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

Draft October 2024

Washington Department of FISH & WILDLIFE

October 2024

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). 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 is the Draft Periodic Status Review for the Columbian Sharp-tailed Grouse. It contains a review of information pertaining to the status of Columbian Sharp-tailed Grouse in Washington. It was reviewed by species experts and will be available for a 90-day public comment period from 30 October 2024 through 27 January 2025. Comments received will be considered during the preparation of the final periodic status review. The Department will present the results of this periodic status review to the Fish and Wildlife Commission at a meeting in Spring 2025.

Submit written comments on this document by 27 January 2025 via email to: TandEpubliccom@dfw.wa.gov or by mail to:

Conservation Assessment Section Manager, Wildlife Program
Washington Department of Fish and Wildlife
P.O. Box 43141
Olympia, WA 98504-3141

This report should be cited as:

Stinson, D.W. and M. Atamian. 2024. Draft periodic status review for the Columbian Sharp-tailed Grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 30 + i pp.

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

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

Draft October 2024

Authors

Derek W. Stinson and Michael Atamian

Report acknowledgements

The draft was improved by contributions and reviews by Carrie Lowe, Kim Thorburn, and Jeff Heinlen. We also appreciate the cooperation of sister wildlife agencies in British Columbia, Idaho, and Utah, that granted permission for translocations of Sharp-tailed Grouse to Washington. We thank our partners in conservation, including the Confederated Tribes of the Colville Reservation, Bureau of Land Management, Spokane Audubon, Wenatchee Sportsmen, Pheasants Forever Spokane, Foster Creek Conservation District, Lincoln County Conservation District, researchers from Washington State University and University of Idaho, and others.

Suggested citation

Stinson, D.W. and M. Atamian. 2024. Periodic status review for the Peregrine Falcon. Washington Department of Fish and Wildlife, Olympia, Washington. 30 + i pp.

Cover photo by Justin Haug.

Acknowledging the Indigenous People of the Pacific Northwest

Since time immemorial, Indigenous People have lived in the Pacific Northwest and hunted, fished, and gathered natural resources, traditional foods, and medicinal plants to support their diverse cultures. They were the original occupants and stewards of this land that all Washingtonians enjoy today.

The very survival of the Pacific Northwest Tribes is a testament of resiliency of what they have endured and continue to endure throughout generations on this landscape. Through many historical encounters of massacre, renunciation of religious freedom, systemic racism, cultural assimilation of native children through institutional residential schools, and the fight for their inherent rights and liberties, they have prevailed. Throughout this painful history brought by colonization, abrogated treaties, infringement of civil rights, and the salmon protests of the 1960s, the Northwest Tribes and the Washington Department of Fish and Wildlife (WDFW) have founded a commitment of respect, unity, and alliance informed by the realities of the past.

Today, tribal governments and WDFW work collaboratively to conserve and manage aquatic and terrestrial resources statewide and practice sound science to guide management decisions. The Tribes and WDFW work together to ensure the sustainability of fish, wildlife, ecosystems, and culture for the next seven generations and beyond.

Table of Contents

List of Tables

List of Figures

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 19th century. However, numbers declined dramatically with the conversion to cropland of large areas of Palouse prairie, the Klickitat region, and arable shrub-steppe in the Columbia Basin. 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, and uplisted to endangered in 2018.

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. 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 areas that were not converted to cropland typically have shallow soils or steep slopes, factors that negatively affect productivity for Sharp-tailed Grouse.

Sharp-tailed Grouse persist in eight scattered populations in Douglas, Lincoln, and Okanogan counties, and the Confederated Tribes of the Colville 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 had remained relatively stable since 2003, ranging from ~750 to ~1000 birds, but dropped precipitously following the 2020 wildfires and as of 2023 is estimated at 410 birds. The recent fires, which affected >700,000 acres of historical Sharp-tailed Grouse habitat, may improve habitat condition in some areas in the longer term by reducing trees and shrub, but the immediate effect was negative due to direct mortality from the fires and loss of nesting and winter riparian habitat. Essential winter riparian cover that was loss will take time to regenerate and/or will need to be replanted.

WDFW lands help support several of the remnant populations, but these lands alone are too small to support viable populations; surrounding private lands with suitable habitat is essential for recovery. The remaining populations in Washington are small, relatively isolated from one another, and unlikely to persist unless they increase in size. Habitat restoration and enhancement and population augmentation using birds from other states and British Columbia are ongoing, but additional areas need to be identified for future reintroductions and prioritized to help focus habitat restoration efforts.

We recommend that the Sharp-tailed Grouse remain listed as endangered in Washington.

This is an update of the 2017 periodic status review for the Columbian Sharp-tailed Grouse in Washington (Stinson 2017). This revision is based largely on the previous document and has been updated to reference new publications regarding demography and to provide a more contemporary overview of management activities. Language from the previous version was revised to a varying extent to improve conciseness and brevity.

Male Sharp-tailed Grouse on the Scotch Creek Wildlife Area, in Okanogan County. Photo by Mike Schroeder.

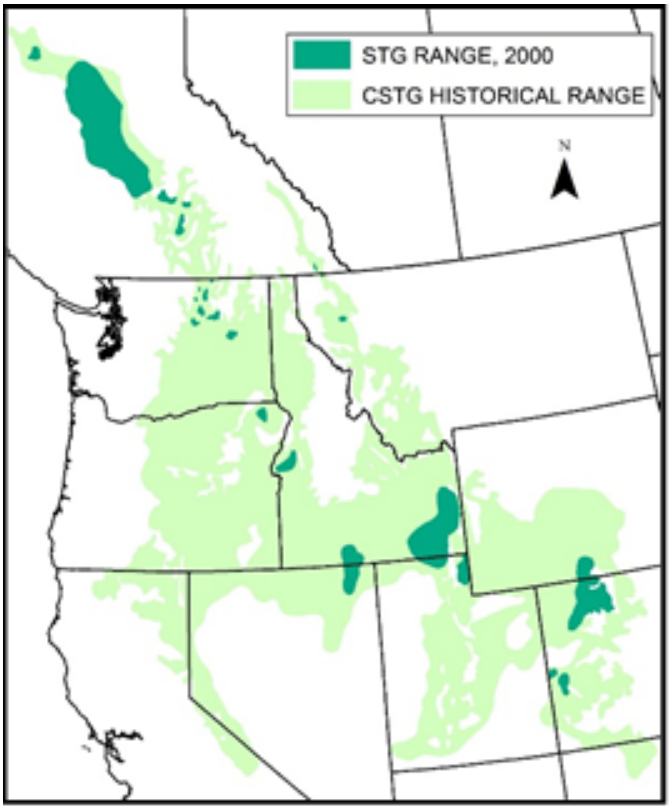
Introduction

The Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*) is a bird of grasslands and shrublands and the rarest of six extant subspecies of Sharp-tailed Grouse. They were historically the most abundant gamebird in Washington, with populations that likely numbered in the tens of thousands. 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 for mating. Sharp-tailed Grouse are culturally significant to Native Americans, and the Confederated Tribes of the Colville Reservation (CTCR) 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. The conversion of most of the grassland and shrub habitats to cropland has caused a long decline and the statewide population has dwindled to <500 birds. They were last hunted in parts of Washington in 1987, were added to the state list of threatened species in 1998, and uplisted to endangered in 2018.

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. 1; Hoffman et al. 2015).

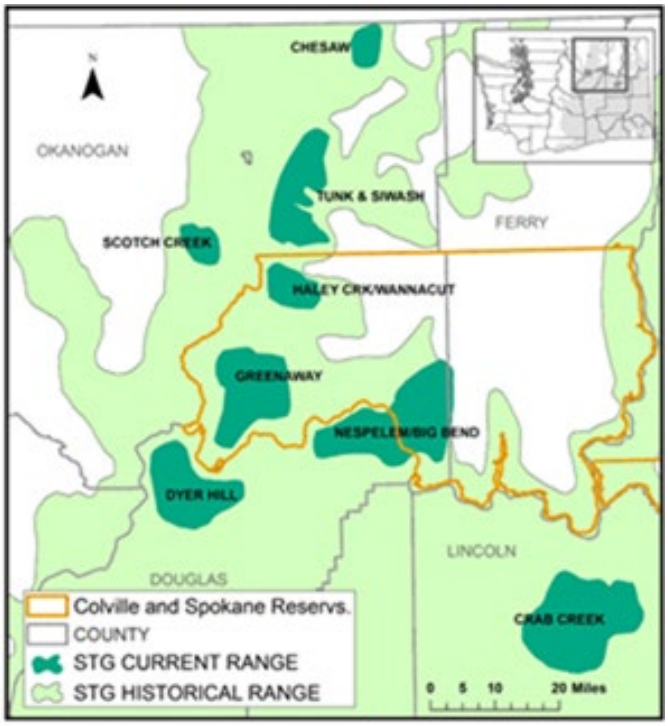
Figure 1. Historical and current range of the Columbian Sharp-tailed Grouse.



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

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 approximately 2.8% of their historical range (Fig. 2; Schroeder et al. 2000).

Figure 2. Historical and current ranges of Columbian Sharp-tailed Grouse in Washington.



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

Natural History

Habitat requirements

Columbian Sharp-tailed Grouse breeding habitat in the Greenaway Springs area, CTCR, Washington. Photo by D. Stinson.

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).

Sharp-tailed Grouse eating buds in trees along Scotch Creek during December 2012.
Photo by Jim Olson.

Riparian areas with deciduous trees and shrubs, including Water Birch (*Betula occidentalis*), Serviceberry (*Amelanchier alnifolia*), Chokecherry (*Prunus virginiana*), rose (*Rosa woodsii*), hawthorn (*Crataegus douglasii*), Common Snowberry (*Symphoricarpos albus*), cottonwood (*Populus deltoides*), and aspen (*Populus tremuloides*), provide critical winter cover and food, such as berries, 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 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 varies 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 for mating. Leks may contain 2–50 males (Connelly et al. 1998, WDFW data), but 8–12 males on a lek is the most typical size (Johnsgard 1973). The morning display period on the lek is variable, but usually lasts 2–4 hours. Males may return in the evening and display for 1–3 hours before dark. In lek mating systems, females mate with established territorial males, 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 et al. 2005, 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 acres and frequently <247 acres (Hoffman et al. 2015). The average spring-summer home range (95% fixed kernel) in Lincoln County was 650 acres for 29 males, and 2,633 acres 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 $\geq$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.

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 the 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 reported ranged from 20–57% (Hoffman et al. 2015). McDonald (1998) reported that survival during 1995–96 on the CTCR 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 responsible for most mortalities (>85%; Hoffman et al. 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 food may be greater, and escape cover may be limited (Schroeder and Baydack 2001). Human-altered landscapes often provide subsidies (e.g., food, 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 density 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). Sharp-tailed Grouse in southern Alberta had 8-times greater nest success in landscapes with <3 corvids (crows & magpies)/km^2 than landscapes with ≥3 per km^2 (Manzer and Hannon 2005).

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 gamebird species and shot by hunters, 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, West Nile and Dead Birds).

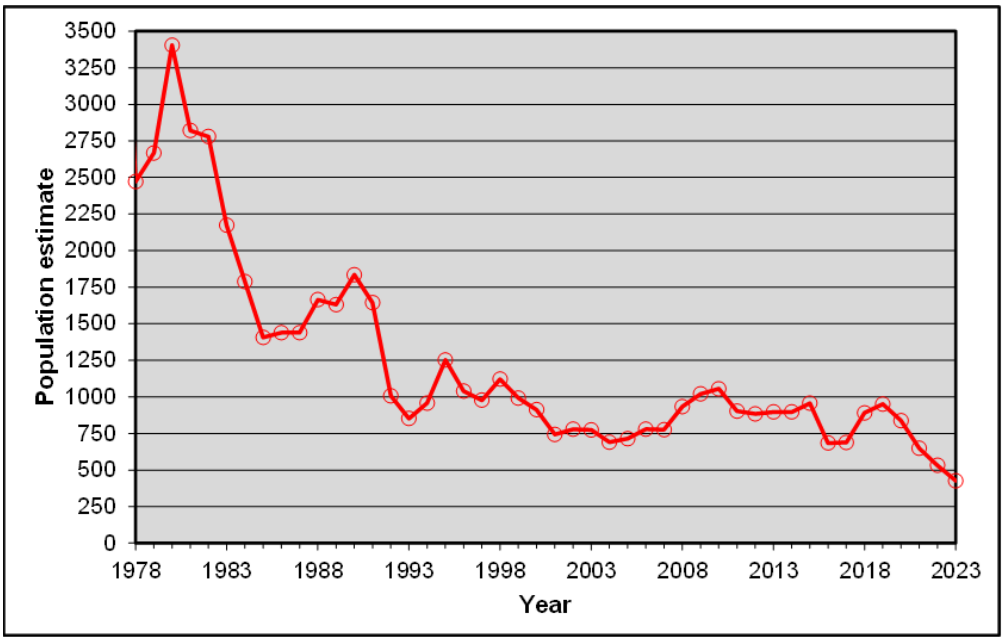
Sub-lethal doses of insecticide may increase the rate of mortality from diseases, parasites, and predation (McEwen and Brown 1966, Zeakes et al. 1981, *in* Peterle 1991). A study in Minnesota found a high prevalence of neonicotinoids in sharp-tailed grouse liver and fecal samples and found a positive correlation with the amount of agriculture within 2 km of the sample site (Roy and Chen 2023). Wheat seeds are commonly treated with neonicotinoids, which can be acutely toxic to some small birds. However, the effects 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 1980 and the early 2000s (Fig. 3).

Figure 3. Estimated annual population of Columbian Sharp-tailed Grouse in Washington, 1978-2023.



Estimated annual population of Columbian Sharp-tailed Grouse in Washington, 1978-2023.

Current population status

Sharp-tailed Grouse persist in eight scattered populations located in Lincoln County, the CTCR, northern Douglas County, and valleys and foothills east and west of the Okanogan River in Okanogan County (Fig. 2). Declines in some remnant populations have continued in recent years, likely due to fragmentation, fires 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 slightly more than 1,000 in 2010, probably in response to augmentations and habitat restoration efforts, including the USDA Conservation Reserve Program (Fig. 3). Since 2010 the population has seen several declines mostly due to wildfire. In 2020, large wildfires seriously impacted the Crab Creek, Dyer Hill, and Greenaway populations, driving the statewide population estimate to its lowest ever (410) in 2023. Unfortunately, none of the populations are currently above 200 birds, the level that Toepfer et al (1990) suggested was sustainable for a few decades (Table 1).

Table 1. Sharp-tailed Grouse estimates for local populations and Washington total, 2013-2023

Year	Scotch Creek	Tunk & Siwash	Chesaw	Dyer Hill	Greenaway & Haley Ck	Big Bend	Nespelem	Crab Creek
2013	66	136	50	110	48	240	192	106
2014	64	118	40	80	80	246	172	142
2015	100	100	56	116	66	264	204	106
2016	22	52	44	84	38	188	152	144
2017	78	38	34	154	52	106	126	132
2018	60	96	32	288	50	166	126	138
2019	54	112	32	316	54	176	152	126
2020	70	104	22	284	32	128	200	72
2021	84	70	30	78	14	174	184	38
2022	54	72	22	88	32	112	130	40
2023	28	60	12	52	18	114	96	46

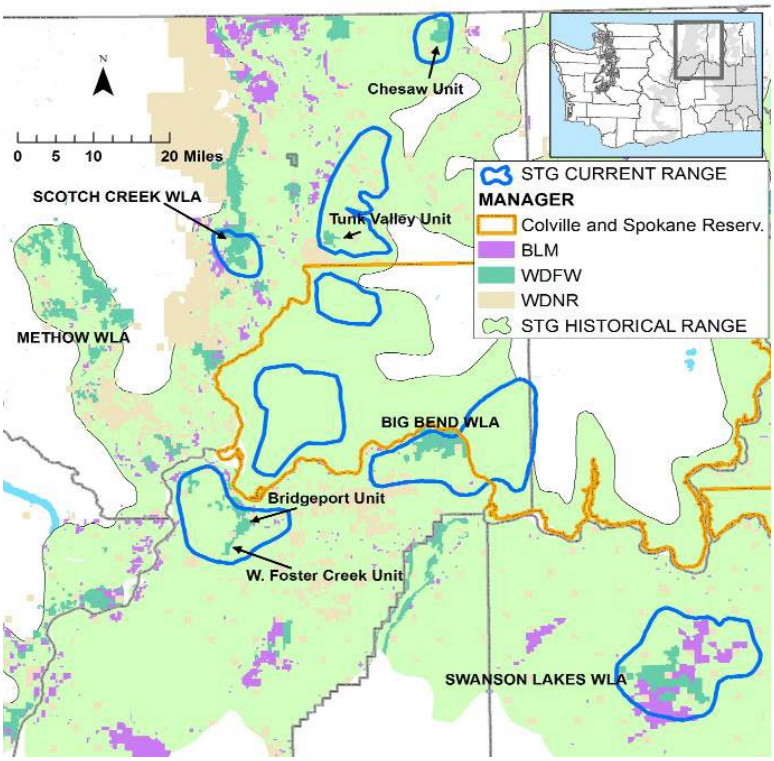
Sharp-tailed Grouse estimates for local populations and Washington total, 2013-2023

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 proportion of the current versus historical range (43.9% vs. 22.2%) is in public or tribal ownership, where conservation is a management goal (Stinson and Schroeder 2012). Lands supporting current populations include areas of the CTCR (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. 4). Though public & tribal lands play a significant role in the current range, private land still composes the majority of the range and private land conservation programs, like CRP and WSRRI, play a critical role in maintaining Sharp-tailed Grouse populations.

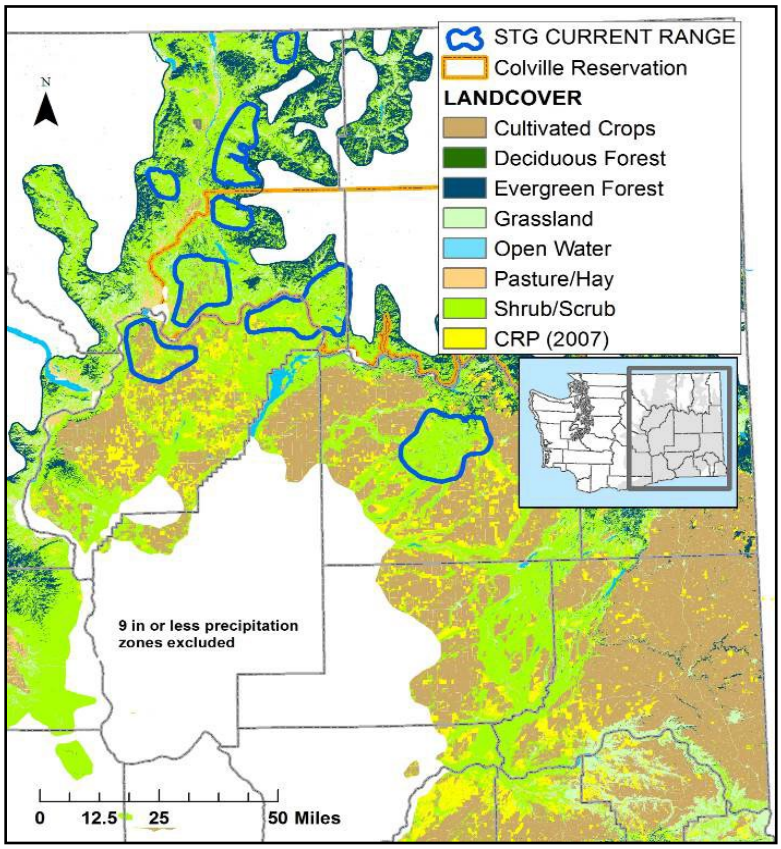
Figure 4. Current range of Sharp-tailed Grouse and important public lands.



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

Stinson and Schroeder (2012) described in detail the 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. 5). In the historical range, cover types potentially suitable for Sharp-tailed Grouse (i.e., shrublands, grassland, and CRP) total only 47% and 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 Sharp-tailed Grouse in Washington, is one of the most endangered ecosystems in the United States (Noss et al. 1995; Weddell and Lichhardt 1998). More recent habitat issues include large wildfires and degradation by feral horses (See **Wildfires** and **Livestock grazing** below).

Figure 5. Landcover in current and part of historical range of Sharp-tailed Grouse in Washington.



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

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 an endangered 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 impact habitat. WDFW provides Priority Habitat and Species (PHS) Program information to counties, agencies, landowners, and consultants for land use planning and permit evaluation purposes; this includes maps and management recommendations (e.g., Schroeder and Tirhi 2003, Azerrad et al. 2011). Though the specific nature of protections varies 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. 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. Although rural densities allowed by zoning (e.g., ~1 dwelling/10–20 ac) benefit many species, they may exceed the tolerance of Sharp-tailed Grouse and other species that require larger 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

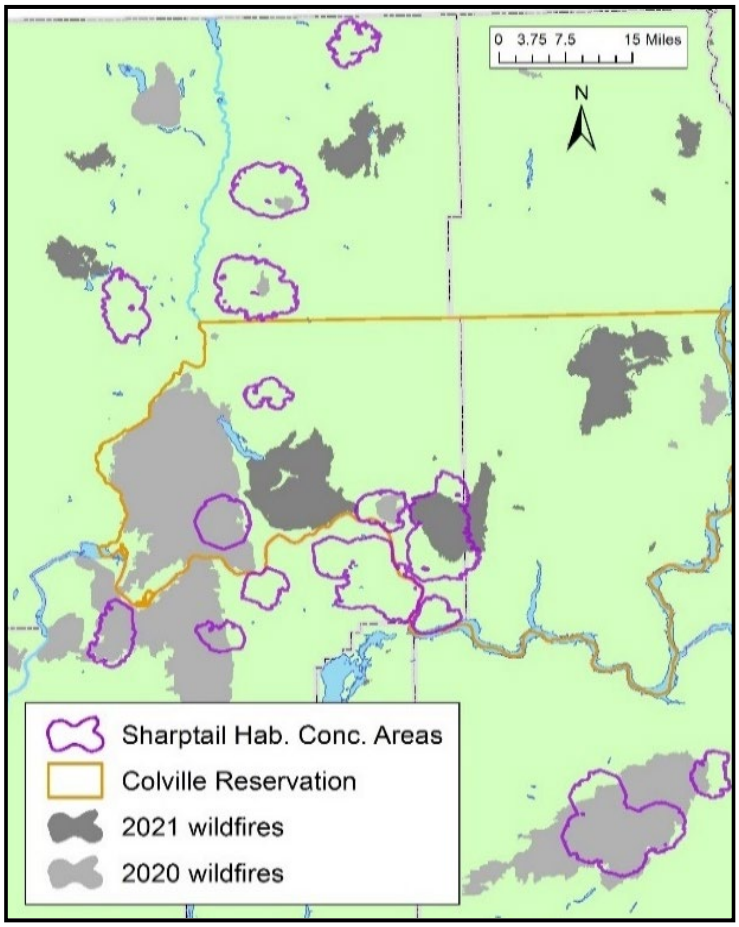
Sharp-tailed Grouse populations in Washington are affected by the reduced quantity, fragmentation, and uneven quality of remaining habitat available. These factors have resulted in the small size of remaining populations, and multiple related issues affect the species' likelihood of persistence and ability 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, Big Ben, and Dyer Hill populations in Washington have exceeded that number in the past ten years and none do currently (Table 1). 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 (Fig. 2). Although annual movements of >40 km have been reported, they generally average <10 km (Hoffman et al. 2015) meaning several populations are 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

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 with exotic grasses (e.g., crested or intermediate wheatgrass) and provide little habitat value. Fields in this condition need to be reseeded with native seed mixes to be of value to Sharp-tailed Grouse. 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 acres of CRP in Idaho (20% of available habitat; Gillette 2014:68), and changes in the Farm Bill have resulted in a large reduction in acreage enrolled in Douglas County.

Figure 6. Sharp-tailed Grouse Habitat Concentration Areas (Robb & Schroeder 2012) and 2020-2021 Wildfires in Washington.



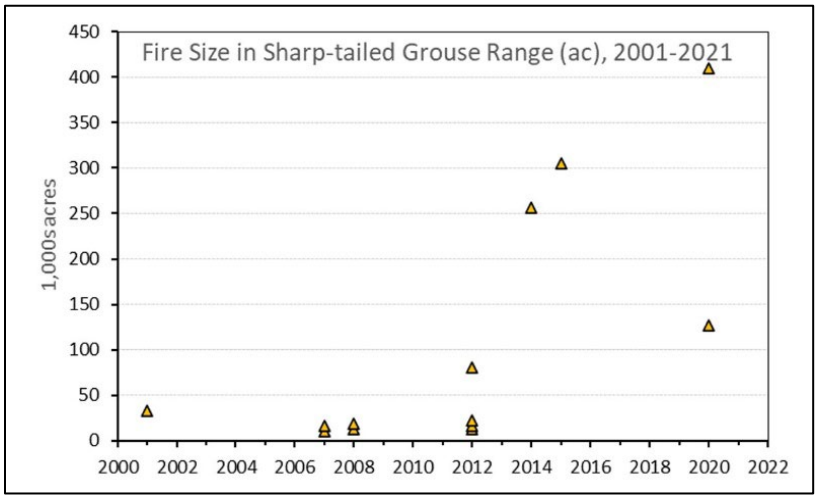
Sharp-tailed Grouse Habitat Conservation Areas (Robb & Schroeder 2012) and 2020-2021 wildfires in Washington.

Aftermath of Pearl Hill Fire, in Douglas County, 2020. Photo by Dan Peterson.

Wildfires

The number and size of wildfires in occupied Sharp-tailed Grouse range in eastern Washington are increasing (Fig. 6 & 7). The most significant of these were the 2020 fires: Whitney in Lincoln County, Pearl Hill in Douglas County, the Cold Spring Canyon and Greenhouse fires on the CTCR, and the Chuweah Creek and Whitmore fires on the CTCR in 2021. Attendance of grouse on traditional lek sites in burned areas typically decreases dramatically for several years due to direct mortality and surviving birds shifting to lek sites outside the fire perimeter (Schroeder et al. 2023). These negative effects will be long-term where perennial bunchgrasses are replaced by invasive annual grasses (e.g. cheat grass [*Bromus tectorum*]) and/or riparian wintering habitat does not recover.

Figure 7. Fire size in Sharp-tailed Grouse range (ac), 2001-2021



Fire size in Sharp-tailed Grouse range (ac), 2001-2021

Climate change and wildfire

The incidence of drought and wind events that increase wildfire size, severity, and frequency are of concern (Fig. 7). Wildfires are a significant immediate threat to Sharp-tailed Grouse survival in Washington through initial mortality during the fires, as well as long-term impacts to habitat. High severity fires can eliminate riparian trees that provide essential winter forage and they can take > 10 years to recover. Drought can greatly influence the risk of catastrophic fire; climate change is predicted to increase frequency of droughts and size of areas burned (McKenzie and Littell 2017). Less severe fires may negatively impact some birds, but pose no long-term damage to habitat, and can via removing excess brush and woody cover contribute to improving habitat suitability for Sharp-tailed Grouse.

Livestock grazing

Livestock grazing is an important factor affecting Sharp-tailed Grouse populations (Bart 2000, Hoffman et al. 2015). This complex issue is only briefly outlined here, but is reviewed in detail in Stinson and Schroeder (2012). 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 impairing 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 have been shown to eliminate local populations (Zeigler 1979, Kessler and Bosch 1982, Giesen and Connelly 1993, Hoffman and Thomas 2007). 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, and willow) has been suppressed by decades of grazing (Franklin and Dyrness 1973, Paulson 1996).

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 annual grasses, and may increase the dominance of unpalatable woody species (Miller et al. 1994, Anderson and Inouye 2001). However, the low precipitation zones (<~ 9 in) where these impacts can be most severe was probably never ideal Sharp-tailed Grouse habitat.

Habitat degradation by feral horses has become a problem on the CTCR in recent years; two long-

established leks were abandoned as a result of feral horses congregating on the sites. The tribe has attempted to address this by capturing and adopting out the horses, and targeting those areas for restoration and weed control (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 in Washington, 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).

Management Activities

Population Monitoring

WDFW staff conduct counts annually on all known active Sharp-tailed Grouse leks, check recently inactive leks for activity, and search suitable habitat for leks that may have moved or are newly established. Similarly, the CTCR Fish and Wildlife Department conducts counts of ~30 leks on the Reservation. Lek count data are used to estimate populations and trends.

Population augmentations

Sharp-tailed grouse being released on Scotch Creek Wildlife Area. Photo by M. Schroeder.

Since 1998, a total of 600 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. 2023; WDFW data). Survey data indicate that augmentations boost local populations long after releases stop (Schroeder et al. 2023). In 2022 and 2023, 40 birds each year from British Columbia were released on

Scotch Creek WLA and on CTCR lands. In 2024, 60 birds were translocated from British Columbia, 30 were released on Swanson Lakes WLA and 30 were released on private ground in the Dyer Hill populations. Additional releases are being considered 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, >2,000 acres of shrub-steppe and grassland have been restored to steppe vegetation in the last 30 years, and >1,400 acres of adjacent BLM lands have also been restored. Fences and signs that burned in the Whitney Fire are being replaced. The fences exclude trespass cattle, and the signs warn upland bird hunters not to shoot Sharp-tailed Grouse. Over 1,500 acres of native shrub-steppe have been restored on Scotch Creek Wildlife Area, and >100,000 trees and shrubs have been planted to restore riparian wintering habitat. In addition to the plantings, 51 beaver dam analogs have been installed in Scotch Creek to slow flows, restore connection to the floodplain, and support riparian restoration. Across the Wildlife Areas in Douglas County >1,200 acres of former agricultural fields have been restored to native shrubsteppe vegetation. To restore, enhance and expand riparian wintering habitat, hundreds of trees and shrubs have been planted and 14 fenced enclosures were built to protect planted trees and shrubs from deer browsing. Beaver dam analogs and Zeedyk rock structures have been installed in West Foster, China, and School creeks to help restore more natural stream flows. Additional restoration is needed and planned for in all of these Wildlife Areas. Legislative funding for the Washington Shrubsteppe Restoration and Resilience Initiative (WSRRI) that passed in 2021 has funded some of this work as well as much needed work on private lands. Foster Creek Conservation District is administering the Voluntary Stewardship Program and projects to protect or improve habitat, including plantings and restoration projects on East Foster Creek.

The SAFE program under CRP in the Farm Bill has been a popular and important tool for farmers to contribute to conservation of threatened and endangered species in a voluntary and incentive-based manner. As of June 2024, producers have enrolled ~131,044 acres in the Shrubsteppe SAFE project area which includes portions of Adams, Douglas, Grant, Lincoln, and Okanogan counties. Private working lands in Douglas County are essential for maintaining core Sharp-tailed Grouse populations, where ~76,045 acres have been enrolled in SAFE since 2009.

Changes to the 2018 Farm Bill are hindering the efforts and partnerships formed through SAFE. The legislation included SAFE acres within the general CRP cap and struck the broad waiver language that allowed a county's cropland acreage enrolled in CRP to exceed the 25% cap. Without the cap waiver, Douglas County has reached its CRP maximum almost every year, resulting in denial of new applications and re-enrollment of expired contracts into the program. WDFW staff are working together with other similarly affected states to request bringing the waiver back in the next Farm Bill.

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 re-mark them

after fences burned) and remove many miles of unneeded fences on its lands in Lincoln, Douglas, and Okanogan counties; partners have included BLM, Lincoln County, East Foster Creek, and Okanogan County conservation districts, the Sage-grouse Initiative, and Wenatchee Sportsmen. Additionally, the WSRRI virtual fence program is working with ranchers across the range to replace internal fencing with GPS collars for cows and reception towers; these allow ranchers to form a virtual fence to control cattle distribution and movement.

Habitat acquisition

With the third phase of acquisition completed, the relatively new Big Bend WLA encompasses 22,121 acres and will help focus management of Sharp-tailed Grouse habitat in northern Douglas County. The 9,243-acre Figlenski property was recently acquired by the CTCR with the help of Conservation Northwest; the area is important for maintaining Sharp-tailed Grouse in the Tunk Valley in Okanogan County.

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 (Fig. 6) and movement corridors. An interagency Sharp-tailed Grouse working group meets quarterly 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 (the Crab Creek population) was completed in 2013 (Stonehouse 2013, Stonehouse et al. 2015). Concurrent with our translocations of birds from British Columbia is a study of the effect of translocation on gut flora; the overall proposed outcomes of this study by researchers at Boise State University are to: 1) demonstrate that diet and microbial communities can be monitored to predict demographics of translocated vertebrates; and 2) co-produce strategies of adaptive management of the diet and microbes to facilitate future translocation success. An additional study underway with the USGS is using feather samples collected during captures and lek surveys to characterize local genetic diversity and assess the effectiveness of the translocations.

Conclusion and Recommendation

The Columbian Sharp-tailed Grouse, once very abundant in Washington, declined with the conversion of habitat to agriculture in the 19th and 20th centuries. After translocations and ongoing restoration work, the population showed signs of stability varying between ~750 to ~1000 birds from 2000 -2020. However, after the fires of 2018, 2019, 2020 and 2021, the estimated population has dropped to its lowest ever (410 birds in 2023) and fewest active leks (31). All the discrete local populations have dropped below 200, and the leks in the Chesaw and Greenaway areas are precariously low. The species was uplisted to endangered in 2018, and we recommend no change in their listing status.

References Cited

The references cited in the draft *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

Reference	Category Code
Arnold, T. W. 1988. Life histories of North American game birds: a reanalysis. Canadian Journal of Zoology 66:1906–1912.	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. http://wdfw.wa.gov/publications/01333/	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 USGS. 110 pp.	I
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
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
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
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
Connelly, J. W., M. W. Gratson, and K. P. Reese. 1998. Sharp-tailed Grouse (Tympanuchus phasianellus). The Birds of North America, No. 354. (A. Poole and F. Gill, editors. The Birds of North America, Inc. Philadelphia, Pennsylvania.	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
Daubenmire, R. F 1970. Steppe vegetation of Washington. Washington Agricultural Experiment Station, Technical Bulletin 62, Washington State University, Pullman. 131 pp.	i

Reference	Category Code
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. Forest Service General Technical Report, PNW-8. 417 pp.	i
Gibbons, D., C. Morrissey, and P. Mineau. 2015. A review of the direct and indirect effects of neonicotinoids and fipronil 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
Hoffman, R. W., and A. E. Thomas. 2007. Columbian Sharp-tailed Grouse (Tympanuchus phasianellus columbianus): A Technical Conservation Assessment. Species Conservation Project. USDA Forest Service, Rocky Mountain Region, 131 pp.	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

Reference	Category Code
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 2005. Relating grouse nest success and corvid density to habitat: a multi-scale approach. Journal of Wildlife Management 69: 110–123.	i
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
McKenzie, D. and J. S. Littell. 2017. Climate change and the eco-hydrology of fire: will are burned increase in a warming western USA? Ecological applications 27(1):26-36	i
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 Creek, Washington. M. S. Thesis. Eastern Washington University, Cheney, Washington.	viii
Peterle, T. J. 1991. Wildlife Toxicology. Van Nostrand Reinhold, New York. 322 pp.	i
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
Roy, C. L. and D. Chen. 2023. High population prevalence of neonicotinoids in sharp-tailed grouse and greater prairie-chickens across an agricultural gradient during spring and fall. Science of the Total Environment 856 (1):159120.	
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

Reference	Category Code
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, C. Lowe, J. Heinlen, J. Lowe, S. Rushing, K. Thorburn, M. Finch, E. Braaten, D. J. Peterson, S. Blake, C. Sato, J. Eilers, E. Jeffreys, S. Fitkin, and B. Dupont. 2023. Recovery of Columbian Sharp-tailed Grouse in Washington: progress report. Washington Department of Fish and Wildlife, Olympia, Washington. 22 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
Schroeder, M. A., and M. Tirhi. 2003. Sharp-tailed Grouse. Pages 16-1 – 16-10, in E. Larsen, J. M. Azerrad, N. Nordstrom, editors. Management Recommendations for Washington's Priority Species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, Washington.	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. 2017. Periodic Status Review for the Columbian Sharp-tailed Grouse in Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 17+ iii pp.	iii, iv
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
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

Reference	Category Code
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

Personal Communication

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

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

Periodic Status Reviews

2024	Pygmy Rabbit
2024	Peregrine Falcon
2024	Bald Eagle
2024	Northern Spotted Owl
2024	Mardon Skipper
2023	Western Gray Squirrel
2023	Woodland Caribou
2023	Columbian White-tailed Deer
2022	American White Pelican
2022	Brown Pelican
2022	Snowy Plover
2022	Cascade Red Fox
2021	Ferruginous Hawk
2021	Oregon Vesper Sparrow
2021	Steller Sea Lion
2021	Gray Whale
2021	Humpback Whale
2021	Greater Sage-grouse
2020	Mazama Pocket Gopher
2019	Tufted Puffin
2019	Oregon Silverspot
2018	Grizzly Bear
2018	Sea Otter
2017	Fisher
2017	Blue, Fin, Sei, North Pacific Right, and Sperm Whales
2017	Sandhill Crane
2017	Western Pond Turtle
2016	Canada Lynx
2016	Marbled Murrelet

Conservation Plans

2013	Bats

Status Reports

2021	Oregon Vesper Sparrow
2019	Pinto Abalone
2017	Yellow-billed Cuckoo
2015	Tufted Puffin
2007	Bald Eagle
2005	Aleutian Canada Goose
1999	Northern Leopard Frog
1999	Mardon Skipper
1999	Olympic Mudminnow
1998	Margined Sculpin
1998	Pygmy Whitefish
1997	Aleutian Canada Goose

Recovery Plans

2020	Mazama Pocket Gopher
2019	Tufted Puffin
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

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