Management Plan for the Conservation of

Columbian Sharp-tailed Grouse

in Idaho 2015-2025

Prepared by **IDAHO DEPARTMENT OF FISH AND GAME**

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Executive Summary

(Photo by Becky Hansis O'Neill).

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*, CSTG) are a medium-sized, gallinaceous upland game bird with a light brown appearance, pointed tail, and conspicuous white spots on the wings. They are 1 of 6 extant subspecies of sharp-tailed grouse in North America and are an important upland game species to the sportsmen and women of Idaho. They currently inhabit portions of British Columbia, Washington, Colorado, Idaho, Nevada, Oregon, Utah, and Wyoming. Columbian sharp-tailed grouse were once considered the most abundant upland game bird in the Pacific Northwest, but now occupy <5% of their historical range in the U.S. Habitat loss, degradation, and fragmentation are primary causes for the decline and remain threats across remaining occupied range.

Columbian sharp-tailed grouse habitat comprises both native and managed perennial bunchgrass prairie and shrub-bunchgrass rangelands with a small percentage in tall, deciduous shrub thickets. These rangeland communities provide nesting and brood-rearing habitat, whereas riparian zones and mountain-shrub thickets are essential during winter months. Columbian sharp-tailed grouse are habitat generalists and can benefit from artificially created habitat, such as Conservation Reserve Program (CRP) or State Acres for Wildlife (SAFE) lands that convert eligible croplands to permanent vegetation. Because approximately 70% of CSTG nesting and brood-rearing habitat occurs on private lands in Idaho, programs such as CRP and SAFE have provided many thousands of acres of suitable perennial grassland habitat for CSTG. As a result, grouse populations increased in recent years, in contrast to their general decline over the past century. However, total acreage in CRP throughout CSTG range in Idaho is declining, in part because of high grain prices and recent Congressional reductions in acreage eligible for these Federal programs. Potential loss of CRP habitat is the most immediate threat to CSTG in Idaho and across the subspecies' range.

Petitions to list CSTG under the Endangered Species Act (ESA) were submitted in 1995 and again in 2004 in response to dramatic declines in populations and distribution. However, in each case, the U.S. Fish and Wildlife Service concluded listing was not warranted. Idaho Department of Fish and Game (IDFG) classifies CSTG as Critically Imperiled in the Idaho Comprehensive Wildlife Conservation Strategy, the Natural Heritage Program indicates the Columbian subspecies is vulnerable to extirpation or extinction in Idaho, and CSTG are designated as a sensitive species by the U.S. Forest Service and the Bureau of Land Management wherever they occur on lands under their jurisdiction. Approximately 60—65% of remaining CSTG in the U.S. are found in Idaho. Therefore, continued and improved CSTG population monitoring and maintenance, research efforts, and habitat conservation in Idaho, are paramount to the range-wide status of the subspecies and to any future ESA listing decisions.

The Idaho Fish and Game Commission and IDFG have a legal responsibility to preserve, protect, perpetuate, and manage all of Idaho's wildlife. To fulfill that obligation, IDFG is guided by a strategic plan, The Compass. Adopted in 2005, The Compass broadly describes objectives for 4 major goals: 1) sustain Idaho's fish and wildlife and the habitats upon which they depend; 2) meet the demand for fish and wildlife recreation; 3) improve public understanding of and involvement in fish and wildlife management; and 4) enhance the capability of IDFG to manage fish and wildlife and serve the public. This Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho (Plan) functions to provide guidance for IDFG and their partners to implement conservation measures that will enhance CSTG habitat and populations in Idaho and prevent the need for future ESA protections.

The Plan is organized into 2 main sections. The introduction provides background on CSTG distribution, population size, conservation status, and ecology, including habitat relationships during breeding, nesting, brood-rearing, and wintering life stages. The Introduction also provides IDFG legal policy and framework for Plan development.

A second section reviews threats, limiting factors, and opportunities for CSTG conservation. Threats to CSTG include loss of habitat due to agricultural and human development; habitat modification from improper livestock grazing, wildfire, invasive species, and shrub control; climate change; disease; pesticide use; and human disturbance. Limiting factors to CSTG populations include concerns associated with isolated populations, predation, interspecific competition, and regulated harvest. A variety of opportunities exist for IDFG to improve management and conservation of CSTG populations, including working with private landowners to secure habitat, engaging the public in citizen-science projects and educational programs, identifying funding to implement research and monitoring programs, and evaluating success of translocation efforts and impacts on source populations.

This Plan follows The Compass and identifies 7 conservation objectives, with specific management direction, performance objectives, and strategies to be implemented over the next 10 years (2015—2025). Objectives are

1. Maintain or improve CSTG populations to meet demand for CSTG hunting,
2. Ensure long-term survival of CSTG,
3. Increase capacity of habitat to support CSTG,
4. Maintain a diversity of CSTG hunting opportunities,
5. Increase opportunities for wildlife viewing and appreciation,
6. Improve citizen involvement in the decision-making process,
7. Improve funding to meet legal mandates and public expectations.

The Idaho Department of Fish and Game is committed to establishing collaborative working relationships with all stakeholders to maintain viable CSTG populations into the future. We look forward to actively implementing actions in this Plan to benefit CSTG and their habitats in Idaho.

Table of Contents

Table of Contents *cont.*

List of Tables

Table of Contents *cont.*

List of Figures

(Photo by Becky Hansis O’Neill).

Introduction

Historical Perspective

The Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*, CSTG) is 1 of 7 subspecies (1 extinct) of sharp-tailed grouse in North America (Connelly et al. 1998). They were once considered the most abundant and well-known upland game bird in the Pacific Northwest (Bendire 1892). Columbian sharp-tailed grouse were found in southern British Columbia, eastern Washington, eastern Oregon, northeastern California, northern Nevada, northern Utah, western Colorado, western Wyoming, western Montana, and Idaho (Fig. 1, Aldrich 1963, Miller and Graul 1980). Of the 6 extant subspecies of sharp-tailed grouse, CSTG have experienced the greatest decline in distribution and abundance (Hamerstrom and Hamerstrom 1961, Miller and Graul 1980).

Historically, CSTG were widely distributed in Idaho and were reported from ≥35 of Idaho's 44 counties (Parker 1970). Declining populations in Idaho were first noted during the early 1900s (Rust 1917). Primary factors contributing to CSTG population declines and range reduction were habitat loss and degradation from expansion of tillable agriculture, livestock grazing, and urbanization. Excessive harvest in the late 19th and early 20th centuries was also identified as a likely cause of population declines and range reduction (Hart et al. 1950, Marks and Marks 1987, Giesen and Connelly 1993). Bart (2000) concluded that, although CSTG populations declined in Idaho beginning in the mid to late 19th century, the major reduction in distribution occurred between 1950 and 1970.

The U.S. Fish and Wildlife Service (USFWS) has twice been petitioned (1995 and 2004) to list CSTG under the Endangered Species Act (ESA). In both cases, the USFWS concluded listing was not warranted (USDI 2000, 2006). Idaho Department of Fish and Game (IDFG) classified CSTG as a Species of Greatest Conservation Need in the Idaho State Wildlife Action Plan, formerly known as the Idaho Comprehensive Wildlife Conservation Strategy (IDFG 2005*a*). The Natural Heritage Program indicates the Columbian subspecies is vulnerable to extirpation or extinction in Idaho (NatureServe 2015). Columbian sharp-tailed grouse are designated as a sensitive species by the U.S. Forest Service and the Bureau of Land Management (BLM) wherever they occur on lands under their jurisdiction.

The entire U.S. breeding population of CSTG was estimated at 51,000 grouse, based on data provided by states to the USFWS in response to a petition to list CSTG (USDI 2000). The range-wide breeding population has been estimated at 56,000—61,500 grouse. Within the U.S., current occupied range encompasses approximately 38,400 km^2 (14,827 mi^2), <5% of the historical range estimate of 780,000 km^2 (301,158 mi^2, USDI 2000); a striking example of a reduction in game bird populations in the western U.S. (Marshall and Jensen 1937).

Over 95% of the breeding population of CSTG occurs in 3 metapopulations: northwestern Colorado and south-central Wyoming; southeastern Idaho and northern Utah; and south-central British Columbia (Fig. 1, Bart 2000). Idaho supports approximately 60—65% of remaining CSTG in the U.S. (Hoffman and Thomas 2007). However, recent studies suggest populations of CSTG in British Columbia, Washington, Idaho, and Utah are genetically distinct from sharp-tailed grouse found in Colorado, Montana, and Wyoming (Spaulding et al. 2006, Warheit and Dean 2009). Sharp-tailed grouse in Colorado, Montana, and Wyoming are more closely related to the Plains subspecies (*T. p. jamesi*), leading some to believe they should be managed as a distinct entity. Thus, Idaho plays a critical role in continued existence of CSTG.

Threats to CSTG are widespread across its range, occur at multiple spatial scales, and

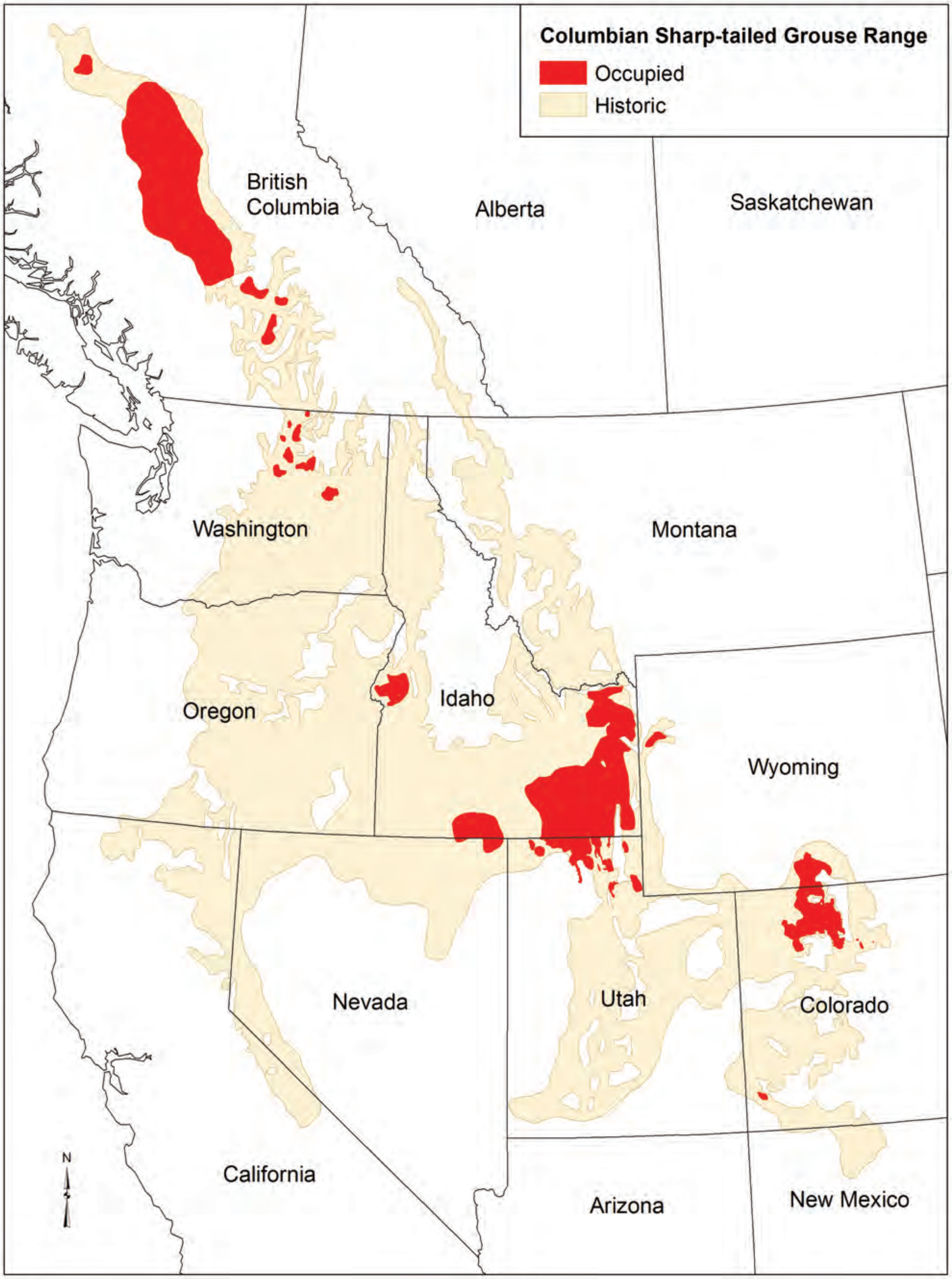

Figure 1. Historical and current range of Columbian sharp-tailed grouse in western North America (modified from Hoffman et al. 2015).

transcend local, state, and regional jurisdictions. Primary threats are all human-related. Foremost are habitat loss and degradation caused by conversion of native habitats to croplands, overgrazing by domestic livestock, energy development, use of herbicides to control big sagebrush (*Artemisia tridentata*), alteration of natural fire regimes, invasion of exotic plants, and urban and rural expansion (Hoffman and Thomas 2007).

Columbian sharp-tailed grouse apparently benefitted more from the Conservation Reserve Program (CRP) than any other prairie grouse (Rodgers and Hoffman 2005). Potential loss of CRP habitat is the most immediate threat to CSTG in Idaho and elsewhere throughout the subspecies' range (Hoffman and Thomas 2007). Since inception in 1985, CRP has provided many thousands of acres of nesting and brood-rearing habitat on private lands in Idaho, resulting in an apparent increase in CSTG populations. Currently, nearly 165,400 ha (408,700 ac) are enrolled in CRP across occupied range of CSTG in Idaho. An additional 45,324 ha (112,000 ac) are enrolled in the State Acres For wildlife Enhancement (SAFE) program (Fig. 2; S. J. Palazzolo, IDFG, personal communication). In 2014, the economic impact of CRP across CSTG range in Idaho was over $31 million (FSA 2015). Although there have been recent general CRP and SAFE sign-ups, acreage of CRP lands continues to decline throughout CSTG range in Idaho (Fig. 2). Approximately 70% of CSTG nesting and brood-rearing habitat occurs on private land in Idaho.

Although numbers declined over time, CSTG remain a popular game bird in Idaho. Current hunting seasons occur during the month of October, with a daily bag limit of 2 and a possession limit of 6. Hunting regulations for CSTG have remained unchanged since 2000. Based on annual harvest surveys, IDFG estimated approximately 2,100 hunters spent 6,000 days hunting to harvest 4,800 CSTG each year from 2000 to 2014.

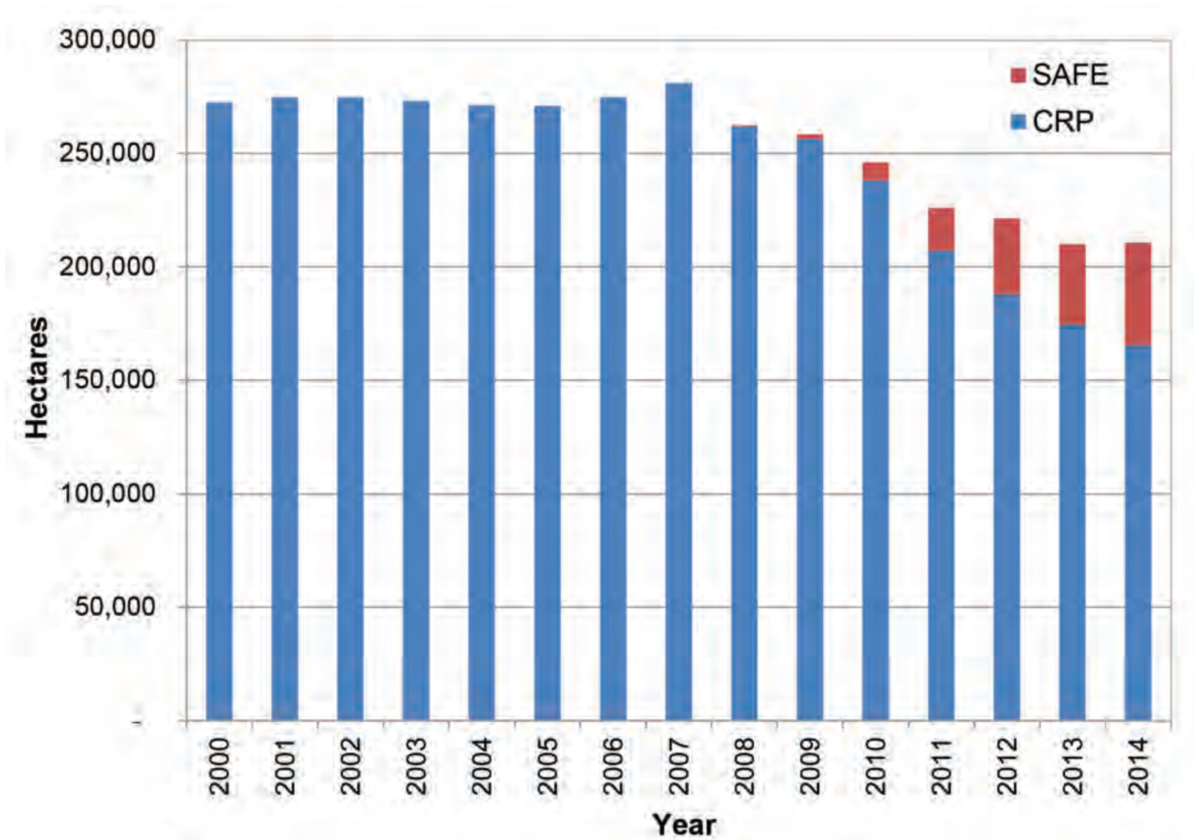

Figure 2. Area (ha) of Conservation Reserve Program (CRP) and State Acres For wildlife Enhancement (SAFE) lands within the range of Columbian sharp-tailed grouse, Idaho, 2000—2014 (FSA 2015).

Purpose

Idaho Code 36-103 establishes statewide policy for wildlife, and can be paraphrased as: all wildlife will be preserved, protected, perpetuated, and managed to provide continuous supplies for hunting, fishing, and trapping. The Idaho Fish and Game Commission (Commission) is charged with administering state wildlife policy through supervision and management of IDFG.

Idaho Code 67-1903 requires state agencies to develop strategic plans that express how they will meet core mission requirements. Plans must identify outcome-based goals and performance measures. The current IDFG strategic plan, The Compass, was implemented in 2005 (IDFG 2005*b*). The Compass calls for development of "action plans" that describe programs, projects, and activities necessary to meet strategic plan goals.

The CSTG management plan tiers off The Compass and functions as the action plan for CSTG management in Idaho. Major issues that affect CSTG are identified, which set overall direction for CSTG management during the next 10 years and provide performance targets and management strategies for management actions. Although not regulatory (e.g., statute or rule), the plan does incorporate Commission policy and provide management direction to IDFG. This plan will guide IDFG in annual work plan development and program priority, and provide guidance on development of regulatory recommendations. Finally, the plan will be used to develop IDFG's annual budget request to the Legislature.

The intent of this plan is to provide guidance for IDFG and their partners to implement conservation measures that will enhance CSTG habitat and populations in Idaho, and prevent the need for ESA protection of CSTG in the future. Whereas the Western Association of Fish and Wildlife Agencies (WAFWA) "*Guidelines for the management of Columbian sharp-tailed grouse populations and their habitats*" (Hoffman et al. 2015) adequately addresses many of the management issues that potentially affect CSTG populations across their range, this plan includes additional conservation strategies more specific to CSTG needs in Idaho.

Relevant IDFG Planning Documents

- Idaho State Wildlife Action Plan, formerly known as the Idaho Comprehensive Wildlife Conservation Strategy (IDFG 2005*a*)
- The Compass, IDFG Strategic Plan (IDFG 2005*b*)
- Mule Deer Management Plan 2008—2017 (IDFG 2008)
- Bureau of Communications Strategic Plan 2011—2015 (IDFG 2011)
- Idaho Elk Management Plan 2014—2024 (IDFG 2014*a*)
- Management Plan for the Conservation of Wolverines in Idaho 2014—2019 (IDFG 2014*b*)

Ecology

Sharp-tailed grouse are in the order Galliformes, Family Phasianidae, and subfamily Tetraoninae. Sharp-tailed grouse were originally described by Linnaeus as *Tetrao phasianellus* in 1758. In 1858, they were placed in the monotypic genus *Pediocetes*, by Baird; however, they were classified as congeneric with prairie-chickens and moved to the genus *Tympanuchus* in 1983 (AOU 1983). They have a mottled, light brown appearance. Distinguishing features include a short, pointed tail; white spots on the wings; and dark V-shaped markings against a pale background on the upper breast feathers (Johnsgard 1973).

The Columbian subspecies was first reported by Lewis and Clark in 1805 on the shrub-steppe plains of the Columbia River Basin. Columbian sharp-tailed grouse are the smallest of the 6 extant subspecies of sharp-tailed grouse in North America and tend to have grayer plumage, more pronounced spotting on the throat, and narrower markings on the undersides (Johnsgard 1973). Males (700—810 g, 1.54—1.79 lb) weigh more than females (600—725 g, 1.32—1.6 lb), and adults weigh more than subadults. Weights vary by season and geographic area (Hoffman and Thomas 2007). Sexes are similar in appearance, but sex can be determined in the hand by presence (females) or absence (males) of transverse barring on central retrices and crown feathers (Ammann 1944, Henderson et al. 1967).

During spring males gather on traditional breeding areas called leks or dancing grounds (Connelly et al. 1998). Leks contain as few as 2 males to ≥30, but average approximately 12 males. Males go through elaborate courtship displays and vocalizations to attract a female for breeding and defend their territory on the lek from other males (Fig. 3). Males that occupy centers of leks do the majority of breeding (Rippin and Boag 1974). Breeding occurs in late April or early May.

After breeding, females construct a rudimentary nest on the ground and lay 10—12 eggs (Hoffman et al. 2015). When a clutch is complete, hens will incubate for 21—23 days (Gross 1930, Hillman and Jackson 1973). Timing of nesting activities is driven by photoperiod, but may be accelerated or delayed ≤14 days by climatic conditions (Hoffman and Thomas 2007). Chicks hatch in late May or early June. If a first clutch is abandoned or depredated before chicks hatch, a hen will often return to a lek for breeding and establish a new nest. Nest success (proportion of nests with ≥1 hatched egg) varies from <40% to >70% (Hart et al. 1950, Giesen 1987, Meints 1991, Schroeder 1994, Apa 1998, McDonald 1998, Boisvert 2002, Collins 2004, Gillette 2014).

When chicks first hatch they are vulnerable to adverse weather, shortages of food, and predation. A cold, wet period during this time can cause loss of entire broods, whereas low food abundance and losses to predators usually cause slow attrition. During the first 2—4 weeks of life, prairie grouse chicks are heavily dependent on high-protein foods such as small arthropods (e.g., beetles, grasshoppers, insect larvae, and ants; Jones 1966, Bergerud 1988). Thereafter, flowering

Figure 3. Male Columbian sharp-tailed grouse performing courtship display on lek (Photo by C. W. Hendricks/IDFG).

parts and leaves of broad-leaf plants, referred to as forbs, make up a significant portion of their diet. Brood success (proportion of successful females with ≥1 chick 35—50 days post-hatch) varies from <40% to nearly 80% (Schroeder 1994, Boisvert 2002, Collins 2004, Gillette 2014).

Adult CSTG consume insects, but plant materials comprise most of their diet (Marshall and Jensen 1937, Hart et al. 1950, Jones 1966, Parker 1970, Marks and Marks 1987, Schneider 1994). The diet often varies as seasons change (Marshall and Jensen 1937, Hart et al. 1950). As summer transitions to autumn, consumption of insects and herbaceous plants decreases, while that of berries increases. In Idaho, fruits of chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier* spp.), hawthorn (*Crataegus douglasii*), and snowberry (*Symphoricarpos* spp.) are heavily used (Parker 1970, Marks and Marks 1987). As the berry crop is depleted and winter snows cover herbaceous plants, grouse switch to buds of deciduous shrubs and trees, especially chokecherry and serviceberry (Schneider 1994). Where available, CSTG will substitute cultivated plants, especially alfalfa, wheat, barley, and corn for berries and buds.

Habitat Relationships

General

At the landscape level, CSTG inhabit a mosaic of agricultural and rangeland communities in the 30.5—50.8-cm (12—20-inch) precipitation zone. They are predominately associated with moderate terrain (Marks and Marks 1987), although they will use top and bottom portions of steeper slopes during winter.

Native CSTG habitat is characterized by bunchgrass prairie and shrub-bunchgrass rangelands in good to excellent ecological condition, with a small percentage of the landscape in tall, deciduous shrub thickets provided by shrubby riparian zones, mountain-shrub patches, and aspen stands (Fig. 4, Meints et al. 1992, Giesen and Connelly 1993). Rangeland communities provide nesting and brood-rearing habitat while riparian zones and mountain-shrub thickets are essential for overwintering (Giesen and Connelly 1993). Rangeland habitats in Idaho are dominated by perennial bunchgrasses, such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*), and shrubs, such as big sagebrush and bitterbrush (*Purshia tridentata*). Serviceberry, choke cherry, and snowberry are particularly valuable mountain-shrub species, whereas hawthorn and willow (*Salix* spp.) are important riparian species. Aspen (*Populus tremuloides*) is used during spring and winter.

Columbian sharp-tailed grouse are habitat generalists and can adapt to moderate landscape modifications (Hoffman and Thomas 2007). They will use, and can benefit from, artificially created habitats (Fig. 5, Connelly et al. 1998, Hoffman and Thomas 2007, Stinson and Schroeder 2012). In some cases, agricultural fields, seeded rangelands, and CRP fields provide suitable habitat, but they must provide physical structure and important food plants similar to those of native rangelands (Hart et al. 1950, Meints 1991, Sirotnak et al. 1991, Apa 1998, McDonald 1998, Boisvert 2002, UDWR 2002, Collins 2004, Leupin and Chutter 2007). Columbian sharp-tailed grouse cannot persist on small, isolated tracts of native habitat; a full suite of seasonal habitats (i.e., nesting, brood-rearing, and winter habitat) across an extensive area is critical to maintain healthy populations (Bergerud 1988, Johnsgard 2002).

Leks

Leks are typically located on low knolls, benches, and ridge tops slightly higher than surrounding terrain (Hart et al. 1950, Rogers 1969, Parker 1970, Ward 1984, Boisvert 2002). A display area for an average-sized lek of 12 males occupies an area approximately 30 m (98.4 ft) in diameter. Vegetation on leks is usually a relatively sparse grass or shrub-grass mix to facilitate visibility and unrestricted movements. Tall, dense shrubs and grasses near a lek provide important escape cover (Boisvert 2002). Meints et al. (1992) suggested the single most important factor for lek locations was proximity to suitable nesting and brood-rearing cover.

Figure 4. Native Columbian sharp-tailed grouse habitat in Idaho is associated with shrub-steppe communities. (Photo by J. M. Knetter/IDFG).

Figure 5. Artificially created Columbian sharp-tailed grouse habitat in Idaho is associated with Conservation Reserve Program lands. (Photo by J. M. Knetter/IDFG).

Nesting and Brood-Rearing Habitat

Columbian sharp-tailed grouse are nest habitat generalists and nest in a variety of cover types (Apa 1998). However, nests are typically located in vegetation types that provide dense vertical and horizontal concealment (Meints et al. 1992, Giesen and Connelly 1993, Tirhi 1995). Regardless of vegetation type used for nesting, CSTG consistently select sites with greater cover than randomly available on the landscape (Hoffman et al. 2015). In Idaho, most nest and brood locations were within 2 km (1.2 mi) of the lek where the hen was bred (Meints 1991, Apa 1998).

Columbian sharp-tailed grouse nest and raise broods in cultivated fields (e.g., irrigated pasture, alfalfa hay, grain stubble, dryland seedings), native grasslands, CRP fields seeded to perennial grasses and forbs, and grass-shrub plant communities. Proportions of grasses and shrubs that comprise suitable CSTG nesting and brood-rearing habitat vary widely, and vegetation height and density appear at least as important as plant species composition in determining CSTG nesting and brood-rearing habitat quality. Columbian sharp-tailed grouse will use grasslands with few shrubs, as well as shrub-grass ranges with shrub cover ≤40% (Hart et al. 1950, Marks and Marks 1987, Meints 1991, Schroeder 1994, Giesen 1997, Apa 1998, McDonald 1998, Boisvert 2002, Collins 2004). Successful nests have more vegetative cover than do unsuccessful nest sites (Hoffman and Thomas 2007).

Brood-rearing habitat is composed of a mosaic of shrub-steppe and grassland communities that support a diversity of forbs and grasses (Giesen and Connelly 1993). Furthermore, brood-rearing habitats must provide plant types that meet nutritional requirements of both females and chicks (Bergerud and Gratson 1988). Suitable brood-rearing habitat must support an abundance of forbs, which are consumed by females, while growing chicks consume insects attracted to the forbs (Hart et al. 1950, Klott and Lindzey 1990, Meints 1991, Apa 1998, McDonald 1998, Boisvert 2002, Collins 2004).

The Robel pole (Robel et al. 1970) is a standard tool to measure vegetative cover at a nest site. The pole, which is divided into 5 cm (1.97 in) increments, is placed in the vegetation and the lowest visible increment is recorded from a standard distance and height. Good quality nesting and brood-rearing habitat will have an average visual obstruction reading of 20—30 cm (7.87—11.81 in). An area that averages <15 cm (5.91 in) visual obstruction is of little or no value to CSTG (Meints et al. 1992).

Growth form of dominant grasses is also an important cover consideration. Bunchgrasses, such as bluebunch wheatgrass and crested wheatgrass (*Agropyron cristatum*), are much more desirable to CSTG than sod-forming grasses, such as intermediate wheatgrass (*Thinopyrum intermedium*) and smooth brome (*Bromus inermis*). Moreover, bunchgrasses with a high percentage of leaves to stems, such as bluebunch wheatgrass, provide better cover than bunchgrasses with a low percentage of leaves to stems, such as crested wheatgrass (Sirotnak et al. 1991, Rodgers and Hoffman 2005).

Winter Habitat

When snow covers herbaceous vegetation or agricultural crops, CSTG utilize shrubby riparian zones and patches of mountain shrubs (Marks and Marks 1988, Giesen and Connelly 1993, Schneider 1994, Ulliman 1995, McDonald 1998). They will often move to higher elevations where higher moisture levels support greater amounts of these shrub habitats. However, if winter conditions are mild, CSTG often stay in open grassland and shrub-grassland communities used for breeding, nesting, and brood-rearing (Ulliman 1995, McDonald 1998). If snow accumulates, CSTG can be forced to utilize tall deciduous shrubs that protrude above the snow to survive winter conditions (Schneider 1994). Distance traveled from leks to wintering areas varies from 0.5 km (0.31 mi) to >40 km (24.86 mi; Meints 1991, Ulliman 1995, Giesen 1997, McDonald 1998, Collins 2004, Boisvert et al. 2005). Giesen and Connelly (1993) suggested presence of mountain-shrub or riparian communities were essential for long-term persistence of CSTG populations.

Threats, Limiting Factors, and Opportunities

Numerous activities have been implicated in the decline of CSTG populations. Primary negative consequences of these activities are habitat loss, degradation, and fragmentation. In this section, continued threats, limiting factors, and opportunities are presented in alphabetical order; they are not ranked or weighted by level of significance.

Agricultural Development

Conversion of native shrub-steppe habitat to agricultural production is often cited as a primary cause of CSTG decline. Intensive agriculture and its associated activities are responsible for CSTG extirpation from approximately 20% of their mapped historical range (Bart 2000). Habitat conversion reduces available nesting and brood-rearing habitat, and riparian shrubs used as winter habitat (Tirhi 1995). Amount of habitat lost to agriculture varies by state, but has been identified as a cause for CSTG disappearance and decline in Idaho, Oregon, Utah, and Washington (Hart et al. 1950, Parker 1970, McDonald and Reese 1998, Bart 2000, Schroeder et al. 2000).

Although agricultural development sometimes provides additional food sources for CSTG, supplemental food does not compensate for resulting loss and fragmentation of native habitats (Hart et al. 1950). Modern, large-scale farming and intensive farming practices (e.g., clean farming, autumn plowing, continuous row cropping) have been detrimental to CSTG. The birds may experience nest loss or direct mortality due to cultivation, haying, mowing, and agricultural chemical application (Ulliman 1995). In Idaho, CSTG make limited use of agricultural fields for food or cover (Meints 1991, Sirotnak 1991, Ulliman 1995).

Climate Change and Severe Weather

Global climate change is a complex issue and ability to credibly predict how climate change will impact any particular area, ecosystem, or species remains difficult (Brown et al. 2005). Impacts of climate change on wildlife, and CSTG specifically, would be related to changes in atmospheric chemistry, temperature and precipitation patterns, and their resulting effects on vegetation communities. For example, Suring et al. (2005) speculated >4.2 million acres of sagebrush cover types in the eastern Great Basin are at high risk of displacement by pinyon (*Pinus edulis*)-juniper (*Juniperus* spp.) within the next 30 years. Modeling of projected vegetation distribution under 7 climate change scenarios suggests decreases in shrubland area in the West during the next century, including a shift from shrubs toward savanna in the Great Basin (Bachelet et al. 2001). Some researchers suggest the area occupied by sagebrush communities will significantly decrease or disappear altogether in the lower 48 states (Hansen et al. 2001).

Climate change impacts on plant community dynamics and health of existing rangeland systems may be magnified compared to other ecosystems, due to the aridity and lower resiliency of these lands. Conversely, rangeland systems could form in areas that currently support other vegetation assemblages. Responses of vegetation to potential changes in precipitation regime are complex and difficult to predict from existing knowledge. Plant response is likely to be highly species-specific, which suggests current plant communities will not simply move to new landscape positions, but will be replaced by novel plant assemblages (Brown et al. 2005). Increased carbon dioxide (CO_2) in the atmosphere will favor cool season plants relative to warm season plants. Recent research demonstrated cheatgrass (*Bromus tectorum*) may respond more favorably to increased CO_2 than some native plants (Smith et al. 2006) and recent increases in CO_2 may have already increased cheatgrass production and resulting wildfire risk (Ziska et al. 2005). Climate change is closely interrelated and synergistic with other important threats, including wildfire, invasive plants, and annual grasslands. These issues are discussed elsewhere in this plan.

Climatic variability, such as frequency and severity of extreme events (e.g., droughts, severe rain events, floods, etc.), is also predicted to increase. Increased climatic variability may result in overall degradation of rangeland conditions and impairment of ecosystem elasticity. Changes in land use in response to climate change and variability also add to complexity of current predictive models.

Extreme climatic events are known to impact game bird populations. Like many upland game birds, spring and early summer weather can greatly influence CSTG chick survival. Snow and cold rain in late May and early June can cause entire broods to die from hypothermia. Cool spring weather and a dry summer can severely limit insect production; consequently, young chicks may die of starvation or predation when forced to travel long distances to find food. Each of these events can dramatically influence autumn populations. Columbian sharp-tailed grouse are well adapted to survive harsh winters. They readily use snow burrows (McDonald 1998) and can subsist on buds of tall shrubs that protrude from snow. Winter conditions, however, may increase their vulnerability to predation or starvation if abundant, dense thickets of deciduous shrubs are not available. An increase in these extremes could impact CSTG over the long term. Conversely, warmer spring temperatures and milder winter conditions associated with a warming climate could positively impact chick survival and overwinter survival with favorable spring weather, increased over-winter insect survival, and reduced snow depth in winter habitat.

Heat stress could also impact grouse populations over time. Several research studies discuss hyperthermia in game birds and its potential impacts. Flanders-Wanner et al. (2004) found average temperatures in May were positively correlated with sharp-tailed grouse production, while June Number of Heat Stress Days (≥35° C, 95° F) was negatively correlated to production. Currently, temperatures rarely reach ≥35° C in Idaho during June, but potential for warmer temperatures may increase given warming trends. While heat stress was an important variable in sharp-tailed grouse production models, drought index was the most valuable predictor of sharp-tailed grouse production. This too could be an issue for CSTG within Idaho depending on how precipitation amounts and timing change over time in CSTG habitat. Guthery et al. (2005) found northern bobwhite (*Colinus virginianus*) exhibited gular flutter, a physiological response indicating heat stress in birds, at 30 ± 0.2° C (86 ± 6.8° F). Other upland game birds may become stressed more frequently during summer months if warming trends continue.

Although weather events can strongly influence CSTG populations, quality of available habitat can temper severity of impacts. Poor quality habitat will increase adverse effects on the birds, while good quality habitat provides more secure cover from both direct impacts of severe weather events and related increases in predator vulnerability.

Disease

Effects of disease and parasitic infections on sharp-tailed grouse populations are not well documented (Peterson 2004). Sharp-tailed grouse host numerous parasites and disease-causing agents, but these organisms do not appear to affect survival or reproductive performance (Herman 1963). Braun and Willers (1967) identified 11 species of protozoan and 20 species of helminth parasites in sharp-tailed grouse. During the past decade, other diseases such as avian influenza and West Nile virus (WNV) have affected avian species around the world. During trapping and translocation activities in northwestern Colorado, 125 CSTG were tested for avian influenza, *Salmonella pullorum*, *Mycoplasma gallisepticum*, *M. synoviae*, and *M.*

meleagridis; all samples tested negative (Gorman and Hoffman 2010).

West Nile virus was first reported in greater sage-grouse (*Centrocercus urophasianus*, hereafter sage-grouse) in 2003 (Naugle et al. 2005). Sage-grouse are highly susceptible to WNV and few, if any, have been known to survive infection. Although WNV has not been detected in sharp-tailed grouse, individuals may have been infected with the virus. No monitoring for WNV has occurred in CSTG. However, extensive monitoring of WNV in sage-grouse in areas where CSTG are sympatric suggests WNV does not affect CSTG. West Nile virus was first detected in Idaho in 2006. Dead sage-grouse found in west-central Idaho tested positive for WNV. The sage-grouse population subsequently decreased as the CSTG population concurrently continued to increase.

Introduced game birds such as ring-necked pheasants (*Phasianus colchicus*) and wild turkeys (*Meleagris gallopavo*) are carriers of *Heterakis gallinarum*, a cecal worm that can be infected with the protozoan that causes blackhead disease (histomoniasis) (Lund and Chute 1972). Pheasants appear resistant to the disease, but whether CSTG are resistant is unclear. Histomoniasis has potential to cause significant mortality (75%) in gallinaceous birds.

Although diseases such as WNV and histomoniasis have not been documented in CSTG, potential for population impacts caused by disease should not be ignored (Peterson 2004). West Nile virus is new to the U.S. and had immediate impacts on sage-grouse populations. We cannot predict what additional diseases may present themselves in avian species. Small, isolated populations are likely at greater risk to diseases or parasitic infection (Walker and Naugle 2011). Columbian sharp-tailed grouse should be closely monitored for unidentified population declines that may suggest a disease outbreak.

Habitat Modification

A variety of factors have altered plant communities in Idaho, resulting in a reduction in CSTG habitat quality. They include, but are not limited to, inappropriate livestock grazing, wildfire, fire suppression, expansion of invasive plants, and shrub control. Most of these factors can lead to development of annual grasslands or juniper-dominated habitats. Livestock grazing is discussed in the Livestock Impacts section; habitat loss and fragmentation are discussed in the Human Development section. This section specifically deals with habitat changes within native habitat.

Wildfire is probably the most important factor influencing native shrub-steppe habitats in Idaho. Although wildfire is a natural disturbance factor, frequency and extent of wildfires has increased in recent decades, particularly in low elevation, Wyoming big sagebrush habitats (*A. t. wyomingensis*, USDI 2004). The increase in wildfires is largely attributed to increases in human-caused ignitions (Idaho Sage-grouse Advisory Committee 2006) and extent of annual grasslands. Invasion and expansion of exotic annual grasses, particularly cheatgrass, into Wyoming big sagebrush habitats, resulted in more frequent wildfires, which increased cheatgrass dominance and extent (Knick 1999, Crawford et al. 2004). Cheatgrass desiccates early in the growing season, resulting in a dense layer of highly flammable material. Once an area has burned, repeated fires are more likely because of further invasion by cheatgrass and a concurrent decline in native grasses and forbs. Most sagebrush species do not re-sprout after fire and reestablishment of sagebrush in burned areas may require decades.

Fire can impact CSTG nesting habitat in the short and long term. Columbian sharp-tailed grouse nest in both shrublands and grasslands, but height and density of nesting cover is more important than species composition (Hoffman and Thomas 2007). For example, loss of shrub nesting cover to fire may not significantly impact CSTG nesting habitat, provided abundant tall perennial grasses and forbs that were not seriously damaged remain after a fire. In high-quality, resilient habitats such as mountain big sagebrush (*A. t. vaseyana*), perennial grasses and forbs will often respond positively to fire. However, following a fire, low-quality, depleted habitats can become dominated by early successional shrubs, including rabbitbrush (*Chrysothamnus viscidiflorus* and *Ericameria nauseosa*) and broom snakeweed (*Gutierrezia sarothrae*). These species re-sprout after a fire, but have limited value to CSTG (Giesen and Connelly 1993). Importantly, when re-seeding after a fire, seed mixes should include a diversity of grasses, forbs, and shrubs. Boisvert (2002) suggested juxtaposition of shrub-steppe, grassland, and mountain-shrub habitats is important to meet all seasonal requirements of CSTG.

Mountain-shrub communities provide critical winter food resources for CSTG. Over the long term, fire in mountain-shrub communities is likely less detrimental to CSTG habitats. Aspen, chokecherry, and snowberry re-sprout following fire, but serviceberry may not (Blaisdell et al. 1982). Over the short term, winter food and cover for CSTG could be lost because several years may pass before shrubs reach sufficient height to protrude above snow and provide food and cover beneficial to wintering grouse. Mountain-shrub areas are more resistant to invasion by cheatgrass because they occur in colder environments; however, in some areas they are more vulnerable to invasion by juniper and other conifers (Pierson and Mack 1990, Wisdom and Chambers 2009).

Lack of fire, or fire suppression, can also decrease habitat quality in some areas. Effective fire suppression, in combination with intense livestock or wildlife grazing, can often increase sagebrush cover to the detriment of herbaceous understory (Crawford et al. 2004). These areas are then at a higher risk for large, intense wildfire.

Fire suppression can also negatively impact mountain-shrub habitats in some areas. Some shrub patches may become too dense for CSTG to access inner portions of the patch. In Colorado, Boisvert (2002) found CSTG used more open stands of serviceberry during winter.

In southern Idaho, invasion by juniper and other conifers has reduced available CSTG habitat. Junipers, in particular, have expanded dramatically because fires have become too infrequent. Junipers and other conifers can also provide perches for raptors and may provide cover for other predators (Hoffman 2001). Conversely, a few junipers may be beneficial. Marks and Marks (1987) observed wintering birds eating juniper berries in west-central Idaho.

Expansion of invasive non-native herbaceous plants is another significant problem facing CSTG. Areas dominated by bulbous bluegrass (*Poa bulbosa*), medusahead (*Taeniatherum caput-medusae*), or cheatgrass do not provide adequate nest and brood concealment. In addition to loss of hiding cover, forbs and associated forage insects often decrease in cheatgrass-dominated areas (Laycock 1991).

Other invasive plant species are degrading or have potential to degrade native CSTG habitats. For example, the BLM estimates 1,862 ha (4,600 ac) of federal land in the West are lost each day to weed infestations (BLM 2007). Noxious weeds displace native and desirable non-native plants and ultimately reduce wildlife forage, alter thermal and escape cover, change water flow and availability to wildlife, and may reduce territorial space necessary for wildlife survival. This disruptive process ultimately affects quantity and quality of available habitat and will reduce CSTG populations. Several plants have potential to invade CSTG habitat: whitetop (*Cardaria draba*), leafy spurge (*Euphorbia esula*), rush skeletonweed (*Chondrilla juncea*), yellow star-thistle (*Centaurea solstitialis*), knapweeds (*Centaurea* spp.), dyer's woad (*Isatis tinctoria*), jointed goatgrass (*Aegilops cylindrica*), and field bindweed (*Convolvulus arvensis*). Many of these species, as well as several other less common plants, can invade an area following wildfire or other disturbances.

Shrub control, through herbicides or prescribed fire, generally has a similar effect on CSTG habitats as wildfire. Herbicide spraying (e.g., 2,4-D) was historically used to remove sagebrush cover over large land areas in the West to increase grass production for livestock. These areas were often re-seeded with crested wheatgrass or smooth brome, which form monocultures with limited habitat value for CSTG (Rodgers and Hoffman 2005). Because 2,4-D can also kill desirable perennial forbs and deciduous shrubs (Blaisdell et al. 1982), habitat diversity for CSTG is further reduced. Herbicide spraying is still a common practice, but typically occurs on smaller parcels on private grazing lands. Klott (1987) reported 2 CSTG leks were abandoned following herbicide treatments of sagebrush in Wyoming.

Human Development

Habitat loss and fragmentation are responsible for extirpation of CSTG across most of their historical range (Bart 2000). Furthermore, habitat loss and degradation continue to be the 2 most unequivocal threats to CSTG throughout their range (Hart et al. 1950, Giesen and Connelly 1993, McDonald and Reese 1998, Hoffman and Thomas 2007). Historically, the primary cause of habitat loss was conversion to intensive agriculture; however, in recent years, the primary causes of habitat loss have been residential and commercial development (Fig. 6, Hoffman and Thomas 2007). Infrastructure can be defined as man-made structures needed for the services of our society. As human populations continue to expand, need for finite resources to support this growth is increasing. Idaho is not immune to this issue. The U.S. Census Bureau (2010) reported Idaho's population increased by 21% during 2000—2010, making Idaho the fourth fastest growing state in the nation.

Infrastructure needed to meet this growth includes rural and urban development, roads, energy development, communication towers, and so forth. Factors that influence grouse populations include, but are not limited to, habitat loss, fragmentation and degradation, increased predation, and behavioral avoidance. Very little research has been conducted on direct or indirect impacts to CSTG from infrastructure. However, results from studies of other gallinaceous birds provide some insight to potential consequences for CSTG.

Impacts of roads to a wildlife population depend upon type of road, density of roads, amount of traffic, and proximity to key habitats. Depending upon the network of road development, roads can fragment habitat into smaller, less effective patches. Lyon and Anderson (2003) documented vehicle noise impacted sage-grouse lek attendance in the Pine Basin of Wyoming. Direct mortality from vehicle collisions was documented in lesser prairie-chickens (*Tympanuchus pallidicinctus*, Crawford and Bolen 1976) and sage-grouse (Lyon and Anderson 2003, Holloran 2005).

Little information exists on impacts of utility lines on gallinaceous birds. Bevanger and Brøseth (2004) documented avian mortality from 4,000 km (2,486 mi) of power lines over a 6-year period in Norway; ptarmigan (*Lagopus* spp.) constituted 80% of birds found. Pruett et al. (2009) found lesser and greater prairie-chickens (*Tympanuchus cupido*) avoided power lines in Oklahoma. In the Powder River Basin in Wyoming and Montana, Walker et al. (2007) concluded power lines had negative effects on lek persistence for sage-grouse. Power line poles and transmission line support towers resulted in increased perches and nest sites for avian predators (Ellis 1984, Steenhof et al. 1993, Braun et al. 2002, Connelly et al. 2004) and, therefore are assumed to result in increased predation rates on grouse.

Fence impacts can vary depending upon type of fencing material and proximity to CSTG habitat. Fence posts can increase perch sites for avian predators and some fencing materials may result in increased avian fence collisions. Direct mortality from fence collisions accounted for 32% of all documented mortalities of lesser prairie-chickens in New Mexico (Patten et al. 2005). In a recent study on sage-grouse in southeastern Idaho, Stevens (2011) documented 83% of avian fence collisions within sagebrush-grass habitat involved upland game species, including CSTG. Several researchers in Europe have shown gallinaceous birds are more susceptible to fence collisions than other species. In Scotland, capercaillie (*Tetrao urogallus*), and red and black grouse (*Lagopus lagopus*, *Tetrao tetrix*), accounted for 93% and 91%, respectively, of documented avian collisions with red deer (*Cervus elaphus*) fencing during 2 studies (Baines and Summers 1997, Baines and Andrew 2003). In Norway, Bevanger and Brøseth (2000)

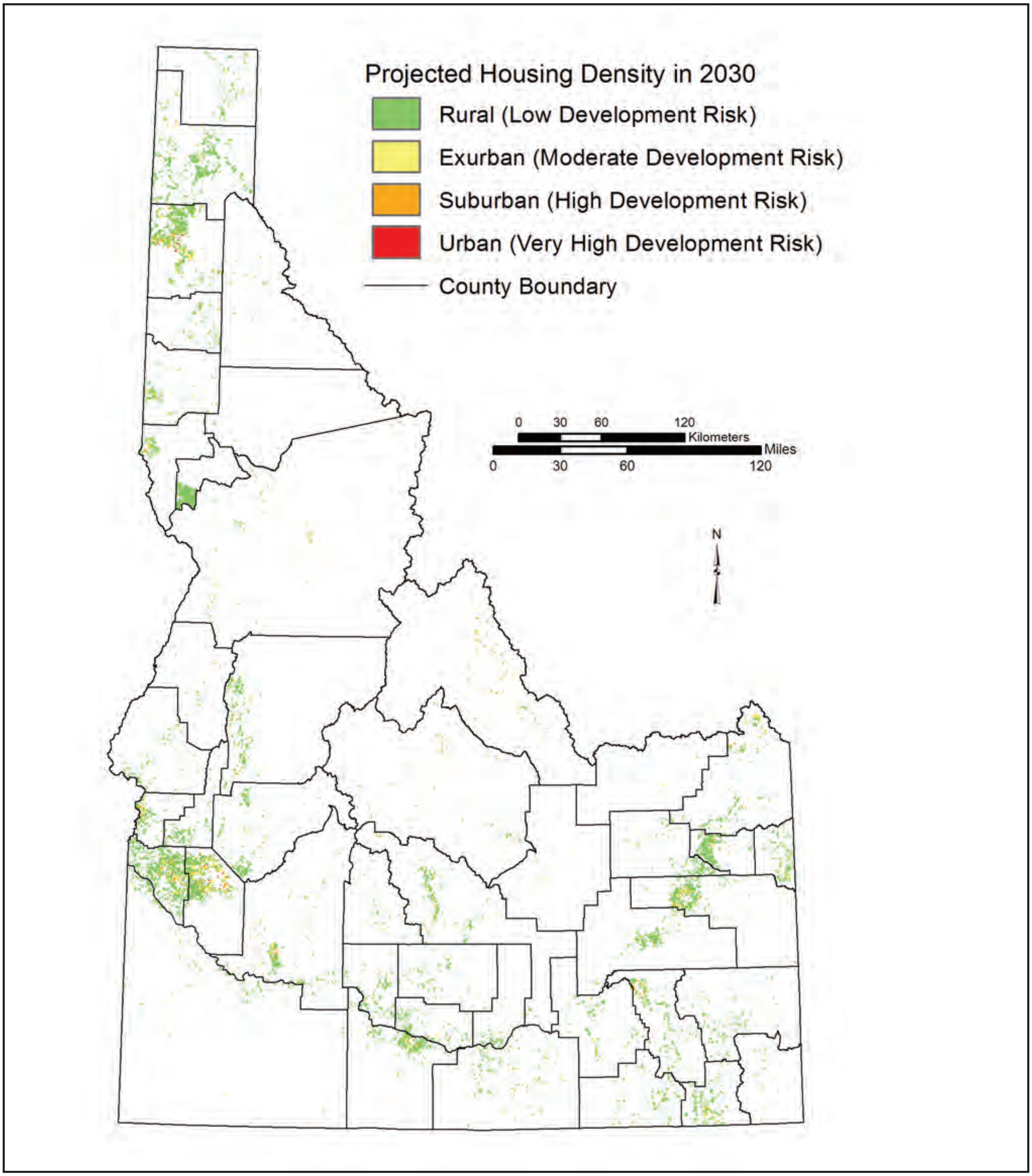

Figure 6. Projected housing density and human development risk in Idaho by 2030 (Theobald 2007).

documented 253 avian fence collisions along 71.1 km (44.2 mi) of reindeer (*Rangifer tarandus*) fence over 4 years, 85% of which were ptarmigan.

Demand for wind energy development has increased dramatically across the U.S., including Idaho. Impacts to CSTG from development of wind energy and associated infrastructure are unknown. Several wind energy developments exist within key grouse habitat in Idaho (Fig. 7). These developments are largely on private land; consequently, opportunities to adequately quantify effects on CSTG prior to and after development have been limited. Direct mortality of CSTG due to turbine collisions has not been documented; however, associated infrastructure of energy development (power lines, roads, fences) may have negative impacts on the species (Kuvlesky et al. 2007). Several studies have documented negative impacts of wind energy infrastructure on gallinaceous birds. LeBeau et al. (2014) documented reduced brood survival for sage-grouse near wind turbines in Wyoming, and Winder et al. (2014*a*) found female greater prairie-chickens avoided turbines in Kansas. Similar studies on greater prairie-chickens have shown turbines did not influence nest site selection or nest survival (McNew et al. 2014) and, unexpectedly, Winder et al. (2014*b*) documented an increase in bird survival following construction of wind turbines.

Sage-grouse displayed behavioral avoidance of anthropogenic structures in relation to the oil and gas boom in Wyoming. Several researchers documented sage-grouse lek abandonment (Braun et al. 2002, Connelly et al. 2004, Holloran 2005), decreased lek attendance (Blickley et al. 2012*a*), and increased stress levels (Blickley et al. 2012*b*) in relation to anthropogenic activity of oil and gas development. Currently, oil and gas development is minimal in Idaho; however, behavioral avoidance may be similar for other infrastructure development within CSTG habitat.

Some predatory wildlife species clearly benefited from human alterations of the landscape; however, quantifying how this change has or will impact CSTG populations presents a challenge. At least 3 common mammalian predators benefited from human impacts: striped skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), and coyotes (*Canis latrans*). As mentioned previously, avian predators take advantage of man-made structures as perches. Coates et al. (2008) documented common ravens (*Corvus corax*) and American badgers (*Taxidea taxus*) as primary nest predators for sage-grouse in northeastern Nevada.

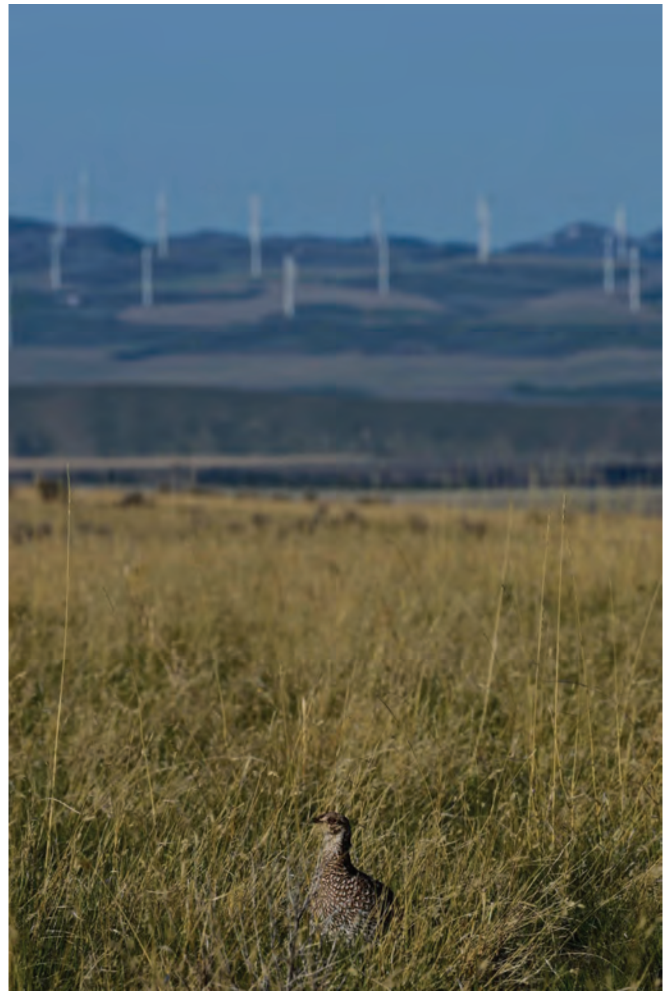

Figure 7. Wind energy developments have expanded into Columbian sharp-tailed grouse habitats in eastern Idaho in recent years. (Photo by T. R. Thomas/www.nature-track.com).

Human Disturbance

Outdoor recreation (hiking, camping, wildlife watching, photography, horse-back riding, motorized recreation) in the West is very popular, due primarily to large tracts of public land available for use. All-terrain vehicles, including motorcycles, ATVs, UTVs, and snowmobiles, are used by >27% of the population in the western U.S. (Cordell et al. 2005). Habitat degradation, displacement, and wildlife harassment are some environmental impacts caused by motorized vehicle use (Ouren et al. 2007).

Increased use and availability of ATVs and snowmobiles has allowed increased human access on the landscape, but whether these activities negatively affect CSTG populations is unknown. A few studies examined disturbance at leks. Baydack and Hein (1987) conducted experimental disturbances at plains sharp-tailed grouse leks and noted males repeatedly came back to leks following human disturbance while females tended to stay away. Stinson and Schroeder (2011) described similar results at CSTG leks where repeated flushing occurred, but noted although hens did not return the same morning, they did return the following morning. Hoffman and Thomas (2007) examined lek attendance when subjected to intensive viewing activities and concluded there was minimal impact.

Other than disturbance at leks, nothing is known about effects of human disturbance on other seasonal habitats, particularly winter habitat. During winter, CSTG tended to be sedentary and use traditional wintering areas (Ulliman 1995, Collins 2004, Boisvert et al. 2005). Winter recreation, such as snowmobiling and back-country skiing, could negatively impact CSTG in traditional wintering areas, particularly if disturbances are regular (Hoffman and Thomas 2007). Repeated disturbances may cause displacement of birds from critical feeding and roosting habitat.

Although CSTG apparently tolerate some disturbance at leks, continuous disturbance should be avoided. Approximately 77% of CSTG leks in Idaho occur on private land where there is very little access by the general public. Lek-disturbing activities, such as continuous daily flushes, should be kept to a minimum. Critical winter-use areas should be protected from human use, particularly during harsh winters when fewer mountain shrubs are exposed above snow. Working with public land managers to identify critical seasonal habitats will be important for minimizing disturbance. Management of off-road vehicle use in critical seasonal habitats should be considered.

Isolated Populations

Isolated CSTG populations occur in west-central (Washington and Adams counties) and south-central Idaho. The west-central population is a remnant population; likely isolated for decades due to human and agricultural development in the Snake River Plain. The south-central population resulted from efforts to reestablish functioning CSTG populations in that area. Reintroduction of CSTG occurred into 2 areas in southern Twin Falls County; 359 grouse were released in Shoshone Basin from 1992 to 1999, and 247 grouse were released at House Creek from 2003 to 2010. Grouse in Shoshone Basin dispersed north and persist 15 years after the last releases in 1999. A population also persists in the House Creek reintroduction area, but whether either reintroduction will result in long-term, self-sustaining populations is not yet known (Gardner 1997, Smith 2012).

By definition, isolated populations are geographically separated from other populations of the same species and receive few or no immigrants. Immigration is the primary means of introducing new genetic material into a population. Therefore, isolated populations often display decreased genetic diversity when compared to larger, interconnected populations. This decrease in genetic diversity can lead to reduced reproductive fitness and reduced ability to adapt to environmental changes. Westemeier et al. (1998) showed an isolated greater prairie chicken population in Illinois underwent drastic declines in genetic diversity and egg viability over a 35-year period, which resulted in a concurrent population decline (from 2,000 to <50 individuals). When genetic diversity of the population was supplemented with translocated prairie-chickens, egg viability significantly improved.

Immigration and reproduction are the 2 ways populations replenish from losses. Because isolated populations likely receive little or no immigration, they are slower to recover and more vulnerable to extirpation related to population-level disturbances (e.g., disease, fire, extreme weather events, overharvest). Therefore, effects of all threats to CSTG identified in this plan could be magnified in Idaho's isolated populations, as all threats have potential to cause environmental change. Thus, isolated populations should be managed under the assumption they are subject to a higher propensity for extirpation.

To date, there have been no efforts to evaluate genetic exchange between CSTG populations within the state or between Idaho and neighboring states. Genetic samples should be collected to evaluate genetic exchange and help identify CSTG management units. Additionally, future habitat improvement and conservation efforts (e.g., CRP, SAFE, conservation easements) should focus on protecting and improving linkage habitat between disjunct CSTG populations. Ideally, quality linkage habitat should be maintained not only among Idaho populations, but also among Idaho populations and those in neighboring states. Future CSTG translocation efforts should be aimed at stimulating linkage between disjunct populations (i.e., establish occupancy in unoccupied linkage habitat), when adequate linkage habitat exists.

Knowledge Gaps

Based on data provided by states in response to a petition to list CSTG under the ESA (USDI 2000), the entire U.S. breeding population of CSTG is approximately 51,000 grouse. Hoffman and Thomas (2007) estimated Idaho supported approximately 60% of this population, or 30,000 grouse. However, estimating population size or trends in Idaho is difficult. Some baseline information regarding status, distribution, general life history, and ecology of CSTG in Idaho is available, but additional information is needed.

Population size and trend estimates are difficult to obtain for CSTG populations in Idaho because 1) lek surveys have varied in intensity through time, 2) survey methods are not standardized, and 3) sampling methods do not utilize a probability sampling approach. For example, there are currently 702 documented leks in Idaho, but status of 437 of those is undetermined because they have not been visited in the last 5 years. Efforts are currently underway to verify status of CSTG leks, but there is a need to develop a standardized, statistically defensible procedure to better monitor leks in Idaho. For example, implementing a probability sampling framework to survey leks on an annual basis would lead to an unbiased estimate of population size (Garton et al. 2005). Such a sampling framework could be based on a spatial or habitat model, which could guide stratification of monitoring efforts. Results would also help to better determine CSTG distribution in Idaho. Furthermore, Hoffman and Thomas (2007) suggested lek attendance patterns need to be determined to improve lek counts. A spatial model could also be used to determine distribution of CSTG during winter.

Although hunting season structure and survey methods have changed over time, harvest estimates may be the best information available on CSTG population trends. From 1986 to 1991, season structure and hunter survey methods were consistent, but estimated harvest increased from 1,700 to 6,000 grouse. From 1992 to 1999, season length was extended in the Southeast Region and an outside contractor was hired to conduct harvest surveys. Estimated harvest during this time period ranged from 7,200 to 14,700 grouse. From 2000 to present, the hunting season has consistently been 1—31 October in both the Southeast and Upper Snake regions. Since 2000, Idaho has required a permit to hunt CSTG and sage-grouse. The permit has allowed IDFG to better estimate harvest, which ranged from 3,500 to 6,900 grouse. Although harvest was likely overestimated prior to implementation of the permit system, CSTG harvest has clearly increased since the mid-1980s.

Hoffman (2001) suggested hunting removed <4% of the autumn population of CSTG in northwestern Colorado, and believed hunting mortality was compensatory to natural mortality. However, Hoffman (2001) also suggested overharvest may occur on public lands. Gillette (2014) used statistical population reconstruction to estimate harvest rates of CSTG in southeast Idaho; from 2000 to 2013, harvest rates ranged from 5% to 8%. Additionally, wings obtained from hunter-harvested grouse are used to assess reproductive success in Idaho (Fig. 8). From 2000 to 2014, juveniles represented 48% of the harvest (Table 1). Unfortunately, there is no method to distinguish males from females based on wing characteristics, but recent efforts have been made to collect head and tail feathers from hunter-harvested birds to determine sex ratios.

Implementation of CRP in the U.S. was a primary reason the USFWS did not list CSTG as threatened in 2000 (Hoffman and Thomas 2007). In Utah, local populations increased as much as 400% when CRP connected isolated habitats and increased available habitat (UDWR 2002). Populations in southeastern Idaho also appeared to increase in response to the program (Mallet 2000). Additionally, 80% of new leks located in southeastern Idaho were found on lands enrolled in CRP (Mallet 2000).

Lands in CRP provide breeding, nesting, and brood-rearing habitat for CSTG (Sirotnak et al. 1991, Apa 1998, McDonald 1998). However, there have been relatively few intensive field studies to determine ecological interactions between CRP lands and CSTG. Gillette (2014) measured CSTG demographic rates in CRP lands from 2011 to 2013 in southeastern Idaho and concluded intrinsic rate of growth of CSTG in CRP was comparatively lower than grouse occupying shrub-steppe habitat. Nonetheless, biologists generally agree CSTG populations will decline if CRP lands are lost (Hoffman 2001). Documenting value of CRP lands to CSTG populations in agricultural habitats is necessary. These data will have an important bearing on future agricultural land use policy and practice. Similar documentation regarding importance of native habitats to long-term survival of CSTG is likewise needed. Should CRP cease to exist, agencies will need to develop long-term management strategies to assure sufficient quantity and quality of native habitat exists to maintain viable CSTG populations in Idaho.

An estimated 70% of CSTG nesting and brood-rearing habitat occurs on private land in Idaho.

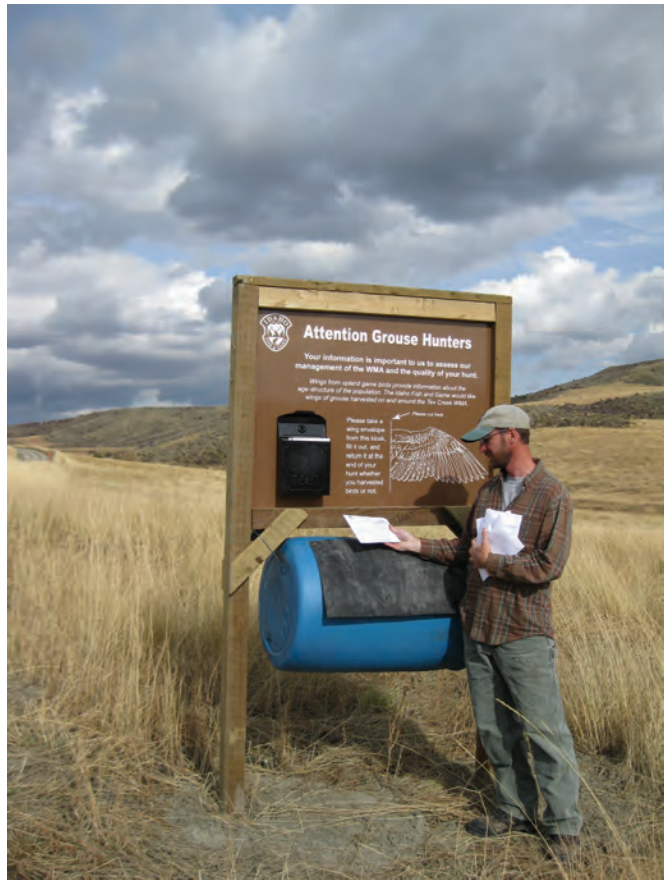

Figure 8. Wing collection kiosk at Tex Creek Wildlife Management Area. (Photo by J. M. Knetter/IDFG).

Furthermore, CSTG are dependent on both private and public land to meet their seasonal habitat requirements. As a result, managers must engage private landowners in CSTG conservation efforts and determine public attitudes towards CSTG. These measures will be particularly pertinent should CSTG be listed as threatened or endangered. Hoffman (2001) believed a potential listing would hinder, rather than promote, conservation efforts for CSTG.

Lack of Funding, Support, and Administration

As with most conservation efforts, allocation of resources is critical to successful CSTG conservation. Given these resources are limited, they must be directed at both population monitoring and habitat enhancement needs. Furthermore, the importance of developing and capitalizing on any opportunities to leverage limited resources cannot be overstated.

Table 1. Hunter-harvested wings of Columbian sharp-tailed grouse collected by Idaho Department of Fish and Game and juvenile:adult index to production, Idaho, 2000—2014.

Year	Juvenile		Adult		Juvenile:adult	*n*
	n	%	*n*	%		
2000	267	58.6	189	41.4	1.42	456
2001	339	50.4	333	49.6	1.02	672
2002	184	37.7	304	62.3	0.61	488
2003	134	42.4	182	57.6	0.73	316
2004	150	55.9	118	44.1	1.27	268
2005	184	39.1	287	60.9	0.64	471
2006	78	32.0	166	68.0	0.47	244
2007	159	42.4	216	57.6	0.74	375
2008	291	57.8	212	42.2	1.37	503
2009	438	57.9	318	42.1	1.38	756
2010	484	49.4	496	50.6	0.98	980
2011	336	47.7	369	52.3	0.91	705
2012	357	51.2	340	48.8	1.05	697
2013	304	47.9	331	52.1	0.92	635
2014	422	52.9	377	47.2	1.12	799
Total	4,127		4,238			8,365
Average		48.2		51.8	0.97	

Currently, population monitoring efforts are primarily achieved through annual spring lek counts. Although IDFG and cooperating partners have invested a substantial effort in lek counts, increasing lek count efforts could bolster current knowledge of population status and trends. However, increasing monitoring efforts with currently allocated resources and time demands is not viewed as a priority for IDFG as compared to other more urgent needs during this seasonal timeframe (e.g., sage-grouse lek monitoring). Therefore, developing strategies to increase availability of observers for improved monitoring efforts would greatly facilitate CSTG conservation efforts in Idaho.

Long-term engagement and commitment of Idaho citizens in CSTG conservation and management is critical to success. Key components to generate this support are ensuring all stakeholders are provided information on CSTG ecology and conservation requirements, and making this information readily available through traditional and innovative communication methods. The IDFG uses newsletters, public meetings, workshops, media outlets, internet, and other communication tools to share information with stakeholders. However, the way society receives information is ever-changing and will continue to evolve. The IDFG strives to keep pace with evolving media formats and communications strategies, and continues to develop innovative website tools designed to engage and inform the public (e.g., Report Observations, Report Roadkill, Hunt Planner, Fishing Planner). Likewise, stakeholder input is integral to helping IDFG make sound resource management decisions. The IDFG is committed to working in partnership with all stakeholders to seek and take into account their knowledge, experience, and perspectives.

Citizen support for CSTG and other wildlife is increasingly channeled through volunteerism. Ever-growing collaboration between IDFG and citizen scientists not only serves to engage the time, skills, and energies of a dedicated constituency, but actively contributes important biological data to assess status of native fish, wildlife, and plants. In 2014, nearly 4,000 volunteers donated >47,000 hours to IDFG projects statewide, which was equivalent to >$1 million donated to wildlife conservation (IDFG, unpublished data).

Currently, IDFG citizen scientists assist with lek surveys, and trapping and translocation projects. Grouse hunters complete annual harvest surveys and contribute wings and feathers, which helps to monitor harvest over time. The IDFG views hunters, non-governmental organizations, citizen scientist volunteers, and Idaho's general public as essential partners in stewardship of CTSG and all native fish, wildlife, and plants in Idaho.

In addition to CRP and SAFE programs, IDFG also uses funds from the Habitat Improvement Program (HIP) to implement habitat projects for CSTG. However, because funding is limited, these projects tend to be much smaller in scale than CRP or SAFE projects. As a result, HIP projects do not have the landscape-scale impact CRP and CRP-SAFE programs are able to achieve. However, HIP projects are important in continuing to raise awareness of CSTG in Idaho, and provide an avenue to implement habitat improvements on properties that do not meet eligibility criteria for U.S. Department of Agriculture (USDA) programs.

Many IDFG and USDA initiatives are designed around a flagship species. When implemented correctly, these efforts will benefit multiple species and ecosystems. Two large efforts, the USDA Sage Grouse Initiative (SGI) and IDFG Mule Deer Initiative (MDI), are creating benefits for CSTG. The SGI works primarily with private landowners to conserve sage-grouse habitat through voluntary cooperation, incentives, and community support. Because current range of CSTG frequently overlaps the range of sage-grouse, habitat conservation activities (e.g., prescribed grazing, juniper removal, and rangeland restoration) implemented to benefit sage-grouse can also benefit CSTG. The MDI works with private landowners and on public lands to improve mule deer (*Odocoileus hemionus*) habitat. Recent efforts to improve grasslands, which include forb and shrub plantings, are designed to enhance habitat for both mule deer and CSTG. Significant overlap occurs between mule deer winter and transition range, and CSTG seasonal habitats.

Livestock Impacts

Livestock grazing is the predominant land use practice across CSTG range in Idaho. Decades of livestock grazing on western rangelands altered composition and productivity of shrubland communities. Although livestock use is reduced today, and some level of recovery has occurred, the legacy of those early impacts on plant community composition is still evident in most areas (West 2000).

Improper livestock grazing is often considered a primary factor contributing to the decline in CSTG populations (Marks and Marks 1987, Klott and Lindzey 1990, Meints 1991, Giesen and Connelly 1993). Bart (2000) stated grazing and its associated effects caused extirpation of CSTG from approximately 75% of historical range.

Although overall effect of livestock grazing on native shrublands is complicated and variable (Miller and Eddleman 2001), improper grazing with high or over-utilization decreases habitat quality for CSTG (Parker 1970, Zeigler 1979, Klott and Lindzey 1990, Saab and Marks 1992, Schroeder and Baydack 2001, Boisvert 2002, Collins 2004, Leupin and Chutter 2007, Hoffman and Thomas 2007, Stinson and Schroeder 2012). Anecdotal and correlative information suggests improper grazing can negatively impact CSTG populations (Marks and Marks 1987, Klott and Lindzey 1990, Boisvert 2002, Collins 2004); however, there have been no experimental studies specifically designed to test this hypothesis. Changes in plant community composition and structure brought about by improper grazing can reduce CSTG food resources, both key food plants and associated insects, and reduce nesting and hiding cover, which can lead to increased predation (Hoffman and Thomas 2007). During drought, intensive grazing by livestock in CSTG nesting and brood-rearing habitats may result in decreased survival of CSTG broods due to loss of protective cover and food resources.

Grazing in mountain-shrub communities and riparian areas can also affect CSTG winter habitat (Giesen and Connelly 1993). Trampling and browsing of shrub stands by domestic livestock and wild ungulates can result in stands that no longer provide adequate escape and loafing cover, or stands of shrubs that no longer protrude above deep snow (Parker 1970).

Other aspects of livestock operations could impact CSTG. These include disturbance at leks due to livestock operations, such as maintenance activities and herding; direct destruction of CSTG nests in pastures; direct killing of CSTG broods in agricultural fields during haying and mowing; collision of CSTG with fences; and drowning of CSTG in water troughs. Inadvertent placement of salt and mineral supplements or water developments in key use areas could result in concentrated damage to CSTG habitats. However, there is no evidence these potentially incompatible practices are currently responsible for depressing populations in Idaho.

Despite impacts improper grazing and associated infrastructure can have on CSTG and their habitats, maintaining ranching as a viable land use is vitally important to conservation of CSTG because most populations are currently associated with private grazing land (Hoffman and Thomas 2007, Stinson and Schroeder 2012). When grazing ceases to be economically viable, private rangeland is often sold for other uses, largely exurban residential development. This land use transforms the landscape and renders the area unsuitable for CSTG.

Clearly, grazing use can be compatible with CSTG, as evidenced by existing and stable populations in some grazed areas. These areas are characterized by healthy, functioning rangelands dominated by perennial native grasses, forbs, and shrubs. By working with ranchers to modify grazing management practices such as controlling timing, intensity, duration, and frequency of grazing, depleted vegetation communities can be improved to increase forage as well as meet needs of CSTG. In situations where original native plant communities have been seriously degraded and changes in grazing practices will not recover the community, making financial incentive programs available to help ranchers reestablish a functioning perennial community can restore habitat for CSTG.

Pesticides

Pesticides used to control insects (insecticides) and plants (herbicides) may have both direct and indirect impacts on CSTG (Hoffman and Thomas 2007). Insecticide spraying may directly kill grouse (Blus et al. 1989, Ritcey 1995), or reduce or eliminate insects available for food. Sharp-tailed grouse chicks rely almost exclusively on insects for food during the first few weeks of life (Bergerud 1988). Herbicide spraying designed to reduce or eliminate shrubs, forbs, or weeds is a form of habitat conversion. Not only does this practice reduce available cover, herbicide use also reduces essential food items such as serviceberry, chokecherry, hawthorn, and various forbs. Insect populations also decline after herbicide treatments due to reductions in shrub and forb abundance and diversity (Hoffman and Thomas 2007).

Organophosphate (dimethoate or Malathion) and benzamide (diflubenzuron) insecticides are commonly used to protect crops from grasshoppers, Mormon crickets (*Anabrus simplex*), and boll weevils (*Anthonomus grandis*). McEwen and Brown (1966) reported 6 of 19 (32%) marked sharp-tailed grouse exposed to Malathion died within 72 hours. At sublethal doses, sharp-tailed grouse terminated breeding and were more vulnerable to predators. Similarly, organophosphate insecticide application on an alfalfa field in eastern Idaho resulted in deaths of 63 sage-grouse occupying that field (Blus et al. 1989).

Grasshoppers and Mormon crickets naturally occur in habitats occupied by CSTG. On rare occasions public lands are sprayed with insecticides to protect neighboring crops. However, insecticide use is uncommon in most areas occupied by CSTG. Farmers in northwestern Colorado indicated use of insecticides on wheat was not cost effective due to marginal conditions and small profit margins (Hoffman and Thomas 2007).

The recent arrival of WNV, which is known to kill sage-grouse, may result in the increased use of insecticides to control mosquitos. Large doses of insecticides may affect CSTG populations, especially near brood-rearing areas. Sharp-tailed grouse chicks rely on insects for growth and survival during the first 3 weeks post-hatch. Use of larvicides and low doses of adulticides may mitigate risk of using insecticides in CSTG range (Rose 2001). However, any application of insecticides should be avoided in CSTG nesting and early brood-rearing habitat.

Predation and Interspecific Competition

Predation is a significant influence on CSTG populations (Schroeder and Baydack 2001). Grouse evolved with predation pressure and developed strategies to avoid predation. For example, CSTG females select nest sites with dense horizontal and vertical vegetative cover to conceal nests from predators (Giesen and Connelly 1993). To further compensate for high predation rates, CSTG have large clutches and high nesting rates, where both adult and yearling females attempt to nest, and adults frequently renest if the first clutch is destroyed (Connelly et al. 1998). However, there are times or situations in which predation on CSTG may exceed normal ranges and lead to negative impacts on populations.

Increased predation on CSTG nests, chicks, or adults is largely attributed to poor quality habitat (Schroeder and Baydack 2001). Inadequate concealing vegetative cover can result in increased nest predation because nests are easier for predators to find. Lack of adequate escape cover can lead to increased predation on adults (Connelly et al. 1991). Habitat fragmentation can also lead to increased predation if predator access to native habitats is increased or birds are forced to travel through risky habitats (Schroeder and Baydack 2001).

Throughout the range of CSTG the suite of potential predators is large. However, composition of the predator community and subsequent impacts on CSTG populations is likely highly variable. This variability is due to differences in types and quality of available habitat, types and abundance of prey species present, and prevalence of anthropogenic subsidies (e.g., landfills, transmission lines) that support elevated predator populations for some species (Hoffman and Thomas 2007). For example, some studies have identified avian predators as the primary source of adult mortality (Marks and Marks 1987, Meints 1991, McDonald 1998), whereas others have attributed most adult mortality to mammalian predators (Coates 2001, Boisvert 2002, Collins 2004). Because of this observed variation, understanding local CSTG population dynamics and how specific species of predators may be influencing CSTG vital rates is important.

Agriculture and infrastructure have allowed some predator populations to increase or expand their range. Raccoons, striped skunks, and red fox (*Vulpes vulpes*) typically are more abundant in agricultural and suburban areas than in native habitats. These species are also known to use roads and ditches as travel corridors into native habitats. Ravens, crows (*Corvus brachyrhynchos*), and several raptor species use human structures and transmission line towers and poles for perching and nesting (Coates et al. 2014). Steenhof et al. (1993) documented an increase in the nesting populations of ravens and raptors in a southern Idaho shrub-steppe habitat following installation of a transmission line. Ravens are generally found in higher abundances in areas with various anthropogenic resources (Howe et al. 2014, Coates 2007, Bui et al. 2010, Coates and Delehanty 2010). Correspondingly, Coates (2007) found higher raven numbers were correlated with decreased nest success for sage-grouse. In the Curlew and Rockland valleys of southern Idaho, Gillette (2014) found 75% of nest depredations were caused by terrestrial mammalian predators, with American badger the most frequent CSTG nest predator.

Habitat management or manipulation is generally considered the appropriate tool to manage predator impacts on CSTG and other prairie grouse populations. For example, habitat restoration or a change in grazing management may be needed to improve nesting cover. As human impacts and habitat fragmentation increase across the landscape, consideration should be given to how predator communities within these altered landscapes might change and how a change could influence CSTG populations. In areas where raven numbers are high, human resource subsidies should be managed (Bui et al. 2010, Coates and Delehanty 2010). These include eliminating or minimizing raven access to landfills, dumpsters, and road-killed animals, as well as retrofitting power poles and other structures to prevent nesting.

Interspecific competition between CSTG and other species is not well understood. Several other gallinaceous bird species occur within CSTG range in Idaho. They include California quail (*Callipepla californica*), chukar (*Alectoris chukar*), dusky grouse (*Dendragapus obscurus*), gray partridge (*Perdix perdix*), sage-grouse, ring-necked pheasant, ruffed grouse (*Bonasa umbellus*), and wild turkey. Nest parasitism on greater prairie-chicken nests by ring-necked pheasants is known to occur where the 2 species are sympatric (Vance and Westemeier 1979). However, no instances of nest parasitism have been reported from studies of nesting CSTG in Idaho, Utah, or Washington (Hart et al. 1950, Meints 1991, Schroeder 1994, Apa 1998, McDonald 1998).

General habitat requirements of sage-grouse and CSTG are similar during nesting and brood-rearing periods. However, in areas where both species occur, they appear to minimize competition by partitioning habitat use. Apa (1998) studied sympatric populations of these species in the Curlew Valley in southeast Idaho and concluded they partitioned nesting habitat, and to a lesser extent, brood-rearing habitat. Sage-grouse nested at higher elevations and nests were generally under sagebrush. Approximately one-half of CSTG nests were under a grass or forb species. During brood-rearing, sage-grouse broods used areas with high forb diversity and cover while CSTG broods used areas with taller forbs and sagebrush. Klott and Lindzey (1990) evaluated habitat partitioning of sympatric sage-grouse and CSTG during the brood-rearing period in Wyoming. They found sage-grouse broods were more often located in sagebrush and sagebrush-bitterbrush areas while CSTG broods were more often observed in deciduous mountain-shrub and sagebrush-snowberry patches.

Mule deer could compete with CSTG for resources during winter when both species rely on deciduous shrubs (e.g., serviceberry) for browse and cover (Ulliman 1995).

Regulated Hunting and Falconry

Eastern Idaho (Southeast and Upper Snake regions) is one of the primary strongholds for CSTG throughout its range and is the only portion of Idaho where regulated hunting opportunity is offered. Although harvest seasons have been conservative in recognition of the range-wide status of the species, CSTG hunting in eastern Idaho remains a popular upland hunting opportunity (Fig. 9). From 1983 to 1999, the CSTG season started on the third weekend of September, ranged from 2 weeks to 1 month in length, and incorporated a daily bag limit of 1 to 3 birds (Table 2). Since 2000, the season has run the entire month of October with a 2-bird daily bag limit. During firearm season, falconers may take firearm season bag and possession limits. Furthermore, Idaho offers an extended falconry

Figure 9. Columbian sharp-tailed grouse remain a popular upland game bird in Idaho. (Photo by J. M. Knetter/IDFG).

season (requires falconry permit) that runs from 15 August to the start of firearms season and from the end of firearms season to 15 March of the following year. During extended falconry season, the daily bag limit is 1 CSTG.

Multiple changes in hunter survey methodology, combined with an inability to specifically survey CSTG hunters apart from other Idaho hunters, likely made harvest estimates during 1983—1999 tenuous. Since 2000, CSTG hunters have been required to purchase a "Sage/Sharp-tailed Grouse Permit Validation" with their hunting license. The permit validation has allowed for a targeted survey of sage-grouse and CSTG hunters, and resulted in a more accurate survey and improved harvest estimates. Each year, a portion of hunters who buy permits (15%—51% during 2000—2014; increased sampling effort since 2009 to ensure an adequate number of both sage-grouse and CSTG hunters were contacted) are sent a mail survey requesting information on their hunting effort and harvest. Non-respondents to the mail survey are then telephoned up to 3 times, on varying days and times, in an attempt to gather harvest information and estimate non-response bias. Since the validation requirement was initiated in 2000, approximately 2,100 hunters have harvested approximately 4,800 birds annually (Table 3). During 2010—2011, there were 159 permitted falconers in the state and only 13 CSTG were harvested.

The relationship between regulated harvest and CSTG population changes has not been explicitly studied. Unregulated commercial and sport hunting was identified as one of the main reasons for range-wide decline of CSTG in the early 1800s (Hart et al. 1950), but the effect of modern regulated hunting is not fully understood.

Table 2. Idaho Department of Fish and Game (IDFG) administrative regions, hunting season dates, season length, and daily bag limit for Columbian sharp-tailed grouse, Idaho, 1983—2014.

Year	IDFG regions	Season dates	Days	Daily bag[a]
1983	Southeast, Upper Snake	17-30 Sep	14	1
1984	Southeast, Upper Snake	15-28 Sep	14	1
1985	Southeast	21 Sep - 4 Oct	14	3
	Upper Snake	21 Sep - 4 Oct	14	2
1986	Southeast, Upper Snake	20 Sep - 3 Oct	14	2
1987	Southeast, Upper Snake	19 Sep - 2 Oct	14	2
1988	Southeast, Upper Snake	17 Sep - 2 Oct	16	2
1989	Southeast, Upper Snake	16 Sep - 1 Oct	16	2
1990	Southeast, Upper Snake	15-30 Sep	16	2
1991	Southeast, Upper Snake	21 Sep - 6 Oct	16	2
1992	Southeast	19 Sep - 18 Oct	30	2
	Upper Snake	19 Sep - 4 Oct	16	2
1993	Southeast	18 Sep - 17 Oct	30	2
	Upper Snake	18 Sep - 3 Oct	16	2
1994	Southeast	17 Sep - 16 Oct	30	2
	Upper Snake	17 Sep - 2 Oct	16	2
1995	Southeast	16 Sep - 15 Oct	30	2
	Upper Snake	16 Sep - 1 Oct	16	2
1996	Southeast, Upper Snake	21 Sep - 6 Oct	16	2
1997	Southeast, Upper Snake	20 Sep - 5 Oct	16	2
1998-1999	Southeast	1-31 Oct	31	2
	Upper Snake	1-16 Oct	16	2
2000-2014	Southeast, Upper Snake	1-31 Oct	31	2

[a] Daily bag for 1983-1985 seasons was in aggregate with greater sage-grouse.

Hoffman (2001) considered a low CSTG harvest level (i.e., 4% of the autumn population) compensatory to natural mortality, whereas Bergerud (1998) suggested any level of harvest can be additive to natural mortality and can negatively affect populations. Ammann (1957) and Connelly et al. (2003) suggested effects of regulated harvest on prairie-chickens, CSTG, and sage-grouse depended on population trend and habitat quality. Flake et al. (2010) suggested harvest mortality <20% was not detrimental to sharp-tailed grouse populations.

Table 3. Hunters, harvest, days hunted, birds/hunter, and birds/day for Columbian sharp-tailed grouse, Idaho, 1983—2014.

Year	Hunters[a]	Harvest[a]	Days hunted[a]	Birds/hunter	Birds/day
1983	600	900	18,400	1.5	0.05
1984	800	900	2,500	1.13	0.36
1985	800	2,000	3,900	2.5	0.51
1986	700	1,700	3,300	2.43	0.52
1987	1,100	4,300	3,100	3.91	1.39
1988	800	3,500	3,400	4.38	1.03
1989	1,200	3,500	4,400	2.92	0.8
1990	1,900	9,800	8,700	5.16	1.13
1991	1,900	6,000	6,700	3.16	0.9
1992	2,400	9,300	7,600	3.88	1.22
1993	5,100	7,200	19,600	1.43	0.37
1994	7,800	8,200	32,400	1.08	0.25
1995	7,900	7,900	40,300	1.04	0.2
1996	7,000	14,700	31,900	2.1	0.46
1997[b]					
1998[b]					
1999	2,600	12,400	11,600	4.77	1.07
2000	2,800	5,800	7,700	2.06	0.75
2001	2,200	4,100	6,000	1.83	0.67
2002	1,900	3,500	5,100	1.84	0.69
2003[c]					
2004	2,300	4,800	6,100	2.08	0.79
2005	2,200	5,200	6,300	2.34	0.83
2006	3,000	6,900	8,300	2.3	0.82
2007	2,200	4,900	6,100	2.27	0.8
2008	2,300	5,000	6,900	2.19	0.72
2009	2,200	5,600	6,300	2.53	0.88
2010	2,000	6,100	6,300	2.99	0.98
2011	1,800	2,900	4,400	1.63	0.64
2012	1,800	4,600	5,400	2.56	0.85
2013	1,700	3,700	5,000	2.18	0.74
2014	1,500	3,500	4,500	2.33	0.78
2000-2014 average	2,136	4,757	6,029	2.22	0.78

[a] Estimates rounded to nearest 100.
[b] Sample sizes were too small in 1997 and 1998 to estimate harvest.
[c] No harvest survey was conducted in 2003.

As discussed in the Lack of Biological Information section, current methods to estimate CSTG population in Idaho are poor and require increased sampling intensity to provide quality data adequate for management. Therefore, estimates of harvest rates (i.e., proportion of the population harvested each year) lack rigor. However, recent efforts to estimate CSTG population size in Idaho hold some promise. Gillette (2014) used Statistical Population Reconstruction to estimate CSTG population size and average harvest mortality in southeast Idaho from 2000 to 2013. Estimated total abundance for the autumn, hunted CSTG population in Idaho ranged from 32,411 to 45,190; similar to estimates made by Hoffman and Thomas (2007, 30,800—33,825). Estimated harvest rate ranged from 4.6% to 8.5%, with an average of 6.4% from 2000 to 2013 (Gillette 2014).

We do not know what proportions of CSTG harvest in eastern Idaho occur on public versus private lands. As of 2014, 84% of CSTG leks consistently monitored by IDFG during annual lek route surveys (n = 63) occur on private lands (Table 4). Many of these private lands are adjacent to large tracts of public land (Fig. 10). Hoffman (2001) suggested overharvest of CSTG may occur on public lands in Colorado due to increased hunter access. Small et al. (1991) and Smith and Willebrand (1999) showed heavily hunted populations of ruffed grouse and willow ptarmigan (*Lagopus lagopus*), respectively, were maintained by immigration of birds produced on surrounding unhunted or lightly hunted private lands. Therefore, overharvest on heavily hunted public lands may be undetectable during subsequent lek surveys conducted primarily on private land (Hoffman and Thomas 2007).

Wings from hunter-harvested CSTG are collected annually to estimate an index of production (i.e., juvenile:adult) in Idaho (Fig. 8, Table 1). Furthermore, CSTG hunter surveys conducted during 2010—2014 made an effort to more accurately describe harvest location (e.g., specific question on harvest survey and wing barrel envelopes that include area maps). These efforts should be continued and expanded to further refine harvest locations, which will allow for a more accurate evaluation of CSTG harvest on public versus private lands. Additionally, CSTG leks included in annual lek surveys should represent land ownership proportions of all documented leks. Based on land ownership of all documented leks in 2014, proportion of leks monitored on private and public land should be approximately 81% and 19%. Current (2014) monitoring efforts are similar to these proportions, with 84% and 16% of monitored leks occurring on private and public land (Fig. 10).

Reliance on CRP Lands

The Conservation Reserve Program is a working lands conservation program administered by the USDA Farm Service Agency (FSA), which converts eligible annual crops to perennial vegetation. In Idaho, CRP converted predominately dryland wheat fields to a mixture of perennial grasses and forbs and,

Table 4. Land ownership (USGS 2012) at documented Columbian sharp-tailed grouse leks in southern Idaho, 2014.

Land ownership	Not part of lek route		Part of lek route		All known leks	
	Leks	% of total	Leks	% of total	Leks	% of total
Private	606	80.5	53	84.1	659	80.8
U.S. Bureau of Land Management	44	5.8	5	7.9	49	6.0
U.S. Forest Service	39	5.2	0	0.0	39	4.8
U.S. Fish and Wildlife Service	2	0.3	0	0.0	2	0.2
Idaho Department of Fish and Game	13	1.7	5	7.9	18	2.2
Idaho Department of Lands	29	3.9	0	0.0	29	3.6
Tribal Land	20	2.7	0	0.0	20	2.5
Total	753		63		816	

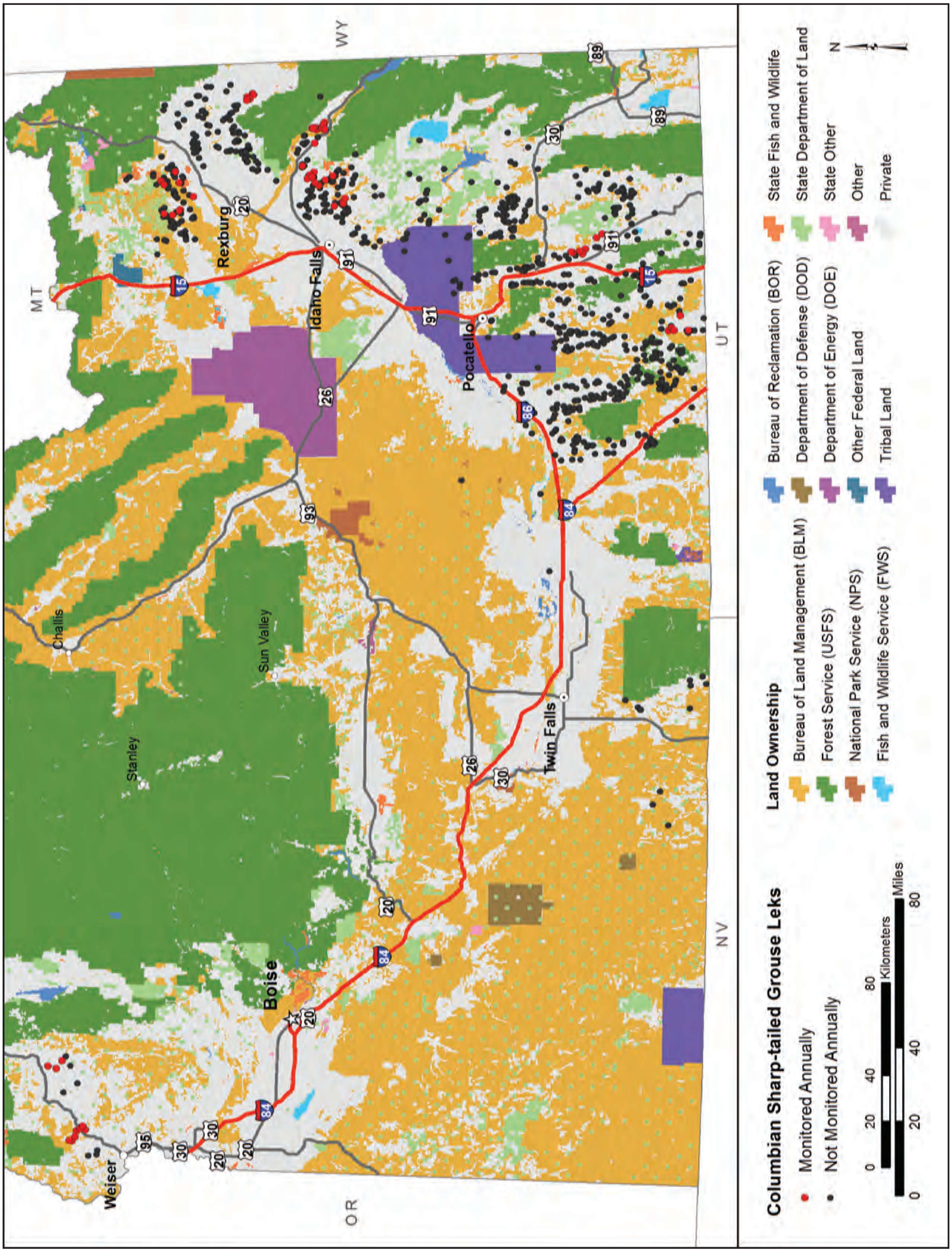

Figure 10. Distribution of Columbian sharp-tailed grouse leks and associated land ownership in Idaho (USGS 2012).

with minor exception, CRP lands have not been grazed or hayed other than during emergency declarations by USDA. The most common grass and forb species seeded were smooth brome, intermediate wheatgrass, and alfalfa, respectively. Since inception of CRP in 1985, many thousands of acres of CSTG nesting and brood-rearing habitat were restored in Idaho. As a result, grouse populations increased; in contrast to their general decline over the past century.

Currently, there are >165,000 ha (408,000 ac) of CRP across occupied CSTG range in Idaho (Fig. 2). Although there have been recent general enrollment opportunities, total CRP acreage throughout CSTG range in Idaho is declining, in part because of high grain prices and 2008 and 2014 Congressional reductions in acreage eligible for enrollment. Hoffman and Thomas (2007) suggested possible loss of CRP lands was the single most important immediate threat to CSTG in Idaho and across the subspecies' range.

The FSA created the State Acres For wildlife Enhancement program to assist states with high-priority wildlife conservation objectives through restoration of vital habitat. In Idaho, producers who elect to enroll in the SAFE program take eligible croplands out of agricultural production and plant habitat to specifically benefit CSTG. The SAFE program was initiated in Idaho during 2006, with a state allocation cap of 2,550 ha (6,300 ac). By January 2015, the state allocation cap grew to 47,471 ha (117,300 ac); the second largest SAFE program in the nation. Growth of this program has helped to mitigate the current decline in CRP in Idaho, and increased awareness of the importance and need for CSTG conservation among the general public and private landowners.

To date, the majority of CSTG habitat management efforts in Idaho have focused on implementation of CRP. The IDFG has focused on 2 main aspects of CRP implementation: 1) enhancing parcels enrolled in general CRP (e.g., adding additional forbs and shrubs to seed mixes, diversifying number of grass species, promoting use of native grasses), and 2) promoting and implementing SAFE practices designed specifically to provide nesting, brood-rearing, and winter habitat for CSTG.

The IDFG has committed significant staff resources to habitat management programs. As of January 2015, IDFG has 2 full-time Farm Bill biologists located within USDA Natural Resources Conservation Service (NRCS) offices in eastern Idaho and 3 technicians with IDFG's Mule Deer Initiative who work on development, planning, and implementation of both CRP and SAFE within the CSTG focus area (Fig. 11).

Idaho Department of Fish and Game has also been successful in modifying the CRP Environmental Benefits Index, which is the scoring mechanism for the general CRP sign-up. Since sign-up number 39 in 2010, IDFG has helped modify criteria used to rank CRP applications so landowners who propose plans that benefit CSTG receive higher points, which increase the likelihood they be accepted into the program.

While CRP and SAFE efforts have been successful in enhancing grouse habitat, they are not permanent solutions (Fig. 12). Conservation Reserve Program and SAFE contracts are active for 10 years and a landowner has the option to buy out of their contract earlier with a penalty. The Federal Farm Bill must be reauthorized every 5 years by Congress. From 2002 to 2008, the national CRP allocation was reduced from 15.9 to 13.0 million ha (39.2 to 32 million ac). The 2014 Farm Bill requires a further reduction in CRP to 9.7 million ha (24 million ac) nationwide by 2017.

In addition to CRP and SAFE, NRCS is exploring options to use their conservation programs to preserve conservation benefits after contracts expire. This effort would strive to keep expired CRP lands in a grass-based system. To date, success has been limited due to high agricultural commodity prices and incentives within the commodity title of the Farm Bill to put expired land back into agricultural production.

The USFWS has been petitioned twice to list CSTG under the ESA and recent population increases are closely linked to success of CRP and SAFE programs (Mallett 2000). If acreage caps

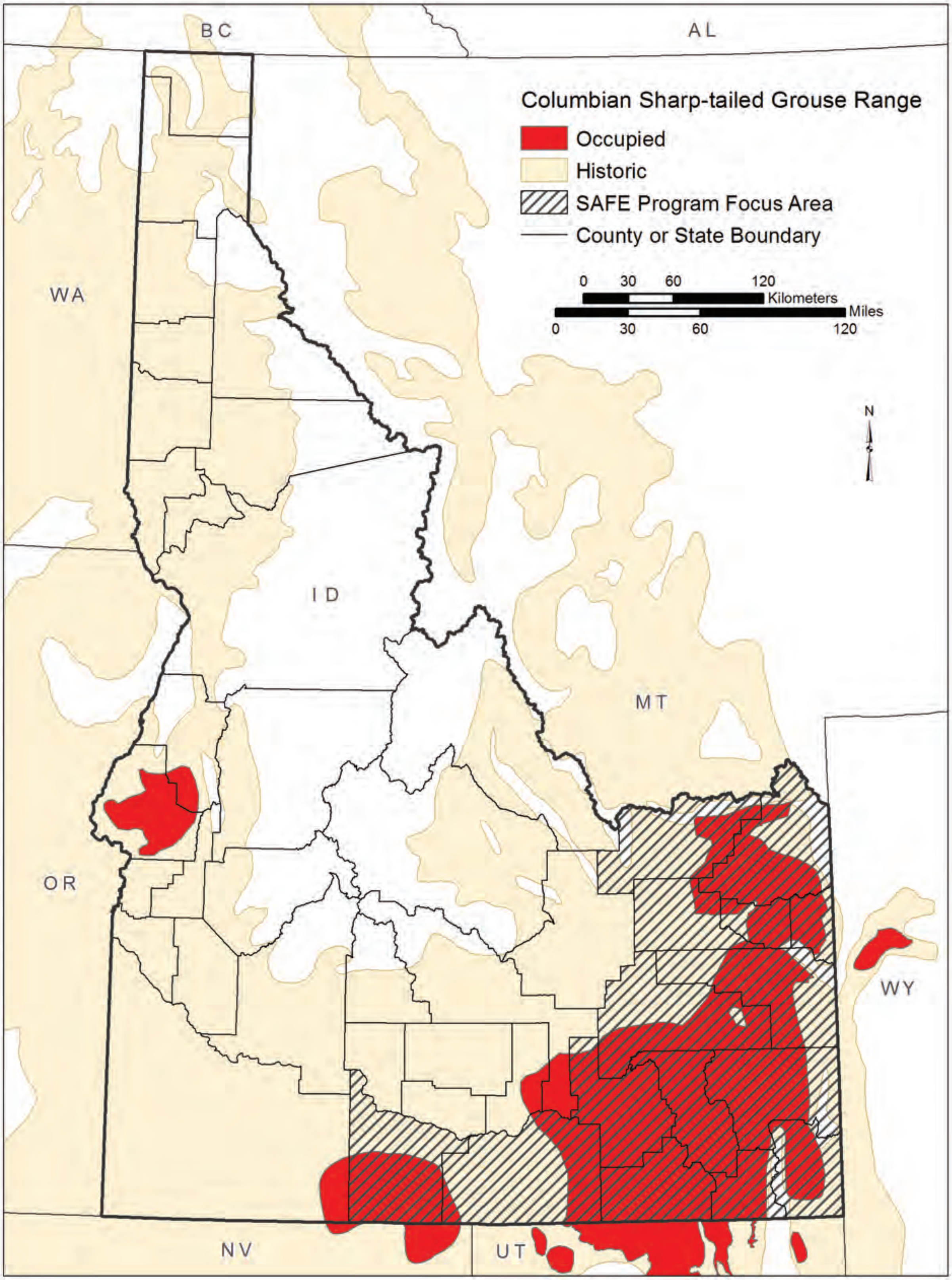

Figure 11. Historical and current range of Columbian sharp-tailed grouse and State Acres For wildlife Enhancement (SAFE) Program Focus Area in Idaho.

Figure 12. Comparative photos depicting important Columbian sharp-tailed grouse habitat lost when Conservation Reserve Program contracts expire and are not re-enrolled in the program. Arrows represent the same point of reference. (Photos by G. L. Gillette/University of Idaho).

of these programs are significantly reduced or landowner interest declines, CSTG populations would be impacted, which could prompt another listing petition.

Translocations

Translocation is the intentional release of animals into the wild to establish, reestablish, or augment a population (Hoffman et al. 2015). During the late 1980s, CSTG populations in southeastern Idaho increased as a result of abundant habitat provided by private lands enrolled in CRP. These increased populations provided a source of birds for translocation efforts to reintroduce CSTG in Idaho and other states, including Oregon, Nevada, and Washington. Translocation efforts, which began in 1991, have moved >1,500 CSTG from source populations in southeast Idaho.

Most CSTG translocation efforts have released birds into formerly occupied habitats (i.e., reintroductions; Hoffman et al. 2015). Long-term success of CSTG reintroduction efforts in northern Nevada (Coates 2001), southern Idaho (Smith 2012), northeastern Oregon (D. A. Budeau, Oregon Department of Fish and Wildlife, personal communication), and in Bull Run Basin in northern Nevada (S.P. Espinosa, Nevada Department of Wildlife, personal communication) remains uncertain. Washington Department of Fish and Wildlife has succeeded in augmenting 2 small, isolated populations and predicted a high probability of success in augmenting 2 additional populations (Schroeder et al. 2010, Stinson and Schroeder 2012). These results highlight the necessity to evaluate potential release sites prior to any translocation efforts. Long-term monitoring efforts are necessary to assess success of translocation efforts and direct future conservation efforts. Furthermore, research efforts to understand impacts (i.e., additive, compensatory) of translocation efforts on source populations are needed to evaluate overall success of CSTG translocation efforts.

Statewide Management Direction

Statewide CSTG management direction (Table 5) is tiered down from the IDFG strategic plan (The Compass), provides higher resolution for management objectives, and takes into account stakeholder desires, agency resources, and resource opportunities and challenges. Furthermore, performance objectives and strategies are assigned to specific management directions (Table 6). These performance objectives and strategies form the foundation for future annual work plans, performance evaluations, and budget requests.

Table 5. Strategic plan objectives and corresponding Columbian sharp-tailed grouse (CSTG) management direction.

COMPASS OBJECTIVE	CSTG MANAGEMENT DIRECTION
Maintain or improve CSTG populations to meet the demand for CSTG hunting.	• Develop biologically-meaningful population management units (PMU) for all CSTG subpopulations in Idaho. • Manage and monitor CSTG populations and harvest by PMU.
Ensure the long-term survival of CSTG.	• Determine distribution, and viability of each CSTG population, within Idaho. • Implement biological investigations to improve CSTG management. • Implement CSTG monitoring program that provides annual estimates of productivity, harvest, and population abundance or trend. • Eliminate or reduce threats to long-term persistence of CSTG populations.
Increase the capacity of habitat to support CSTG.	• Protect quantity and quality of existing native CSTG habitat. • Provide incentives and assistance to landowners to improve CSTG habitat on private land. • Improve condition of degraded CSTG habitat.
Maintain a diversity of CSTG hunting opportunities.	• Provide CSTG hunting opportunities that reflect preferences and desires of hunters.
Increase opportunities for wildlife viewing and appreciation.	• Promote and publicize CSTG viewing and appreciation.
Improve citizen involvement in the decision-making process.	• Increase citizen involvement in CSTG management.
Improve funding to meet legal mandates and public expectations.	• Seek new sources of funding for CSTG management efforts.

Table 6. Compass objective, statewide Columbian sharp-tailed grouse (CSTG) management direction, performance objectives, and strategies.

COMPASS OBJECTIVE: Maintain or improve CSTG populations to meet the demand for CSTG hunting.		
Management Direction	**Performance Objective**	**Strategy**
Develop biologically meaningful population management units (PMU) for CSTG in Idaho.	Use all available data and biological expertise to delineate PMUs by spring 2016.	Compile all CSTG location data (lek locations, aerial surveys, telemetry locations, and incidental observations), genetic samples, and information on CSTG habitats for input into PMU mapping. Convene regional meetings with IDFG staff and agency partners to review draft mapping efforts and reach consensus on PMU delineations.
Manage and monitor CSTG populations and harvest by PMU.	Develop measurable and achievable management objectives for CSTG in each PMU by summer 2017. Evaluate CSTG population status and compare to management objectives by summer 2017 and annually thereafter.	Develop a season-setting matrix to balance hunting opportunity with current population trend. Manage populations to satisfy demand for CSTG hunting opportunities. Determine harvest rates of CSTG within PMUs.

COMPASS OBJECTIVE: Ensure the long-term survival of CSTG.		
Management Direction	**Performance Objective**	**Strategy**
Determine distribution of CSTG, and status (e.g., stable, increasing, declining) of each CSTG population, within Idaho.	Develop a statewide map that depicts CSTG distribution, including seasonal habitats, by 2018. Maintain or increase CSTG populations, no net loss.	Compile all CSTG location data (lek locations, aerial surveys, telemetry locations, and incidental observations) and information on CSTG habitats for input into a mapping effort. Conduct lek searches to identify new occupied habitat. Promote use of Idaho Fish and Wildlife Information System's web-based *Observations* for public and partner sightings of CSTG. Collect genetic samples throughout the state to evaluate genetic exchange between PMUs. Monitor trends in CSTG abundance, reproduction, and harvest in each PMU. Evaluate population status, in conjunction with PMU-specific threats (e.g., habitat, disease, predation, etc.), to determine limiting factors for each PMU. Evaluate previous translocation efforts, including success of translocation, and effects on donor population. Use spatial models to identify potential unoccupied CSTG habitat. Consider additional translocations to either create new CSTG populations in unoccupied suitable habitat, or augment populations that are declining or at low levels.

Management Direction	Performance Objective	Strategy
Implement biological investigations to improve CSTG management.	Develop a standardized protocol for conducting CSTG lek counts by spring 2016. Obtain baseline vital rates and life history data for each CSTG population by 2020. Investigate relationships between human disturbance, habitat quality, harvest, reproductive fitness, and survival by 2025.	Develop a standardized survey protocol to monitor CSTG leks that provides a population estimate with error estimates (e.g., 90% confidence intervals). Utilize radio telemetry studies to ascertain survival and cause-specific mortality, reproductive success, home range size, seasonal movements, and habitat influences on survival and reproduction. Determine the role predation plays in CSTG population dynamics.
Implement CSTG monitoring program that provides annual estimates of productivity, harvest, and population abundance or trend information.	Develop a standard survey protocol to provide a population estimate for each PMU annually by 2020. Obtain annual estimates of productivity and age and sex structure.	Maintain statewide CSTG database and update annually. Work with agency partners and volunteers to assist in lek surveys. Initiate or increase wing, head feather, and tail feather collection efforts in each PMU, using wing barrels, check stations, mailers, or other new methods (e.g., DNA methods). Evaluate sample sizes necessary to obtain estimates of reproduction and age and sex structure within each PMU. Evaluate feasibility of implementing population reconstruction given current data inputs. Evaluate hunter survey techniques to determine if harvest estimates can be improved.
Eliminate or reduce threats to long-term persistence of CSTG populations.	Minimize human disturbance to CSTG during the lekking and nesting season (1 Mar to 15 July).	Provide updated information on CSTG lek locations, and suggestions for minimizing impacts to land management agencies and cooperating landowners. Work with land management agencies and landowners to identify alternative bedding sites or herding routes, if livestock activities have been documented to repeatedly displace birds from leks. Work with land management agencies to close or manage off-road recreation vehicle access in key areas during the lekking and nesting season. Work with land management agencies, private companies, and landowners to avoid maintenance activities within 1 km (0.6 mi) of occupied leks from 1800 to 0900, 1 Mar to 1 May.
	Minimize loss of CSTG due to drowning in water troughs.	Work with landowners and land management agencies to ensure new and existing livestock troughs and open water storage tanks are fitted with ramps to facilitate wildlife escape.

Management Direction	Performance Objective	Strategy
	Minimize potential for CSTG collisions with fences.	Work with landowners and land management agencies to identify fences (including new fences) that may pose risk for collision mortality. Evaluate all fences within 2 km (1.2 mi) of occupied leks and other important seasonal habitats, and develop recommendations for marking or relocating fences.
	Minimize impact of new and existing roads and trails on CSTG habitats.	Participate in road planning and siting to avoid or minimize impacts to important CSTG habitats. For unavoidable impacts from roads, seek mitigation compensation. Identify specific roads or road sections where CSTG mortality has been documented. Work collaboratively with appropriate agency(s) to develop measures to reduce risk of road-related mortalities of CSTG. Work with agencies to reduce risk of vehicle or human-caused wildfires, and spread of invasive species along existing or new roads and trails.
	Avoid or minimize impacts of energy development on local CSTG populations.	Promote adoption of the WAFWA guidelines for energy development in CSTG habitats (Hoffman et al. 2015) by land management agencies. Distribute important CSTG GIS layers to land management agencies, energy companies, cities, and counties for use in land-use policies, planning, and project development. Work with land management agencies and energy companies to locate new infrastructure projects (e.g., oil or gas pipelines, wind energy, transmission lines, cell towers, and related facilities) as far as possible, preferably ≥2 km (1.2 mi), from occupied leks. Alternatively, place along existing corridors or within other altered habitats to the extent possible. Where large-scale infrastructure projects within CSTG habitat is unavoidable, work with land management agencies and private companies to monitor CSTG populations and habitat 1) for ≥3 years before project construction, 2) during construction, and 3) for ≥5 years after construction is completed and implementation has begun, to complement existing knowledge of impacts and to help in design of future conservation measures.
	Protect existing habitat from residential and commercial development.	Work with county and city planning and zoning to avoid development in important CSTG habitat. Distribute important CSTG GIS layers to land management agencies, energy companies, cities, and counties for use in land-use policies, planning, and project development. Educate landowners and developers about CSTG habitat requirements. Where opportunities allow (incentives, partnerships, willing landowner, etc.), off-site mitigation should be employed to offset unavoidable alteration and losses of CSTG habitat.

Management Direction	Performance Objective	Strategy
	Improve knowledge of impacts of severe weather and climate change on CSTG populations and habitats.	Maintain maximum resiliency of sage-steppe ecosystems by managing towards healthy, diverse, sustaining vegetation communities with high levels of vegetation vigor as global climate changes increase environmental stress on the community's ecological viability. Develop monitoring strategies to track long-term changes to sage-steppe communities.
	Reduce exposure of CSTG populations and habitats to insecticides.	Work with USDA and private landowners to avoid application of insecticides within CSTG range, particularly in nesting and brood-rearing habitat. Use NRCS or other programs to incentivize reductions in pesticide use in CSTG habitat. Encourage use of larvicides to control mosquitoes as an alternative to aerial insecticides. Collaborate with Cooperative Extension agents, NRCS, North American Grouse Partnership and others to develop an information and education campaign to develop solutions to reduce adverse insecticide impacts to sharp-tailed grouse.
	Increase disease sampling for CSTG.	Add disease surveillance protocols to CSTG research and management programs that involve trapping and handling wild birds by collecting, processing, and analyzing fecal and blood samples (Hoffman et al. 2015). Collect any non-harvest related field mortalities of CSTG and submit to IDFG Wildlife Health Lab for necropsy. Conduct studies to monitor potential disease transmission from pen-raised game birds (any species) to the wild.

COMPASS OBJECTIVE: Increase the capacity of habitat to support CSTG.

Management Direction	Performance Objective	Strategy
Protect quantity and quality of existing native CSTG habitat.	Convene a team of biologists by 2016 to develop a habitat assessment tool for CSTG.	Incorporate WAFWA CSTG guidelines (Hoffman et al. 2015) and other important documents (e.g., Meints et al., 1992, Giesen and Connelly 1993) for development of a habitat assessment tool appropriate for Idaho CSTG habitats. Coordinate with IDFG staff working on similar habitat monitoring tools.
	Work with BLM and other land management agencies to incorporate the CSTG habitat assessment tool into grazing management assessments by 2017. Work with land management agencies and livestock producers to minimize improper grazing in important CSTG habitat.	Use scientifically based protocols and procedures to evaluate rangeland health and CSTG habitats. Use appropriate conservation programs (e.g., NRCS, FSA, Partners for Fish and Wildlife, HIP) to provide financial incentives to help offset cost of grazing management measures that benefit CSTG. Encourage livestock producers to discuss various opportunities available with local NRCS district conservationist. Use CSTG Management Plan and WAFWA guidelines (Hoffman et al. 2015) to provide useful and biologically based technical assistance to land management agencies and livestock producers to • distribute salt and mineral supplements in locations that will minimize localized damage to CSTG habitats, • manage grazing of riparian areas, and springs to promote vegetation structure and composition appropriate to the site, • avoid or limit use of alfalfa or grain stubble by livestock after harvest to provide forage for CSTG broods, and • target grazing utilization of current annual growth of key winter shrubs to ≤35% use.
	Minimize impact of drought on CSTG.	Encourage grazing management adjustments during periods of drought to reduce impacts on perennial herbaceous cover, plant species diversity, and plant vigor. Promote strategically located forage reserves for livestock, which would allow for limited grazing in important CSTG areas during times of drought or following wildfire. Consider seed sources and species that are more resilient to changing climatic conditions in CSTG habitat restoration and enhancement projects. Work with NRCS to discourage emergency haying and grazing of CRP lands in important CSTG habitats.

Management Direction	Performance Objective	Strategy
	Provide technical assistance on spring enhancement and water development projects in CSTG habitats.	Work with landowners and land management agencies to design new spring developments in CSTG habitat to maintain or enhance free-flowing characteristics of springs and wet meadows. Work with landowners and land management agencies to avoid placing new water developments into breeding and early brood-rearing habitats. Work with landowners and land management agencies to avoid placing water developments within 400 meters (0.25 mile) of shrub thickets and riparian areas used as winter habitat.
	Reduce wildfire impacts to CSTG habitat. Annually assure IDFG staff participates in interdisciplinary Burned Area Emergency Response (BAER) and Emergency Stabilization and Rehabilitation (ESR) teams.	Work with land management agencies to identify habitat that will benefit from wildfire (e.g., aspen stands) and those that should be protected from wildfire. Provide maps or GIS files of CSTG leks and seasonal habitats to fire response agencies to help prioritize fire suppression efforts which ensure CSTG nesting and wintering habitat will be protected. Encourage public land management agencies to include CSTG habitat considerations into restoration and burned area rehabilitation plans, particularly in important and isolated habitats. In breeding habitats, work with land management agencies and landowners to rehabilitate CSTG habitats damaged by fire, including selection of appropriate seed mixes. In winter habitats, work with land management agencies and landowners to ensure seedlings and re-sprouting deciduous shrubs are not over-utilized by livestock to allow recovery.
	Provide comments on 100% of NRCS shrub management proposals in CSTG habitat. Provide technical assistance on 100% of NRCS-approved shrub management projects in CSTG habitat.	Use CSTG Management Plan and WAFWA guidelines (Hoffman et al. 2015) to provide useful and biologically based technical assistance on NRCS shrub management projects. If analysis shows shrub management is advisable, design projects to achieve desired habitat objectives (e.g., understory does not meet seasonal habitat characteristics and restoration is desired; there is a need to restore ecological processes, or to convert a monotypic exotic grass seeding back to a diverse shrub-steppe habitat). Ensure any sagebrush treatment in nesting habitat does not exceed 20% of the area, with individual treatments not to exceed 810 ha (2,000 ac), and be no closer than 1.6 km (1.0 mi) apart. Allow adequate recovery time (approximately 4—6 years) before treating other portions of nesting habitat. Ensure any shrub treatments in winter habitat do not exceed 20% of the area and allow for adequate recovery time (approximately 7—10 years) before treating other portions of winter habitat Ensure treatments are configured in a manner that promotes use by CSTG, including leaving adequate untreated sagebrush areas for loafing and hiding cover near leks. Work with NRCS and landowners to evaluate and monitor treatments to determine project success.

Management Direction	Performance Objective	Strategy
Provide incentives and assistance to landowners to protect and improve CSTG habitat on private land.	Maintain 505,000 (2013-2014 average) acres of land enrolled in the CRP program across CSTG range in Idaho. Increase SAFE program enrollment to 117,200 acres by 2016.	Maintain 2 IDFG Farm Bill Biologists at NRCS offices in southern Idaho. Add a full-time IDFG Farm Bill Biologist in the Southwest Region to promote the SAFE program. Encourage use of CRP, SAFE, Conservation Stewardship Program, Agricultural Conservation Easement Program (ACEP), or similar USDA incentive programs to protect habitat for CSTG. Maintain incentives within the CRP Environmental Benefits Index to benefit CSTG (i.e., Conservation Priority Area). Promote and implement IDFG HIP to improve CSTG habitat on private lands. Work with NRCS and landowners to encourage CRP seed mixes to include at least 5 grass, 4 forb, and 1 shrub species. Grasses should be bunchgrasses rather than sod-forming; forbs should include legumes (Hoffman et al. 2015).
	Protect existing CSTG habitat from conversion to cropland.	Work with landowners to promote use of ACEP, or similar USDA incentive programs, to avoid conversion of CSTG habitat to cropland. Identify and prioritize areas important to CSTG. Develop and implement a program to encourage landowners to protect, enhance, and restore CSTG habitat within these areas. Use protection (purchase, easements, or exchange) and habitat enhancement and restoration tools.
	Address expired CRP acres with other options to maintain permanent cover.	Work with landowners to promote use of ACEP or similar USDA incentive programs, to maintain suitable habitat for CSTG. Work with NRCS to develop Cooperative Conservation Partnership Initiative to fund grazing plans and implement on expired CRP lands.
Improve the condition of degraded CSTG habitat.	Statewide, directly enhance 5,000 acres of CSTG habitat annually. Develop a prioritized list of projects for restoration and enhancement of CSTG habitat by 2016. Work with NRCS to evaluate all CRP projects due for mid-term management.	Work with sage-grouse Local Working Groups to identify restoration projects that will mutually benefit sage-grouse and CSTG. Coordinate with IDFG's Mule Deer Initiative (MDI) program to improve CRP acres through forb and shrub plantings that will benefit mule deer and CSTG. Use MDI or HIP to provide seed to private landowners to enhance vegetative condition and composition during mid-term management of degraded CRP lands. Minimize spread of noxious weeds and invasive plants. Work with county weed offices, land management agencies, and Cooperative Weed Management Districts to develop weed control plans. Work with NRCS District Conservationists, IDFG Farm Bill Coordinators, and IDFG Technical Service Providers to ensure available practices (e.g., forb plots and light disking) are used to increase plant vigor and forb diversity to improve CRP fields for CSTG. Develop and conduct CSTG management workshops for private landowners.

COMPASS OBJECTIVE: Maintain a diversity of CSTG hunting opportunities.		
Management Direction	**Performance Objective**	**Strategy**
Provide CSTG hunting opportunities that reflect preferences and desires of hunters.	Gauge hunter opinions and measure satisfaction with CSTG management and hunting opportunities by 2018. Annually implement the most liberal seasons and bag limits as biologically justified. Maintain current level of CSTG hunters and hunter-days annually. Increase variety and distribution of access to private land for CSTG hunting opportunities.	Conduct a CSTG hunter opinion survey by 2016. Create and implement guidelines for establishing CSTG hunting seasons. Incorporate CSTG hunting opportunities and techniques into upland bird hunting clinics Develop and distribute a brochure on CSTG hunting and viewing. Review regional *Access Yes!* priorities by Mar 2016.

COMPASS OBJECTIVE: Increase opportunities for wildlife viewing and appreciation.		
Management Direction	**Performance Objective**	**Strategy**
Promote and publicize CSTG viewing and appreciation.	Implement management actions that improve opportunities to view, photograph, or otherwise use CSTG resources. Create a CSTG information page on the IDFG website by 2017.	Develop lists of CSTG viewing and photography opportunities by 2016. Provide interpretive signage, kiosks, and printed materials for WMAs where CSTG are present. Create a You Tube® video(s) detailing habitat needs of CSTG and provide an identification guide to CSTG (especially in comparison to other grouse and upland birds). Promote use of Idaho Fish and Wildlife Information System's web-based Observations for public and partner sightings of CSTG. Provide structured lek-viewing opportunities for the public and school groups. Promote CSTG ecology and management in public schools via the *WILD About Grouse* Project WILD workshop.
	Provide opportunities for the public to participate in CSTG lek surveys.	Develop and maintain a database of contact information for volunteers and Master Naturalists available to assist with CSTG monitoring.

COMPASS OBJECTIVE: Improve citizen involvement in the decision-making process.		
Management Direction	**Performance Objective**	**Strategy**
Increase citizen involvement in CSTG management.	Provide the public with an opportunity to comment on CSTG management. Solicit public comments on proposed CSTG hunting seasons via the IDFG web site.	Integrate CSTG with sage-grouse Local Working Groups where applicable. Develop and maintain a public involvement invitation list. Invite the public to events through newspapers, direct mail, radio, podcasts, Web site, web chats, e-mail, and social networks such as Facebook® and Twitter®. Provide incentives to draw the public to meetings and open houses, including donated outdoor recreation items for free drawings, among others.

COMPASS OBJECTIVE: Improve funding to meet legal mandates and public expectations.		
Management Direction	**Performance Objective**	**Strategy**
Seek new sources of funding for CSTG management efforts.	Establish a dedicated funding source for CSTG conservation, management, and research by 2016.	Determine value of CSTG associated recreation, and CRP and SAFE lands to Idaho's economy. Improve public and legislative recognition of value of CSTG to Idaho's economy. Work with Governor's Office of Species Conservation and Legislature to increase funding for CSTG management. Explore feasibility of creating an account to hold funds to be used to acquire, protect, or restore CSTG habitat in exchange for negative impacts to occupied CSTG habitat. Work with USDA to maintain and develop conservation programs to benefit CSTG. Encourage partner agencies to direct funding towards CSTG conservation, management, and research.

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