Wildlife Management Report ADF&G/DWC/WMR–2023-2

Status of Grouse, Ptarmigan, and Hare in Alaska, 2021 and 2022

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Alaska Department of Fish and Game Division of Wildlife Conservation

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Cover Photo: ©2016 ADF&G. Addy tacks a break from a brood survey in Delta Junction Alaska. Photo by Tom St. Clair.

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Introduction

Species considered small game in Alaska are defined by the Alaska Department of Fish and Game (ADF&G), Division of Wildlife Conservation (DWC) for regulatory purposes as grouse, ptarmigan, and hare. Alaska has 7 species of grouse and ptarmigan (Tetraonidae; Storch 2000) including ruffed (*Bonasa umbellus*), sharp-tailed (*Tympanuchus phasianellus*), sooty (*Dendragapus fuliginosus*), and spruce grouse (*Falcipennis canadensis*); and rock (*Lagopus muta*), white-tailed (*L. leucurus*), and willow ptarmigan (*L. lagopus*). In addition, Alaska has 2 species of hare (Leporidae) including Alaska (*Lepus othus*) and snowshoe hare (*L. americanus*). All 9 species of small game can be legally harvested in Alaska with liberal seasons and bag limits for all Game Management Units (units; Fig. 1).

RUFFED GROUSE

Ruffed grouse reside in Interior, Southcentral, and small localized areas of Southeast Alaska near large river mouths (e.g., Stikine and Taku rivers). Ruffed grouse are native to mixed-forest areas in the Interior and portions of Southeast. Ruffed grouse were translocated to the Matanuska-Susitna Valley (Mat-Su; Fig. 2) in the late 1980s and to the Kenai Peninsula in the mid-1990s from populations near Anderson (Steen 1995, 1999). In the Mat-Su, translocated populations have expanded their range to include the entire lower Susitna River basin (just south of Cantwell), west to the southern slopes of the Alaska Range, south of Tyonek in west Cook Inlet, and along the Matanuska River (east of Chickaloon). On the Kenai Peninsula, translocated populations have expanded their range very little, and only a handful of birds have been observed on the Kenai Peninsula in the past 5–10 years. The cause of this is unknown; however, the maritime climate and predominance of spruce may influence population growth and range expansion.

Population monitoring of ruffed grouse prior to the 1990s was primitive, done primarily through hunter questionnaires. To provide a better indication of the status of these species throughout their range, both DWC and collaborators initiated spring breeding surveys near Palmer (Unit 14A), following translocation in 1992, near Anderson in 1993 (Unit 20C), Delta Junction in 2003 (Unit 20D), Tok in 2014 (Unit 12), and Fairbanks in 2016 (Unit 20B). Spring breeding surveys have also been conducted intermittently on the Kenai Peninsula, near Fairbanks, Tok, and in the McGrath area. Over the last decade, wings collected from harvested ruffed grouse have provided information on harvest composition and brood production from various populations. Other work done in coordination with the Ruffed Grouse Society and the nonprofit group Founding Forty has focused on habitat modification projects intended to provide greater hunting and viewing opportunities near Fairbanks, Delta Junction, Tok, and the Mat-Su.

SHARP-TAILED GROUSE

Sharp-tailed grouse reside in Interior Alaska and portions of the upper Copper River basin. They are typically observed in the upper Koyukuk River, Tanana River, middle and upper Yukon and Kuskokwim rivers, and at lower elevations along portions of the Wrangell–St. Elias Mountains. However, observations have also been made of sharp-tailed grouse in the upper Nenana River, areas west and north of Glennallen (Units 13A and 13D), and areas in Southwest Alaska where

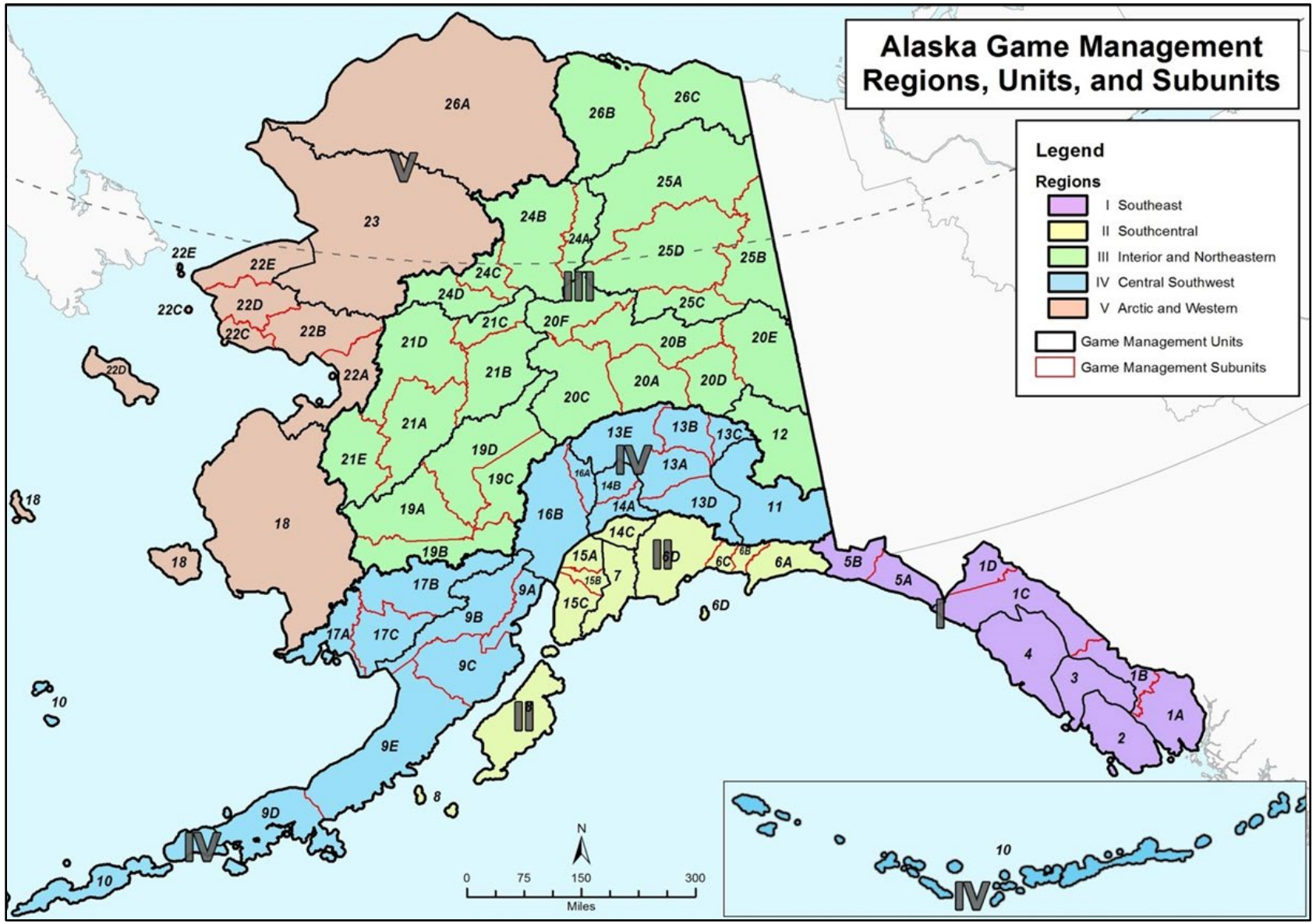

Figure 1. State of Alaska Game Management Units.

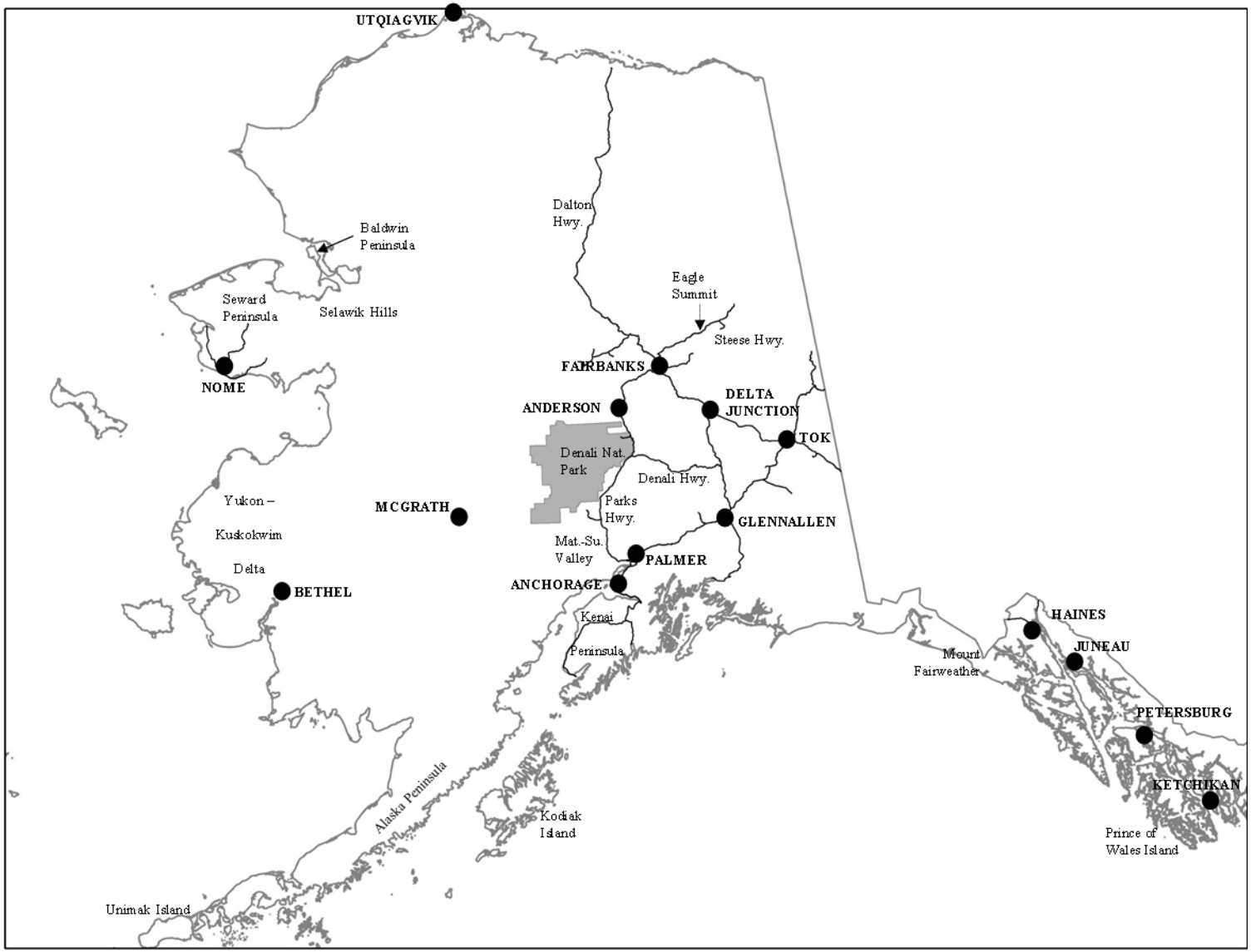

Figure 2. Alaska road system map with general locations at which abundance surveys or research studies were completed or field observations were made.

they are much less abundant. Sharp-tailed grouse prefer recently burned areas, open grass-shrub habitat, agricultural lands, sparse shrub-spruce at timberline, and muskegs.

Early monitoring of sharp-tailed grouse was done primarily through hunter questionnaires. Biologists working for DWC established spring breeding surveys for sharp-tailed grouse in Interior Alaska near Tok in the early 1960s. These roadside surveys were later expanded to other areas near Delta Junction and Manley Hot Springs (Unit 20B) in the early 1980s. Between the early 2000s and 2013 DWC was limited to conducting spring breeding surveys of sharp-tailed grouse in Delta Junction on the Delta Junction Agricultural Project (DJAP). Since April 2013, with the help of the University of Alaska Fairbanks (UAF) Cooperative Extension Service and volunteers, efforts were made to identify additional leks near Delta Junction and Tok. Several lek sites near Tok have been identified and have been monitored annually since 2014. Like ruffed and spruce grouse, wings collected from harvested sharp-tailed grouse over the last decade have provided valuable information on juvenile production. In addition to population monitoring, there have been several research projects (Raymond 2001, Paragi et al. 2012) that have taken place on the DJAP that have furthered our understanding of seasonal habitat selection of sharp-tailed grouse.

SOOTY GROUSE

Sooty grouse (formerly known as blue grouse) is the largest of the grouse species in Alaska and resides in the coastal rainforest of Southeast, from approximately Mount Fairweather south, including Units 1 and 3–5 (Zwickel and Bendell 2004; Fig. 1). However, this grouse is not found on Prince of Wales Island (Unit 2) or immediately adjacent islands. Male sooty grouse are often found in Sitka spruce (*Picea sitchensis*), mountain (*Tsuga mertensiana*) and western hemlock (*T. heterophylla*) emitting a low, guttural "hoot" during the breeding season.

Historically, monitoring of sooty grouse was primarily done through hunter questionnaires and wing collections from hunters. Beginning in April 2015, spring breeding surveys were established near Juneau (Unit 1C) and Petersburg (Unit 3) along trails and roadways. In April 2019, additional survey routes were created in Haines (Unit 1D) and Ketchikan (Unit 1A). Survey routes will be conducted annually to monitor changes in breeding abundance of male sooty grouse.

SPRUCE GROUSE

Spruce grouse is the most ubiquitous grouse species in Alaska. This grouse is found throughout most of forested Alaska, with the exception of Southeast Alaska, where spruce grouse occur only on Prince of Wales Island and immediately adjacent islands. Spruce grouse are often observed in mature white spruce (*P. glauca*) and paper birch (*Betula papyrifera*) woodlands and occasionally in black spruce (*P. mariana*) bogs.

To supplement information gathered through hunter questionnaires, roadside surveys of spruce grouse were initiated on the Steese Highway northeast of Fairbanks and along the Taylor Highway northeast of Tok in 1965 (Ellison and Weeden 1966). The surveys continued until funding for small game projects declined around the mid-1970s. Around the same time, DWC supported a graduate student who conducted research on spruce grouse on the Kenai Peninsula

(Ellison 1972). Spruce grouse is a very difficult species to assess using more traditional methods like spring breeding surveys or summer brood surveys due to their inconspicuous mating display. As a result, less has been known about spruce grouse population abundance and productivity. However, beginning in fall 2019, DWC initiated a fall roadside evaluation survey method in the Mat-Su (Units 14 and 16). This method takes advantage of spruce grouse early morning "graveling" behavior along rural gravel roads. This is a common behavior among grouse throughout North America during the fall as they collect gravel along roadways for use in their gizzard. Counts are completed annually between late September and mid-October. These data are currently being reviewed and the survey method is being evaluated for effectiveness. In addition, much is learned about spruce grouse production through hunter-harvested wing collections.

ROCK PTARMIGAN

Rock ptarmigan is the second most abundant ptarmigan species in Alaska and can be found throughout the state, including the Aleutian Islands and Southeast Alaska. Rock ptarmigan typically inhabit higher elevation habitat, more exposed rock faces, scree slopes, and alpine ridges. Alpine areas with abundant dwarf birch (*B. nana* and *B. glandulosa*) provide good habitat and are likely places to observe rock ptarmigan.

Population monitoring and research was initiated at Eagle Summit (Unit 25C) on the Steese Highway by DWC in the late 1950s to better understand life history and population ecology of rock ptarmigan (Weeden 1965b). Concern over the potential impacts of hunting on the easily accessible ptarmigan population near Eagle Summit led to additional research in the early 1970s (McGowan 1975). Lack of funding in the 1980s brought the rock ptarmigan monitoring program at Eagle Summit to an end, and further information on rock ptarmigan populations was gleaned using wing collection and hunter questionnaires. Declines in rock ptarmigan populations along the Denali Highway in the 1990s led to concerns of potential overharvest by hunters. This concern prompted DWC to initiate spring breeding surveys along the Denali Highway (Units 13B and 13E) in the late 1990s. As more resources became available, monitoring programs were initiated along the Steese Highway near 12-mile and Eagle summits (Unit 25C), near Donnelly Dome (Unit 20D), near Mount Fairplay (Unit 12), at Isabel Pass (Unit 13B), within Denali National Park (DNP, Unit 20C, and most recently at various locations throughout the Kenai Mountains (Units 7 and 15A). Since 2016 volunteer-led, summer brood surveys have been completed on public lands adjacent to the Denali and Steese Highways, and within Hatcher Pass. As a result of increased volunteer interest, these efforts were expanded in 2021 to also include Sheep Mountain (Unit 13A), Chugach State Park (Unit 14C), and the Kenai Mountains (Unit 7). These data allow DWC to better understand early chick survival and overall population productivity.

Since 2013, the statewide Small Game Program (SGP) has completed 2 rock ptarmigan research studies examining movement, mortality, and breeding success within Unit 13B (Merizon et al. 2018) and near Eagle Summit. The study near Eagle Summit has also documented annual spring breeding surveys within the study area formerly used by researcher Robert Weeden in the 1960s and early 1970s. Beginning in spring 2018, SGP, in cooperation with UAF, initiated a third research study to compare rock ptarmigan reproductive ecology and population productivity between Eagle Summit (Unit 25C) and the Denali Highway (Unit 13B) populations.

WHITE-TAILED PTARMIGAN

White-tailed ptarmigan is the smallest species of ptarmigan and inhabits high elevation alpine habitat within the Alaska Range and south through Southeast Alaska. White-tailed ptarmigan observations are very rarely confirmed north or west of the Alaska Range. However, hunters do periodically report harvest of this species along the western Alaska Range, near the South Fork of the Kuskokwim River. This species is endemic to North America and can be found in high alpine portions of Southeast Alaska, coastal British Columbia, and the western United States south to New Mexico.

Due to their more remote and relatively inaccessible habitats, monitoring of spring breeding abundance of white-tailed ptarmigan is difficult. Since 2016 volunteer-led summer brood surveys have been completed annually on public lands for white-tailed ptarmigan near Hatcher Pass, Chugach State Park, and the Kenai Mountains. Data from these surveys allow DWC to get a sense of chick survival and juvenile recruitment into the population just prior to the hunting season. These surveys are particularly important for white-tailed ptarmigan, a challenging species to assess. The ongoing statewide hunter harvested wing collection program also yields very beneficial data for this species.

WILLOW PTARMIGAN

Willow ptarmigan is the most common and abundant ptarmigan species in Alaska, occurring in most alpine and subalpine unforested habitats throughout the state. However, this species is not found in the Aleutian Islands west of Unimak Island or the islands off the west coast of Alaska. Willow ptarmigan are commonly found in montane valley bottoms and along rivers where willow (*Salix* spp.) shrubs are abundant.

As with the other grouse species, early monitoring of willow ptarmigan was done through hunter questionnaires and by wing collections. Early research conducted in the 1960s by DWC provided managers with a better understanding of life history and population ecology of willow ptarmigan (Weeden 1965b). Declines in rock ptarmigan populations along the Denali Highway in the 1990s led to concerns of potential overharvest of ptarmigan (including willow) by hunters. This concern prompted DWC to initiate spring breeding surveys of both rock and willow ptarmigan along the Denali and Richardson highways in the late 1990s. As more resources became available, monitoring programs were initiated along the Parks Highway near Broad Pass and at several locations near Anchorage, Donnelly Dome, and most recently at various locations in the Kenai Mountains (2013), Denali National Park (2014), and Mount Fairplay (2015). Since 2016 volunteer-led summer brood surveys have been completed annually at Hatcher Pass and on public lands adjacent to the Denali and Steese Highways. As a result of increased volunteer interest these efforts were expanded to also include Sheep Mountain, Chugach State Park, and the Kenai Mountains. These data allow DWC to get a sense of chick survival and juvenile recruitment into the population just before the hunting season. Between 2013 and 2015 an SGP supported graduate research project was completed examining the ecology and distribution of willow ptarmigan in the upper Susitna River (Frye 2020, Frye et al. 2022). In addition, an SGP research project was initiated examining the movement ecology of willow ptarmigan on the Yukon-Kuskokwim (YK) delta in May 2022.

ALASKA HARE

Alaska hare is one of the most poorly understood game species in the state. The species ranges from the Baldwin and Seward peninsulas to the lower YK Delta and throughout the Alaska Peninsula (Figs. 1 and 2). The Alaska hare inhabits coastal lowlands, alder (*Alnus* spp.) and willow thickets, and wet meadows.

Historically there was no program aimed at long-term population monitoring of Alaska hare beyond information received from hunter questionnaires. Research initiated in fall 2012 by DWC and UAF examined the genetic variability of the species throughout its range (Cason et al. 2016). This study has provided a strong first step toward documenting and understanding the species' range throughout Alaska in addition to the genetic diversity of the species within its range.

Beginning in fall 2017, SGP, along with several other DWC colleagues, initiated a series of rural community tours throughout western Alaska (historical range of Alaska hare) including the YK delta to discuss Alaska hare observations, historical abundance, and hunting patterns with rural residents. This outreach effort led DWC and UAF collaborators to initiate a graduate research project in summer 2018 to develop an effective population monitoring technique and document movement patterns for this species. All field operations for this project were completed in March 2022 and data analysis and report preparation have begun. In total 9 hares were captured and collared with Global Positioning System (GPS) transmitters and several thousand fecal pellets have been collected as a means to estimate abundance from areas throughout Units 17, 18, 22, and 23. A final report is anticipated to be available by 2024.

SNOWSHOE HARE

Snowshoe hares are found throughout Alaska although they are much less abundant in Southeast Alaska. They commonly inhabit mixed-spruce forests, wooded swamps, and brushy areas that provide good cover from predators.

Early monitoring of snowshoe hare populations was from information received from hunter questionnaires. Since the late 1990s DWC has monitored population fluctuations of snowshoe hares by performing twilight roadside counts along the Richardson, Parks, Steese, Denali, and Alaska highways.

SMALL GAME PROGRAM

The interest in promoting Alaska's small game species as a valuable resource has resulted in further growth and development of the Small Game Program (SGP). SGP objectives are diverse and comprehensive. In addition to education and outreach, the primary objectives of SGP are two-fold: One, document population status and understand the dynamic ecology of Alaska's small game species. This is completed by monitoring harvest composition, conducting spring breeding and summer brood surveys, and evaluating population productivity, particularly for those species that are heavily harvested by hunters along road systems. Two, develop research efforts to better inform management concerns and the Alaska Board of Game (board) hunting regulatory process.

DWC staff use the information provided in this report to manage harvest, inform the hunting public, and determine the status of various small game populations throughout the state. These data will inform DWC's use of its discretionary authority within seasons specified by the board to adjust bag limits to restrict or liberalize harvest.

This report details the activities conducted by SGP between regulatory years (RY) 2020 and 2021 (a regulatory year begins 1 July and ends 30 June, e.g., RY21 = 1 July 2021–30 June 2022). Brood survey results from summer 2022 are also provided. Specifically, this report addresses 1) recent board regulatory changes, 2) status of monitored grouse, ptarmigan, and snowshoe hare populations, 3) the harvest composition from the seasons addressed, 4) management concerns, 5) current research, and 6) future work. Information will be provided by species in each of the 7 sections of this report representing unique geographic regions of the state. These regions include 1) Fairbanks and Interior Road System (FIRS), 2) Alaska Range, 3) Southcentral Road System, 4) Kenai Peninsula, 5) Western Rural, 6) Alaska Peninsula, and 7) Southeast Alaska.

Methods for Population Monitoring

SPRING BREEDING SURVEYS

An understanding of spring breeding abundance is critical to the management of Alaska's small game, particularly for heavily exploited populations and those adjacent to the road system. Beginning in mid-April each year, numbers of snowshoe hare, and breeding male grouse and ptarmigan are counted at fixed survey locations (Pierce et al. 2012) from the Steese Highway in the Interior to Ketchikan in Southeast Alaska (Fig. 2). These surveys provide indices used to monitor and manage populations.

Spring breeding behavior of many tetraonids allows a means to index annual breeding abundance and the eruptive nature of grouse and ptarmigan populations (McBurney 1989, Taylor 1992, Zwickel and Bendell 2004, Pierce et al. 2012). In Alaska, male grouse including ruffed, sharp-tailed, and sooty grouse; and willow and rock ptarmigan; perform conspicuous springtime territorial displays. Male spruce grouse and white-tailed ptarmigan also perform a springtime display, but it is one that is not easily located or viewed, making monitoring of spring breeding abundance through this behavior more challenging. These 2 species are monitored through wing collections, periodic site visits to areas where fall harvest occurs, and reports from DWC biologists, hunters, and outdoor enthusiasts. White-tailed ptarmigan are also monitored through summer brood surveys near Hatcher Pass (Unit 14A), Chugach State Park (Unit 14C), and the Kenai Mountains (Unit 7).

The spring breeding season for grouse and ptarmigan in Alaska occurs from mid-April through late May (Weeden 1965b, Taylor 2013). Due to the geography of Alaska, limited road system, poor access off the road system in the spring, and staff limitations, SGP has been largely restricted to monitoring species in accessible areas where breeding behaviors can be observed. SGP has focused on those populations that are either heavily exploited by hunters, in popular outdoor recreational areas, or near to large urban areas or road systems and so afford consistent and reliable access from year to year. A more detailed description of the methods used for each specific species is included under the appropriate species section.

Ruffed Grouse

From mid-April to mid-May, male ruffed grouse exhibit a spring breeding behavior known as drumming. Males attempt to attract females by standing on a prominent log, stump, or subtle rise on the forest floor and flap their wings adjacent to their nearly upright body, making a sound like that of a quickening drumbeat. Typically, male ruffed grouse have a preferred drumming post that is within an early successional trembling aspen (*Populus tremuloides*) or other mixed hardwood stand (McBurney 1989).

Survey methods used for ruffed grouse have been developed to be consistent with state and national techniques (McBurney 1989, Taylor 1992). In Alaska, drumming typically peaks between 15 April and 15 May. Survey routes generally consisted of 10 to 12 stops along a trail or rural road. At each stop, an observer listened for drumming males for 4 minutes. All drums heard during the 4 minutes and their direction from the observer were recorded. Attempts were made to survey each route 2–4 times during the breeding season. Spring breeding data are reported here as the average number of individual drumming males per listening post or stop for a given survey location with associated confidence intervals calculated using bootstrap methods. Status reports prior to 2015 documented the total count of drumming males per survey area. Roadside and trail transects in known ruffed-grouse habitat were established in Anderson (1993), Delta Junction (2003), Cooper Landing on the Kenai Peninsula (2007), Palmer (1992), Fairbanks (2016), and Tok (2014 and 2016) and have been completed annually since their inception (Carroll and Merizon 2021, Taylor 2013).

Sharp-tailed Grouse

Male and female sharp-tailed grouse return to lek sites (communal breeding display areas) during the breeding season from mid-April through mid-May. Females are often observed, though their presence is highly variable as their behavior near leks can be cryptic. Male counts form the basis of springtime breeding estimates as they consistently return to lek sites every spring. Spring breeding survey data are reported as average number of males per lek. Leks are generally visited by observers 2–3 times during the peak of the breeding season. Males were distinguished from females by their engorged yellow supercilium (eyebrow), vocalizations, foot stomping, tail rattling, and body posturing. In Alaska, lek sites generally have been located in 1) open areas, including recent burns and cleared agricultural fields, 2) along roads, or 3) within 1–2 m of balsam poplar (*P. balsamifera*), willow, or aspen regeneration that occurs after a burn or clearing. During lek visits the peak of daily activity occurred 1 hour prior to sunrise and generally continued for 2 to 3 hours. Leks were approached quietly on foot and males were counted. A lek is defined here as ≥1 male observed displaying at a site during 2 consecutive years. A lek is considered inactive or abandoned when no males are observed displaying for 5 consecutive years. Inactive leks are not included in the analysis, and only leks surveyed in consecutive years are included in the analyses. Sample sizes and relative abundance estimates for this report may differ from previous reports for several reasons: 1) only leks surveyed in consecutive years are included here and 2) leks included in the analyses in previous reports may not have met our revised definition of a lek.

Lek sites have been monitored for male sharp-tailed grouse abundance near Delta Junction since 1997 and near Tok since 2013.

Sooty Grouse

Male sooty grouse begin breeding activity in late March in Southeast Alaska; however, the peak of the breeding season generally occurs between mid-April and mid-May. Males utilize the acoustic characteristics of montane valleys to broadcast repeated hooting calls, typically from Sitka spruce or mountain hemlock near the alpine.

Beginning in April 2015, survey transects were created along hiking trails and roadways near Juneau and Petersburg to monitor the spring breeding abundance of males. In April 2019, survey transects were created in Ketchikan and Haines. Survey transects consisted of 6–20 stops, much like the design of ruffed grouse surveys. They were completed either on foot or using a highway vehicle. Spring breeding survey data are reported as the average number of males heard per survey stop by area or region (e.g., Mitkof Island). Surveys were repeated 2–3 times during the peak of breeding activity. Spring breeding data are reported here as the average number of individual hooting males per listening post or stop for a given survey location with associated confidence intervals calculated using bootstrap methods. Prior to the creation of these survey transects in 2015, no formal, systematic survey was completed for sooty grouse in Southeast Alaska.

Spruce Grouse

The springtime display of male spruce grouse in Interior and Southcentral Alaska is relatively quiet and inconspicuous, making it difficult to locate displaying males. Males in Southeast Alaska have been heard and observed making wing claps while displaying, making them slightly easier to locate; however, due to a low population density and limited staff time, DWC has not been able to establish spring survey routes for this population. While displays are difficult to monitor, the presence of both male and female spruce grouse throughout the state has been noted by DWC staff during spring fieldwork, and these observations correlate with fall abundance.

Rock Ptarmigan

Male rock ptarmigan defend breeding territories through vocalizations and display flights beginning in early April. Territories typically occur in high elevation alpine areas, often adjacent to stands of dwarf birch on exposed montane slopes and ridges (Weeden 1965b).

To assess spring breeding abundance of rock ptarmigan, observers used a broadcast call of a territorial male played at between 5 and 15 stops along designated survey transects (Choate 1963; Watson 1965; Bergerud and Mercer 1966; Bergerud 1970; Braun and Rogers 1971; Taylor 2000, 2013). Surveys were completed either by highway vehicle along rural, high-elevation roadways or on foot. Spring breeding data are reported here as the average number of individual males per listening post or stop for a given survey location with associated confidence intervals calculated using bootstrap methods. Surveys are repeated 2–3 times during the peak of breeding activity.

Beginning in spring 2022, an effort to evaluate the effectiveness of the current rock and willow ptarmigan spring breeding survey methodology was initiated. Results from this evaluation will be available in a future wildlife management report.

White-tailed Ptarmigan

The springtime displays of male, white-tailed ptarmigan are more difficult to monitor than those of other ptarmigan species in Alaska and the Small Game Program (SGP) is currently not conducting spring breeding surveys for this species. Access to the high alpine ridges and peaks on which they breed is very poor in Alaska because there are few roads to these areas and the high mountains are frequently covered in deep snow and prone to avalanche during breeding season. Based on field observations in Alaska, male and female white-tailed ptarmigan disperse during the summer months (post breeding) and are rarely found together. However, flocks of white-tailed ptarmigan are found in alpine habitat in late September and October.

Willow Ptarmigan

Like male rock ptarmigan, beginning in April and continuing through late May, male willow ptarmigan vigorously defend breeding territories through calling and display flights. These territories are typically set up in transitional shrub habitat between the subalpine and alpine in willow and dwarf birch stands (Weeden 1965b). Willow ptarmigan spring breeding abundance is assessed and reported using the same methodology as rock ptarmigan.

Beginning in spring 2022, an effort to evaluate the effectiveness of the current rock and willow ptarmigan spring breeding survey methodology was initiated. Results from this evaluation will be available in a future status report.

SPRING-SUMMER COUNTS

Alaska Hare

Currently, there are no active programs aimed at long-term population monitoring of Alaska hares. This species is one of the least accessible small game species to view and hunt, yet it is often harvested opportunistically by trappers and remote winter travelers in western Alaska.

Snowshoe Hare

Snowshoe hare populations are subject to large cyclic fluctuations that normally occur over a 9- to 10-year period (Krebs et al. 1987, 2001; Taylor 2013). SGP does not estimate population size but rather monitors population fluctuations. Population monitoring is done by completing early morning roadside counts of snowshoe hares along the Richardson, Parks, Steese, Denali, and Alaska highways. Numerous partners assist SGP in population monitoring and data collection for statewide hare populations including the National Park Service, other agency partners, and private individuals.

SUMMER BROOD SURVEYS

Brood surveys have been used by numerous state and federal fish and wildlife agencies to monitor population trends and productivity (brood size and density) of various galliform species (including grouse, quail, turkey, and pheasant) throughout North America (Autenrieth et al. 1982, Guthery and Mecozzi 2008, Merizon and Carroll 2019, Hansen et al. 2015). However,

limited funding and staff availability can make these surveys difficult to achieve. Often state agencies can partner with other government agencies, conservation organizations, or dog-training groups to complete surveys. The use of trained pointing dogs has been found to be one of the most effective and efficient techniques for locating cryptic grouse broods that dwell in open habitats (Dahlgren et al. 2010, 2012; Guthery and Mecozzi 2008).

Since 2016, SGP has partnered with numerous volunteers and their highly trained pointing dogs on an annual basis to complete summer brood surveys. From 2016 to 2020 surveys were completed along designated transects for sharp-tailed grouse (Delta Junction) and rock and willow ptarmigan (Eagle Summit, Denali Highway, and Hatcher Pass). Beginning in summer 2021, additional volunteers were recruited, and many additional survey routes were created to assess all 3 species of ptarmigan near Sheep Mountain, Chugach State Park, and the Kenai Mountains. All of these locations were visited during the 2022 brood survey effort and will continue to be monitored annually. All dogs were evaluated for steadiness on point and to flush prior to participating in brood surveys. Observers, working alongside dogs and their handlers, counted the number of chicks and adults, and recorded brood locations. Read more about brood surveys and the value of volunteers in the Management Implications section of this report.

Fall Grouse Counts

Spruce grouse are a difficult species to monitor through other standardized methods such as spring breeding surveys or summer brood surveys (methods employed for other grouse and ptarmigan species in Alaska). Their breeding displays are virtually silent and inconspicuous. Because of the dense forest habitat in which they reside, it is difficult to accurately monitor them with pointing dog or traditional brood survey techniques. Therefore, a roadside survey method, where an observer drives along a gravel road and counts the number of grouse observed, was initiated in late summer/early fall 2019 to begin collecting baseline information on spruce grouse throughout the Mat-Su Valley. At least 4 survey routes have been established and 2–3 surveys are completed on each route where the maximum count is used as an index of abundance. Particular concern arose in 2019 due to the extent of an ongoing spruce bark beetle infestation throughout the Mat-Su Valley and Kenai Peninsula and its potential impacts on spruce grouse habitat availability. This infestation has severely affected mature white spruce (*P. glauca*) throughout Units 14A, 14B, and 16. Data collected through these surveys will better inform managers, hunters, and the regulatory process in the future. Ruffed grouse and snowshoe hare are also counted during these surveys.

Wing Collections

In order to understand annual grouse and ptarmigan harvest composition and population productivity, the Small Game Program (SGP) continues to collect hunter-harvested wings and tail fans of all species of grouse and ptarmigan (Tables 1 and 2). In addition, SGP attempts to collect the heads of harvested ptarmigan. By examining these samples, biologists can determine age (juvenile or adult), sex, and verify the species of harvested birds (Bergerud et al. 1963, Weeden and Watson 1967, Szuba et al. 1987, Gullion 1989, Dinsmore and Johnson 2012). This is a very cost- and time-effective way for SGP to index harvest composition. This is also a second method to estimate population and brood production from the previous breeding season.

To promote future wing collections, SGP has free wing envelopes available at most ADF&G offices throughout the state.

Grouse wings were used to determine age by examining the stage of molt and primary feather (P) wear. For spruce grouse only, calamus (feather shaft) diameter of P1 was measured (Szuba et al. 1987) to determine age. For ptarmigan, wings were used for one or more purposes, including to 1) determine age by examining the degree of pigmentation on P8, P9, and P10 (Bergerud et al. 1963, Weeden and Watson 1967); 2) estimate sex by measuring P8 length; or 3) estimate sex by measuring wing-chord length (Merizon 2012, Taylor 2013). Grouse rectrices (tail feathers) were used to determine sex (Henderson et al. 1967, Schulz 1983). Heads from fall (August through early October) harvested ptarmigan were used to verify species and sex by examining plumage characteristics prior to completing their fall molt.

Table 1. Total number of hunter-harvested wings collected statewide from grouse and ptarmigan by Game Management Unit (unit), Alaska, regulatory year 2020.

	Grouse				Ptarmigan			
Unit	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	52	13	1	0	66
2	0	0	0	0	3	0	0	3
3	0	0	0	2	0	0	0	2
4	0	0	0	17	0	0	0	17
7	0	74	0	0	92	0	7	173
8	0	0	0	0	0	6	0	6
9	0	9	0	0	4	0	0	13
12	3	2	6	0	0	0	0	11
13	1	4	2	0	60	0	0	67
14	16	25	0	0	50	9	74	174
15	1	101	0	0	0	0	0	102
16	0	4	0	0	38	0	0	42
19	0	10	0	0	0	0	0	10
20	14	55	40	0	2	0	0	111
25	0	0	0	0	5	0	0	5
Total	35	284	48	71	267	16	81	802

Table 2. Total number of hunter-harvested wings collected statewide from grouse and ptarmigan by Game Management Unit (unit), Alaska, regulatory year 2021.

	Grouse				Ptarmigan			
Unit	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	13	0	0	0	13
3	0	0	0	2	0	0	0	2
4	0	0	0	1	0	0	0	1
7	0	55	0	0	38	1	7	101
9	0	0	0	0	70	3	0	73
13	0	2	0	0	62	2	2	68
14	13	26	0	0	46	6	28	119
15	0	92	0	0	0	0	0	92
16	0	0	0	0	63	0	0	63
20	19	51	53	0	5	0	0	128
21	0	5	0	0	0	0	0	5
22	0	0	0	0	16	3	0	19
24	0	4	0	0	0	0	0	4
25	0	0	0	0	9	0	0	9
Total	32	235	53	16	309	15	37	697

Summer 2020 through Summer 2022 Climate Patterns and Breeding Seasons

Near normal temperatures and above average precipitation were recorded for Southcentral and much of the Interior during the summer of 2020. Fairbanks and Delta Junction received 1–3 times the amount of normal rainfall (Alaska Climate Research Center 2022). The Alaska Range and Talkeetna and Chugach mountains received considerable snowfall above 914 meters (3,000 feet) in June 2020 which likely had negative consequences for grouse and ptarmigan chick survival. Despite the rainfall in June, much of August 2020 was dry and sunny in Southcentral and the Interior; however, traditional fall rains returned in late-August.

Weather was mild in early fall 2020, but by October temperatures and precipitation normalized across the state. The overall winter of 2020–2021 was near normal to slightly colder and snowier than much of the state. Southwest Alaska experienced normal to slightly below normal temperatures and precipitation compared to the previous 10 years. Southeast Alaska experienced a very wet winter during 2020–2021 which caused several severe mudslides throughout the region.

March and April 2021 were colder than normal delaying snowmelt and leaf phenology throughout much of the state. Southeast Alaska had very cold temperatures and heavy snowfall in April that may have delayed sooty grouse breeding activity and subsequent nesting.

Overall, May and June 2021 returned to near normal temperatures and precipitation. However, much of the west-central portion of the state experienced a significant snowfall (more than 762–

914 meters or 2,500–3,000 feet) in June 2021, which may have contributed to low, ptarmigan-chick survival. Indeed, the 2021 brood survey documented very low numbers of broods and chicks per brood suggesting the June snow event likely had a negative effect on juvenile production (either through reduced nest success and/or reduced chick survival). Much of Southcentral did not receive this poor weather pattern and rock and willow ptarmigan chick survival remained relatively high as evidenced by brood survey results from July 2021. Southwest and Western Alaska experienced a very wet June and July 2021 with heavy rain and cool temperatures. This also may have had a strong negative effect on chick production in that area.

Throughout August 2021 Southcentral and the Interior experienced heavy rainfall. The first significant snowfall of the season was recorded in Anchorage in mid-September. Despite a brief warm-up period by mid- to late-October, temperatures plummeted throughout November 2021 for much of the state and set numerous low-temperature records. Bethel recorded the coldest November in over 80 years (Alaska Climate Research Center 2022) followed by the warmest December on record. December 2021 and January 2022 temperatures returned to near normal or slightly above normal in Southcentral and the Interior; however, heavy snow was recorded from Southeast to the Interior and western Alaska during the same month. In addition, a severe, large, geographic-scale icing event that deposited 1–3 cm (0.4–1.2 in) of ice throughout the western Alaska Range and much of west-central Interior occurred in December of 2021. Icing also occurred throughout Southcentral and portions of Southwest Alaska. This icing event likely reduced snow-roosting habitat for grouse and ptarmigan. Temperatures soared to above average in February and March throughout the entire state; however, snowfall continued accumulating in Southcentral and the Interior. The snow that had accumulated throughout early winter in Southwest Alaska had largely melted by early-March. As a result of this warm-up, much of the subnivean habitat likely remained poor or inaccessible to snow-roosting grouse.

Spring 2022 was also near normal for temperature and precipitation. Deep snow throughout Interior and Southcentral challenged SGP field crews in accessing spring breeding-survey locations. A mid-May rapid rise in temperatures led to flooding and very swollen rivers by late May in some Interior and Southcentral rivers. There was very little snow in Southwest Alaska in April and May 2022, and temperatures were well above average in May and much of June. Between mid-May and mid-July many regions of the state experienced a prolonged warm, clear, and dry period that exacerbated the fire season. By mid-July 2022, over 3 million acres had burned throughout Alaska (Alaska Division of Forestry & Fire Protection 2022). Despite the fires, the warm and dry conditions between mid-May and mid-July 2022 were likely highly favorable to early grouse and ptarmigan chick survival.

Beginning in mid-July 2022, a significantly wetter and cooler period continued through much of August. Snow was observed above 1,524 meters (5,000 feet) in the Talkeetna and Chugach mountains in late-July.

Statewide Summary

Highly variable climate patterns across Alaska between 2021 and 2022 likely had a large role in localized differences in grouse and ptarmigan abundance. Between May and mid-July 2022 much of the state experienced dry and warm conditions. This weather pattern and the reduced

abundance of avian and terrestrial predators due to the recent snowshoe hare decline, appears to have had a positive influence on many grouse and ptarmigan populations throughout the state.

Ruffed grouse throughout Alaska generally remain at or near the low of their 7- to 10-year population cycle peak statewide. Spring breeding surveys near Palmer, Delta Junction, Anderson, and Tok reflect low populations.

Sharp-tailed grouse abundance declined near Delta Junction but stayed relatively stable near Tok. Field reports suggest below average numbers of sharp-tailed grouse were observed by hunters throughout their range including Tok, Delta Junction, and areas along the Taylor Highway. Few broods were observed during the summer of 2022. As a result, hunters can expect to see fewer sharp-tailed grouse during fall 2022.

Overall, spring breeding data between 2015 and 2019 documented fairly stable numbers of male sooty grouse throughout monitored populations in Juneau and Petersburg. However, beginning in 2020 and continuing through 2022, declining spring breeding abundance has been documented in Juneau and on Mitkof Island (Petersburg). Hunters generally reported seeing and harvesting fewer birds during the 2021–2022 season throughout the Southeast region.

Currently, there is no systematic statewide population monitoring for spruce grouse. However, due to concerns over the widespread effects of spruce bark beetles, in August 2019 DWC initiated a fall, early-morning, roadside count of spruce grouse in the Mat-Su Valley. The effectiveness of these fall counts is currently being evaluated. Based on field observations, brood production appeared to be near the long-term average in 2022 overall, with the exception of the Kenai Peninsula where fall spruce grouse abundance is anticipated to be higher than the long-term average.

Rock ptarmigan populations throughout much of the road system remained relatively stable or modestly declined in 2021 and 2022. However, populations increased modestly in the Alaska Range in 2022. Field observations from Southwest Alaska suggest continued, strong growth of local populations that were low between 2014 and 2020. Based on brood surveys and observations throughout summer 2022, rock ptarmigan populations are expected to be above average throughout Southcentral, the Kenai Peninsula, and the Alaska Range.

Very little is known about white-tailed ptarmigan abundance throughout their range in Alaska. Most harvest occurs near high alpine road systems (Hatcher and Thompson passes) and alpine hiking trails throughout Southcentral and the Kenai Peninsula. Generally, very few hunters report harvesting white-tailed ptarmigan due to the difficulty in accessing their high alpine habitat. Overall, abundance is expected to be above average in RY22 based on summer field observations.

Willow ptarmigan abundance throughout much of the state remained low or stable between 2019 and 2021. Due to cool temperatures and heavy rain in late June and early July of both 2020 and 2021, ptarmigan populations likely suffered high chick mortality throughout Southcentral, Kenai Peninsula, and the Alaska Range. However, population growth was observed throughout Southwest Alaska, Alaska Peninsula, and portions of the Alaska Range in 2022 based on spring breeding surveys. Summer 2022 weather conditions were highly favorable, and 2022 brood

survey results documented high chick survival throughout much of the state. As a result, hunters can anticipate above average populations of willow ptarmigan.

Snowshoe hare abundance is highly variable depending on the location within the state. Populations in the Interior are 1–2 years past the population peak and have declined to low abundance throughout this region. Snowshoe hare abundance in Southcentral is also past the population peak. Populations on the Kenai Peninsula are expected to reach their population cycle peak in 2022. The snowshoe hare population appears to be a strong driver in statewide grouse and ptarmigan population abundance (Carroll and Merizon 2017). As snowshoe hare densities begin increasing, specialist and generalist predator populations also increase in abundance. As a result, in the past we have documented a rapid decline in Alaska grouse and ptarmigan populations during previous snowshoe hare population highs.

Alaska hare is one of the least well known of the small game species in Alaska. Overall, this species remains at low abundance throughout its statewide range with harvest being reported throughout many small coastal villages in Western and Southwest Alaska. The Small Game Program (SGP) and other DWC staff embarked on a new, multi-year research study beginning in 2018 to try and learn more about this species' life history and develop a long-term monitoring technique to begin tracking abundance and distribution. Results from this study will be available in 2023 or 2024.

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Statewide Board of Game

During the March 2022 Statewide Board of Game (board) meeting in Fairbanks, the board adopted proposal 162 (5 AAC 92.220) requiring the salvage of hide or meat of snowshoe hare for human use statewide. This new regulation will take effect in RY22. The human use designation provides broad latitude for hunters to meet the salvage requirement including human consumption. It also allows using the hide for sewing, trapping bait, dog food, and other potential uses.

Fairbanks and Interior Road System

For purposes of this report, the FIRS region encompasses Units 12, 19–21, 24, 25, 26B, and 26C (Fig. 3). Specifically, the region extends southwest of Aniak (Units 19 and 21), northwest of Huslia (Unit 24), northeast of Deadhorse to the Canadian border (Unit 26), and southeast of Northway (Unit 12). The region includes 8 major highways (Dalton, Elliott, Alaska, Richardson, Parks, Steese, Taylor, and Glenn highways). The range of habitat is somewhat diverse and includes mixed deciduous species and black spruce that dominate the landscape, to alpine and tundra habitats of the Brooks Range and North Slope. The network of major highways allows for relatively easy access along or adjacent to road corridors; however, there is a large portion of the region that is only accessible by small aircraft or boat. Locations near Fairbanks and Delta Junction are popular for both ruffed and sharp-tailed grouse hunting due to the forest composition (mixed aspen) and frequency of wildfires that provide appropriate habitat. Spruce grouse are found widely in forested habitats. Ptarmigan hunting is also popular in this region at higher elevations along the Steese, Elliott, Dalton, and Richardson highways. Sooty grouse and Alaska hare are not found in this region.

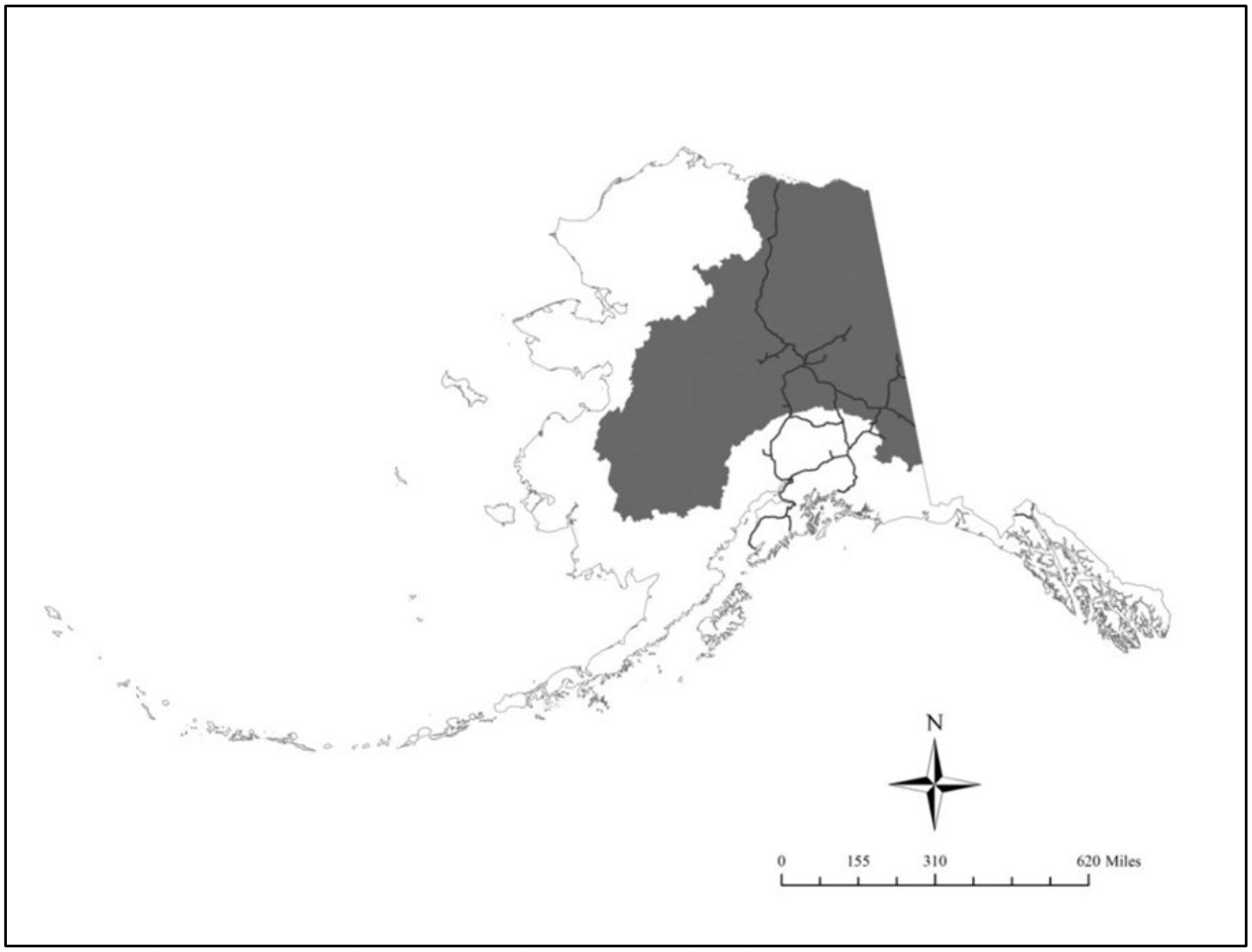

Figure 3. Map of the Fairbanks and Interior Road System region, Alaska. The Interior Alaska region is shaded in grey, and black lines delineate roads.

RUFFED GROUSE

Spring Breeding Surveys

Small Game Program (SGP) staff, other DWC staff, and volunteers completed annual spring breeding surveys for ruffed grouse between 26 April and 19 May in 2021, and between 29 April and 20 May in 2022. Surveys were conducted on state and military lands near Clear Space Force Station (SFS), state lands near Fairbanks, military lands near Eielson Air Force Base (Yukon Training Area [YTA]), state (Delta Junction Bison Range [DJBR]) and military lands (Delta Training Area [DTA] and Gerstle River Training Area [GRTA]) near Delta Junction, and state lands near Tok.

The winter of 2021 resulted in above normal snowfall with considerable snow falling in March that persisted well into April and early May. Near record snowfall, and in some cases record snowfall (National Centers for Environmental Information 2022), throughout much of the Interior in 2022 resulted in substantial snow remaining along survey routes during the survey period. Observations throughout the Interior indicated delayed breeding activity for many birds, including grouse.

Survey conditions in both years for all drumming counts in the FIRS region were generally good with temperatures ranging from −3.4°C to 12.8°C (25.9°F to 55.0°F), and winds light to moderate (range of 0–8.4 kph [0–5.2 mph]). Count data suggests that numbers of ruffed grouse are slowly starting to increase near Clear SFS, Fairbanks, and within the YTA (Table 3) from the cyclical low observed in 2018. Count data from locations in the Eastern Interior near Delta (Table 4) and Tok (Table 5) suggest ruffed grouse numbers have remained low since 2018.

The 2022 relative abundance estimate for ruffed grouse near Clear SFS was likely an underestimate. Field observations indicated that the peak in breeding behavior for ruffed grouse in the Interior likely did not occur until the third or fourth week of May, after surveys had been conducted near Clear SFS. Spring migration observations from both Interior (R. Snowden, Project Director, Alaska Songbird Institute, personal communication) and Southcentral Alaska (HawkWatch International 2022) suggest migration was delayed by about a week for a number of bird species. SGP staff attempted additional surveys during the regular survey period later in May near Delta and Tok once it was clear that the peak of breeding had not yet occurred. However, due to time constraints, additional surveys near Clear SFS were not possible.

Table 3. Mean number of male ruffed grouse estimated per listening post (stop) within the greater Fairbanks and Interior Road System (FIRS), Alaska, 2014–2022.

	Clear AFS		Fairbanks		YTA	
Year	Mean	95% CI	Mean	95% CI	Mean	95% CI
2014	0.16	0.07–0.27	–	–	0.30	0.00–0.70
2015	0.17	0.10–0.24	–	–	0.40	0.10–0.75
2016	0.24	0.12–0.38	–	–	0.52	0.07–1.02
2017	0.35	0.23–0.48	0.85	0.55–1.12	0.27	0.07–0.51
2018	0.02	0.00–0.06	0.45	0.20–0.75	0.00	0.00–0.00
2019	0.07	0.02–0.12	0.17	0.05–0.32	0.00	0.00–0.00
2020	0.01	0.00–0.03	0.22	0.07–0.38	0.00	0.00–0.00
2021	0.10	0.03–0.20	0.25	0.07–0.45	0.05	0.00–0.15
2022	0.08	0.03–0.13	0.38	0.10–0.70	0.17	0.00–0.42

Note: 95% confidence intervals (CI) use bootstrap sampling distribution. Survey routes include the area near Clear Space Force Station (SFS), Fairbanks, and on military lands in the Yukon Training Area (YTA).

Table 4. Mean number of male ruffed grouse estimated per listening post (stop) with bootstrap 95% confidence intervals (CIs) for survey routes on state and private lands (Quartz Lake and Nistler), military lands (Donnelly Training Area [DTA] and Gerstle River Training Area [GRTA]), and on all routes combined near Delta Junction within the greater Fairbanks and Interior Road System (FIRS), Alaska, 2014–2022.

	Quartz Lake		Nistler		DTA		GRTA		All Delta Routes	
Year	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
2014	–	–	0.17	0.00–0.38	0.67	0.35–1.08	0.08	0.00–0.25	0.32	0.16–0.50
2015	–	–	0.50	0.25–0.75	0.83	0.52–1.15	0.35	0.15–0.60	0.57	0.40–0.74
2016	0.42	0.21–0.64	0.46	0.17–0.76	0.62	0.38–0.83	0.35	0.12–0.60	0.47	0.34–0.60
2017	0.25	0.07–0.49	0.38	0.15–0.67	0.34	0.13–0.59	0.06	0.00–0.19	0.26	0.16–0.38
2018	0.05	0.00–0.14	0.21	0.04–0.42	0.02	0.00–0.06	0.05	0.00–0.12	0.08	0.03–0.14
2019	0.11	0.00–0.30	0.28	0.08–0.50	0.04	0.00–0.12	0.00	0.00–0.00	0.11	0.04–0.19
2020	0.18	0.05–0.34	0.17	0.03–0.31	0.06	0.00–0.17	0.04	0.00–0.12	0.11	0.05–0.18
2021	0.02	0.00–0.07	0.12	0.00–0.27	0.08	0.00–0.21	0.02	0.00–0.06	0.06	0.02–0.11
2022	0.09	0.00–0.25	0.08	0.00–0.19	0.06	0.00–0.14	0.04	0.00–0.12	0.07	0.03–0.12

Table 5. Mean number of male ruffed grouse estimated per listening post (stop) with bootstrap 95% confidence intervals (CIs) for survey routes on state lands near Tok and on all routes combined near Tok within the greater Fairbanks and Interior Road System (FIRS), Alaska, 2014–2022.

	River Road		Alaska Highway		Mudslinger		All Tok routes	
Year	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
2014	0.19	0.04–0.38	–	–	–	–	0.19	0.04–0.39
2015	0.50	0.29–0.69	–	–	–	–	0.50	0.29–0.68
2016	0.97	0.56–1.36	0.68	0.38–1.03	–	–	0.82	0.55–1.09
2017	0.31	0.14–0.58	0.47	0.15–0.84	0.19	0.05–0.39	0.34	0.19–0.51
2018	0.06	0.00–0.17	0.00	0.00–0.00	0.05	0.00–0.15	0.03	0.00–0.09
2019	0.11	0.00–0.22	0.09	0.00–0.23	0.10	0.03–0.18	0.10	0.04–0.17
2020	0.07	0.00–0.22	0.18	0.03–0.33	0.05	0.00–0.10	0.10	0.03–0.18
2021	0.08	0.00–0.19	0.07	0.00–0.20	0.07	0.00–0.17	0.08	0.03–0.14
2022	0.10	0.03–0.17	0.03	0.00–0.09	0.00[a]	0.00–0.00	0.04	0.01–0.07

[a] Surveys along this route were completed prior to the peak in ruffed grouse drumming behavior, which was delayed due to record snowfall in winter 2021–2022.

Wing Collections

There were 17 ruffed grouse hunter-harvested wing samples collected from the FIRS region in RY20, and 19 collected during RY21 (Table 6). Most of the wings were collected from Units 20B and 20D, which are the most accessible units in the FIRS region. Small sample sizes in both 2020 and 2021 make it difficult to draw any strong conclusions about the proportion of juveniles in the harvested population each year and possible changes in the proportion of juveniles between years.

Table 6. Total number and proportion of juvenile ruffed grouse with binomial 95% confidence intervals (CIs) based on harvested wing collections from within the Fairbanks and Interior Road System (FIRS), Alaska, regulatory years 2011–2021.

Regulatory year	Units	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI
2011	20C, 20D	6	17	1	24	0.74	0.52–0.90
2012	20B, 20C, 20D	8	17	0	25	0.68	0.46–0.82
2013	20A, 20B, 20C, 20D	9	7	1	17	0.44	0.20–0.70
2014	20A, 20B, 20C, 20D, 20E	20	35	1	56	0.64	0.50–0.76
2015	20A, 20B, 20C, 20D, 20E, 25D	28	93	0	121	0.77	0.68–0.84
2016	20B, 20C, 20D	16	41	0	57	0.72	0.58–0.83
2017	20A, 20B, 20C, 20D	39	94	0	133	0.71	0.62–0.78
2018	20B, 20C, 20D	1	10	0	11	0.91	0.59–0.99
2019	20B, 20D	6	23	0	29	0.79	0.60–0.92
2020	12, 20B, 20C, 20D	3	14	0	17	0.82	0.57–0.96
2021	20B, 20C, 20D	3	16	0	19	0.84	0.60–0.97

Habitat Improvement Work

Between November 2017 and March 2022, a habitat modification project near Delta Junction for the benefit of grouse breeding and brood rearing habitat was completed by the Small Game Program (SGP) in collaboration with the Alaska Department of Natural Resources, Division of Forestry, and through financial support from the Federal Wildlife Restoration Program and Founding Forty, a nonprofit, statewide conservation group. Over 500 acres of habitat were crushed with a roller chopper. Habitat selected for crushing was predominately made up of aspen and willow trees as these species are quick to respond to disturbance with vigorous growth. Within several years of this type of effort, regrowth from these tree species provides excellent breeding and brood rearing habitat for grouse. A map of the habitat work, as well as other habitat work completed throughout Interior and Southcentral Alaska, is available on ADF&G's website under ADF&G Home | Hunting | Small Game | Habitat Projects: http://www.adfg.alaska.gov/index.cfm?adfg=smallgamehunting.habitatprojects.

Research

Winter weather has long been thought to play a role in ruffed grouse population cycles. Winters characterized by cold temperatures and deep snow are thought to provide adequate cover for both predator avoidance and thermoregulation. Several studies have found winter weather variables (e.g., winter temperature and precipitation) or anomalies in these variables to be correlated with ruffed grouse abundance (Pomara and Zuckerberg 2017, Zimmerman et al. 2008). Recently, with financial support from the nonprofit conservation group Founding Forty and Federal Wildlife Restoration Program funds, a project was completed that evaluated the relationship between weather variables and ruffed grouse abundance for a population of ruffed grouse in Interior Alaska. The project was a collaboration between DWC and Dr. Glen Liston and Adele Reinking with Interworks Consulting LLC. Winter weather variables of interest such as snow depth, length of core snow period, start and end dates of the core snow period, and precipitation during the core snow period (among others) were estimated from 1993 to 2019 using a spatially-explicit SnowModel. This SnowModel can calculate snow distribution, snow depth, and snow cover duration (among over variables) across a specified area using meteorological and snow data (Liston and Elder 2006) collected from nearby weather stations; it can also incorporate data from Moderate Resolution Imaging Spectroradiometer (MODIS). Using generalized linear mixed models (GLMMs), SGP staff evaluated the relationship between weather variables known to be important to ruffed grouse and annual drumming counts of ruffed grouse in Interior Alaska. Although we did not find any correlation between winter weather variables that we considered and ruffed grouse abundance indices, our results indicated that there was some evidence that precipitation during the first 10 days of the brood-rearing period had a negative influence on ruffed grouse abundance indices. This is consistent with other research that has found precipitation during the brood rearing period to be negatively correlated with reproductive success in capercaillie (Moss et al. 2001, Summers et al. 2004, Baines et al. 2016), rock ptarmigan (Novoa et al. 2008, Novoa et al. 2016) and white-tailed ptarmigan (Wann et al. 2016); and population growth rates in black grouse (Viterbi et al. 2015). None of the other weather variables considered in our analysis seemed to influence ruffed grouse abundance indices during the period from 1993 to 2019. The results of this research are available in a report which can be found on ADF&G's website under ADF&G Home | Hunting | Small Game | Research & Reports: http://www.adfg.alaska.gov/index.cfm?adfg=smallgamehunting.research.

SHARP-TAILED GROUSE

Spring Breeding Surveys

Spring lek counts of male sharp-tailed grouse near Delta Junction and Tok occurred between 16 and 30 April, and on 3 May 2021; and between 20 and 30 April, and between 2 and 4 May 2022. Lek counts were conducted on private (DJAP), state (DJBR), and military lands (DTA and GRTA) near Delta Junction and on state lands near Tok. Prior to 2020 lek counts on military lands were conducted by contractors for the United States Army. However, U.S. Department of Defense funding for wildlife surveys on military lands was reduced in 2018 and eliminated in 2020. Since 2020 lek surveys on military lands near Delta Junction have been completed by SGP staff and volunteers. Survey conditions were generally good, with relatively cool weather and mostly light to moderate winds in both 2021 (temperature range of −7.8°C to 8.9°C [18.0–

48.0°F]; wind range of 0.0 kph to 10.1 kph [0.0–6.3mph]) and 2022 (temperature range of −10.0°C to 7.3°C [14.0°F–45.1°F]; wind range of 0.0 kph to 9.8 kph [0.0–6.1 mph]).

The average number of males estimated per lek on the Delta Junction Agricultural Project (DJAP) and Delta Junction Bison Range (DJBR) has been declining for the last 5 years (Table 7) and the 2022 estimate is below the previous 5-year-average (2.98 males per lek). The average number of males estimated per lek on military lands near Delta Junction has also been on the decline the past few years and the 2022 estimate is below the previous 5-year-average (5.25 males per lek). The 2022 estimate from Tok for the number of males per lek is above the previous 5-year average (4.00 males per lek). However, yearly estimates from leks near Tok had relatively low precision due to the small number of known leks monitored. When feasible, additional effort will be expended to find new lek sites near Tok. Across all leks visited within the FIRS region, a decline in the average number of males estimated per lek has been observed since 2019 and the current estimate for 2022 is well below the previous 5-year-average (3.84 males observed per lek).

It is important to note that although the average number of males observed per lek on military lands (DTA, GRTA, and Fort Greely) appears to have been markedly higher in earlier years (2007–2011) compared with those on the DJAP and DJBR, this is likely due to a sampling bias. This sampling bias occurs for a couple of reasons: 1) fewer leks were monitored in earlier years and sites likely had the largest aggregations of males, which makes them easier to find, and 2) an increase in sampling effort leads to an increase in the number of leks being monitored over time. These 2 issues inherently lead to a negative bias in the estimate over time (Hagen 2011).

Table 7. Mean number of male sharp-tailed grouse estimated per lek with bootstrap 95% confidence intervals from surveys of leks near Delta Junction within the Delta Junction Agricultural Project (DJAP) and on the Delta Junction Bison Range (DJBR), leks on military lands within Fort Wainwright-Donnelly Training Area (DTA), Fort Wainwright-Gerstle River Training Area (GRTA), and Fort Greely, leks near Tok, and all leks combined within the Fairbanks and Interior Road System region (FIRS), Alaska, 2007–2022.

	DJAP/DJBR			DTA/GRTA/Fort Greely			Tok			All leks combined		
Year	No. leks	Mean males/lek	95% CI[a]	No. leks	Mean males/lek	95% CI[a]	No. leks	Mean males/lek	95% CI[a]	No. leks	Mean males/lek	95% CI[a]
2007	14	4.57	3.07–6.29	2	11.50	1.00–22.00	–	–	–	16	5.38	3.25–8.56
2008	19	4.05	2.68–5.74	2	9.50	3.00–16.00	–	–	–	21	4.52	3.00–6.43
2009	22	2.41	1.36–3.59	2	11.50	7.00–16.00	–	–	–	24	3.13	1.79–4.83
2010	23	2.65	1.48–3.83	5	7.60	4.40–12.40	–	–	–	28	3.59	2.32–5.00
2011	24	2.63	1.58–3.75	7	8.14	4.57–12.29	–	–	–	31	3.87	2.48–5.55
2012	23	2.43	1.26–3.78	7	5.14	2.14–8.43	–	–	–	30	3.07	1.83–4.60
2013	18	3.72	1.72–5.89	7	4.43	2.00–7.43	–	–	–	25	3.92	2.40–5.68
2014	22	4.00	2.59–5.77	4	6.25	3.75–9.00	–	–	–	26	4.38	2.96–5.73
2015	22	4.50	2.91–6.14	9	3.89[b]	1.67–6.33	3	2.33	1.00–4.00	34	4.00	3.03–5.24
2016	22	4.14	2.36–6.36	9	4.78	2.78–6.89	4	3.00	0.50–6.75	35	4.12	2.76–5.67
2017	26	4.50	3.00–6.19	11	6.00	3.45–9.00	6	4.17	1.00–9.50	43	4.81	3.43–6.33
2018	26	2.65	1.58–3.92	12	4.33	2.33–6.67	7	5.14	1.43–10.29	45	3.52	2.48–4.83
2019	23	3.43	2.04–5.04	14	5.71	3.86–8.50	7	3.71	0.42–9.00	44	4.33	3.01–5.89
2020	22	1.95	1.04–2.91	13	5.31	3.31–7.85	7	2.83	0.00–6.29	42	3.13	2.13–4.38
2021	22	2.27	1.00–3.73	15	4.87	3.07–6.94	6	3.83	1.33–7.67	43	3.44	2.29–4.60
2022	22	2.00	0.95–3.23	13	4.00	2.15–6.31	6	4.33	1.33–7.83	41	2.96	1.95–4.14

Note: Sample sizes and relative abundance estimates for this report may differ from previous reports for several reasons: 1) only leks surveyed in consecutive years are included here and 2) leks included the analyses in previous reports may not have met our revised definition of a lek.

[a] CI stands for confidence interval.

[b] Sampling effort in 2014 was limited to 4 leks due to an increase in time spent on other wildlife surveys by contractors on military lands near Delta Junction. Three of the 4 leks visited are the largest known leks on military lands. Counts on these 4 leks likely biased the count high in 2014; therefore, the decline observed in 2015 is likely a result of that sampling bias.

Brood Surveys

Since 2016, the Small Game Program (SGP) has completed sharp-tailed grouse brood surveys near Delta Junction with the help of volunteers and their trained pointing dogs. Volunteers and their dogs walked predetermined transects. While a dog located grouse, the dog handler controlled their dog, and a second person recorded biological and distance (distance of brood group from transect line) data. These data provide important demographic information (e.g., ratio of juveniles per adult, average brood size, broods per kilometer) to managers prior to the hunting season. In 2021 surveys were conducted on 24 and 25 July. Survey conditions in 2021 were generally good with temperatures averaging 16.0°C (60.8°F; range of 13.0–20.0°C [55.4–68.0°F]) and winds averaging 1.2 kph (0.7 mph; range of 0–3.5 kph [0.0–2.2 mph]). In 2022, surveys were conducted on 23 and 24 July. Survey conditions in 2022 were generally good with temperatures averaging 13.8°C (56.8°F; range of 8.6–21.5°C [47.5–70.7°F]) and winds averaging 0.4 kph (0.2 mph; range of 0.0–2.3 kph [0.0–1.4 mph]). Construction of fencing on private lands in 2021 and 2022, and the inclusion of additional line transects in both 2021 and 2022 preclude any comparisons between years 2020 to 2022; however, very few brood groups were observed along survey routes in 2021 and 2022 despite a sizeable increase in kilometers walked (49.2 km [30.6 mi] in 2017 to 2020, versus 53.2 km [33.1 mi] in 2021, and 68.1 km [42.3 mi] in 2022). Data from 2017 to 2020 is presented below (Table 8).

Table 8. Mean number of sharp-tailed grouse chicks observed per brood group, range in number of chicks observed per brood group, number of broods seen per kilometers walked, and the number of broods seen (sample size, *n*) within the Fairbanks and Interior Road System (FIRS); 2017–2020.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km[a])	No. of broods (*n*)
2017	3.9	1–8	0.16	8
2018	1.0	1–1	0.04	2
2019	5.2	3–8	0.12	6
2020	1.0	1–1	0.04	2

[a] 1 kilometer = 0.62 miles.

Wing Collections

There were 46 hunter-harvested, sharp-tailed grouse wing samples donated from the FIRS region during RY20, and 55 hunter-harvested wing samples donated from RY21 (Table 9). Based on wing donations, the proportion of juveniles in the population appears to have declined from 2019 to 2020 suggesting poor recruitment of juveniles into the fall population. However, data from 2021 suggest an increase in the proportion of juveniles in the total harvest indicating better recruitment of juveniles into the fall population. The low proportion of juveniles in the fall 2020 harvest may in part be due to the relatively wet conditions experienced across much of the Interior in June 2020. Conversely, warmer and drier weather during June 2021 likely had a positive influence on recruitment of juveniles into the population during fall of 2021. Weather conditions during the month of June coincide with the hatch and early brood-rearing period of sharp-tailed grouse and have been found to be important in survival of grouse chicks (Moss

1985, Baines 1991, Moss et al. 2001, Loneux et al. 2003, Summers et al. 2004, Ludwig et al. 2010, Viterbi et al. 2015, Wann et al. 2016, Wegge and Rolstad 2017).

Table 9. Total number and proportion of juvenile sharp-tailed grouse with binomial 95% confidence intervals based on harvested wing collections within the Fairbanks and Interior Road System (FIRS), Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[a]
2011	20D	20	35	1	56	0.64	0.50–0.76
2012	20B, 20D	18	31	0	49	0.63	0.48–0.77
2013	19D, 20D, 20E	11	9	0	20	0.45	0.23–0.68
2014	12, 20B, 20D, 20E, 25C	37	60	2	99	0.62	0.51–0.72
2015	20B, 20D, 25D	32	57	0	89	0.64	0.53–0.74
2016	20B, 20D	24	58	0	82	0.71	0.60–0.80
2017	12, 20B, 20D, 20E	60	99	1	160	0.62	0.54–0.70
2018	12, 20B, 20D	39	34	0	73	0.47	0.35–0.59
2019	20D	27	80	0	107	0.75	0.65–0.83
2020	12, 20D, 20E	20	26	0	46	0.57	0.41–0.71
2021	12, 20A, 20B, 20C, 20D, 20E	16	39	0	55	0.71	0.57–0.82

[a] CI stands for confidence interval.

SPRUCE GROUSE

Spring Breeding Surveys

Currently, DWC has no spruce grouse population assessment projects within the FIRS region. In reports to SGP during regulatory years 2020 and 2021 (RY20 and RY21), hunters indicated that fewer spruce grouse broods were seen than in recent years.

Wing Collections

There were 67 hunter-harvested, spruce grouse wing samples collected within the FIRS region during RY20, and 61 collected during RY21 (Table 10). Based on wing samples, the proportion of juvenile spruce grouse in the population may have increased slightly in RY20 and remained relatively stable in RY21 suggesting slightly higher juvenile recruitment in RY20 and RY21 compared to RY19, and above the record low observed in RY18.

Table 10. Total number and proportion of juvenile spruce grouse with binomial 95% confidence intervals based on harvested wing collections within the Fairbanks and Interior Road System (FIRS), Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[a]
2011	20B, 20D	4	13	0	17	0.76	0.50–0.93
2012	12, 20B, 20C, 20D, 24B, 25C	25	44	1	70	0.63	0.51–0.75
2013	12, 19D, 20B, 20D, 20E	19	43	0	62	0.69	0.56–0.80
2014	12, 20B, 20C, 20D, 20E, 25C	22	61	3	86	0.73	0.63–0.83
2015	12, 20B, 20C, 20D, 20E, 25D	46	149	0	195	0.76	0.70–0.82
2016	12, 19D, 20B, 20C, 20D, 20E	29	78	0	107	0.73	0.63–0.81
2017	20A, 20B, 20C, 20D, 20E	52	108	0	160	0.68	0.60–0.75
2018	20B, 20C, 20D, 20E	45	45	0	90	0.50	0.39–0.61
2019	20A, 20B, 20D	35	48	10	93	0.58	0.46–0.69
2020	12, 19A, 20B, 20C, 20D, 20E	21	44	2	67	0.68	0.55–0.79
2021	20A, 20B, 20C, 20D, 20E, 20F, 21D, 24A, 24D	22	39	0	61	0.64	0.51–0.76

[a] CI stands for confidence interval.

ROCK PTARMIGAN

Spring Breeding Surveys

In the FIRS region, rock ptarmigan surveys were completed from 29 April to 24 May in 2021 and from 28 April to 24 May in 2022. In both 2021 and 2022, rock ptarmigan surveys were completed near Donnelly Dome along the Richardson Highway (Unit 20D), at Mount Fairplay along the Taylor Highway (Unit 20E), and along a portion of Primrose Ridge in Denali National Park (DNP; Unit 20C). In most years roadside counts were conducted once and no estimate of precision is available. However, repeat counts have been conducted at Mount Fairplay and data suggest that numbers were likely relatively stable from 2018 to 2020, doubled in 2021, and then fell slightly from 2021 to 2022 (Table 11). The maximum counts from surveys where repeat counts were unavailable (Donnelly Dome, 12-mile, Eagle Summit, and Primrose Ridge) were used as a relative index of abundance for each area. Results from these surveys suggest that ptarmigan populations may be relatively stable at low densities near Donnelly Dome and appear to be increasing near Primrose Ridge in DNP. Surveys near 12-mile and Eagle Summit were discontinued in 2020. However, a separate spring survey conducted near Eagle Summit indicates that numbers of rock ptarmigan have very likely increased from 2020 to 2022 (see Table 12).

Table 11. Mean number of male rock ptarmigan estimated per listening post (stop, *n* = 7) with bootstrap 95% confidence intervals for survey route near Mount Fairplay in Unit 20E within the Fairbanks and Interior Road System (FIRS), Alaska, 2015–2022.

Year	Mean (males/stop)	95% CI[a]
2015	0.57	0.14–1.14
2016	1.10	0.57–1.52
2017	1.29	1.00–1.57
2018	0.52	0.19–0.86
2019	0.67	0.33–1.00
2020	0.57	0.29–0.90
2021	1.14	0.86–1.48
2022	0.76	0.48–1.05

[a] CI stands for confidence interval.

In addition to roadside surveys, in 2015 the Small Game Program (SGP) began conducting spring breeding surveys of territorial males within a 33.3-km^2 (12.9-mi^2) area near Eagle Summit (Weeden 1965) as part of a larger research project using conventional distance sampling methodology (Buckland et al. 2001). Observers walk survey transects and record the number of breeding males seen and distance from the observer on the transect to the bird. Distance measurements allow researchers to calculate a detection function, which accounts for birds not seen during the survey and increases the reliability of the abundance estimate. Unlike most other surveys the SGP conducts, the rock ptarmigan survey near Eagle Summit provides an estimate of density or abundance rather than a relative index of abundance. Data presented here is from 2016 through 2022 due to changes made in survey methods between 2015 and 2016 (Table 12). Survey data indicate that the number of territorial males near Eagle Summit dipped in 2017 but has increased since.

Table 12. Abundance and density (males per km^2) estimates for territorial male rock ptarmigan with 95% confidence intervals, and sample sizes (*n*) within a 33 km^2 (13 mi^2) study area adjacent to the Steese Highway within the Fairbanks and Interior Road System (FIRS), Alaska, 2016–2022.

Year	Abundance (males/33km^2)	95% CI[a]	Density (males/km^2)[b]	95% CI	*n*
2016	66.98	41.69–107.64	2.01	1.25–3.23	52
2017	53.39	37.40–76.20	1.60	1.12–2.29	59
2018[c]	–	–	–	–	–
2019	63.23	40.79–98.00	1.90	1.22–2.94	50
2020	61.08	43.38–86.00	1.83	1.30–2.58	55
2021	71.82	46.68–110.51	2.15	1.40–3.31	60
2022	80.16	52.93–121.38	2.40	1.59–3.64	52

Note: All estimates were calculated using conventional distance sampling methodology with year as a covariate and the half normal detection function following standard model selection procedure (e.g., lowest AIC score).
[a] CI stands for confidence interval.
[b] 1 km^2 = 0.39 mi^2.
[c] No survey due to staff availability.

Brood Surveys

In 2021 brood surveys were completed between 30 July and 1 August. In 2022 brood surveys were attempted during 30–31 July; however, a complete survey was not possible due to volunteer unavailability. Survey conditions in 2021 were excellent with temperatures averaging 12.0°C (53.6°F; range of 9.0–20.0°C [48.2–68.0°F]) and winds averaging 3.1 kph (1.9 mph; range of 0.0–8.7 kph [0.0–5.4 mph]). The total number of broods seen in 2021 was identical to the number observed in 2020; however, the average number of chicks per brood was higher in 2021 (Table 13).

Table 13. Mean number of rock ptarmigan chicks observed per brood group, range in number of chicks observed per brood group, number of broods seen per kilometer walked, and the number of broods seen (sample size; *n*) within a study area on the Steese Highway within the Fairbanks and Interior Road System (FIRS), Alaska, 2016–2022.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km)[b]	No. of Broods (*n*)
2016	6.3	2–13	0.20	4
2017	3.2	1–6	0.25	5
2018	3.8	2–7	0.30	6
2019[a]	–	–	–	–
2020	3.9	1–5	0.36	7
2021	5.4	1–10	0.36	7
2022[a]	–	–	–	–

[a] Incomplete survey due to inclement weather or staff/volunteer availability.
[b] 1 kilometer = 0.62 miles.

Wing Collections

No hunter-harvested rock ptarmigan wing samples were collected within the FIRS region during either RY20 or RY21. Harvest data based on wings collected from hunters from previous years is shown below (Table 14).

Table 14. Total number and proportion of juvenile rock ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Fairbanks and Interior Road System (FIRS), Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[a]
2011	20B	10	9	0	19	0.47	0.24–0.71
2012	20B, 20D, 25C, 26B	21	26	0	47	0.55	0.40–0.70
2013	20B, 25C	0	6	0	6	1.00	0.54-1.00
2014	25C	7	4	0	11	0.36	0.11–0.69
2015	20B, 25C	2	5	0	7	0.71	0.29–0.96
2016	20B, 25C	1	5	0	6	0.83	0.36–1.00
2017	20B, 20D, 25C	6	15	0	21	0.71	0.48–0.89
2018	20B, 20E, 25C	10	24	0	34	0.71	0.53–0.85
2019	20B	0	1	0	1	1.00	0.03–1.00
2020[b]	–	–	–	–	–	–	–
2021[b]	–	–	–	–	–	–	–

[a] CI stands for confidence interval.
[b] No wings were donated in RY20 or RY21.

Research

Concern by both members of the public and Small Game Program (SGP) staff over low abundance of rock ptarmigan observed prior to and during spring surveys in 2014 along the Steese Highway prompted efforts to study this important game species. Previous research in the area (Weeden 1965a) provided an incentive and a means to compare our research findings with historical data. To better understand changes in rock ptarmigan abundance, movement patterns, and survival rates along the Steese Highway near Eagle Summit, SGP initiated a 3-year research project in spring 2015. This study was extended in 2018 to include data collection of movements and overwinter survival of juvenile (young-of-the-year) rock ptarmigan. From 2015 to 2019 SGP and other DWC staff captured 254 rock ptarmigan and fitted 232 individuals (129 females, 57 males, and 46 young-of-the-year) with very high frequency (VHF) radio transmitters to document movement patterns, survival, and nest success of this heavily hunted population. Preliminary data suggest movements generally differed by sex. Yearling and adult males remained on or very near the breeding grounds throughout the year. However, yearling and adult females dispersed varying distances (up to 170 km or 106 mi) away from the breeding grounds to their wintering areas. These data are consistent with other studies that have documented differences in sex-specific dispersal rates (Weeden 1964, Gruys 1993, Warren and Baines 2007, Hornell-Willebrand et al. 2014, Merizon et al. 2018). Further analysis on seasonal movements and survival is underway and will be available in an upcoming report which will be available[1] on ADF&G's website under ADF&G Home | Hunting | Small Game | Research & Reports: http://www.adfg.alaska.gov/index.cfm?adfg=smallgamehunting.research.

[1] To subscribe to email announcements regarding new technical publications from the Alaska Department of Fish and Game, Division of Wildlife Conservation please use the following link: http://list.state.ak.us/mailman/listinfo/adfgwildlifereport

In 2018 DWC received funding and initiated field work for a graduate research project building on ongoing research at Eagle Summit and completed research along the Denali Highway (Unit 13B; Merizon et al. 2018). This project aims to compare the reproductive ecology of rock ptarmigan near Eagle Summit and along the Denali Highway. Estimates of nest initiation rates, clutch size, nest success, sex ratio at hatch, and brood survival will be compared between the 2 populations. Two years of field work (2018–2019) were completed in the summer of 2019 and a thesis is being prepared by a master of science (MS) student at University of Alaska Fairbanks (UAF).

WILLOW PTARMIGAN

Spring Breeding Surveys

In the FIRS region, willow ptarmigan surveys were completed from 29 April to 24 May in 2021 and from 28 April to 24 May 2022. Surveys occurred along a portion of the Denali National Park (DNP) road just west of the Savage River, on military lands within the Donnelly Training Area (DTA) near Delta Junction, and near Mount Fairplay along the Taylor Highway. All surveys were conducted by SGP staff, USFWS collaborators, and volunteers in 2021 and 2022.

Within DNP, spring breeding abundance of willow ptarmigan appears to have increased in all years since 2015 except 2021 where there was a decrease in numbers (Table 15). Willow ptarmigan abundance within the DTA has continued to remain low for the last 2 years. Further east willow ptarmigan abundance near Mount Fairplay appears to have dropped significantly with the lowest number of males observed in the past 8 years. Compared to other survey areas in FIRS, willow ptarmigan appear to exist at much higher density along the DNP route.

Table 15. Mean number of male willow ptarmigan per listening post (stop) with bootstrap 95% confidence intervals from survey routes within Denali National Park (DNP) along the park road, at Mount Fairplay in Unit 20E, and on the Donnelly Training Area (DTA) near Delta Junction within the Fairbanks and Interior Road System (FIRS), Alaska, 2014–2022.

	DNP Park Road (13 stops)		DTA (17 stops)		Mount Fairplay (12 stops)	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
2014	0.77	0.31–1.31	0.04	0.00–0.12	–	–
2015	0.77	0.54–1.04	0.22	0.10–0.35	0.58	0.25–1.00
2016	1.12	0.69–1.50	0.06	0.00–0.14	0.50	0.22–0.81
2017	1.46	0.77–2.27	0.18	0.07–0.29	1.25	0.86–1.70
2018	1.79	1.28–2.36	0.06	0.00–0.18	0.31	0.14–0.50
2019	2.38	1.95–3.00	0.14	0.04–0.27	0.42	0.11–0.75
2020	2.88	2.31–3.42	0.26	0.09–0.47	0.64	0.36–0.94
2021	2.31	1.88–2.73	0.00	0.00–0.00	0.78	0.44–1.19
2022	2.95	2.62–3.28	0.13	0.04–0.24	0.25	0.07–0.51

[a] CI stands for confidence interval.

Wing Collections

A total of 7 hunter-harvested, willow ptarmigan wing samples were collected within the FIRS region during RY20, and 16 wing samples were collected during RY21 (Table 16). It is difficult to make meaningful inferences about differences in annual juvenile production based on the low sample sizes and we recommend caution in drawing conclusions from these counts.

Table 16. Total number and percent juvenile willow ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Fairbanks and Interior Road System (FIRS), Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[a]
2011	20B, 20C, 20D	8	10	0	18	0.56	0.31–0.78
2012	20B, 20D, 25C	5	4	0	9	0.44	0.14–0.79
2013	19C, 25C	2	2	0	4	0.50	0.07–0.93
2014	20E, 25C	2	7	0	9	0.78	0.40–0.97
2015	20B, 25C	0	1	11	12	–	–
2016	20B, 20D, 25C	3	2	0	5	0.40	0.05–0.85
2017	12, 20B, 20C, 25C	6	10	0	16	0.63	0.35–0.85
2018	20E, 25C	7	11	0	18	0.61	0.36–0.83
2019	20A, 20B	1	1	0	2	0.50	0.01–0.99
2020	20E, 25C	4	3	0	7	0.43	0.10–0.82
2021	20A, 20B, 25C	3	13	0	16	0.81	0.54–0.96

[a] CI stands for confidence interval.

SNOWSHOE HARE

Abundance Surveys

Roadside counts of snowshoe hares were conducted from 16 April to 7 May 2021, and from 20 April to 8 May 2022 near Delta Junction, Tok, and Anderson. In addition to the roadside counts conducted by the Small Game Program, Denali National Park researchers have maintained an index of hare abundance since the late 1980s.

Snowshoe hare populations in Alaska and northern Canada exhibit 9- to 10-year population cycles (Krebs et al. 2013). The most recent peak in the snowshoe hare cycle for the eastern Interior was in 2017 or 2018 and the most recent peak for the central Interior was in 2018 or 2019 (Table 17).

Table 17. Interior snowshoe hare population survey data broken up by region within the greater Fairbanks and Interior Road System (FIRS), Alaska, 2005–2022.

	Western Interior		Eastern Interior				
Year	DNP[a]	Anderson[b]	Delta Junction[c]	Delta BBS[d]	Donnelly BBS[e]	Tok[f]	Steese[g]
2005	6.25	–	–	57	10	–	–
2006	25.20	–	–	129	–	–	–
2007	26.20	24[h]	109	96	50	–	21
2008	28.25	82	91	89	21	–	14
2009	40.57	27	54	87	14	–	8
2010	32.86	10	37	18	12	–	3
2011	9.60	4	16	7	3	–	1
2012	0.48	3	27	8	3	–	0
2013	0.04	–	–	5	1	–	0
2014	0.53	–	4	8	1	–	1
2015	0.48	1[i]	4[i]	6	4	–	–
2016	0.53	7	28	32	14	–	3
2017	6.29	23	72	52	26	42	19
2018	10.75	105	55[j]	32[k]	28	56	–
2019	11.60	34	31	7	0	0	1
2020	8.60	3	6	–	–	0	–
2021	0.78	2	0	–	–	0	–
2022	0.88	2	1	–	–	0	–

Note: All data is reported as the maximum number of snowshoe hares observed per count area unless otherwise noted. En dash indicates that no survey was conducted.

[a] Denali National Park count survey is conducted by the National Park Service (C. McIntyre, Wildlife Biologist, National Park Service, Denali National Park, personal communication). This is the number of adult snowshoe hares seen per day during field work from April through June.

[b] This is a roadside count near Anderson conducted by DWC staff and it includes 4 roadside count areas.

[c] This is a roadside count near Delta Junction conducted by DWC staff and it includes 3 roadside count areas. In 2021 a fourth roadside count was added.

[d] The Delta Junction Breeding Bird Survey (BBS) hare count is conducted by other agency biologists, and it includes 1 historical BBS route.

[e] The Donnelly Dome Breeding Bird Survey (BBS) has been conducted by DTA personnel or other agency biologists and it includes 1 historical BBS route.

[f] This is a roadside count near Tok conducted by DWC staff and it includes 2 roadside count areas.

[g] This is a roadside count along the Steese Highway conducted by DWC staff and it includes 1 roadside count area.

[h] Three of the 4 survey routes were counted.

[i] Two of the 3 survey routes were counted.

[j] Gusting winds during survey.

[k] Partial survey.

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Alaska Range

For purposes of this report the Alaska Range region includes Units 9A, 9B, 11, 13B, 13C, 13E, and 16B (Fig. 4). This area includes the Denali Highway and portions of the Richardson and Parks highways. The Alaska Range region is largely an alpine area composed of willow, dwarf birch, and subalpine spruce forests; however, mixed-spruce and hardwood forests dominate several lowland areas of the Susitna River valley and Wrangell–St. Elias National Park. There are numerous small water bodies, large rivers, steep rocky vegetated hills, tall peaks, and glaciated mountains. This region is accessible by road, boat, air, and off-road vehicle for recreation and hunting. The Denali Highway, in particular, is an area that receives significant grouse and ptarmigan hunting pressure during the fall and late winter (Merizon and Carson 2013, Merizon et al. 2015). Sooty grouse are not found in this region.

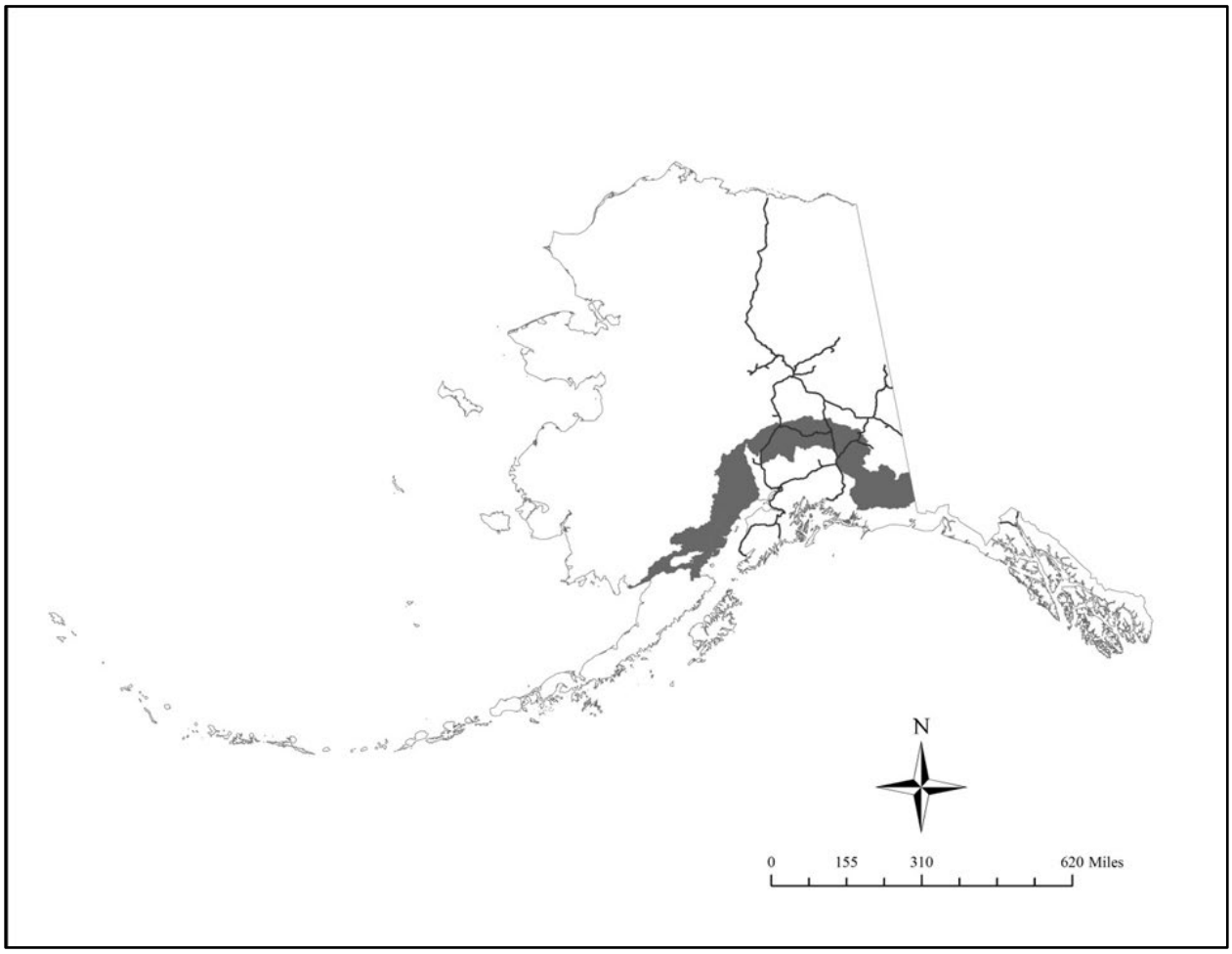

Figure 4. Map of the Alaska Range region. The Alaska Range is shaded in grey, and black lines delineate roads.

RUFFED GROUSE

Currently there are no ruffed grouse spring breeding or brood survey efforts within this region. Ruffed grouse do breed within this region and are harvested and observed each year, although infrequently.

SHARP-TAILED GROUSE

Spring Breeding Surveys

Currently, there are no sharp-tailed grouse spring breeding or brood survey efforts within this region. However, sharp-tailed grouse are routinely observed during the breeding season in April and May as well as during the winter by local outdoor enthusiasts in the upper Nenana and upper Copper rivers as well as the eastern Talkeetna Mountains.

Wing Collections

Zero (0) sharp-tailed grouse wings were collected by hunters during RY20 and 2 during RY21 in the Alaska Range. Low harvest in this region is primarily a function of limited access to the best sharp-tailed grouse habitat.

SPRUCE GROUSE

Spring Breeding Surveys

Currently there are no spruce grouse spring breeding or summer brood survey efforts within this region. Based on hunter reports and DWC staff field observations, spruce grouse abundance in most of the Alaska Range region was average during RY20 and RY21. However, reports closer to Dillingham and King Salmon suggested slightly higher abundance of spruce grouse than in the recent past.

Wing Collections

Four (4) spruce grouse wings were collected by hunters during RY20 and 1 during RY21 in the Alaska Range. No inferences can be provided regarding juvenile production with small sample sizes. If larger sample sizes are collected over future years, comparisons will be possible.

ROCK PTARMIGAN

Spring Breeding Surveys

Rock ptarmigan spring breeding surveys occurred between 27 April and 14 May in 2021 and between 25 April and 18 May in 2022 at 4 survey locations (Unit 13B; Table 18). The mean number of breeding male rock ptarmigan observed per stop increased in 2022 (0.34 males per stop) from 2021 (0.22 males per stop). Due to difficulty in accessing rock ptarmigan spring breeding locations in late April and May, there are currently no other survey locations for rock ptarmigan in this region.

During the RY20 and RY21 hunting seasons along the Denali Highway, hunters reported seeing and harvesting fewer-than-average numbers of rock ptarmigan.

Table 18. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 43) with bootstrap 95% confidence intervals in Unit 13B, Alaska, 2014–2022.

Year	Mean (males/stop)	Confidence interval	
		Lower	Upper
2014	0.60	0.46	0.82
2015	0.34	0.23	0.45
2016	0.72	0.51	0.93
2017	0.37	0.11	0.75
2018	0.32	0.08	0.55
2019	0.19	0.08	0.30
2020	0.27	0.06	0.52
2021	0.22	0.06	0.44
2022	0.34	0.14	0.56

Brood Surveys

Between 19–21 July 2021 and 27–29 July 2022 DWC staff and volunteers completed brood surveys for rock ptarmigan in the Alaska Range region. Only 4 rock ptarmigan were observed in 2021 and none were observed in 2022 along 26 km (16.2 mi) of transects. Despite a few previous observations, rock ptarmigan were not anticipated in large numbers along the selected survey locations. This is because rock ptarmigan in Unit 13B tend to rear broods in areas at high elevation (≥1,200 meters or ≥1,312 yards; Merizon et al. 2018), and ideal survey locations are less accessible. As a result, willow ptarmigan will be the primary species enumerated during future ptarmigan annual brood surveys in the Alaska Range region.

Wing Collections

Zero (0) rock ptarmigan wing samples were collected from hunters during RY20 and only 2 samples were collected during RY21 in the Alaska Range region.

Research

In 2018 DWC received funding and initiated field work for a graduate research project comparing the reproductive ecology of rock ptarmigan near Eagle Summit and along the Denali Highway. This builds on ongoing research at Eagle Summit and adds to completed research along the Denali Highway (Merizon et al. 2018; Unit 13B). Estimates of nest initiation rates, clutch size, nest success, sex ratio at hatch, and brood survival will be compared between the 2 populations. Two years of field work (2018–2019) were completed and a thesis is being prepared by an MS student at UAF.

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently, no spring breeding surveys for white-tailed ptarmigan are conducted anywhere in the state. White-tailed ptarmigan densities are typically low where they occur, and their habitat selection makes this one of the more challenging small game species to pursue in Alaska.

Wing Collections

Zero (0) white-tailed ptarmigan wings were collected by hunters during RY20 and only 2 during RY21 in the Alaska Range region.

WILLOW PTARMIGAN

Spring Breeding Surveys

Willow ptarmigan spring breeding surveys occurred between 27 April and 14 May 2021 and between 25 April and 18 May 2022 at 7 survey locations (Table 19). The 2022 spring breeding estimate for Unit 13B (1.16 males per stop) rose modestly from 2021 (1.07 males per stop). Both 2021 and 2022 estimates remain below the recent 5-year average (1.42 males per stop). In Unit 13E the 2022 spring breeding estimate increased (0.80 males per stop) from 2021 (0.37 males per stop).

Table 19. Mean number of spring breeding male willow ptarmigan per listening post (stop) with bootstrap 95% confidence intervals in Units 13B and 13E in the Alaska Range, 2014–2022.

	Unit 13B			Unit 13E		
	Mean	Confidence interval		Mean	Confidence interval	
Year	(males/stop)	Lower	Upper	(males/stop)	Lower	Upper
2014	0.85	0.34	1.31	0.67	0.56	0.79
2015	1.04	0.74	1.29	0.57	0.53	0.60
2016	1.76	1.43	2.04	0.95	0.89	1.00
2017	1.13	0.89	1.45	0.74	0.57	0.90
2018	2.31	1.68	2.94	0.60	0.53	0.67
2019	1.29	1.04	1.60	1.35	1.27	1.43
2020	1.32	1.00	1.59	0.25	0.08	0.42
2021	1.07	0.76	1.42	0.37	0.30	0.43
2022	1.16	1.05	1.28	0.80	0.30	1.30

Brood Surveys

Brood surveys were completed for willow ptarmigan between 19–21 July 2021 and 27–29 July 2022 in the Alaska Range region (Table 20). Surveys were completed in 2 separate locations along the Denali Highway. At each location there were 6–10 transects, measuring 26 km (16 mi)

in length. Average willow ptarmigan brood size remained very low in 2021 (2 chicks per brood), likely due to heavy rain, cool temperatures, and an unexpected snow event during the critical 2- to 3-week period after chicks generally hatch. However, average brood size increased considerably in 2022 (5.7 chicks per brood). This increase is likely a result of very favorable weather conditions (warm and dry) for the 2–3 weeks post hatch in June and early July 2022.

Hunters along the Denali Highway in fall 2020 and 2021 reported seeing very few willow ptarmigan. Those that were observed were mostly adults.

Table 20. Number of willow ptarmigan chicks observed per brood group within Units 13B and 13E within the Alaska Range, 2016–2022.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km)[a]	Number of broods (*n*)
2016	4.3	1–6	0.60	5
2017	5.9	1–13	1.00	16
2018	3.4	1–5	0.30	6
2019	6.7	2–13	0.50	12
2020	1.5	1–2	0.10	2
2021	2.0	–[b]	0.04	1
2022	5.7	5–6	0.14	3

[a] 1 kilometer = 0.62 miles.
[b] Range unavailable because only one brood group was observed.

Wing Collection

The number of hunter-harvested, willow ptarmigan wing samples collected within the Alaska Range region totaled 48 during RY20 and 58 during RY21 (Table 21). The proportion of juveniles appeared to be down precipitously in RY20 compared to RY19 (23% juveniles). This was likely due to the poor weather in June 2020 and was further documented during summer brood surveys in July 2020. However, a slight improvement was documented in RY21 (43% juveniles). Hunters reported poor to very poor hunting for willow ptarmigan in both RY20 and RY21 in this region.

Table 21. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals (CI) based on harvested wing collections within the Alaska Range region, regulatory years 2011–2021.

Regulatory year	Units	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI
2011	9, 13, 16	67	79	0	146	0.54	0.46–0.62
2012	9, 13, 16	39	28	2	69	0.41	0.30–0.54
2013	9, 13, 16	146	103	0	249	0.41	0.35–0.48
2014	9, 13, 16	30	27	0	57	0.47	0.34–0.61
2015	9, 13, 16	46	70	0	116	0.60	0.51–0.69
2016	9, 13, 16	67	97	0	164	0.59	0.51–0.67
2017	9, 13, 16	37	58	0	95	0.61	0.51–0.71
2018	9, 13, 16	62	40	0	102	0.39	0.30–0.49
2019	9, 13, 16	70	102	0	172	0.59	0.52–0.67
2020	9, 13, 16	37	11	0	48	0.23	0.12–0.37
2021	9, 13, 16	33	25	0	58	0.43	0.30–0.57

SNOWSHOE HARE

Abundance Surveys

Currently, there are no snowshoe hare survey locations within the Alaska Range region. However, despite the lack of survey data, snowshoe hare abundance likely peaked in 2019 and has declined based on DWC, hunter, and other observations.

ALASKA HARE

Abundance Surveys

Currently, there are no Alaska hare survey locations in the state. However, there is a research project in Unit 9 that is examining movement and mortality. This project aims to develop a long-term abundance survey technique for this species (see the Western Rural section below).

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Southcentral Road System

For purposes of this report the Southcentral Road System includes Units 6, 13A, 13D, 14, and 16A (Fig. 5). This area includes the heavily populated Anchorage Bowl, including Eagle River and Chugiak, and the Mat-Su Valley metro area of Wasilla and Palmer. It also includes Cordova, Glennallen, Talkeetna, Valdez, and many other smaller communities. This region is a mix of lower elevation, mature, mixed hardwood-spruce forest; alpine slopes and peaks; and coastal rainforest. There are numerous small water bodies, small creeks, and large rivers. The region is highly accessible by road, air, boat, and off-road vehicle for recreation, tourism, and hunting. Sooty grouse and Alaska hare are not found in this region.

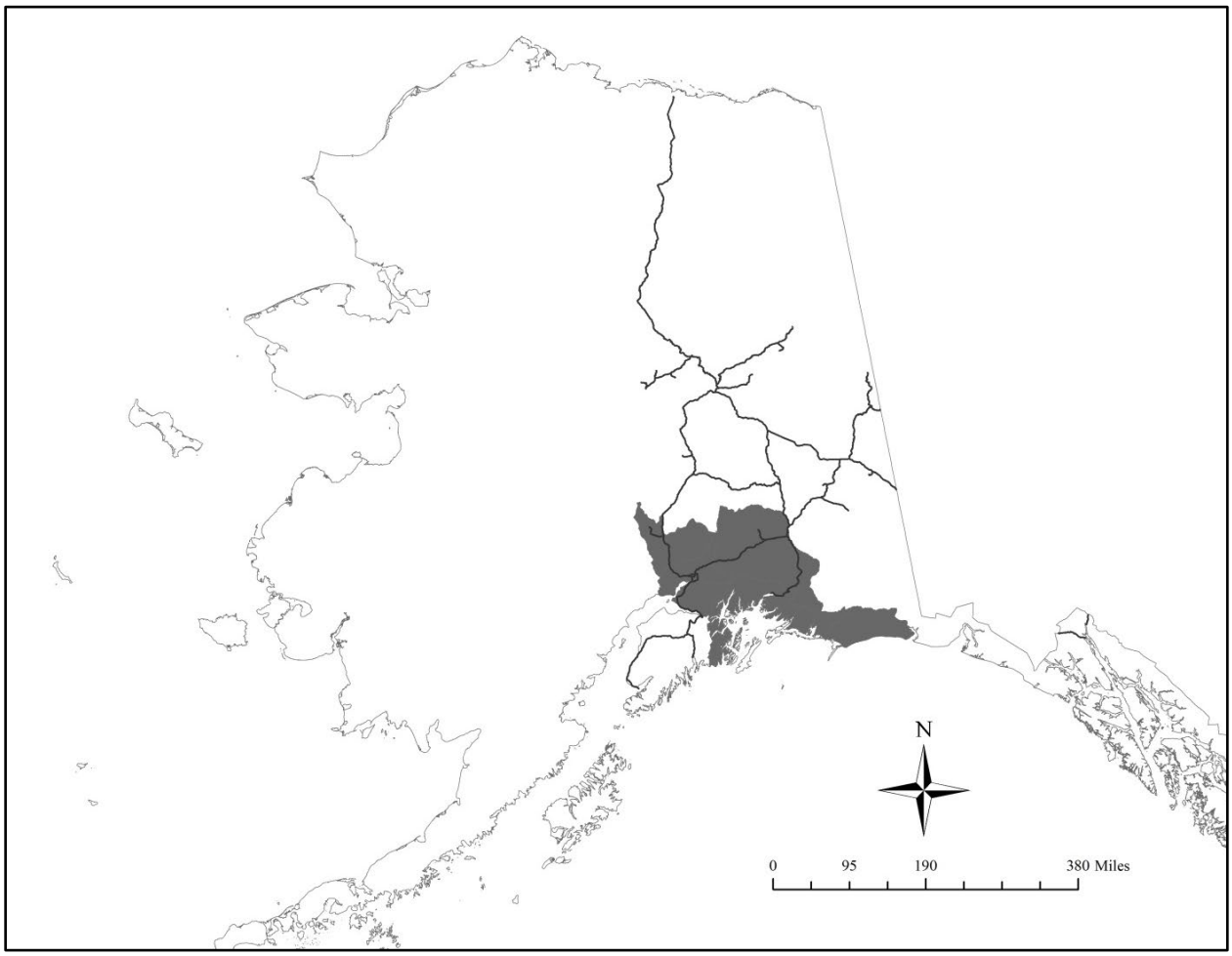

Figure 5. Map of the Southcentral Road System, Alaska. Southcentral Alaska is shaded in grey, and black lines delineate roads.

RUFFED GROUSE

Spring Breeding Surveys

Ruffed grouse spring breeding surveys in Palmer and the Matanuska Valley Moose Range (Unit 14A) occurred between 21 April and 12 May 2021 and between 24 April and 16 May 2022 (Table 22). The spring breeding estimates in 2021 (0.08 males per stop) and 2022 (0.04 males per stop) remained near historic lows. Survey routes in 2021 and 2022 remained snow covered through much of April which resulted in survey initiation being delayed by about a week. Once surveys began in late April, weather conditions were near the long-term average.

Table 22. Mean number of spring breeding male ruffed grouse (drummers) per listening post (stop, *n* = 48) with bootstrap 95% confidence intervals in Unit 14A, Alaska, 2013–2022.

	Mean	Confidence interval	
Year	(drummers/stop)	Lower	Upper
2013	0.15	0.08	0.25
2014	0.14	0.05	0.24
2015	0.28	0.24	0.32
2016	0.21	0.13	0.30
2017	0.17	0.08	0.29
2018	0.16	0.08	0.25
2019	0.13	0.55	0.21
2020	0.04	0.02	0.08
2021	0.08	0.04	0.13
2022	0.04	0.00	0.08

Note: Between 2013 and 2014 a total of 4 survey routes (33 listening posts) were used in the estimate. Two additional survey routes were added in 2015 for a total of 6 survey routes (48 listening posts).

Since translocated ruffed grouse were released in Southcentral during the early 1990s, the beginning of a typical 8- to 10-year population cycle was not observed until around 2012. A high in the cycle was observed in spring 2015 with a steady decline reaching a cyclical low in 2020 and continuing through spring 2022. The extended period of low abundance is being monitored closely by the Small Game Program.

Fall Counts

Early morning roadside counts of ruffed grouse were initiated in late-summer and fall 2019. This was primarily an effort to begin monitoring spruce grouse populations to investigate how the wide-spread spruce bark beetle infestation may be affecting population numbers in Units 14A, 14B, and 16A. After fall 2020, the prehunting survey period was dropped due to few ruffed and spruce grouse observations. Nine (9) ruffed grouse were observed in 2019, 1 in 2020, and 2 in 2021. Fall surveys will be continued in future years allowing another means to monitor spruce grouse population trends in the Mat-Su Valley.

Wing Collections

Seventeen (17) hunter-harvested, ruffed grouse wing samples were collected during RY20 and 13 in RY21 in the Southcentral Road System region (Table 23). It is difficult to make meaningful inferences with low sample sizes that are likely a result of the low population density in the Mat-Su Valley during RY20 and RY21.

Table 23. Total number and proportion of juvenile ruffed grouse with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southcentral Road System, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI
2011	13,14	4	1	0	5	0.20	0.01–0.40
2012	13,14	2	2	0	4	0.50	0.07–0.93
2013	13,14	8	19	0	27	0.70	0.50–0.86
2014	13,14	4	13	0	17	0.76	0.50–0.93
2015	13,14	8	21	0	29	0.72	0.53–0.87
2016	13,14	6	22	0	28	0.79	0.59–0.92
2017	13,14	9	22	0	31	0.71	0.52–0.86
2018	13,14	3	5	0	8	0.63	0.24–0.91
2019	13,14	4	22	0	26	0.85	0.65–0.96
2020	13,14	7	10	0	17	0.59	0.33–0.82
2021	13,14	1	12	0	13	0.92	0.64–1.00

SHARP-TAILED GROUSE

Currently there are no sharp-tailed grouse breeding or brood survey efforts within this region. Historically, sharp-tailed grouse have been present in Units 13A and 13D and are harvested or observed each year.

Sharp-tailed grouse have been observed each year since 2017 as far south as Anchorage, Point McKenzie, the Susitna Flats, and Hatcher Pass Recreational Area by hikers, hunters, and bird enthusiasts. As sharp-tailed grouse populations appear to have declined over the past few years in the Interior where SGP conducts counts, fewer observations have been made throughout Southcentral since 2020.

SPRUCE GROUSE

Beginning in summer 2016 and continuing into spring 2021, a spruce bark beetle outbreak has dramatically affected the forest composition throughout Southcentral Alaska and the Kenai Peninsula thus reducing overall habitat availability. This most recent outbreak in the Southcentral Road System region could have a potentially significant impact on the spruce grouse population that heavily uses mature white spruce for foraging and overwintering habitat.

Spring Breeding Surveys

Currently there are no spruce grouse spring breeding or summer brood survey efforts within this region. Based on field observations and hunter reports from within Units 14 and 16 road-accessible areas, densities of spruce grouse appeared to be near to slightly below numbers observed in the recent past during mid-summer 2022. Many hunters reported seeing fewer spruce grouse within the entire Southcentral Road System region during RY21 and based on field observations in spring and summer 2022, spruce grouse densities continue to be lower than normal.

Fall Counts

Early morning roadside counts of spruce grouse were initiated in late-summer and fall 2019 to determine whether the wide-spread spruce bark beetle infestation in Units 14A, 14B, and 16A is affecting spruce grouse population numbers. After fall 2020, the prehunting survey period was dropped because few spruce grouse were observed. During the in-season portion of the count, a peak was observed in 2019 (70 bird count) followed by a decline in 2020 (51 peak count) and 2021 (42 peak count). The vast majority of spruce grouse observations occurred in Units 14B and 16A (71–88% among all years). Unit 14A consistently has the lowest number of observations (12–29% among all years) of spruce grouse within surveyed areas. Fall surveys will be continued in future years allowing another means to monitor spruce grouse populations in the Mat-Su Valley.

During fall surveys, observers also roughly estimated the severity of the beetle infestation along designated survey routes. All routes in Units 14B and 16A were estimated to have between 60% and 100% beetle-killed large white spruce (>23 cm [>9 in] in diameter). Large white spruce are the preferred roosting and forging habitat for spruce grouse in Southcentral Alaska between October and April. Surveys also estimated between 10% and 70% beetle killed small white spruce (<23 cm) along designated survey routes.

Wing Collections

Twenty-nine (29) hunter-harvested, spruce grouse wing samples were collected during RY20 and 28 during RY21 (Table 24). Despite the small sample size (n = 29), the proportion of juveniles in the harvest declined markedly from 50% in RY19 to 38% in RY20. This may be a function of low sample size; however, there were 61% juveniles in RY21, which is just above the recent 10-year average (57% juveniles). Again, strong inferences should be tempered due to low sample size in RY21 (n = 28).

Table 24. Total number and proportion of juvenile spruce grouse with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southcentral Road System, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2011	13, 14, 16	15	18	0	33	0.55	0.36–0.72
2012	13, 14, 16	32	38	0	70	0.54	0.42–0.66
2013	13, 14, 16	16	25	0	41	0.61	0.45–0.76
2014	13, 14, 16	25	39	0	64	0.61	0.48–0.73
2015	13, 14, 16	23	59	0	82	0.72	0.61–0.81
2016	13, 14, 16	21	52	0	73	0.71	0.59–0.81
2017	13, 14, 16	22	39	0	61	0.64	0.51–0.76
2018	13, 14, 16	20	17	0	37	0.46	0.29–0.63
2019	13, 14, 16	31	33	2	66	0.50	0.37–0.63
2020	13, 14, 16	18	11	0	29	0.38	0.21–0.58
2021	13, 14, 16	11	17	0	28	0.61	0.41–0.78

ROCK PTARMIGAN

Spring Breeding Surveys

Rock ptarmigan spring breeding surveys occurred between 20 April and 14 May 2021, and 21 April and 6 May 2022 in Unit 14C (Table 25). The 2022 spring breeding estimate (0.40 males per stop) for rock ptarmigan in Unit 14C declined from 2021 (0.50 males per stop) which had declined from 2020 (0.71 males per stop).

Table 25. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 7) with bootstrap 95% confidence intervals (CI) in the Southcentral Road System, Alaska, 2014–2022.

Year	Mean (males/stop)	Confidence interval	
		Lower	Upper
2014	0.54	0.50	0.58
2015	1.00	–	–
2016	0.43	–	–
2017	0.29	–	–
2018	1.14	–	–
2019	0.43	–	–
2020	0.71	0.43	1.00
2021	0.48	0.43	0.54
2022	0.43	0.36	0.50

Note: With only 1 survey completed each year it was not possible to calculate confidence intervals for the period 2015–2019. En dashes indicate data unavailable because repeat surveys were not conducted until 2020.

Hunters reported seeing and harvesting average numbers of rock ptarmigan in the winters of 2019–2020 and 2020–2021 near popular hunting locations in the Chugach and Talkeetna mountains.

Brood Surveys

Brood surveys were completed along 1 route at Hatcher Pass from 2016 to 2020. Beginning in 2021, a significant increase in volunteer support led to the creation of a 1 survey route at Sheep Mountain (Unit 13A) and 9 routes in Chugach State Park (Unit 14C). Surveys were completed between 15–30 July 2021 and 15–28 July 2022. Survey routes enumerate brood counts and brood size of all 3 species of ptarmigan.

Rock ptarmigan chicks per brood increased considerably in 2022 (5.5 chicks per brood) from 2021 (3.5 chicks per brood; Table 26). Similar to many other areas of the state, the warm and dry conditions experienced in summer 2022 were likely ideal for early chick survival. These surveys will be continued annually so that meaningful comparisons can be made regarding annual population productivity.

Table 26. Number of rock ptarmigan chicks observed per brood group within the Southcentral Road System, 2016–2022.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km)[a]	Number of broods (*n*)
2016	6.7	2–12	0.38	3
2017	2.0	–[b]	0.31	1
2018	2.0	1–3	0.11	2
2019	4.0	1–10	0.48	3
2020	–	–	–	–
2021	3.5	2–5	0.06	2
2022	5.5	3–9	0.15	6

Note: En dashes indicate that there was no survey. The years 2016–2020 include only Hatcher Pass data; years 2021–2022 include Hatcher Pass and all Chugach State Park routes.

[a] 1 kilometer = 0.62 miles.

[b] Range unavailable because only one brood group was observed.

Wing Collections

Nine (9) hunter-harvested rock ptarmigan wing samples were collected during RY20 and 6 during RY21 (Table 27). Due to low sample sizes, no inferences can be made using RY20 and RY21 data.

Table 27. Total number and proportion of juvenile rock ptarmigan with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southcentral Road System, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI
2011	13, 14	4	4	0	8	0.50	0.16–0.84
2012	13, 14	15	4	0	19	0.21	0.06–0.46
2013	13, 14	19	10	0	29	0.34	0.18–0.54
2014	13, 14	17	20	0	37	0.54	0.37–0.71
2015	13, 14	5	10	0	15	0.67	0.38–0.88
2016	13, 14	20	6	0	26	0.23	0.09–0.44
2017	13, 14	6	9	0	15	0.60	0.32–0.84
2018	13, 14	15	4	0	19	0.21	0.06–0.46
2019	13, 14	25	18	0	43	0.42	0.27–0.58
2020	13, 14	7	2	0	9	0.22	0.03–0.60
2021	13, 14	3	3	0	6	0.50	0.12–0.88

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently there are no spring breeding surveys for white-tailed ptarmigan established in Alaska. Observations and limited reports of white-tailed ptarmigan in specific locations in the Alaska Range, Talkeetna, Chugach, and Kenai mountains indicate a continued presence of low-to-moderate densities at each location. These observations are inadequate to determine if white-tailed ptarmigan numbers in Alaska periodically cycle. Long-term studies on hunted and unhunted populations in Colorado found extensive population fluctuations with evidence of a low amplitude, natural cycle (C. Braun, Wildlife Biologist, Grouse, Inc., personal communication).

To date, it appears the white-tailed ptarmigan's mostly inaccessible habitat has kept harvest by humans relatively low in most of its range in Southcentral Alaska. However, white-tailed ptarmigan often rely on their cryptic plumage to avoid predation rather than fleeing and are thus very approachable. This behavior exposes them to potentially high harvest rates in areas with high hunter densities. In the future, if additional harvest pressure is exerted on white-tailed populations near urban centers, additional management tools may need to be employed to avoid overexploitation.

Brood Surveys

From 2016 to 2020 brood surveys were completed along 1 route in Hatcher Pass. Beginning in 2021, a significant increase in volunteer support led to the creation of a single survey route at Sheep Mountain (Unit 13A) and 9 routes in Chugach State Park (Unit 14C). Surveys were completed between 15 and 30 July 2021 and 15 and 28 July 2022. Survey routes enumerate brood counts and brood size of all 3 species of ptarmigan.

White-tailed ptarmigan chicks per brood modestly increased in 2022 (6.0 chicks per brood) over 2021 (5.3 chicks per brood; Table 28). Similar to many other areas of the state, summer 2022 conditions were likely ideal for early chick survival. These surveys will be continued annually so that meaningful comparisons can be made regarding annual population productivity.

Table 28. Number of white-tailed ptarmigan chicks observed per brood group within the Southcentral Road System, 2016–2022.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km)	Number of broods (*n*)
2016	0.0	0	0.00	0
2017	6.0	–[b]	0.08	1
2018	0.0	0	0.00	0
2019	6.0	–[b]	0.16	1
2020[a]	–	–	–	–
2021	5.3	4–7	0.06	3
2022	6.0	–[b]	0.15	1

Note: Years 2016–2020 include only Hatcher Pass data, years 2021–2022 include Hatcher Pass and all Chugach State Park routes. En dashes indicate data unavailable.

[a] No survey was conducted in 2020.

[b] Range unavailable because only one brood group was observed.

Wing Collections

Seventy-seven (77) hunter-harvested, white-tailed ptarmigan wing samples were collected during RY20, and 28 during RY21 (Table 29). There was an overall increase from the previous year in the proportion of juveniles in both RY20 (47%) and RY21 (61%).

Through 11 years of collecting white-tailed ptarmigan wings (almost entirely from Units 14A and 14C), it appears that overall juvenile recruitment into the white-tailed ptarmigan hunted population is lower on average than juvenile recruitment for rock or willow ptarmigan. That conclusion may be more influenced by the low annual sample size; however, it could also be explained by the more extreme high-elevation habitats in which white-tailed ptarmigan reside. Typically, this is a low- to moderately-abundant species throughout Alaska.

As in years past, during RY20 and RY21 the majority of the wing samples were harvested in Unit 14A (southern Talkeetna Mountains). Few other reports from hunters or outdoor enthusiasts were available regarding abundance and presence of white-tailed ptarmigan.

Table 29. Total number and proportion of juvenile white-tailed ptarmigan with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southcentral Road System, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2011	13, 14	17	21	2	40	0.53	0.38–0.71
2012	13, 14	9	3	0	12	0.25	0.05–0.57
2013	13, 14	16	7	0	23	0.30	0.13–0.53
2014	13, 14	20	18	0	38	0.47	0.31–0.64
2015	13, 14	34	35	0	69	0.51	0.38–0.63
2016	13, 14	19	17	0	36	0.47	0.30–0.65
2017	13, 14	9	9	0	18	0.50	0.26–0.74
2018	13, 14	5	10	0	15	0.67	0.38–0.88
2019	13, 14	20	13	0	33	0.39	0.23–0.58
2020	13, 14	41	36	0	77	0.47	0.35–0.58
2021	13, 14	11	17	0	28	0.61	0.41–0.78

WILLOW PTARMIGAN

Spring Breeding Surveys

Spring breeding surveys of willow ptarmigan occurred between 21 April and 14 May 2021 and 27 April and 7 May 2022 in Unit 14C (Table 30).

The 2022 spring breeding estimate for willow ptarmigan in Unit 14C increased considerably (3.27 males per stop) from 2021 (1.98 males per stop). During spring 2022 all survey routes in Unit 14C were above the recent 5- and 10-year averages. Hunters generally reported seeing above average numbers of willow ptarmigan in the southern Talkeetna and western Chugach mountains during fall and winter of 2021–2022.

Table 30. Mean number of spring breeding male willow ptarmigan per listening post (stop, *n* = 18) with bootstrap 95% confidence intervals in the Southcentral Road System, Alaska, 2014–2022.

Year	Mean (males/stop)	Confidence interval	
		Lower	Upper
2014	1.13	1.09	1.17
2015	0.88	0.17	1.58
2016	1.21	0.33	2.08
2017	2.13	0.83	3.42
2018	2.33	0.50	4.17
2019	0.88	0.00	1.75
2020	1.28	0.72	1.83
2021	1.98	0.89	3.07
2022	3.27	1.33	5.20

Brood Surveys

Beginning in summer 2021, a significant increase in volunteer support allowed SGP to increase brood survey effort throughout Southcentral Road System. As a result, 9 survey routes were created in Chugach State Park (Unit 14C) in 2021 (29.4 km [18.3 mi] survey transects) and 2 additional routes were added in 2022 (34.7 km [21.6 mi] total). Surveys were completed between 15–30 July 2021 and 15–28 July 2022. Survey routes enumerate brood size of all 3 species of ptarmigan.

Despite fewer willow ptarmigan brood observations, average chicks per brood increased considerably from 2021 (5.0 chicks per brood) to 2022 (7.75 chicks per brood; Table 31). Similar to many other areas of the state, summer 2022 conditions were likely ideal for early chick survival. These surveys will be continued annually so that meaningful comparisons can be made regarding annual population productivity.

Table 31. Number of willow ptarmigan chicks observed per brood group within the Southcentral Road System, 2021–2022.

Year	Mean (chicks/brood)	Range (chicks/brood)	Effort (broods/km)[a]	Number of broods (*n*)
2021	5.00	2–8	0.17	5
2022	7.75	7–10	0.12	4

[a] 1 kilometer = 0.62 miles.

Wing Collections

During RY20, 104 hunter-harvested, willow ptarmigan wing samples were collected, and 138 were collected in RY21 (Table 32). The proportion of juveniles in RY20 (56%) was near the recent 10-year, long-term average (54%; 2012–2021); however, the proportion of juveniles in RY21 was considerably higher (78%). Summer 2021 temperature and precipitation were much

more favorable for early chick survival than in the Alaska Range. Conditions were warmer and slightly drier. In addition, there was no late-summer snowfall at high elevations, unlike the Alaska Range and portions of the Talkeetna Mountains.

Table 32. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southcentral Road System, Alaska, regulatory years 2011–2021.

Regulatory year	Units	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2011	6, 13, 14, 16	60	85	0	145	0.59	0.51–0.67
2012	6, 13, 14, 16	85	68	1	154	0.44	0.36–0.53
2013	6, 13, 14, 16	46	32	0	78	0.41	0.30–0.53
2014	6, 13, 14, 16	32	49	0	81	0.60	0.49–0.71
2015	6, 13, 14, 16	29	61	0	90	0.68	0.57–0.77
2016	6, 13, 14, 16	31	29	0	60	0.48	0.35–0.62
2017	6, 13, 14, 16	44	66	0	110	0.60	0.50–0.69
2018	6, 13, 14, 16	44	30	0	74	0.41	0.29–0.53
2019	6, 13, 14, 16	30	50	0	80	0.63	0.51–0.73
2020	6, 13, 14, 16	46	58	0	104	0.56	0.46–0.66
2021	6, 13, 14, 16	31	107	0	138	0.78	0.70–0.84

SNOWSHOE HARE

Abundance Surveys

Currently, there are no snowshoe hare survey locations within the Southcentral Road System region. However, based on DWC staff observations and hunter reports, snowshoe hare abundance has declined since the peak in 2020–2021. Snowshoe hare populations in the Interior continue to remain low; population highs were observed in 2018 and 2019 (Denali National Park). Note that the peak in the snowshoe hare cycle for the Southcentral region is generally 1–2 years after the peaks in the FIRS region.

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Kenai Peninsula

For the purposes of this report the Kenai Peninsula region includes Units 7 and 15 (Fig. 6). This area includes the communities of Cooper Landing, Homer, Kenai, Seward, and Soldotna, as well as many smaller communities. This region includes a wide variety of montane, coastal, spruce forest; mixed, lowland, spruce-hardwood forest; subalpine shrubs; and alpine habitat. There are numerous small and large water bodies, creeks, and large rivers. This region is highly accessible by road, air, boat, and off-road vehicles for recreation, tourism, and hunting. Sharp-tailed and sooty grouse, and Alaska hare are not found in this region.

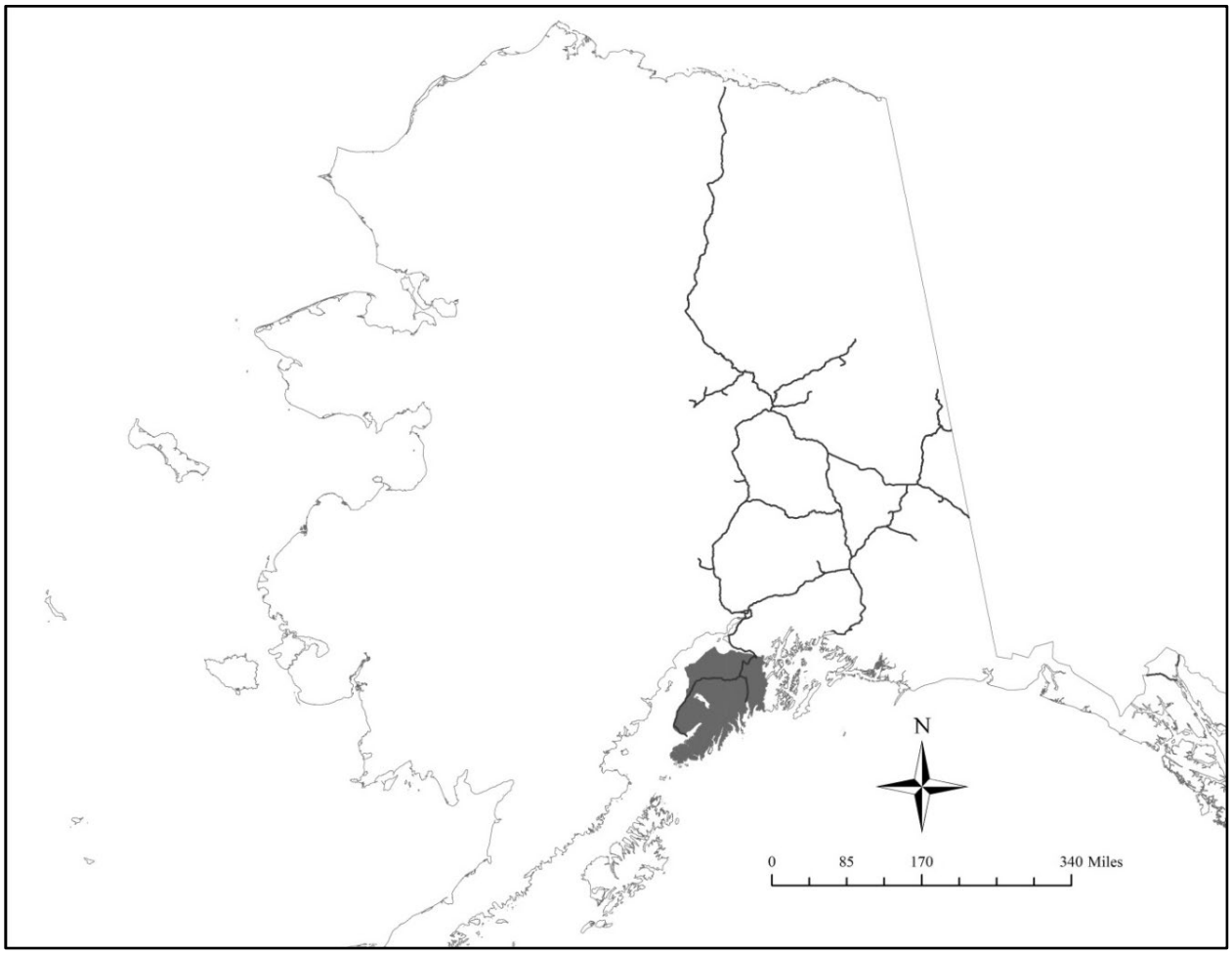

Figure 6. Map of the Kenai Peninsula region, Alaska. The Kenai Peninsula is shaded in grey, and black lines delineate roads.

RUFFED GROUSE

Spring Breeding Surveys

Very few ruffed grouse have ever been observed or harvested on the Kenai Peninsula, based on staff observations from the recent past and hunter reports.

The ruffed grouse population on the Kenai Peninsula continues to persist over 25 years after translocation, although the population remains at low density. The Small Game Program (SGP) is requesting that observations of ruffed grouse on the Kenai Peninsula be reported. Reports can be submitted via e-mail at dfg.dwc.smallgame@alaska.gov.

Wing Collections

One (1) ruffed grouse wing was collected from the Kenai Peninsula during RY20 and zero from RY21. Ruffed grouse abundance on the Kenai Peninsula is expected to remain low. Hunters who harvest ruffed grouse on the Kenai Peninsula are asked to please provide a report of location and a wing sample. Contact information can be found on the title page of this report or on SGP's website at www.smallgame.adfg.alaska.gov (ADF&G Home | Hunting | Small Game | Getting Involved).

SPRUCE GROUSE

The ongoing spruce bark beetle infestation on the Kenai Peninsula persisted through 2021 and has been much less severe in 2022. This infestation has impacted numerous stands of mature white spruce and as a result may have significant impacts to the foraging and overwintering habitat for spruce grouse on the Kenai Peninsula; this may have a long-term negative impact on population abundance in affected areas.

Spring Breeding Surveys

Currently there are no spruce grouse breeding or brood survey efforts within this region. Spruce grouse abundance on the Kenai Peninsula was variable depending on location throughout both RY20 and RY21, based on hunter reports and DWC staff field observations. Some hunters reported seeing good to very good numbers of spruce grouse while out hiking and hunting and others reported very few.

Wing Collections

One hundred seventy-five (175) hunter-harvested, spruce grouse wing samples were collected during RY20, and 147 in RY21 (Table 33). Despite the large sample size, overall proportion of juveniles remained low in RY20 (41%) and RY21 (36%). Given the low proportion of juveniles in RY21, it is likely that chick survival was poor in summer 2021. The proportion of juveniles in the Kenai Peninsula region was similar to the Southcentral Road System in RY20; yet, considerably lower in RY21.

Table 33. Total number and proportion of juvenile spruce grouse with binomial 95% confidence intervals (CI) based on harvested wing collections, Kenai Peninsula, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2011	7, 15	27	54	0	81	0.67	0.55–0.77
2012	7, 15	59	33	0	92	0.36	0.26–0.47
2013	7, 15	73	49	0	122	0.40	0.31–0.49
2014	7, 15	49	54	0	103	0.52	0.42–0.62
2015	7, 15	46	69	0	115	0.60	0.50–0.69
2016	7, 15	22	67	1	90	0.74	0.64–0.83
2017	7, 15	50	65	0	115	0.57	0.47–0.66
2018	7, 15	69	54	0	123	0.44	0.35–0.53
2019	7, 15	51	128	0	179	0.72	0.64–0.78
2020	7, 15	104	71	0	175	0.41	0.33–0.48
2021	7, 15	94	53	0	147	0.36	0.28–0.44

ROCK PTARMIGAN

Spring Breeding Surveys

Volunteers and DWC staff conducted spring breeding surveys throughout the Kenai Mountains between 1 and 19 May 2021, and between 27 April and 15 May 2022 (Table 34). Overall, rock ptarmigan, spring-breeding estimates increased in 2021 (0.78 males per stop) and declined in 2022 (0.57 males per stop). Both 2021 and 2022 estimates are higher than the recent 5-year average (0.51 males per stop). All but 2 of the 5 survey locations on the Kenai Peninsula are primarily in willow ptarmigan habitat; however, rock ptarmigan can be heard and recorded along several of the routes in the Kenai Mountains. Access through deep snow is a chronic issue when trying to enumerate spring breeding abundance of rock ptarmigan in the Kenai and Chugach mountains particularly in late April and early May.

Table 34. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 21) with bootstrap 95% confidence intervals in the Kenai Mountains, Alaska, 2015–2022.

Year	Mean (males/stop)	Confidence interval Lower	Confidence interval Upper
2015	0.18	0.10	0.25
2016	0.25	0.19	0.31
2017	0.75	0.50	1.00
2018	0.38	0.25	0.50
2019	0.49	0.17	0.81
2020	0.69	0.63	0.75
2021	0.78	0.69	0.88
2022	0.57	0.19	0.95

Brood Surveys

Beginning in summer 2021, a significant increase in volunteer support allowed SGP to increase brood survey effort throughout the road system of Alaska including in the Kenai Peninsula region. As a result, 7 survey routes were created in the Chugach and Kenai mountains (Unit 7) in 2021 for a total of 17.5 km (10.6 mi) of transects. Surveys were completed between 17–31 July 2021 and 18–30 July 2022. Survey routes enumerate brood size of all 3 species of ptarmigan.

Despite 2 years of survey effort, no rock ptarmigan broods have been observed along any survey routes. Additional effort will be employed over the coming years to identify potential survey locations to capture rock ptarmigan brood data in the Chugach and Kenai mountains. Despite the lack of rock ptarmigan observations during formal brood surveys, DWC staff and outdoor recreationalists have all reported seeing large broods of all 3 species of ptarmigan throughout the Kenai Peninsula during the summer of 2022.

Wing Collections

No hunter-harvested rock ptarmigan wings were collected during RY20 and only 1 was collected during RY21 from the Kenai Peninsula region.

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently there are no spring breeding surveys for white-tailed ptarmigan in the Kenai Peninsula region. Dall sheep (*Ovis dalli*) hunters and hikers reported observing fewer adult and juvenile white-tailed ptarmigan throughout the Kenai and Chugach mountains during the summers of 2021 and 2022 than in previous years.

Brood Surveys

Beginning in summer 2021, a significant increase in volunteer support allowed the SGP to increase brood survey effort throughout the road system of Alaska including in the Kenai Peninsula region. As a result, 7 survey routes were created in the Chugach and Kenai mountains (Unit 7) in 2021 for a total of 17.5 km (10.6 mi) of transects. Surveys were completed between 17–31 July 2021 and 18–30 July 2022. Survey routes enumerate brood size of all 3 species of ptarmigan.

Despite 2 years of survey effort, white-tailed ptarmigan broods were only observed in 2022. A total of 4 separate brood groups were documented in the Kenai Mountains with 4.75 chicks per brood. As with other grouse and ptarmigan populations around Alaska, the warm and dry summer of 2022 was likely favorable to early chick survival.

Wing Collections

Seven (7) hunter-harvested, white-tailed ptarmigan wing samples were collected in both RY20 and RY21. All samples were harvested from the Kenai Mountains. It is difficult to make any meaningful inferences from these data due to small sample size.

WILLOW PTARMIGAN

Spring Breeding Surveys

Volunteers and DWC staff conducted spring breeding surveys between 27 April and 19 May 2021 and between 26 April and 15 May 2022 in Units 7, 15A, and 15B (Table 35). Spring breeding survey estimates in 2022 increased (1.21 males per stop) from 2021 (0.85 males per stop), which was also larger than the 2020 estimate (0.58 males per stop). In 2021, all survey routes were visited at least twice and in 2022, 2 routes were visited 3 times.

Table 35. Mean number of spring breeding male willow ptarmigan per listening post (stop, *n* = 56) with bootstrap 95% confidence intervals in Units 7, 15A, and 15B, Kenai Peninsula, Alaska, 2015–2022.

	Mean	Confidence intervals	
Year	(males/stop)	Lower	Upper
2015	0.30	0.03	0.73
2016	0.29	0.08	0.51
2017	0.90	0.38	1.60
2018	0.78	0.20	1.37
2019	0.55	0.30	0.78
2020	0.58	0.26	0.91
2021	0.85	0.29	1.52
2022	1.21	0.52	1.86

Brood Surveys

Beginning in summer 2021, a significant increase in volunteer support allowed the Small Game Program (SGP) to increase brood survey effort throughout the road system of Alaska including in the Kenai Peninsula region. As a result, 7 survey routes were created in the Chugach and Kenai mountains (Unit 7) in 2021 for a total of 17.5 km (10.6 mi) of transects. Surveys were completed between 17–31 July 2021 and 18–30 July 2022. Survey routes enumerate brood size of all 3 species of ptarmigan.

Despite 2 years of survey effort, no brood groups of willow ptarmigan were observed along survey routes in the Kenai Peninsula. Additional effort will be employed over the coming years to identify potential survey locations to capture willow ptarmigan brood data in the Chugach and Kenai mountains. Despite the lack of willow ptarmigan observations during formal brood

surveys, DWC staff and outdoor recreationalists have all reported seeing large broods of all 3 species of ptarmigan throughout the Kenai Peninsula during the summer of 2022.

Wing Collections

Eighty-eight (88) hunter-harvested willow ptarmigan wings were collected in RY20 and 38 in RY21 (Table 36). The proportion of juveniles from wing data from both years (47% in RY20 and 42% in RY21) suggest early chick survival. The subsequent contribution of juveniles to the fall harvest was likely below the 5-year (53% juveniles) and 10-year average (61% juveniles).

Table 36. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals (CI) based on harvested wing collections, Kenai Peninsula, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2011	7, 15	0	5	0	5	1.00	0.48–1.00
2012	7, 15	17	27	0	44	0.61	0.45–0.76
2013	7, 15	9	25	0	34	0.74	0.56–0.87
2014	7, 15	10	9	0	19	0.47	0.24–0.71
2015	7, 15	10	14	0	24	0.58	0.37–0.78
2016	7, 15	6	6	0	12	0.50	0.21–0.79
2017	7, 15	2	9	0	11	0.82	0.48–0.98
2018	7, 15	9	4	0	13	0.31	0.09–0.61
2019	7, 15	28	35	0	63	0.56	0.42–0.68
2020	7, 15	47	41	0	88	0.47	0.36–0.58
2021	7, 15	22	16	0	38	0.42	0.26–0.59

SNOWSHOE HARE

Abundance Surveys

The Small Game Program (SGP) does not have any snowshoe hare population assessment projects on the Kenai Peninsula. Based on hare pellet counts on the Kenai Peninsula completed by the United States Fish and Wildlife Service (USFWS), population density peaked in 2011, remained high during winter 2011–2012, and began to decrease in summer 2012. Kenai Peninsula hare densities likely reached the population cycle low in 2015–2016. Based on DWC staff and hunter observations throughout the Kenai during spring 2022, snowshoe hare numbers will likely peak in 2022 and begin to decline quickly in 2023.

The peak in the snowshoe hare cycle on the Kenai Peninsula is often 2–3 years after the peak in the FIRS region, and 1–2 years after the peak in the Southcentral Road System region.

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Western Rural

For purposes of this report, the Western Rural region includes Units 17, 18, 22, 23, and 26A (Fig. 7). Specifically, this region encompasses an area that extends from northern Bristol Bay near Dillingham (Unit 17) north to Utqiaġvik (Unit 26A). The dominant habitats in this region are tundra, wetlands, and pockets of mixed white and black spruce along major river corridors. With the exception of the Nome road system, recreational access within the Western Rural region is limited to boat, snowmachine, or small aircraft. Rock and willow ptarmigan are an important subsistence resource for many hunters within this area. Spruce grouse are also a popular small game species in this region, where they are locally abundant in white spruce forests. Alaska hare are found only within this and the Alaska Peninsula regions. Sooty grouse are not found in this region. Ruffed grouse occur at low abundance and sharp-tailed grouse and white-tailed ptarmigan are rarely observed within this region.

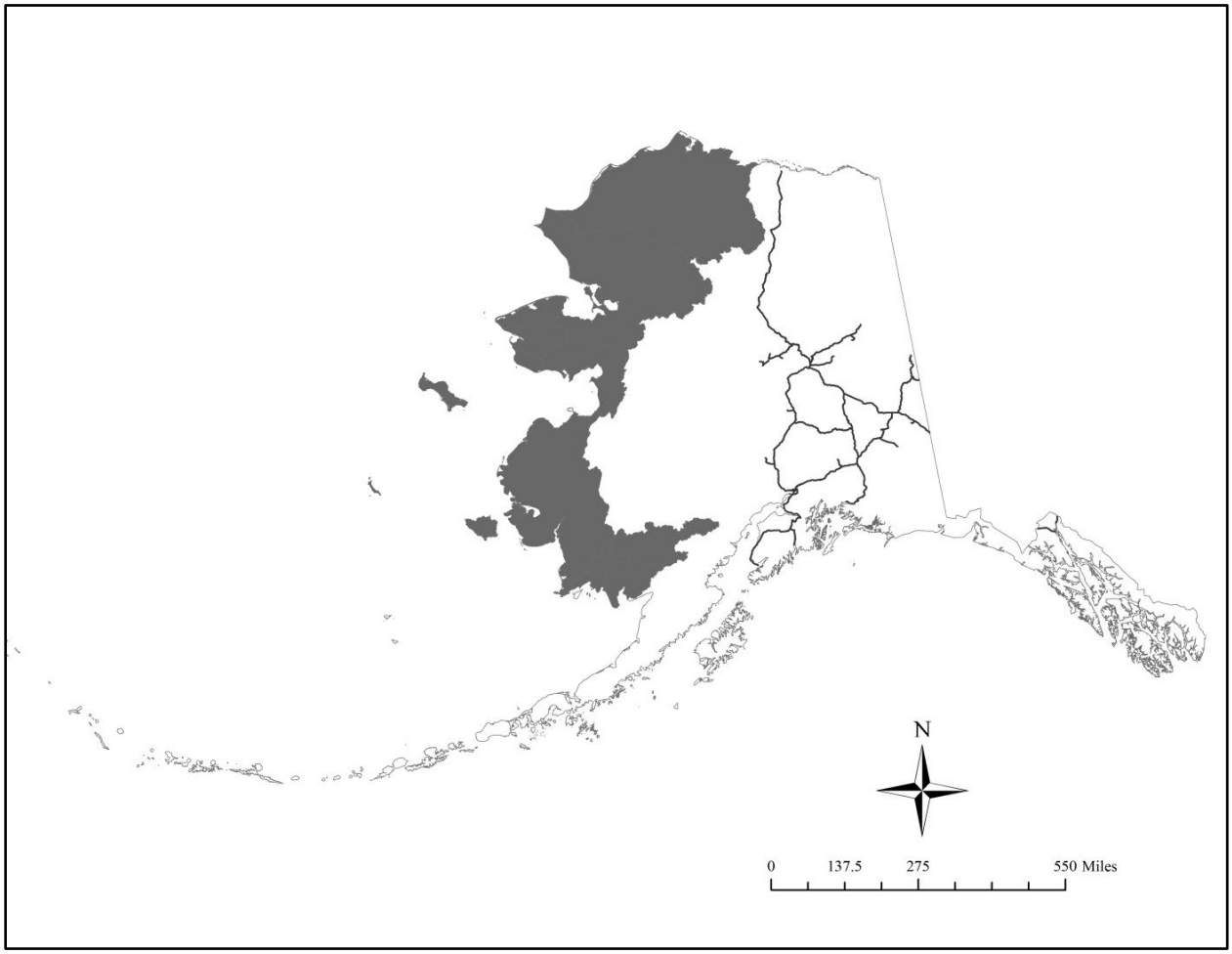

Figure 7. Map of the Western Rural region, Alaska. Western Alaska is shaded in grey, and black lines delineate roads.

BOARD OF GAME

During the January 2022 Region IV Alaska Board of Game meeting in Wasilla, the board adopted Proposal 24 (5 AAC 85.065 and 5 AAC 92.220). The adoption of this proposal created a season (1 November–31 January), bag limit (1 per day, 4 annually), and salvage requirement of human use for Alaska hare in Unit 17. This is in addition to the recent action taken in 2018 and 2020 to create similar seasons, bag limits, and salvage requirements throughout the range of the Alaska hare (Units 9, 18, 22, and 23).

As a result of recent board action, research findings, and numerous rural resident observations, the Federal Subsistence Board has also taken action to curtail harvest of this valuable subsistence resource. Under both state and federal regulations, season duration, harvest limits, and salvage requirements have been employed throughout the entire range of the species.

RUFFED GROUSE AND SPRUCE GROUSE

Spring Breeding Surveys

Currently, there are no population assessment projects for either ruffed or spruce grouse in the Western Rural region. Based on DWC staff observations, spruce grouse have appeared to increase slightly near Dillingham, King Salmon, and the forested areas of the YK Delta since the lows between 2016 and 2018. Summer 2021 weather was likely very conducive to high chick survival with conditions warmer and dryer than normal throughout the region.

Based on DWC staff reports near Bethel, ruffed grouse are observed and harvested by hunters; however, they compose the minority of grouse harvest in this region.

Wing Collections

Ten (10) hunter-harvested spruce grouse wings were collected in RY20 and zero from RY21. All samples were collected from Unit 18 in RY20.

ROCK PTARMIGAN

Spring Breeding Surveys

Currently, there are no spring breeding survey locations in the Western Rural region for rock ptarmigan. Accessing rock ptarmigan habitat during April and May has proven to be very difficult on an annual basis. If reliable access allows, in the future DWC may look for and create a route that would focus on rock ptarmigan. Despite the lack of formal surveys for rock ptarmigan, DWC staff reported observing more adjacent to the Nome road system in spring and summer 2022 than in the recent past.

Based on DWC staff observations from near Bethel (Unit 18) and Dillingham (Unit 17), rock ptarmigan abundance has begun to rebound from the past 5–7 year low. DWC staff were in the field in Unit 18 for the majority of May 2022 and observed abundant rock and willow ptarmigan throughout the Yukon-Kuskokwim (YK) Delta. Between late April and mid-July 2022, summer

conditions were likely highly favorable to strong chick survival and a continued growth in the population is expected. However, avian influenza has been widely documented throughout the YK delta, primarily in migratory waterfowl. It is unknown if and how extensively this will impact local rock and willow ptarmigan populations.

Wing Collections

No hunter-harvested rock ptarmigan wings were collected in RY20 and only 3 were collected in RY21. Based on previous hunter surveys (Merizon et al. 2015), DWC staff observations, and communication with Western Rural region hunters, the vast majority of ptarmigan harvested in this region are willow ptarmigan. Although rock ptarmigan are present, and often at high densities in localized areas, their habitat often remains far less accessible than willow ptarmigan habitat.

WILLOW PTARMIGAN

Spring Breeding Surveys

Beginning in spring 2018, DWC staff have completed 2 spring breeding surveys for willow ptarmigan along the Nome road system. Surveys were completed between 5 and 11 May 2021 and between 13 and 29 May 2022 in Unit 22C (Table 37). In 2021, only 1 survey route was completed due to road access and DWC staff constraints. Spring breeding survey estimates were larger in 2021 (2.30 males per stop) than the previous 3 years but were much smaller in 2022 (1.23 males per stop). Summer 2021 brood rearing conditions from late June through early August were very poor with frequent heavy rain and cool temperatures. Several observations of very small chicks during the early part of the RY21 hunting season suggest renesting may have been common during summer 2021 and the wet and cool conditions likely contributed to low chick survival for the 2021 cohort. Thus, it is not surprising to see a considerable decline during the 2022 spring breeding surveys in Unit 22. In addition, local observations throughout the area documented several icing events in December 2021 created very poor subnivean habitat for snow roosting and likely had an influence on winter survival.

Table 37. Mean number of spring breeding male willow ptarmigan per listening post (stop, *n* = 56) with bootstrap 95% confidence intervals in the Western Rural region, Alaska, 2018–2022.

	Mean	Confidence interval	
Year	(males/stop)	Lower	Upper
2018	1.79	0.89	2.70
2019	1.65	1.45	1.85
2020	1.73	1.25	2.20
2021	2.30	–	2.30
2022	1.23	0.85	1.60

Note: With only 1 survey completed each year it was not possible to calculate confidence intervals for the period 2015–2019. En dash indicates data unavailable.

Based on DWC staff observations from near Bethel (Unit 18) and Dillingham (Unit 17), willow ptarmigan abundance has begun to rebound from the past 5–7 year low. DWC staff were in the field in Unit 18 for the majority of May 2022 and observed abundant willow ptarmigan throughout the YK Delta. Between late April and mid-July 2022, summer conditions were likely highly favorable to strong chick survival and a continued growth in the population is expected. However, avian influenza has been widely documented throughout the YK delta, primarily in migratory waterfowl. It is unknown if and how extensively this may impact local grouse and ptarmigan populations.

Wing Collections

Zero hunter-harvested willow ptarmigan wing samples were collected in RY20 and only 16 in RY21 (Table 38). All samples from RY21 were collected along the Nome road system and do not reflect the entire Western Rural region. Making meaningful inference about overall proportion of juveniles and early chick survival are difficult with such a small sample size.

Table 38. Total number and proportion of juvenile willow ptarmigan based on harvested wing collections within the Western Rural region, Alaska, regulatory years 2012–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[a]
2012	18, 22, 23, 26A	90	131	0	221	0.59	0.52–0.66
2013	22C, 23, 26A	74	94	0	168	0.56	0.48–0.64
2014	22C	54	56	0	110	0.51	0.41–0.61
2015	22C	38	90	0	128	0.70	0.62–0.78
2016	22C	27	82	0	109	0.75	0.66–0.83
2017	22C	52	131	0	183	0.72	0.64–0.78
2018	22C	38	85	0	123	0.69	0.60–0.77
2019	22C	34	49	0	83	0.59	0.48–0.70
2020	22C	0	0	0	0	–	–
2021	22C	6	10	0	16	0.63	0.35–0.85

[a] CI stands for confidence interval. Endash indicates data unavailable.

ALASKA HARE

Alaska hares are endemic to Alaska and are only found in Western Alaska (including the Alaska Peninsula north to Kotzebue). Currently, there are no active programs aimed at long-term population monitoring of Alaska hares. This species is one of the least accessible small game species to view and hunt, yet it is often harvested opportunistically by trappers and rural residents in Western Alaska.

Despite the lack of long-term monitoring efforts in 2018, the Small Game Program (SGP) in collaboration with ADF&G's Threatened, Endangered, and Diversity (TED) Program embarked on a 4-year study to evaluate movement patterns and assess the efficacy of various monitoring techniques for Alaska hare. Field work was completed for this study in spring 2022. To date, 9 Alaska hares have been fitted with GPS radio collars. Preliminary data suggests Alaska hare home range is much larger than snowshoe hare in some cases, covering an area of 100 km^2

(39 mi^2; C. Barger, Wildlife Biologist, ADF&G, Fairbanks, personal communication). In addition, several thousand fecal pellets have been collected to sequence DNA and determine unique individuals throughout the range of the species. This is one method that can be used to get a population estimate.

The extraction of genetic material from fecal pellets will likely become a very useful management tool as a method to track localized long-term population trends. In total, over 1,500 fecal pellet samples have been collected near 3 primary study sites (Kotzebue/Selawik Hills [Unit 23], Nome [Unit 22], and Ekuk [Unit 17]), yet less than 120 individuals have been identified through DNA genotyping. Approximately 250 miles of pellet transects have been created via snowmachine in the Nome area alone and were sampled 2 times last year. Field work was completed in March 2022. Data analysis and a final report is anticipated by 2024.

Based on field observations throughout its range, Alaska hare populations continue to remain well below what was historically observed in the 1950s and 1960s. It remains uncertain whether this is a long-term decline or a mid-century crash, with a continued low but stable population in recent years. Many long-term residents report much lower abundance throughout the species' historical range.

SNOWSHOE HARE

Currently there are no snowshoe hare population assessment projects being conducted in this region. However, DWC staff reports suggest snowshoe hare abundance is patchy throughout the region. It appears that snowshoe hare abundance on the Seward Peninsula and upper Kuskokwim River drainages has declined from the highs observed in 2019 with the exception of small, isolated patches (e.g., interior Seward Peninsula) within willow habitat where densities remain elevated. Hare abundance also remains elevated in areas in the southern portion of the region (e.g., near Bristol Bay).

Alaska Peninsula

For purposes of this report the Alaska Peninsula region includes Units 8, 9C, 9D, 9E, and 10 (Fig. 8). This area includes the communities of Cold Bay, Dutch Harbor, King Salmon, and Kodiak. Natural features include coastal tundra, steep volcanic mountains, isolated islands, and small isolated spruce forests; and there are numerous large lakes, small water bodies, and creeks. This region is bordered by Bristol Bay and the Bering Sea to the north and the Pacific Ocean and Gulf of Alaska to the south. This region is remote with no widespread road system and access is largely limited to aircraft or boat.

Willow and rock ptarmigan are the predominant small game species in this region. Willow ptarmigan do not occur west of Unimak Island; however, rock ptarmigan do occur throughout the Alaska Peninsula, and the Aleutian Islands to Attu Island. Ruffed, sharp-tailed, and sooty grouse; and white-tailed ptarmigan are not found in the Alaska Peninsula region. Alaska and snowshoe hare occur throughout mainland portions of this region.

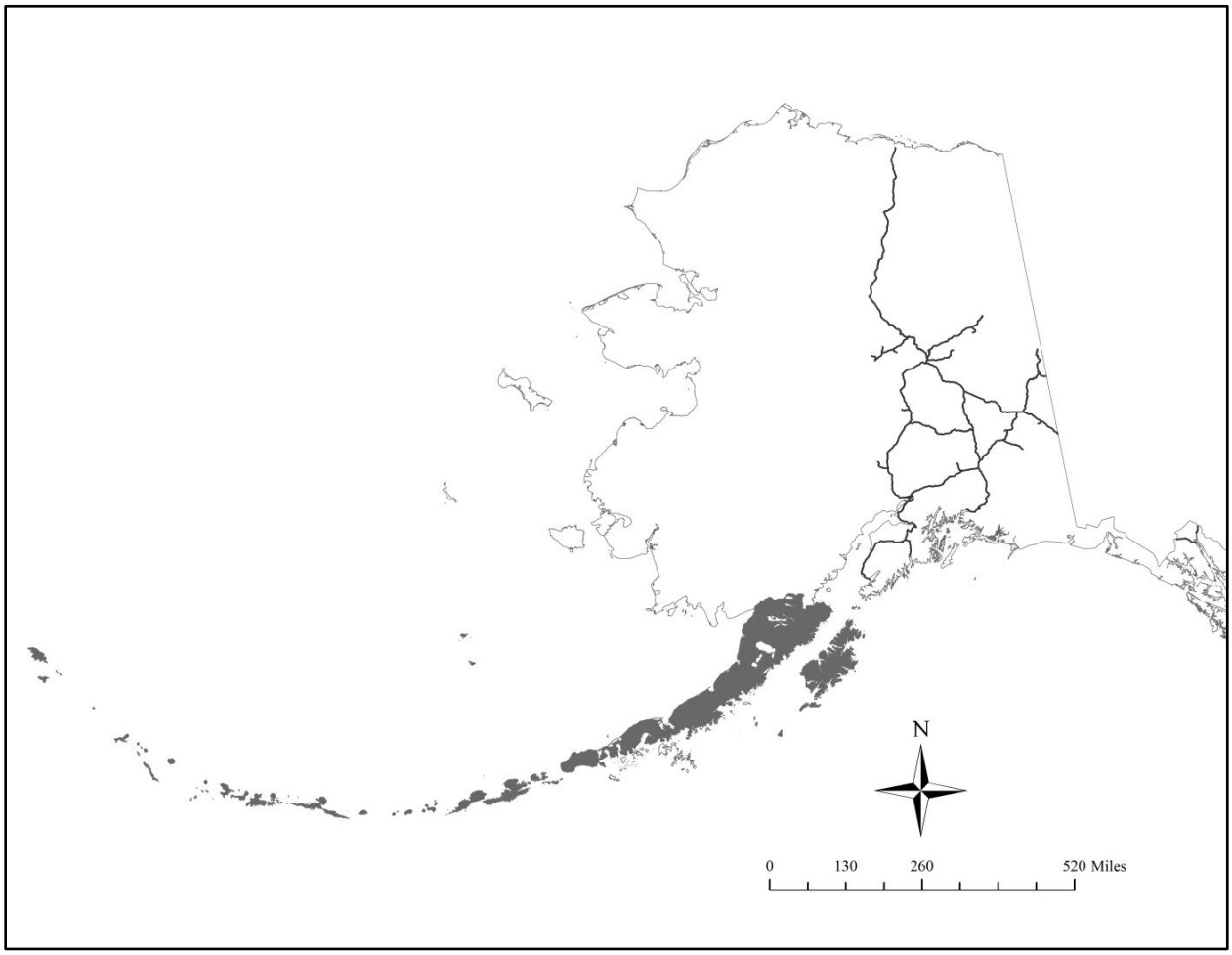

Figure 8. Map of the Alaska Peninsula region, Alaska. The Alaska Peninsula is shaded in grey, and black lines delineate roads.

SPRUCE GROUSE

The extent of spruce grouse distribution in this region is currently unknown and DWC does not have any population assessment projects within the Alaska Peninsula region. DWC staff reported relatively high abundance of spruce grouse during summer 2022 to the north near Dillingham in the Western Rural region.

ROCK PTARMIGAN AND WILLOW PTARMIGAN

Spring Breeding Surveys

Despite a previous short-term monitoring project aimed at evaluating the use of point counts to estimate changes in rock ptarmigan numbers in Unit 10 (Braun et al. 2019) there are no spring breeding or brood survey efforts within this region. Based on observations from DWC staff, hunters, and rural residents within Unit 9, it appears that overall rock and willow ptarmigan abundance has increased over the past 2 years from Cold Bay to King Salmon.

Summer and winter weather conditions between 2014 and 2019 were very poor for rock and willow ptarmigan throughout the region. The Alaska Peninsula experienced cool and wet spring and summer periods, particularly during the critical early brood rearing period (mid-June through early July) when chicks are most vulnerable to these types of weather. In addition, the Peninsula experienced unusually warm, wet, and largely snow-free winters during the same time period. Therefore, snow burrowing for thermal protection and predator avoidance was largely unavailable throughout the lower elevation areas (<800 m) and may have resulted in increased overwinter mortality. Between 2019 and 2022, summer weather conditions went from warm and dry (2019) to cool and wet (2020) and back to warm and dry (2022). This likely had a large impact on chick survival and recruitment into the population. Although the outlook for fall 2022 is more promising for ptarmigan on the Alaska Peninsula than in the recent past, it may take several years before rebounding to pre-2014 levels.

Wing Collections

Only 4 hunter-harvested willow ptarmigan wing samples were collected in RY20; but 45 were collected in RY21 (Table 39). Despite the small sample size from RY20, it appears that overall chick survival was very good during the summer of 2021 in the central portion of this region near Cold Bay.

Six (6) hunter-harvested rock ptarmigan wing samples were collected in RY20 and 3 in RY21.

Table 39. Total number and proportion of juvenile willow ptarmigan based on harvested wing collections within the Alaska Peninsula region, Alaska, regulatory years 2011–2021.

Regulatory year	Unit	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[a]
2011	9D	47	65	0	112	0.58	0.48–0.67
2012	9D	29	31	1	61	0.51	0.38–0.64
2013	9D, 9E	81	93	0	174	0.53	0.46–0.61
2014	8, 9D	1	23	0	24	0.96	–
2015[b]	–	–	–	–	0	–	–
2016	9D	1	1	0	2	0.50	–
2017[b]	–	–	–	–	0	–	–
2018	9D	1	1	0	2	0.50	–
2019[b]	–	–	–	–	–	–	–
2020	9D	1	3	0	4	0.75	–
2021	9D	5	40	0	45	0.89	0.75–0.96

Note: En dashes indicate data unavailable.
[a] CI stands for confidence interval. Confidence intervals were not estimated for years 2014–2020 due to low sample size.
[b] No wing donations were available from 2015, 2017, and 2019.

ALASKA HARE

There are currently no population assessment projects or research on Alaska hare within this region. See the Western Rural section for information on Alaska hare.

SNOWSHOE HARE

Currently, DWC has no population assessment project for snowshoe hare in the Alaska Peninsula region. Based on recent DWC staff observations in 2022, snowshoe hare abundance has declined throughout the northern and central portions of the Alaska Peninsula.

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Southeast

For purposes of this report the Southeast region includes Units 1–5 and includes the coastal communities of Haines, Juneau, Ketchikan, Petersburg, Sitka, Yakutat, and numerous smaller communities (Fig. 9) on a network of islands. Temperate rainforest is the dominant habitat type where Sitka spruce, mountain hemlock, and western hemlock are most prevalent. Sooty grouse is the most popular and abundant small game species in the region. Some montane, alpine habitat is found on the highest coastal peaks, providing habitat for willow, rock, and white-tailed ptarmigan. Access is largely limited to aircraft and boat. Ruffed grouse and snowshoe hare occur at low densities, primarily near large river deltas (i.e., Alsek, Stikine, and Taku rivers). Spruce grouse are only found on Prince of Wales (POW) Island and the small islands immediately adjacent to POW. Sharp-tailed grouse and Alaska hare are not found in this region.

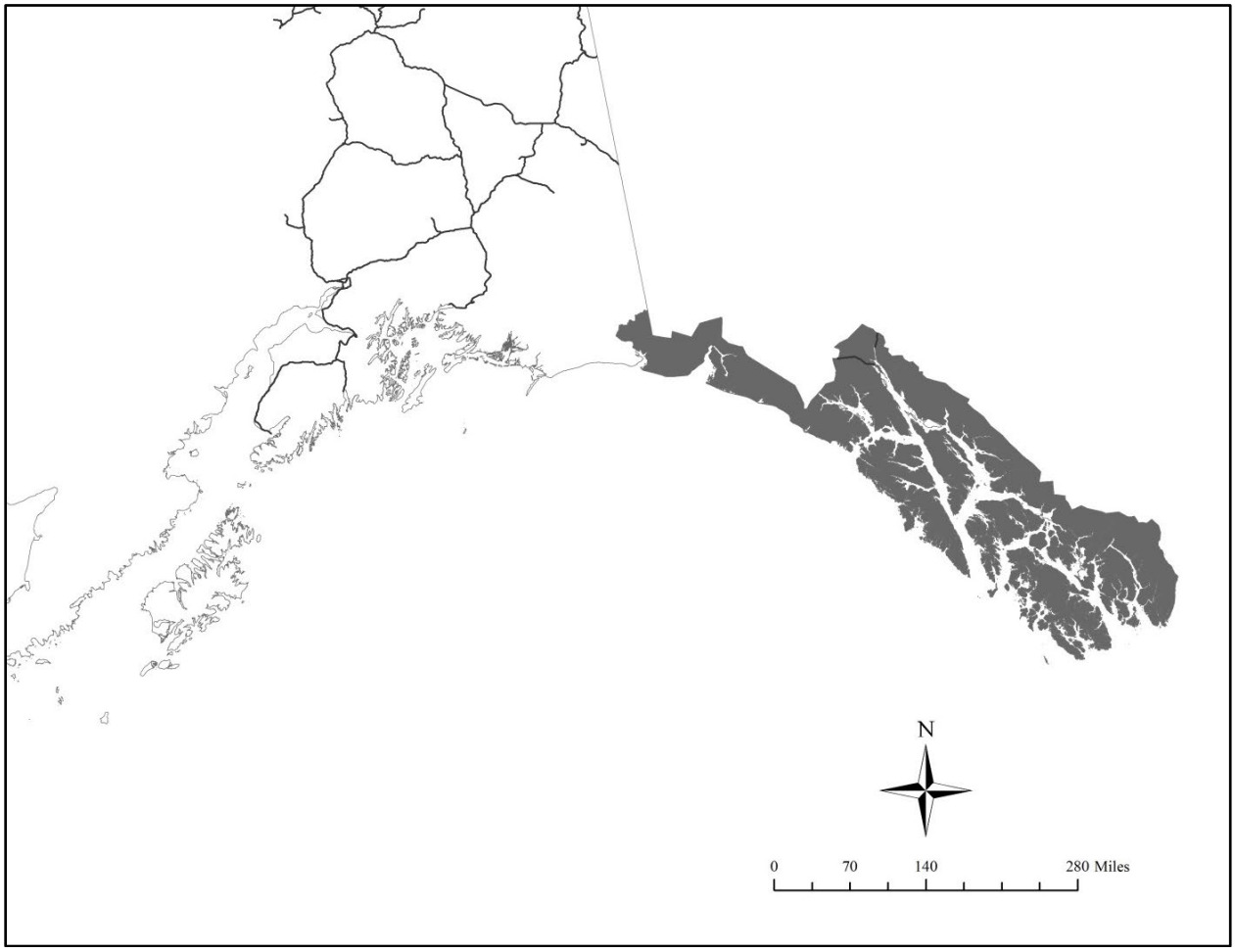

Figure 9. Map of the Southeast region, Alaska. Southeast Alaska is shaded in grey, and black lines delineate roads.

RUFFED GROUSE

Currently, there are no ruffed grouse breeding or brood surveys within this region. Although ruffed grouse exist in the Southeast region, their distribution is restricted to the large river deltas (Alsek, Stikine, and Taku rivers) where alder, willow, and black cottonwood occur. Currently, abundance in these locations is unknown; hunters and outdoor enthusiasts periodically report observing ruffed grouse.

SOOTY GROUSE

Beginning in 2021 an outbreak of western black-headed budworm (*Acleris gloverana*) began throughout large portions of Southeast Alaska (U.S. Forest Service 2022). This species is native to this region and the last known outbreak was in the early 1990s. The budworm primarily affects western hemlock, but also feeds on Sitka spruce, giving branches a reddish appearance. In severe outcomes it can cause mortality to the affected tree. The most severely affected areas include Admiralty, Baranof, Kuiu, Kupreanof, Mitkof, Prince of Wales, Wrangell, and Zarembo islands. It is uncertain to what extent this recent outbreak will affect sooty and spruce grouse populations in this region.

Spring Breeding Surveys

Spring breeding surveys were completed between 6 April and 20 May 2021, and between 5 April and 25 May 2022 (Table 40). The spring breeding estimate for sooty grouse in Unit 1C was 1.35 males per stop in 2020. This decreased in 2021 (1.01 males per stop) and again in 2022 (0.86 males per stop). In Unit 3, the spring breeding estimate increased substantially from 0.46 males per stop in 2020 to 2.26 males per stop in 2021, then decreased slightly in 2022 to 1.77 males per stop.

Beginning in 2019, volunteers in Haines created and completed 2 new sooty grouse spring breeding survey routes along the Haines area road system (Unit 1D). Those surveys estimated lower density in the Haines area than other locations in 2019. However, due to COVID-19 travel restrictions, those surveys could not be completed in 2020. Surveys were completed in 2021 but due to lack of volunteer support were not completed in 2022.

The spring breeding estimate for sooty grouse in Unit 1A was 0.65 males per stop in 2022 which was an increase from 0.44 males per stop in 2021. Beginning in 2020, DWC staff created and completed 3 spring breeding surveys in the Ketchikan area (Unit 1A, Gravina and Revillagigedo islands). However, 2 of the original 3 routes created in 2020 were not completed in 2022. The Lunch Creek route was discontinued due to chronic water noise and the Gravina route has been suspended temporarily due to active logging operations along the route. As a result, DWC created 1 new route on Revillagigedo Island in an effort to boost overall coverage of spring breeding activity in the area. DWC plans to continue those surveys in the future.

Table 40. Mean number of spring breeding male sooty grouse per listening post (stop) with bootstrap 95% confidence intervals in Units 1C and 3 in the Southeast region, Alaska, 2015–2022.

	Unit 1D Haines[a]			Unit 1C Juneau			Unit 3 Petersburg			Unit 1A Ketchikan[c]		
	Mean	Confidence interval		Mean	Confidence interval		Mean	Confidence interval		Mean	Confidence interval	
Year	(males/stop)	Lower	Upper	(males/stop)	Lower	Upper	(males/stop)	Lower	Upper	(males/stop)	Lower	Upper
2015	–	–	–	1.81	1.46	2.29	1.51	1.03	1.99	–	–	–
2016	–	–	–	1.93	1.42	2.47	2.41	2.00	2.83	–	–	–
2017	–	–	–	1.13	0.81	1.46	2.29	1.78	2.80	–	–	–
2018	–	–	–	1.00	0.60	1.49	2.00	1.29	2.68	–	–	–
2019	0.72	0.54	0.90	1.32	0.88	1.82	1.68	1.02	2.43	–	–	–
2020	–[d]	–	–	1.35	0.81	2.05	0.46[b]	0.23	0.58	0.59	0.20	1.17
2021	1.92	1.9	1.94	1.01	0.72	1.34	2.26	1.47	2.97	0.44	0.39	0.48
2022	–[d]	–	–	0.86	0.62	1.17	1.77	1.54	2.06	0.65	0.37	0.93

Note: En dash indicates data is unavailable.

[a] Unit 1D surveys were initiated in 2019.

[b] Due to COVID-19 travel restrictions and persistent snow throughout Mitkof and Kupreanof islands, surveys on Kupreanof Island were not completed in 2020. All prior survey results for Unit 3 spring breeding estimates included surveys on Kupreanof Island.

[c] Unit 1A surveys were initiated in 2020.

[d] Surveys were not conducted in Unit 1D in 2020 or 2022.

Wing Collections

Seventy-one (71) hunter-harvested sooty grouse wings were collected during RY20, and 16 in RY21 (Table 41). The proportion of juveniles was 61% in RY19, decreased in RY20 (46%), then increased again in RY21 (56%). Most hunters reported fewer grouse during RY20 and RY21 than in the recent past within popular hunting areas. According to hunter reports and DWC staff observations sooty grouse densities have remained higher in more remote portions of the region.

Harvest composition data for sooty grouse are dissimilar and difficult to compare to other grouse and ptarmigan data in Alaska. The overwhelming majority of the harvest of this species occurs from mid-April to mid-May and is predominantly composed of males due their conspicuous breeding behavior (hooting). The majority of harvest on all other Alaskan grouse species occurs between mid-August and late-October when the proportion of juveniles in the harvest is higher than in the spring due to natural mortality patterns in most tetraonid populations. As a result, it is not surprising to document relatively lower proportion of juveniles during the period of harvest when the majority of wings are collected (mid-April through mid-May).

Table 41. Total number and proportion of juvenile sooty grouse with binomial 95% confidence intervals (CI) based on harvested wing collections within the Southeast region, Alaska, regulatory years 2012–2021.

Regulatory year	Units	Adult	Juvenile	Unknown	Total	Proportion of juveniles	95% CI[b]
2012	1–4	24	17	0	41	0.41	0.26–0.58
2013	1–4	1	8	0	9	0.89	0.52–1.00
2014	1–4	28	15	0	43	0.35	0.21–0.51
2015	1–4	12	5	0	17	0.29	0.10–0.56
2016	1–4	25	33	1	59	0.56	0.42–0.69
2017	1–4	23	19	0	42	0.45	0.29–0.61
2018	1–4	37	30	0	67	0.45	0.33–0.57
2019	1–4	14	22	0	36	0.61	0.43–0.77
2020	1–4	38	33	0	71	0.46	0.35–0.59
2021	1–4	7	9	0	16	0.56	0.30–0.80

SPRUCE GROUSE

There is a small population of spruce grouse that only resides on Prince of Wales and immediately adjacent islands. This population of spruce grouse is believed to be a subspecies (*F.c. franklinii*) that has distinct plumage and size differences from the subspecies found throughout the remainder of Alaska (*F.c. canadensis*, Dickerman and Gustafson 1996). However, genetic analysis of samples collected from this population failed to make a firm distinction between the Southeast population and the mainland Alaska population (Neraas and Tallmon 2008). Currently, the Small Game Program (SGP) has no population assessment project in or wing collections from spruce grouse in the Southeast region.

Rock, White-tailed, and Willow Ptarmigan

Currently, SGP has no breeding or brood surveys for rock, white-tailed, or willow ptarmigan in this region. The extent and distribution of these 3 species within the Southeast region are unknown; however, they are observed and harvested by hunters in the higher elevation subalpine or alpine areas of most islands and the mainland.

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Other Small Game Program Projects

Volunteers are a critically important component of the statewide Small Gram Program (SGP). As a result, SGP staff have been able to take advantage of local knowledge and contacts, collect more geographically comprehensive information, and provide a much greater benefit to the statewide hunting public. Since 2015, nearly 3,000 volunteer hours have been accrued between assistance with spring breeding and summer brood surveys, voluntary hunter reports, and assistance prospecting for new survey locations. With continued volunteer support and perhaps additional interest from future volunteers, SGP can continue to expand the geographic scale of spring breeding and summer brood survey effort. SGP plans to continue growing its involvement with volunteers statewide. If you are interested in assisting SGP please contact the small game biologist in Fairbanks (907.459.7237).

Management Implications

As mentioned in the Methods for Population Monitoring section earlier in this report, annual brood surveys have become an efficient means to document hatch year (that year's production) survival of some of the most heavily-hunted sharp-tailed grouse and ptarmigan (rock, white-tailed, and willow) populations from north of Fairbanks to the Kenai Peninsula. Upland bird hunters are interested in how these data reflect overall abundance during the fall hunting season. Hatch-year birds typically make up the majority of the fall harvest in most hunted tetraonid populations, especially during the early part of the season (Hansen et al. 2012). By documenting hatch-year survival immediately prior to the start of the hunting season, SGP can project the general abundance levels for hunters which often correspond to overall success rates. These data are valuable from both a management and hunter education standpoint.

The Small Game Program (SGP) has built the brood survey project with the assistance of volunteers and the methods are largely based on those from the wildlife management program in Norway (Jo Inge Breisjøberget, Wildlife Biologist, The Norwegian State-owned Land and Forest Enterprise, personal communication). Since summer 2016, SGP has recruited volunteer dog trainers and their highly skilled pointing dog breeds to complete all the statewide surveys. Prior to going afield, volunteers and their dogs are put through a steadiness test to ensure the dog will not lunge or grab live, wild birds. Volunteers are then asked to walk a set of predetermined transects (0.5–2 km [0.3–1.2 mi] in length) to enumerate the number of brood groups and the composition of hatch year and adult birds in each brood group. Beginning in 2016 SGP recruited 11 volunteers statewide. That number slowly grew annually through 2020. In 2021, several passionate volunteers energized the project with a renewed recruiting effort and 38 volunteers

completed brood surveys across the state totaling 586 hours of donated time and over 8,000 vehicle miles. In addition, because of this growth, multiple brood survey transects were added in each of 3 new areas of the state including Sheep Mountain (Unit 13A), Chugach State Park (Unit 14C), and the Kenai Mountains (Unit 7). The same level of interest and effort was similarly employed during summer 2022 brood surveys. Growth in volunteer support has allowed SGP to expand the geographic scale of surveys and the number of transects in each area which increases the reliability of the brood survey data.

Because of this increased volunteer interest beginning in 2021, the value of the project has far greater implications for the general hunting public. Brood size and brood number are strong indicators of what hunters can expect to find when they go afield within 10–14 days of the completion of the project each year. Under ideal summer conditions, hatch year survival tends to be strong, and hunters can typically expect to see greater numbers of upland birds at the start of the season. However, multiple days of heavy rain, wind, or even snow immediately after the hatch often lead to very low survival, and as a result hunters typically report very poor success and generally low bird abundance.

Given the growth in volunteer support in 2021, the Small Game Program (SGP) sought ways to leverage volunteer time to expand Alaskan upland bird research efforts. Volunteer time used as state "match" to leverage additional Pittman-Robertson (P-R) funds under the Federal Aid in Wildlife Restoration Act. As a result of the volunteer effort in 2021, an additional $65,000 was secured and thus allowed SGP to initiate an otherwise financially unattainable ptarmigan research project.

Beginning in spring 2022, with funds generated from volunteer-based brood surveys in summer 2021, SGP initiated a willow ptarmigan research project in the YK Delta. SGP purchased 30 cutting edge GPS collars that staff planned to deploy on willow ptarmigan in the spring and fall of 2022 (Fig. 10). Due to challenging conditions and unpredictable bird behavior, few of those collars were deployed in 2022. Additional efforts will be employed during winter 2022–2023 to deploy the remaining GPS units. The YK willow ptarmigan population is a highly valued subsistence resource for many rural residents throughout Unit 18. Over the past 5–7 years, reports from longtime residents of Unit 18 suggest that the YK willow ptarmigan population may have experienced a substantial decline. As a result, subsistence needs have not been met. What has caused this decline? Is the decline related to high mortality or have these ptarmigan altered their movement patterns so that they are no longer available to hunters in areas where they have historically been? Due to the remote location, high prices for fuel and transportation, and difficult logistical challenges, SGP has been unable to financially support work to answer some of these management questions until additional resources from volunteer-based brood surveys became available. Due to these resources, this research will continue in the YK Delta.

This is an example of a state wildlife management agency and passionate volunteers working to safeguard the conservation of our shared public trust resource. Given the changing landscape of hunters versus nonhunters, declining hunter license revenue, and increased polarization towards how wildlife is viewed by the public, the upland bird brood surveys in Alaska have demonstrated that citizens can directly engage in the conservation of shared resources for the benefit of all Alaskans.

Figure 10. Photograph of a global positioning system (GPS) collared female willow ptarmigan on the Yukon-Kuskokwim Delta, May 2022.

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