MORE*

Baker

Priority habitats adequately represent this population because most of the area used by this population has been mapped as priority habitat. We do not recommend removing portions of this area from priority habitat because these areas are needed for long-term conservation of this population. The landscape for the Baker population is more similar to extirpated sites than extant ones (Wisdom et al 2011). There is no redundancy in this population as everything occurs in one general area.

The Baker population is more at risk and probably less resilient since connectivity to other populations appears limited (future genetics work will help clarify this). Also, the quality of habitat is more similar to extirpated populations than extant ones. Finally, much of this population occurs on private lands where there are limited regulatory mechanisms, making it

uncertain as to whether state-recommended conservation measures and practices will be applied on the majority of lands within this population.

The Baker population has approximately the same distribution as the area covered by the Baker administrative unit identified in Oregon's Sage-grouse Conservation Strategy. The Baker spring population was estimated to be 872 -1,650 birds in 2010 (Hagen 2011), the smallest extant population in Oregon. Garton et al. (2011) based their Baker population assessment on minimum estimate of 137 birds in 2007 and estimated a 61.9 percent chance there will be fewer than 50 birds in the population by the year 2037, similarly, there is 66.8 percent chance of fewer than 50 birds by 2137. ODFW lek counts indicated more than 300 males (or 750 birds if applying the Garton et al. (2011) 2.5 sex ratio) in Baker County in 2011. Since systematic counts began in 1989, the number of counted males/lek has remained relatively stable (Hagen 2011). Due to habitat and topography it has been assumed the Baker population has little connectivity with other sage-grouse populations. Recent telemetry information suggests that at least some birds move from the Weiser population in Idaho to Baker County, and Baker population birds move to the Weiser population.

More than 80 percent of the historic habitat for the Baker Population remains available today but steeper habitat and rugged topography reduces the suitability for sage-grouse. Nearly 300,000 acres in this region were identified as Core Area, and includes much of the current range of the Baker population. Most (68 percent) of the sage-grouse habitat for the Baker population is in private ownership and 31 percent is administered by BLM (Hagen 2011). This is the largest proportion of privately managed sage-grouse habitat for any population in Oregon. Principal threats to this population include renewable energy development (primarily wind), transmission, invasive weeds, OHV recreation, and juniper encroachment. Recently, thousands of acres of juniper have been treated in this region to benefit sage-grouse and other sagebrush obligates. Overall, this population is considered at risk (C2).

East central Idaho

Areas within the East Idaho Uplands in the Blackfoot River drainage downstream from Blackfoot Reservoir have historically provided popular sites for greater sage-grouse hunters. The area is generally characterized by a high proportion of private and state land and a local working group has been actively pursuing conservation measures. Nevertheless little information is available on sage-grouse populations other than some limited location and attendance data on a few leks. No lek routes have been established within this area that would allow consistent monitoring of sage-grouse populations. This lack of data is largely due to very difficult access in most years during winter and spring. Analysis of limited data by Garton et al. (2011) suggests that this population has a low probability of persistence. Although causal observation and some historic data suggest the study area provides adequate breeding and nesting habitat, sage-grouse numbers appear to be very low. Initial summer surveys in 2011 suggested sage-grouse were reasonably widespread throughout the area. However, given the apparent overall quality of the habitat, sage-grouse numbers seem surprisingly low and difficult to explain. Factors that could act to reduce sage-grouse populations in this area include sagebrush treatments in breeding habitat, West Nile virus, and loss or fragmentation of winter range. Overall this population is considered high risk (C1).

Southwest Montana

The Southwest Montana Population occurs in Beaverhead and Madison Counties, within a 60 mile radius of Dillon, MT. Segments of this population also make seasonal migrations into Idaho. Garton et al. 2011 analyzed the Southwest Montana population as 4 separate smaller populations (i.e., Bannack, Wisdom, Red Rocks, and Bridges), which biased the results of their analysis, suggesting a high probability of each population dropping below 200 males. Telemetry data, however, has demonstrated considerable intermingling between each of these lek complexes, clarifying that these birds represent a single population (and could be more accurately described as 4 sub-populations). Core habitats encompass about 80 percent of the habitat associated with the Southwest Montana Population. These core areas were identified because of the relatively high density of sage-grouse and the genetic conduit this area provides with Idaho's birds. Habitat threats are generally limited to improper grazing management, isolated sagebrush control efforts, and expansion of conifers into sage-grouse habitat in localized instances. Habitat conversion on the Idaho side of this Management Zone may also affect this population, but to a lesser extent. Both the Centennial and Big Hole valleys are focus areas for native habitat conservation for grayling, sage-grouse and other wildlife, resulting in considerable acreage enrolled in long term and perpetual conservation agreements with private landowners. Given this population's size, limited habitat threats, and ties to Idaho's birds, the Southwest Montana population is characterized as being at a low level of risk (C4).

Snake-Salmon-Beaverhead

Recent data indicates this large population extends into southwestern Montana. This area contains a large amount of publicly managed land (largely BLM and USFS). Within the southern portion of this population, wildfires and invasive species have continued to reduce the quality of habitat. The mountain Valley portions of this population appear to have relatively stable habitats. A recent rate of change analysis indicates this population has been stable to increasing from 2007 to 2010. Garton et al. (2011) indicated that this population had virtually no chance of declining below 500 in the next 100 years. Population analysis indicates that sage-grouse fluctuated around 5000 males since 1992. Overall this population is considered low risk (C4).

Belt Mountains

This population occurs within a broad intermountain valley that extends roughly from White Sulfur Springs south toward Livingston, within Meagher and Park Counties. This population experienced considerable habitat conversion to small grain cropping in the late 1960s through the 1980s, involving at least one key sage-grouse wintering area (Swenson et al. 1987). Ironically, some of these croplands have since been enrolled into CRP but natural sagebrush recovery appears minimal. Garton et al. (2011) were unable to develop any population predictions due to a lack of sufficient data. This population is at least 50 miles distant from the nearest adjacent population. Timbered and mountainous terrain and expansive non-habitat provide barriers further isolate~~ing~~ this population in nearly every direction. Sagebrush control projects, primarily using herbicides, and conversion to cropland and domestic seeded pastures have continued to affect portions of the remaining habitat during the past 20 years. More recently, isolated housing

developments and limited drilling for oil and/or gas resources have impacted a relatively small portion of remaining sagebrush grassland habitats in this area. The small population size, isolation from other populations, and a history of significant habitat perturbations, some of which continue but perhaps at a slower rate, characterizes this population as high risk (C1).

Weiser

This small population in western Idaho did not have sufficient data to allow analysis by Garton et al. (2011). However, 2010 data indicated the area had 14 occupied leks. Recently some connection with the Baker, OR population has been documented. The area is generally characterized by a high proportion of private land and a local working group has been actively pursuing conservation measures. This population is considered at risk (C2).

Northern Great Basin

The Northern Great Basin population was divided into the Oregon, Idaho, and Nevada portion and then the Box Elder Management Area in Utah.

Oregon, Idaho, and Nevada Portion *****add risk rank*

Redundancy and representation appear to be captured adequately. from an Oregon perspective. In Oregon, priority habitats capture 95 percent of all known breeding locations, 98 percent of known wintering locations (which was expected since this was based on telemetry data) and 89 percent of known summer locations. Priority habitat and low density habitat combined capture all but 3 percent of known summer, 1 percent of known breeding, and 1 percent of known wintering habitat. We do have a question about why the Knick connectivity map is so different from the priority map in the Oregon portion of this population. Oregon priority mapping also considered connectivity so these analyses were expected to be similar.

The Nevada portion of the Northern Great Basin population represents the largest, most contiguous sage-grouse population in Nevada and includes the Santa Rosa, Desert, Tuscarora, North Fork, O'Neil Basin, Islands, Snake and Gollaher Population Management Units. Redundancy and representation is captured by the current designation of priority habitat areas. Portions of this population are well connected with Oregon, Idaho and Utah.

The Oregon portion of the Northern Great Basin is demonstrating some resiliency. There have been several large fires, numerous smaller fires, and extensive (quantify?) habitat conversion. Specifically between 1963 and 1974, 500,000 acres of sagebrush habitat was seeded to crested wheatgrass or sprayed with herbicide, and 1,600 water developments and 463 miles of pipeline were installed in the Vale District BLM's area for the Vale project. Populations, even in some of the areas that were converted, appear to be coming back – although they do not have the numbers they previously had. This is the second healthiest population in Oregon.

As in Oregon, the northern Great Basin population in Nevada is demonstrating at least some resiliency. Rehabilitation efforts and the higher elevation/higher precipitation zones for some recent wildfires have led to expedited habitat recovery that is once again being utilized by sage-

grouse. Winter habitat for subpopulations has been compromised although recent winter snowpack has been below average, allowing birds to utilize an expanded area. Concern remains over the Gollaher and Tuscarora PMUs as these areas have been prone to wildfire and are more susceptible to invasive species such as cheatgrass.

As mentioned above, there are portions of the northern Great Basin population that are at risk, particularly the Tuscarora and Gollaher PMUs. Portions of these areas are lower in elevation and precipitation received and has either experienced conversion to monotypic cheatgrass landscapes or is at risk. In many instances, these areas were historic or are Wyoming big sagebrush habitats.

Oregon represents the western part of this large population which is shared with Southern Idaho, NE Nevada, and NW Utah. Within Oregon, this represents one of the largest populations. The delineation of the Northern Great Basin population doesn't correspond well to any existing assessment for Oregon, but does include almost all of the Vale administrative unit, as well as portions of the Burns administrative unit. In just Oregon, the spring population in the Northern Great Basin is likely several thousand birds, with 2011 spring lek counts approaching 3,000 males (or 7,500 birds if applying the Garton et al. (2011) 2.5 sex ratio) in the Beulah, Malheur River, Owyhee, and eastern portion of Whitehorse Wildlife Management Units. Garton et al. (2011) estimated for the Northern Great Basin a minimum population estimate of 9,114 birds in 2007 (includes S. ID, NE NV, NW UT). Modeling suggested there is a 2.5 percent chance birds will drop below 500 by the year 2037, but a 99.7 percent chance the population will be below 500 by 2137 (Garton et al. 2011).

Historically this population was likely much larger in Oregon, but extensive sagebrush removal programs occurred during the 1960's and large fires in more recent times have reduced the available sage-grouse habitat. Some sagebrush conversions of the 1960's are beginning to be recolonized by sagebrush and should assist with maintaining local populations in the future. Fire remains a threat and is often followed by non-native annual grasses and other invasives which increase the probability of frequent fire. Other threats in this region include mining development, renewable energy development, transmission, and juniper encroachment at higher elevations. West Nile virus has also been consistently detected in mosquitoes in this region and the population was subjected to the largest known West Nile virus mortality event involving sage-grouse in Oregon (2006).

This large population extends into northeastern Nevada, northwestern Utah, and eastern Oregon. This area contains a large amount of publicly managed land (largely BLM). Despite efforts to manage wildfire risks, wildfires and invasive species have continued to reduce the quality of habitat in portions of this area. The Murphy fire complex recently affected roughly 600,000 acres of habitat for this population. A recent rate of change analysis indicated that at least part of this large population (based in Idaho) has been stable to increasing from 2007-2010. Garton et al. (2011) indicated that this population had virtually no chance of declining below 50 in 30 or 100 years. Population analysis indicated that sage-grouse will fluctuate around a carrying capacity that will decline from an estimated 6,770 males in 2007 to 1787 males in 2037 if current trends continue (Garton et al. 2011). Overall this part of the population is potentially at risk (C3).

Box Elder

The Box Elder Sage-Grouse Management Area is located in northwestern Utah and is part of a significant population center, the Southern Great Basin population, for sage-grouse Utah, Idaho, and Nevada. This management area had an estimated 755 males on leks as of 2011. This population is regarded as stable with a potential for growth. Key threats include wildfire, invasive species, loss of agricultural operations, and habitat fragmentation. The Box Elder Management Area is identified as a unit that can likely sustain increases in Sage-grouse populations with continued reclamation and restoration. Resource management in the area has contributed to large populations to date, and those populations can be enhanced by providing high quality habitat. As a result, this area should be a high priority for funding of habitat enhancement. In connection with the populations in Nevada and Idaho, the management area has a risk ranking of C3 (potential risk).

Sawtooth

This small population in central Idaho did not have sufficient data to allow analysis by Garton et al. (2011). No occupied leks are known to exist at this time. This area is largely encompassed by the Sawtooth National Recreation Area and includes a high proportion of public land. This population declined to 1 male on 1 lek in 1986 and was subsequently increased by translocation during the mid-1980s. Overall this population is high risk (C1).

Management Zone V: Northern Great Basin

***need to see if this has similar info as the opening paragraph in MZ I-III but ran out of time.
add risk ranks to pops here

There are four sage-grouse populations identified in this management zone, one of which (Central Oregon) is entirely within Oregon. Two populations (Western Great Basin, Klamath) are shared with Nevada and/or California, while the Warm Springs Valley population occurs entirely within Nevada. Only two of the populations (Central Oregon and Western Great Basin) had sufficient information for a population assessment by Garton et al. (2011).

The Greater Sage-grouse Conservation Assessment and Strategy for Oregon, adopted in 2011 identified Core (priority) Areas for sage-grouse in the Central Oregon and Western Great Basin populations. In the entire state, including populations in the Management Zone IV (MZIV), 6.57 million acres of Core Area were identified. The Core Area represents about 36.5 percent of the known sage-grouse distribution in Oregon. The delineation of Core Areas were based on the existing breeding density, connectivity based on expected movements (16 km), and known wintering areas. The exterior boundaries of Core Areas were adjusted to remove non-habitat and incorporate additional priority habitats adjacent to existing Core Areas. Core Areas were not identified for sage-grouse in the Oregon portion of the Klamath population which are believed extirpated in Oregon, with the last confirmed observation in Oregon in 1993 (Hagen 2011). Multiple Core Areas were identified within each of the Central Oregon and Western Great Basin populations in Oregon. Core Area maps will help in the siting of large-scale industrial developments, recognizing that siting such developments in Core Areas will likely be more of a

challenge to avoid impacts to sage-grouse habitats. Generally, the recommendation is to avoid impacts to sage-grouse habitat in Core Areas and to mitigate at a no net loss with a net benefit for impacts to sage-grouse in non-Core Area habitat. The Greater Sage-grouse Conservation Assessment and Strategy for Oregon includes voluntary conservation guidelines that are designed to maintain or enhance the quality of sage-grouse habitat in Oregon, and are applicable to all sage-grouse habitat (Hagen 2011). If the prescribed conservation guidelines are followed and the existing sage-grouse habitat is protected and enhanced it is expected these areas will provide the necessary representation and redundancy for these populations to persist into the foreseeable future.

Central Oregon

Resiliency depends in part on the timeframe of our analysis. Based on Garton et al.'s SAB chapter, this population appears fairly resilient in 30 years, but not in 100 years. Also, the landscape's characteristics in this population are more similar to landscapes with extirpated sage-grouse populations than landscapes with extant populations.

Redundancy and representation appear to be captured adequately. In Oregon, priority habitats capture 95 percent of all known breeding locations, 98 percent of known wintering locations (which was expected since this was based on telemetry data) and 89 percent of known summer locations. Priority habitat and low density habitat combined capture all but 3 percent of known summer, 1 percent of known breeding, and 1 percent of known wintering habitat. Most of the sites within this population (with the possible exception of the southwestern site) probably have some connectivity with other sites in this population, though verification from genetics is lacking. Although a lot of the known habitat is mapped, we do not recommend removing any of these habitats from the priority mapping. Since this population's habitat/landscape appears more similar to landscapes in extirpated populations than extant populations (Wisdom et al. 2011), we suggest retaining all priority habitats for this populations.

The Central Oregon population has approximately the same distribution as the area covered by the Prineville administrative unit identified in Oregon's Sage-grouse Conservation Strategy. Approximately 700,000 acres of habitat for the Central Oregon population has been identified as Core Area. This is a relatively large population, with the minimum spring population estimated at 1,775-2,084 birds in 2010 (Hagen 2011). The population has declined steadily since 1980 (average, -0.004 percent/yr [Hagen 2011]). There is a 15.2 percent chance the population will decline below 500 by 2037, and a 91.3 percent chance that fewer than 500 birds will be in the population by 2137 (Garton et al. 2011).

It is estimated to have only 53 percent of historic sage-brush habitat, having lost more historic habitat than any other sage-grouse administrative unit in Oregon. The area also has more privately owned sage-grouse habitat (48 percent) than most other sage-grouse management zone populations in Oregon. This population faces a wide suite of threats, including juniper encroachment, renewable energy development (both wind and geothermal), transmission, roads, OHV recreation, and residential development. Projections based on historic trends suggest this population is at risk, but in the last 2 years there have been a number of positive developments including thousands of acres of habitat improvement under the NRCS's Sage-grouse Initiative

and increasing local interest sage-grouse conservation. Overall this population is considered a split between C2 (at risk) and C3 (potential risk).

Klamath

There is no priority habitat mapped for this population in Oregon because Sage-grouse in the Oregon part of the Klamath population are thought to be extirpated. As recently as the early 1990's, a few birds attended leks in Oregon, but there have been no confirmed sightings since 1993 despite periodic survey efforts. A few birds exist on the California side, particularly in the vicinity of Clear Lake National Wildlife Refuge. Oregon has permitted the trapping of birds from the Western Great Basin population to augment the population around Clear Lake. The Klamath population lacks resiliency and is at risk of extirpation.

The Klamath Population in Oregon likely had limited connection with sage-grouse populations to the east due to barriers of unsuitable habitat and was likely an extension of the population in NE California. Habitat in Oregon was severely compromised by juniper encroachment. Significant juniper treatments have taken place in the former Oregon range, particularly by BLM, and there is potential of limited habitat for sage-grouse in the future. Juniper encroachment, and invasive weeds, have also compromised the habitat it in California. Large treatments of juniper have been conducted on the Clear Lake NWR and in the vicinity in hopes of expanding suitable habitat in that area.

The Klamath population is all that remains from a population that once extended throughout the Devil's Garden Area of California, which had at least 46 known leks as recently as the 1970s, and was well connected to populations in Oregon and the Western Great Basin. By the early 2000s, only one known lek remained on the Clear Lake National Wildlife Refuge, with less than 10 males. Since 2005, birds have been translocated from Oregon and Nevada to prevent extirpation. A small amount of priority habitat is mapped for the area, but not connected to the Western Great Basin or Central Oregon populations. Redundancy is not adequate and resistence is poor. This population would be at immediate risk of extinction without augmentation. There is no priority habitat mapped in this population for Oregon because we have not documented birds there recently.

Warm Springs Valley

This is a small population that exists in southern Washoe County within the Virginia Population Management Unit. Only two confirmed active leks comprise this population; however, lek size is relatively large (avg. >40). The identified priority habitat encompasses the majority of use areas. Extensive research has been conducted within this particular PMU. Some individuals have dispersed to the southern portion of the western Great Basin population during the winter, so there is the possibility of genetic interchange. There is an indication of this within work conducted by Oyler-McCance suggesting a relationship with the Lassen population in California. Representation and redundancy are at risk within this population due to its small size, proximity to urbanized setting and threats from invasive species.

The Warm Springs population in southern Washoe County may be close to a threshold if additional threats occur. This population is very near to urbanization, has experienced large

wildfire and energy development in the form of a utility scale transmission line (345kV Alturas line) and water transfer pipeline (Vidler Water), and is experiencing some pinyon and juniper encroachment. However, the core use area of the population (Spanish Flat) remains intact and benefits from higher elevation precipitation regimes.

Western Great Basin

Redundancy and representation appear to be captured adequately in the Oregon portion of this population based on the fact that priority habitats include most of the known distribution of birds (see rationale in Central above). The Nevada portion of this population includes the Buffalo/Skedaddle, Massacre, Vya, Sheldon, Black Rock, Pine Forest and Lone Willow Population Management Units. Currently identified priority habitat encompasses an area greater than the 85 percent core breeding density as reconstructed by the Nevada Department of Wildlife using methods described by Doherty et al. (2010), but utilizing the 10-year average for lek attendance rather than the most recent peak. Redundancy and representation are adequately captured both within the Nevada portion of this population and certainly within the Western Great Basin population as identified by Garton et al. (2011).

Over 8 analysis periods conducted by Garton et al. (2011), average rates of change were <1.0 in 3 of those periods and the minimum population estimate was determined to be 5,904 males in 2007 based on counts at 393 leks. Garton et al. (2011) indicates that this population has a 0 percent chance of declining below Ne=500 within the next 30 years. From an Oregon perspective, this is the most robust population in Oregon and therefore the most resilient. Healthy sage-grouse populations occur in the Pueblo, Steens, Hart , and Trout Creek Mountain areas.

Within the Nevada portion of the western Great Basin, populations are experiencing a slight increase. When considering habitat characteristics, populations appear to be most stable within the Lone Willow, Sheldon, Black Rock and Vya Population Management Units if no further threats are realized.

The Lone Willow population (connected with Oregon) faces threats from lithium and uranium exploration and extraction. Both the Massacre and Buffalo/Skedaddle PMUs face high risk due to invasive species being pervasive within the understory of lower elevation sagebrush communities. Improper livestock grazing practices and wild horse utilization has caused severe habitat degradation in some instances, especially with respect to meadow, spring and riparian habitats.

The Western Great Basin Population is shared among Oregon, NE California and NW Nevada. Oregon's portion of the population has some of the best habitat and highest sage-grouse densities in the state, including Hart Mountain National Antelope Refuge and Trout Creek Mountains. The delineation of the Western Great Basin population doesn't correspond well to any existing assessment for Oregon, but does include almost all of the Lakeview administrative unit, as well as portions of the Burns and Vale administrative units. In just Oregon, the spring population in the Western Great Basin likely exceeded 10,000 birds in 2010 (interpolation from Hagen 2011). Garton et al. (2011) estimated for the Western Great Basin a minimum population estimate of

5,904 birds in 2007 (includes NE CA, NW NV). Modeling suggested there is a 6.4 percent chance birds will drop below 500 by the year 2037, but a 99.1 percent chance the population will be below 500 by 2137 (Garton et al. 2011).

In the Oregon portion of the Western Great Basin, >80 percent of the historical sage-grouse habitat remains intact, and most of the habitat is in public ownership (Hagen 2011). In the Lakeview administration unit, which comprises most of the Western Great Population in Oregon, about 78 percent of the region is administered by the BLM and the USFWS manages more than 278,000 acres. Invasive weeds and juniper encroachment (particularly on the western edge) represent some of the greatest risks to this population. Renewable energy development (wind and geothermal) and fire also represent risks to the Oregon portion of the population. Feral horses have been identified as a threat to sage-grouse habitat in portions (e.g., Steens, Dry Valley/Jack Mountain Action Areas) of the Western Great Basin. Given the majority of this population occupies federal land, proper and proactive habitat management could ensure the persistence of this sage-grouse population well into the future.

The California portion of the Western Great Basin includes the majority of the Buffalo-Skedaddle Population Management Unit. Priority habitat in California includes 100 percent of known sage-grouse distribution. This population was part of a much larger population that was connected to the Klamath population into the 1970's. Habitat degradation, including juniper expansion and spread of exotic grasses have been extraordinary in this region. The extant population is well connected and adequately captures redundancy, but further losses would jeopardize the long term existence of sage-grouse in California. Recent population trends have shown consistent increases, demonstrating that the population exhibits positive growth rates during years of favorable environmental conditions. Habitat suitability is low in much of the currently occupied habitat and habitat conditions need to be improved to increase resistance of this population.

Over 8 analysis periods conducted by Garton et al. (2011), average rates of change in the Western Great Basin were <1.0 in 3 of those periods and the minimum population estimate was determined to be 5,904 males in 2007 based on counts at 393 leks. Garton et al. indicates that this population has a 0 percent chance of declining below Ne=500 within the next 30 years. The Western Great Basin is most resilient in MZ5, but reducing threats alone is not likely to ensure long-term persistence in some areas. Resiliency needs to be improved in the California portion of the Western Great Basin with increased habitat suitability in terms of shrub densities and native grasses and forbs.

Management Zone VI: Columbia Basin

***need to see if this has similar info as the opening paragraph in MZ I-III but ran out of time

There are four identified populations in Management Zone 6, which exists mostly in Washington State. Two of these populations, Moses Coulee and Yakima Training Center, are extant populations that were identified and assessed by Garton et al. 2012. The additional populations are Crab Creek and Yakama Nation, both of which were addressed with the aid of translocated individuals. The priority areas likely are large enough to support the current populations and the

recovery areas encourage the expansion needed to improve the overall viability. The small size of existing populations and lack of current viability in this management zone means that current management direction (target toward recovery rather than maintenance) is different than in other management zones.

The priority areas within this management zone capture redundancy and representation within the management zone, assuming that the protections and management prescriptions area adequate within priority/core areas and they are adhered to. The priority areas were specifically chosen to protect the identified populations. However, because the populations in this management zone are not believed to be viable at this time, the area of protection is larger and designed to include recovery areas which are needed to support a larger, more connected, and hopefully viable population in the future. Based on population viability, it is unlikely that any of the populations in this zone are resilient to 'threats' and/or 'disturbances'. The order of descending risk is Yakama Nation, Crab Creek, Yakima Training Center, and Moses Coulee.

Moses Coulee

The Moses Coulee population has been maintaining its number for the last 30 years, largely due to the support of farm programs. However, the lower risk of Moses Coulee does not mean that the population is at no risk. This population was ranked C2 (at risk). In 2007, 230 males were counted in this population (Garton et al. 2012); they estimated an 88 percent probability that the population would dip below 200 males by the year 2037 or close to a 100 percent probability that the population would dip below 200 males by the year 2107. The estimated a 62 percent probability that the population would dip below 20 males by 2107. Despite these dire concerns, the Moses Coulee population of males was estimated to be about 350 in 2012 (Schroeder et al. 2011).

Major issues in Moses Coulee are the lack of habitat stability due to the abundant private land, habitat fragmentation, and dependence on farm programs. There is public land managed by the Washington Department of Fish and Wildlife, Bureau of Land Management, Washington and Department of Natural Resources, but the public land is relatively sparse compared to the quantity of private land (Stinson et al. 2004). The abundance of private land adds to the management uncertainty. Because of relatively large amounts of enrollment in CRP (Conservation Reserve Program) and SAFE (State Acres for Wildlife Enhancement), there is a great deal of support for sage-grouse in the Moses Coulee area at least for the next decade. Even so, the high degree of fragmentation and 'subsidized' predators (subsidized with road kill, orchards, and nesting and perching structures) increases the overall predation rate.

Yakama Nation

The Yakama Nation population is extremely small with extremely low viability, if any. The area was historically occupied, but the extinction of the endemic population was not precisely documented (Schroeder et al. 2000). During 2006-2008 sage-grouse were translocated to the Yakama Nation in an attempt to re-establish a population. Although it is still to early to evaluate success, the results are not promising at this state. The Yakama Nation faces many threats to their sage-grouse population including poor habitat quality, small population size, lack of connectivity with existing populations, and wild horses. The wild horse population is severe in

portions of the Yakama Nation. It is not clear if the Yakama will be able to aggressively deal with the horse issue. On the positive side, the land is owned by the Yakama Nation and the strictly control access. Consequently, they have a great deal of management control as well as interested in recovering a population of sage-grouse on their land. This population is considered high risk (C1).

Crab Creek

The Crab Creek was occupied by sage-grouse until the mid-1980s (Schroeder et al. 2000). By the mid-1990s the Washington Department of Wildlife and the Bureau of Land Management had acquired and/or consolidated approximately 50,000 acres in the Crab Creek area. Because sage-grouse were a priority for management on many of these acres and management direction was altered in favor of sage-grouse, it was believed that this area could once again support sage-grouse. Translocations were initiated in 2008 (Schroeder et al. 2011). In 2012, the number of males counted on a single lek was 13. Based on survival and productivity, the potential for this population appears promising. However, it is still too early to determine if the re-establishment effort was successful. The primary risk factors for this population include its small size, habitat fragmentation, and the risk of losing acres formerly enrolled in farm programs (CRP and SAFE). This population is considered high risk (C1).

Yakima Training Center

The second most resilient population in this zone is the Yakima Training Center population which is much smaller than Moses Coulee, but is almost entirely public land. Long-term viability is anything but certain. In 2007, 85 males were counted in this population (Garton et al. 2012); they estimated a 26 percent probability that the population would dip below 20 males by the year 2037 or 50 percent probability that the population would dip below 20 males by 2107. The number of males counted in 2011 was 72 (Schroeder et al. 2011). The use of the Yakima Training Center for military training activities and the risk of fire have reduced the overall suitability of the habitat supporting this population. A substantial amount of the sage-grouse habitat on the area has been harmed directly and indirectly military training activities, particularly due to wildfires. Despite efforts to manage wildfire risks, wildfires have continued to reduce the quality of habitat in the population. Other key factors in this population are two interstate highways (I 82 and I 90) which border the population on north and west side, powerlines which border the population on the north, west, and south sides, the Columbia River Valley which is natural but reduces movement on the east side, and wind development on the north side. The cumulative effect of these factors is that the population is constricted with little opportunity for expansion. On the positive side, the population occupies and area dominated by public land. This population is considered high risk (C1).

Management Zone VII: Colorado Plateau

The priority areas in the MWR and PPR populations (the only 2 populations in this MZ) capture redundancy and representation as best as can be accomplished. Priority habitats are well mapped and include all high probability of use habitat (which includes breeding, summer, and winter habitat within 4 miles of all known leks) and linkage zones to closest MZ 2 to the north. There is no known connectivity with UT (MZ3 to the west) due to natural habitat fragmentation and large

Comment [DJD3]: JC: What does this mean?... does this mean , given what the potential is to restore what has been lost?

areas of non-habitat. Explain why not describing Garfield, White river Utah and east tavaputs here --- all extirpated?. Add risk rank and make sure this opening paragraph includes similar info as mz 1-3 introductions.

Parachute-Piceance- Basin

Piceance Basin (Parachute-Piceance-Roan [PPR]): - Within the PPR population, representation appears to be captured adequately. Priority habitats capture 60 percent of the occupied range in this population and also includes 100 percent of all known active leks and all habitat that was modeled "high probability of use" within 4 miles of a lek that has been active in the last 10 year. Redundancy is not captured within this population because it is a fairly small (3 year running average number of males is 93) and somewhat isolated population. This population is on the very southern edge of the species range. There is some potential for connectivity to the north to the Wyoming Basin. Linkage habitats have been included in our mapping efforts. Representation and redundancy are at risk within this population due to its small size, energy development and the associated infrastructure, especially road development. Piñon-juniper encroachment is also an issue. The Parachute-Piceance-Roan population appears to have some resiliency. The population has been monitored since 2005 and appears to be fluctuating similar to other larger populations in the state. A large majority of priority habitat is privately owned mostly by energy companies. Energy and Mineral Development is the highest ranked threat to GrSG in PPR. Advances in drilling technology and rapid natural gas demand and subsequent rising prices have led to a significant increase in natural gas drilling activity in the PPR. Road and Infrastructure are also ranked high as they are related/interrelated with energy production. Historic habitat has been lost and fragmented also by PJ encroachment.

Meeker-White River Colorado

There is no redundancy and little representation in the MWR population (3-year running average high male count is 6 birds). Priority habitats capture 27 percent of the occupied range in this population and include the only known active lek. All habitat modeled "high probability of use" and within 4 miles of any lek (active in the last 10 years) is within priority habitat. Representation and redundancy are at risk within this population due to its small size, proximity to an urbanized setting and, thus, housing development and associated infrastructure and agriculture conversion. This is a very small population located near the town of Meeker and consists of only 1 active lek that was discovered in 2004, and strutting male counts have been on a steady decline since (e.g., from a high of 30 males in 2004 to 6 males in 2012). Most of the occupied habitat is privately owned (90 percent) and is in 2 disconnected patches of habitat, separated by the White River. One of the patches remains unfragmented. The other patch is located where housing development will primarily occur. Meeker White River has lost resiliency. The population has been monitored since 2004 and the population has been in a steady decline from 30 males to the current 6 males. Housing development is increasing mainly due to energy development in nearby counties. A large part of the habitat was converted to agriculture in the 1960's, which was a primary reason why the population went into decline. Current issue is that some of the lands in pasture and CRP land may now be converted back to crop lands.

Bi-State DPS

The Bi-State Distinct Population Segment is geographically and genetically isolated from other populations of greater sage-grouse. Four populations are identified in the Bi-State DPS, including: Pine Nut, North of Mono Lake, South of Mono Lake, and the White Mountains. These populations are delineated based on a fair degree of geographic and genetic isolation within the overall Bi-State DPS. The Bi-State DPS has consistently grown each year from 2008 – 2012, presumably in response to higher precipitation and favorable range conditions. Relatively large population increases have been seen in the core populations to the north and south of Mono Lake that have multiple well-connected leks, while peripheral populations have not seen these population increases. The Bi-State DPS is still represented in most of the known historic distribution, but threatened by small and isolated populations on the periphery of the range. Genetic diversity remains high in most of the Bi-State DPS, with emerging evidence of that representation has been lost in some areas by population reduction and some loss of genetic diversity.

North Mono Lake

The population to the north of Mono Lake consists of a central stronghold located in the Bodie Hills, CA, and several additional peripheral populations in CA and NV that vary in size and degree of isolation. The Bodie Hills population has grown in recent years to be the largest and most connected population in the Bi-State, with more than 500 males counted on leks in 2012. The Bodie Hills has about 10-15 leks , ranging from about 150-500 males counted over the past 20 years. The Bodie Hills breeding complex appears to be best connected with the Aurora, Rough Creek and Nine Mile Flat area within the Mount Grant PMU in Nevada. This area, plus Mount Grant proper in the Wassuk Range contains 8 active leks. The Fales area in California, consisting of 2 known leks at Wheeler Flat and Burcham Flat on the northwestern edge of this population, is largely isolated from Bodie, but probably has some connectivity to another small population at Jackass Spring along the border and Desert Creek/Sweetwater Flat in NV. The Fales population was much larger prior to the early 1980's and has experienced the greatest population declines in California, with less than 100 males counted on leks in 2012. The core population to the north of Mono Lake in total appears to be fairly resistant but individual subpopulations much less so. While the population remains relatively stable, the size and geographical extent is moderately small and the degree of historic impacts has not been severe. Although there is good resistance in the core of this population, additional threats should be avoided in both the core and peripheral areas.

South Mono Lake

The population to the south of Mono Lake consists of a central stronghold located in Long Valley, CA. The Long Valley and Bodie Hills populations are considered the two main core populations in the Bi-State DPS. Similar to Bodie, the Long Valley population has grown in recent years, with more than 400 males counted on leks in 2012. The Long Valley breeding complex contains about 10-15 leks, with about 150-400 males counted over the past 20 years. One additional breeding population located at Parker Creek in CA is considered isolated from Long Valley and only known to contain one lek. The Long Valley breeding complex remains relatively stable and resistance to ongoing impacts is generally good. As with the North Mono population, however, this breeding complex is not overly large. The Long Valley population is

probably more vulnerable than Bodie because it is considered isolated from other Bi-State populations and seasonal habitats are limited to a relatively small area. Therefore, this population could be severely impacted by catastrophic events, and further cumulative threats should be avoided. The Parker population is probably well under 100 estimated birds total and lacks resistance.

Pine Nut

The Pine Nut population is the smallest and most threatened population in the Bi-State DPS. The population consists of one consistently active lek, although there is indication that additional sites may be present and there is some connectivity to the population to the north of Mono Lake. The long-term average male attendance is approximately 14 males over the past 11 years. The population appears predisposed to environmental vagaries in the form of wildfire and drought as well as additional anthropogenic stressors that have and continue to influence the population. These conditions have resulted in a population that is largely nonresistant to additional impacts.

White Mountains

The population in the White Mountains is not well understood because of difficulty in accessing the area to conduct lek surveys. However, at least one lek is known to exist at Chiatovich Flat in California and 2 recently discovered leks are known to exist in NV. As with the other Bi-State breeding populations, sage-grouse in the White Mountains are probably mostly threatened by small population size and are therefore vulnerable to catastrophic events. However, this population, located in high elevation habitats on the extreme southwest of the species range, has probably always been small and faces the fewest threats in the Bi-State DPS.