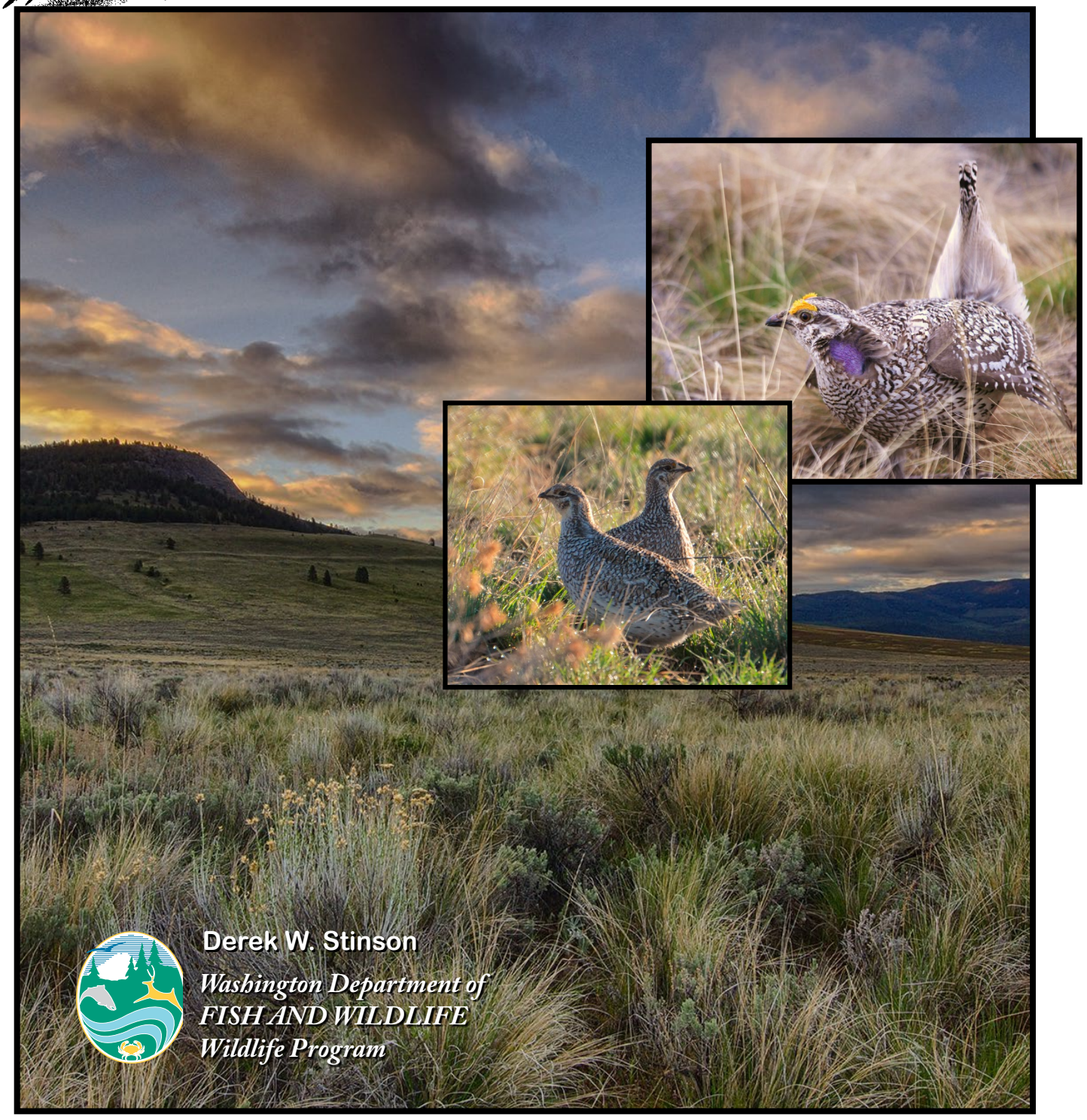
STATE OF WASHINGTON December 2017

Periodic Status Review for the Columbian Sharp-tailed 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 220-610-010 and 220-200-100). 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 220-610-110). These 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. These periodic reviews include an update on the species status to determine whether the species warrants its current listing or deserves reclassification. The agency notifies the general public and specific parties interested in the periodic status review, at least one year prior to the end of 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 be changed from its present state, the Department prepares documents to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act.

This final periodic status review for the Columbian Sharp-tailed Grouse was reviewed by species experts and was available for a 90-day public comment period from August 25 to November 23, 2017. All comments received were considered during the preparation of the final periodic status review. The Department intends to present the results of this periodic status review to the Fish and Wildlife Commission at the December 8-9, 2017 meeting in Olympia.

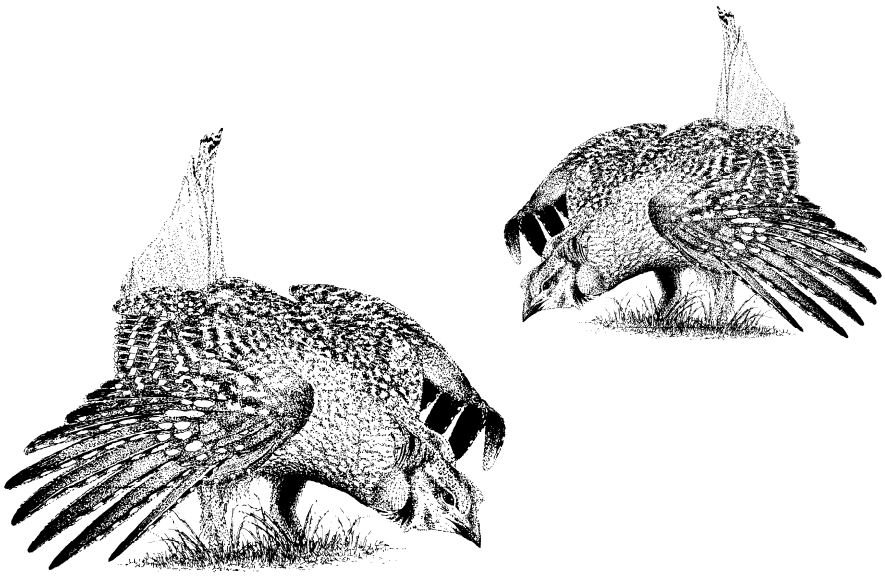
This report should be cited as:

Stinson, D. W. 2017. Periodic Status Review for the Columbian Sharp-tailed Grouse in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 17+ iii pp.

On the cover: inset photo of male sharptail by Mike Schroeder; two subadults by Kourtney Stonehouse; background photo of Tunk Valley in Okanogan County by Jeff Heinlen

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

Periodic Status Review for the Columbian Sharp-tailed Grouse in Washington



Prepared by
Derek W. Stinson

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

December 2017

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

ACKNOWLEDGEMENTS

The draft was improved by contributions and reviews by Jeff Heinlen, Mike Schroeder, Kourtney Stonehouse, Mike Atamian, Gary Wiles, Hannah Anderson, and Lori Salzer. We thank our partners in conservation, including the Colville Confederated Tribes, Bureau of Land Management, Spokane Audubon, Wenatchee Sportsmen, Lincoln County Conservation District, researchers from Washington State University and University of Idaho, and others. We also appreciate the cooperation of sister wildlife agencies in Idaho, Utah, and British Columbia that granted permission for translocation of Sharp-tailed Grouse to Washington.

EXECUTIVE SUMMARY

The Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), the rarest of six extant subspecies of Sharp-tailed Grouse, was the most abundant and important game bird in eastern Washington during the 1800's. However, numbers declined dramatically with the conversion of large areas of Palouse prairie, the Klickitat region, and arable shrub-steppe in the Columbia Basin to cropland. The statewide population continued to decline through the 20th century, and the species was listed as a state threatened species by the Washington Fish and Wildlife Commission in 1998.

Habitat quantity, quality, and fragmentation limit the populations. Good Sharp-tailed Grouse nesting habitat contains a mix of perennial bunchgrasses, forbs, and a few shrubs, and critical winter habitats are riparian areas with deciduous trees and shrubs that provide cover, berries, seeds, buds, and catkins. Historically, the highest densities of Sharp-tailed Grouse were in mesic grassland and steppe types where annual precipitation averaged at least 11 inches annually. Most of these areas are now in cropland or orchards, and many areas that were not converted to cropland have shallow soils or steep slopes, factors that negatively affect productivity for Sharp-tailed Grouse.

Sharp-tailed Grouse persist in eight scattered populations in Lincoln, Douglas, and Okanogan counties, and the Colville Indian Reservation. Declines of some remnant populations have continued due to degradation of habitat, isolation, and possibly declining genetic health. At least one local population (Horse Springs Coulee) has gone extinct since 2000. The statewide population estimate increased partly in response to translocations and habitat restoration from 665 in 2004 to 894 in 2015, but after the 2015 fires, dropped to 608 in 2017. The recent fires, which affected >700,000 ac of historical sharp-tailed grouse habitat, may have improved habitat condition in the longer term, but the immediate effect was negative, and some riparian cover will likely need to be replanted.

WDFW lands help support several of the remnant populations, but these lands alone are too small to support viable populations; suitable conditions of surrounding lands is essential for recovery. The remaining populations in Washington are small, relatively isolated from one another, and are not likely to persist unless they increase in size. Habitat restoration and enhancement and population augmentation using birds from other states are ongoing and have prevented extirpation of at least one subpopulation, but additional areas need to be identified for future reintroductions and prioritized to help focus habitat restoration efforts. The U.S. Department of Agriculture's Conservation Reserve Program (CRP) provides a financial incentive for private landowners to establish and maintain perennial vegetation. State Acres for Wildlife Enhancement (SAFE), an initiative under the CRP program with stricter planting requirements, may boost grouse populations; >70,000 ac have been enrolled since 2010 for Greater Sage-grouse and Sharp-tailed Grouse habitat in Douglas County. Land enrolled in SAFE are written up as 10 or 15 year contracts, however, CRP enrollment is voluntary, and re-enrollment is affected by commodity prices. Perhaps as a result of recent fires, and a hard winter in 2016/17, we have not yet seen a clear boost to numbers in Douglas County.

The recovery plan (Stinson and Schroeder 2012) stipulates that the species will be considered for up-listing to endangered status if the population drops below 450 birds. However, all of the local populations have dropped below 200, and the leks in the Tunk, Siwash, and Greenaway areas are all precariously low. If the recent decline continues, the listing status may need to be revisited before the next scheduled status review in ~2021. For now, to be consistent with the recovery plan, it is recommended that the Columbian Sharp-tailed Grouse remain listed as threatened in Washington.

INTRODUCTION

The Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*, Fig. 1) is the rarest of six extant described subspecies of Sharp-tailed Grouse, a bird of grasslands and shrublands. They were historically the most abundant gamebird in Washington, with populations that likely numbered in the tens of thousands. With the conversion of grassland and shrub habitat to cropland, they dwindled to <1,000 birds. Sharp-tailed Grouse were last hunted in parts of Washington in 1987, and they were added to the state list of threatened species in 1998. This review briefly updates the status information in the 2012 recovery plan (Stinson and Schroeder 2012).

Figure 1. Male Sharp-tailed Grouse on the Scotch Creek Wildlife Area, in Okanogan County (*photo by Mike Schroeder*).

The spring breeding activities of male Sharp-tailed Grouse provide one of the most interesting wildlife spectacles in North America. Males gather at traditional lek sites (dancing grounds) where they engage in specialized behavioral displays to attract females in hopes of mating. Sharp-tailed Grouse are culturally significant to Native Americans, and the Colville Confederated Tribes have long been a partner with Washington Department of Fish and Wildlife (WDFW) in efforts to restore Sharp-tailed Grouse populations in north-central Washington.

DISTRIBUTION

Currently, Columbian Sharp-tailed Grouse occupy <10% of their historical range which spanned from central British Columbia south across eastern Washington to northeastern California and to western Colorado (Fig. 2; Hoffman et al. 2015). In Washington, Columbian Sharp-tailed Grouse (hereafter 'Sharp-tailed Grouse', unless referring specifically to the subspecies) currently occupy eight isolated areas in Douglas, Lincoln, and Okanogan counties that encompass perhaps 2.8% of their historical range (Fig. 3; Schroeder et al. 2000).

NATURAL HISTORY

Habitat requirements. Good Sharp-tailed Grouse habitat contains a mix of perennial bunchgrasses, forbs, and shrubs. Most historical records are from areas that average ≥11 inches of annual precipitation, and the highest densities were probably in the more mesic grassland and meadow steppe types. These 'meadow steppe' communities in Washington have several grasses, including Bluebunch Wheatgrass (*Pseudoroegneria spicata*) and Idaho Fescue (*Festuca idahoensis*) (Daubenmire 1970). The most important vegetation zones for Sharp-tailed Grouse historically were the Palouse, Wheatgrass/Fescue, Three-tip Sagebrush, Big Sage/Fescue, and Central Arid Steppe zones (Cassidy 1997).

Riparian areas with deciduous trees and shrubs, including water birch, serviceberry, chokecherry, rose, hawthorn, snowberry, cottonwood, and aspen, provide critical winter cover and food, such as berries,

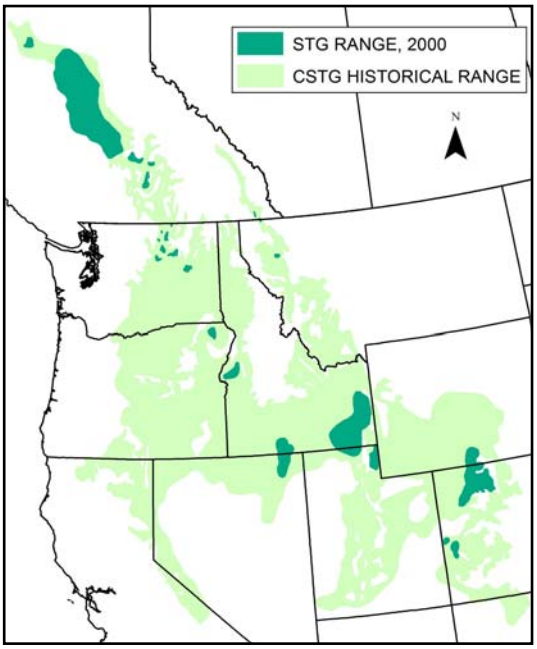


Figure 2. Historical and current range of the Columbian Sharp-tailed Grouse.

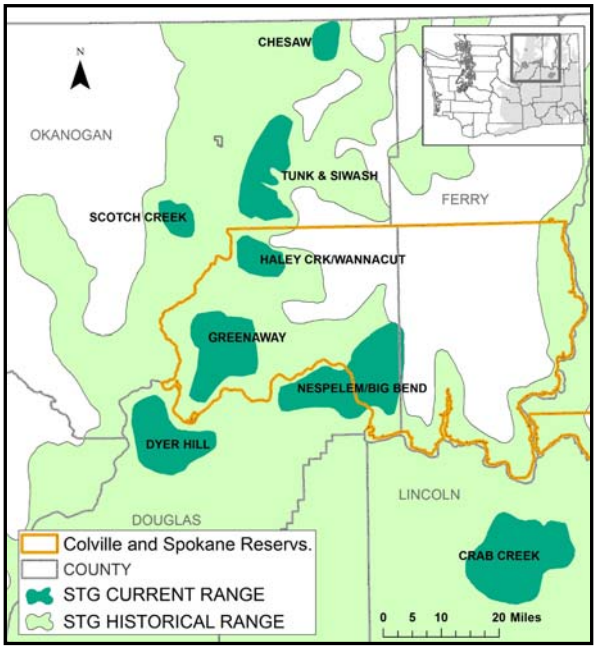


Figure 3. Historical and current ranges of Columbian Sharp-tailed Grouse in Washington.

seeds, buds, and catkins, particularly when the ground is snow-covered. Some areas with suitable nesting and brood-rearing habitat may remain unused because they lack adequate winter resources. Shortages of nesting, brood rearing, and wintering habitats are important factors limiting population recovery.

Diet. Plants comprise most of the diet of Sharp-tailed Grouse year-round. Jones (1966) reported that the spring diet in Washington included grass blades, especially Sandberg Bluegrass (*Poa secunda*), Sagebrush Buttercup (*Ranunculus glaberrimus*), Common Dandelion flowers (*Taraxacum officinale*), beetles, and grasshoppers. Important winter foods, particularly when the ground is snow-covered, include buds and catkins of water birch, cottonwood, and aspen, and fruits of serviceberry, chokecherry, rose, hawthorn, and snowberry. Insects, particularly grasshoppers, ants, and beetles, comprise only a small

Figure 4. Columbian Sharp-tailed Grouse breeding habitat in the Greenaway Springs area, Colville Indian Reservation, Washington (*photo by author*).

Figure 5. Sharp-tailed Grouse eating buds in trees along Scotch Creek during December 2012 *(photo by Jim Olson).*

proportion of the diet of adults, but 92–100% of the diet of 2–3 week old chicks (Hoffman et al. 2015).

Lek mating system. The mating season generally begins about the same time each year (~late March), but varying somewhat depending on snow conditions. At the beginning of the breeding season, male Sharp-tailed Grouse establish small territories on the dancing grounds, or 'leks'; they gather before dawn each morning where they engage in specialized behavioral displays to attract females in hopes of mating. Leks may contain 2–50 males (Connelly et al. 1998, WDFW data), but 8–12 males are more typical (Johnsgard 1973). The morning display period on the lek is variable, but typically lasts 2–4 hours, lasting longer on cloudy mornings. Males return in the evening and display during the 1–3 hours before dark. In lek mating systems, females mate with established territorial males at a lek, and a male may mate with many females. Most male Sharp-tailed Grouse return to the same lek in the fall and again the following spring (Bergerud 1988a, Giesen and Connelly 1993, Drummer et al. 2011). Males exhibit greater fidelity to leks than females (Boisvert 2002, Drummer et al. 2011).

Sites used for leks are typically a small area (up to ¼ ac) on open elevated knolls or ridges with good visibility. Leks may shift location over time or cease to exist with population declines or changes in vegetation, but many persist in the same location for many years (Sexton and Gillespie 1979, Gratson 1988, Berger and Baydack 1992); one lek in eastern Washington seemed to move on an annual or biannual basis among >10 locations (Schroeder 2006).

Home range and movements. Seasonal home ranges of Columbian Sharp-tailed Grouse are generally <494 ac and frequently <247 ac (Hoffman et al. 2015). The average spring-summer home range (95% fixed kernal) in Lincoln County was 650 ac for 29 males, and 2,633 ac for 14 females (Stonehouse et al. 2015), but these birds had been translocated. Most females nest and raise broods within 1.2 mi of their lek of capture (Schroeder 1996, Hoffman et al. 2015). Sharp-tailed Grouse appear to return to the same winter ranges each year (Collins 2004, Boisvert et al. 2005). In Douglas County, Sharp-tailed Grouse moved up to 8.5 miles between breeding and wintering ranges (Schroeder 1994), but the average was 1.7 mi for 41 males and 2.7 mi for 28 females (Schroeder 1996).

Nesting and brood rearing. Females in Washington initiate incubation of a clutch of 8–12 eggs from mid-April to late June (average 8 May; Schroeder 1996). Most females will renest if their initial clutch is lost to predation (McDonald 1998). Nest success (% nests that hatch ≥1 egg) varies year-to-year depending on habitat conditions and predator populations. During 1992–1996, nest success averaged 43% (n = 67), but renesting resulted in 65% of females hatching a clutch (Schroeder 1996). Females remained within 0.6 mi of their nest site during spring and early summer, and remained with their brood all summer, moving to open areas containing succulent vegetation and insects (Schroeder 1996). By three months of age, the size, habits, and flight abilities of Sharp-tailed Grouse are well developed and juveniles are not easily distinguished from adults.

Figure 6. Successful sharp-tailed grouse nest in Lincoln County (*photo by B. Maletzke*).

Chick survival and recruitment. Chick survival to ~50 days of age is important for maintaining populations; the period of highest chick mortality is the first 2–3 weeks post-hatch, because young chicks cannot fly or maintain their internal body temperature (Bergerud 1988b, Dobson et al. 1988, Manzer and Hannon 2008). Prolonged cold and wet weather in the first week reduces chick survival (Bousquet and Rotella

1998, Roersma 2001, Manzer and Hannon 2008), but rain during the 10 days prior to hatching may improve survival, due to its effect on plant growth and insect numbers (Goddard and Dawson 2009). Goddard and Dawson (2009) reported the most important variables affecting chick survival to 35 days were, in order of importance: 1) weather during the first week; 2) hatch date; 3) weather during 10 days pre-hatch; 4) distance moved during the first week; 5) female body condition; and 6) female age. Drought conditions likely also affect chick survival and recruitment (Collins 2004).

Adult survival and longevity. Most annual survival rates range from 20–57% (Hoffman et al. 2015). McDonald (1998) reported that survival during 1995–96 on the Colville Indian Reservation and Swanson Lakes Wildlife Area was 54.6 $\pm$ 0.84% (n = 38, 19 males, 19 females). Mortality was somewhat higher during the reproductive period because females are reluctant to abandon their broods, and males may be more vulnerable when gathered on a lek. The longevity record for Sharp-tailed Grouse is 7.5 years (Arnold 1988), but few live past 3 years (Hoffman et al. 2015).

Predation. Predation is an important factor affecting the population dynamics of Sharp-tailed Grouse and is typically responsible for most mortalities (>85%; Hoffman 2015). Predation rate is generally considered a function of habitat quality (Hoffman et al. 2015). Where habitat is limited, fragmented, or of poor quality, nests and birds are more vulnerable because they are more visible, foraging and travel times to obtain adequate food may be greater, and escape cover may be limited (Schroeder and Baydack 2001). Human-altered landscapes often provide food subsidies, nest sites, and hunting perches for raptors, Common Ravens (*Corvus corax*), and Coyotes (*Canis latrans*) resulting in relatively high predator densities (Stinson and Schroeder 2012). The number of raptors, corvids, and mammals affect nest success, juvenile survival, and survival of breeding-age Sharp-tailed Grouse (Schroeder and Baydack 2001). McDonald (1998) did not provide percentages, but noted that most nest predation in Lincoln and Okanogan counties appeared to be by ravens, with coyotes the next most frequent nest predator. Of 98 mortalities of radio-marked birds in Lincoln County from 2005-2014, 27 were attributed to avian predators and 7 to mammals (Schroeder et al. 2015). Manzer and Hannon (2008) reported that the odds of a female having a successful nest were 8 times greater in landscapes with <7.8 corvids/mi^2 (3/km^2) than in areas with >7.8 corvids/mi^2.

Other sources of mortality. Additional sources of mortality include collisions with fences, wires, and vehicles; wire fences are particularly problematic for grouse. Sharp-tailed Grouse are occasionally mistaken for other upland bird species and shot, including one in 2016 (WDFW data). They are also occasionally affected by diseases, parasites, and toxins. West Nile Virus has not been detected in Sharp-tailed Grouse, but has been reported in Greater Prairie-chickens (*Tympanuchus cupido*) and Greater Sage-grouse (*Centrocercus urophasianus*) (Center for Disease Control, http://www.cdc.gov/ncidod/dvbid/westnile/birdspecies.htm).

Sub-lethal doses of insecticide may increase the rate of mortality from diseases, parasites, and predation (McEwen and Brown 1966, Zeakes et al 1981, *in* Peterle 1991). Seeds are commonly treated with neonicotinoids, which can be acutely toxic to some small birds; the risks from sublethal doses for larger birds, such as grouse, need further study (Mineau and Palmer 2013, Gibbons et al. 2015).

POPULATION AND HABITAT STATUS

Historical populations. Columbian Sharp-tailed Grouse were an abundant and important game bird in eastern Washington during Euro-American settlement. They declined dramatically with the spread and intensification of agriculture and were extirpated from significant portions of their historical range in Washington by the 1920s (Stinson and Schroeder 2012). Hunting seasons for Sharp-tailed Grouse were

shortened and bag limits were reduced steadily beginning in 1897. The season was closed statewide from 1933 to 1953, but short seasons were opened from 1954 to 1987. The population continued to decline after 1950, perhaps a time-lagged response to past habitat loss, but probably also due to continued loss of riparian winter habitat and intensive livestock grazing on remaining areas of steppe vegetation that degraded habitat. The population declined almost continually between 1960 and 2001 (Fig. 7).

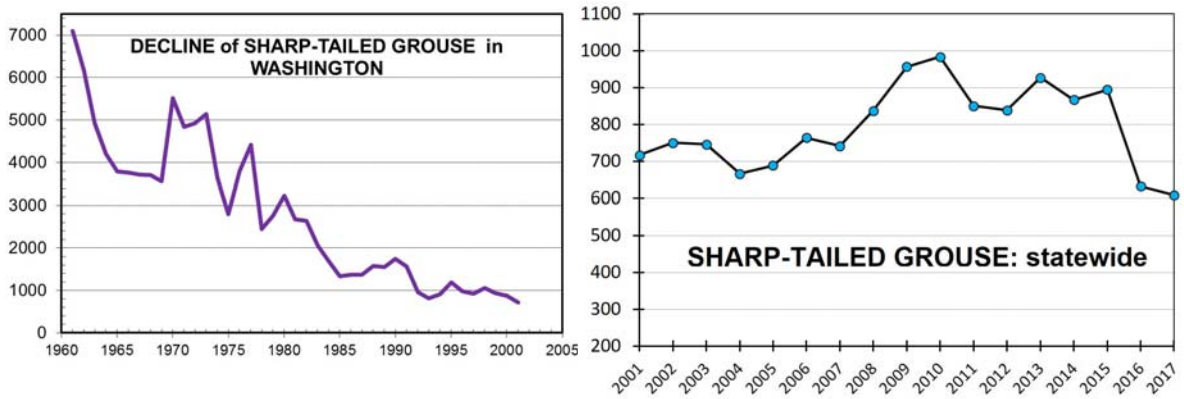


Figure 7 (left). Estimated annual total population size of Columbian Sharp-tailed Grouse in Washington, 1961–2001, and Figure 8 (right) 2001–2017.

Current population status. Sharp-tailed Grouse persist in eight scattered populations located in Lincoln County, the Colville Indian Reservation, northern Douglas County, and valleys and foothills east and west of the Okanogan River in Okanogan County (Fig. 3). Declines of some remnant populations have continued in recent years, likely due to continued fragmentation and degradation of habitat, isolation of small populations, and a concurrent decline in genetic diversity. The small remaining populations in Washington may not persist unless they are able to increase in size. One population, Horse Springs Coulee, appears to have gone extinct since 2000. The statewide population estimate dipped to 665 in 2004, then increased to nearly 1,000, probably in response to augmentations and habitat restoration (Fig. 8). The estimate for 2015 was 894, but after late season fires, the estimate dropped to 632 in 2016, and 608 in 2017, although a few birds were later observed in the Tunk Valley where none were counted during surveys. Unfortunately, none of the populations are above 200 birds, the level that Toepfer (1990) suggested was sustainable for a few decades; the Nespelem population, a former stronghold has continued to decline, and the Tunk & Siwash population has dropped dramatically (Table 1). Some of the recent decline and volatility can be attributed to the fires, that likely killed some birds and required the

Table 1. Sharp-tailed Grouse estimates for local populations and Washington total, 2008-2017.

Year	Total	Scotch Creek	Tunk & Siwash	Chesaw	Dyer Hill	Greenaway & Haley Crk	Big Bend	Nespelem	Crab Creek
2008	857	116	195	45	20	34	171	221	54
2009	980	54	236	121	70	30	153	243	57
2010	1007	60	244	54	80	26	195	271	66
2011	877	68	184	61	68	23	136	235	87
2012	865	62	139	45	96	24	185	210	97
2013	865	66	136	50	85	48	178	191	112
2014	858	65	118	39	64	80	173	172	147
2015	885	100	100	57	88	66	182	186	106
2016	631	22	58	44	66	38	122	136	144
2017	608	78	14	34	122	52	64	112	132

remainder to move to unfamiliar areas that may be less suitable and expose them to higher risk of predation.

Habitat status. Areas that may have historically supported the greatest numbers of Sharp-tailed Grouse, including the Palouse region, currently have very little suitable habitat or land dedicated to conservation. A larger portion of the current range than the historical range (43.9% vs. 22.2%) is public or tribal lands with significant portions dedicated to conservation or multiple uses (Stinson and Schroeder 2012). Lands supporting current populations include areas of the Colville Reservation (28%), and public lands managed by WDFW (6.9%), Washington Department of Natural Resources (WDNR, 4.8%), and the Bureau of Land Management (BLM, 4.1%) (Fig. 9).

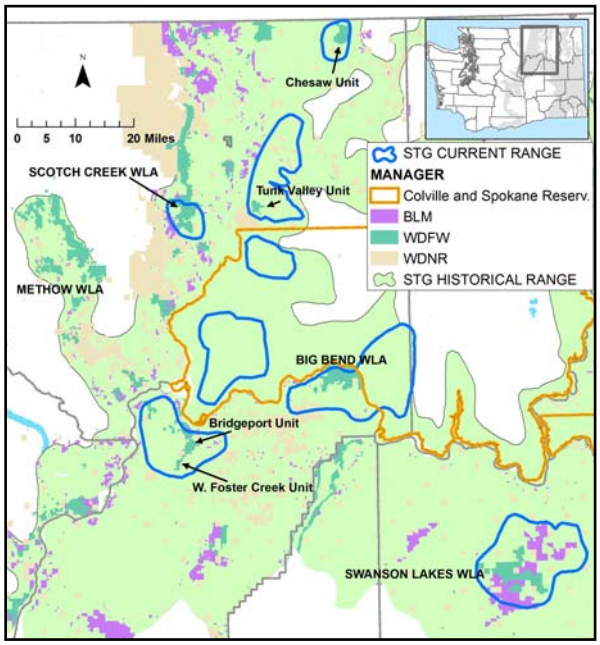


Figure 9. Current range of Sharp-tailed Grouse and important public lands.

Stinson and Schroeder (2012) described in detail the current condition of the historical and current ranges of Sharp-tailed Grouse in Washington. National Land Cover Data show that nearly 80% of the currently occupied area is in cover types potentially suitable for Sharp-tailed Grouse (shrub/scrub, grassland, CRP), whereas less than 10% is in cultivated crops, which is generally not suitable (Fig. 10). In the historical range, cover types potentially suitable for Sharp-tailed Grouse (i.e., shrublands, grassland, and CRP) total about 47% but large portions of this type are at the dry end of suitable (≤11" precipitation), have thin rocky soils, have been degraded by past or ongoing heavy grazing, and/or are highly fragmented by agriculture and steep slopes. Grasslands, historically the most important cover types, now account for only 6.7% of the historical range, and the Palouse prairie, perhaps the historical center of abundance of Sharp-tailed Grouse in Washington, is one of the most endangered ecosystems in the United States (Noss et al. 1995; Weddell and Lichhardt 1998). The largest areas of remaining native grassland are along the breaks of the Snake and Grand Ronde rivers. These areas may be only marginally suitable for Sharp-tailed Grouse, however, due to the prevalence of steep ground (slopes of 45–70%; Tisdale 1986), and they have not been occupied by grouse since the 1950s. Many acres of

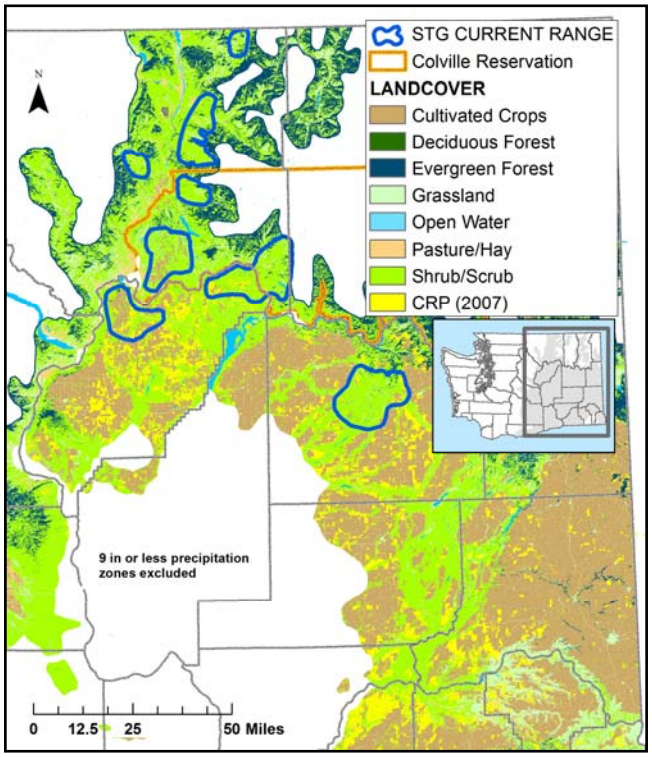


Figure 10. Landcover in the current and part of the historical range of Sharp-tailed Grouse in Washington.

cropland in the historical range were enrolled in CRP beginning in the late 1980s, but planted to exotic grasses; this older type CRP does not provide habitat suitable for Sharp-tailed Grouse.

More recent habitat issues include recent wildfires and degradation by feral horses (See *Wildfires* and *Livestock grazing* below).

FACTORS AFFECTING COLUMBIAN SHARP-TAILED GROUSE

Federal regulatory protection. The Columbian Sharp-tailed Grouse was petitioned for listing under the Endangered Species Act in 1995 and 2004, but listing was considered not warranted (USFWS 2006). The BLM considers the Columbian Sharp-tailed Grouse a 'sensitive' species.

State and county regulations. The Sharp-tailed Grouse is protected from 'take' as a threatened species by state law (RCW 77.12.020, RCW 77.15.130). Its habitat receives some protection through county critical area ordinances which generally require environmental review and habitat management plans for development proposals that affect state-listed species. On non-federal lands, the Growth Management Act (GMA) is Washington's primary regulatory tool to protect rare and threatened species from development impacts. 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 that "counties and cities should consult current information on priority habitats and species identified by the Washington State Department of Fish and Wildlife." Many counties use the federal and state lists of endangered, threatened, and sensitive species, and require review and mitigation before issuing permits for projects that would impact habitat. WDFW provides counties with Priority Habitat and Species (PHS) Program information to agencies, landowners, and consultants for land use planning and permit evaluation purposes; this includes maps and management recommendations (e.g. (http://wdfw.wa.gov/conservation/phs/mgmt_recommendations/ Schroeder and Tirhi 2003, Azerrad et al. 2011). Though the specific nature of protections vary across the counties, Douglas, Grant, Lincoln, and Okanogan counties either identify threatened, endangered, and sensitive species and their habitat in critical areas, or will with updates scheduled for 2017 or 2018. Known or discovered locations of Sharp-tailed Grouse and habitat triggers a process of avoiding, minimizing, and mitigating impacts. Counties also adopt 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 by zoning (e.g. ~1 dwelling/10–20 ac) may meet the needs of most species, but may exceed the tolerance of Sharp-tailed Grouse and other species of open spaces. Land use regulations generally provide some protection for wildlife and occupied habitat. However, recovery of Sharp-tailed Grouse will require increasing the populations and expanding occupied areas (Stinson and Schroeder 2012); regulations do not protect habitat that is not occupied, and generally do not prevent fragmentation of habitat in developing areas.

Habitat quantity, quality, fragmentation

Sharp-tailed Grouse populations in Washington are affected by the reduced quantity, fragmented nature, and uneven quality of remaining habitat available. These factors have resulted in the small size of remaining populations and multiple related issues affect the species' likelihood of persistence and ability to recover. Elsewhere, populations of fewer than 200 Sharp-tailed Grouse have not persisted due to demographic and genetic factors (Toepfer et al. 1990). Only the Nespelem population in Washington may exceed that number. Most of the eight areas currently occupied by Sharp-tailed Grouse are

separated by 10–20 km, and the Lincoln County population is separated from the next closest population (Nespelem) by ~40 km. Although annual movements of >40 km have been reported, they generally average <10 km (Hoffman et al. 2015), so several populations may be effectively isolated. Enhancement of habitat in occupied areas and, where possible, restoration of habitat to re-establish connections between occupied areas will be essential for recovery.

Conservation Reserve Program. The U.S. Department of Agriculture's Conservation Reserve Program (CRP) provides financial incentives for private landowners to establish perennial vegetation that will provide habitat for Sharp-tailed Grouse. However, many older CRP fields enrolled in the 1980s and 1990s were seeded to crested or intermediate wheatgrass, smooth brome, or other exotic grasses, and provide little habitat value to Sharp-tailed Grouse compared to native grassland. Fields in this condition need to be reseeded with native seed mixes in order to be of value to Sharp-tailed Grouse. More recently, the State Acres for Wildlife Enhancement (SAFE) programs have improved planting requirements that provide greater habitat value for Sharp-tailed Grouse (*see* SAFE under Management Activities). However, the vulnerability of a voluntary program is evident by the recent conversion back to agriculture of > 210,000 ac of CRP in Idaho (20% of available habitat; Gillette 2014:68).

Wildfires. Lighting storms ignited many fires in Eastern Washington in 2012, 2014, and 2015 that affected >700,000 ac of historical Sharp-tailed Grouse range, including large areas of occupied habitat (Fig. 11). The most significant of these for habitat were the Tunk Block, Okanogan Complex, Leahy Junction, Reach, and Apache Pass fires. Numbers of grouse on traditional lek sites in burned areas decreased dramatically in 2016, and several leks were inactive. Long-term effects will be negative where riparian wintering habitat does not recover. However, where grasses, a shrub component, and woody riparian food species recover, long-term effects may be positive; areas that had become completely dominated by shrubs, or invaded by conifers prior to the fires, may now have a healthier herbaceous community and be more suitable for Sharp-tailed Grouse.

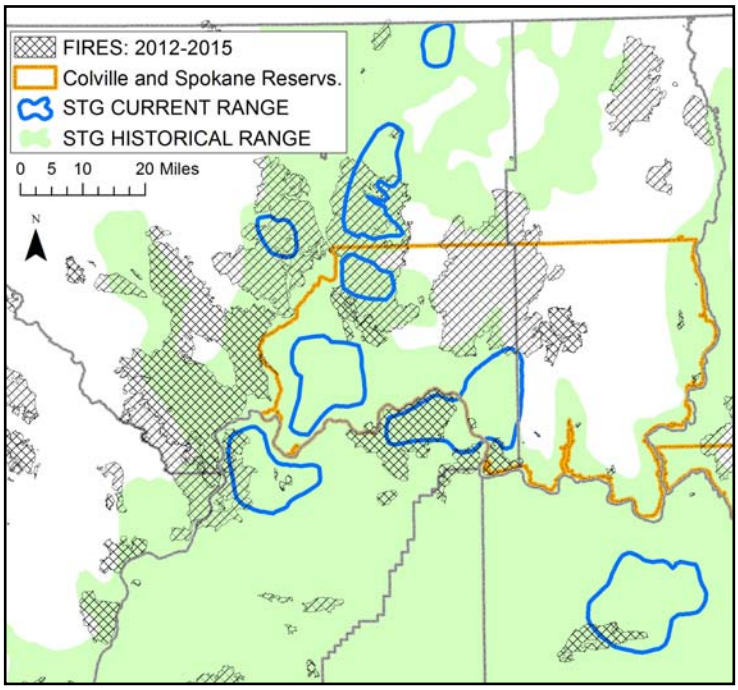


Figure 11. Wildfires, 2012-2015, and current range of Sharp-tailed Grouse in north-central Washington.

Livestock grazing. Livestock grazing is an important factor affecting Sharp-tailed Grouse populations (Bart 2000, Hoffman et al. 2015). The issue is complex and is reviewed in detail in Stinson and Schroeder (2012), and is only briefly outlined here. Bart (2000) concluded that past livestock grazing and its secondary effects were the primary cause of extirpation of Columbian Sharp-tailed Grouse on roughly 75% of their historic range. Although habitat conversion was a more important historical factor in Washington, the degraded condition of remaining habitat due to past heavy grazing and ongoing effects in local areas are important factors hurting recovery.

Excessive grazing by livestock or feral horses is known or believed to: 1) affect Sharp-tailed Grouse reproductive success through reduction of key food plants and insects (Hoffman and Thomas 2007); 2) reduce residual cover making females, nests, and chicks more vulnerable to predation (Schroeder and Baydack 2001, Flanders-Wanner et al. 2004, Manzer 2004); and 3) degrade riparian and upland shrub winter habitat. These impacts of grazing can eliminate local populations (Zeigler 1979, Kessler and Bosch 1982, Giesen and Connelly 1993, Hoffman and Thomas 2007).

Habitat degradation by feral horses has become a problem on the Colville Indian Reservation in recent years; two long established leks were abandoned as a result of feral horses congregating on the sites. The tribe has begun addressing this by capturing and adopting out the horses, and they are erecting a 40,000 ac exclosure around key Sharp-tailed Grouse areas (R. Whitney, pers. comm.).

Although livestock grazing has the potential to have major negative impacts to Sharp-tailed Grouse, it is probably essential to keep large ranches and farms intact because once ranches are subdivided and subsequently developed, the habitat is fragmented or permanently lost. Whether livestock grazing is compatible with Sharp-tailed Grouse on any particular site depends on many factors including the grazing history of the site, site condition, precipitation zone, year-to-year precipitation, livestock involved, stocking rate, and the season, frequency and duration of grazing. Although there have been few experimental studies designed to investigate the effects of grazing on Sharp-tailed Grouse populations, many correlative studies have documented low use and productivity, or absence of birds at sites with heavy grazing (Stinson and Schroeder 2012, Hoffman et al. 2015).

The impact of livestock grazing in the Columbia Basin is different than in other regions because the native shrub-steppe vegetation, characterized by an understory of bunchgrasses and a biotic crust (Belnap et al. 2001), reflects a recent evolutionary history without large numbers of large herbivores (Tisdale 1961, Daubenmire 1970, Mack and Thompson 1982). The herbaceous plants of the Palouse and sagebrush communities are sensitive to defoliation in the late spring and early summer, when heavy grazing reduces their vigor and coverage (Crawford et al. 2004). In general, heavy grazing in sagebrush steppe decreases perennial forbs and grasses, often increases the dominance of introduced annuals, and may increase the dominance of unpalatable woody species (Miller et al. 1994, Anderson and Inouye 2002). However, the low precipitation zones (<~ 9 in) where these impacts can be most severe was probably never ideal Sharp-tailed Grouse habitat.

Probably the most important negative impact of livestock on habitat in Washington has been the destruction of riparian deciduous habitat. In some riparian areas, the regeneration of shrubs and trees (e.g. water birch, hawthorn, serviceberry, aspen, willows, etc.) has been suppressed by decades of grazing (Franklin and Dyrness 1973, Paulson 1996). In some locations, these species have often been replaced by sagebrush and rabbitbrush, or exotics that are resistant to grazing such as bluegrass, thistles, teasel, dandelion, and reed canarygrass (Chaney et al. 1993).

MANAGEMENT ACTIVITIES

Population monitoring. WDFW staff conduct counts annually on ~40 active Sharp-tailed Grouse leks, and check another ~16 inactive leks for activity. Searches are also conducted in suitable habitat for leks that may have moved or are newly established. Similarly, the Colville Confederated Tribes, Fish and Wildlife Department conducts counts of ~30 leks on the reservation. Lek count data are used to estimate populations and trends.

Population augmentations. Since 1998, a total of 430 Sharp-tailed Grouse from healthy populations outside the state have been translocated and released to improve the vigor of local declining populations (Schroeder et al. 2015, 2016). During 1998–2000, 63 birds from southeastern Idaho (51 birds) and the Colville Indian Reservation (12 birds) were released on the Scotch Creek Wildlife Area, and apparently prevented extirpation of that population. An additional 367 birds from Idaho, Utah, and British Columbia were released during 2005-2013 at sites in Lincoln, Douglas, and Okanogan counties. Additional releases are planned in future years to stabilize existing populations and eventually establish additional populations.

Habitat restoration and enhancement. Restored fields are heavily used by Sharp-tailed Grouse (Stonehouse 2013, Stonehouse et al. 2015), and WDFW wildlife area staff have been restoring habitat on former agricultural fields with funding from the Bonneville Power Administration, the state Recreation and Conservation Office, BLM, and U.S. Fish and Wildlife Service. On Swanson Lakes WLA, 1,685 ac of shrub-steppe and grassland have been restored in the last 20 years, and 1,400 ac of adjacent BLM lands have been restored; projects totaling another 341 ac were recently completed. Over 1,500 ac of native shrub-steppe have been restored on Scotch Creek WLA, and >100,000 trees and shrubs have been planted to restore riparian wintering habitat. Current actions include planning restoration of a 90 ac feedlot on the Eder Unit. In Douglas County, a 300 ac restoration project on the Wells-Sagebrush Flats WLA was nearing completion in fall 2016, and 110 ac of old fields were being seeded in the Indian Dan Canyon and Central Ferry Canyon units. Also, restoration of 300 ac of alfalfa fields is on a list of planned projects on the Big Bend WLA, as funding is available. Additional restoration is needed on Scotch Creek, Swanson Lakes, Wells, and the Methow WLAs.

The SAFE program is a relatively recent initiative under CRP that has increased emphasis on the restoration of native vegetation and wildlife benefits. A total of >73,000 ac have been enrolled since 2010 in the Sage-grouse and Sharp-tailed Grouse SAFE program in Douglas County, and a total of 18,722 ac have been enrolled in the Shrub-steppe SAFE in Lincoln, Grant, and Okanogan counties. Perhaps as a result of recent fires, and a hard winter in 2016/17, we have not yet seen a clear boost to numbers in Douglas County.

Collision mortalities of grouse with fences can be dramatically reduced by attaching vinyl markers to increase the visibility of fence wire. WDFW has worked with partners to mark fences and remove many miles of unneeded fences on its lands in Lincoln, Douglas, and Okanogan counties; partners have included BLM, Lincoln County Conservation District, the Sage-grouse Initiative, and Wenatchee Sportsmen. Powerlines pose both a collision hazard and provide perches for raptors and ravens that prey on Sharp-tailed Grouse or their nests. A BLM funded project in 2011–12 removed 4.3 miles of distribution line on BLM and WDFW lands in Lincoln County.

Habitat acquisition. The new Big Bend WLA will help focus management of Sharp-tailed Grouse habitat in northern Douglas County. If the currently proposed third phase of acquisition is approved, the wildlife area will include a total of 20,571 ac of habitat. In the last 10 years, WDFW acquired the Charles and Mary Eder Unit (5,756 ac) and the Thornburg property (373 ac), now parts of the Scotch Creek WLA in Okanogan County. The Eder Unit is 10 mi west of the Chesaw Unit and was historically occupied by Sharp-tailed Grouse.

Conservation planning. A state recovery plan was completed in 2012 (Stinson and Schroeder 2012), with the goal of restoring and maintaining viable populations in a substantial portion of the species' historical range. An analysis of connectivity patterns for Sharp-tailed Grouse in the Columbia Plateau

was completed in 2012 (Robb and Schroeder 2012); the analysis modeled habitat concentration areas and movement corridors. Sharp-tailed Grouse have been identified as one of the focal species of the Arid Lands Initiative (Arid Lands Initiative 2014). An interagency Sharp-tailed Grouse working group meets annually to share information and identify and plan recovery tasks.

Research. A study of Greater Sage-grouse and Sharp-tailed Grouse habitat use and selection in Lincoln County (Crab Creek population) was recently completed (Stonehouse 2013, Stonehouse et al. 2015). This work examined how sympatric, translocated Sharp-tailed Grouse and sage-grouse used space and selected habitats within their home ranges, at nest sites, and at lek sites in spring-summer.

CONCLUSION AND RECOMMENDATION

The Columbian Sharp-tailed Grouse, once very abundant in Washington, declined concurrent with the conversion of habitat to agriculture in the 19th and 20th centuries. The population reached a low of ~665 in 2004. After translocations and ongoing restoration work, they rebounded to 894 in 2015, though some populations were still very small. While the longer term impact of the 2015 fires on Sharp-tailed Grouse numbers is uncertain, the 2017 population estimate was down to 608 and several traditional lek sites in burned areas were inactive. However, a few birds were later observed in an area where none were detected during surveys, suggesting some birds moved to inaccessible private lands and were not counted.

The recovery plan (Stinson and Schroeder 2012) stipulates that the species will be considered for up-listing to endangered status if the population drops below 450 birds. However, all of the local populations have dropped below 200, and the leks in the Tunk, Siwash, and Greenaway areas are all precariously low. If the recent decline continues, the listing status may need to be revisited before the next scheduled status review in ~2021. For now, to be consistent with the recovery plan, it is recommended that the Columbian Sharp-tailed Grouse remain listed as threatened in Washington.

REFERENCES CITED

The references cited in the *Periodic Status Review for the Columbian Sharp-tailed 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 October 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:

34.05.271(1)(c) RCW	Category Code
(i) Independent peer review: review is overseen by an independent third party.	i
(ii) Internal peer review: review by staff internal to the department of fish and wildlife.	ii
(iii) External peer review: review by persons that are external to and selected by the department of fish and wildlife.	iii
(iv) Open review: documented open public review process that is not limited to invited organizations or individuals.	iv
(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.	v
(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.	vi
(vii) Records of the best professional judgment of department of fish and wildlife employees or other individuals.	vii
(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).	viii

Reference	Category Code
Anderson, J. E., and R. S. Inouye. 2001. Landscape-scale changes in plant species abundance and biodiversity of a sagebrush steppe over 45 years. Ecological Monographs 71: 531–556.	i
Arid Lands Inititative. 2014. The Arid Lands Initiative – Shared Priorities for Conservation at a Landscape Scale. Summary Prepared by Sonia A. Hall (SAH Ecologia LLC) and the Arid Lands Initiative Core Team. Wenatchee, Washington. 39 pp.	viii
Arnold, T. W. 1988. Life histories of North American game birds: a reanalysis. Canadian Journal of Zoology 66:1906–1912.	i
Bart, J., 2000. Status assessment and conservation plan for Columbian Sharp-tailed Grouse. Forest and Rangeland Ecosystem Science Center, U. S. Geological Survey, Boise, Idaho. 58 pp.	i
Belnap, J., J. H. Kaltenenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldredge. 2001. Biological Soil Crusts: Ecology and Management. Technical Ref. 1730–2. USDI, BLM and	i

Reference	Category Code
USGS. 110 pp.	
Berger, R. P., and R. K. Baydack. 1992. Effects of aspen succession on Sharp-tailed Grouse, *Tympanuchus phasianellus*, in the Interlake Region of Manitoba. Canadian Field-Naturalist 106: 185–191.	i
Bergerud, A. T. 1988a. Mating systems in grouse. Pages 439–472 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse. University Minnesota Press, Minneapolis.	i
Bergerud, A. T. 1988b. Population ecology of North American grouse. Pages 578–685 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse. University Minnesota Press, Minneapolis.	i
Bergerud, A. T., and M. W. Gratson. 1988. Survival and breeding strategies of grouse. Pages 473–577 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse. University Minnesota Press, Minneapolis.	i
Black, A. E., J. M. Scott, E. Strand, R. G. Wright, P. Morgan, C. Watson. 1999. Biodiversity and Land-use History of the Palouse Bioregion: Pre-European to Present. Chapter 10, *in* T. D. Sisk, editor. Perspectives on the land-use history of North America: a context for understanding our changing environment. U. S. Geological Survey, Biological Resources Report USGS/BRD/BRS 1998-0003 (rev. Sept 1999). 104 pp.	viii
Boisvert, J. H. 2002. Ecology of Columbian Sharp-tailed Grouse associated with Conservation Reserve Program and reclaimed surface mine lands in northwestern Colorado. M. S. Thesis, University of Idaho, Moscow. 184 pp.	viii
Boisvert, J. H., R. W. Hoffman, and K. P. Reese. 2005. Home range and seasonal movements of Columbian sharp-tailed grouse associated with Conservation Reserve Program and mine reclamation. Western North American Naturalist 65: 36–44.	i
Bousquet, K. R., and J. J. Rotella. 1998. Reproductive success of sharp-tailed grouse in central Montana. Prairie Naturalist 30: 63–70.	i
Caldwell, P. J. 1976. Energetic and population considerations of Sharp-tailed Grouse in the aspen parkland of Canada. Ph. D. Dissertation. Kansas State University, Manhattan, Kansas. 113 pp.	
Cassidy, K.M. 1997. Land cover of Washington State: description and management. Volume 1, *in* K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, editors. Washington State Gap Analysis—Final Report. Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle. 260 pp.	i
Chaney, E., W. Elmore, and W.S. Platts. 1993. Livestock grazing on western riparian areas. Northwest Resource Information Center, Inc., Eagle, Idaho. Prepared for U.S. Environmental Protection Agency. 45 pp.	viii
Collins, C.P. 2004. Ecology of Columbian Sharp-tailed Grouse breeding in coal mine reclamation and native upland cover types in northwestern Colorado. M. S.Thesis, University of Idaho, Moscow. 201 pp.	viii
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
Daubenmire, R. F 1970. Steppe vegetation of Washington. Washington Agricultural Experiment Station, Technical Bulletin 62, Washington State University, Pullman. 131 pp.	i
Dobson, A. P., E. R. Carper, and P. J. Hudson. 1988. Population biology and life-history variation of gamebirds. Pages 73–97, in P. J. Hudson and M. R. W. Rands, editors. Ecology and Management of Gamebirds. BSP Professional Books, Oxford, UK. 263 pp.	i
Drummer, T. D., R. G. Corace III, and S. J. Jogren. 2011. Sharp-tailed Grouse lek attendance and fidelity in upper Michigan. Journal of Wildlife Management 75(2): 311-318.	i
Flanders-Wanner, B. L., G. C. White, L. L. McDaniel. 2004. Weather and prairie grouse: dealing with effects beyond our control. Wildlife Society Bulletin 32: 22–34.	i
Franklin, J. F., and C. T. Dyrness. 1973. Natural vegetation of Oregon and Washington. U.S.D.A.	i

Reference	Category Code
Forest Service General Techical Report, PNW-8. 417 pp.	
Gibbons, D., C. Morrissey, and P. Mineau. 2015. A review of the direct and indirect effects of neonicotinoids and fibronil on vertebrate wildlife. Environmental Science and Pollution Research 22:103–118.	i
Giesen, K. M., and J. W. Connelly. 1993. Guidelines for management of Columbian Sharp-tailed Grouse habitats. Wildlife Society Bulletin 21:325–333.	i
Gillette, G. L. 2014. Ecology and management of Columbian Sharp-tailed Grouse in southern Idaho: evaluating infrared technology, the Conservation Reserve program, statistical population reconstruction, and the olfactory concealment theory. Ph.D. dissert., University of Idaho, Moscow.	viii
Goddard, A. D., and R. D. Dawson. 2009. Factors influencing the survival of neonate sharp-tailed grouse *Tympanuchus phasianellus*. Wildlife Biology 15: 60–67.	i
Gratson, M. W. 1988. Spatial patterns, movements, and cover selection by sharp-tailed grouse. Pages 158–192 *in* A. T. Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse, Volume 1. University Minnesota Press, Minneapolis.	i
Hoffman, R. W., K. A. Griffin, J. M. Knetter, M. A. Schroeder, A. D. Apa, J. D. Robinson, S. P. Espinosa, T. J. Christiansen, R. D. Northrup, D. A. Budeau, and M. J. Chutter. 2015. Guidelines for the management of Columbian Sharp-tailed Grouse populations and their habitats. Sage and Columbian Sharp-tailed Grouse Technical Committee, Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming, USA.	i
Jones, R. E. 1966. Spring, summer, and fall foods of the Columbian sharp-tailed grouse in eastern Washington. Condor 68:536–540.	i
Johnsgard, P. A. 1973. Grouse and quails of North America. University of Nebraska Press, Lincoln, NE. 553 pp.	i
Kessler, W. B., and R. P. Bosch. 1982. Sharp-tailed grouse and range management practices in western rangelands. Pages 133–146 *in* J. M. Peek and P. D. Dalke, editors. Proceedings Wildlife-livestock Relationships Symposium, Coeur d'Alene, Idaho, 20–22 April., Forest, Wildlife and Range Experiment. Station, Proceedings 10, University of Idaho, Moscow, ID. 614 pp.	i
Lichthardt, J., R. K. Moseley. 1997. Status and Conservation of the Palouse Grassland in Idaho. Idaho Department of Fish and Game, Boise, Idaho. 30 pp+ appendices.	vii
Mack, R. N., and J. N. Thompson. 1982. Evolution in steppe with few large, hooved mammals. American Naturalist. 119:757–773.	i
Manzer, D. L. 2004. Sharp-tailed Grouse breeding success, survival, and site selection in relation to habitat measured at multiple scales. Ph.D. Dissertation, University of Alberta, Edmonton. 158 pp.	viii
Manzer, D. L. and S. J. Hannon 2008. Survival of sharp-tailed grouse *Tympanuchus phasianellus* chicks and hens in a fragmented prairie landscape. Wildlife Biology 14: 16–25.	i
McDonald, M. W. 1998. Ecology of Columbian Sharp-tailed Grouse in eastern Washington. M. S. Thesis. University of Idaho, Moscow. 125 pp.	viii
Miller, R. F., T. J. Svejcar, and N. E. West. 1994. Implications of livestock grazing in the intermountain sagebrush region: plant composition. Pages 101–146, *in* M. Vavra, W. A. Laycock, and R. D. Pieper, editors. Ecological implications of livestock herbivory in the West. Society for Range Management, Denver, CO. 297 pp.	i
Mineau, P, and C. Palmer. 2013. The impact of the Nation's most widely used insecticides on birds. American Bird Conservancy, USA. 83 pp+appendices.	viii
Noss, R. F., E. T. La Roe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. U.S. Department of the Interior, National Biological Service, Washington, D.C. 58 pp.	i
Paulson, G. C., 1996. Livestock grazing: effect on woody riparian plant communities used by wintering Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Lake	viii

Reference	Category Code
Creek, Washington. M. S. Thesis. Eastern Washington University, Cheney, Washington.	
Peterle, T. J. 1991. Wildlife Toxicology. Van Nostrand Reinhold, New York. 322 pp.	i
Resource Planning Unlimited, Inc. 2002a. North Fork Palouse River Watershed Characterization: Final report. Prepared for Palouse Conservation District, Pullman, Washington.	viii
Resource Planning Unlimited, Inc. 2002b. South Fork Palouse River Watershed Characterization: Final report. Prepared for Palouse Conservation District, Pullman, Washington.	viii
Robb, L. and M. Schroeder. 2012. Appendix A.1 Habitat Connectivity for Sharp-tailed Grouse (*Tympanuchus phasianellus*) in the Columbia Plateau Ecoregion. Washington Wildlife Habitat Connectivity Working Group (WHCWG). 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/	vi
Roersma, S. J. 2001. Nesting and brood rearing ecology of Plains Sharp-tailed Grouse (*Tympanuchus phasianellus jamesi*) in a mixed-grass/fescue ecoregion of southern Alberta. M. S. Thesis, University of Manitoba. 124 pp.	viii
Schroeder, M. A. 1994. Productivity and habitat use of Sharp-tailed Grouse in north-central Washington. Upland Bird Job Progress Report, Federal Aid in Wildlife Restoration. Washington Department of Fish and Wildlife, Olympia.	vi
Schroeder, M. A. 1996. Productivity and habitat use of Sharp-tailed Grouse in north-central Washington. Upland Bird Job Progress Report, Federal Aid in Wildlife Restoration. Washington Department of Fish and Wildlife, Olympia.	vi
Schroeder, M. A. 2006. Distribution, abundance, and translocation of Columbian Sharp-tailed Grouse in Washington. *In* Job Progress Report: project #3, Upland Bird Population Dynamics and Management, Federal Aid in Wildlife Restoration. Washington Department of Fish and Wildlife, Olympia.	vi
Schroeder, M., M. Atamian, R. Whitney, and D. Stinson. 2015. Re-establishment of viable populations of Columbian Sharp-tailed Grouse in Washington: progress report. Washington Department of Fish and Wildlife, Olympia, Washington. 21 pp.	vi
Schroeder, M., M. Atamian, J. Lowe, R. Whitney, K. Thorburn, M. Finch, J. Anderson, D. Stinson, and J. Gallie. 2016. Recover of Columbian Sharp-tailed Grouse in Washington: progress report. Washington Department of Fish and Wildlife, Olympia, Washington. 21 pp.	vi
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., D. W. Hays M. A. Murphy, and D. J. Pierce. 2000. Changes in the distribution and abundance of Columbian Sharp-tailed Grouse in Washington. Northwestern Naturalist 81:95-103.	i
Sexton, D. A., and M. M. Gillespie. 1979. Effects of fire on the location of a Sharp-tailed Grouse arena. Canadian Field-Naturalist. 93:74–76.	i
Stinson, D. W., and M. A. Schroeder. 2012. Washington state recovery plan for the Columbian Sharp-tailed Grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 159 + x 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, 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
Tisdale, E. W. 1961. Ecologic changes in the Palouse. Northwest Science 35: 134–138.	i
Tisdale, E. W. 1986. Canyon Grasslands and associated shrublands of west-central Idaho and adjacent areas. College of Forestry, Wildlife, and Range Sciences Bulletin No. 40, Forest, Wildlife and Range Experiment Station contribution No. 284, University of Idaho, Moscow. 42	i

Reference	Category Code
pp.	
Toepfer, J. E., R. L. Eng, and R. K. Anderson. 1990. Translocating prairie grouse: what have we learned? Transactions North American Wildlife and Natural Resources Conference 55: 569–579.	viii
USFWS (U. S. Fish and Wildlife Service) 2006. 90-Day finding on a petition to list the Columbian Sharp-tailed Grouse as Threatened or Endangered. Federal Register 71(224): 67318–67325.	i
Weddell, B. J., and J. Lichthardt. 1998. Identification of conservation priorities for and threats to Palouse Grassland and Canyon Grassland Remnants in Idaho, Washington, and Oregon. Technical Bulletin No. 98-13, Prepared for Bureau of Land Management, Cottonwood, ID. 57 pp.	i
Zeigler, D. L. 1979. Distribution and status of the Columbian Sharp-tailed Grouse in eastern Washington. Federal Aid in Wildlife Restoration Project W-70-R-18. Washington Department of Game, Olympia.	vi

APPENDIX A. PUBLIC COMMENTS ON THE DRAFT PERIODIC STATUS REVIEW

Section	Comment and response
Conclusion and recommendation	Please keep the Columbian sharp-tailed grouse on the state's threatened species list. The grouse has not sufficiently recovered enough to be removed from the list.
	Agreed, the trend for most of the populations is not good.
	Take them off the list.
	Comment noted.

PERSONAL COMMUNICATION

Richard Whitney, Wildlife Program Manager
Fish & Wildlife Department
Colville Confederated Tribes
Nespelem, Washington

WASHINGTON STATE PERIODIC STATUS REVIEWS, STATUS REPORTS, RECOVERY PLANS, AND CONSERVATION PLANS

Periodic Status Reviews

2017 Fisher
2017 Blue, Fin, Sei, North Pacific Right, and Sperm Whales
2017 Woodland Caribou
2017 Sandhill Crane
2017 Western Pond Turtle
2017 Green and Loggerhead Sea Turtles
2017 Leatherback Sea Turtle
2016 American White Pelican
2016 Canada Lynx
2016 Marbled Murrelet
2016 Peregrine Falcon
2016 Bald Eagle
2016 Taylor's Checkerspot
2016 Columbian White-tailed Deer
2016 Streaked Horned Lark
2016 Killer Whale
2016 Western Gray Squirrel
2016 Northern Spotted Owl
2016 Greater Sage-grouse
2016 Snowy Plover
2015 Steller Sea Lion

Conservation Plans

2013 Bats

Recent Status Reports

2017 Yellow-billed Cuckoo
2015 Tufted Puffin
2007 Bald Eagle
2005 Mazama Pocket Gopher, Streaked Horned Lark, and Taylor's Checkerspot
2005 Aleutian Canada Goose
1999 Northern Leopard Frog
1999 Mardon Skipper
1999 Olympic Mudminnow
1998 Margined Sculpin
1998 Pygmy Whitefish
1997 Aleutian Canada Goose
1997 Gray Whale
1997 Olive Ridley Sea Turtle
1997 Oregon Spotted Frog
1993 Larch Mountain Salamander
1993 Oregon Silverspot Butterfly

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

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