STATE OF WASHINGTON February 2016

# Periodic Status Review for the Greater Sage-grouse

**Derek W. Stinson**
*Washington Department of*
*FISH AND WILDLIFE*
*Wildlife Program*

The Washington Department of Fish and Wildlife maintains a list of endangered, threatened, and sensitive species (Washington Administrative Codes 232-12-014 and 232-12-011). In 1990, the Washington Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297). The procedures include how species listings will be initiated, criteria for listing and delisting, a requirement for public review, the development of recovery or management plans, and the periodic review of listed species.

The Washington Department of Fish and Wildlife is directed to conduct reviews of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing by the Washington Fish and Wildlife Commission. The periodic status reviews are designed to include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification. The agency notifies the general public and specific parties who have expressed their interest to the Department of the periodic status review at least one year prior to the five-year period so that they may submit new scientific data to be included in the review. The agency notifies the public of its recommendation at least 30 days prior to presenting the findings to the Fish and Wildlife Commission. In addition, if the agency determines that new information suggests that the classification of a species should be changed from its present state, the agency prepares documents to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act.

This document is the final Periodic Status Review for the Greater Sage-grouse. It contains an update of information pertaining to the status of the Greater Sage-grouse in Washington since the publication of the state recovery plan (Stinson et al. 2004). The Department presented the results of this periodic status review to the Fish and Wildlife Commission at the 22-23 January 2016 meeting in Vancouver. The recommendation to keep the Greater Sage-grouse listed as threatened was affirmed by the Commission at their 26 February meeting in Olympia.

**This report should be cited as:**

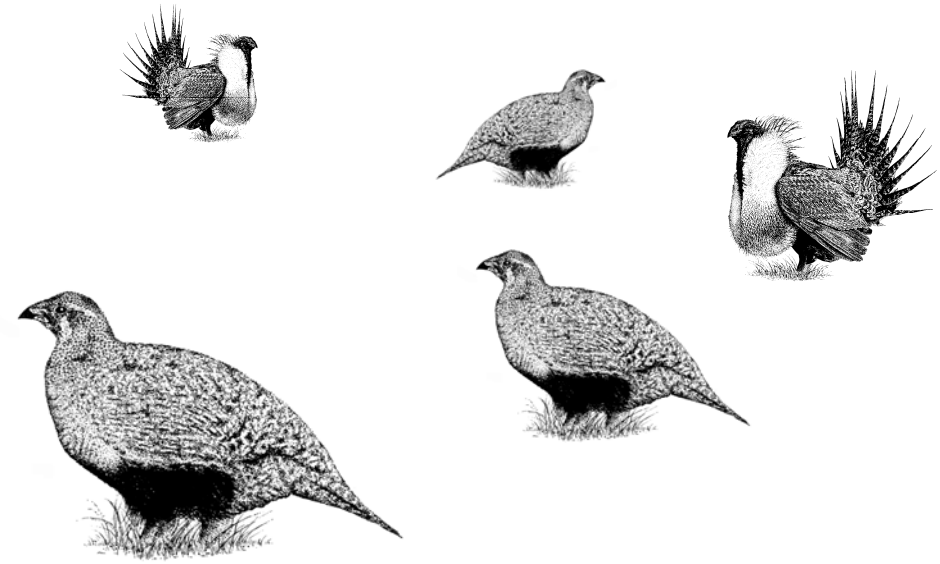
Stinson, D. W. 2016. Periodic status review for the Greater Sage-grouse in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 25+ iii pp.

*On the cover: photos of male sage-grouse and Swanson Lakes WLA background by Mike Schroeder; black and white illustrations by Darrell Pruett*



*This work was supported in part by personalized and endangered species license plates*

# Periodic Status Review for the Greater Sage-grouse in Washington



Prepared by
Derek W. Stinson

Washington Department of Fish and Wildlife
Wildlife Management Program
600 Capitol Way North
Olympia, WA 98501-1091

January 2016

# TABLE OF CONTENTS



# LIST OF FIGURES AND TABLES

# EXECUTIVE SUMMARY

The Greater Sage-grouse historically was found throughout the shrub-steppe areas of eastern Washington. The species is now limited in distribution in the state to Douglas County, the Yakima Training Center, and two areas where reintroduction projects are re-establishing populations in Lincoln County and on the Yakama Indian Reservation. The 2015 state-wide population estimate based on lek counts was 1,004 birds.

The sage-grouse was state-listed as threatened in 1998, and a state recovery plan was completed in 2004. The Greater Sage-grouse Columbia Basin Distinct Population Segment (DPS) was a candidate for listing under the U. S. Endangered Species Act from 2001-2015. In September 2015, the U.S. Fish and Wildlife Service decided that the population in Washington did not meet the criteria for a DPS, and listing of the Greater Sage-grouse across its entire range was not warranted.

The potential of wildfires to eliminate sagebrush on extensive areas is perhaps the greatest immediate threat to sage-grouse in Washington. Uncertainty about the long-term maintenance of habitat that depends on voluntary Farm Bill programs (CRP/SAFE) is also a major concern. Other major management issues include habitat that is fragmented by roads, agriculture, and development and degraded by past wildfires, historical excessive livestock grazing, fencing, electrical transmission lines, and exotic vegetation. Sage-grouse may suffer mortality rates above historical levels as a result of collisions with fences, powerlines, and vehicles, and higher populations of some predators.

Numerous partners are working on recovery of sage-grouse in Washington. Without these efforts, the Greater Sage-grouse would likely decline to extinction in Washington. It is recommended the species remain state-listed as threatened.

# ACKNOWLEDGMENTS

Copies of reports or survey data were provided by Jason Lowe, Colin Leingang, and Dave Blodgett. Preparation was made easier by recent reports by Colleen Stinson, Jason Lowe, and Kourtney Stonehouse. The draft was improved by reviews by Mike Atamian, Mike Schroeder, Dave Blodgett, Colin Leingang, Kevin White, Jason Lowe, Penny Becker, Gerry Hayes, Kevin Kalasz, and Cynthia Wilkerson. Many thanks to our partners and cooperators in sage-grouse conservation, including Bureau of Land Management, Oregon Department of Fish and Wildlife, Washington State University, U.S. Fish and Wildlife Service, Department of Defense-Yakima Training Center, Spokane Audubon, Yakama Nation, USDA Farm Service Agency, Natural Resource Conservation Service, Wenatchee Sportsmen, Inland Northwest Wildlife Council, Lincoln County Conservation District, and The Nature Conservancy.

# INTRODUCTION

The Greater Sage-grouse, the largest grouse species in North America, was once abundant in the shrub-steppe of eastern Washington. Sage-grouse are closely associated with sagebrush and populations require extensive areas of sagebrush habitat to persist. Sage-grouse have not been hunted in Washington since 1987. The species was state-listed as threatened in 1998 (Hays et al. 1998), and a recovery plan was completed in 2004 (Stinson et al. 2004).

***Distribution.*** Sage-grouse persist in two main areas in Washington: one primarily on the U.S. Army's Yakima Training Center (YTC) in Kittitas and Yakima counties and the other, often referred to as the Moses Coulee population, in Douglas County and adjacent parts of Grant County (Stinson et al. 2004). Two additional populations are currently being re-established; one in Lincoln County (i.e. Crab Creek), and the other on the Yakama Indian Reservation (Fig. 1).

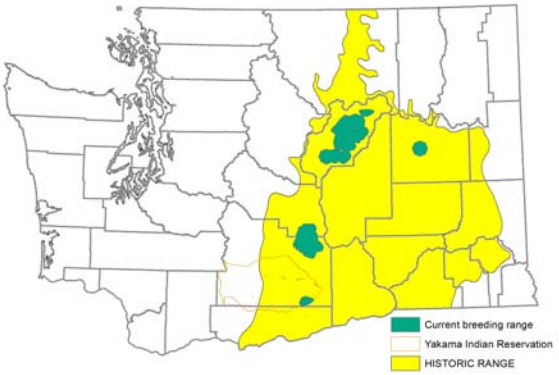



Figure 1. Historical range and current breeding range (Habitat Concentration Areas) of Greater Sage-grouse in Washington.

# LIFE HISTORY

The spring courtship display of males at specific locations, called 'leks,' is the most conspicuous behavior of sage-grouse. Male and female sage-grouse gather in the spring for displaying and mating on the lek. Sage-grouse are polygynous, with the dominant males mating with multiple females. In Douglas County, most birds return to breeding areas in late February or March. Females generally return to the same nesting area (Schroeder et al. 1999), and probably visit the same lek or leks each year. Males begin to leave leks in late April and early May and move to summer habitat (Stinson et al. 2004).

After mating, females devote most of their time to nesting and brood-rearing; males do not assist in these activities. First nests are generally initiated in April, and renesting after predation or other failure, are initiated in May (Schroeder 1997). In Douglas County, the first nests of 82 females (n = 204 nests) averaged 7.3 km (4.5 mi) from the lek of capture, and 5.1 km (3.2 mi) from the nearest lek (Stinson et al. 2004). Sage-grouse females attempt to raise one brood per year (Schroeder et al. 1999). The precocial chicks feed themselves, but females spend considerable time keeping chicks warm and guarding them for the first four to five weeks.

***Survival, predation, and population dynamics*.** In north-central Washington, the survival rate for juveniles to 50 days of age was 33.4% (n = 515) (Stinson et al. 2004). In grouse species, predation typically accounts for about 85% of reported non-hunting mortalities and 79-94% of nest failures (Bergerud 1988:615,684; Moynahan et al. 2007). Moynahan et al. (2007) reported that average seasonal nest success rate of 0.24–0.32 for early nests and 0.32–0.42 for late nests in Montana. Habitat quality, specifically the amount and type of vegetation available to conceal nests from visually hunting predators, like Common Ravens (*Corvus corax*), ultimately affects the number of nests destroyed by predators (Gregg et al. 1994, Ritchie et al. 1994, Rebholz 2007). Recent studies suggest that predation on young

sage-grouse chicks can be high, and in fragmented landscapes or in areas with subsidized predators, predation can limit population growth (Hagen 2011). In Washington, ravens, Coyotes (*Canis latrans*), and Badgers (*Taxidea taxus*), preyed on sage-grouse eggs and were responsible for many nest failures (Eberhardt and Hofmann 1991, Sveum 1995, Stinson et al. 2004). The annual survival rate for adult males in Washington was 56.9% (n = 29) and 72.5% for adult females (n = 88) (Schroeder 2000). Overwinter survival is generally high and most mortalities occur in spring, summer and early fall (Connelly et al. 2011a). Greater Sage-grouse are relatively long-lived for gamebirds with individuals up to 9 years old recorded in the wild; they may be able to live 14 or 15 years as reported in Sooty and Dusky Grouse (*Dendragapus fuliginosus*, and *D. obscurus*; Zwickel et al. 1992). Sage-grouse populations fluctuate dramatically, and the somewhat regular nature of these fluctuations has led some researchers to hypothesize the existence of regular cycles with peaks occurring every 8-12 years (Rich 1985, Fedy and Doherty 2010).

***Habitat requirements.*** Greater Sage-grouse rely upon shrub-steppe habitat for food, nesting and hiding cover. Sagebrush comprises 60-80% of the yearly diet of adult sage-grouse and up to 95-100% of the winter diet (Schroeder et al. 1999). Wyoming Big Sage (*Artemesia tridentata wyomingensis*) and Three-tip Sage (*Artemesia tripartita*) are the most important species in Washington. Sage-grouse need large areas of shrub-steppe with sagebrush canopy (~15-35%), and a healthy herbaceous understory for nest concealment and brood-rearing cover and food (>10% forb cover, >15% grass cover, >18 cm grass height) (Connelly et al. 2000b, Stinson et al. 2004, Hagen et al. 2007). A healthy diverse herbaceous component that supplies forbs for food during the pre-laying period, and forbs and insects, particularly grasshoppers, beetles, and ants, during early chick development are important for successful reproduction and recruitment (Connelly et al. 2011b). Later in summer, the diet of juveniles shifts from insects to more forbs, and broods often move to higher elevations or more mesic sites, such as seeps, riparian areas, and alfalfa fields that stay green when the vegetation of surrounding areas has dried (Gregg and Crawford 2009, Connelly et al. 2011b). In winter, sage-grouse feed almost exclusively on sagebrush, and rely on the sagebrush that remains accessible above the snow for food and shelter (Connelly et al. 2011b). Sage-grouse have large home ranges; single season home ranges in Washington averaged 2–44 $km^2$ (0.8–12 $mi^2$; Stinson et al. 2004:14); maximum distances moved from leks ranged from 4 to 36 km (2–22 mi) in Washington (Stinson et al. 2004). In Lincoln County, Sage-grouse had spring–summer home ranges nearly 6 times larger than Sharp-tailed Grouse (*Tympanuchus phasianellus*), selected nest sites that were richer in vegetation types, and contained more shrub cover within 10 m of the nests (Stonehouse et al. 2015). Sage-grouse in Lincoln County also tend to avoid roads, electrical distribution lines, and vertical structures (distribution poles and trees) in their spring–summer home ranges, and when selecting nest sites (Stonehouse et al. 2015). Sage-grouse in Douglas County also tended to avoid transmission lines (Schroeder and Vander Haegen 2014, Shirk et al. 2015); this may be a predator avoidance behavior because of an association of tall structures with avian predators.

## POPULATION STATUS

The Greater Sage-grouse population declined dramatically in Washington with the historical conversion of shrub-steppe to agriculture and degradation of the remaining habitat (Stinson et al. 2004). The current range in the state is about 8% of the historical range. Based on changes in number of males counted on lek complexes, the sage-grouse population size in Washington declined more than 50% from 1970 to 2012 (Schroeder et al. 2014). The state-wide population estimate for 2015 was 1,004, up slightly from 2014 after a decline since 2010 (Fig. 2). Other states also report a recent decline which was attributed to drought, followed by an increase in 2015. The high in 2010 in Washington was somewhat an artifact of the discovery of a large lek on Conservation Reserve Program (CRP) enrolled land that was unsuitable cropland until relatively recently. Prior to 2010, the relative stability of the population since the early

1990s has been attributed to the maturation of CRP fields in Douglas County (Schroeder and Vander Haegen 2011). Factors which may be affecting sage-grouse in Douglas County include the large wild fires of 2012 which affected sagebrush cover around one or more leks, farm land coming out of CRP contracts being put back into production, and tilling of older CRP that did not comply with stricter planting requirements of the Sage-grouse and Sharp-tailed Grouse State Acres for Wildlife (SAFE) program. CRP enrolled lands allowed the Douglas County population to remain relatively stable, while the Yakima Training Center (YTC) population underwent a long decline between 1983 and 2012, despite encompassing one of the largest areas (1,300 km$^2$, 502 mi$^2$) of shrub-steppe remaining in the state (Fig. 3). The 2015 YTC population estimate was 247, an increase from the low of 148 in 2012.

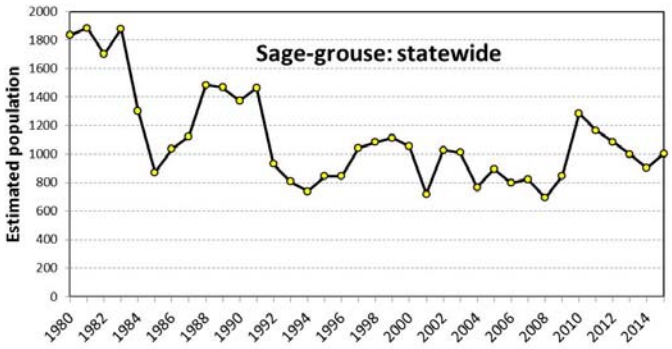



Figure 2. Statewide population estimate of sage-grouse in Washington, 1980-2015.

Each year, WDFW and YTC staff count birds at active leks, and check inactive leks are for activity. In 2015, 27 leks were active (7 of these on YTC), and 14 inactive lek complexes were checked (4 on the YTC). Searches turned up several new leks in recent years (Douglas County, unless indicated): 4 in 2010, 3 in 2012, 1 in 2013, 1 in 2014 (YTC), and 2 in 2015. In 2015, 1 new lek was found using aerial infrared imaging, and another by ground surveys, and a satellite of an existing lek (temporary site, often attended by young males) was found with the aid of GPS marked males.

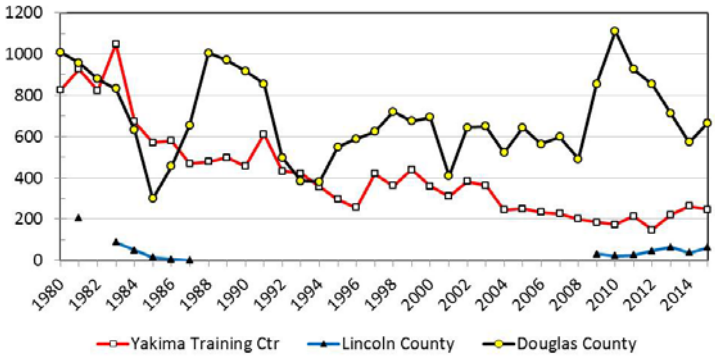



Figure 3. Estimates for three populations of sage-grouse in Washington, 1980-2015.

## HABITAT STATUS

Greater Sage-grouse in Washington inhabit large remnants of shrub-steppe on public land, and areas where a matrix of private land contains a high percentage of shrub-steppe fragments and lands enrolled in Farm Bill conservation programs (CRP and SAFE). Larger areas not converted to cropland were typically grazed by livestock, and some of these remaining shrub-steppe areas have little perennial grass or forb cover, a legacy of past heavy grazing. The largest areas of shrub-steppe vegetation on public lands are affected by factors that have degraded their habitat value for sage-grouse. The current condition and situation of the Sage-grouse Management Units (Tables 1, 2) (SMU; Stinson et al. 2004) are briefly described below, with a focus on those that currently support grouse populations. These occupied management units were identified as Priority Areas for Conservation (PACS) as part of a rangewide initiative (USFWS 2013); the Yakima Training Center Unit was modified in delineating the PAC to include additional areas south and west of the YTC (Fig. 4).

Table 1. Land ownership (percent) in 14 Sage-grouse Management Units.

| Sage-grouse Unit | Private | Tribes | DFW | DOD | DNR | BLM | DOE | BOR | FWS | WSP | Total (ac) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ahtanum Ridge | 29.4 | 59.3 | 6.3 | 0 | 4.5 | 0.5 | 0 | 0 | 0 | 0 | 167,845 |
| Bridgeport Point | 0.2 | 99.7 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0.1 | 180,289 |
| Colockum | 24.2 | 0 | 66.6 | 0.1 | 4.6 | 1.7 | 0 | 0 | 0 | 2.9 | 146,458 |
| Crab Creek | 84.1 | 0 | 2.6 | 0 | 4.3 | 8.3 | 0 | 0.7 | 0 | 0 | 808,948 |
| Dry Falls[a] | 72.4 | 0 | 7.8 | 0 | 8.3 | 0.8 | 0 | 8.6 | 0.1 | 1.5 | 400,325 |
| Hanford[b] | 3.5 | 0 | 0.8 | 0 | 0.3 | 1.1 | 48.6 | 2.8 | 42.7 | 0 | 410,892 |
| Mansfield Plateau | 79.7 | 0 | 4.1 | 0.3 | 12.0 | 2.2 | 0 | 1.5 | 0 | 0 | 620,540 |
| Moses Coulee[a] | 81.1 | 0 | 1.0 | 0 | 8.0 | 9.6 | 0 | 0.3 | 0 | 0 | 476,155 |
| Potholes | 58.8 | 0 | 26.2 | 0 | 3.0 | 0.0 | 0 | 3.0 | 8.9 | 0 | 213,543 |
| Rattlesnake Hills[b] | 86.6 | 0 | 0.5 | 0 | 6.7 | 6.1 | 0 | 0 | 0 | 0 | 508,075 |
| Saddle Mtns | 40.7 | 0 | 21.8 | 0 | 4.5 | 19.9 | 0 | 11.6 | 1.5 | 0 | 117,418 |
| Toppenish | 0 | 99.9 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0.1 | 0 | 317,374 |
| Umtanum Ridge | 43.3 | 0 | 45.9 | 0.1 | 4.3 | 6.0 | 0 | 0.3 | 0 | 0 | 149,319 |
| Yakima Tr. Ctr | 5.1 | 0 | 0 | 93.6 | 0.2 | 0.1 | 0 | 0 | 0 | 1.0 | 348,220 |
| **Total** | **54.4** | **12.3** | **7.1** | **6.7** | **5.1** | **4.1** | **4.1** | **1.7** | **4.0** | **0.3** | **4,865,400** |

[a]Percent calculation does not include small area of lands owned by the National Park Service.
[b]Percent calculation does not include small area of lands owned by the County.

Table 2. Area and percent land cover[a] in steppe vegetation, CRP, and agriculture for 14 Sage-grouse Management Units.

| Sage-grouse Management Unit | Area ($km^2$) | Steppe [Semi-Desert]%[b] | CRP(%)[c] | Agriculture (%)[d] |
|---|---|---|---|---|
| Ahtanum Ridge | 679 | 45.6[f] | 0.6 | 24.3 |
| Bridgeport Point | 730 | 55.7[f] | 0.0 | 15.5 |
| Colockum | 592 | 70.9 | 1.1 | 4.3 |
| Crab Creek[e] | 3,273 | 46.6[f] | 12.9 | 36.3 |
| Dry Falls | 1,620 | 58.1[f] | 2.3 | 27.6 |
| Hanford | 1,662 | 48.5[f] | 0.0 | 2.1 |
| Mansfield Plateau[e] | 2,511 | 33.9 | 20.2 | 31.9 |
| Moses Coulee[e] | 1,926 | 39.9 | 12.1 | 40.1 |
| Potholes | 864 | 48.3 | 1.4 | 36.9 |
| Rattlesnake Hills | 2,056 | 46.8 | 11.0 | 30.1 |
| Saddle Mountains | 475 | 63.3 | 0.0 | 21.2 |
| Toppenish[e] | 1,284 | 67.8[f] | 0.1 | 6.2 |
| Umtanum Ridge | 604 | 66.6 | 1.3 | 11.2 |
| Yakima Training Center[e] | 1,409 | 90.1 | 0.0 | 3.0 |
| **Total** | **19,685** | **62.2** | **8.8** | **24.3** |

[a]Data (with the exception of CRP), are from US Geological Survey, Gap Analysis Program (GAP). May 2011. National Land Cover, Version 2 Classification System;
[b]Includes both shrub-steppe types suitable and unsuitable for sage-grouse, and areas of suitable types in poor condition due to low shrub cover or high shrub and low grass/forb understory; NVC Class 'Semi-Desert' includes these ecological systems: Inter-Mountain Basins Mixed Salt Desert Scrub, Columbia Plateau Steppe and Grassland, Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Big Sagebrush Steppe, Inter-Mountain Basins Montane Sagebrush Steppe, Columbia Plateau Low Sagebrush Steppe, Columbia Plateau Scabland Shrubland, Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Semi-Desert Shrub Steppe.
[c]CRP acres (based on 2007 data layer; more recent data is not publicly available) were subtracted from the NVC classifications.
[d]Includes NVC class Agricultural vegetation; ecological systems cultivated cropland and pasture/hay.
[e]Currently occupied by sage-grouse; other units have occasional use.
[f]Over 40% of the steppe vegetation in this unit had low shrub cover (<10%) based on 1993 Landsat data, and was generally unsuitable for nesting (Stinson et al. 2004).

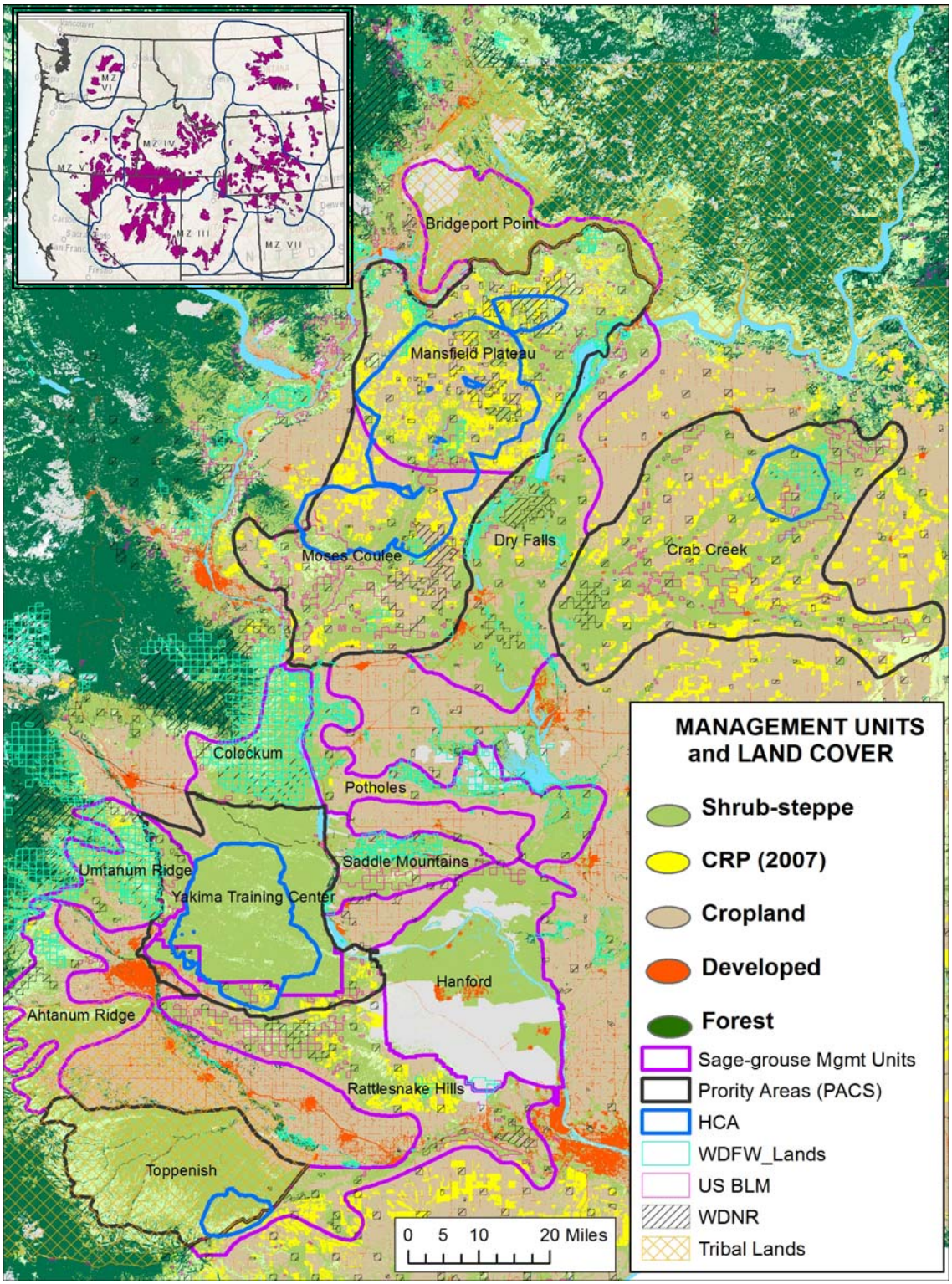



Figure 4. Landcover and WDFW, BLM, WDNR lands, and Yakama and Colville Confederated Tribe reservations and Sage-grouse Management Units (Stinson et al 2004), Priority Areas for Conservation (PACS) identified as part of national initiative (inset; USFWS 2013), and Habitat Conservation Areas (HCAs; revised, from Robb and Schroeder 2012).

***Yakima Training Center SMU/Yakima Training Center PAC.*** The YTC is a 327,000 ac army training area of which about 145,000 ac can potentially support the Wyoming Big Sagebrush/Bluebunch wheatgrass habitat type (Stinson et al. 2004). The leks and nesting and brood-rearing areas on the YTC have been designated Sage-grouse Protection Area (SGPA). YTC expanded the SGPA from approximately 44,000 ac to 77,600 ac (24% of installation) in 2010 (C. Leingang pers. comm.). The northern portion of the YTC (65,000 ac), acquired in 1991, is traversed by large power transmission lines, but the bunchgrass and forb understory has improved considerably since grazing by livestock was largely eliminated in 1995. As a U.S. Army training facility, maintaining vegetation requires ongoing programs to restore impacts from vehicles and fires. Fire is a constant threat on the YTC, particularly when live-fire training activities occur during the driest months of May to October.

A 230 kilovolt transmission line between substations at Vantage and Pomona is proposed that would pass across either the northern portion of the YTC, or south of the YTC, and the impacts to sage-grouse and other factors are under consideration.

***Moses Coulee & Mansfield Plateau SMUs/Moses Coulee PAC***. The Moses Coulee population centered in Douglas County occupies a 461,583 ac Habitat Concentration Area (HCA) that is a mosaic of predominantly private lands used for dryland farming (mostly wheat), lands enrolled in the CRP, or lands with high-quality shrubsteppe (Schroeder and Vander Haegen 2011). WDNR owns significant portions (12%) of the Mansfield Plateau and Moses Coulee (8%) sage-grouse units, and BLM and WDFW own small portions. The U.S. Department of Agriculture's CRP program is currently the main financial incentive for private landowners to provide sage-grouse habitat, and has been essential for providing habitat for sage-grouse in Washington (Schroeder and Vander Haegen 2006, 2011). The Sage-grouse and Sharp-tailed Grouse SAFE program, has specific planting requirements and may boost grouse populations; 63,000 ac were allocated in 2010 for sage-grouse and sharp-tailed grouse habitat in northern Douglas County. WDFW biologists assisted landowners with planting plans for >61,000 ac of enrolled lands.

*Wildfires in 2012.* Sage-grouse habitat in the Mansfield Plateau unit was impacted by wildfires ignited by lightning storms in 2012. The Barker Canyon (>17,000 ac) and Leahy fires (73,000 ac) burned over 92,000 ac of cropland, CRP, and shrub-steppe. Fortunately, many of the CRP-SAFE fallow fields waiting to be seeded acted as firebreaks. One active and one inactive lek site was burned in the Leahy fire, likely indicating a loss of nesting, brood rearing and wintering habitat in the surrounding area. The Foster Creek Fire totaled about 1,350 ac including private lands, BLM and WDFW; most of the ~725 ac of WDFW land had suitable sage-grouse habitat with >30% cover of sagebrush.

***Crab Creek SMU/PAC.*** Substantial shrub-steppe habitat has remained in the Lincoln County portion of the Crab Creek SMU where 'channeled scablands' formed by the ice age floods contain thin or rocky soil that is poorly suited to cropland. Many of the areas with deeper soils were converted to wheat, and many were later enrolled in CRP contracts. The combined WDFW (Swanson Lakes Wildlife Area) and BLM (Twin Lakes and Telford management areas) ownership totals 53,000 ac. The relatively large blocks of suitable and/or restored habitat, along with management changes have improved the potential for sage-grouse since the birds were extirpated in the 1980s. Since the early 1990s, WDFW and BLM have restored >2,500 ac to shrub-steppe vegetation, many miles of fences have been removed or marked to reduce collision mortalities of birds, and several miles of unused power lines have been removed. Livestock grazing has ceased on the WDFW lands, and is managed on BLM lands to minimize negative effects on grouse.

The Apache Pass wildfire in Lincoln County burned 23,324 ac (State = 2,406 ac, BLM = 5,874 ac, private land = 15,044 ac) within the SMU/PAC in 2012, much of which included occupied sage-grouse habitat.

Using remote sensing and ground-truthing, the BLM determined that 6,098 ac of moderate and dense shrub (>5% cover) was converted to grassland as a result of the fire (J. Lowe, pers. com). WDFW and BLM staff collaborated to reseed 100 ac on SLWA and 100 ac of BLM land with a grass/forb/legume mix, and 200 ac were experimentally seeded with sagebrush using three different techniques, but these were unsuccessful.

During the 10-year period from 2003-2012, approximately 29,000 acres (28%) of the Crab Creek Habitat Concentration Area (HCA, Fig. 5; rough approximation of the occupied area; Robb and Schroeder 2012) burned in 6 major wildfires (2 lightning-caused, 4 human-caused); some of these wildfires overlapped resulting in approximately 7,800 acres burning twice and 1,400 acres burning three times within 10 years (BLM 2014a). The cumulative impact is that the sparse shrub cover type is nearly twice as prevalent as it was under the historic fire regime. Of the 68,010 ac of area capable of supporting sage-grouse nesting conditions, 28,335 ac (42%) currently support moderate to dense shrub and are suitable for nesting, while 39,674 ac (58%) are currently in an early seral stage with sparse sagebrush cover and is currently unsuitable for sage-grouse nesting (BLM 2014a).

***Toppenish Ridge SMU/Yakama PAC.*** The Toppenish Ridge SMU, on the Yakama Indian Reservation, contains substantial areas of shrub-steppe. An evaluation of habitat was conducted for the 180,000 ac East Satus area, which encompasses about 50% of the Toppenish Ridge Management Unit (Jamison and Livingston 2004). The major management issues are feral horses and wildfires. Despite multiple fires, including the 77,000 acre Mule Dry Fire in 2000, and a feral horse problem, modeling predicted that over 80,000 ac of the East Satus area would support sage-grouse. Much of the burned area was still dominated by native forbs and bunchgrass, so suitability was predicted to improve with recovery and restoration of sagebrush cover (Jamison and Livingston 2004). The Yakama Nation has been engaged in efforts to reduce the potential for large wildfires, and to reduce feral horse numbers. Feral horse management has been hampered by the lack of a domestic slaughter facility; some horses are rounded up and sold, but in numbers too small to adequately reduce the large growing herds. Fences exclude horses from 19,500 ac and an additional 18,000 ac are being fenced. Additional funding is being pursued to enlarge the original exclosure to protect an additional 30,000 ac (D. Blodgett III, pers. comm.).

***Hanford SMU***. The Hanford SMU is located on lands that are, or were formerly, part of the Department of Energy's (DOE) Hanford Site in Benton and Grant counties. The area includes the Central Hanford, and the Hanford Reach National Monument. These areas provide a block of about 378,000 ac of steppe vegetation types, but wildfires in 1981, 1984, 1993, 2000, 2005, 2006, and 2007, (*pale color in* Fig. 5) dramatically decreased the abundance of Wyoming Big Sagebrush in the area (Dettweiler-Robinson et al. 2013). The 1980s fires may have caused the local extirpation of sage-grouse in Benton County (Stinson et al. 2004). More recently, the fire in 2000 burned >160,000 ac (66,000 ha), including all of the Fitzner-Eberhardt Arid Lands Ecology Reserve. The fire caused >90% mortality of shrubs over 85% of the area (Earnst et al. 2009). Restoration efforts have included planting more than 1.5 million seedlings across ~5,434 ac (2,200 ha) in 2001, 2002, 2005, 2006, and 2007 (Dettweiler-Robinson et al. 2013). But annual precipitation on the Hanford Unit averages <5 inches (12.7 cm) and survival of seedlings varies greatly with precipitation the first year after planting. Re-establishing suitable conditions on the Hanford SMU will require extreme effort and investment.

***Dry Falls SMU***-This unit is very important for connectivity between Crab Creek and Moses Coulee units, particularly the area from Banks Lake, south to Ephrata (Robb and Schroeder 2012); a few sage-grouse are known to have moved through this area. Connectivity value is compromised by Banks Lake and two 500 kilovolt transmission lines radiating from Grand Coulee Dam.

***Colockum SMU***-This unit is very important for potential connectivity between Moses Coulee and the

Yakima Training Center populations (Robb and Schroeder 2012). The Colockum, Quilomene, and Whiskey Dick Wildlife Areas comprise 2/3 of this unit (Table 1), but topography is rather rugged and connectivity value is compromised by Interstate-90. The presence of wind turbines may have a negative on sage-grouse use, but one sage-grouse female nested near one of these turbines in ~2010.

***Umtanum Ridge SMU***- This unit is important for potential population expansion and connectivity between the Yakima Training Center population and Toppenish Ridge. Much of the unit is owned by WDFW and a female sage-grouse from the YTC has nested two seasons in the eastern portion. A lek was located in this unit, historically, and the habitat supports a strong forb component. The higher moisture and diverse topography may make it a more climate resilient location and less susceptible to complete shrub loss during fires.

***Ahtanum Ridge SMU***- This unit is potentially important for connecting the Yakima Training Center population and Toppenish Ridge, if it becomes reoccupied by the re-established population. It has substantial native vegetation and public lands, but the topography is rather rugged.

***Rattlesnake Hills SMU***-This unit provides potential connectivity between Toppenish Ridge, the Hanford, and Yakima Training Center SMUs. Sage-grouse released on the Toppenish Ridge unit have established a lek in the southwestern portion of this unit. The northwestern portion, which has been designated as part of the YTC PAC, is sometimes used by sage-grouse from the YTC population.

***Potholes and Saddle Mountain SMUs***- These units offer some public land, shrub-steppe habitat, and have potential for connectivity between YTC and Moses Coulee, but birds would have to cross the Columbia River twice, and there is a 500 kv transmission running north-south through these units. These units also provide connectivity with the extensive public lands of the Hanford SMU, but the large wildfires, low average precipitation, and predicted increased drought frequency create uncertainty about the future of habitat there.

***Bridgeport Point SMU***- This unit is on the Colville Confederated Tribes Reservation; it offers potential expansion area, though connectivity is inhibited by the Columbia River. The unit provides some habitat and sage-grouse have occasionally been sighted there.

# FACTORS AFFECTING GREATER SAGE-GROUSE IN WASHINGTON

## Adequacy of Regulatory Mechanisms

***Federal regulation.*** From 2001-2015, because the Greater Sage-grouse population in Washington was considered the Columbia Basin DPS and was a candidate for listing under the Endangered Species Act, this raised the priority of sage-grouse conservation in the state. Although the Washington population is no longer a candidate since the September 2015 decision, the possibility remains that the decision to not list range-wide or to recognize the Columbia Basin as a DPS could be challenged by litigation.

Since 2001, there has been a consistent focus on habitat protection on federal lands including the YTC, and BLM. BLM is in the process of finalizing a resource management plan that includes recommendations for management on multiple important areas for sage-grouse. The YTC incorporates best management practices and mitigation measures during the NEPA process for construction-related projects both on and adjacent to the Training Center (C. Leingang pers. comm.). The Sikes Act requires the development and implementation of Integrated Natural Resources Management Plans (INRMPs) for Military installations. INRMPs, prepared in cooperation with the Service and State fish and wildlife

agencies, integrate natural resource programs with military operations and training and their implementation does not compromise the capability of DoD lands to support the military mission. YTC has been proactive in efforts to accommodate the needs of sage-grouse with their army training mission. It is not yet clear if the recent decision that the population does not qualify as a DPS will negatively affect protections and priorities afforded in Farm Bill programs, on federal lands, and in funding priorities.

***State and local regulations.*** Loss of habitat is often due to conversion to cropland or development. On non-federal lands, the Growth Management Act (GMA) is Washington's primary regulatory tool to protect rare and threatened species from development impacts. Local governments are required to create and implement development regulations that protect state-listed species and their habitat. The county adopts zoning ordinances that ensure areas outside of urban growth areas remain rural in character, and development does not occur on natural resource lands designated for long-term agricultural use. However, rural densities allowed (e.g. ~1 dwelling/20 ac) by zoning may meet the needs of most species, but may exceed the tolerance of sage-grouse.

The state rule implementing GMA (WAC 365-190-130) requires that wildlife habitat conservation areas (FWHCA - a type of critical area) must be considered and designated and "Counties and cities should consult current information on priority habitats and species identified by the Washington State Department of Fish and Wildlife." The Priority Habitat and Species (PHS) Program provides important wildlife and habitat information to agencies, landowners, and consultants for land use planning and permit evaluation purposes. PHS management recommendations for sage-grouse and shrub-steppe habitat are available to planning entities http://wdfw.wa.gov/conservation/phs/mgmt_recommendations/ (Schroeder et al. 2003, Azerrad et al. 2011). PHS management recommendations are not regulatory, but they are often adopted through county regulations. For example, permanent developments such as buildings, parking lots, gravel pits, and roads, and any activity that creates continuous noise during the display season, should be no closer than 3 kilometers from leks (Azerrad et al. 2011).

Once a project has passed review for compliance with the comprehensive plan and zoning ordinances, they would be reviewed for impacts to sage-grouse and shrub-steppe at the site scale before issuance of the appropriate permits. Yakima, Kittitas, Douglas, Benton, Grant, Lincoln, and Franklin Counties identify threatened, endangered, and sensitive species and their habitat associations as FWHCAs, and provide protections for these areas in their ordinances. In each of these cases, known or discovered locations of sage-grouse and habitat triggers the process of avoiding, minimizing, and mitigating impacts. Though the specific nature of these protections varies across the counties, the inclusion of sage-grouse and shrub-steppe habitat provides a mechanism for minimizing disturbance from construction and development activities.

Land use regulations generally provide some protection for wildlife and occupied habitat, but do not adequately protect habitat that is not occupied. Recovery of sage-grouse in Washington will require increasing the populations and expanding occupied areas (Stinson et al. 2004).

## Continued Habitat Loss, Fragmentation or Degradation

Sage-grouse are generally a species of undeveloped shrub-steppe landscapes. A range-wide analysis of sage-grouse data found a strong negative effect of development (urban, suburban areas, and interstate and state highways) within 18 km (11.2 mi) of leks; most active leks had no developed lands within 5 km (3.1 mi; Johnson et al. 2011). Compared to where they remain, the portion of sage-grouse range where they were extirpated contained almost 27 times the human density, almost 3 times more area in agriculture, was 60% closer to highways, and had 25% higher density of roads than occupied range (Wisdom et al. 2011). Transmission lines have also been negatively correlated with sage-grouse persistence and

movements (Connelly et al. 2004, Beck et al. 2006, Wisdom et al. 2011, Shirk et al. 2015). Schroeder and Vander Haegen (2014) reported that the presence of existing transmission lines was negatively correlated with the distribution of sage-grouse pellets in Douglas County. Two radio-collared sage-grouse that moved from Lincoln County to Douglas County were found dead near (~25 m and 100 m) transmission lines and it is suspected that they were collision casualties.

Another long-term concern with the potential for major negative impact on sage-grouse in Washington is that Farm Bill programs (e.g. CRP/SAFE) are voluntary, and require periodic renewal by Congress and are dependent on the federal budget. The result is a somewhat unstable habitat condition across the landscape as lands come in and out of these programs. The Douglas County population in particular largely depends on these programs.

The Moses Coulee and Mansfield Plateau Sage-grouse Management Units have more potential to be impacted by development because of the amount of private land and its location near larger population centers and Banks Lake, which is attractive for recreation. In the Crab Creek unit, urban and ex-urban development is a small and localized threat at this time. Development has not been an issue in the Toppenish Ridge unit. Development on the YTC, including development of training ranges, and other facilities has undoubtedly had some cumulative effects, but to a lesser extent than on private land elsewhere. Military training with vehicles affects habitat quality through sagebrush mortality and disturbance to understory vegetation, which requires ongoing programs to restore vegetation (Environmental and Natural Resources Division 2002).

***Wildfire.*** Wildfires degrade significant amounts of shrub-steppe annually, and are considered the most immediate threat to sage-grouse in Washington (Stinson et al. 2004). High severity fires eliminate sagebrush, and it may take >30 years to recover sufficient sagebrush cover to be suitable for sage-grouse, assuming enough residual sagebrush survived to provide a seed source. Drought can greatly influence the risk of catastrophic fire, and some of the ignitions are due to human activities that are not closely regulated such as target shooting, and burning of weeds. Gaps in fire district coverage can also lead to time delays in suppressing fires when they are small and more easily controlled. The emphasis on protecting infrastructure and directing fire resources to developed areas allows fires to expand.

Prescribed fire, once considered a potential tool for reducing sagebrush cover to increase forage for livestock, as well as understory forbs for grouse, has been shown to be largely ineffective for improving sage-grouse habitat in Wyoming Big Sagebrush communities and generally greatly degrades habitat (Fischer et al. 1996, Connelly et al. 2000c, Nelle et al. 2000, Wambolt et al. 2001, 2002, Baker 2006, 2011, Schroeder et al. 2006, Rhodes et al. 2010, Beck et al. 2011); small-scale prescribed burns of narrow fire breaks to protect habitat may be the exception. Efforts within Washington and rangewide to reduce the size of wildfires include establishing fuel breaks; their effectiveness may depend on sustained funding to maintain them over the long-term so that they remain effective.

***Livestock grazing and management.*** Livestock grazing is the most widespread land use occurring in remaining sage-grouse range. Livestock grazing is compatible with sage-grouse where the habitat characteristics needed for breeding and wintering can be consistently maintained (Connelly et al. 2000b, 2011b; Wambolt et al. 2002, and Crawford et al. 2004). The effects of livestock on sage-grouse habitat depend on stocking level, season of use, utilization levels, history of the site, and drought. The most immediate impact of grazing can be reduction of grass cover at sage-grouse nest sites, which can result in high rates of nest predation (Gregg et al. 1994, Hockett 2002, Rebolz 2007). Fencing constructed to manage livestock causes direct mortality to sage-grouse (Stevens et al. 2012). Water developments can result in the degradation of important brood-rearing habitat by concentrating livestock and they may facilitate the spread of West Nile Virus by providing mosquito breeding sites (Walker and Naugle 2011).

Sage-grouse population declines may be correlated with drought (Johnson et al. 2011), which can increase the negative effects of a grazing regime that might otherwise be sustainable. Though sage-grouse range still shows some effects of excessive historical grazing, in general, livestock management has improved, and ranching on private lands is less detrimental for sage-grouse than alternative land uses such as development of ranchettes or conversion to cropland.

On public lands, grazing is monitored to ensure that the appropriate standards are met. On state lands, this is required by Ecosystem Standards for State-Owned Agricultural and Grazing Land (RCW 79.13.600, 79.13.610, and 77.12.204). Livestock grazing is currently not permitted on the majority of WDFW-managed lands within the Sage-grouse Management Units, with the exception of seven grazing leases representing a small percentage of the acres in the Units. Only one of these leases is in occupied habitat. Grazing permits on WDFW managed land for periods of more than two weeks require livestock grazing management plans that include monitoring and schedules for evaluation.

DNR owns more than 150,000 ac of land in sage-grouse PACs in Douglas, Lincoln, and Grant Counties. 80,000 ac are leased for grazing, with most of the remaining leased for dryland crop, USDA Conservation Reserve Program, or irrigated agriculture. The leases are required to comply with applicable state regulations. DNR ensures this through a combination of random lease compliance checks, a detailed review of conditions every 5 years when rental rates are adjusted, and at any time a lease is put out for public auction, and a Cooperative Monitoring Program that requires a Lessee to document grazing activities with photos and written records. Habitat impacts are *primarily* managed through deferred grazing, stocking rate, and utilization levels designed to be appropriate for the particular site and species involved (R. Roeder, pers. comm.).

Additionally, DNR leases are often associated with private ranch lands managed at a landscape scale. DNR encourages tenants to work with agencies and non-government organizations to coordinate management activities for sage-grouse associated with their ranch (R. Roeder, pers. comm.).

The BLM is currently undertaking a planning process to revise their Resource Management Plan. This revised plan will address grazing impacts on sage-grouse and their habitat. BLM primarily implements deferred rotation grazing systems with conservative stocking rates (J. Lowe, pers. comm.). The rotations are set up to seasonally avoid grazing in areas that are most likely to support nesting birds during the breeding season. A sage-grouse habitat assessment on the Twin Lakes allotment using 30 stratified random transects showed BLM land under grazing management is meeting breeding habitat requirements for all 7 nesting habitat indicators and is not significantly different than un-grazed control transects (BLM 2014a). A sage-grouse habitat assessment for Douglas Creek BLM lands showed potential breeding habitat was mostly marginal or unsuitable primarily due to lack of shrub cover (BLM 2014b).

Three planning and incentive efforts are underway to work with landowners with the objective of promoting better habitat and fewer impacts to sage-grouse on working ranch and farm lands. These include the Douglas County General Conservation Plan, the Sage-grouse Initiative, and a Candidate Conservation Agreement with Assurances; these are discussed below in *Management Activities*.

## Other Factors Affecting Sage-grouse

***Predation***. Predation is the most important proximate cause of mortality for sage-grouse, and the rate of predation is affected by the quality of habitat (Connelly et al. 2011a,b). Losses to predation are sustainable in large populations, but have a more significant impact on small populations in fragmented habitat. Although sage-grouse are adapted for avoiding predators most of the time, habitat changes and human-associated food sources (e.g. roadkill, agriculture, landfills) and nesting and perching structures

have generally increased the abundance of some predators that affect sage-grouse. In Washington, these include American Crows (*Corvus brachyrhynchos*), Common Ravens, Black-billed Magpies (*Pica hudsonia*), Coyotes, and Great Horned Owls (*Bubo virginianus*) (Sauer et al. 2008), and possibly Raccoons (*Procyon lotor*), Striped Skunks (*Mephitis mephitis*), and Red Foxes (*Vulpes vulpes*)(Stinson and Schroeder 2012). The population of Common Ravens has tripled in North America in the past 40 years (Sauer et al. 2008), and they are an important predator of sage-grouse eggs and chicks (Schroeder and Baydack 2001). Coates and Delehanty (2010) reported that daily survival rate of Greater Sage-grouse nests in Nevada was directly related to local abundance of ravens.

Great Horned Owls, which often nest in aspen groves and trees planted at farmsteads, killed at least 10 sage-grouse translocated to Lincoln County during 2008-2014 (Schroeder et al. 2014). Nine Great Horned Owls were trapped and released a sufficient distance (>30 km) from the project area to avoid return between 2009-2014 (Schroeder et al. 2014). Hagen (2011) suggested that areas with higher predator populations in human altered landscapes may be population sinks. He noted that short-term reduction of predators may be warranted during translocation projects, because translocated birds often suffer higher than normal rates of mortality (Hagen 2011).

***West Nile Virus.*** West Nile virus (WNV), a disease new to North America, is affecting many bird species and has caused high mortality in Greater Sage-grouse populations in some locations (Naugle et al. 2005, Walker and Naugle 2011). It is transmitted primarily between mosquitoes and birds; after being bitten by an infectious mosquito, most birds and mammals become infected, and many die within 4–8 days; if they survive, the antibodies may confer long-lasting protection from reinfection (Kilpatrick et al. 2007). Positive tests for WNV in sage-grouse have not been reported in Washington, but have for other birds and mammals. In 2009, 4 mosquito samples from the YTC were positive for WNV.

# MANAGEMENT ACTIVITIES

Stinson and Schroeder (2014) describe conservation actions to address tasks in the state recovery plan for sage-grouse; the main activities are briefly outlined below. The FWS recently convened a Conservation Objectives Team (COT) of state and FWS representatives that developed range-wide conservation objectives for the sage-grouse (USFWS 2013). Stinson (2014) evaluated efforts in Washington to address threats to the viability of Sage-grouse listed in the COT report (USFWS 2013).

***Lincoln County reintroduction.*** WDFW, in cooperation with the U.S. Bureau of Land Management (BLM), Washington State University, Oregon Department Fish and Wildlife, and the U.S. Fish and Wildlife Service, initiated a project in 2008 to reintroduce Greater Sage-grouse to WDFW and BLM lands in Lincoln County. From spring 2008 to spring 2015, 277 Greater Sage-grouse from southern Oregon were released in the area (Schroeder et al. 2014). The movements, productivity, habitat use, and survival of these birds have been monitored. A lek was established in 2010, and observations indicate recruitment is occurring. Plans for 2016 include continuing to closely monitor the translocated birds and the local population in Lincoln County.

***Sage-grouse and sharp-tailed grouse habitat use study.*** Concurrent with the translocations, Stonehouse (2013, Stonehouse et al. 2015) conducted a study of sage-grouse and Sharp-tailed Grouse habitat use in Lincoln County. She examined how sympatric, translocated sage-grouse and Sharp-tailed Grouse used space and selected habitats within their home ranges, at nest sites, and at leks in spring–summer.

***YTC augmentations and demographic study.*** A population augmentation effort was conducted to address genetic issues associated with the YTC population (e.g., lack of heterogeneity and small population size).

During 2004-2006, 61 birds from Nevada or Oregon were released. Results from analysis of genetic samples to determine if the augmentation was successful at introducing new genetic material to the population was inconclusive. Given the small size of the population, it was anticipated that periodic genetic augmentation may be needed; the augmentation effort resumed in 2014, with 10 females from Idaho, and 8 females in 2015. The YTC initiated a telemetry study in 2012 to validate core use areas, monitor grouse distribution on and off the YTC, and investigate sources of mortality; sage-grouse have been monitored for movements, nesting success, and survival (C. Leingang, pers. comm.).

***Yakama Nation reintroduction.*** The Yakama Nation is working to re-establish a population on the Yakama Reservation in the Toppenish Ridge SMU. A total of 155 sage-grouse from Oregon, Nevada, and Wyoming have been released since 2006. In 2013, 35 birds (12 f, 23 m) from Nevada were released, and in 2014, 34 birds (10 f, 24 m) were released. A lek is established, and the high count after the 2014 release was 15 males (D. Blodgett, pers. comm.). The high count for 2015 was 13 males. Concurrent projects are erecting fencing around large areas to exclude feral horses.

***Research on sage-grouse male movements and post-fire habitat use.*** In 2014, 20 males were outfitted with GPS satellite transmitters to obtain more detailed data on movements and use of areas burned in the 2012 Apache Pass Fire. As of 9 September 2015, 4 of these were still alive and transmitting data. A couple of these males have made long-distance movements, including between Lincoln and Douglas County (Fig. 5). The GPS transmitters recovered from the birds killed by predators were placed on males captured in Douglas County in spring 2015 to document movements, post-fire habitat use, and lek attendance there.

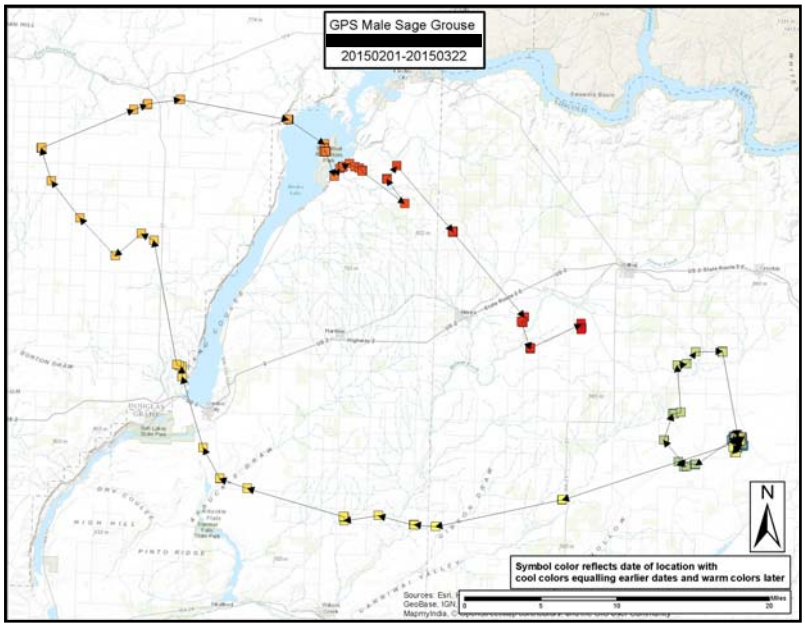



Figure 5. Movements of a GPS collared male sage-grouse from Lincoln County to Douglas County, and back, 1 Feb – 22 March 2015.

***Wildfire suppression and prevention.*** The threat of wildfires is being addressed in several ways. The YTC has done substantial planning and established the capacity for aggressive fire suppression, but fire from ignition sources on and off the YTC continues to pose a threat to habitat. In Douglas County the presence of green or fallow agricultural fields that do not carry fire well provides some fire protection for part of the year. Although this did not prevent loss of substantial areas of habitat in 2014, the impact could have been greater. In Lincoln County, 6 fires during a 10 year period have left 58% of the potential nesting habitat in the occupied area with shrub cover too sparse for nesting (BLM 2014a). BLM, Lincoln County Conservation District, Swanson Lakes WLA and others are developing a local plan to create brush-free roadside firebreaks.

***BLM Upper Crab Creek Habitat Assessment.*** BLM (2014) completed a sage-grouse habitat assessment of the Upper Crab Creek HCA, the core occupied area in Lincoln County to evaluate current land condition relative to sage-grouse needs (*see* Crab Creek SMU section above).

***Habitat restoration.*** Restoration projects have had varied success at reestablishng sage-grouse habitat due to differences in precipitation levels, soil quality, invasion by non-native species, and the length of time required (Arkle et al. 2014). Benson et al. (2011) and Dunwiddie and Camp (2013) provided guidance, specific recommendations, tools and templates, and case studies for restoration of shrub-steppe in eastern Washington. Federal Farm Bill Programs such as CRP and SAFE have been essential in providing additional habitat and in buffering patches of remnant natural habitat. The SAFE programs have 61,983 ac enrolled in Douglas County, 3,300 in Grant, and 3,400 in Lincoln County. However, these contracts with landowners can be relatively short (i.e. 10-15 years) and the future of these programs is somewhat tenuous due to their reliance on federal budgets and periodic reauthorization by Congress.

Several habitat restoration projects in sage-grouse management units are in various stages of completion (Stinson and Schroeder 2014). Since 1996, WDFW has restored almost 2,500 ac of former cropland in Lincoln County. In northern Douglas County, work is currently underway to restore 413 ac of old grain fields to shrub-steppe with a $250,000 grant. YTC is in the fourth year of a five year 35,000 acre sagebrush restoration to address areas affected by past wildfires (C. Leingang, pers. comm.).

Returning burned areas to a native perennial plant community can make the area less likely to carry intense fires, help break the cheat grass cycle, and keep out invasive weeds. However, restoration of habitat affected by wildfire is challenging and it can take decades for restored areas to establish a shrub, perennial grass, and forb structure needed for sage-grouse (Arkle et al. 2014). The funding required to restore suitable habitat conditions at the needed scale limits the amount of restoration work that can occur.

***Fence marking and removal.*** Fence collisions can be a major source of mortality for sage-grouse, and making them more visible (Fig. 6), can dramatically reduce collisions (Stevens et al. 2012). In 2011-12, a BLM project marked 126 miles (203 km) of fences, and removed 4.3 miles (6.9 km) of powerline on BLM and WDFW lands in Lincoln County. WDFW also assisted the Lincoln County Conservation District with a grant to remove 20 miles (32 km) of unneeded fencing in 2010-2011. Wenatchee Sportsmen marked 28 miles (45 km) of fences on WDFW lands in Douglas County with the help of a grant in 2011. Since 2005, 7.12 miles (11.45 km) of standing fence have been removed within the Sage-grouse Protection Area on the YTC, and during 2012 and 2013, 10.9 miles (17.6 km) of boundary fence were marked (C. Leingang, pers. comm.). Marking reduces collisions, but does not eliminate them.

Figure 6. Fence with markers to reduce grouse collisions.

***Sage-grouse Initiative (SGI).*** The Natural Resource Conservation Service's (NRCS), in partnership with Pheasants Forever, initiated the Sage-grouse Initiative (SGI) in 2010. SGI has used various Farm Bill programs to enroll lands including expiring CRP acres and rangeland. SGI typically funds infrastructure such as pipelines, troughs, wells and fence to develop rest/deferred-rotational grazing systems on private lands. Since 2010, 57,671 ac of private land have been enrolled in 44 SGI contracts in Washington. Rotational grazing under SGI will improve range condition, (although it will result in an increased number of miles of fencing on the landscape). Washington's SGI anticipates developing grazing plans for an additional 41,000 ac of shrub-steppe habitat within priority sage-grouse areas in 2016.

***Candidate Conservation Agreements with Assurances (CCAA).*** WDFW is working with the USFWS and key stakeholders on voluntary plans available to landowners. A CCAA is a voluntary agreement that

formalizes commitments of non-federal land owners to manage their lands to remove or reduce threats to species of concern and candidates under the Endangered Species Act (ESA) in exchange for regulatory certainty in the event of a listing. The CCAA clarifies management responsibilities and expectations of the USFWS, WDFW, and prospective participants, and will serve as the basis for the Service to issue Federal Enhancement of Survival Permits (Permits) to Landowners pursuant to section 10(a)(1)(A) of the ESA. Once issued, Permits will authorize a defined level of 'incidental take' of sage-grouse from implementation of the CCAA's conservation measures and the covered activities performed by the landowner on enrolled properties as long as the actions on those properties are consistent with the objectives of the CCAA.

The conservation objectives of the CCAA as it pertains to enrolled properties are to:

1. Eliminate further destruction, modification or curtailment of shrub-steppe habitat on enrolled lands;
2. Maintain or improve the suitability of enrolled lands for sage grouse;
3. Minimize direct disturbance to, and mortality of, sage-grouse, associated with covered activities;
4. Minimize artificially high predation of sage-grouse due to the covered activities; and
5. Prevent West Nile virus from becoming a serious threat to Washington's sage-grouse population.

***Douglas County General Conservation Plan.*** The Foster Creek Conservation District developed a Multiple Species General Conservation Plan for Douglas County (MSGCP) that includes sage-grouse as a covered species. A General Conservation Plan is a type of programmatic Habitat Conservation Plan under which multiple Section 10 permits can be issued; Section 10 permits allow the "incidental take" of threatened or endangered species resulting from otherwise lawful activities. The MSGCP describes a process for applicants (private agriculture landowners) to develop voluntary site-specific farm plans that will result in improved habitat for covered species. The draft MSGCP, which could include most of the Moses Coulee PAC, has grazing guidelines for developing grazing management plans on enrolled private lands with the objective of promoting better habitat and encouraging plant productivity and vigor, seed production, photosynthesis, recovery, and re-growth. Pastures are only grazed once every three years during the critical boot stage through the seed formation period for bunchgrass species. If approved, the MSGCP will facilitate review of future incidental take permit applications. Permittees can use this process to gain long-term assurances for their agriculture operations, while committing to certain measures to help conserve sage-grouse and other threatened, endangered, or rare species.

***Landscape connectivity research and implementation.*** Re-establishing connections between populations that are now isolated is vital for the long-term viability of sage-grouse populations in Washington. Robb and Schroeder (2012) modeled habitat concentration areas and movement corridors for Greater Sage-grouse to help prioritize protection and restoration of key linkage habitat. Shirk et al. (2015) used data from telemetry, genetics, and leks to evaluate the expert opinion models used in the Columbia Plateau sage-grouse connectivity analysis to predict rates of movement, gene flow, and lek persistence. Their analysis suggested that transmission lines, and factors related to elevation such as irrigated agriculture and precipitation, likely limit movements between subpopulations.

Efforts to improve habitat connectivity for sage-grouse include land acquisitions, prioritization of areas for Farm Bill programs, the Sage-grouse Initiative, and Candidate Conservation Agreements. WDFW has provided input on Farm Bill conservation programs; this included the location of the Sage-grouse and Sharp-tailed Grouse and Shrub-steppe SAFE programs. Currently more than 200,000 acres of CRP enrolled lands within sage grouse range in Washington State. Nearly 150,000 of those acres are in Douglas County.

***Land acquisition.*** In 2011, WDFW acquired 473 ac of land in Douglas County that may benefit sage grouse. WDFW was approached by Douglas County to help secure the future of the 20,000 ac Grand Coulee Ranch property in the northeast corner of the county, in prime shrub-steppe habitat that has been identified as a core area in the habitat connectivity modeling. In 2014, 2,000 ac of this property were acquired in Phase 1, some of which is potential sage-grouse habitat. In 2015, WDFW received over $4 million in state and federal funding for the second phase of the Grand Coulee Ranch acquisition.

***Perch deterrent study***. Power poles provide perches for predators and can facilitate predation on sage-grouse nests, chicks and adults. Dwyer and Doloughan (2012) evaluated the use of five perch deterrent designs on five power poles in Lincoln County. Spiked deterrents were most effective, but all horizontal surfaces need to be fitted with spikes, and deterrents were least effective for smaller species, such as corvids and American Kestrels.

## CONCLUSION AND RECOMMENDATION

Formerly found throughout the shrub-steppe areas of eastern Washington, most habitat of sage-grouse was converted to cropland or degraded by historical unsustainable livestock grazing. Greater Sage-grouse are now limited in distribution to two main areas centered in Douglas County and the Yakima Training Center. Reintroduction projects are re-establishing populations in Lincoln County and the Yakama Indian Reservation. The 2015 population estimate based on lek counts is 1,004 birds.

Although wildfires still pose a major threat to habitat, efforts are underway by various partners to reduce this risk, including YTC, BLM, and Lincoln County Conservation District. Numerous local, state, federal and private landowner partners are also working on recovery of sage-grouse in Washington, and Farm Bill conservation programs have helped maintain the sage-grouse population. Without these efforts, the Greater Sage-grouse would likely decline to extinction in Washington. Since sage-grouse have not reached the populations levels indicated in the Washington State Recovery Plan for up-listing (<650 birds) or down-listing (average of ≥3,200 for a 10-year period), it is recommended the species remain state-listed as threatened.

Figure 7. Sage-grouse on a new lek in Lincoln County established by birds translocated from Oregon (*photo by Kim Thorburn*)

## REFERENCES CITED

The references cited in the Periodic *Status Review for the Greater sage-grouse* are categorized for their level of peer review pursuant to section 34.05.271 RCW, which is the codification of Substitute House Bill 2661 that passed the Washington Legislature in 2014. A key to the review categories under section 34.05.271 RCW is provided in Table A. References were categorized by the author in December 2015.

Individual papers cited cover a number of topics discussed in the report, including information on: 1) the species' description, taxonomy, distribution, and biology; 2) habitat requirements; 3) population status and trends; 4) conservation status and protections; 5) research, monitoring, and restoration activities; and 6) factors affecting the continued existence of the species.

**Table A. Key to 34.05.271 RCW Categories:**

| Category Code | 34.05.271(1)(c) RCW |
|---|---|
| i | (i) Independent peer review: review is overseen by an independent third party. |
| ii | (ii) Internal peer review: review by staff internal to the department of fish and wildlife. |
| iii | (iii) External peer review: review by persons that are external to and selected by the Department of Fish and Wildlife. |
| iv | (iv) Open review: documented open public review process that is not limited to invited organizations or individuals. |
| v | (v) Legal and policy document: documents related to the legal framework for the significant agency action including but not limited to: (A) federal and state statutes; (B) court and hearings board decisions; (C) federal and state administrative rules and regulations; and (D) policy and regulatory documents adopted by local governments. |
| vi | (vi) Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection. |
| vii | (vii) Records of the best professional judgment of Department of Fish and Wildlife employees or other individuals. |
| viii | (viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c). |

| Reference | Category |
|---|---|
| Arkle, R. S., D. S. Pilliod, S. E. Hanser, M. L. Brooks, J. C. Chambers, J. B. Grace, K. C. Knutson, D. A. Pyke, J. L., Welty, and T. A. Wirth. 2014. Quantifying restoration effectiveness using multi-scale habitat models: implications for sage-grouse in the Great Basin. Ecosphere 5(3):31. http://dx.doi.org/10.1890/ES13-00278.1 | i |
| Azerrad, J. M., K. A. Divens, M. F. Livingston, M. S. Teske, H. L. Ferguson, and J. L. Davis. 2011. Management recommendations for Washington's priority habitats: managing shrub-steppe in developing landscapes. Washington Department of Fish and Wildlife, Olympia, Washington | iii |
| Baker, W.L. 2006. Fire and restoration of sagebrush ecosystems. Wildlife Society Bulletin 34:177-185. | i |
| Baker, W.L. 2011. Pre-Euroamerican and recent fire in sagebrush ecosystems. Studies in Avian Biology 38: 185-202. | i |
| Beck, J.L., K.P. Reese, J. W. Connelly, and M. B. Lucia. 2006. Movement and survival of juvenile greater sage-grouse in southwestern Idaho. Wildlife Society Bulletin 34:1070-1078. | i |
| Beck, J. L.; J. G. Klein, J. Wright, and K. P. Wolfley. 2011. Potential and Pitfalls of Prescribed Burning Big Sagebrush Habitat to Enhance Nesting and Early Brood-Rearing Habitats for Greater Sage-Grouse. Natural Resources and Environmental Issues: Vol. 16, Article 5. | i |
| Benson, J. E., R.T. Tveten, M. G. Asher, and P.W. Dunwiddie. 2011. Shrub steppe and Grassland Restoration Manual for the Columbia River Basin. WDFW, Olympia, Washington. | iii |
| Bergerud, A. T. 1988. Population ecology of North American grouse. Pp 578-648 in A. T. Bergerud and M. W. Gratson, eds. Adaptive strategies and population ecology of northern grouse. University of Minnesota Press., Minneapolis. | i |
| BLM (Bureau of Land Management). 2014a. Habitat Assessment for Greater Sage-grouse in the Upper Crab Creek Habitat Concentration Area. Unpublished report. Bureau of Land Management, Spokane District, Border Field Office. Spokane, WA. 109 p. | viii |
| BLM (Bureau of Land Management). 2014b. Land Health Evaluation Report Douglas Creek Watershed. Unpublished report. Bureau of Land Management, Spokane District, Wenatchee Field Office. Wenatchee, WA. 111 p. | viii |
| Coates, P. S. and D. J. Delehanty 2010. Nest predation of greater sage-grouse in relation to microhabitat factors and predators. Journal of Wildlife Management 74(2): 240–248. | i |
| Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Unpublished Report, Western Association of Fish and Wildlife Agencies. Cheyenne, WY. 610 pp. | viii |
| Connelly, J. W., K. P. Reese, R. A. Fischer, and W. L.Wakkinen. 2000a. Response of a sage grouse population to fire in southeastern Idaho. Wildlife Society Bulletin 28:90–96. | i |
| Connelly, J. W., M. A. Schroeder, A. R. Sands, C. E. Braun. 2000b. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28:967-985. | i |
| Connelly, J. W., C. A. Hagen, and M. A. Schroeder. 2011a. Characteristics and Dynamics of Greater Sage-grouse Populations. Pp. 53-67, in S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |
| Connelly, J. W., E. T. Rinkes, and C. E. Braun. 2011b. Characteristics of Greater Sage-grouse Habitats: a landscape species at micro- and macroscales. Pp. 69-83, in S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |
| Crawford, J. A., R. A. Olson, N. E. West, J. C. Mosley, M. A. Schroeder, T. D. Whitson, R. F.. Miller, M. A. Gregg, and C. S. Boyd. 2004. Ecology and management of sage-grouse and sage-grouse habitat. Journal of Range Management 57: 2-19. | i |
| Dettweiler-Robinson, E., J. D. Bakker, J. R. Evans, H. Newsome, G. M. Davies, T. A. Wirth, D. A. Pyke, R. T Easterly, D. Salstrom and, P. W. Dunwiddie. 2013. Outplanting Wyoming Big Sagebrush following wildfire: Stock performance and economics. Rangeland Ecology and | i |

| Reference | Category |
|---|---|
| Management 66(6):657-666. | |
| Dunwiddie, P. and P. Camp. 2013. Enhancement of degraded shrub steppe habitats with an emphasis on potential applicability in eastern Washington. Tech Note. Bureau of Land Management, Spokane District, Spokane, WA. 88 pp. | viii |
| Dwyer, J. F., and K.W. Doloughan. 2012. Testing pole-top systems of avian perch deterrents on electric power distribution poles. Final Report submitted to USDI BLM. EDM International, Inc. Fort Collins, Colorado. 37 pp. | viii |
| Earnst, S. L., H. L. Newsome, W. L. LaFramboise, and N. LaFramboise. 2009. Avian response to wildfire in interior Columbia Basin shrubsteppe. Condor 111(2):370–376. | i |
| Eberhardt, L. E. and L. A. Hofmann. 1991. Sage-grouse on the Yakima Training Center: A Summary of Studies Conducted During 1989 and 1990. PNL-7647, Pac. Northwest Lab., Richland, Washington. | viii |
| Fedy, B. C., and K. E. Doherty. 2011. Population cycles are highly correlated over long time series and large spatial scales in tow unrelated species: greater sage-grouse and cottontail rabbits. Oecologia 165:915-924. | i |
| Environmental and Natural Resources Division. 2002. Final Cultural and Natural Resources Management Plan, 2002-2006. Environmental and Natural Resources Division, Yakima Training Center. | v |
| Fischer, R. A., K. P. Reese, and J. W. Connelly 1996. An investigation on fire effects within xeric Sage Grouse habitat. Journal of Range Management 49:194–198. | i |
| Gregg, M. A., J. A. Crawford. 2009. Survival of Greater Sage-grouse Chicks and Broods in the Northern Great Basin. Journal of Wildlife Management 73(6):904–913. | i |
| Gregg, M. A., J. A. Crawford, M. S. Drut, and A. K. Delong. 1994. Vegetational cover and predation of sage-grouse nests in Oregon. Journal Wildlife Management 58:162-166. | i |
| Hagen, C. A. 2011. Predation on Greater Sage-grouse: facts, process, and effects. Pp. 95-100, in S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |
| Hagen, C. A., J. W. Connelly, and M. A. Schroeder. 2007. A meta-analysis of greater sage-grouse *Centrocercus urophasianus* nesting and brood-rearing habitats. Wildlife Biology 13(supplement 1):42-50. | i |
| Hays, D. W., M. J. Tirhi, and D. W. Stinson. 1998. Washington State Status report for the Sage Grouse. Washington Department of Fish and Wildlife, Olympia. 62 pp. | iii,iv |
| Herrick, J. E., J.W. Van Zee, K. M. Havstad, L. M. Burkett, and W.G. Whitford. 2005. Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems. USDA-ARS, Jornada Experimental Range, Las Cruces, NM (Distributed by University of Arizona Press, Tucson, AZ). | viii |
| Hockett, G. A. 2002. Livestock impacts on the herbaceous components of sage grouse habitat: a review. Intermountain Journal of Sciences 8:105-114. | i |
| Holloran, M. J., R. C. Kaiser, and W. A. Hubert. 2010. Yearling greater sage-grouse response to energy development in Wyoming. The Journal of Wildlife Management 74:65-72. | i |
| Jamison, B. E., and M. F. Livingston. 2004. Sage-grouse evaluation in the shrub steppe ecosystem of the Yakama Reservation, Washington. Project Final Report, Interagency Agreement No. GP00065800. Yakama Nation Wildlife Resource Management, Toppenish, Washington. 343 pp+appendices. | viii |
| Johnson, D. H., M. J. Holloran, J. W. Connelly, S. E. Hanser, C. L. Amundson, and S. T. Knick. 2011. Influences of environmental and anthropogenic features on Greater Sage-grouse populations, 1997-2007.Pp. 407-450, in S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |
| Kilpatrick, A. M., S. L. LaDeau, and P. P. Marra. 2007. Ecology of West Nile virus transmission and its impact on birds in the western hemisphere. Auk 124(4):1121–1136. | i |
| Moynahan, B.J., M.S. Lindberg, J.J. Rotella, and J. W. Thomas. 2007. Journal Wildlife Management | i |

| Reference | Category |
|---|---|
| 71:1773-1783. | |
| Naugle, D. E., C. L. Aldridge, B. L. Walker, K. E. Doherty, M. R. Matchett, J. McIntosh, T. E. Cornish, M. S. Boyce. 2005. West Nile virus and sage-grouse: What more have we learned? Wildlife Society Bulletin 33(2): 616–623. | i |
| Nelle, P.J., K.P. Reese, and J.W. Connelly. 2000. Long-term effects of fire on sage grouse nesting. Journal of Range Management 53:586-591. | i |
| Rebholz, J. L. 2007. Influence of habitat characteristics on Greater Sage-grouse reproductive success in the Montana Mountains, Nevada. M. S. Thesis, Oregon State University, Corvallis. 64 pp. | viii |
| Rhodes, E. C., J. D. Bates, R. N. Sharp, and K. W. Davies. 2010. Fire effects on cover and dietary resources of sage-grouse habitat. Journal of Wildlife Management 74(4) 755-764. | i |
| Rich, T. 1985. Sage Grouse Population Fluctuations: Evidence for a 10-year Cycle. Technical Bulletin 85-1. Idaho State Office, USDI Bureau of Land Management. 28 pp. | viii |
| Ritchie, M. E., M. L.Wolfe, and R. Danvir. 1994. Predation of artificial sage grouse nests in treated and untreated sagebrush. Great Basin Naturalist 54:122-129. | i |
| Robb, L. and M. A. Schroeder. 2012. Appendix A.2 Habitat Connectivity for Greater Sage-grouse (Centrocercus urophasianus) in the Columbia Plateau Ecoregion. In, Washington Wildlife Habitat Connectivity Working Group. Washington Connected Landscapes Project: Analysis of the Columbia Plateau Ecoregion. Washington's Department of Fish and Wildlife, and Department of Transportation, Olympia, WA. Available from http://waconnected.org/columbia-plateau-ecoregion/ | iii |
| Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966–2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD. | viii |
| Schroeder, M. A. 1997. Unusually high reproductive effort by sage-grouse in a fragmented habitat in north-central Washington. Condor 99:933-941. | i |
| Schroeder, M. A. 2000. Population dynamics of greater and Gunnison sage-grouse: a review. Job Progress Report. Upland Bird Research. Washington Department of Fish and Wildlife. | vii |
| Schroeder, M. A., and R. K. Baydack. 2001. Predation and the management of prairie grouse. Wildlife Society Bulletin 29:24-32. | i |
| Schroeder, M. A., and W. M. Vander Haegen. 2006. Use of Conservation Reserve Program fields by Greater Sage-grouse and other shrubsteppe-associated wildlife in Washington state. Technical report prepared for U.S. Department of Agriculture Farm Service Agency. Washington Department of Fish and Wildlife, Olympia, Washington. | vii |
| Schroeder, M. A., and M. Vander Haegen. 2011. Response of Greater Sage-grouse to the Conservation Reserve Program in Washington State. Pages 517-529 in S. T. Knick and J. W. Connelly, (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology No. 38. | i |
| Schroeder, M. A., and W. M. Vander Haegen. 2014. Monitoring of Greater Sage-grouse and other breeding birds on the Winthrow Wind Power Project Site. Final Report. Washington Department of Fish and Wildlife, Olympia, WA.26 pp. | vii |
| Schroeder, M. A., J. R. Young, and C. E. Braun. 1999. Sage grouse (Centrocercus urophasianus). In A. Poole and F. Gill, (eds.). The Birds of North America, No. 425. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and the American Ornithologists' Union, Washington, D.C. | i |
| Schroeder, M. A. J. W. Connelly, C. L. Wambolt, C. E. Braun, C. A. Hagen, and M. R. Frisina 2006. Society for Range Management Issue Paper: Ecology and Management of Sage-Grouse and Sage-Grouse Habitat—A Reply. Rangelands 28: 3-7. | viii |
| Schroeder, M. A., M. Atamian, H. Ferguson, H. Ferguson, M. Finch, K. Stonehouse, and D. W. Stinson. 2014. Reintroduction of Greater Sage-grouse to Lincoln County, Washington. Progress Report. Washington Department of Fish and Wildlife, Olympia, Washington. | vii |
| Schroeder, M. A., D. Stinson, and M. Tirhi. 2003. Greater Sage-grouse (*Centrocercus urophasianus*). Priority Habitat and Species Management Recommendations Vol. IV: Birds. 19 pp. | iii |
| Shirk, A. J., M. A. Schroeder, L. A. Robb. 2015. Empirical validation of landscape resistance models: | i |

| Reference | Category |
|---|---|
| insights from Greater Sage-grouse (*Centrocercus urophasinaus*). Landscape Ecology 15 May 2015. http://dx.doi.org/10.1007/s10980-015-0214-4 | |
| Stevens, B. S, K. P. Reese, J. W. Connelly, and D. D. Musil. 2012. Greater Sage-grouse and fences: does marking reduce collisions? Wildlife Society Bulletin 36(2):297-303. | i |
| Stinson, C. M. 2014. Report on Conservation Efforts in Response to Threats to Greater Sage-grouse in Washington: An evaluation of Washington State's efforts to address threats to the viability of Sage-grouse listed in the Conservation Objective Team (COT) report (USFWS 2013). Lands Division, Washington Department of Fish and Wildlife, Olympia. 26 pp. | ii |
| Stinson, D. W., and M. A. Schroeder. 2012. Washington State Recovery Plan for the Columbian Sharptailed Grouse. Washington Department of Fish and Wildlife, Olympia. 159+x pp. | iii, iv |
| Stinson, C. M., and M. A. Schroeder. 2014. Sage-grouse Conservation in Washington: 2013. 48 pp. | ii |
| Stinson, D. W., D. W. Hays, and M. A. Schroeder. 2004. Washington State recovery plan for the Greater Sage-grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 109 pp. | iii, iv |
| Stonehouse, K. F. 2013. Habitat selection by sympatric translocated greater sage-grouse and Columbian sharp-tailed grouse in eastern Washington. M.S. thesis, Washington State University, Pullman, Washington. | viii |
| Stonehouse, K. F., L.A. Shipley, J. Lowe, M. T. Atamian, M. E. Swanson, and M. A. Schroeder. 2015. Habitat selection and use by sympatric, translocated Greater Sage-grouse and Columbian sharp-tailed Grouse. Journal of Wildlife Management 79(8):1308-1326. | i |
| Sveum, C. M. 1995. Habitat selection by sage-grouse hens during the breeding season in south-central Washington. M.S. Thesis, Oregon State Univ., Corvallis, OR. 85 pp. | viii |
| Thompson, T. R., A. D. Apa, K. P. Reese, K. M. Tadvick. Captive Rearing Sage-Grouse for Augmentation of Surrogate Wild Broods: Evidence for Success. Journal of Wildlife Management 79(6):998–1013. | i |
| USFWS (U.S. Fish and Wildlife Service). 2001. 12-month finding for a petition to list the Washington population of western sage grouse (*Centrocercus urophasianus phaios*). Federal Register 66(88):22984-22994. | v |
| USFWS (U.S. Fish and Wildlife Service). 2010. 12-month finding for a petition to list the Greater Sage grouse (*Centrocercus urophasianus*). Federal Register 75(No. 55: 23 March 2010):13910-14014. | v |
| USFWS. 2013. Greater Sage-grouse (Centrocercus urophasianus) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, CO. February 2013. 92+15 pp. | viii |
| USFWS (U.S. Fish and Wildlife Service). 2015. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List Greater Sage-grouse (*Centrocercus urophasianus*) as an Endangered or Threatened. Federal Register Vol. 80, No. 191 (October 2):59858-59942. | v |
| Walker, B. L., and D. E. Naugle. 2011. West Nile Virus ecology in sagebrush habitat and impacts on Greater Sage-grouse populations. Pp. 127-142, *in* S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |
| Wambolt, C. L., K. S. Walhof, and M. R. Frisina. 2001. Recovery of big sagebrush communities after burning in south-western Montana. Journal of Environmental Management 61: 243–252 | i |
| Wambolt, C. L., A. J. Harp, B. L. Welch, N. Shaw, J. W. Connelly, K. P. Reese, C. E. Braun, D. A. Klebenow, E. D. McArthur, J. G. Thompson, L. A. Torell, J. A. Tanaka. 2002. Conservation of greater sage-grouse on public lands in the western U.S.: implications of recovery and management policies. PACWPL-Policy Paper SG- 02-02. Policy Analysis Center for Western Public Lands, Caldwell, ID. 41 pp.. | viii |
| Wisdom, M. J., C. W. Meinke, S. T. Knick, and M. A. Schroeder. 2011. Factors associated with extirpation of sage-grouse. Pp. 451-472, in S. T. Nick and J. W. Connelly (eds.). Greater Sage-grouse: ecology and conservation of a landscape species and its habitats. Studies in Avian Biology vol.38. University of California Press, Berkeley, California. 646 pp. | i |

| Reference | Category |
|---|---|
| Zwickel, F. C. 1992. Blue Grouse (*Dendragapus obscurus*). A. Poole and F. Gill, (eds.) The Birds of North America No. 15. The Birds of North America, Inc., Philadelphia, Pennsylvania, USA. | i |

## PERSONAL COMMUNICATIONS

David Blodgett III, Wildlife Biologist
Wildlife Resource Management
Yakama Nation,
Toppenish, Washington

Colin G. Leingang, Wildlife Program Manager
JBLM Yakima Training Center
Yakima, Washington

Jason Lowe, Biologist
USDI Bureau of Land Management
Spokane District Office,
Spokane, Washington

Rick Roeder, Assistant Division Manager
Product Sales & Leasing
Department of Natural Resources

# APPENDIX A. Public Comments on the DRAFT Periodic Status Review for the Greater Sage-grouse.

| | Comment and response |
|---|---|
| **General comments** | Please keep the Greater Sage-grouse on the threatened species list. |
| | *Comment noted. By law (WAC 232-12-297), species listings and delistings by the state must be based solely on the biological status of the species and its continued existence in the state. We will review their status again in 5 years as required in the WAC for de-listed species.* |
| | Washington needs to continue to list the Greater Sage-grouse as a threatened species under the state Endangered Species Act for the following reasons:<br>• Multiple factors affect sage-grouse and their habitat including increased fire frequency, fragmentation, fences, past and ongoing livestock grazing, cheatgrass, West Nile virus, roads, and climate change.<br>• The current statewide population is nowhere near the estimated minimum viable population of 3,200 identified in the recovery plan for considered down-listing to threatened.<br>• Multiple transmission lines and I-90 create a barrier and effectively isolate the YTC and Douglas County populations.<br>• As stated in the recovery plan, the two main populations are too small to be considered viable. |
| | *Thanks, we agree that sage-grouse should remain on the state list of threatened species.* |
| | As defined in WAC 232-12-297, Section 2.4, classifying a species as state endangered means "any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state." We think that a continuing decline of suitable habitat and stagnant or declining populations, even with cooperative management and conservation efforts to remove threats, warrants reclassification of greater sage grouse from state threatened to state endangered. |
| | *The state recovery plan (Stinson et al. 2004:57) identifies the point at which the species will be considered for up-listing to state-endangered. If the population declines to less than 650 sage-grouse in Washington and the population continues to decline, WDFW would propose uplisting the species to endangered.* |
| | Retaining the Sage-grouse on the state's threatened species list is not necessary. There is very little supporting evidence that they are in fact threatened; it's pretty clear the agenda behind this is simply to eliminate public access just like the rest of the western states. I recommend their removal from ANY protected or threatened list. |
| | *Our recommendation to retain sage-grouse as threatened species is based solely on the biological status of the species, as required in state regulation (WAC 232-12-297); there is no wider agenda. The evidence that the species is still threatened is clear, as outlined in the status review.* |
| | In an effort to recover the sage-grouse, it would seem reasonable for the Department to begin farm-raising them. |

| | |
|---|---|
| | *Rearing pheasants for release before the upland game opener is much easier than rearing grouse that are intended to survive and repopulate an area. Captive rearing for release, is a near last resort for many species due to the great expense, and the released animals can be inbred or otherwise not well adapted to life in the wild. This includes grouse, as most efforts we are aware of have had limited success. Sage-grouse seem to be more susceptible to diseases in captivity and success in past studies was hampered by issues of nutrition and low fertility of eggs. Birds from incubator and hand-rearing survive poorly upon release; parent-reared chicks have better survival rates, but are more much more costly to produce. Of several attempts to captive rear Sage-grouse, two produced small numbers of chicks at great expense, although a recent study reported some success by captive hatching of eggs and facilitation of adoption of the young chicks into the brood of a wild female; one advantage is that it can avoid predation of the eggs and increase the size of wild broods (Thompson et al. 2015). This would require very intensive monitoring of hens, but it may be worth investigating in the future. As discussed in this report and the recovery plan, the main issue inhibiting recovery for these species, and Sage-grouse in particular, is the shortage of high quality habitat.* |
| **Management Activities** | The state recovery plan (Stinson et al. 2004) should be updated to include the latest science. |
| | *We agree the background literature review is due for an update, but the basic strategies and recovery objectives are still sound. This has been precluded by other listing and recovery activities.* |
| | We recommend the following for sage-grouse recovery:<br>• Exclude new transmission lines from priority sage-grouse habitat;<br>• A moratorium on permitting wind projects in occupied sage-grouse habitats;<br>• Set a limit of 10 dBA above defined ambient noise level of 15 dBA within 4 miles of leks and identified wintering habitats;<br>• A 7-inch grass height requirement should be adopted into State of Washington policy for all grazing management decisions on state lands;<br>• Mandate rest from grazing to allow native perennial grasses to recover in areas where cheatgrass has become a significant component of the understory.<br>• Do everything in its power to avoid the construction of additional fences in sage grouse habitats, and to remove those fences that currently exist.<br>• To avoid mortalities from West Nile virus, minimize the creation of new ponds in sage grouse habitat;<br>• Minimize the probability of large-scale fire in sage grouse habitat, without resorting to techniques that themselves destroy or degrade sage grouse habitats;<br>• Codify a moratorium on vegetation projects that reduce or eliminate sagebrush;<br>• Where road densities exceed 0.7 linear miles per square mile in occupied sage grouse habitats, existing roads should be decommissioned and revegetated;<br>• Adopt 4-mile lek buffers preventing any industrial uses in sage grouse habitats;<br>• Adopt a 3% surface disturbance limit, calculated per each square mile in priority sage-grouse habitat. |
| | *WDFW includes many of these policies and provisions in the HCP for its agency-owned lands that is expected to be completed early this year. Some of these recommendations have been implemented (e.g. fence marking, removal; 7-inch stubble height; see discussion under Management Activities). However, the HCP will not influence management of, nor impose restrictions on other public or private lands. WDFW has little authority to impose such management on other land ownerships, but does provide recommendations to land managers and regulatory agencies. WDFW is also engaged in providing technical review in the* |

| | |
|---|---|
| | *development and implementation of other conservation efforts, including Farm Bill programs, the Sage-grouse Initiative, and a Candidate Conservation Agreement with Assurances for Sage-grouse. These are briefly described in the Draft.* |

# Washington State Status Reports, Periodic Status Reviews, Recovery Plans, and Conservation Plans

## Status Reports

| | |
|---|---|
| 2015 | Tufted Puffin |
| 2007 | Bald Eagle |
| 2005 | Mazama Pocket Gopher, Streaked Horned Lark, and Taylor's Checkerspot |
| 2005 | Aleutian Canada Goose |
| 2004 | Killer Whale |
| 2002 | Peregrine Falcon |
| 2000 | Common Loon |
| 1999 | Northern Leopard Frog |
| 1999 | Olympic Mudminnow |
| 1999 | Mardon Skipper |
| 1999 | Lynx Update |
| 1998 | Fisher |
| 1998 | Margined Sculpin |
| 1998 | Pygmy Whitefish |
| 1998 | Sharp-tailed Grouse |
| 1998 | Sage-grouse |
| 1997 | Aleutian Canada Goose |
| 1997 | Gray Whale |
| 1997 | Olive Ridley Sea Turtle |
| 1997 | Oregon Spotted Frog |
| 1993 | Larch Mountain Salamander |
| 1993 | Lynx |
| 1993 | Marbled Murrelet |
| 1993 | Oregon Silverspot Butterfly |
| 1993 | Pygmy Rabbit |
| 1993 | Steller Sea Lion |
| 1993 | Western Gray Squirrel |
| 1993 | Western Pond Turtle |

## Periodic Status Reviews

| | |
|---|---|
| 2015 | Brown Pelican |
| 2015 | Steller Sea Lion |

## Recovery Plans

| | |
|---|---|
| 2012 | Columbian Sharp-tailed Grouse |
| 2011 | Gray Wolf |
| 2011 | Pygmy Rabbit: Addendum |
| 2007 | Western Gray Squirrel |
| 2006 | Fisher |
| 2004 | Sea Otter |
| 2004 | Greater Sage-Grouse |
| 2003 | Pygmy Rabbit: Addendum |
| 2002 | Sandhill Crane |
| 2001 | Pygmy Rabbit: Addendum |
| 2001 | Lynx |
| 1999 | Western Pond Turtle |
| 1996 | Ferruginous Hawk |
| 1995 | Pygmy Rabbit |
| 1995 | Upland Sandpiper |
| 1995 | Snowy Plover |

## Conservation Plans

| | |
|---|---|
| 2013 | Bats |

Status reports and plans are available on the WDFW website at:
http://wdfw.wa.gov/publications/search.php