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Status of Grouse, Ptarmigan, and Hare in Alaska, 2017 and 2018

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Alaska Department of Fish and Game Division of Wildlife Conservation

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Cover Photo: A snowshoe hare (*Lepus americanus*) in spring 2018, southern Interior of Alaska.

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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 (Unit, 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 up 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 more 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, DWC initiated spring breeding surveys near Palmer (Unit 14A), following translocation in 1992, near Anderson in 1993 (Unit 20C), Delta Junction in 2008 (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, 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 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 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. For the last 15 years DWC has been limited to conducting spring breeding surveys of sharp-tailed grouse in Delta Junction on the Delta Junction Agricultural Project (DJAP). However, 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 have been identified and have been monitored annually since. 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 in 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 done primarily 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 and will be continued annually to monitor changes in breeding abundance.

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). Currently the DWC statewide Small Game Program (SGP) does not monitor spring breeding abundance of spruce grouse and information on population status is derived primarily from hunter-harvested wing collections and hunter observations.

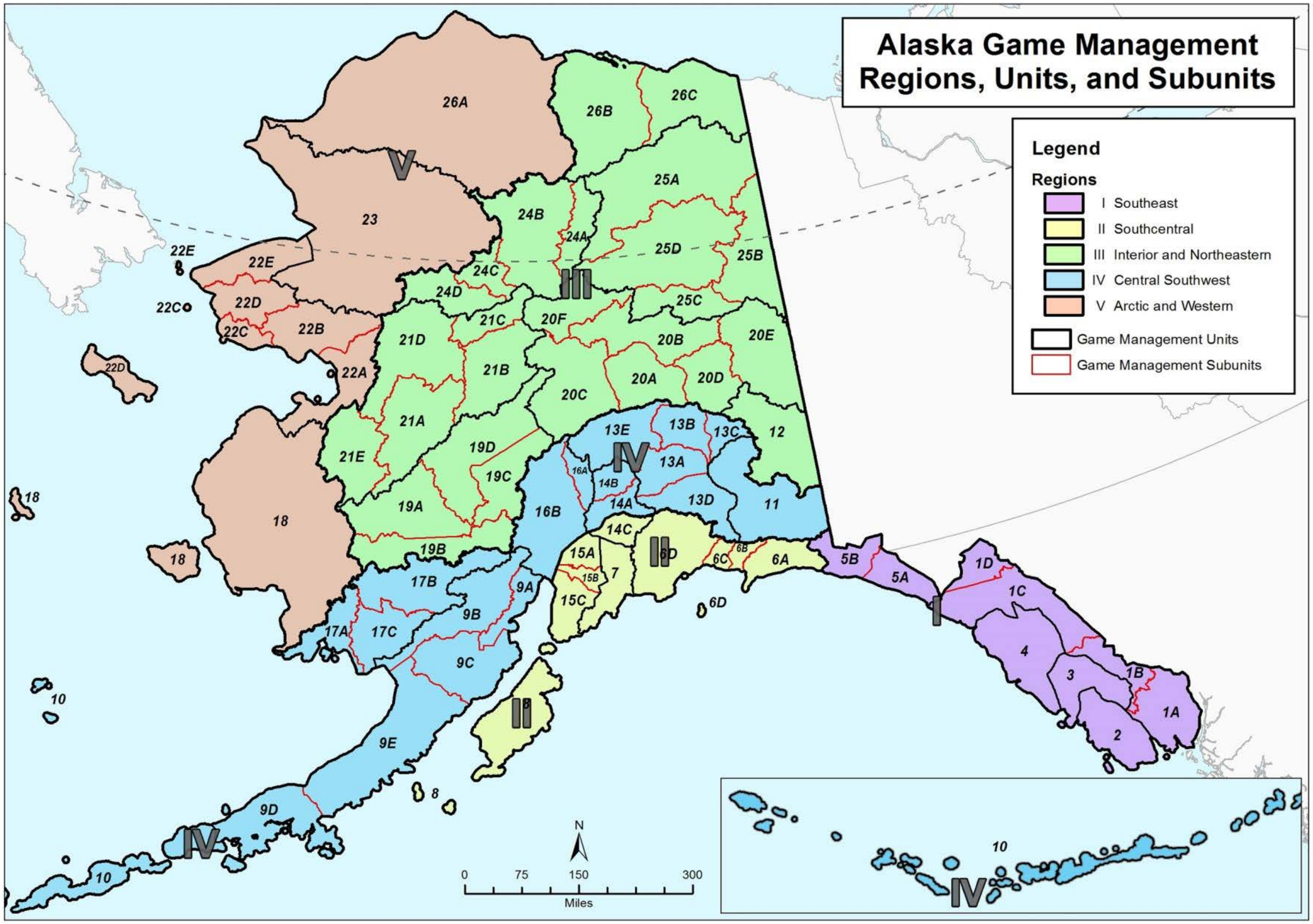

Figure 1. State of Alaska game management units.

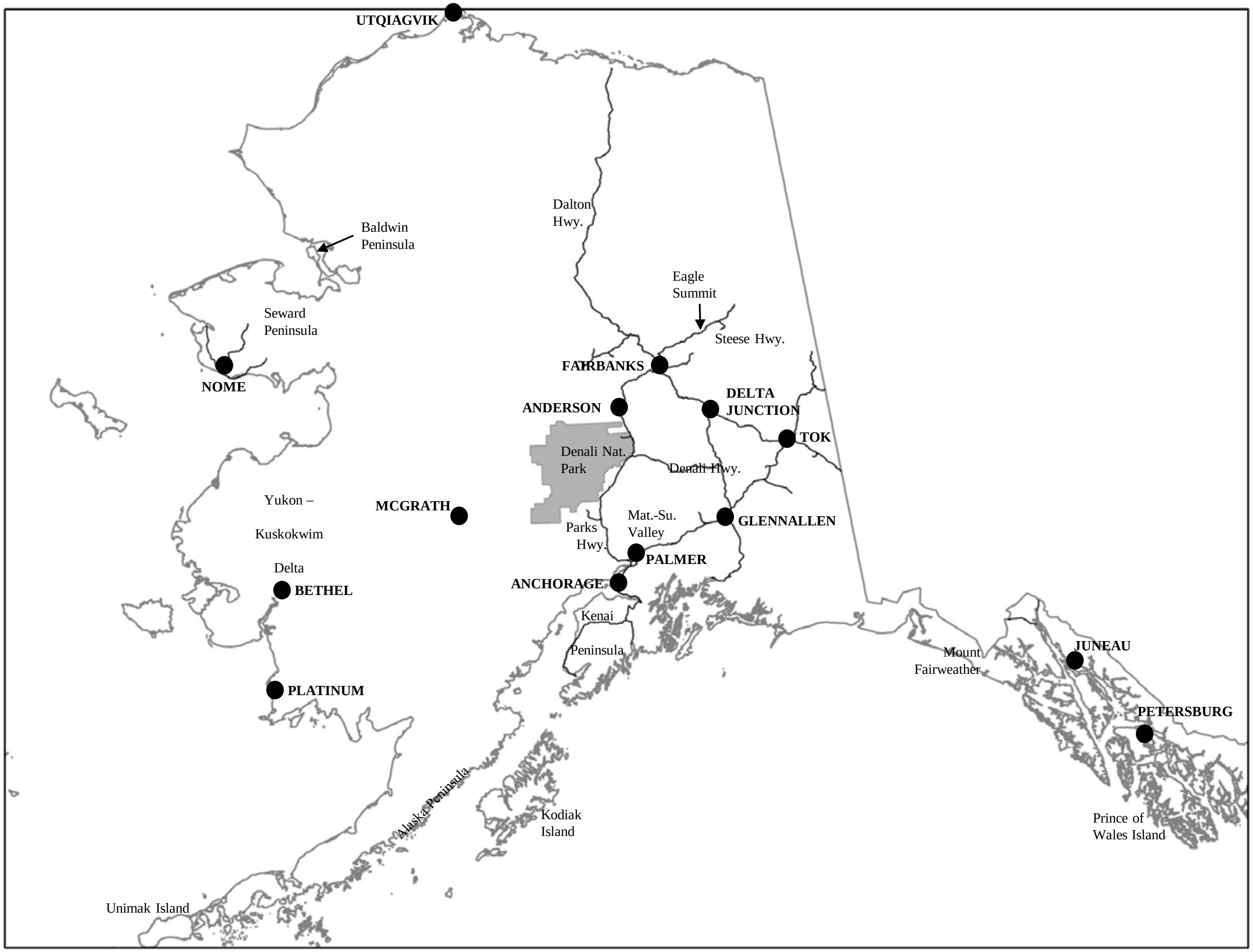

Figure 2. Alaska road system and general locations at which abundance surveys or research studies were completed or field observations were made. Locations are referred to in this report.

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, more exposed rock faces, scree slopes, and alpine ridges. Alpine areas with abundant dwarf birch (*B. nana*) 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 1965). 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, near Donnelly Dome (Unit 20D), and Isabel Pass (Unit 13B), and most recently at various locations throughout the Kenai Mountains (Unit 7 and 15A, 2013), within Denali National Park (DNP, Unit 20C, 2014), and near Mount Fairplay (Unit 12, 2015). Since 2013, the 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 completed annual spring breeding surveys within the study area formerly used by researcher Robert Weeden in the 1960s and early 1970s. Beginning in spring 2018, the SGP in cooperation with UAF has initiated a third research study examining rock ptarmigan reproductive ecology and population productivity between Eagle Summit 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 are very rarely confirmed north or west of the Alaska Range. However, periodically white-tailed ptarmigan are reported harvested by hunters along the western Alaska Range, near the South Fork of the Kuskokwim River. On one rare occasion, a white-tailed ptarmigan was harvested near Whitefish Lake (Unit 19A in 2016). This species is endemic to North America and populations 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. Information recorded on white-tailed ptarmigan populations has been obtained primarily through hunter questionnaires and wing collection from hunters.

WILLOW PTARMIGAN

Willow ptarmigan is the most common and abundant ptarmigan species in Alaska, occurring in most alpine and subalpine non-forested 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 1965). 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, Fort Greeley, and most recently at various locations in the Kenai Mountains (2013), DNP (2014), and Mount Fairplay (2015). Between 2013 and 2015, in cooperation with UAF and the Alaska Energy Authority, the SGP completed a 3-year research study to examine the ecology and distribution of willow ptarmigan adjacent to the proposed Susitna–Watana Hydroelectric Project (Susitna–Watana Project) site in the upper Susitna River.

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 Yukon and Kuskokwim river deltas (Y-K) and throughout the Alaska Peninsula (Fig. 1). The Alaska hare inhabits coastal lowlands, alder (*Alnus* spp.) and willow thickets, and wet meadows.

Beyond information received from hunter questionnaires there are no active programs aimed at long-term population monitoring of Alaska hares. 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 that range.

Beginning in spring 2017, the DWC initiated efforts to evaluate capture techniques with the goal of attaching radio collars to captured hares. Also beginning in fall 2017, the DWC initiated a series of village tours to discuss Alaska hare observations, historical abundance, and hunting patterns with rural residents throughout the range of the Alaska hare. Beginning in summer 2018 DWC in cooperation with UAF initiated a graduate research project to examine movement and mortality of Alaska hares as well as test and develop an effective abundance monitoring technique that could be employed throughout western Alaska.

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 SGP. The SGP objectives are diverse and comprehensive. In addition to education and outreach, the primary objectives of the SGP are 2-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 used by hunters along road systems. Two, develop research efforts to better inform management concerns and the Alaska Board of Game (BOG) hunting regulatory process.

Spring breeding survey, harvest composition, and brood survey data, observations, and information provided in this report are for use by DWC staff to manage harvest and inform decisions on the status of various small game populations within their areas as well as to inform the hunting public. These data will inform DWC's use of its discretionary authority, within seasons specified by the BOG to adjust bag limits to restrict or liberalize harvest.

This report details the activities conducted by the SGP between regulatory years (RY) 2016 and 2017 (regulatory year begins 1 July and ends 30 June, e.g., RY16 = 1 July 2016–30 June 2017). The brood survey results from summer 2018 are also provided. Specifically, this report addresses 1) the harvest composition from the seasons addressed, 2) status of monitored grouse, ptarmigan, and snowshoe hare populations, 3) management concerns, 4) recent BOG regulatory changes; 5) current research, and 6) future work. Information will be provided by species within each of 7 sections of the 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

Critical to the management of Alaska's small game is an understanding of spring breeding abundance, particularly of heavily exploited populations and those adjacent to the road system. Beginning in mid-April each year, numbers of breeding male grouse and ptarmigan are counted at fixed survey locations (Pierce et al. 2012) from the Steese Highway in the Interior to Petersburg in Southeast Alaska (Fig. 2). This provides useful indices from which populations can be monitored and management action can be taken, if warranted. Snowshoe hares are also counted in the same areas for the same purpose.

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, Haddix 2007, Pierce et al. 2012). In Alaska, male ruffed, sharp-tailed, and sooty grouse, as well as 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).

The spring breeding season for grouse and ptarmigan in Alaska occurs from mid-April through late May (Weeden 1965, Taylor 2013). Due to the geography of Alaska, limited road system, poor access off the road system in the spring, and staff limitations, the SGP has been largely restricted to monitoring species in accessible areas in which breeding behaviors can be observed. The SGP has focused on those populations that are either heavily exploited by hunters, in popular outdoor recreational areas, or live very close to large urban areas or road systems and so afford consistent and reliable access from year to year. However, efforts have been made to establish remote, fly-out only survey locations for a variety of species to begin evaluating whether our road-system surveys adequately reflect the unit or subunit population trend. 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 breeding 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 drum beat. 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 have 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 and their direction from the observer were recorded. Attempts were made to survey each route 2–3 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. Previous reports documented the total count of drumming males per survey area. Roadside and trail transects through known ruffed grouse habitat were established in Anderson (1993), Delta Junction (2008 and 2016), 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 2014, 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 were often observed, though their presence was 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 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 (*Salix* spp.), 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.

Lek sites have been monitored for male sharp-tailed grouse abundance in Delta Junction (1997) and Tok (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, transects were created along hiking trails and roadways near Juneau and Petersburg to monitor the spring breeding abundance of males. Transects consisted of 6–20 stops much like the design of ruffed grouse surveys. They were completed either on foot or with the use of 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. The average for each area was calculated by using the peak count for each survey transect for that season. 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 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 have proven to correlate with fall abundance.

The State of Minnesota Department of Natural Resources is developing and testing an abundance estimation method for spruce grouse that may be evaluated in Alaska in 2019 or 2020 (Roy et al. 2018).

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 1965).

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 by either driving a highway vehicle along rural, high elevation roadways or walking on foot. Responding males were counted only within a 0.4 km (0.25 miles) radius of each stop along the route. Spring breeding survey data are reported as the average number of males recorded per survey stop by area or region (i.e., eastern Denali Highway). Surveys are repeated 2–3 times during the peak of breeding activity.

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 SGP is currently not completing spring breeding surveys for them. 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 the alpine 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 1965). Willow ptarmigan spring breeding abundance is assessed and reported using the same methodology as for rock ptarmigan.

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. The DWC is currently assessing various techniques that if found successful could be employed regionally to estimate abundance. This survey technique evaluation will take 3 to 4 more years (2021–2022) before it could be deployed throughout the species range in 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). The 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. The SGP has also relied upon numerous partners to assist in monitoring statewide hare populations, including the National Park Service and private individuals, to obtain data and other information.

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, Carroll and Merizon 2014, 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. In addition, statewide wing collection efforts from hunter-harvested grouse and ptarmigan offer complimentary data on harvest composition, productivity, harvest location, and species that generate the greatest hunter effort (Carroll and Merizon 2014, Hansen et al. 2015). 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, the SGP has partnered with numerous volunteers and their highly trained pointing dogs on an annual basis to complete summer brood surveys. Surveys were completed along designated transects for sharp-tailed grouse (Delta Junction) and rock and willow ptarmigan (Eagle Summit, Denali Highway, and Hatcher Pass). Dogs were evaluated for steadiness prior to completing surveys and were used to locate broods. Observers counted number of chicks and adults, and recorded brood locations. These data have proven to be useful to assess population productivity and abundance immediately prior to the hunting season in August.

Hunter-Harvested Wings and Tails

In order to understand annual grouse and ptarmigan harvest composition and population productivity, the SGP continues an effort to collect hunter-harvested wings, tails, and heads of all species of grouse and ptarmigan (Tables 1 and 2). By examining these samples, biologists can determine age (juvenile or adult), sex, and verify 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 the SGP to index harvest composition and a second method through which 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.

Table 1. Total number of hunter-harvested wings collected statewide from grouse and ptarmigan by game management unit, Alaska, regulatory year[a] 2016.

Game Mgmt. Unit (GMU)	Grouse				Ptarmigan			
	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	32	0	0	0	32
3	0	0	0	27	0	0	0	27
6	0	1	0	0	0	0	0	1
7	0	47	0	0	11	1	2	61
9	0	0	0	0	19	0	0	19
10	0	0	0	0	0	9	0	9
11	0	5	0	0	0	0	0	5
12	0	8	0	0	0	0	0	8
13	1	33	6	0	175	11	0	226
14	28	60	0	0	26	23	36	173
15	0	35	0	0	1	0	3	39
16	0	2	0	0	6	0	0	8
19	0	4	0	0	0	0	0	4
20	53	92	72	0	3	2	2	224
22	0	0	0	0	109	6	0	115
25	0	0	0	0	2	4	0	6
Total	82	287	78	59	352	56	43	957

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).

Table 2. Total number of hunter-harvested wings collected statewide from grouse and ptarmigan by game management unit, Alaska, regulatory year[a] 2017.

Game Mgmt. Unit (GMU)	Grouse				Ptarmigan			
	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	29	3	1	0	33
3	0	0	0	4	0	0	0	4
4	0	0	0	9	0	0	0	9
6	0	2	0	0	0	0	0	2
7	0	93	0	0	11	0	2	106
11	0	3	0	0	2	0	3	8
12	0	0	4	0	1	0	0	5
13	0	17	15	0	124	1	1	158
14	30	37	0	0	30	14	15	126
15	0	22	0	0	0	0	0	22
16	1	12	0	0	31	0	2	46
20	127	156	155	0	2	7	0	447
22	0	0	0	0	183	1	0	184
25	0	0	0	0	13	14	0	27
Total	158	342	174	42	400	38	23	1,177

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2017 = 1 July 2017–30 June 2018).

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 verify sex by examining plumage characteristics prior to completing their fall molt.

Summer 2016–Spring 2018 Climate Patterns and Breeding Seasons

The month of June and early July 2016 were generally very favorable for chick rearing in Southcentral, Interior, and portions of Western Alaska (Seward Peninsula). However, during late June and early July 2016 rain and cool temperatures in the Y-K Delta and Alaska Peninsula likely caused very high grouse and ptarmigan chick mortality in those areas.

Generally, statewide, July 2016 was warmer than normal; Anchorage set a record for the warmest month ever recorded (Shedlock 2016). For much of the state, late July and August were quite wet. In the Y-K Delta and the Alaska Peninsula late June and July were very wet and temperatures were below normal.

Statewide breeding activity of male grouse and ptarmigan occurred largely near the historical average. Broods of rock and willow ptarmigan in Southcentral and the Alaska Range were documented in late July with between 4 and 6 chicks per brood.

During fall 2016, temperatures also remained above average throughout most of the state including at Utqiaġvik, Kotzebue, Nome, and St. Paul which all recorded the warmest October on record (Rosen 2016) and as a result very little snow accumulation below 600 m elevation through most of November and much of December. The Y-K Delta and the Alaska Peninsula remained snow-free for much of the winter, which likely had a negative impact on ptarmigan and hare populations in those areas of the state. This warm weather phenomenon was further reinforced by a very limited extent of sea ice in the Bering Sea, which resulted in warmer air over western and northern Alaska for longer than normal. January through March 2017 had more typical winter temperatures and snowfall. Snowmelt remained limited in Southcentral and Interior regions until mid-April due to persistent high pressure and cold temperatures. In late May 2017 in montane areas of Interior and Southcentral Alaska a significant snow event likely impacted early nesting grouse and ptarmigan.

For Southcentral, Interior, and portions of western Alaska, spring and summer 2017 were near normal with average to slightly above average temperatures and near normal precipitation. June and July were warm and generally very favorable for grouse and ptarmigan chick survival. This resulted in large and numerous broods of sharp-tailed grouse and rock and willow ptarmigan throughout monitored populations in Southcentral and Interior Alaska. Reports from hunters and residents on the Seward Peninsula also reported abundant willow ptarmigan throughout the Nome road system during fall 2017. However much like summer of 2016, the Y-K Delta and Alaska Peninsula again experienced a wet and cool summer between late June and August.

Again, this likely strongly contributed to DWC staff and fall 2017 hunter observations throughout those regions of very low rock and willow ptarmigan abundance. Throughout much of the winter of 2017–2018 these same areas received very little snow until January or February 2018, which likely further stressed likely further stressing those populations.

The winter of 2017–2018 for Southcentral and Interior Alaska received near normal temperatures and precipitation through October. However, November and December 2017 were warmer than normal for much of the state, setting a new record for the warmest December on record (Zak 2018). Mountain snow was present in the Chugach, Talkeetna, and Kenai mountains; however, lowland rain persisted through much of December in Southcentral. Very little snow was documented in Southcentral until mid-January 2018. However, near normal monthly snowfall returned in February and March. The Interior and Alaska Range received near record snowfall throughout January and March. Fairbanks was largely snow-free by the second week of May; however, the Alaska Department of Transportation and Public Facilities (DOT&PF) crew along the Denali Highway was repeatedly set back by late winter snowstorms and a deep and persistent snowpack that could not be cleared until 18 May 2018.

During fall 2017, a growing spruce bark beetle (*Dendroctonus rufipennis*) outbreak became obvious throughout Southcentral Alaska and the Kenai Peninsula. The Kenai Peninsula has experienced the outbreak for the past 3–4 years; however, the threat has moved throughout the Anchorage Bowl and the Mat-Su. Beetle infestations have moved rapidly and largely impacted white spruce ≥15 cm in diameter. This outbreak has the potential to significantly impact spruce grouse populations throughout Southcentral Alaska.

During June and early-July 2018, several significant snowfall events occurred throughout the Alaska Range and the Chugach and Talkeetna mountains that had a measurable impact on alpine nesting ptarmigan populations. Frequent and heavy rain accompanied cool temperatures also affected lower elevation grouse populations throughout the Interior, Kenai Peninsula, Southcentral, and Southwestern Alaska. This resulted in low chick survival for both grouse and ptarmigan throughout monitored populations in these areas. As a result, overall expectations of abundance for the RY18 season are poor for most grouse and ptarmigan populations throughout the state.

Statewide Summary

Highly variable climate patterns across Alaska between 2017 and 2018 resulted in localized differences in grouse and ptarmigan abundance. The summers of 2016 and 2017 along the road system and the Seward Peninsula were relatively warm and dry, which generally resulted in strong chick production for many monitored grouse and ptarmigan populations. During RY16 and RY17, hunters reported abundant populations of willow ptarmigan throughout the Seward Peninsula, Interior, Alaska Range, and Southcentral Alaska. As a result of this annually increasing abundance, a record number of breeding willow ptarmigan were documented throughout the Alaska Range in spring 2018. However, Southwest Alaska and the Alaska Peninsula experienced several cool and wet summers in a row followed by warm, largely snow-free winters. This weather pattern likely put extraordinary negative pressure on rock and willow ptarmigan populations in the area. DWC staff and hunters reported ptarmigan abundance was very low to completely absent in Cold Bay, King Salmon, Dillingham, Bethel, and throughout Southwest Alaska.

June and early July 2018 were generally wet and cool for much of the state. This weather pattern likely had a negative influence on many grouse, particularly ptarmigan, populations throughout the state.

Snowshoe hare abundance is currently at or near the peak in the population cycle throughout Alaska. Interior populations likely observed a peak in 2018 and Southcentral populations will likely peak between 2018 and 2019. Kenai Peninsula hare populations should peak between 2020 and 2021. The snowshoe hare population appears to be a 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 hare highs. This decline in grouse abundance is currently being observed throughout much of the state and is being exacerbated by recent cool and wet weather in spring / summer 2018.

Ruffed grouse throughout Alaska appeared to be 1 to 2 years beyond their 7– to 10-year population cycle peak. Spring breeding surveys near Delta Junction, Anderson, and Tok reflect declining populations while monitored populations in the Mat-Su appeared to be stable in 2018.

Sharp-tailed grouse abundance was relatively high and stable throughout the species’ range between 2016 and 2017. Field reports and observations in 2017 from Chicken, Tok, Delta Junction, Sourdough, and Anderson all reported seeing abundant sharp-tailed grouse populations. In 2017 and 2018, sharp-tailed grouse were also observed in the Palmer, Anchorage, Hatcher Pass and Denali Highway survey areas. However, spring breeding surveys in 2018 suggested sharp-tailed grouse abundance has declined in the Interior.

Spring breeding surveys for sooty grouse have been completed since 2015. Overall, data between 2015 and 2017 documented stable populations throughout monitored populations in Juneau and Petersburg. In 2018, a modest decrease in abundance was documented in Juneau, and on Douglas and Mitkof islands. However, an increase in abundance was documented on Kupreanof Island. Hunters generally reported seeing and harvesting fewer birds during RY17 throughout the Southeast region.

There currently is no systematic statewide population monitoring for spruce grouse. Despite this, spruce grouse appeared to have below average abundance along the road system based on field observations and hunter reports in 2018. Overall brood production appeared to be slightly lower than average in 2018 based on field observations. In portions of Southwest Alaska, abundance has been well below the long-term average since 2015; however, several communities have reported seeing more spruce grouse in 2018 than in the recent past. Weather patterns appear to be contributing factors to this low abundance.

Rock ptarmigan populations throughout the road system have declined from the historic high in spring 2016 but have remained near or above the long-term average. Hunters reported seeing and harvesting more rock ptarmigan than average along the road system during RY16 and RY17.

However, rock ptarmigan populations in Southwest Alaska and the Alaska Peninsula have remained very low and will likely remain low throughout the RY18 season based on weather patterns during summer 2018. Rock ptarmigan appeared to be increasing in 2017 in the Interior based on spring breeding surveys but counts in 2018 suggested a decline in abundance in the eastern Interior. Overall in RY18, based on summer 2018 brood surveys, abundance is expected to be below average in the Alaska Range, and the Chugach, Talkeetna, and Kenai mountains.

Very little is known about white-tailed ptarmigan abundance throughout their range in Alaska. Most of the 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 below average in RY18 much like rock and willow ptarmigan.

Willow ptarmigan abundance has steadily increased since 2016 along the road system and the Seward Peninsula. Record high spring breeding abundance was documented throughout the Alaska Range and Southcentral in 2018. However, like rock ptarmigan, populations of willow ptarmigan remain very low to absent for Southwest Alaska and the Alaska Peninsula. The same cool and wet weather pattern in June and early July 2018 also reduced chick survival along the road system and hunters can anticipate finding below average numbers of willow ptarmigan in RY18 despite the strong breeding abundance.

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 SGP and other DWC staff have embarked on a new, multi-year research study 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.

♦ ♦ ♦

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 from 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 inaccessible save for 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, and Richardson highways. Sooty grouse and Alaska hare are not found in this region.

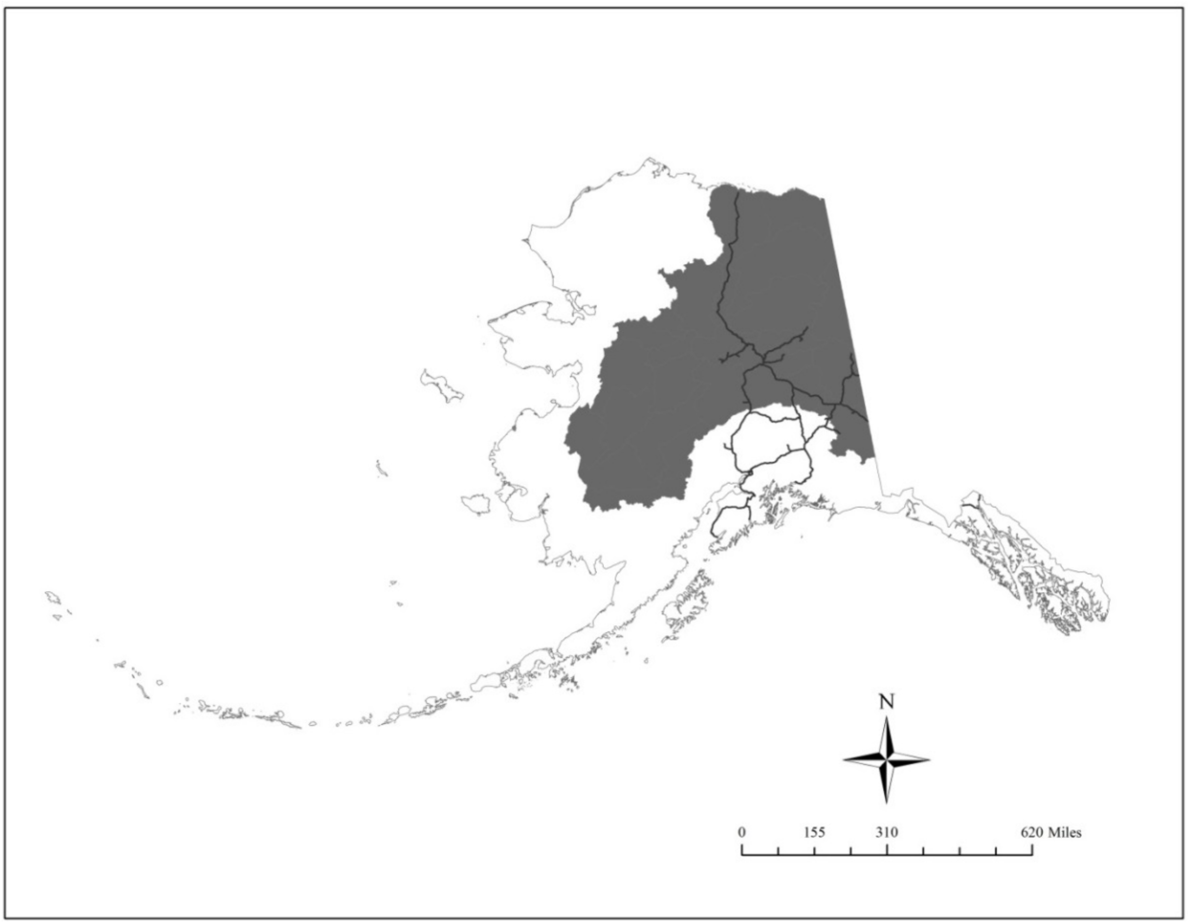

Figure 3. Map of the Fairbanks and Interior road system region, Alaska.

RUFFED GROUSE

Spring Breeding Surveys

Since 2016, the SGP has increased survey and monitoring efforts for ruffed grouse in the FIRS region. New survey routes have been initiated near Fairbanks, Tok, and Delta Junction in an effort to detect population trends across the broader FIRS region as well as to monitor how ruffed grouse are responding to recent habitat improvement projects.

The SGP completed drumming counts from 22 April to 13 May in 2017 and from 16 April to 11 May in 2018. In 2018, substantial snow cover made travel to survey areas difficult and subsequently led to flooding along access trails when temperatures warmed. Despite these challenges, SGP staff and volunteers were able to complete repeated counts at all survey locations. Survey conditions in both years for all drumming counts in the FIRS region were generally good with temperatures ranging from approximately -8°C to 13°C and winds generally light to moderate. In 2018, fewer drumming males were documented during surveys compared to 2017. The decrease in the average number of drumming males observed per listening post was statistically significant for 3 out of the 4 survey locations within the FIRS region (Table 3; Clear Air Force Station (AFS) $t = 6.56$, *P-value* (*P-val*) < 0.001; Delta Junction $t = 2.41$, *P-val* < 0.02; Tok $t = 5.07$, *P-val* < 0.001).

The forest stand composition at our longest running survey location (Clear AFS, 1993–2018) in the FIRS region has matured and as a result declined in quality for ruffed grouse from an aspen dominated landscape to one dominated largely by black spruce. It was postulated in 2016 that the decline in habitat quality had likely reduced the carrying capacity for ruffed grouse and that drumming surveys were no longer able to provide a good index of population trends of ruffed grouse in the area. However, total counts of drumming ruffed grouse in the spring of 2017 were at or near the highest numbers recorded in the 24 years surveys have been conducted, indicating the habitat is adequate for supporting high densities of ruffed grouse. Therefore, SGP plans to continue drumming surveys at this location for the foreseeable future.

Contractors for the United States Army completed drumming counts during spring 2017 on Fort Wainwright along one route in the Yukon Training Area (YTA) near Fairbanks and along 2 routes south of Delta Junction near Fort Greely within the Donnelly Training Area (DTA) and Gerstle River Training Area (GRTA, Table 4; Haddix 2007). However, U.S. Department of Defense funding for wildlife surveys on military lands was substantially reduced in 2018 and contractors were able to conduct surveys only within the YTA and DTA. SGP staff conducted ruffed grouse surveys on the GRTA in 2018. Data suggest ruffed grouse numbers started to decline in 2017 across all sites on military lands with a statistically significant decline in the mean number of males observed per post on the GRTA (GRTA $t = 3.28$, *P-val* = 0.002). The data further suggest that decline continued into 2018 with statistically significant differences in the mean number of males observed per post for the YTA, DTA, and data from the DTA and GRTA combined (YTA $t = 3.61$, *P-val* < 0.001; DTA $t = 2.77$, *P-val* = 0.008; DTA/GRTA $t = 2.65$, *P-val* = 0.009).

Taken together, data from the FIRS region suggest that ruffed grouse numbers peaked in 2016 in the eastern Interior and in 2017 in the western Interior.

Table 3. Mean number of male ruffed grouse estimated per listening post (stop) with bootstrap 95% confidence intervals for survey locations near Clear Air Force Station (AFS), Delta Junction, Fairbanks, and Tok within the Fairbanks and Interior road system region, Alaska, 2012–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

	Clear AFS			Fairbanks			Delta Junction			Tok		
Year	# Stops	Mean	95% CI[a]	# Stops	Mean	95% CI	# Stops	Mean	95% CI[a]	# Stops	Mean	95% CI[a]
2012	41	0.06	0.02-0.10	--	--	--	--	--	--	--	--	--
2013[b]	NS	NS	NS	--	--	--	--	--	--	--	--	--
2014	41	0.16	0.07–0.28	--	--	--	11	0.33	0.06–0.67	9	0.19	0.00–0.39
2015	41	0.17	0.10–0.25	--	--	--	11	0.45	0.18–0.73	9	0.50	0.28–0.68
2016	41	0.25	0.12–0.39	--	--	--	22[c]	0.45	0.27–0.64	19[c]	0.80	0.54–1.09
2017	41	0.35	0.24–0.47	10	0.57	0.85–1.10	22	0.32	0.17–0.50	29[d]	0.33	0.20–0.50
2018	41	**0.02**	0.00–0.06	10	0.45	0.20–0.75	22	**0.13**	0.03–0.25	29	**0.03**	0.00–0.09

[a] CI = confidence interval.
[b] No survey was conducted at Clear AFS in 2013 because deep persistent snow along survey routes precluded surveys
[c] Prior to 2016 1 survey route for ruffed grouse was completed near Delta Junction and Tok. In 2016 an additional survey route was added near both Delta Junction and Tok.
[d] In 2017 an additional survey route was added near Tok.
Note: Significant differences between years where the number of stops was different are not shown because a direct comparison between numbers in those years is not appropriate.

Table 4. Mean number of male ruffed grouse estimated per listening post (stop) with bootstrap 95% confidence intervals for survey locations on Fort Wainwright-Yukon Training Area (YTA), Fort Wainwright-Donnelly Training Area (DTA), Fort Wainwright-Gerstle River Training Area (GRTA), and DTA/GRTA combined within the Fairbanks and Interior road system region, Alaska, 2011–2018. Numbers in bold indicate a statistically significant difference from the previous the year (α = 0.05).

	YTA (10 stops)		DTA (13 stops)		GRTA (12 stops)		DTA/GRTA combined	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
2011	--	--	0.34	0.17–0.54	0.25	0.04–0.50	0.30	0.16–0.44
2012	0.32	0.14–0.50	0.44	0.23–0.71	0.38	0.19–0.58	0.43	0.27–0.59
2013	**0.06**	0.00–0.16	0.31	0.08–0.56	0.08	0.00–0.25	**0.26**	0.14–0.42
2014	0.30	0.00–0.70	**0.67**	0.33–1.04	0.08	0.00–0.25	0.39	0.17–0.63
2015	0.40	0.10–0.75	0.83	0.52–1.14	**0.35**	0.15–0.60	**0.60**	0.38–0.82
2016	0.50	0.15–1.00	0.62	0.38–0.83	0.35	0.15–0.58	0.49	0.32–0.67
2017	0.25	0.06–0.51	0.33	0.13–0.59	**0.06**	0.00–0.19	**0.20**	0.08–0.37
2018	**0.00**	0.00–0.00	**0.02**	0.00–0.06	0.05	0.00–0.13	**0.03**	0.00–0.07

[a] CI = confidence interval.

Wing Collections

There were 57 ruffed grouse hunter-harvested wing samples collected from the FIRS region in RY16 and 133 collected during RY17 (Table 5). Most of the wings were collected from Units 20B and 20D, which are the most accessible units in the FIRS region. The proportion of juveniles in the harvest appears to have remained relatively stable from 2015 to 2017, suggesting good juvenile production during that time period.

Table 5. Total number and proportion of juvenile ruffed grouse with binomial 95% confidence intervals based on harvested wing collections from within the Fairbanks and Interior road system region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2011 = 1 July 2011–30 June 2012).
[b] CI = confidence interval.

Habitat Improvement Work

In 2017, the SGP in collaboration with Division of Forestry and through support from Founding Forty, a nonprofit, statewide conservation group, and funds from the federal Wildlife Restoration Program completed a habitat modification project near Delta Junction for the benefit of ruffed grouse breeding and brood rearing habitat. Over 200 acres of habitat was treated with a roller chopper with more treatment areas planned for winter 2018–2019. The SGP plans to establish spring drumming routes within and adjacent to treated areas to assess the value of these projects to local ruffed grouse populations.

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). However, no work has been completed in Alaska to examine the relationship with winter weather patterns and ruffed grouse abundance. Therefore, with financial support from the nonprofit conservation group Founding Forty and Wildlife Restoration Program funds, the SGP initiated a project to evaluate the relationship between winter weather variables and ruffed grouse abundance. The project is a collaboration between the DWC and an outside investigator, Dr. Glen Liston (InterWorks Consulting LLC), who has developed a spatially-explicit SnowModel that can calculate snow distribution and depth and snow cover duration (among other variables) across a specified area using meteorological data (Liston and Elder 2006).

SHARP-TAILED GROUSE

Spring Breeding Surveys

Spring lek counts of male sharp-tailed grouse occurred 18–25 April 2017 and 16–26 April 2018 in DJAP and the adjacent Delta Junction Bison Range (DJBR) near Delta Junction. Survey conditions were generally good, with seasonably warm weather and mostly light to moderate winds (0–6 kph with rare gusts up to 21 kph). It appears as though sharp-tailed grouse numbers may have peaked in 2017 although there was no significant difference in the mean number of males observed per lek between 2016 and 2017 (t = -0.50, *P-val* = 0.62). Numbers appear to have declined in 2018 as the mean number of males observed per lek on the DJAP and DJBR decreased significantly from 2017 to 2018 (Table 6; t = 2.39, *P-val* = 0.02).

Until 2018 contractors for the Unites States Army performed lek surveys on military lands on and near Fort Greely south of Delta Junction within the DTA and GRTA. However, U.S. Department of Defense funding for wildlife surveys on military lands was substantially reduced in 2018 and lek surveys on military lands were completed by SGP staff. Going forward it appears as though SGP staff will be responsible for lek surveys on military lands if they are to continue. With the current SGP staffing levels this added workload may be unsustainable and a process of prioritizing leks to be monitored would be prudent. Sharp-tailed grouse count data from leks on military lands suggest that numbers appear to have been on the decline since 2014 yet have remained relatively stable for the last 3 years. 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 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) leks monitored in earlier years were few and likely sites with 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 two issues inherently lead to a negative bias in the estimate over time (Hagen 2011).

Since 2013 the SGP in cooperation with UAF Cooperative Extension has been working to identify leks near Tok, Alaska. At least 11 leks have been identified since 2013; however, 7 of these sites are considered satellite leks because of either their relative size and proximity to larger leks or ephemeral nature in years of high grouse abundance. At this time there are only 3 known leks that have consistently had birds present in a given year; this small sample size of occupied leks limits their usefulness in providing information on population trends. The SGP hopes to identify additional leks in the future to aid in reporting population trends across the broader FIRS region.

Table 6. Mean number of male sharp-tailed grouse estimated per lek with bootstrap 95% confidence intervals from surveys of leks within the Delta Junction Agricultural Project (DJAP) and on the Delta Junction Bison Range (DJBR), and leks on military lands within Fort Wainwright-Donnelly Training Area (DTA), Fort Wainwright-Gerstle River Training Area (GRTA), and Fort Greely, and all leks combined within the Fairbanks and Interior road system region, Alaska, 2007–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

	DJAP/DJBR			DTA/GRTA/Ft. Greely			All Leks Combined		
Year	Leks counted	Mean (males/lek)	95% CI[a]	Leks counted	Mean (males/lek)	95% CI[a]	Leks counted	Mean (males/lek)	95% CI[a]
2007	25	2.68	1.48–3.92	4	6.50	0.50–16.75	29	3.10	1.76–5.14
2008	30	2.73	1.67–3.90	4	4.75	0.00–12.00	34	2.94	1.76–4.38
2009	32	1.69	0.87–2.56	4	5.75	0.00–12.00	36	2.11	1.14–3.39
2010	33	1.82	1.03–2.85	7	5.29	2.00–10.00	40	2.50	1.45–3.68
2011	32	2.10	1.22–3.03	8	7.38	3.75–11.38	40	3.08	1.93–4.55
2012	32	2.00	1.09–3.09	8	4.38	1.63–7.75	40	2.51	1.49–3.72
2013	22	3.52	1.77–5.67	12	3.58	2.08–5.67	34	3.57	2.19–5.17
2014	25	3.65	2.33–5.23	6	4.00	1.20–7.25	31	3.75	2.52–5.08
2015	23	4.25	2.61–6.13	15	3.00	1.59–4.62	38	3.77	2.63–5.09
2016	23	3.88	2.35–6.00	20	2.38	1.15–3.85	43	3.23	2.11–4.67
2017	24	4.69	3.04–6.55	21	2.67	1.18–4.68	45	3.72	2.52–4.93
2018	32	**2.17**	1.18–3.29	26	2.40	1.19–3.73	58	2.30	1.50–3.14

[a] CI = confidence interval.

Note: Estimates for this report include data from all leks visited, which differs from the 2016 SSG report where only leks visited in consecutive years were used for estimates.

Brood Surveys

Since 2016, the 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 the dog located grouse, the dog handler controlled their dog, and a second person recorded biological and distance (distance of group from transect line) data. These data provide important demographic information (e.g., ratio of juveniles per adult, average brood size, birds/km) to managers prior to the hunting season. In 2017 surveys were conducted over 4 days during the last 2 weeks of July. Survey conditions in 2017 were generally good with temperatures averaging 18.7°C (range: 13.8°C to 22.6°C) and winds averaging 2.4 kph (range: 0 kph to 8.5 kph). In 2018 surveys were conducted over 3 days during the last 2 weeks of July. Survey conditions in 2018 were generally good with respect to temperature but less than ideal with respect to wind. In 2018 temperatures averaged 16.1°C (range: 7.2°C to 22.3°C) and winds averaged 1.1 kph (range: 0 kph to 3.2 kph). Wind conditions during the surveys were often calm or light and variable, which resulted in dogs flushing birds ahead of observers. This made aging birds very difficult and sometimes impossible and resulted in a conservative estimate of the average number of chicks in 2018. Direct comparison of chicks per brood are not appropriate for 2016–2018 because of changes to the survey methodology between years. Despite this, anecdotal evidence from brood surveys suggests that the number of chicks per brood may have increased from 2016 to 2017 but likely decreased in 2018.

Wing Collections

There were 82 hunter-harvested sharp-tailed grouse wing samples within the FIRS region during RY16 and 160 wing samples during RY17 (Table 7). Juvenile production appears to have decreased from 2016 to 2017 but the values are not statistically different ($X^2 = 1.71$, *P-val* = 0.19).

Table 7. 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 region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2011 = 1 July 2011–30 June 2012).
[b] CI = confidence interval.

Spruce Grouse

Spring Breeding Surveys

Currently, DWC has no spruce grouse population assessment projects within the FIRS region. Hunters reported seeing good numbers of spruce grouse throughout the Interior during the 2016 and 2017 hunting seasons.

Wing Collections

There were 107 hunter-harvested spruce grouse wing samples collected within the FIRS region during RY16 and 160 collected during RY17 (Table 8). Although the number of juveniles in the harvest declined slightly from 2016 to 2017 the difference was not significant (X^2 = 0.88, *P-val* = 0.35) and it appears as though juvenile production has been good for the past 5 years.

Table 8. 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 region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2011 = 1 July 2011–30 June 2012).
[b] CI = confidence interval.

Rock Ptarmigan

Spring Breeding Surveys

In the FIRS region, rock ptarmigan roadside counts were completed from 27 April to 16 May in 2017 and from 28 April to 21 May in 2018. In 2017, surveys were completed near Donnelly Dome along the Richardson Highway, at Mount Fairplay along the Taylor Highway (Unit 20E), near 12-mile Summit and Eagle Summit along the Steese Highway (Unit 25C), and along a portion of Primrose Ridge in DNP (Unit 20C). The same surveys were completed in 2018 except for those near 12-mile Summit or Eagle Summit along the Steese Highway. Surveys were conducted early in the morning and during periods with little to no precipitation to standardize methods as much as possible. In most years roadside counts were conducted once and therefore no estimate of precision in the numbers are available. However, repeat counts have been conducted at Mount Fairplay and the data suggest a decrease in the average number of rock ptarmigan observed per listening post from 2017 to 2018 (Table 9; t = 4.9, *P-val* < 0.001). It is important to note the small sample size (n = 7) results in large confidence intervals and limits our ability to draw strong conclusions regarding population trends. The maximum counts from surveys where repeat counts were not available (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 ptarmigan populations may be relatively stable at low density near Donnelly Dome and relatively stable at higher density near Primrose Ridge in DNP. Although data from 2018 were unavailable, rock ptarmigan numbers may have increased near 12-mile and Eagle Summits from 2016 to 2017.

Table 9. 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 region, Alaska, 2015–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

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

[a] CI = confidence interval.

In addition to the roadside surveys, in 2015 DWC began conducting spring breeding surveys of territorial males within a 34-km^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 DWC conducts the rock ptarmigan survey near Eagle Summit provides an estimate of abundance (or density) rather than a relative index of abundance. Although transect length changed slightly from 2015 to 2016, making direct comparisons between those years inappropriate, it appears that ptarmigan numbers have increased each year data has been collected. Data from 2016 to 2017 suggest that the population of rock ptarmigan near Eagle Summit increased, although the difference between number of males observed per stop was not statistically significant between years (Table 10; z = 0.52, *P-val*= 0.61).

Table 10. Mean number of territorial male rock ptarmigan estimated per square kilometer with 95% confidence intervals using distance sampling methodology within a study area on the Steese Highway within the Fairbanks and Interior road system region, Alaska, 2015–2018.

Year	Mean (males/km^2)	95% CI[a]
2015	1.15	0.80–1.65
2016[b]	1.66	1.22–2.25
2017	1.83	1.36–2.46
2018	NS[c]	NS[c]

[a] CI = confidence interval.
[b] Transect length changed slightly from 2015 to 2016 so direct comparison between those years is not appropriate.
[c] No survey.

Brood Surveys

Since 2016 the DWC has completed rock ptarmigan brood surveys near Eagle Summit with the help of volunteers and their trained pointing dogs. Volunteers and their dogs walked predetermined transects while the dog located grouse, the dog handler controlled their dog, and a second person recorded biological and distance (distance of group from transect line) data. These data provide important demographic information (e.g., ratio of juveniles per adult, average brood size, birds/km) to managers prior to the hunting season. In 2017 surveys were completed over 3 days during the last week of July. Survey conditions in 2017 were generally good with temperatures averaging 14.3°C (range: 14°C to 17.9°C) and winds averaging 10.6 kph (range: 2.4 kph to 21.7 kph). In 2018 surveys were completed over 4 days during the last week of July. Survey conditions in 2018 were generally good with temperatures averaging 17.6°C (range: 6.6°C to 30.0°C) and winds averaging 3.0 kph (range: 0 kph to 14.3 kph). The average number of chicks per brood decreased between 2016 and 2017 (Table 11), suggesting lower juvenile production in the summer of 2017. In 2018 the average number of chicks per brood group was slightly higher than the previous year, suggesting juvenile production was similar to 2017.

Table 11. Number of rock ptarmigan chicks observed per brood group within a study area on the Steese Highway within the Fairbanks and Interior road system, Alaska, 2016–2018.

Year	Sample Size (*n*)	Mean (chicks/brood)	Range (chicks/brood)
2016	4	6.25	2–13
2017	5	3.20	1–6
2018	6	3.83	2–7

Wing Collections

Only 6 hunter-harvested rock ptarmigan wing samples were collected within the FIRS region during RY16 and 21 samples in RY17 (Table 12). It is most likely that the low number of wings collected is a reflection of hunter participation in the wing collection program and not rock ptarmigan abundance or hunter effort as spring surveys indicated populations were likely stable to increasing in areas surveyed in those years. 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 numbers.

Table 12. 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 region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2011 = 1 July 2011–30 June 2012).
[b] CI = confidence interval.

Research

Concern by both members of the public and 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 1965) 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, the SGP initiated a 3-year research project in spring 2015. This study was extended in 2018 to include data collection on movements and overwinter survival of juvenile (young-of-the-year) rock ptarmigan. Since 2015, 180 rock ptarmigan (94 females, 59 males, and 27 juveniles) have been captured and fitted with VHF radio transmitters to document movement patterns, survival, and nesting success of this heavily hunted population. Preliminary data suggest movements generally differed by sex. Juvenile and adult males remained on or very near the breeding grounds throughout the year. However, juvenile and adult females dispersed varying distances (up to 170 km) away from the breeding grounds to where they spent much of the winter months. 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).

In 2018 the DWC received funding and initiated field work for a graduate research project that would build on ongoing research at Eagle Summit as well as completed research along the Denali Highway (Merizon et al. 2018; Unit 13B). The graduate research project aims to examine the reproductive ecology of rock ptarmigan near Eagle Summit and the Denali Highway from 2018 to 2020. Estimates of nest initiation rates, clutch size, nest success, sex ratio at hatch, and brood survival will be compared between the two populations.

WILLOW PTARMIGAN

Spring Breeding Surveys

In the FIRS region, willow ptarmigan surveys were completed from 27 April to 10 May 2017 and from 28 April to 16 May 2018. Surveys occurred along a portion of the DNP road just west of the Savage River, within the DTA near Delta Junction, and near Mount Fairplay along the Taylor Highway. Prior to 2018 surveys along the route within the DTA was conducted by military contractors. In 2018 the U.S. Department of Defense reduced funding for wildlife monitoring on military lands so SGP staff completed surveys along this route in 2018.

Within the DNP, spring breeding abundance of willow ptarmigan has been increasing the last few years, although the difference between years is not significant (Table 13; *P-values* ≥ 0.32). Willow ptarmigan abundance within the DTA appears to have remained relatively stable at low density for the last 3 years based on the mean number of males observed per stop. Further east willow ptarmigan abundance near Mount Fairplay likely increased from 2016 to 2017 but then decreased from 2017 to 2018 as the mean number of males observed per stop was significantly different from 2016 to 2017 ($t = -3.63$, *P-val* < 0.001) and again from 2017 to 2018 ($t = 4.92$, *P-val* < 0.0001).

Table 13. 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 Fort Wainwright-Donnelly Training Area (DTA) near Delta Junction within the Fairbanks and Interior road system region, Alaska, 2014–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

	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

[a] CI = confidence interval.

Wing Collections

A total of 5 hunter-harvested willow ptarmigan wing samples were collected within the FIRS region during RY16 and 16 during RY17 (Table 14). 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 14. Total number and percent juvenile willow ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Fairbanks and Interior road system, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2011 = 1 July 2011–30 June 2012).
[b] CI = confidence interval.

SNOWSHOE HARE

Abundance Surveys

Roadside counts of snowshoe hares were conducted from 18 April to 16 May 2017 near Delta Junction, Anderson, and along the Steese Highway and in late June near Donnelly Dome. In 2018, roadside counts were conducted from 20 April to 3 May near Delta Junction, and Anderson, and in late June near Donnelly Dome. In addition to the roadside counts conducted by SGP, DNP 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 last peak in the snowshoe hare cycle for eastern Interior was in 2007 or 2008 and for the western Interior 2008 or 2009 (Table 15). Therefore, the next peak in the hare cycle was expected to occur in either 2017 or 2018 for the eastern Interior and in 2018 or 2019 for the western Interior. Indeed, count data for the eastern Interior suggests that the hare cycle peaked either in 2017 or 2018. Count data suggest hare numbers have been on the increase for the last 5 years in the western Interior, but it is still too early to tell if numbers reached a peak in 2018.

Table 15. Interior snowshoe hare population survey data, Alaska, 2005–2018. All data is reported as the maximum number of snowshoe hares observed per count area unless otherwise noted.

Year	DNP[a]	Anderson[b]	Delta[c]	Delta BBS[d]	Donnelly BBS[e]	Tok[f]	Steese[g]
2005	6.25	--	--	57	10	--	--
2006	25.20	--	--	129	NS[i]	--	--
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	NS[i]	NS[i]	5	1	--	0
2014	0.53	NS[i]	4	8	1	--	1
2015	0.48	1[j]	4[j]	6	4	--	NS[i]
2016	0.53	7	28	32	14	--	3
2017	6.29	23	72	52	26	42	19
2018	10.75	105	55[k]	32[l]	28	56	NS

[a] Denali National Park count survey is conducted by the National Park Service (C. McIntyre, personal comm.). This is the number of snowshoe hares seen per hour during field work.
[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.
[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] NS = no survey.
[j] Two of the 3 survey routes were counted.
[k] Gusting winds during survey.
[l] Partial survey.

♦ ♦ ♦

Alaska Range

For purposes of this report the Alaska Range region includes Units 9B, 9A, 11, 13C, 13B, 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). Sooty grouse are not found in this region.

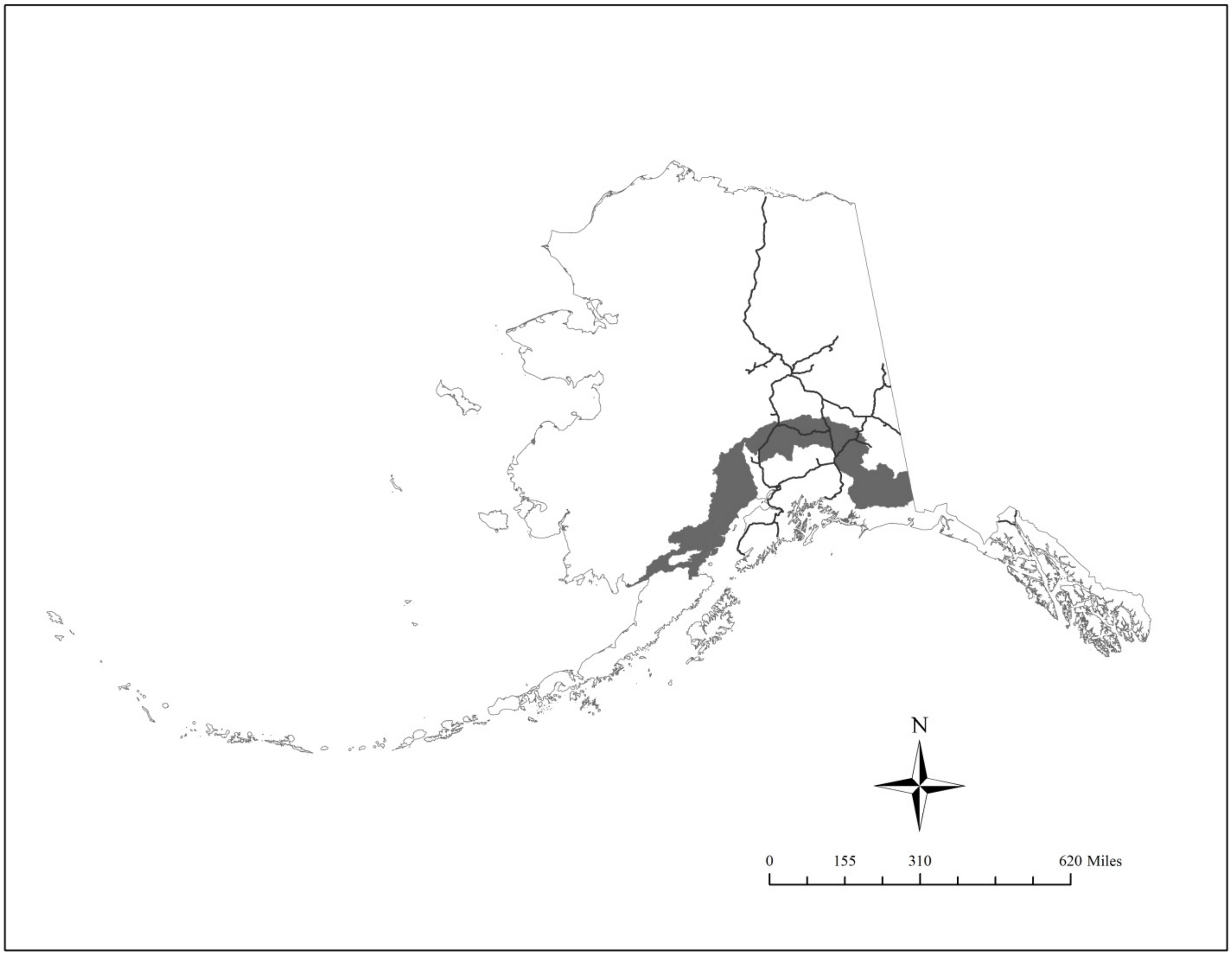

Figure 4. Map of the Alaska Range region.

BOARD OF GAME

During its February 2018 meeting in Dillingham, the Alaska Board of Game (BOG) addressed several regulatory proposals addressing grouse, ptarmigan, and hare throughout the Alaska Range region (a portion of DWC Region 4). The BOG amended and passed proposal 120, aligning the ptarmigan hunting season dates in Units 13B and 13E. Both units open 10 August and now close on 15 February. This is a reduction of hunting opportunity of 6 weeks in Unit 13E but an increase of opportunity in 13B by 2.5 months. Daily bag limits remain unchanged.

The BOG also modified the management of Alaska hare in Unit 9. Historic regulations had no closed season and no salvage requirement. By passing proposal 135 the BOG created a season from 1 November to 31 January, restricted harvest to 4 per year, and required the salvage of either the hide or meat for Alaska hare throughout Unit 9. In addition, reporting the harvest is encouraged through the King Salmon ADF&G office so that the DWC can learn more about harvest, effort, and public observations of the species on the landscape.

These new regulatory changes will take effect during the RY18 season.

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 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.

In April 2018, the Bureau of Land Management office in Glennallen began searching for and monitoring sharp-tailed grouse leks in the vicinity of the Alyeska Pipeline corridor south of Sourdough. Several areas were located with several displaying males present. Lek search and monitoring efforts will continue in spring 2019.

Wing Collections

Three (3) sharp-tailed wings were collected by hunters during RY16 and 6 during RY17 in the Alaska Range. No inference can be made on overall juvenile production based on such a small sample. Low harvest in this region is a function of primarily limited access to the best sharp-tailed grouse habitat in this region.

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 to high during RY16 and RY17. However, reports closer to King Salmon suggested lower abundance of spruce grouse in the vicinity of Lake Iliamna.

Wing Collections

Twenty (20) spruce grouse wings were collected by hunters during RY16 and 11 during RY17 in the Alaska Range. It is difficult to make meaningful inferences regarding juvenile production with small sample sizes. However, 60% of the RY16 sample wings were from juveniles and were collected primarily from Unit 13B. 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 29 April and 12 May in 2017 and between 8 and 22 May in 2018 at 4 survey locations (Unit 13B; Table 16). Counts of the mean number of breeding male rock ptarmigan observed per stop were significantly lower in 2017 and 2018 than in 2016 ($t = 2.85$, $P\text{-}val = 0.005$), which suggests a declining trend in the population. 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 RY16 and RY17 hunting seasons along the Denali Highway, hunters reported seeing and harvesting average to fewer-than-average numbers of rock ptarmigan in this region.

Table 16. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 43) with bootstrap 95% confidence intervals in Unit 13B, Alaska, 2014–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (males/stop)	95% CI[a]
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

[a] CI = confidence interval.

Brood Surveys

Between 17 and 19 July in 2017 and between 21 and 27 July in 2018, DWC completed the brood surveys for rock and willow ptarmigan in the Alaska Range region. A total of 3 separate survey locations were completed along the Denali Highway annually. Only 2 small broods of rock ptarmigan were documented each year along 33 km of transects in this region. Despite a few previous observations, rock ptarmigan were not anticipated at one survey location or portions of the other two. Merizon et al. (2018) documented that rock ptarmigan in Unit 13B tend to rear broods in areas distant from road-accessible locations and at high elevation (≥1,200 m). Accessibility is very important to efficiently and reliably enumerate and estimate brood sizes each year. Current brood survey locations are most effective at estimating and enumerating willow ptarmigan brood success.

Wing Collections

Only 8 rock ptarmigan wing samples were collected from hunters during RY16 in the Alaska Range region. No rock ptarmigan wings were collected within this region during RY17.

Research

To better understand the Unit 13B rock ptarmigan population in relation to hunting and BOG action in 2009, the SGP began a study in spring 2013 with 3 primary objectives: 1) document rock ptarmigan movement patterns relative to proximity to roadways, 2) estimate annual mortality, and 3) monitor nesting behavior, predation, and hatch success (Merizon et al. 2018). Between spring 2013 and summer 2016, DWC staff captured and radiocollared 102 rock ptarmigan (53 males, 49 females) in Unit 13B. The greatest movements occurred by adult and juvenile females (>50 km) in the fall and winter. High mortality was documented in the fall (hunter harvest and predation) while generally lower mortality was documented after November. Arctic ground squirrels (*Spermophilus parryii*) were documented as the most prevalent nest predator for both rock ptarmigan eggs and live chicks.

Beginning in spring 2018, the SGP initiated a second study in the Alaska Range for rock ptarmigan (Please see “Research” in the Fairbanks and Interior road system region).

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

No white-tailed ptarmigan wings were collected by hunters during RY16 and RY17 in the Alaska Range region.

WILLOW PTARMIGAN

Spring Breeding Surveys

Willow ptarmigan spring breeding surveys occurred between 29 April and 14 May 2017 and between 27 April and 24 May 2018 at 7 survey locations (Table 17). At all survey locations observers recorded higher counts of breeding male willow ptarmigan than the previous 5- and 10-year averages. In Unit13B, the mean number of males observed per stop was significantly higher in 2018 than in 2016 or 2017 (t = -3.36, *P-val* < 0.001). In Unit 13E, spring breeding abundance was significantly lower in 2018 than in 2016 (t = 2.01, *P-val* = 0.04) but not significantly lower than in 2017 suggesting a strong difference in willow ptarmigan abundance patterns between Units 13B and 13E.

Table 17. 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 region, 2014–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

	Unit 13B		Unit 13E	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
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**	1.42–2.04	**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

[a] CI = confidence interval.

Brood Surveys

Between 17 and 19 July 2017 and between 21 and 27 July 2018, SGP completed brood surveys for rock and willow ptarmigan in the Alaska Range region (Table 18). Surveys of 3 separate locations were completed along the Denali Highway annually with numerous survey transects at each location. Average willow ptarmigan brood size increased in 2017 to 5.9 chicks per brood from 4.3 chicks per brood in 2016. However, brood size decreased in 2018 to 3.4 chicks per brood. The number of broods per survey kilometer increased from 0.4 broods per km (n = 12 km) in 2016 to 0.8 broods per km (n = 19 km) in 2017. However, with increased volunteer support in 2018, transects were added and repeated. In 2018, volunteers documented fewer broods on more survey kilometers (0.1 broods per km; n = 46 km). This further underscores the low early chick survival in this region, which was likely the result of poor post-hatch weather pattern.

Table 18. Number of willow ptarmigan chicks observed per brood group within Units 13B and 13E within the Alaska Range, 2016–2018.

Year	Sample Size (*n*)	Mean (chicks/brood)	Range (chicks/brood)
2016	5	4.3	1–6
2017	16	5.9	1–13
2018	6	3.4	1–5

Wing Collection

The number of hunter-harvested willow ptarmigan wing samples collected within the Alaska Range region totaled 164 during RY16 and 95 during RY17 (Table 19). The proportions of juveniles were very similar, not significantly different, in RY15, RY16, and RY17 ($z = 0.04$, *P-val* = 0.84). These data support brood survey results that documented high chick survival and recruitment into the hunted population in RY16 and RY17. Hunters reported very good hunting and high densities of willow ptarmigan throughout the RY16 and RY17 seasons in this region.

Table 19. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Alaska Range region, regulatory years[a] 2011–2017.

Regulatory year	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

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 appears to be very high and likely at or very near its 9- to 10-year population cycle peak in 2018 based on DWC, hunter, and other outdoor enthusiast observations. Snowshoe hare will likely begin to decline by 2019.

ALASKA HARE

Abundance Surveys

Currently, there are no Alaska hare survey locations in the state. However, Unit 9 is one of the Units that has been and will continue to be included in an ongoing research project that will examine movement, mortality, and attempt to develop a long-term abundance survey technique for this species (see also ‘Western Rural’).

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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 metro area of Wasilla and Palmer. It also includes Cordova, Glennallen, Talkeetna, and 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.

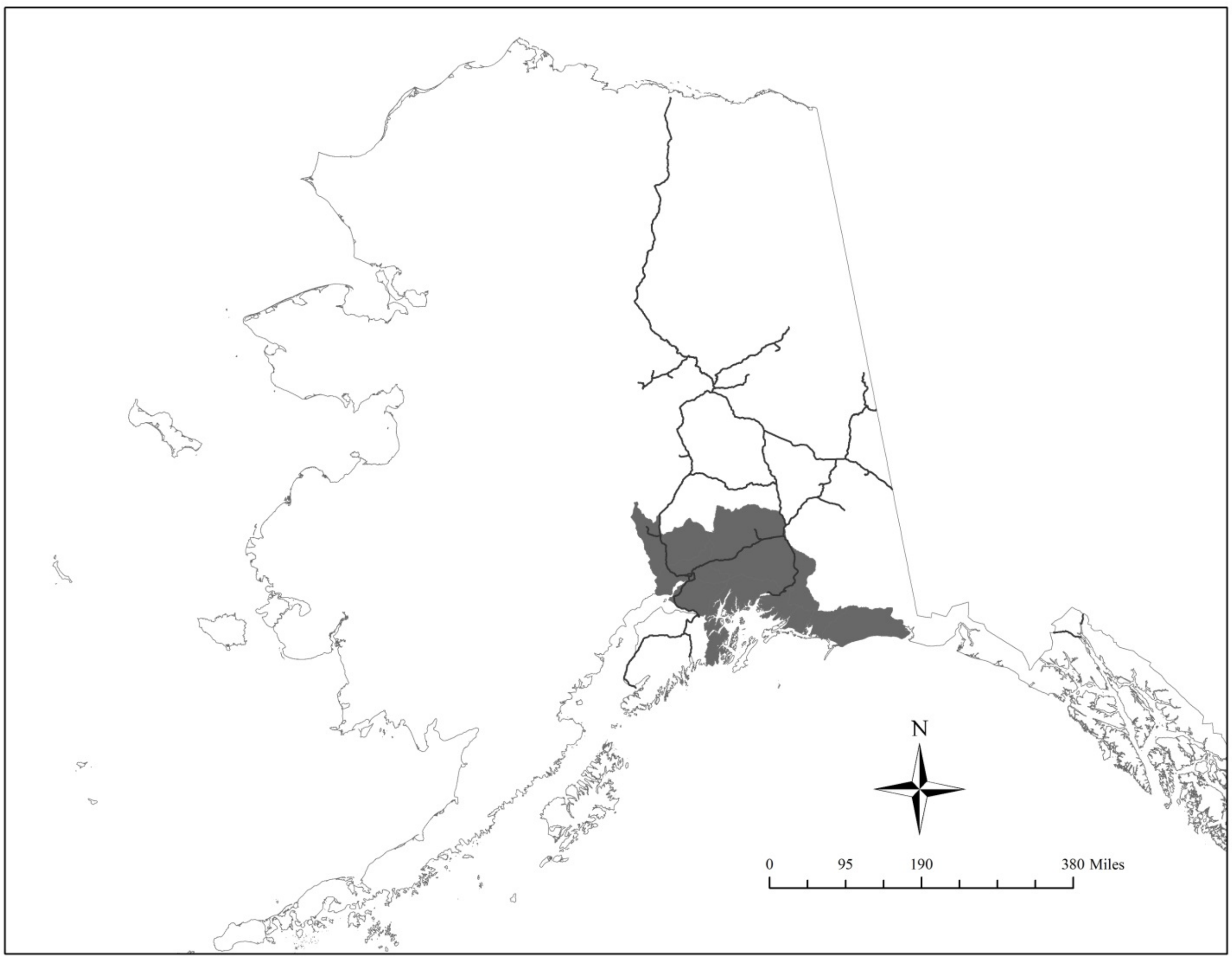

Figure 5. Map of the Southcentral road system region, Alaska.

Ruffed Grouse

Spring Breeding Surveys

The SGP's ruffed grouse spring breeding surveys in Palmer and the Matanuska Valley Moose Range (Unit 14A) occurred between14 April and 6 May 2017 and between 13 April and 10 May 2018 (Table 20). The mean number of males heard per stop in 2017 and 2018 was not significantly different than in 2016 (t = 1.16, P-val = 0.25) and the population appears to be quite stable. Drumming surveys were initiated earlier in 2017 than previous years due to warm and dry conditions. However, in 2018 cool and wet spring temperatures postponed several survey efforts. Each route was completed at least 3 times during both the 2017 and 2018 survey periods.

Table 20. Mean number of spring breeding male ruffed grouse (drummers) per listening post (stop, *n* = 46) with bootstrap 95% confidence intervals in Unit 14A, Alaska, 2009–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (drummers/stop)	95% CI[a]
2009	0.17	0.09–0.25
2010	0.15	0.08–0.22
2011	0.16	0.00–0.29
2012	**0.07**	0.01–0.12
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

[a] CI = confidence interval.

Due to increasing human noise along historic routes in the Mat-Su, in 2013, SGP and local DWC staff began exploring new areas throughout the Mat-Su to create additional spring breeding survey routes. Beginning in spring 2015, SGP created and began conducting surveys along 2 additional routes northeast of Palmer that are less impacted by human noise and disturbance. The 2015 and 2016 spring breeding counts in Table 20 reflect those 2 new routes. The SGP plans to continue completing all 6 routes in 2019 unless human-caused noise levels are too high to rely on those data.

Since translocated ruffed grouse were released in Southcentral during the early 1990s, a typical 8- to 10-year population cycle has not been observed based on the ongoing spring drumming counts. Since a low in 2012, the Mat-Su population has remained quite stable with modest annual variation.

Wing Collections

Twenty-eight (28) hunter-harvested ruffed grouse wing samples were collected during RY16 and 31 during RY17 in the Southcentral road system region (Table 21). It is difficult to make meaningful inferences with low sample sizes; however, there was no significant difference in the proportion of juveniles in the harvest between RY15, RY16, and RY 17 (z = 0.45, P-val = 0.50). A high proportion of juveniles in the harvest during RY16 and RY17 suggests strong juvenile recruitment in both years.

Table 21. Total number and proportion of juvenile ruffed grouse with binomial 95% confidence intervals based on harvested wing collections within the Southcentral road system region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
2011	13, 14	4	1	0	5	0.20	0.01–0.07
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

SHARP-TAILED GROUSE

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

Beginning summer and fall 2017, sharp-tailed grouse became increasingly and repeatedly observed by hikers, hunters, and bird enthusiasts as far south as Anchorage, Point McKenzie, Susitna Flats near the mouth of the Ivan River on the western side of Cook Inlet, Alaska State Fair Grounds in Palmer, and throughout the Hatcher Pass area (north of Palmer). Several hunters turned in wings from harvested sharp-tailed grouse in Hatcher Pass to verify species. Throughout the winter and spring of 2018 outdoor enthusiasts continued reporting observations online and in-person to SGP staff in Palmer and Anchorage. Reports were verified with photos and detailed location information. The SGP staff will continue to monitor the recent movement of sharp-tailed grouse further into the Southcentral road system region and continue to provide updates in future reports. If spring lek locations are identified, SGP staff will make efforts to monitor those leks annually.

SPRUCE GROUSE

Between summer 2016 and fall 2017, a growing spruce bark beetle outbreak became apparent throughout Southcentral Alaska and the Kenai Peninsula (Wohlforth 2017). This most recent outbreak in the Southcentral road system region could have a potentially significant impact on the spruce grouse population that heavily utilizes mature white spruce for foraging and overwintering habitat.

Spring Breeding Surveys

Based on field observations and hunting reports from within Units 14 and 16 road-accessible areas, densities of spruce grouse appeared to be above average during fall 2016 and 2017. Many hunters reported seeing abundant spruce grouse within the entire Southcentral road system region, particularly during RY17.

Wing Collections

Seventy-three (73) hunter-harvested spruce grouse wing samples were collected during RY16 and 61 during RY17 (Table 22). The proportion of juveniles in both RY16 and RY17 supported the observations of abundant spruce grouse populations throughout the region. Although the proportion of juveniles in the harvest modestly decreased from RY16 (71%) to RY17 (64%) the difference was not significant ($z = 0.81$, $P\text{-}val = 0.37$). Overall juvenile production appears to have remained strong throughout the region since RY12 in the Southcentral road system region.

Table 22. Total number and proportion of juvenile spruce grouse with binomial 95% confidence intervals based on harvested wing collections within the Southcentral road system region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

ROCK PTARMIGAN

Spring Breeding Surveys

Rock ptarmigan spring breeding surveys occurred on 10 May in 2017 and on May 22 in 2018 in Unit 14C. DWC was unable to complete surveys in Unit 13A in 2017 or 2018 due to snow conditions and access.

Due to SGP and other DWC staff schedules and persistent strong winds along the survey route, spring breeding surveys were conducted only once in 2017 and 2018 (as in 2015 and 2016); therefore, confidence intervals are unavailable (Table 23). When surveys could not be completed multiple times during the breeding season, we used the maximum count as our index of abundance.

Survey data from Unit 14C in 2018 suggest rock ptarmigan numbers may be increasing from the low recorded in 2017. The mean number of rock ptarmigan males observed per stop within Unit 14C in 2017 was significantly higher in 2018 than in 2017 (t = -2.68, *P-val* = 0.02). Further, the mean number of rock ptarmigan a males observed per stop in 2018 was well above the recent 5-year (0.69 males/stop) and 10-year (0.71 males/stop) averages.

Table 23. Mean number of spring breeding male rock ptarmigan per listening post (stop, n = 7) with bootstrap 95% confidence intervals in the Southcentral road system region, Alaska, 2014–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (males/stop)	95% CI[a]
2014	0.64	0.48–0.80
2015	**1.00**	–[b]
2016	**0.43**	–
2017	0.29	–
2018	**1.14**	–

[a] CI = confidence interval.
[b] With only one survey completed each year it was not possible to calculate confidence intervals 2015–2018.

Throughout Units 14C and 13A in both 2016 and 2017, hunters reported seeing and harvesting near average numbers of rock ptarmigan near popular hunting locations in the Chugach and Talkeetna mountains.

Brood Surveys

The SGP completed brood surveys for rock, white-tailed, and willow ptarmigan on 16 and 23 July in 2017 and 28 July in 2018 in the Southcentral road system region. Two separate survey routes were completed near Hatcher Pass in both years. An average of 2.0 chicks per brood was documented in each year (Table 24). These brood sizes are low when compared to other locations and years, suggesting high early chick mortality both years in monitored populations. Surveys were repeated at least twice within the last 2 weeks of July each year to increase the confidence of our results. These surveys will be continued annually so that meaningful comparisons can be made regarding annual population productivity.

Table 24. Number of rock ptarmigan chicks observed per brood group within the Southcentral road system region, 2016–2018.

Year	Sample Size (n)	Mean (chicks/brood)	Range (chicks/brood)
2016	3	6.7	2–12
2017	1	2.0	2
2018	2	2.0	1–3

Wing Collections

Twenty-six (26) hunter-harvested rock ptarmigan wing samples were collected during RY16 and 15 during RY17 (Table 25). In RY16, most samples were collected from Unit 14C (Chugach Mountains) and they suggest a low proportion of juveniles in the harvest (*n* = 6). Due to the low sample size it is difficult to make meaningful inferences about differences in juvenile production between the years where data are available.

Table 25. Total number and proportion of juvenile rock ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Southcentral road system region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently there are no spring breeding surveys for white-tailed ptarmigan established in Alaska. Very little breeding, population productivity, or mortality data are available for white-tailed ptarmigan 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

The SGP completed brood surveys for rock, white-tailed, and willow ptarmigan on 16 and 23 July in 2017 and 18, 19, and 28 July in 2018 within the Southcentral road system region. One survey route was completed near Hatcher Pass in both years. Averages of 3.0 chicks per brood in 2017 (n=2), and 0 chicks per brood in 2018 (n=2) were documented. Brood surveys for white-tailed ptarmigan are not completed anywhere else in the state. As a result of these very low sample sizes it is difficult to make any meaningful inferences regarding early chick survival of white-tailed ptarmigan in this region. In 2018, late-spring snow and cold temperatures were documented throughout the Talkeetna and Chugach mountains that likely played a significant role in early chick survival. Surveys were repeated at least twice within the last 2 weeks of July each year to increase the confidence of our results. These surveys will be continued annually, and efforts will be made to create additional survey routes, provided sufficient volunteer support exists.

Wing Collections

Thirty-six (36) hunter-harvested white-tailed ptarmigan wing samples were collected during RY16 and 18 during RY17 (Table 26). It appears as though the proportion of juveniles in the harvest has stabilized since RY13, and the differences were not significant (P-value encompasses changes seen in consecutive years from RY14 through RY17; $P\text{-}val > 0.8$). Through 7 years of collecting white-tailed ptarmigan wings (almost entirely from Units 14A and 14C) it appears as though overall juvenile recruitment into the hunted population is lower on average than rock or willow ptarmigan. Although this is likely explained by the low annual sample size, 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.

In RY16 and RY17, equal numbers of wing samples were collected between the southern Talkeetna and western Chugach mountains. Few other reports from hunters or outdoor enthusiasts were available regarding abundance and presence of white-tailed ptarmigan.

Table 26. Total number and proportion of juvenile white-tailed ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Southcentral road system region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

WILLOW PTARMIGAN

Spring Breeding Surveys

Spring breeding surveys of willow ptarmigan occurred on 8 May in 2017 and between 18 April and 14 May in 2018 (Table 27). Two survey routes were completed in Unit 14C; however, DWC was unable to complete the route in Unit 13A during 2017 or 2018.

A significant increase in the mean number of males observed per post ($t = -2.03$, *P-val* = 0.05) suggests male willow ptarmigan breeding abundance increased between 2016 and 2017. Hunters generally reported seeing many more willow ptarmigan in the southern Talkeetna and western Chugach mountains during the fall and winter of 2016–2017 and 2017–2018. However, 2018 spring breeding counts were not significantly higher than 2017. Maximum counts remained higher than the recent 5- and 10-year averages. One survey route in Unit 14C recorded an historic high count of breeding males in 2018.

Table 27. Mean number of spring breeding male willow ptarmigan per listening post (stop, *n* = 18) with bootstrap 95% confidence intervals in the Southcentral road system region, Alaska, 2014–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (males/stop)	95% CI[a]
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

[a] CI = confidence interval.

Brood Surveys

The SGP completed brood surveys for rock, white-tailed, and willow ptarmigan on 16 and 23 July in 2017 and 18, 19, and 28 July in 2018 within the Southcentral road system region. Two survey routes were completed near Hatcher Pass in both years. Zero willow ptarmigan were recorded along either route in both years. The SGP is evaluating the effectiveness of these routes to enumerate and estimate willow ptarmigan brood size. Additional survey routes will be examined in July 2019 and may be used to either supplement or completely replace existing routes.

Wing Collections

Sixty (60) hunter-harvested willow ptarmigan wing samples were collected during RY16 and 110 during RY17 (Table 28). The proportion of juveniles declined significantly in RY16 from RY15 ($z = 5.67$, *P-val* = 0.02); however, the proportion of juveniles increased to near the long-term average (60%) in RY17 ($z = 2.14$, *P-val* = 0.14). Hunter observations of high willow ptarmigan abundance during RY17 throughout the Southcentral road system provide additional support that juvenile production was higher in 2017 than 2016.

Table 28. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Southcentral Road System region, Alaska, regulatory years[a] 2011–2017.

Regulatory year	Unit	Adult	Juvenile	Unk	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

SNOWSHOE HARE

Abundance Surveys

Currently, there are no snowshoe hare survey locations within the Southcentral road system region. However, strong anecdotal evidence from DWC staff, hunters, and other outdoor enthusiasts suggests snowshoe hare abundance is very high. Snowshoe hares are likely nearing the peak of their 9- to 10-year population cycle that will likely occur in 2019 (generally 1 year after the FIRS and Alaska Range regions). The local snowshoe hare population is anticipated to begin declining in 2020 or 2021.

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Kenai Peninsula

For 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 forests, subalpine shrub, and alpine habitats. 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.

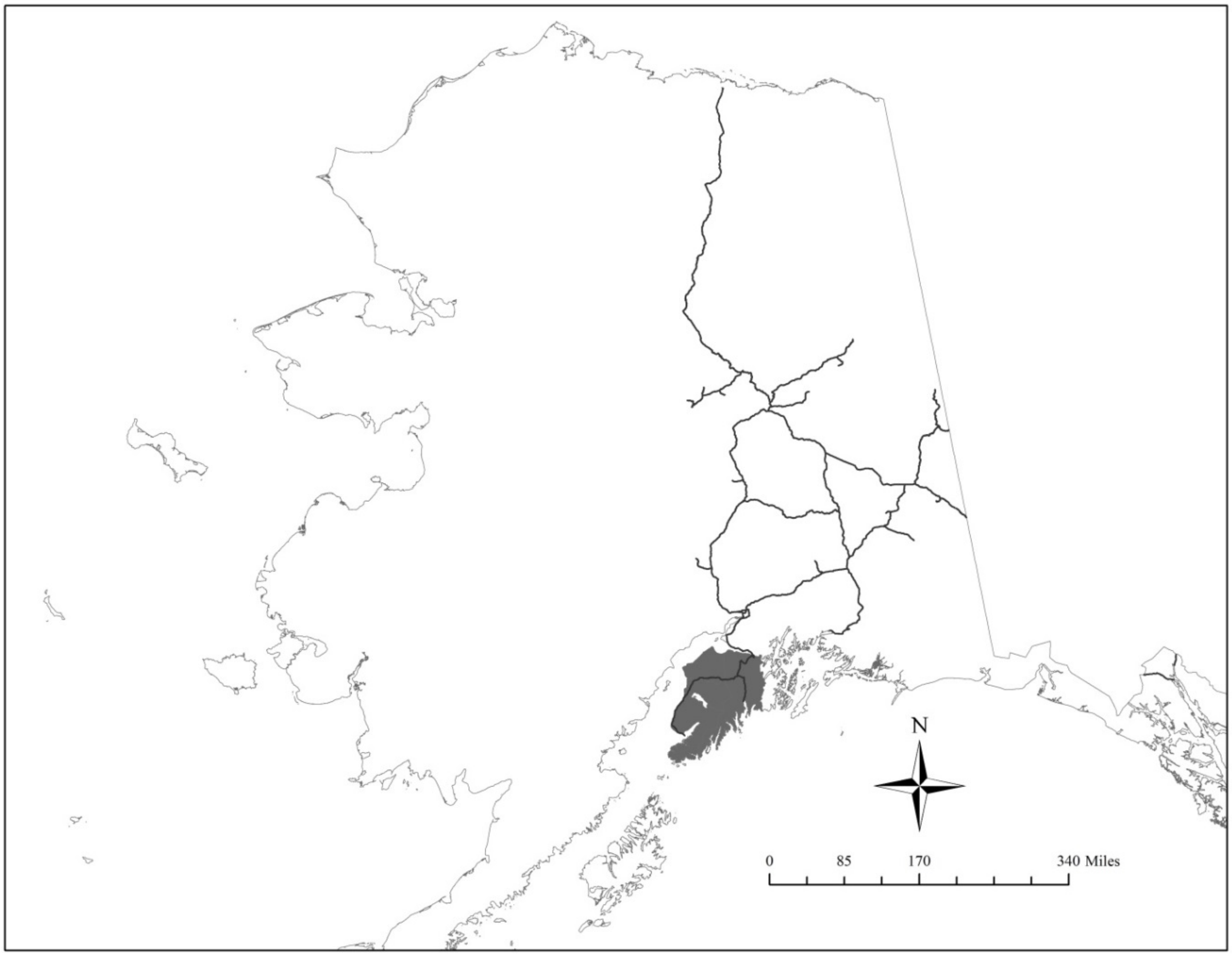

Figure 6. Map of the Kenai Peninsula region, Alaska.

RUFFED GROUSE

Spring Breeding Surveys

In spring 2017 and 2018, SGP was unable to complete the ruffed grouse breeding survey on Skilak Loop Road. 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 appears to be at very low density and SGP asks for any help in reporting observations of ruffed grouse on the Kenai Peninsula. Reports can be submitted via e-mail at the SGP web page (www.smallgame.adfg.alaska.gov).

Wing Collections

No ruffed grouse wings were collected from the Kenai Peninsula during RY16 or RY17. Ruffed grouse abundance on the Kenai Peninsula is expected to remain very low during RY18. 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.

SPRUCE GROUSE

The ongoing spruce bark beetle infestation on the Kenai Peninsula persisted through 2017 and 2018. 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 relatively high throughout RY16 and RY17, based on hunter reports and DWC staff field observations.

Wing collections

Ninety (90) hunter-harvested spruce grouse wing samples were collected during RY16 and 115 in RY17 (Table 29). The proportion of juveniles in RY16 (74%) was significantly higher than in RY15 (z = 4.72, *P-val* = 0.03). Juvenile spruce grouse production in 2016 was likely very strong following a relatively warm, dry summer. However, the proportion of juveniles in RY17 declined significantly from RY16 (z = 7.07, *P-val* = 0.008).

Table 29. Total number and proportion of juvenile spruce grouse with binomial 95% confidence intervals based on harvested wing collections within the Kenai Peninsula region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

ROCK PTARMIGAN

Spring Breeding Surveys

Volunteers and DWC staff conducted spring breeding surveys between 28 April and 6 May in 2017 and between 14 April and 11 May in 2018 throughout the Kenai Mountains (Table 30). Overall breeding abundance appeared to be higher in 2017 but was not significantly higher than in 2016 ($t = -1.69$, *P-val* = 0.11). In addition, 2018 breeding estimates were not significantly lower than in 2017 ($t = 1.12$, *P-val* = 0.27). All but 1 survey location on the Kenai Peninsula are primarily in willow ptarmigan habitat; however, rock ptarmigan can be heard and recorded along several of the routes. SGP staff will continue to explore and delineate new routes that would be appropriate for rock ptarmigan; however, access through deep snow is a chronic issue when trying to enumerate spring breeding abundance of this species on the Kenai Peninsula.

Table 30. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 21) with bootstrap 95% confidence intervals in the Kenai Mountains in the Kenai Peninsula region, Alaska, 2015–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (males/stop)	95% CI[a]
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

[a] CI = confidence interval.

DWC staff and outdoor enthusiast observations suggest that juvenile production was poor for rock ptarmigan in the summer of 2018 as relatively few broods were seen and those observed were small in size. Much like in other high elevation portions of southern Alaska, the Kenai and Chugach mountains received cool and often wet conditions throughout June 2018, with periodic mountain snow to 1,200 m. This weather pattern likely had a negative effect on early chick survival.

Wing Collections

No hunter-harvested rock ptarmigan wings were collected during RY16 or RY17 on the Kenai Peninsula.

White-tailed Ptarmigan

Spring Breeding Surveys

Currently there are no white-tailed ptarmigan breeding or brood survey efforts within this region. Dall sheep (*Ovis dalli*) hunters and hikers reported observing very few and small broods of white-tailed ptarmigan throughout the Kenai and Chugach mountains during summer 2018. Similar to rock ptarmigan (above) June 2018 weather patterns likely had a negative effect on chick survival and subsequent abundance for RY18.

Wing Collections

A total of 7 hunter-harvested white-tailed ptarmigan wing samples were collected during RY16 and RY17. The small sample size makes it difficult to make any meaningful inferences.

Willow Ptarmigan

Spring Breeding Surveys

Volunteers and DWC staff completed willow ptarmigan spring breeding surveys between 28 April and 6 May in 2017 and between 20 April and 11 May in 2018 in Units 7, 15A, and 15B (Table 31). The mean number of males observed per stop in 2017 was significantly higher than in 2016 (t = -2.12, *P-val* = 0.04). Although spring breeding abundance appeared to be lower in 2018 based on the mean number of males observed per stop it was not significantly different than in 2017 (t = -0.02, *P-val* = 0.97).

Several survey locations in Unit 7 have historically been difficult to access due to persistent and deep snow and that remained the case in 2017 and 2018. However, survey crews were able to visit each survey route at least once in both years. Due to these challenges, SGP staff canceled 1 survey route in Unit 7 and 1 in Unit 15 and created 2 new routes in spring 2018 (Unit 7) to address the chronic access challenges caused by deep snow. Both of the new routes show promise and will reflect areas that are frequented by hunters in the fall and winter. They will continue to be monitored indefinitely along with the remaining routes that were initiated in 2013 and 2014.

In addition, DWC staff, local hikers, and other outdoor enthusiasts reported observing very few and small broods of willow ptarmigan throughout the Kenai and Chugach mountains during summer 2018. Similar to rock and white-tailed ptarmigan, June 2018 weather patterns likely had a negative effect on chick survival and subsequent abundance for RY18.

Table 31. Mean number of spring breeding male willow ptarmigan per listening post (stop, *n* = 56) with bootstrap 95% confidence intervals in the Kenai Peninsula region, Alaska, 2015–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

Year	Mean (males/stop)	95% CI[a]
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

[a] CI = confidence interval.

Wing Collections

Only 12 hunter-harvested wings were collected in RY16 and 11 in RY17 (Table 32). The small sample size makes it difficult to make any meaningful inferences.

Table 32. Total number and proportion of juvenile willow ptarmigan with binomial 95% confidence intervals based on harvested wing collections within the Kenai Peninsula region, Alaska, regulatory years[a] 2011–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

SNOWSHOE HARE

Abundance Surveys

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, population density peaked in 2011, remained high during winter 2011–2012 and began to drop in summer 2012. Pellet counts suggest that snowshoe hare continued to decline during summer 2013. Hare densities likely reached the population cycle low in 2015–2016 and are expected to peak between 2020–2021.

The snowshoe hare population cycle typically occurs from north to south and the Kenai Peninsula often peaks 2–3 years after the FIRS region and 1–2 years after 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, and white-tailed ptarmigan are not found in this region. Sharp-tailed grouse are rarely observed within this region.

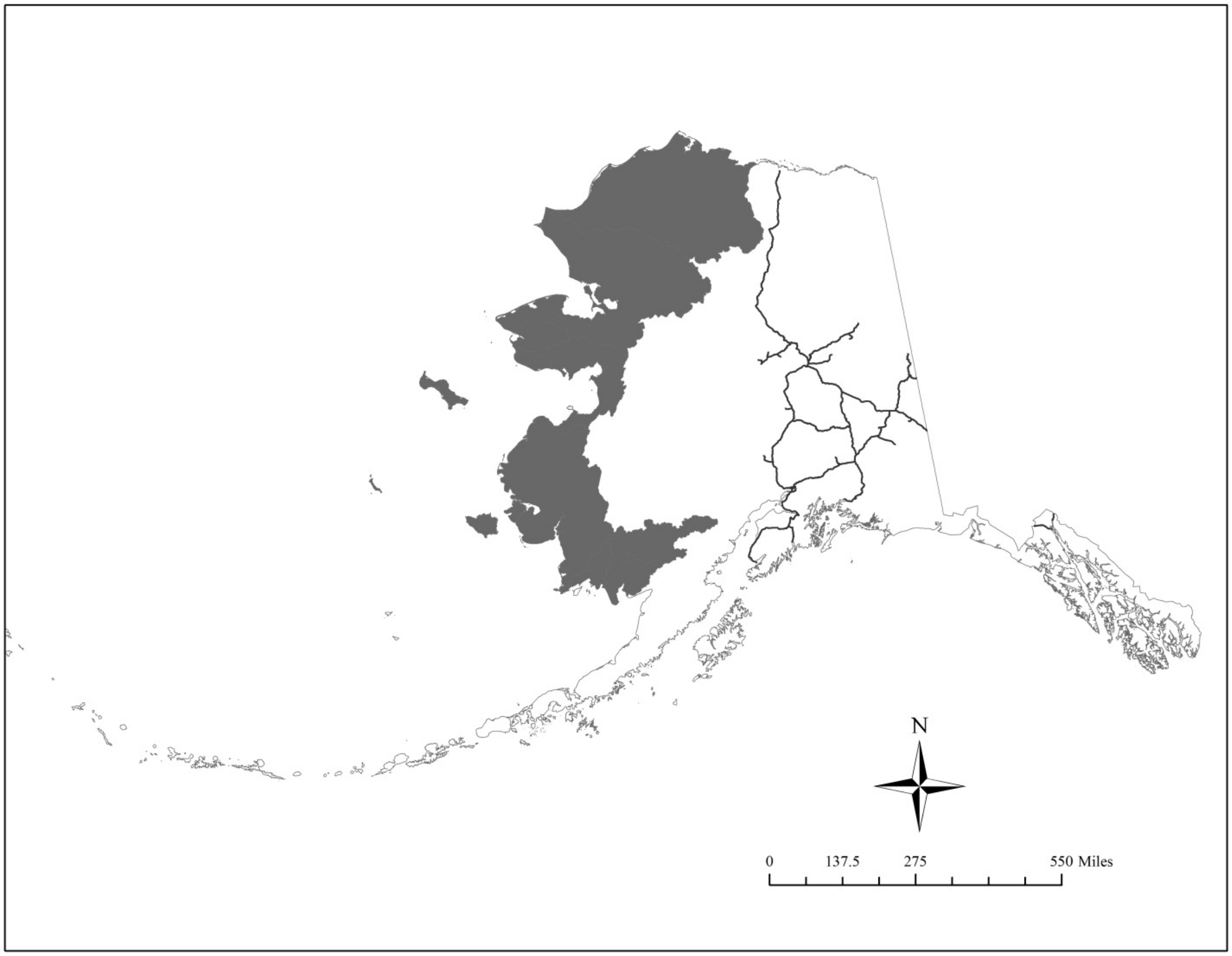

Figure 7. Map of the Western Rural region, Alaska.

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 abundance appeared to be low near Dillingham and King Salmon and forested areas adjacent to the Y-K Delta in 2017 and 2018. DWC staff and hunter reports suggest continued poor chick recruitment and overall low to very low abundance during the summer 2018. The Western Rural region has suffered 2–3 springs and summers with cool and wet conditions that likely had a negative effect on chick survival. Spruce grouse abundance is expected to remain low to very low through RY18.

Wing Collections

No hunter-harvested spruce grouse wings were collected in RY16 or RY17. Between RY12 and RY14, Dillingham High School students and their science teacher donated their harvest to the SGP to estimate harvest composition as part of a citizen science project in Unit 17. Since RY15 that program has stopped and the SGP has lost a reliable source of wings from the region although efforts to continue to recruit citizen scientists are currently ongoing.

ROCK PTARMIGAN

Spring Breeding Surveys

Beginning in spring 2018, DWC staff in Nome created and initiated 2 new spring breeding surveys for rock and willow ptarmigan along the Nome road system. Due to the location of the surveys, they primarily enumerate willow ptarmigan. Surveys were completed between 1 and 12 May 2018 and no rock ptarmigan were documented on either route. If reliable access allows, in the future the DWC may look for and create a route that would focus more on rock ptarmigan spring breeding habitat that is generally located at slightly higher elevation.

In addition to the new DWC breeding surveys, the Peregrine Fund completed rock ptarmigan surveys on the Seward Peninsula from 2015 through 2018 (D. Anderson, Director of Gyrfalcon Conservation Project, Peregrine Fund, Boise, Idaho, personal communication), in coordination with a gyrfalcon study. Based on spring and summer 2018 surveys it appears that overall abundance was high along the Nome road system although final data analysis has not been completed. Finalized study results will be included in future reports. DWC staff and hunter observations suggest good production and survival of rock ptarmigan in the southern portion of Unit 22.

Based on DWC staff observations from near Bethel (Unit 18) and Dillingham (Unit 17) rock ptarmigan abundance appears to be very low. This trend is likely the result of poor weather conditions experienced over the last few years during both the summer (cool temperatures and wet conditions) and winter (warm temperatures and low snowfall).

Wing Collections

Six (6) hunter-harvested rock ptarmigan wings were collected in RY16 and 1 in RY17 which came from the Nome road system (Unit 22C). No inference can be made with such a small sample size.

WILLOW PTARMIGAN

Spring Breeding Surveys

Beginning in spring 2018, DWC staff in Nome created and completed 2 new breeding surveys for rock and willow ptarmigan along the Nome road system. Surveys were completed between 1 and 12 May 2018. Observers recorded 1.79 males per stop along the survey route. Although it is impossible to make any inferences in population trends from 1 year of data, relative to other monitored willow ptarmigan populations in the state, 1.79 males per stop suggests relatively high breeding abundance near Nome. Unit 22 hunters reported very high willow ptarmigan abundance throughout RY17 and survey results from 2018 support those observations. DWC staff and outdoor enthusiasts also report very high abundance of willow ptarmigan throughout the Nome road system (Unit 22) during spring and summer 2018.

However, DWC staff observations from near Bethel (Unit 18) and Dillingham (Unit 17) suggest willow ptarmigan numbers continue to remain very low, as they have been since 2016 (Patrick Jones, Area Management Biologist– Bethel and Neil Barten, Area Management Biologist– Dillingham personal communication; see ‘Rock Ptarmigan’ above.

Researchers with the Peregrine Fund completed willow ptarmigan surveys on the Seward Peninsula from 2015 through 2018 (D. Anderson, personal communication) in coordination with a gyrfalcon study. Based on spring and summer 2018 surveys it appears that overall abundance of willow ptarmigan was high along the Nome road system although final data analysis has not been completed. Finalized study results will be included in future reports.

Late summer and early fall hunter observations from near Nome suggest chick production and survival of juvenile willow ptarmigan in the area were excellent in 2017 and 2018.

Wing Collections

SGP collected 109 hunter-harvested willow ptarmigan wing samples in RY16 and 183 in RY17. All samples from RY14 through RY17 were collected from along the Nome road system and do not reflect the entire Western Rural region. The proportion of juveniles in the harvest has remained high for the last 3 years (Table 33; $z = 0.06$, *P-val* = 0.80) suggesting excellent juvenile production in Unit 22 in 2016 and 2017.

Table 33. Total number and proportion of juvenile willow ptarmigan based on harvested wing collections within the Western Rural region, Alaska, regulatory years[a] 2012–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

Alaska Hare

Alaska hare can only be found in the Western Rural and Alaska Peninsula regions. 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 2017 and 2018 the SGP and other DWC staff visited several communities throughout the range of the Alaska hare (Units 17, 18, 22, and 23) in an effort to evaluate capture techniques, assess long-term monitoring techniques through the use of fecal pellets, and talk with rural residents. In May 2018, the DWC was successful in capturing and radiocollaring the first Alaska hare. The SGP and other DWC staff are initiating a 3- to 4-year study beginning in July 2018 to examine movement and mortality through the use of radio collars, and to test various long-term monitoring techniques for eventual use throughout the species' range. Through the upcoming study the DWC is poised to learn a great deal more about this poorly understood species. Future updates on Alaska hare and the status of the species will be provided in future reports.

Based on field observations throughout its range, populations continue to remain well below what was historically observed in the 1950s and 1960s. It remains uncertain whether this has been 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 abundance has been increasing since 2016 with much higher snowshoe hare densities near Nome in 2018 than in the previous few years. Snowshoe hare also appear to be increasing in areas along the Kuskokwim River and throughout the Y-K Delta. Snowshoe hare densities seem to be sporadic in areas near Dillingham and King Salmon, with the most abundant concentrations of hares in dense stands of willow.

Alaska Peninsula

For purposes of this report the Alaska Peninsula region includes Units 8, 9, and 10 (Fig. 8). This area includes the communities of Cold Bay, Dutch Harbor, King Salmon, and Kodiak. The region includes coastal tundra, steep volcanic mountains, isolated islands, and small isolated spruce forests. There are numerous large lakes, and 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 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.

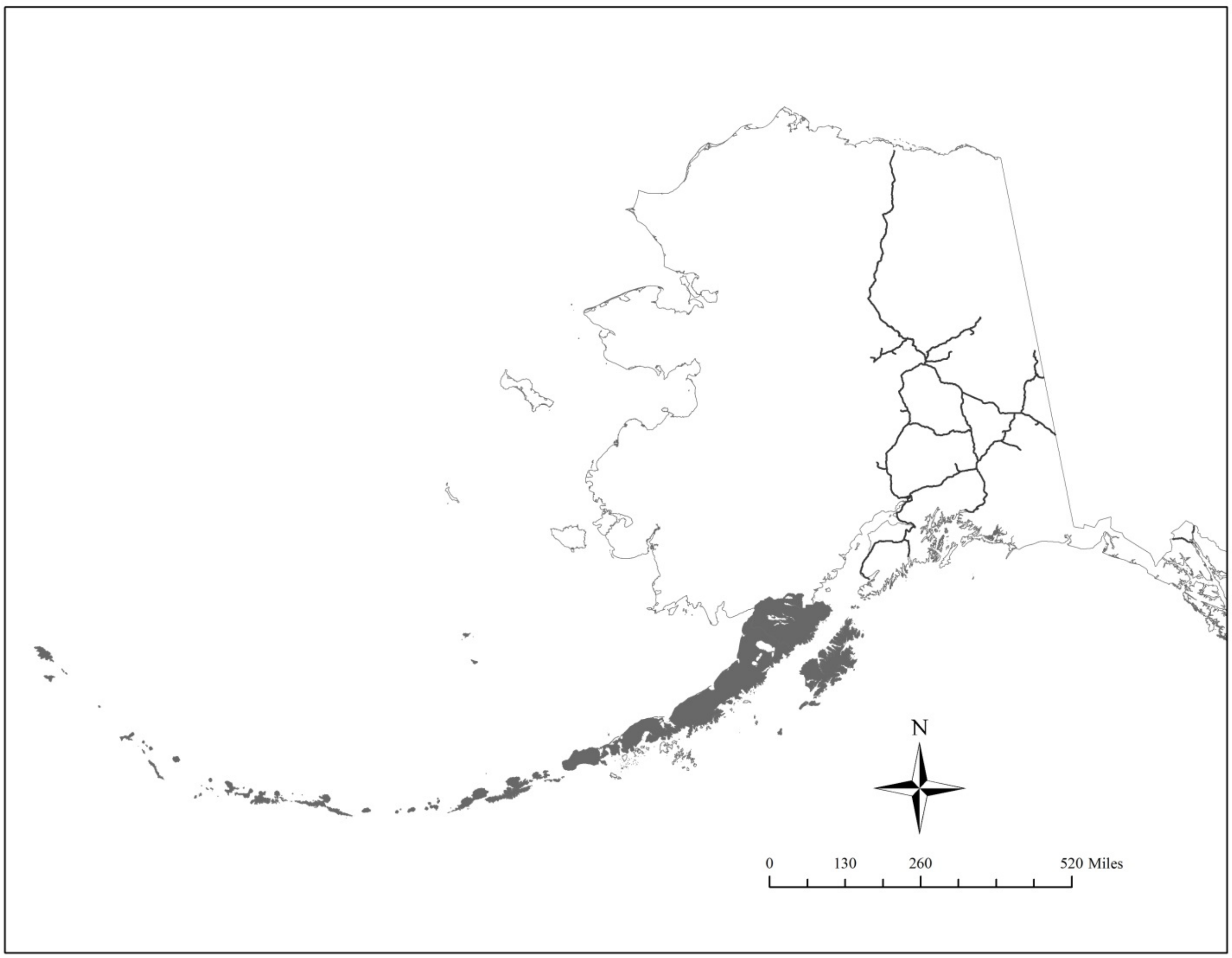

Figure 8. Map of the Alaska Peninsula region.

BOARD OF GAME

During the February 2018 meeting in Dillingham, the BOG addressed 2 regulatory proposals affecting Unit 9 ptarmigan and hare. The BOG amended and passed proposal 134 that changed the season dates to August 10 to February 28 and reduced the daily bag limit to 10 ptarmigan per day.

The BOG also modified the management of Alaska hare in Unit 9. Historic regulations had no closed season and no salvage requirement. Through passage of proposal 135 the BOG created a season from November 1 to January 31, restricted harvest to 4 per year, and required the salvage of either the hide or meat for Alaska hare throughout Unit 9. In addition, reporting the harvest is encouraged through the King Salmon ADF&G office so that the SGP can learn more about harvest, effort, and the public's observations of the species on the landscape. These new regulatory changes will take effect in RY18.

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 report continued low abundance of spruce grouse near King Salmon since 2015 (Dave Crowley, Area Management Biologist—King Salmon, personal communication). Although, during summer 2018 DWC staff reported a modest increase in the number of spruce grouse broods than had been observed in the previous 3–4 years.

ROCK PTARMIGAN AND WILLOW PTARMIGAN

Spring Breeding Surveys

Currently, there have been no ongoing, long-term rock or willow ptarmigan spring breeding or brood survey efforts within this region. However, based on observations from DWC staff, hunters, and rural resident within Unit 9 it appears that overall rock and willow ptarmigan abundance is low to very low throughout most of the Alaska Peninsula.

Overall, summer and winter weather patterns since 2015 have not been favorable for rock and willow ptarmigan throughout the region. The Alaska Peninsula has experienced several recent 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 patterns. In addition, the Peninsula has experienced several unusually warm, wet, and largely snow-free winters. Therefore, snow burrowing for thermal protection and predator avoidance has not been available throughout the lower elevation areas (<650-800m) and may have resulted in increased overwinter mortality.

Wing Collections

Only 9 hunter-harvested rock ptarmigan and 2 willow ptarmigan wing samples were provided in RY16 and 0 in RY17, making inferences about juvenile production impossible.

Alaska Hare

In Alaska, this species can be found only in the Alaska Peninsula and Western Rural regions. 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.

A large 3- to 4-year research study will begin in July 2018 to evaluate movement and mortality, and to evaluate long-term monitoring techniques (see the Western Rural region, Alaska Hare section of this report).

In Unit 9, Alaska hare have been observed recently near Lake Iliamna and several areas south of King Salmon. Hunters periodically report harvesting individual animals throughout the region. During January 2018 in Unit 9, SGP and other DWC staff attempted capturing and radiocollaring Alaska hare, collected pellets and talked with local residents. These efforts will continue into the future with the goal of learning more about this cryptic species.

Snowshoe Hare

Currently, DWC has no population assessment project for snowshoe hare in the Alaska Peninsula region. It is believed that snowshoe hares in the region are currently experiencing the same high population abundance found throughout Interior and Southcentral Alaska. Snowshoe hare abundance is expected to peak sometime between 2018 and 2020.

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Southeast

For purposes of this report the Southeast region includes Units 1–5 (Fig. 9). This area includes the coastal communities of Haines, Juneau, Ketchikan, Petersburg, Sitka, and Yakutat, as well as numerous smaller communities. This region is a temperate rainforest composed of a network of small to large islands covered largely by Sitka spruce, and mountain and western hemlock. 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. This region is accessible predominantly by air and boat. Ruffed grouse and snowshoe hare occur only at very low densities, primarily near large river deltas (i.e., Alsek, Stikine, and Tuka rivers). Sharp-tailed grouse and Alaska hare are not found in this region.

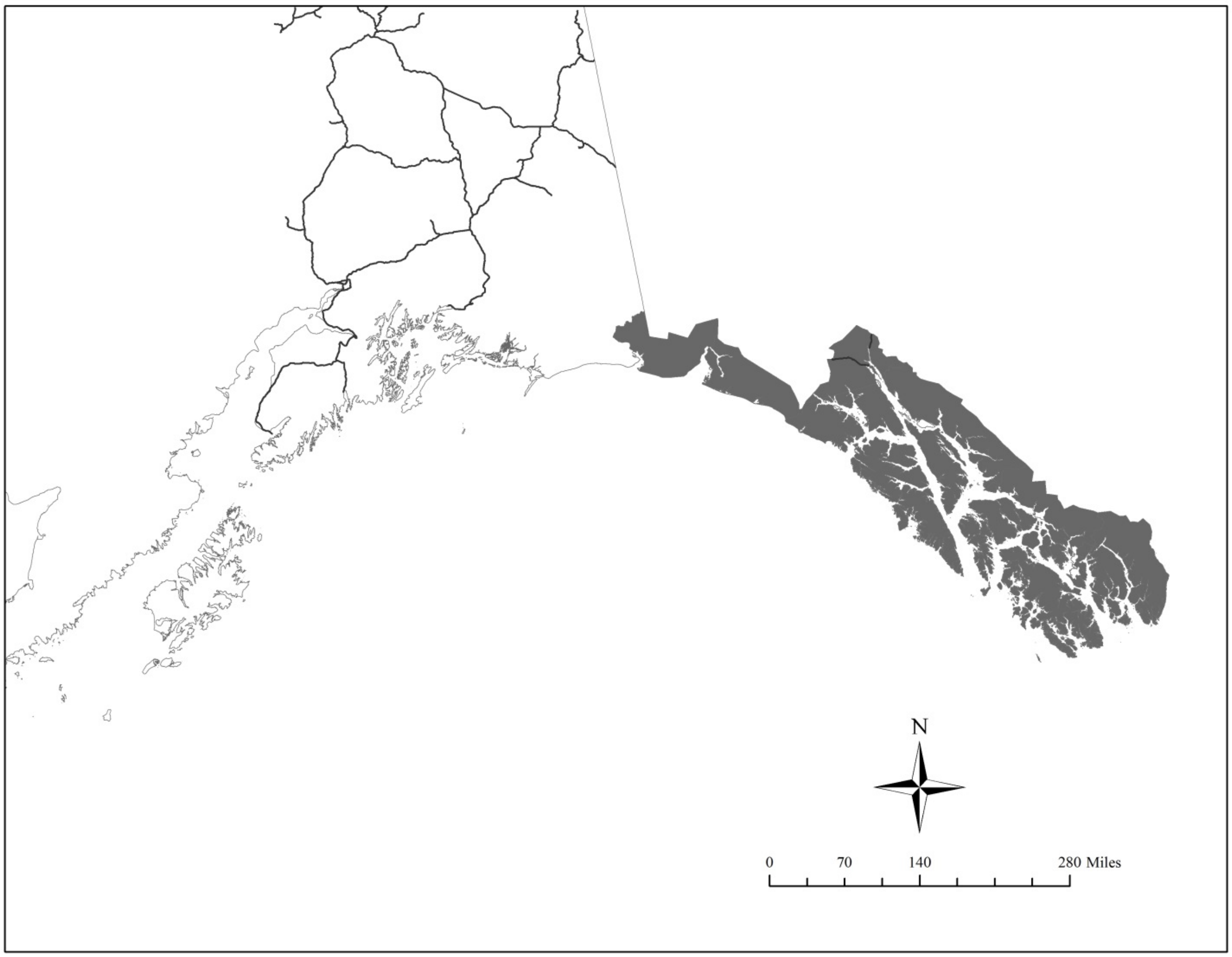

Figure 9. Map of the Southeast region, Alaska.

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 (*P. trichocarpa*) occur. Currently, abundance in these locations is unknown; hunters and outdoor enthusiasts periodically report observing ruffed grouse.

SOOTY GROUSE

Spring Breeding Surveys

Spring breeding surveys were completed between 8 April and 19 May 2017, and between 9 April and 22 May 2018 (Table 34). During both 2017 and 2018, access to the road system survey locations on Mitkof and Kupreanof islands was limited until late April due to deep snow. However, each survey route on those two islands was visited at least twice and, overall, survey conditions were good. In 2017 and 2018, spring breeding abundance appeared to be lower in both Units 1C and 3. Spring breeding abundance of sooty grouse likely decreased in Unit 1C from 2016 to 2017 as the mean number of males observed per post declined significantly (t = 2.87, *P-val* = 0.006) but not for Unit 3 (t = 0.96, *P-val* = 0.33). The data suggest slight declines from 2017 to 2018 in both units, but the change in the mean number of males observed per post was not significant (t = 0.83, *P-val* = 0.40). During the spring of 2018 hunters reported hearing average to above average numbers of hooting males in select locations distant from any road system (i.e., Admiralty and Kuiu islands).

Table 34. 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, 2015–2018. Numbers in bold indicate a statistically significant difference from the previous year (α = 0.05).

	Unit 1C		Unit 3	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
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

[a] CI = confidence interval.

Wing Collections

Fifty-nine (59) hunter-harvested sooty grouse wings were collected during RY16 and 42 in RY17 (Table 35). The proportion of juveniles was significantly higher in RY16 (z = 3.71, *P-val* = 0.05) than RY15. The proportion of juvenile sooty grouse in the harvest declined from RY16 to RY17 but the difference between years was not statistically significant (z = 1.12, *P-val* = 0.30). Most hunters reported high abundance of male sooty grouse during spring 2016 and fewer during the spring of 2017.

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 on 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.

Table 35. Total number and proportion of juvenile sooty grouse with binomial 95% confidence intervals based on harvested wing collections within the Southeast region, Alaska, regulatory years[a] 2012–2017.

Regulatory year[a]	Unit	Adult	Juvenile	Unk	Total	Proportion of juveniles	95% CI[b]
2012	1, 3, and 4	24	17	0	41	0.41	0.26–0.58
2013	1, 3, and 4	1	8	0	9	0.89	0.52–1.00
2014	1, 3, and 4	28	15	0	43	0.35	0.21–0.51
2015	1, 3, and 4	12	5	0	17	0.29	0.10–0.56
2016	1, 3, and 4	25	33	1	59	0.56	0.42–0.69
2017	1, 3, and 4	23	19	0	42	0.45	0.29–0.61

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2016 = 1 July 2016–30 June 2017).
[b] CI = confidence interval.

SPRUCE GROUSE

There is a small population of spruce grouse that resides only on Prince of Wales Island and the immediately adjacent islands. This population of spruce grouse is believed to be that of the 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, 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 mainland.

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Other Small Game Program Projects

Volunteers are becoming an increasingly important component of the statewide SGP. As a result, SGP staff has 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. In 2015, more than 100 volunteer hours were accrued. The total has continued to grow and from 2016 through July 2018, a total of 600 hours were accrued annually to help the SGP complete breeding and brood surveys. If you are interested in assisting the SGP please contact the small game biologist in Palmer or Fairbanks.

Beginning in July 2015, small game hunting curriculum became a part of the annual Alaskans Afield educational courses offered by ADF&G in both the Mat-Su and Fairbanks. These courses include a lecture that covers species, regulations, tactics, equipment, as well as learning how to field dress gamebirds. A second component of the class includes a 2- to 3-hour field trip that highlights various habitat features used by Alaska grouse and ptarmigan. With financial support from the Founding Forty, a nonprofit, conservation group, the SGP was able to offer these classes in many other communities in 2017 and 2018, including Nome, Soldotna, Juneau, and Ketchikan. Courses are also being discussed in Anchorage, Bethel, Kotzebue, and Petersburg. If you are interested in participating in a future class please visit the ADF&G hunter education homepage: http://huntereducation.alaska.gov (look under "Adult and Family Programs," which will take you to the Alaskans Afield webpage).

In addition to partnering with the Founding Forty on increased educational opportunities, the SGP has also continued to complete habitat modification projects in Tok and Delta Junction since 2015. These projects directly benefit ruffed and sharp-tailed grouse breeding, nesting, and brood rearing habitat. They also provide benefits to other species that depend on early successional habitats, including moose, snowshoe hare, and a variety of passerines and small mammals. Hunters can find maps of habitat projects near Delta Junction, Tok, as well as Palmer, and Fairbanks on the SGP website: www.smallgame.adfg.alaska.gov.

Management Implications

Between 2013 and 2017, the SGP completed a study on rock ptarmigan in Unit 13B examining movement, mortality, and nesting behavior (Merizon et al. 2018). This study was initiated to evaluate a regulatory change made in 2009 due to low abundance of this species. More than 100 male and female rock ptarmigan were radiocollared at 3 discrete locations throughout Unit 13B and movement and mortality were monitored twice monthly throughout each year.

This study documented that male rock ptarmigan tend to remain close to their breeding territories year-round. Females and juveniles had a higher likelihood of moving longer distances (10–95 km) from spring breeding and summer nesting locations during the fall, yet often returned to the same breeding locations the following spring.

During each relocation survey it was possible to determine whether a radiocollared bird was alive or dead. Through the analysis of the mortality data it was estimated that a bird that was located ≤3 km from a roadway (e.g., Denali or Richardson highways) had up to a 286% higher risk of mortality. Therefore, males defending their territories within 3 km of a roadway had a much higher likelihood of being harvested than those >3 km away. Through spring breeding surveys, it is clear that rock and willow ptarmigan breeding abundance has consistently been higher in areas distant from roadways. Some segments of the hunter population complain that ptarmigan abundance and harvest opportunities are reduced adjacent to roadways, which is likely where most ptarmigan hunting effort occurs. This research supports that there are localized effects in these areas and hunting is a likely contributor.

Annually, the SGP collects between 150 and 350 rock and willow ptarmigan wings from Unit 13 hunters to estimate harvest composition and population productivity (Carroll and Merizon 2017). In Unit 13, the harvest is largely bimodal, with an overwhelming majority of the harvest occurring during the late-winter portion of the season (15 February–31 March; season closure date in Unit 13A, C, D, and E is 31 March). During this time period, day length is increasing and snow conditions are generally good; most hunters use snowmachines for access (Merizon et al. 2015 and Merizon and Carson 2013).

From the rock ptarmigan study in 13B, the SGP was able to also understand mortality as it relates to season. The "fall season" was defined as August 10 through November, and the "winter season" as December through March. Results show that mortality for rock ptarmigan is relatively high through the fall, particularly within 3km of a roadway. This is somewhat expected and is very common for other studied ptarmigan and grouse populations throughout the Northern Hemisphere. Natural juvenile mortality tends to be very high during the fall and is considered to be largely compensatory. However, rock ptarmigan mortality is quite low during the winter season in 13B (season closure date for this unit has been 30 November).

During the same time period we were also completing a second and very similar radiocollaring study on willow ptarmigan, primarily in Unit 13E, where harvest is allowed through 31 March. We similarly documented in that study area, overall mortality began to increase as the winter season progressed from January through March

Grouse and ptarmigan research across the northern hemisphere has largely supported the belief that late winter harvest is additive. Assuming this is also occurring in Unit 13 it would be expected that birds that survive the fall season have a higher likelihood of contributing to the spring breeding population due to their overall low natural mortality in the winter, provided they're not harvested in the winter season as was suggested in the Unit 13E willow ptarmigan study.

We have completed 2 statewide small game hunter surveys (Merizon et al. 2015 and Merizon and Carson 2013). Through these efforts we have twice documented the phenomenon that very few ptarmigan hunters statewide typically harvest their daily bag limit (daily average bag per hunter in Unit 13 is approximately 1 ptarmigan). The most effective hunters are those who use snowmachines in late winter.

As a result, on a statewide level, adjusting daily bag limits may not provide as an effective means of managing a low or declining population as season duration would, unless that population is largely pursued by hunters using snowmachines as are often used by hunters in Unit 13.

Assuming that winter harvest is additive, what the SGP is learning about ptarmigan management is that there are a wide variety of management options to consider. In very general terms, ptarmigan management comes down to this: 1) shorter hunting seasons (ending before mid-February) increase the likelihood of higher spring breeding populations because natural mortality is believed to generally be low after November, or 2) longer hunting seasons through March results in additive mortality increases thus reducing the spring breeding populations.

Managing ptarmigan really comes down to a choosing which scenario hunters prefer, ample time opportunity through longer seasons with the likelihood harvest may be diminished due to the effect of late-winter hunting on ptarmigan populations, or shorter seasons with the higher likelihood of more birds on the landscape.

During the February 2018 meeting in Dillingham the BOG deliberated this very topic with regard to ptarmigan hunting regulations within Units 13B and 13E. After public testimony and deliberations, the BOG decided to shorten the season closure date in Unit 13E from 31 March to 15 February and synchronize season dates with adjacent Unit 13B. The SGP plans to continue evaluating the effects of this management scenario over the next 5–10 years.

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