Wildlife Management Report ADF&G/DWC/WMR-2017-1

Status of Grouse, Ptarmigan, and Hare in Alaska, 2015 and 2016

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Alaska Department of Fish and Game Division of Wildlife Conservation

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Cover Photo: Roosting rock ptarmigan, *Lagopus muta*, midwinter along the Denali Highway. ©2016 ADF&G, photo by Richard A. Merizon.

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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 (*Falcipennis canadensis*) grouse; and rock (*Lagopus muta*), white-tailed (*L. leucurus*), and willow (*L. lagopus*) ptarmigan. In addition, Alaska has 2 species of hare (Leporidae) including Alaska (*Lepus othus*) and snowshoe (*L. americanus*) hare. 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 (Mat-Su) Valley (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 Valley, 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 forest may be influencing 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), and Tok in 2014 (Unit 12). Spring breeding surveys have also been conducted intermittently on the Kenai Peninsula, near Fairbanks, and McGrath. 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 (RGS), has focused on habitat improvement projects intended to provide greater hunting and viewing opportunities near Fairbanks, Delta Junction, Tok, and the Mat-Su Valley.

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, the Tanana River, the 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.

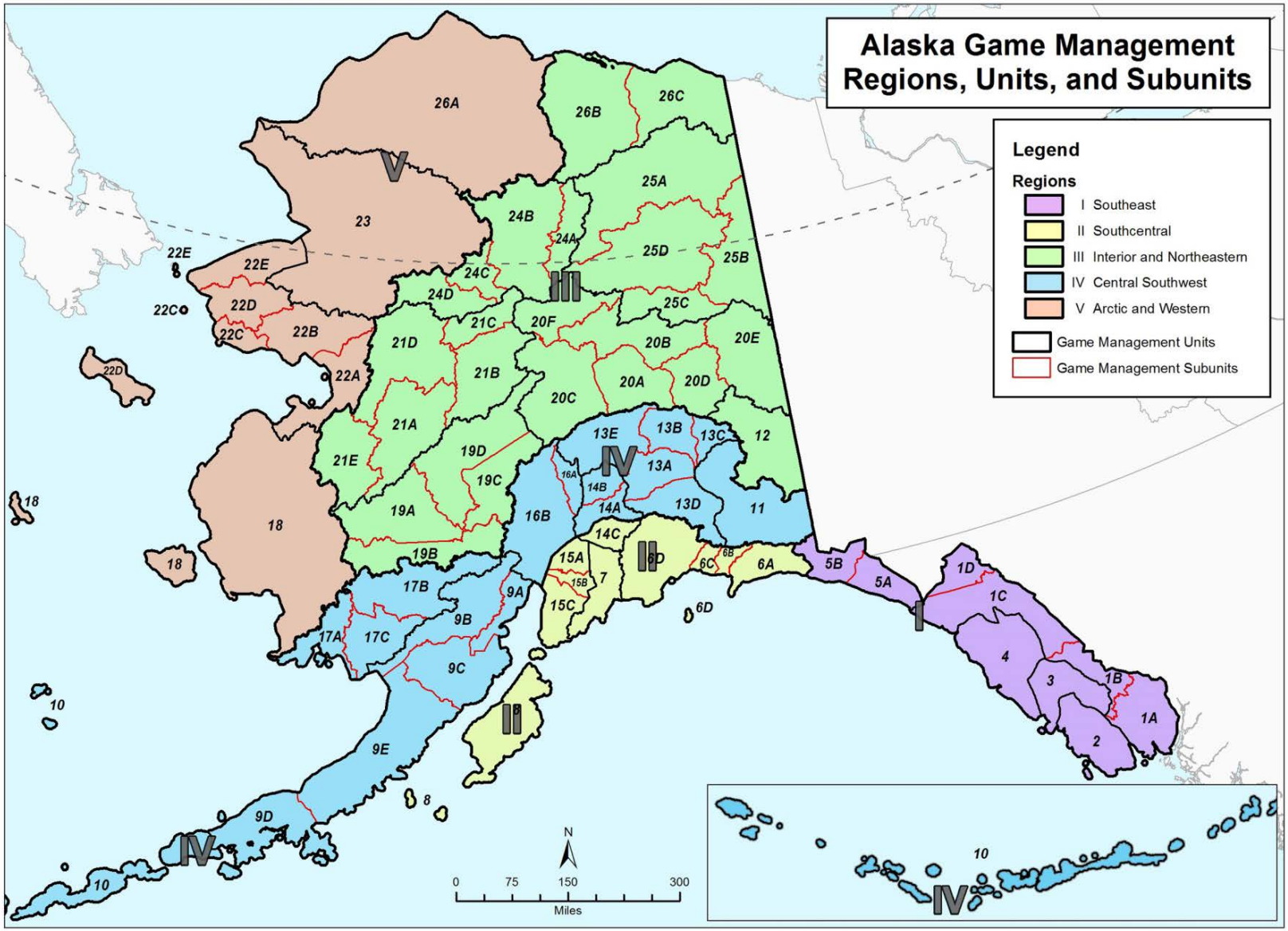

Figure 1. State of Alaska game management units.

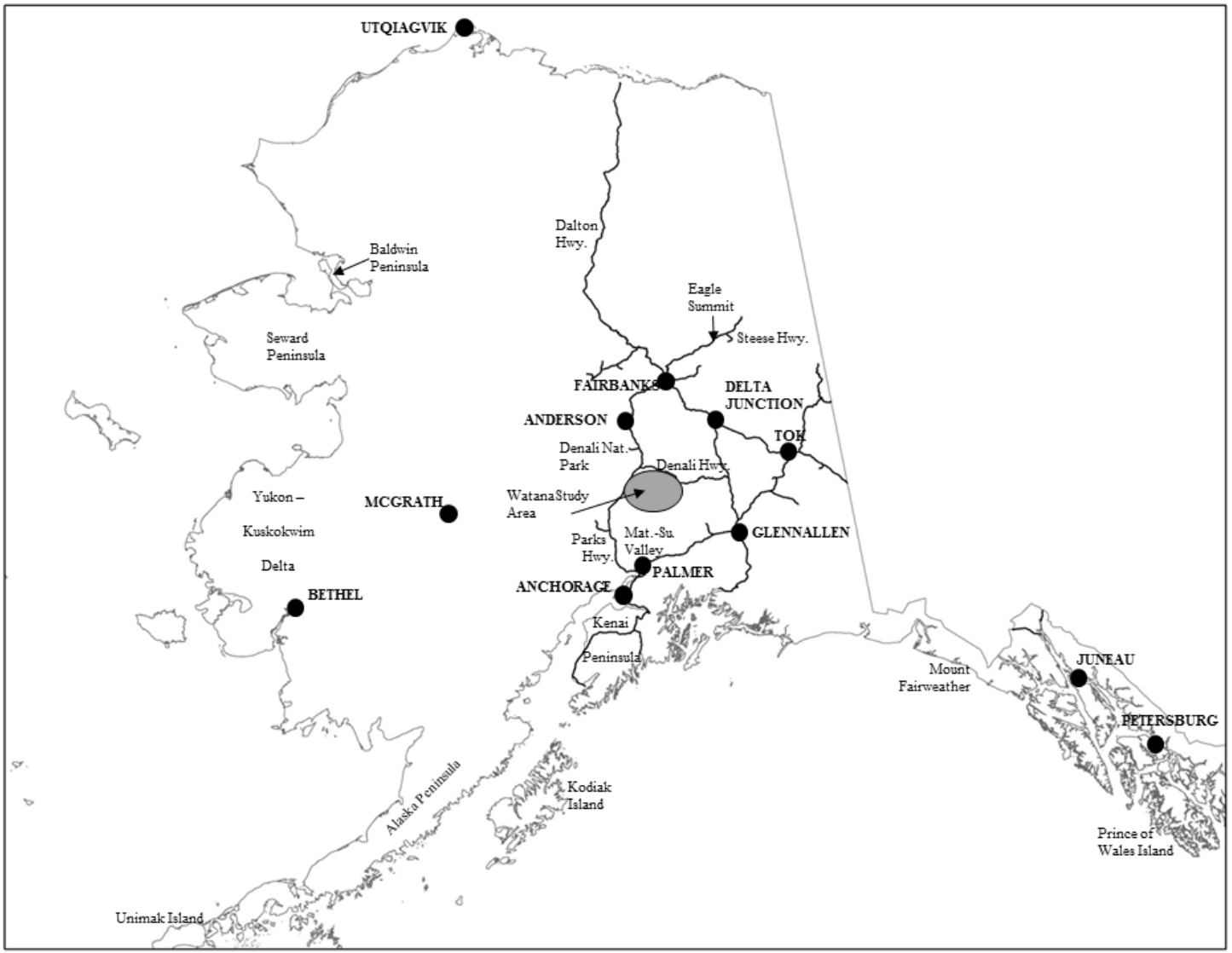

Figure 2. Alaska road system and general locations at which abundance surveys or research studies were completed or field observations were made. Locations are referred to in this report.

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, 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 about the proportion of juveniles. 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 understanding of seasonal habitat selection of sharp-tailed grouse.

SOOTY GROUSE

Sooty grouse (formerly known as blue grouse) are the largest of the grouse species in Alaska and reside in the coastal rainforest of Southeast, from approximately Mount Fairweather south, including Units 1 and 3–5 (Zwickel and Bendell 2004; Fig. 2). However, they are 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 collection 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 are 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 as well as 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 DWC does not monitor spring breeding abundance and information on population status is derived primarily from hunter-harvested wing collections and hunter observations.

ROCK PTARMIGAN

Rock ptarmigan are the second most abundant ptarmigan 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), and within Denali National Park (DNP, Unit 20C; 2014). Since 2013, DWC has begun 2 rock ptarmigan research projects examining movement, mortality, and breeding success within Unit 13B and near Eagle Summit. The study near Eagle Summit also plans to complete annual surveys within the study area formerly used by researcher Robert Weeden in the 1960s and early 1970s.

WHITE-TAILED PTARMIGAN

White-tailed ptarmigan are the smallest species of ptarmigan and inhabit high elevation alpine habitat within the Alaska Range and south through Southeast Alaska. No white-tailed ptarmigan have been confirmed in Alaska north or west of the Alaska Range. However, in February 2016 a hunter reported harvesting “a small bodied ptarmigan with a white tail” near Whitefish Lake in western Unit 19A. 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 locations, monitoring of spring breeding abundance is difficult. Information on white-tailed ptarmigan populations has been done primarily through hunter questionnaires and wing collection from hunters.

WILLOW PTARMIGAN

Willow ptarmigan are the most common and abundant ptarmigan species in Alaska, occurring in most alpine and subalpine nonforested habitats throughout the state. However, they are 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) and DNP (2014). In 2013, and in cooperation with UAF and the Alaska Energy Authority, DWC began a 3-year research project to examine the ecology and distribution of willow ptarmigan adjacent to the proposed Susitna-Watana Hydroelectric Project (Federal Energy Regulatory Commission, No. 14241; 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 rivers and throughout the Alaska Peninsula. The Alaska hare inhabits coastal lowlands, alder (*Alnus* spp.) thickets, and wet meadows.

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

SNOWSHOE HARE

Snowshoe hares are found throughout Alaska although they are much less abundant throughout 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, and Denali 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 our statewide small game program. The small game program objectives are diverse and comprehensive. In addition to education and outreach, the primary objectives of the program are 2-fold. One, better understand population status. This is completed by monitoring harvest composition, spring breeding abundance, and population productivity,

particularly those that are heavily used by hunters along road systems. Two, develop research efforts to better inform management concerns.
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 inform the hunting public. These data will inform DWC's use of its discretionary authority, within seasons specified by the Alaska Board of Game (BOG) to adjust bag limits to restrict or liberalize harvest.

This report details the activities conducted by the small game program between regulatory years (RY) 2014 and 2015 (regulatory year begins 1 July and ends 30 June, e.g., RY14 = 1 July 2014–30 June 2015). Specifically, it addresses 1) the harvest composition from the past season; 2) status of monitored grouse, ptarmigan, and snowshoe hare populations; 3) management concerns; 4) 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 late April each year, numbers of breeding male grouse and ptarmigan are counted at fixed survey locations (Pierce et al. 2012) from the Steese Highway to Petersburg (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 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 population 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 small game program has been largely restricted to monitoring species and areas in which population abundance can be accessed. The program has focused on those populations that are either heavily exploited by

hunters, popular outdoor recreational areas, or very close to large urban areas or road systems, and 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 behavior known as drumming. This time of year, 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 are consistent with state and national techniques (McBurney 1989; Taylor 1992). In Alaska drumming typically peaks between mid-April and mid-May; thus, spring breeding surveys have been completed between 25 April and 15 May. Survey routes generally consisted of 10 to 12 stops along a trail or rural road. At each stop, the observer listened for drumming males for 4 minutes. All drums and their direction from the observer were recorded. Attempts are made to survey each route 2–3 times during the breeding season. Starting in 2016, spring breeding data are reported 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), Copper Landing (2007), Palmer (1992,), and Tok (2013) and have been completed annually since their inception (Carroll and Merizon 2014; Taylor 2013). Additional routes are being explored for future survey routes near Tok.

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; they may have been hidden in nearby vegetation while watching displaying males. 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 1–3 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 have generally 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 and bowls 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 consists of 6–20 stops much like the design of ruffed grouse surveys. They are 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 (i.e., Mitkof Island). Surveys are repeated 2–3 times during the peak of breeding activity. The average for each area is calculated by taking the peak count for each survey transect for that season. Prior to the creation of surveys in Juneau and Petersburg, sooty grouse abundance was loosely monitored through DWC staff conducting Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) spring pellet count surveys. Staff recorded the presence of sooty grouse along established transects used to enumerate deer pellets.

Spruce Grouse

The springtime display of the 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.

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 we used accepted methods of counting territorial males. A broadcast call of a territorial male was played at between 5 and 15 stops along a survey transect (Choate 1963; Watson 1965; Bergerud and Mercer 1966; Bergerud 1970; Braun and Rogers 1971; Taylor 2000, 2013). Surveys were completed by either driving a survey route along rural roads or walking on foot. Responding males were counted only within a one-quarter mile radius of each stop along the survey 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. Access to the high alpine ridges and peaks on which they breed during the breeding season 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, based on field observations and hunter reports, 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 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.

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). DWC 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, and Denali highways. DWC has also relied upon numerous partners to assist in monitoring statewide hare populations, including the National Park Service, U.S. Fish and Wildlife Service (USFWS), 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. These groups and their agency partners share common goals of wisely and conservatively managing these important resources for decades to come. In addition,

statewide wing collection efforts from hunter-harvested grouse and ptarmigan offers complimentary data on productivity, harvest location, and species that draw the greatest hunter effort (Carroll and Merizon 2014; Hansen et al. 2015).

A variety of techniques have been used throughout North America to monitor galliform broods including passive observations of broods while conducting other fieldwork (Scott Walter, Wisconsin Department of Natural Resources, personal communication), counting the number of broods annually along set routes, and using trained pointing dogs (Guthery and Mecozzi 2008; Dahlgren et al. 2010, 2012). 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).

Beginning in 2016, DWC partnered with numerous volunteers and their highly trained pointing dogs to complete a test of this technique and its usefulness in providing productivity and abundance data for hunters and managers. The use of trained pointing dogs while conducting brood surveys was tested on sharp-tailed grouse in Delta Junction, rock and willow ptarmigan at Eagle Summit, Denali Highway, and Hatcher Pass. This technique proved to be very useful and is planned to become one of the primary means through which population productivity is assessed.

HUNTER-HARVESTED WINGS AND TAILS

In order to understand annual grouse and ptarmigan harvest composition, the program developed and is continuing an effort to collect wings, tails, and heads harvested by hunters (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 DWC to index harvest composition and a second method through which to estimate brood production from the previous breeding season. To promote future wing collections, DWC 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] 2014.

	Grouse				Ptarmigan			
Unit	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	33	0	0	0	33
2	0	4	0	0	0	0	0	4
3	0	0	0	2	0	0	0	2
4	0	0	0	8	0	0	0	8
6	0	0	0	0	4	0	0	4
7	0	57	0	0	19	0	16	92
8	0	0	0	0	1	1	0	2
9	0	0	0	0	23	2	0	25
11	0	3	0	0	0	0	0	3
12	0	4	8	0	0	0	0	12
13	1	19	3	0	107	6	0	136
14	16	46	0	0	18	31	38	149
15	0	46	0	0	0	0	2	48
16	0	3	0	0	9	0	0	12
17	0	60	0	0	0	0	0	60
20	57	81	89	0	4	0	0	231
22	0	0	0	0	108	2	0	110
25	0	1	2	0	5	11	0	19
Total	74	324	102	43	298	53	56	950

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2014 = 1 July 2014–30 June 2015).

Table 2. Total number of hunter-harvested wings collected statewide from grouse and ptarmigan by game management unit, Alaska, regulatory year[a] 2015.

	Grouse				Ptarmigan			
Unit	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	0	0	7	0	0	0	7
3	0	0	0	4	0	0	0	4
4	0	0	0	9	0	0	0	9
6	0	0	0	0	2	0	0	2
7	0	76	0	0	19	1	9	105
10	0	0	0	0	0	18	0	18
11	0	1	0	0	0	0	0	1
12	0	7	0	0	0	0	0	7
13	4	92	13	0	148	12	6	275
14	25	34	2	0	39	15	64	179
15	0	41	0	0	5	0	0	46
16	0	2	0	0	2	0	0	4
17	0	35	0	0	0	0	0	35
20	117	165	79	0	11	3	0	375
21	0	16	0	0	0	0	0	16
22	0	0	0	0	135	19	0	154
25	4	8	10	0	1	4	0	27
Total	150	477	104	20	362	72	79	1,264

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2015 = 1 July 2015–30 June 2016).

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). For ptarmigan, wings were used for one or more of several 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; or 3) estimate sex by measuring wing chord (Merizon 2012; Taylor 2013). Grouse rectrices (tail feathers) were used to determine sex (Henderson et. al. 1967; Schulz 1983). Heads of ptarmigan were used to verify species and estimate sex by examining plumage characteristics.

Summer 2014–Spring 2016 Climate Patterns and Breeding Season

Generally statewide, summer 2014 was drier and warmer than the previous 2–3 summers. During fall 2014, temperatures also remained above average throughout most of the state and as a result very little snow accumulation below 600 m through most of November. Winter and spring 2014–2015 experienced unusually low snowfall across the state and an early arrival of spring. The city of Anchorage set a record for least snowfall in a winter with nearly one-third the normal annual total. Much of Southcentral Alaska remained 25–50% of normal snowpack in April as measured by the National Water and Climate Center (http://www.wcc.nrcs.usda.gov/cgibin/ak_snow.pl?state=alaska) while portions of the Interior were closer to but still below average. What snow was present began melting by late March in Southcentral and early April throughout the majority of the Interior. A combination of low snowfall throughout the winter and virtually no rainfall into early July created severe fire danger across much of the state. By 31 July 2015, over 730 individual wildfires (total of 4.8 million acres) had sparked throughout the state (Alaska Interagency Coordination Center Situation Report, http://fire.ak.blm.gov/). This warm and dry weather pattern was very favorable for breeding activity, nesting, and early chick survival. Statewide breeding activity of male grouse and ptarmigan occurred either near the historical average or was early for several populations (e.g., peak drumming activity of Mat-Su Valley ruffed grouse occurred in late April). Based on a sample of closely monitored rock ptarmigan in the Alaska Range, incubation began between 24 May and 30 May with clutches hatching between 17 June and 23 June. Broods of ruffed and spruce grouse and rock and willow ptarmigan in Southcentral and the Alaska Range were documented with between 7 and 11 chicks per brood which is average to slightly above average. Weather conditions across much of Alaska during summer 2015 were very favorable to early chick survival with low rainfall, moderate to warm temperatures, no snow below 1,830 m, and good insect production (based on numerous field visits and staff reports). As a result, strong juvenile grouse and ptarmigan recruitment into the fall 2015 hunted populations was documented.

Winter 2015–2016 was also very similar to winter 2014–2015. The period between 1 December 2015 and 29 February 2016 experienced unusually low snowfall across the state in locations below 250 m–310 m and unusually warm midwinter temperatures. The National Weather Service documented the second warmest midwinter period on record for Anchorage, Juneau, and Yakutat and the warmest period on record for Barrow, King Salmon, and Sitka (Alaska Dispatch News, 1 March 2016, https://www.adn.com/). February 2016 was the warmest February ever recorded for the state as a whole (Alaska Dispatch News, 10 March 2016) with an average monthly temperature of −8°C degrees compared to the long-term average of −15.1°C degrees. The same period was also unusually dry at lower elevations throughout the state. Fairbanks set a

record low precipitation for the same midwinter period. However, montane areas above 310 m elevation in the Chugach, Kenai, Talkeetna, and White Mountains, and the Alaska Range were either near or above average snowfall. The warm weather pattern was likely driven by several factors including a powerful El Niño and warm water in the north Pacific Ocean driven by the Pacific Decadal Oscillation.

What snow was present below 250–310 m elevation largely melted by early to mid-March 2016 in Southcentral and late March to early April throughout the majority of the southern Interior. A combination of low snowfall throughout the winter and virtually no rainfall into early June created severe fire danger across much of the state. However, fire danger was lessoned by mid-June for much of the state with several weather events that produced near average monthly rainfall.

Much like spring and summer 2015, the warm dry weather pattern in April and May 2016 was very favorable for grouse and ptarmigan breeding activity, nesting, and early chick survival. In addition, statewide breeding activity of male grouse and ptarmigan also occurred either near the historical average or was early for several populations. Based on a sample of closely monitored rock ptarmigan in both the Alaska Range and White Mountains (Steese Highway), incubation began between 22 May and 29 May with clutches hatching between 11 June and 24 June. Broods of ruffed and spruce grouse and rock and willow ptarmigan in Southcentral and the Alaska Range were documented with average counts of 5–11 chicks per brood. One of the primary drivers of grouse and ptarmigan population productivity is the weather pattern 2–3 weeks posthatch, particularly for ptarmigan. Weather conditions in June and July 2016 across portions of Southcentral were very favorable to early chick survival with low rainfall, average to record high temperatures, no snow below 1,830 m, and good insect and berry production (based on numerous field visits and staff reports). Weather conditions in the central Interior were somewhat less favorable with June 2016 being the third wettest on the record in Fairbanks (http://akclimate.org/city-summaries/2016/6) with 2 of the wettest days in June occurring just prior to or during the hatch and slightly below average temperatures for the month. As a result, we anticipate strong juvenile recruitment into fall 2016 for most hunted populations of grouse and ptarmigan with potentially lower recruitment into populations near Fairbanks.

Statewide Summary

Climate patterns during 2014 and 2015 were generally very favorable for grouse and ptarmigan throughout the state. During both winters (2014–2015 and 2015–2016), weather was unseasonably warm and dry breaking both high temperature and low snowfall records across the state. Those warm and dry patterns persisted for most areas (third wettest June on record for Fairbanks in 2016) into both spring and summer 2015 and 2016. This weather pattern along with good insect production allowed for average to strong juvenile survival across much of the state in summer 2014, 2015, and 2016. Hunters reported abundant grouse and ptarmigan populations throughout much of the state (with some exceptions) likely as a result of the ideal weather patterns during the summer 2014 and 2015 brood rearing season. Hunters in Interior and Southcentral should again anticipate strong juvenile recruitment into the fall 2016 hunted population and abundant populations of grouse and ptarmigan as a result of warm dry weather patterns in late June and early July 2016 (save for near Fairbanks where wet weather throughout June may possibly have influenced chick survival following hatch).

Snowshoe hare populations appear to be drivers in statewide grouse and ptarmigan population abundance. As snowshoe hare densities begin increasing (as they are statewide), specialist and generalist predator populations are also expected to increase. As a result, in the past, we have documented a decline in Alaskan grouse and ptarmigan populations during previous snowshoe hare highs. This trajectory will change again after the snowshoe hare densities decrease.

Ruffed grouse throughout Alaska appear to be at or nearing the peak of their 7–8 year population cycle based on spring breeding counts. Drumming counts from Delta Junction, Anderson, Tok, and Palmer generally reflected stable to increasing breeding abundance in both 2015 and 2016.

Sharp-tailed grouse abundance was relatively high and increasing throughout their range in 2014–2015 but leveled out in 2016. Field reports and observations in 2014 and 2015 from Chicken, Tok, Delta Junction, Sourdough, and Anderson all reported seeing more sharp-tailed grouse than in the previous 5 years. Sharp-tailed grouse were observed and harvested by hunters in areas that normally have no to low abundance including Sheep Mountain (Unit 13D, north of Palmer) and the Denali Highway.

Despite only 2 years of systematic spring breeding surveys, sooty grouse have some of the highest breeding densities in the state where they occur compared with other grouse. Despite hunters and DWC staff hearing more male grouse during April and May each year in remote areas (distant from established communities), monitored populations near Juneau and Petersburg appear abundant and stable. The vast majority of birds being harvested are males during late April and early May.

There currently is no systematic statewide population monitoring for spruce grouse. Despite this, spruce grouse appear to be at near average abundance based on field observations and hunter reports. Overall brood production appeared to be average based on hunter-harvested wing samples from fall 2014 and 2015. Based on spring and summer 2016 weather patterns, juvenile recruitment is anticipated to be similar to what was observed in 2015.

Rock ptarmigan have also shown an increasing trend over the last 3 years in areas that are monitored through spring breeding surveys. During spring 2016, rock ptarmigan were at historic highs along the Denali Highway and data suggest an increasing trend near Eagle Summit. Hunters also reported observing and harvesting more rock ptarmigan during winters 2014–2015 and 2015–2016 than in the previous 5 years.

Very little is known about white-tailed ptarmigan abundance throughout its 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.

Willow ptarmigan abundance, like rock ptarmigan, was also higher than during the previous 10 years in areas monitored through spring breeding surveys. Hunters reported observing more willow ptarmigan than during the previous 5 years in areas of the Chugach and Talkeetna mountains, and the Alaska Range.

Alaska hare is the least well known of all the small game species in the state. Overall, this species remains at low abundance throughout its statewide range with harvest being reported throughout many small coastal villages in western and southwestern Alaska.

Throughout Alaska, snowshoe hare populations have been increasing in Interior and Southcentral Alaska since the low in 2013–2014. During spring 2016, a clear and marked increase was documented of monitored populations in Delta Junction and Anderson. In Southcentral Alaska, snowshoe hares have also begun to increase. Although the high will likely not occur until 2018–2019 in Interior and 2019–2020 in Southcentral and the Kenai Peninsula hunters can expect to see considerably more snowshoe hares this fall and winter than during the previous 4–5 years.

♦ ♦ ♦

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.

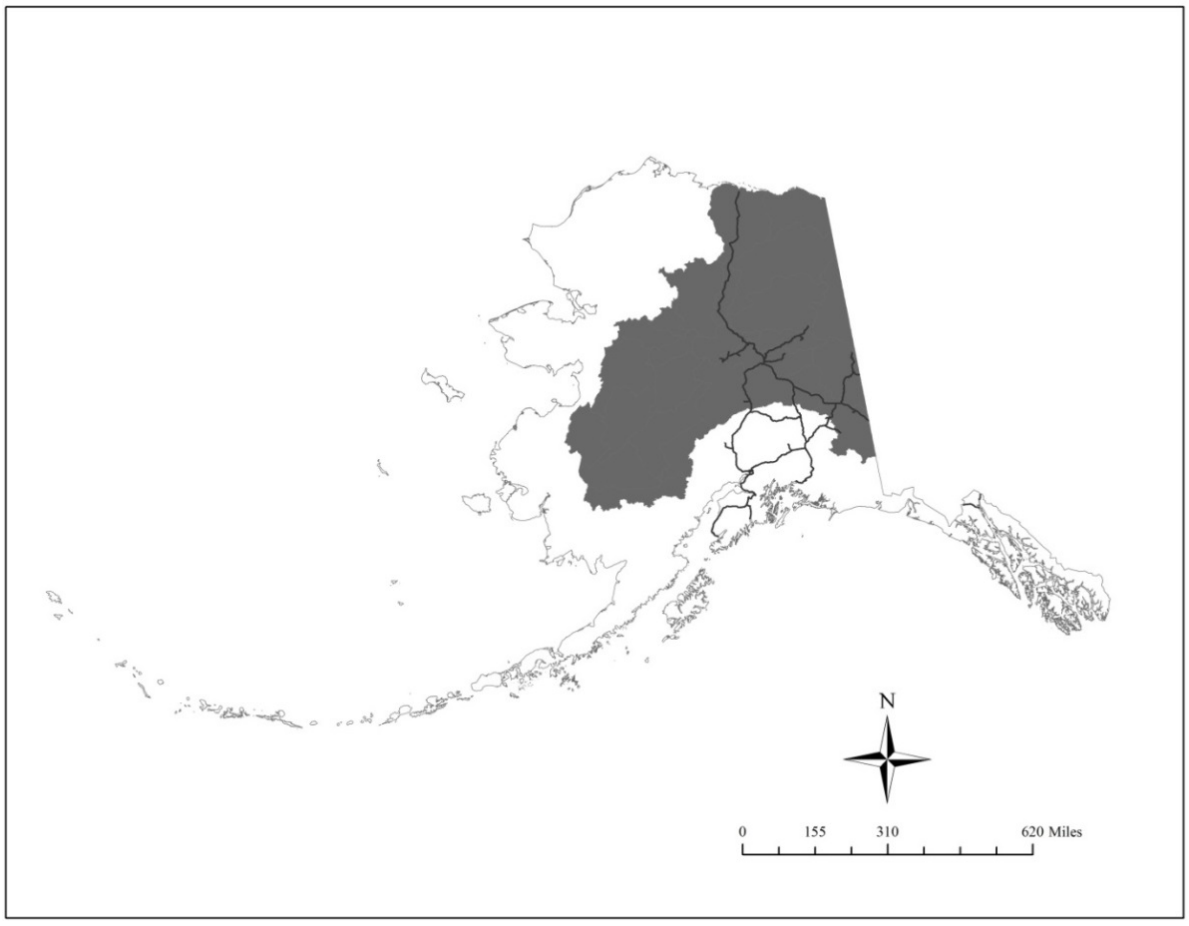

Figure 3. Map of the Fairbanks and Interior road system region, Alaska.

RUFFED GROUSE

Spring Breeding Surveys

In 2015, DWC completed drumming counts from 25 April to 3 May and in 2016 from 18 April to 2 May. Surveys were completed earlier in 2016 due to an earlier onset of spring and complete lack of snow in many survey areas. In both years survey conditions for all drumming counts in the FIRS region were generally good, with seasonably warm weather and mostly calm to moderate winds (0–11 kph with rare gusts up to 16–19 kph). Despite a slight drop in mean number of males heard near Delta Junction from 2015 to 2016, which was not statistically significant ($t_{0.05(2),\,46} = 0.595$, $P = 0.6$), drumming counts in the region conducted by DWC staff suggest that populations are likely stable to increasing with a statistically significant increase in the population near Tok from 2015 to 2016 ($t_{0.05(2),\,58} = -2.329$, $P = 0.02$). If the 7–10 year ruffed grouse population cycle tracks that of the snowshoe hare cycle that is believed to show an east to west progression from western Canada into Alaska with a lag of 1–3 years (Krebs et al. 2013), then drumming counts should show a peak earlier near Tok and a lag several years before peaking near Clear Air Force Station and DNP.

The forest stand composition has matured and as a result declined in quality for ruffed grouse from an aspen dominated landscape to one dominated largely by black spruce at our longest running survey location (1993–2016) near Clear Air Force Station. This decline has likely reduced the carrying capacity or ability of the habitat to support large numbers of ruffed grouse meaning drumming surveys here may no longer provide a good index of population trends of ruffed grouse in the area. DWC plans to conduct at least 1 more year of spring surveys but will likely discontinue surveys in the area as the data are less informative than in previous years. Issues with noise and habitat fragmentation around the Delta Junction ruffed grouse survey route are likely having an influence on our ability to detect population trends as well. In 2016, DWC staff initiated surveys in another suitable location near Delta Junction in an effort to gather more data to help detect population trends in the area (Table 3).

In addition to the ruffed grouse survey routes established and completed by DWC, other organizations and government agencies conduct drumming counts annually. Contractors for the United States Army completed drumming counts during spring 2015 and 2016 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; Haddix 2007). Data suggest the population may be stable to increasing on both YTA and GRTA (Table 4). The increase in the population on GRTA was statistically significant from 2014 to 2015 ($t_{0.05(2),\,66} = -2.831$, $P = 0.01$) and appears to have remained relatively stable in 2016. Data from counts on the DTA suggest a decrease in the population from 2015 to 2016 but the change was not statistically significant ($t_{0.05(2),\,94} = 1.514$, $P = 0.13$).

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, and Tok within the Interior road system region, Alaska, 2011–2016. Unless noted there was one survey route for each survey location with survey routes consisting of 9–13 listening posts (stops). Numbers in bold indicate statistically significant difference from previous year.

	Clear AFS[a]		Delta Junction (11 stops)		Tok (9 stops)	
Year	Mean (males/stop)	95% CI[b]	Mean (males/stop)	95% CI[b]	Mean (males/stop)	95% CI[b]
2011	0.12	0.03–0.23	0.18	0.00–0.41		
2012	0.06	0.02–0.10	0.55	0.23–0.86		
2013	NS[c]	NS[c]	0.18	0.00–0.45		
2014	0.16	0.07–0.28	0.33	0.06–0.67	0.19	0.00–0.39
2015	0.17	0.10–0.25	0.45	0.18–0.73	0.50	0.28–0.68
2016	0.25	0.12–0.39	0.39	0.12–0.74	**0.97**	0.58–1.39

[a] Prior to 2012 data are based on 3 of 4 survey routes with 31 total listening posts (stops) because several stops were moved in 2012 due to flooding or construction in the survey area. From 2012 to 2016 data are based on 4 survey routes with 41 total listening posts (stops).
[b] CI = confidence interval.
[c] NS = no survey was conducted due to late spring snow cover.

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), and Fort Wainwright-Gerstle River Training Area (GRTA) within the Fairbanks and Interior road system region, Alaska, 2011–2016. Numbers in bold indicate statistically significant difference from previous year.

	YTA (10 stops)		DTA (13 stops)		GRTA (12 stops)	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
2011			0.35	0.20–0.54	0.25	0.04–0.50
2012	0.32	0.14–0.50	0.46	0.23–0.71	0.38	0.19–0.56
2013	0.06	0.00–0.14	0.31	0.10–0.58	0.23	0.08–0.38
2014	0.30	0.00–0.70	0.67	0.33–1.04	0.08	0.00–0.25
2015	0.40	0.10–0.75	0.83	0.52–1.14	**0.35**	0.15–0.60
2016	0.53	0.08–1.00	0.62	0.38–0.83	0.35	0.15–0.60

[a] CI = confidence interval.

Wing Collections

There were 56 ruffed grouse wing samples collected from hunters that hunted within the FIRS region during RY14 and 120 ruffed grouse wing samples collected during RY15 (Table 5). The number collected in RY15 was a substantial increase in the number of wings collected in previous years and is likely a combination of an increase in hunter participation in the wing collection program as well as an increase in number of birds available to harvest. Despite the substantial increase in the number of harvested wings collected the number is still relatively small considering the large geographic area from which the data were collected. The majority of the wings were collected from Units 20B and 20D, which are the most accessible units in the Interior. The proportion of juveniles in the harvest (based on hunter-harvested wing collections) is used as an index of juvenile recruitment (Carroll and Merizon 2014) and one measure of population status. The proportion of juveniles in the harvest appears to have increased each year since RY13 with a statistically significant increase in the proportion of juveniles harvested from RY13 through RY15 ($z_{0.05(2)} = 7.858$, $P = 0.01$) suggesting good juvenile production in summer

2015. It is possible that the low proportion of juveniles recorded from wing samples in RY13 may have been at least partly due to cold spring temperatures in spring 2013 that persisted until early June throughout the Interior (www.akclimate.org) that may have negatively influenced chick survival.

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] 2011–2015.

Regulatory year	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

[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

Up until the dissolution of the Southcentral chapter of RGS in early 2016 the organization was very active in supporting ruffed grouse habitat improvement across the state and had over the years raised substantial funds to support habitat manipulation and hunter education and participation in the Interior. From spring 2014 to winter 2016 the Department of Natural Resources-Division of Forestry, in collaboration with DWC and RGS, completed roller chopping operations on approximately 510 acres within a portion of Tanana Valley State Forest in an effort to improve ruffed grouse habitat near Tok. This habitat improvement should provide increased nesting and brood rearing habitat for ruffed grouse over the next 5–30 years. DWC has plans to conduct additional habitat manipulation projects in collaboration with Division of Foresty and the Founding Forty, a nonprofit, statewide conservation group, to improve ruffed grouse habitat on state lands near Delta Junction in the near future. DWC plans to establish drumming routes along manipulated plots and in habitat adjacent to manipulated plots to assess the value of these improvement projects to local grouse populations.

SHARP-TAILED GROUSE

Spring Breeding Surveys

In 2015 springtime lek counts of male sharp-tailed grouse occurred during 21–25 April and in 2016 during 18–30 April in DJAP and the adjacent Delta Junction Bison Range near Delta Junction. Survey conditions were generally good, with seasonably warm weather and mostly calm to moderate winds (0–11 kph with rare gusts up to 16–19 kph). The mean number of males observed per lek appears to have decreased slightly from 2015 to 2016 on DJAP and Delta Junction Bison Range lands but not significantly (Table 6; $t_{0.05(2),} = 0.465$, $P = 0.6$).

Contractors for the United States Army also performed lek surveys on military land near Fort Greely south of Delta Junction within DTA and GRTA. The mean number of males observed per

lek appears to have increased slightly from 2015 to 2016 but the difference is not statistically significant (Table 6; $t_{0.05(2),} = -0.109$, $P = 0.9$).

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) and Fort Wainwright-Gerstle River Training Area (GRTA) within the Fairbanks and Interior road system region, Alaska, 2007–2016. Only leks counted in consecutive years were used in analyses.

	DJAP/DJBR			DTA/GRTA		
Year	Leks counted	Mean (males/lek)	95% CI[a]	Leks counted	Mean (males/lek)	95% CI[a]
2007	25	2.62	1.48–3.96	5	4.70	0.00–13.80
2008	30	2.73	1.63–4.00	5	3.80	0.00–10.20
2009	32	1.66	0.84–2.56	5	4.60	0.00–11.00
2010	33	1.91	1.00–2.91	5	6.80	3.60–11.40
2011	32	2.09	1.19–3.09	9	6.78	4.22–9.44
2012	29	2.07	1.10–3.24	9	4.11	1.56–7.01
2013	21	3.33	1.71–5.38	11	3.27	1.45–5.64
2014	24	3.71	2.42–5.29	6	4.17	1.50–7.17
2015	24	4.25	2.79–6.04	15	3.07	1.60–4.87
2016	22	3.64	2.00–6.05	15	3.33	1.73–5.07

[a] CI = confidence interval.

DJAP and Delta Junction Bison Range lands provide reliable and consistent access to lek sites, but the highly human-manipulated environment may not offer an accurate reflection of the greater FIRS region population status. So, from 2013 to 2016 DWC worked with volunteers from the UAF Cooperative Extension Service to document lek sites away from human-manipulated environments along the Steese, Taylor, and Alaska highways. Several active leks have been located near Tok in recently burned areas and DWC will continue to monitor those and search for new leks over the next few years.

Brood Surveys

New in 2016, DWC 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 with the dog locating grouse and the observer handling the dog and recording biological and distance (distance of group from transect line) data. These data will provide much needed demographic information (e.g., ratio of juveniles per adult, average brood size, birds/km) just prior to the hunting season. Surveys were conducted over 2 weekends on 8, 9, and 15–17 July. Survey conditions were generally good and ranged between 16°C and 23°C, although warmer than preferred on 15 July when the temperature reached above 26°C. Light to moderate winds (0–10 kph) were recorded. Average brood size was 3.3 chicks per brood ($n = 6$), which is likely a minimum count due to the difficulty in differentiating chicks from adults when birds were sometimes only seen for a brief moment before flushing away from observers. At least one more year of data collection is needed before we can report possible trends.

Wing Collections

There were 99 sharp-tailed grouse wing samples collected from hunters that hunted within the FIRS region during RY14 and 89 wing samples collected during RY15 (Table 7). The decrease from RY14 to RY15 is likely due more to a decrease in hunter participation than changes in sharp-tailed grouse abundance. Juvenile production appears to have increased since 2013 but the numbers are not statistically different (*P*-value encompasses changes seen in consecutive years from 2013 to 2015; $P > 0.10$). It is possible that the low proportion of juveniles recorded from wing samples in RY13 may have been at least partly due to cold spring temperatures in 2013 that persisted until early June throughout the Interior (www.akclimate.org) and may have negatively influenced chick survival.

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] 2011–2015.

Regulatory year	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

[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. Hunter reports of spruce grouse abundance throughout the FIRS region were up in RY15. Reports near Fairbanks, Tok, Eagle, and along the Elliott Highway suggested higher numbers in RY15 than RY14. In one day, after receiving the first real snowfall of the year, a member of DWC staff reported seeing 12–15 brood groups of spruce grouse of at least 6–8 individuals from about mile 40–80 of the Elliott Highway in fall 2015.

Wing Collections

Eighty-six spruce grouse wing samples were collected from hunters within the FIRS region during RY14 and 195 spruce grouse wing samples during RY15, up from recent years (Table 8). It appears as though the proportion of juveniles in the FIRS region has remained high and relatively stable for the last few years (*P*-value encompasses changes seen in consecutive years from 2013 to 2015; $P > 0.5$).

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] 2011–2015.

Regulatory year	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

[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 during 3–22 May 2015 and from 26 April to 22 May in 2016. Surveys occurred near Donnelly Dome along the Richardson Highway, at Mount Fairplay along the Taylor Highway (Unit 20E), near 12-mile and Eagle summits on the Steese Highway, and along a portion of Primrose Ridge in DNP. 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, multiple counts were conducted at Mount Fairplay in 2015 and 2016 and the data suggest an increase in the population although the numbers are not statistically different between years (Table 9; $t_{0.05(2),\,14} = -1.398$, $P = 0.2$). Based on surveys where repeat counts were not available we used the maximum count as a relative index of abundance. These surveys suggest ptarmigan populations may be relatively stable at low density near Donnelly Dome, decreasing near 12-Mile and Eagle summits and increasing near Primrose Ridge within DNP. However, data collected from a research project near Eagle Summit suggest that roadside count data near Eagle Summit is likely a poor relative index of population abundance (Table 10). In the future, DWC hopes to conduct replicate counts for each survey route to get an estimate of precision.

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, 2015–2016.

Year	Mean (males/stop)	95% CI[a]
2015	0.57	0.14–1.14
2016	1.10	0.57–1.52

[a] CI = confidence interval.

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, 2015–2016.

Year	Mean (males/km^2)	95% CI[a]
2015	1.15	0.80–1.65
2016	1.70	1.24–2.31

[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. Data from 2015 and 2016 suggest that the population of rock ptarmigan near Eagle Summit is likely increasing although the difference between years is not statistically significant (Table 10; $z_{0.05(2)} = 1.8$, $P = 0.07$).

Brood Surveys

New in 2016, DWC 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 with the dog locating ptarmigan and the observer handling the dog and recording biological and distance (distance of group from transect line) data. These data will provide much needed demographic information (e.g., ratio of juveniles per adult, average brood size, birds/km) just prior to the hunting season. Surveys were conducted over 2 days during 23–24 July 2016. Survey conditions were generally good, temperatures ranged between 9°C and 16°C. Wind conditions were variable with light to moderate (3–8 kph) recorded on 23 July and moderate to high (13–19 kph) on 24 July. Average brood size was 6.3 chicks per brood ($n = 4$), which is likely a minimum count due to the difficulty in differentiating chicks from adults when birds were sometimes only seen for a brief moment before flushing away from observers. At least one more year of data collection is needed before we can report possible trends.

Wing Collections

Eleven rock ptarmigan wing samples were collected from hunters within the FIRS region during RY14 and 7 rock ptarmigan wing samples were collected in RY15 (Table 11). 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 as spring surveys show populations are likely stable to increasing in areas surveyed. 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 11. 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] 2011–2015.

Regulatory year	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		
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

[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 DWC 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, DWC initiated a 3-year research project in spring 2015. Since 2015, 51 rock ptarmigan (16 females, 35 males) have been captured and fitted with VHF radio transmitters to document movement patterns, survival, and nesting success of this heavily hunted population. Final data from this research project should be included in a subsequent report (For information about additional rock ptarmigan research being undertaken, see the Alaska Range section of this report).

WILLOW PTARMIGAN

Spring Breeding Surveys

In the FIRS region, willow ptarmigan surveys were completed from 26 April to 12 May 2016. Surveys occurred along a portion of the DNP road just west of the Savage River Bridge and near Mount Fairplay along the Taylor Highway. Surveys suggest an increase in willow ptarmigan within DNP from 2015 to 2016 and likely stable numbers near Mount Fairplay although the numbers are not statistically different (Table 12; $t_{0.05(2),\,44} = -1.53$, $P = 0.13$, and $t_{0.05(2),\,43} = 0.406$, $P = 0.7$, respectively).

In addition to surveys conducted by DWC staff, contractors for the United States Army conduct a territorial male willow ptarmigan count south of Delta Junction near Fort Greely within DTA. The mean number of territorial male willow ptarmigan observed per stop decreased significantly from 2015 to 2016 (Table 12; $t_{0.05(2)} = 2.732$, $P = 0.007$).

Table 12. 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, 2014–2016.

	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

[a] CI = confidence interval.

Wing Collections

A total of 9 willow ptarmigan wing samples were collected from hunters within the FIRS region during RY14 and 12 willow ptarmigan wing samples collected during RY15 (Table 13). 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 13. 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] 2011–2015.

Regulatory year	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		

[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

In 2015, roadside counts were conducted during 21–25 April and 1–5 May near Delta Junction, Anderson, and along the Steese Highway and late June near Donnelly Dome. In 2016, roadside counts were conducted from 18 April to 12 May near Delta Junction, Anderson, and along the Steese Highway and during 23–24 June near Donnelly Dome. Hare numbers appear to be on the increase from previous years (Table 14).

In addition to the roadside counts conducted by DWC, DNP staff have maintained an index of hare abundance since the late 1980s. In 2013, hare abundance was at a record low and has stayed low for the last 4 years (Table 14).

Table 14. Interior snowshoe hare population survey data, Alaska, 2005–2016.

Year	Denali National Park[a]	Anderson[b]	Delta Jct.[c]	Delta Jct.[d]	Donnelly[e]	Steese Hwy[f]
2005	6.25			57	10	
2006	25.20			129		
2007	26.20	24[g]	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[h]	NS[h]	5	1	0
2014	0.53	NS[h]	4	8	1	1
2015	0.48	1[i]	4[i]	6	4	NS[h]
2016	0.53	7	28	35	14	3

[a] Denali National Park count survey is conducted by the National Park Service (C. McIntyre, personal communication).
[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 along the Steese Highway conducted by DWC staff and it includes 1 roadside count area.
[g] Three of the 4 survey routes were counted.
[h] NS = no survey.
[i] Two of the 3 survey routes were counted.

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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, spruce forest dominates in several lowland areas of the Susitna River Valley and Wrangell–St. Elias National Park. There are numerous small water bodies, large alpine rivers, and steep rocky and slightly vegetated hills and mountains. This region is fairly easily 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 and Alaska hare are not found in this region.

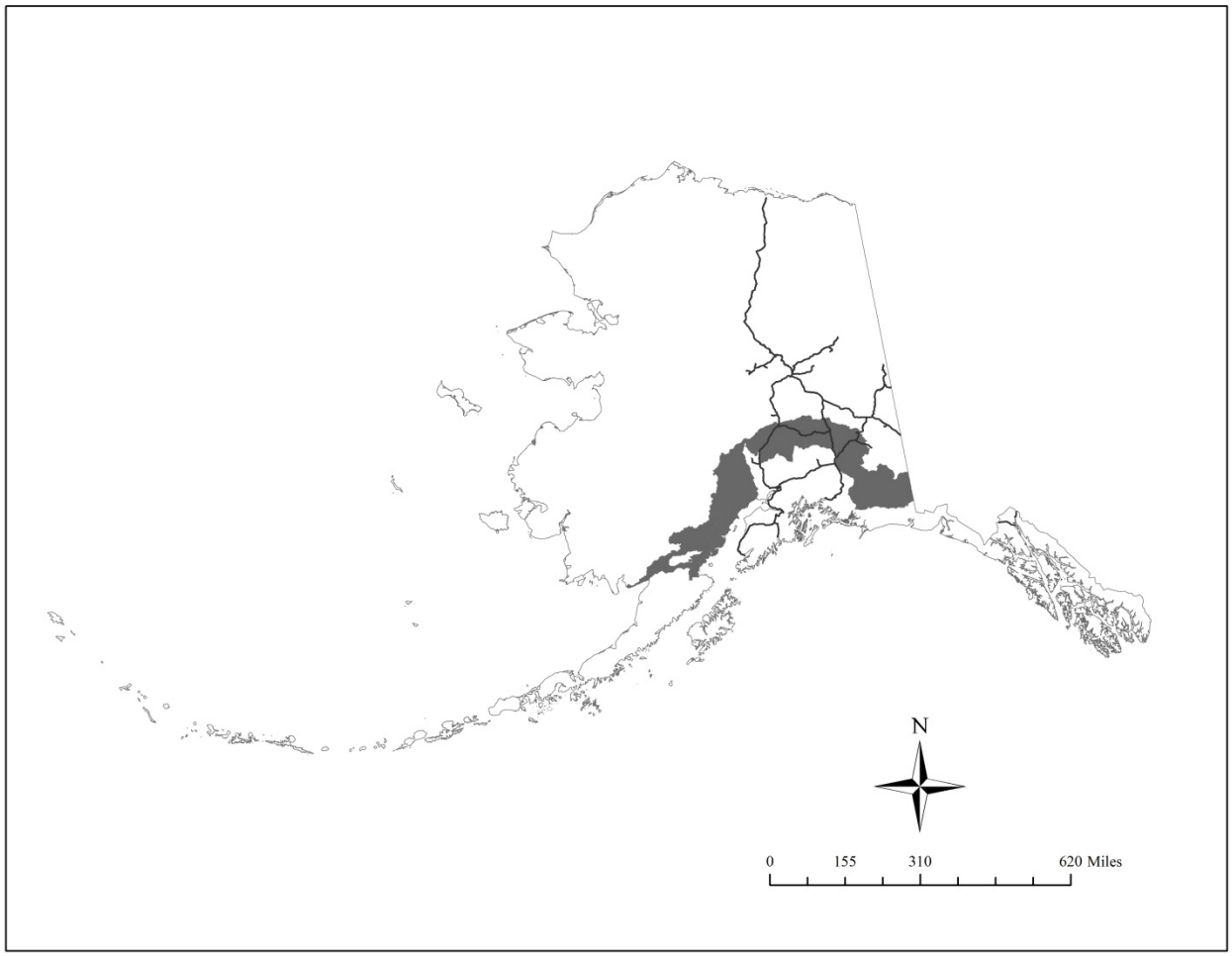

Figure 4. Map of the Alaska Range region.

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 in the spring during breeding season in April and May well as during the winter by local recreationalists and trappers in the upper Nenana and upper Copper rivers as well as the eastern Talkeetna Mountains.

Wing Collections

Three sharp-tailed wings were collected by hunters during RY14 and 8 during RY15 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 both low densities and 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 brood survey efforts within this region. Based on hunter reports and DWC staff field observations, spruce grouse abundance in the Alaska Range region was low during RY14 and RY15.

Wing Collections

Seven spruce grouse wings were collected by hunters during RY14 and 47 wings were collected in RY15 in the Alaska Range. It is difficult to make meaningful inferences regarding juvenile production based on disparate sample sizes. However, 64% of the RY15 sample were 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

In 2015, rock ptarmigan spring breeding surveys occurred during 5–20 May and from 29 April to 4 May in 2016 at 4 survey locations (Unit 13B; Table 15). Counts of breeding male rock ptarmigan were higher in 2016 along the eastern Denali Highway than during the previous 10 years. The mean number of males observed per stop was significantly higher in 2016 than in 2015 ($t_{0.05(2),106} = -2.531$, $P = 0.01$) which suggests a positive trend in the population. Maximum counts of breeding males in the spring have not been as high since 1999 in 3 of the survey areas. 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 late winter 2014, hunters reported seeing and harvesting more rock ptarmigan in this region than in years past. Also, while completing fieldwork this winter and spring, territorial

male rock ptarmigan were observed in areas where they normally do not occur in habitat considered marginal.

Table 15. Mean number of spring breeding male rock ptarmigan per listening post (stop, *n* = 43) with bootstrap 95% confidence intervals in Unit 13B, Alaska, 2014–2016.

Year	Mean (males/stop)	95% CI[a]
2014	0.60	0.46–0.82
2015	0.36	0.22–0.46
2016	0.70	0.48–0.93

[a] CI = confidence interval.

Brood Surveys

During 18–19 July 2016, DWC completed the first formal brood surveys for ptarmigan in the Alaska Range region. A total of 3 separate survey locations were completed along the Denali Highway. No rock ptarmigan broods were identified along any of these routes. Despite the lack of observations, rock ptarmigan were not anticipated at one survey location and portions of the other two. It is the hope of DWC that additional volunteer dog handlers can be signed up in future years so that additional effort can be put forth to locate and estimate rock ptarmigan brood size more effectively in this region. Based on radiocollared female rock ptarmigan being monitored as part of a larger ongoing research study in Unit 13B the average brood size was 6 chicks (n = 4). These surveys will be continued annually so that meaningful comparisons can be made regarding annual population productivity.

Wing Collections

Only 12 rock ptarmigan wing samples were collected from hunters during RY15 in the Alaska Range region. No rock ptarmigan wings were collected within this region during RY14.

Research

Ptarmigan hunting has been closed in Unit 13B after 30 November since 2009 based on a concern of low rock ptarmigan abundance. Due to the similarities in plumage with the more abundant willow ptarmigan it would be impossible to manage the species separately. During its March 2013 and subsequent 2015 meeting, BOG decided to maintain the season closure date of 30 November. To better understand the rock ptarmigan population in relation to hunting, the small game program began a study in spring 2013 with 2 primary objectives: 1) document rock ptarmigan movement patterns relative to the road system and points of access for hunters, and 2) create additional remote (road-inaccessible) survey locations to assess whether our roadside surveys reflect the greater Unit 13B population.

Since spring 2013, DWC staff captured and radiocollared over 100 female and male rock ptarmigan in Unit 13B. Through these collared individuals DWC has been learning a great deal about movement patterns and mortality. The greatest movements have occurred by adult and juvenile females (>50 km); while the adult and often juvenile males tend to stay within 1–8 km

of spring breeding territories year-round. High mortality has been documented in the fall (hunter harvest and predation) while generally lower mortality has been documented after November.

In addition, DWC staff have placed remote, motion sensitive cameras adjacent to nests (n = 16) to learn more about nesting behavior and population productivity. The cameras have successfully documented many behavioral traits of the incubating females including nest departure frequency, hatch timing, chick predation on the nest, and nest departure. The cameras have also documented weather patterns that had a strong negative affect including high rates of nest abandonment and subsequently low chick survival that would otherwise have gone undocumented.

A final report on this research study is expected in late 2017 or early 2018 and will be available on the Small Game Program webpage (www.smallgame.adfg.alaska.gov).

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

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

Wing Collections

Zero white-tailed ptarmigan wings were collected by hunters during RY14 and RY15 in the Alaska Range region.

WILLOW PTARMIGAN

Spring Breeding Surveys

In 2015 willow ptarmigan spring breeding surveys occurred during 5–19 May and from 29 April to 11 May in 2016 at 7 survey locations (Table 16). All locations documented higher counts of breeding male willow ptarmigan than during the previous 10 years. The mean number of males observed per stop was up significantly in 2016 compared to 2015 on both the eastern Denali Highway (Unit 13B; $t_{0.05(2),\ 111} = -4.139$, $P = 0.0001$) and western Denali Highway routes (Unit 13E; $t_{0.05(2),\ 92} = -2.218$, $P = 0.03$) suggesting an increase in numbers of willow ptarmigan adjacent to the Denali Highway.

Table 16. 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, 2014–2016.

	Unit 13B (68 stops)		Unit 13E (30 stops)	
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

[a] CI = confidence interval.

Brood Surveys

During 18–19 July 2016 DWC completed the first formal brood surveys for ptarmigan in the Alaska Range region. A total of 3 separate survey locations were completed along the Denali Highway. An average willow ptarmigan brood size of nearly 4 chicks (1–6; $n = 6$) per brood was documented. Summer 2016 was the first year of this project and additional routes are planned provided DWC can gain further support from volunteer dog handlers.

Wing Collection

A total of 57 willow ptarmigan wing samples were collected from hunters in the Alaska Range region during RY14 and 116 during RY15. The proportion of juveniles appeared to be higher in RY15 than in RY14 although the difference was not statistically significant (Table 17; $z_{0.05(2)} = 2.613$, $P = 0.11$). The proportion of juveniles in the harvest in RY15 was significantly higher than in RY13 ($z_{0.05(2),} = 11.433$, $P = 0.001$) and therefore it is likely that juvenile production in summer 2015 was quite good. Hunters reported very good hunting and high densities of willow ptarmigan throughout the RY14 and RY15 seasons in this region.

Table 17. 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] 2011–2015.

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

[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

In May 2013, in cooperation with UAF, the Alaska Energy Authority, and DWC, a large 3-year research study examining the ecology and distribution of willow ptarmigan adjacent to the proposed Susitna–Watana Hydroelectric Project site in the upper Susitna River was initiated (Fig. 2). A UAF graduate student has been leading the project. The last cohort of willow ptarmigan were captured and radiocollared in August 2015 and the final aerial telemetry flight occurred in June 2016. In total, over 240 VHF radio collars were deployed on willow ptarmigan between spring 2013 and fall 2015 at 5 separate locations in the study area and nearly 30 separate aerial telemetry survey flights were completed. Currently, data analysis is ongoing with a final report anticipated by January–February 2017 which will be available on the small game webpage (www.smallgame.adfg.alaska.gov).

SNOWSHOE HARE

Abundance Surveys

Currently, there are no snowshoe hare survey locations within the Alaska Range region.

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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 heavily populated Anchorage, Eagle River, Glennallen, Palmer, Valdez, Wasilla, and several other smaller communities scattered throughout the region. 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. This 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.

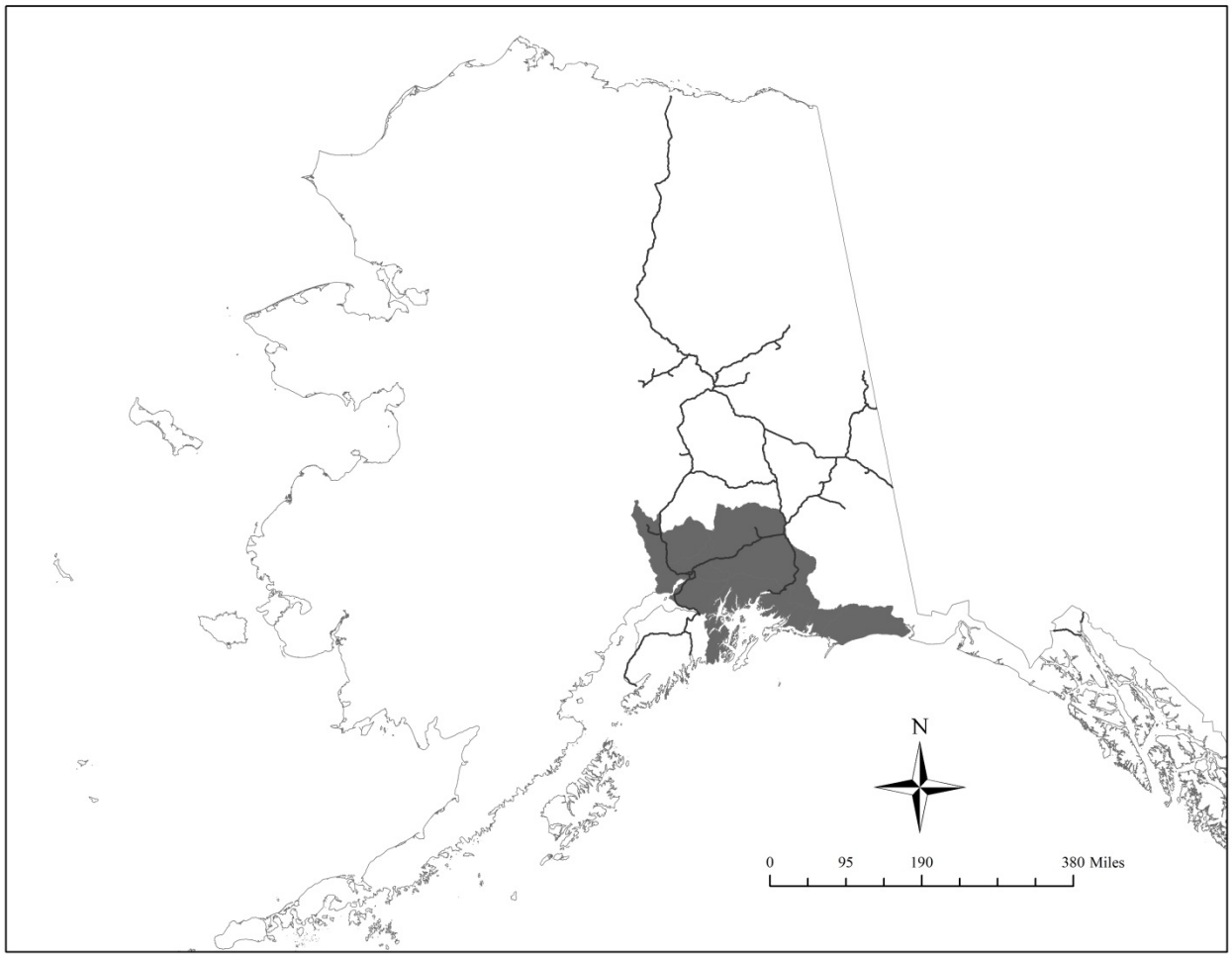

Figure 5. Map of the Southcentral road system region, Alaska.

Board of Game

During the February 2015 meeting in Wasilla, BOG adopted proposal 103, the creation of the Hatcher Pass Youth Hunt Management Area north of Palmer (Unit 14A). Annually, between 10 August and 25 August the management area is open to small game hunting only for youth (16 years and younger). Youth must be accompanied by a licensed hunter 18 years old or older who has successfully completed a basic hunter education course if the youth has not successfully completed a basic hunter education course.

RUFFED GROUSE

Spring Breeding Surveys

DWC's ruffed grouse spring breeding male (drumming) counts in Palmer and the Matanuska Valley Moose Range (Unit 14A) occurred from 22 April to 21 May 2015 and 7 April to 12 May 2016 (Table 18). A total of 16 drumming male ruffed grouse were heard during spring 2016 surveys (along routes repeated annually since 1992) which is a historic high since counts began in 1992. The mean number of males heard per stop in 2016, however, was not significantly different from 2015 ($t_{0.05(2),\,272} = 0.728$, $P = 0.5$) and the population is likely stable. Due to early onset of spring weather in 2016, DWC initiated surveys 7–10 days early with generally very good conditions throughout the spring breeding season. Daytime high temperatures were average to above average.

Table 18. Mean number of spring breeding male ruffed grouse (drummers) per listening post (stop, *n* = 46) with bootstrap 95% confidence intervals in Unit 14A, Alaska, 2006–2016.

Year	Mean (males/stop)	95% CI[a]
2006	0.16	0.09–0.20
2007	0.17	0.05–0.25
2008	0.19	0.13–0.25
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

[a] CI = confidence interval.

Due to increasing human noise along historic routes in the Mat-Su Valley in 2013, DWC began exploring new areas throughout the valley to create additional spring breeding survey routes. Beginning in spring 2015, DWC created and began completing 2 additional routes northeast of Palmer that allow greater distance from human noise sources. The 2015 and 2016 spring breeding counts in Table 16 reflect those 2 new routes. However, the historic high count of 16 drumming ruffed grouse reflects only the routes that were completed since 1992.

Since translocated ruffed grouse were released in the early 1990s, a typical population cycle has not been observed based on the ongoing springtime drumming counts. However, since 2012 the Mat-Su Valley population has been steadily increasing closely resembling the population cycle of ruffed grouse throughout other monitored populations in the FIRS region.

The Founding Forty conservation group (formerly RGS) continues to actively support ruffed grouse habitat improvement and raise money to support habitat manipulation throughout the state (see the Fairbanks and Interior Road System, Ruffed Grouse section).

Wing Collections

Seventeen ruffed grouse wing samples were collected from hunters during RY14 and 29 during RY15 in the Southcentral region (Table 19). It is difficult to make meaningful inferences about differences in annual juvenile production based on low sample sizes and we recommend caution in drawing conclusions from these counts.

Table 19. 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] 2011–2015.

Regulatory year	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

[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.

SHARP-TAILED GROUSE

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

SPRUCE GROUSE

Spring Breeding Surveys

Based on field observation and hunting reports from within Units 14 and 16 road-accessible areas, densities of spruce grouse appeared to be near average during fall 2015. Hunters off the road system, including along the Yentna and Skwentna rivers and remote trail systems, reported average densities of spruce grouse during fall 2015.

Wing Collections

Sixty-four spruce grouse wing samples were collected from hunters during RY14 and 82 during RY15 (Table 20). Although the proportion of juveniles appeared to increase from RY14 to RY15 the difference was not statistically significant ($z_{0.05(2)} = 1.976$, $P = 0.2$).

Table 20. 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] 2011–2015.

Regulatory year	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

[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 2015, rock ptarmigan spring breeding surveys occurred on 28 May and in 2016 on 14 May in Unit 14C. DWC was unable to complete surveys in Unit 13A in 2015 and 2016.

In 2015 and 2016 spring breeding surveys were conducted once and therefore no estimate of precision is available. Based on surveys where repeat counts were not available we used the maximum count as a relative index of abundance.

Abundance of territorial males within Unit 14C in 2016 appeared to be below the long-term average. In 2016, rock and willow ptarmigan breeding activity in the Southcentral road system region appeared to have peaked earlier than normal. This may have been driven by the early onset of spring weather. The 2016 rock ptarmigan survey in Unit 14C was completed after what appeared to be a peak in activity near late April to very early May. Therefore, the 2016 count of breeding male rock ptarmigan is likely biased low.

Throughout Units 14C and 13A in both 2014 and 2015, hunters reported seeing and harvesting above average numbers of rock ptarmigan near popular hunting locations. It is difficult to determine the specific cause or causes of this abundance in the absence of more comprehensive spring breeding surveys; however, several factors may have contributed to this increased abundance, including the warm, dry summers of 2014 and 2015.

Brood Surveys

On 30 July 2016 DWC completed the first formal brood surveys for ptarmigan in the Southcentral road system region. Two separate survey routes were completed near Hatcher Pass. An average of 7 chicks per brood (n = 3) were documented. An additional 15 rock ptarmigan were documented; however, observers were unable to determine age prior to them flushing. It is difficult to make meaningful inferences regarding the size of observed broods; however, 7 chick per brood is high when compared to brood data collected through a rock ptarmigan research study in Unit 13B (2013–2016; see Alaska Range, Rock Ptarmigan). These surveys will be

continued annually so that meaningful comparisons can be made regarding annual population productivity.

Wing Collections

Thirty-seven rock ptarmigan wing samples were collected from hunters during RY14 and 15 during RY15 (Table 21). Due to the low sample sizes it is difficult to make meaningful inferences about differences in juvenile production between the years where data are available.

Table 21. 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] 2011–2015.

Regulatory year	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

[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.

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently there are no spring breeding surveys 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 their 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 that are targeted by hunters. 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

On 30 July 2016 DWC completed the first formal brood surveys for ptarmigan in the Southcentral road system region. Two separate survey routes were completed near Hatcher Pass. Despite the use of pointing dogs only 1 breeding white-tailed ptarmigan female was observed along the survey routes. Summer 2016 was the first year of this project and additional routes are planned to increase geographic coverage and detection rates.

Wing Collections

Thirty-eight white-tailed ptarmigan wing samples were collected from hunters during RY14 and 69 during RY15 (Table 22). It appears as though the proportion of juveniles in the harvest has increased since the low recorded in RY12, however, the differences were not statistically significant (*P*-value encompasses changes seen in consecutive years from 2012 to 2015; $P > 0.2$). The majority (93%) of the samples in RY14 and RY15 in this region were collected from 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 22. 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] 2011–2015.

Regulatory year	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

[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.

WILLOW PTARMIGAN

Spring Breeding Surveys

In 2015, spring breeding surveys occurred during 12–13 May and in 2016 during 13–16 May. Two survey routes were completed in Unit 14C; however DWC was unable to complete the route in Unit 13A during 2015 and 2016.

There was no statistically significant change in the number of breeding male willow ptarmigan observed per stop on survey routes between 2015 and 2016 (Table 23; $t_{0.05(2),\,32} = -0.907$, $P = 0.4$). However, maximum counts remained modestly higher than the long-term average. Low precision around the estimate from 2016 makes inferences regarding population trends very difficult. Hunters generally reported seeing slightly fewer to average numbers of willow ptarmigan in the western Chugach Mountains during 2014 and 2015. However, abundant

populations of willow ptarmigan were reported throughout the northern Chugach Mountains (Unit 13A) and southern Talkeetna Mountains (Unit 13D) during the same time period.

Table 23. 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, 2014–2016.

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

[a] CI = confidence interval.

Brood Surveys

On 30 July 2016 DWC completed the first formal brood surveys for ptarmigan in the Southcentral road system region. Two separate survey routes were completed near Hatcher Pass; however only 1 brood group of willow ptarmigan was located with 6 chicks. It is difficult to make meaningful inferences regarding the size of observed broods. Despite the low number of broods documented during surveys, 1 survey route was at high elevation where willow ptarmigan are less common. Summer 2016 was the first year of this project and additional routes are planned at lower elevation where willow ptarmigan will be more common.

Wing Collections

Eighty-one willow ptarmigan wing samples were collected from hunters during RY14 and 90 during RY15 (Table 24). Although the proportion of juveniles did not increase significantly from RY14 to RY15 ($z_{0.05(2)} = 0.986$, $P = 0.3$) there was a significant increase from RY13 to RY15 ($z_{0.05(2)} = 12.101$, $P = 0.001$) suggesting good juvenile production in summer 2015. Hunters generally reported low willow ptarmigan abundance during the RY13 season; however, many reported higher abundance in RY14 and RY15. Increase proportion of juveniles (higher chick production) during RY14 and RY15 support these observations.

Table 24. 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] 2011–2015.

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

[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

DWC currently has no population assessment surveys in the Southcentral road system region for snowshoe hare. However, based on DWC staff and hunter observations, snowshoe hare abundance remained low in 2015 with modest increases observed in 2016. Based on population assessment surveys throughout the Interior, snowshoe hare abundance is anticipated to increase annually through 2018 and peak shortly after in this region. Population densities in the region are expected to peak between 2018 and 2020.

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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 numerous 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 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.

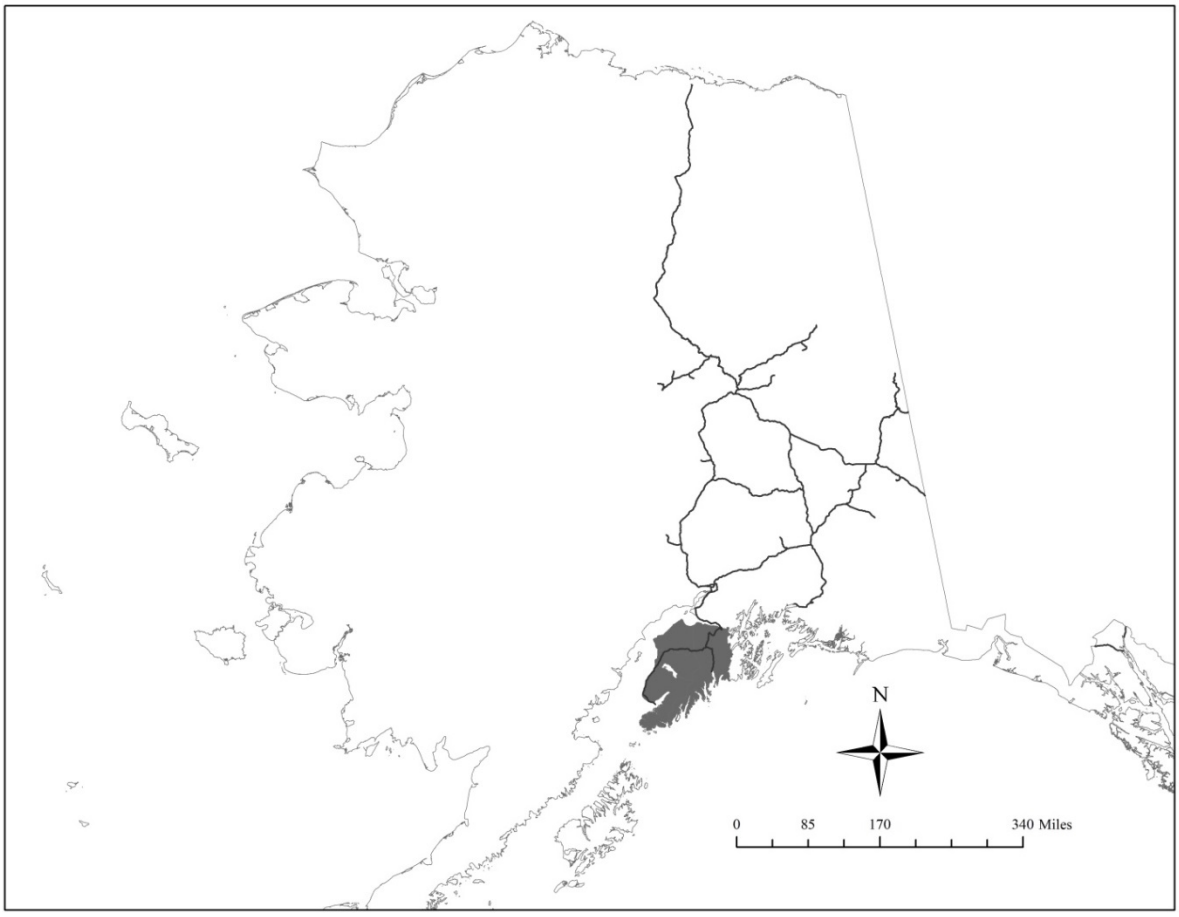

Figure 6. Map of the Kenai Peninsula region, Alaska.

RUFFED GROUSE

Spring Breeding Surveys

In spring 2015 and 2016, DWC was unable to complete the ruffed grouse breeding survey on the Skilak Loop Road. Very few ruffed grouse have 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 DWC asks for any help in reporting observations of ruffed grouse on the Kenai Peninsula. Reports can be submitted via e-mail at the small game web page (www.smallgame.adfg.alaska.gov).

Wing Collections

No ruffed grouse wings were collected from the Kenai Peninsula during RY14 or RY15. Ruffed grouse abundance on the Kenai Peninsula is expected to remain very low during RY16. 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 in this report or on ADF&G's website at www.adfg.smallgame.alaska.gov.

SPRUCE GROUSE

Spring Breeding Surveys

Currently there are no spruce grouse spring breeding or brood survey efforts within this region. Spruce grouse abundance on the Kenai Peninsula was relatively high throughout 2014 and 2015 based on hunter reports and DWC staff field observations.

Wing collections

Over 100 spruce grouse wing samples were collected from hunters during RY14 and RY15 in the Kenai Peninsula region (Table 25). The proportion of juveniles in RY15 was not significantly different than in RY14 ($z_{0.05(2)} = 1.267$, $P = 0.3$); however, the proportion of juveniles was higher in RY15 compared to RY13 ($z_{0.05(2)} = 9.317$, $P = 0.002$), suggesting good juvenile production in 2015. The lower proportion of juveniles in RY13 matches what hunters reported and DWC staff observed during that season and to some extent RY14.

Table 25. 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] 2011–2015.

Regulatory year	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

[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

Volunteers and DWC staff conducted spring breeding rock ptarmigan surveys between 2 May and 20 May 2015 and between 22 April and 25 May 2016 throughout the Kenai Mountains (Table 26). Overall spring breeding abundance appeared to be very low across all survey locations in 2015 and 2016. Although more breeding male rock ptarmigan were observed during spring 2016 then in the recent past, particularly in areas near Cooper Landing, the mean number of males observed per stop in 2015 was not statistically different from 2016 ($t_{0.05(2),\,56}$, $P = 0.7$).

Table 26. 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, 2015–2016.

Year	Mean (males/stop)	95% CI[a]
2015	0.18	0.10–0.25
2016	0.25	0.19–0.31

[a] CI = confidence interval.

Despite the low breeding abundance observed throughout the Kenai Mountains in 2015 and 2016, hikers and DWC staff observations indicate large broods of rock ptarmigan were present during summer 2016.

Wing Collections

No rock ptarmigan wings were collected during RY14 or RY15 on the Kenai Peninsula.

Board of Game

During the March 2015 BOG meeting in Anchorage the ptarmigan hunting season dates and daily bag limit were modified for a portion of Unit 15C. Within Unit 15C, the area north of the Fox River and Kachemak Bay closes for ptarmigan hunting on 31 January and the daily bag limit for the duration of the season was reduced from 10 ptarmigan per day to 5 per day. This change was adopted due to concern for low ptarmigan abundance being reported by local hunters. This change applies to all 3 species of ptarmigan in Unit 15C.

WHITE-TAILED PTARMIGAN

Spring Breeding Surveys

Currently there are no white-tailed ptarmigan spring breeding or brood survey efforts within this region. Dall sheep (*Ovis dalli*) hunters and hikers reported observing large and abundant broods of white-tailed ptarmigan throughout the Kenai and Chugach mountains on the Kenai Peninsula during summer 2016.

Wing Collections

Eighteen white-tailed ptarmigan wing samples were collected from hunters during the RY14 and 9 from RY15 on the Kenai Peninsula. 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 in 2015 between 2 May and 20 May and in 2016 between 22 April and 25 May in the Kenai Mountains (Table 27). The number of males observed per stop in 2016 was not statistically different from those observed in 2015 ($t_{0.05(2),\ 135} = 1.673$, $P = 0.10$) and it appears as though the population is stable. In 2016, willow ptarmigan breeding activity appeared to have peaked earlier than normal. This may have been driven by the early onset of spring weather. Regardless, 6 of the 11 spring breeding surveys completed in the Kenai Peninsula region in 2016 were completed on or after what appeared to be the peak of breeding activity. Therefore, spring 2016 survey values may underrepresent actual breeding abundance. In addition, DWC staff, local hikers, and other outdoor enthusiast reports suggested strong willow ptarmigan abundance on the Kenai Peninsula in 2016. Many observations have been made of numerous and large broods in the Kenai Mountains during June and July 2016.

Table 27. 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, 2015–2016.

Year	Mean (males/stop)	95% CI[a]
2015	0.30	0.03–0.73
2016	0.29	0.08–0.51

[a] CI = confidence interval.

Wing Collections

Only 19 hunter-harvested wings were collected in RY14 and 24 in RY15 (Table 28). Although the proportion of juveniles in the harvest appears to have decreased from RY13 the numbers are not statistically different (*P*-value encompasses changes seen in consecutive years from 2013 to 2015; $P > 0.06$). The majority of hunter-harvested wings were collected from Unit 7.

Table 28. 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] 2011–2015.

Regulatory year	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, 16	17	27	0	44	0.61	0.45–0.76
2013	7, 17	9	25	0	34	0.74	0.56–0.87
2014	7, 18	10	9	0	19	0.47	0.24–0.71
2015	7, 19	10	14	0	24	0.58	0.37–0.78

[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.

SNOWSHOE HARE

Abundance Surveys

DWC does not have any snowshoe hare population assessment projects on the Kenai Peninsula. In the past USFWS has completed annual hare pellet counts on the Kenai National Wildlife Refuge. These counts have been a very good index of abundance for the Kenai Peninsula. However, serial stage advancement of the long-term survey plots on the peninsula may be influencing the future reliability of these surveys.

Based on hare pellet counts on the Kenai Peninsula, 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 begin rising through 2016–2017. The next population cycle high on the Kenai Peninsula is expected sometime between 2019 and 2021.

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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 Bristol Bay south of Dillingham (Unit 17) north to Barrow (Unit 26A). The dominant habitat in this region is 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. Willow ptarmigan are generally abundant and 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 only found within this and the Alaska Peninsula regions. Sooty grouse and white-tailed ptarmigan are not found in this region.

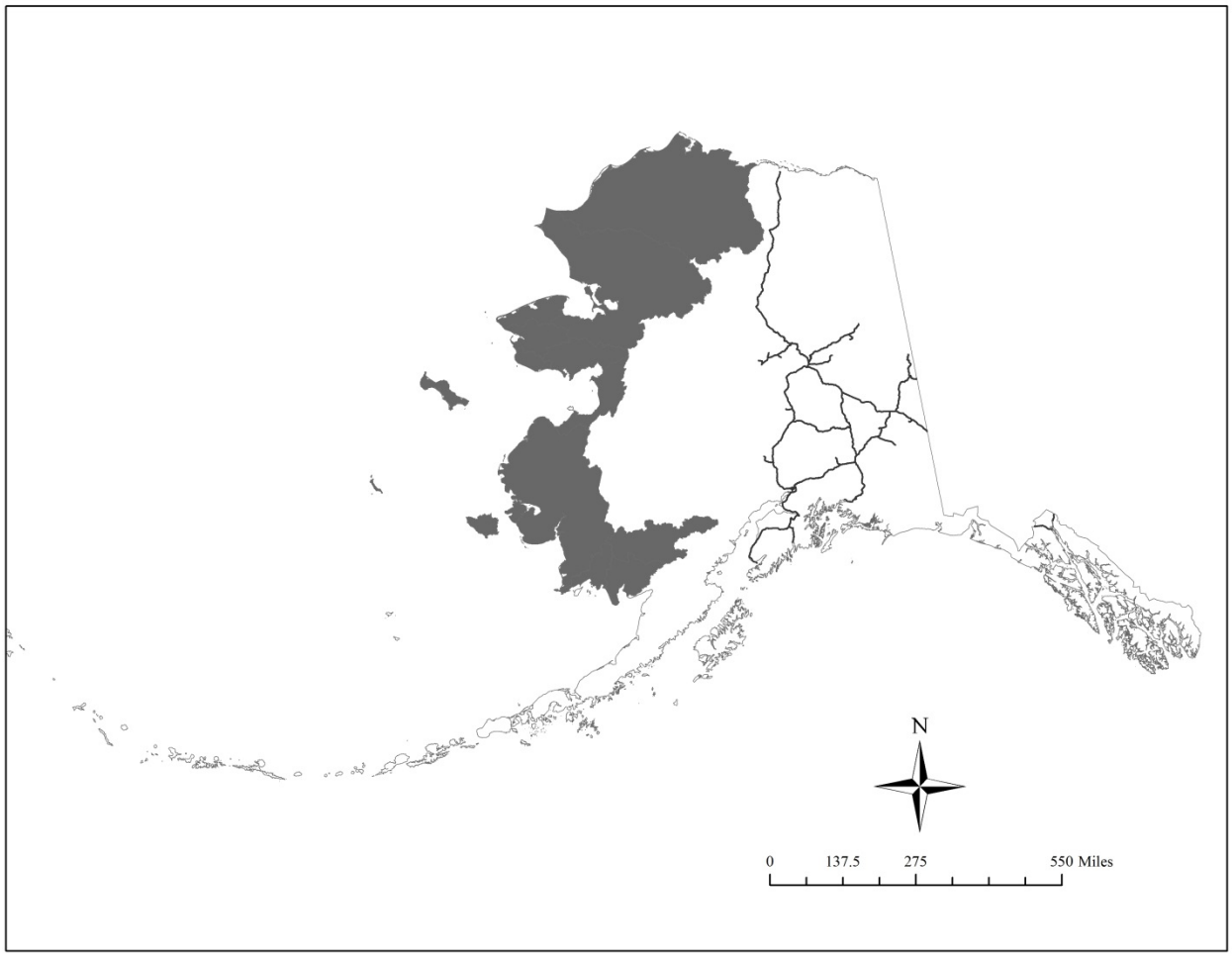

Figure 7. Map of the Western Rural region, Alaska.

RUFFED GROUSE AND SPRUCE GROUSE

Spring Breeding Surveys

Currently, there are no population assessment projects for either ruffed or spruce grouse being conducted in the Western Rural region. Based on DWC staff observations, spruce grouse abundance appears to be lower near Dillingham (Unit 17) in 2016 than in the past 1–2 years but likely higher than average near Bethel (Unit 18), which is likely at the far extent of the species range in Alaska.

Wing Collections

Sixty spruce grouse were collected from hunters in RY14 and 35 spruce grouse were collected from hunters in RY15. All harvested wings were donated by Dillingham High School students and their teacher as part of a citizen science project in Unit 17. Based off of harvest data there was no significant change in the proportion of juveniles in the population near Dillingham from RY14 to RY15 ($z_{0.05(2)} = 0.321$, $P = 0.6$).

ROCK PTARMIGAN

Spring Breeding Surveys

Currently, DWC does not have any population assessment projects for rock ptarmigan in this region. However, researchers with the Peregrine Fund completed rock and willow ptarmigan surveys on the Seward Peninsula in 2015 and 2016 (D. Anderson, Director of Gyrfalcon Conservation Project, Peregrine Fund, Boise, Idaho, personal communication) in coordination with a gyrfalcon study. Findings from the study will be included in future reports as there is only 1 year of data because survey methods changed in 2016. Hunter observations suggest good production and survival of rock ptarmigan in the southern portion of Unit 22. However, based on staff observations from near Dillingham and Bethel ptarmigan numbers appear to be quite low although the warmer weather and lack of snow in recent years may be having an influence on movements and aggregation size (P. Jones, Wildlife Biologist, ADF&G, Bethel, personal communication).

Wing Collections

Only 1 harvested rock ptarmigan wing was donated by hunters in RY14 and 21 in RY15. All donated wings in RY14 and RY15 came from near Nome (Unit 22). The sample is too small to make any inferences about changes in the proportion of juveniles in that local population and in the larger region as a whole.

WILLOW PTARMIGAN

Spring Breeding Surveys

Currently, DWC does not have any population assessment projects for willow ptarmigan in this region. However, researchers with the Peregrine Fund completed rock and willow ptarmigan

surveys on the Seward Peninsula in 2015 and 2016 (D. Anderson, personal communication) in coordination with a gyrfalcon study. Late summer and early fall hunter observations from near Nome suggest production and survival of juvenile willow ptarmigan in the area was again excellent in 2016. Staff observations from near Dillingham and Bethel suggest ptarmigan numbers may be quite low although the warmer weather and lack of snow in recent years may be having an influence on movements and aggregation size (P. Jones, personal communication).

Wing Collections

DWC collected 110 willow ptarmigan wing samples from hunters in RY14 and 128 in RY15. All samples from RY14 and RY15 were collected from along the Nome road system. The proportion of juveniles in the harvest increased significantly ($z_{0.05(2)} = 9.393$, $P = 0.002$) from RY14 to RY15, indicating excellent juvenile production in summer 2015 (Table 29).

Table 29. Total number and proportion of juvenile willow ptarmigan based on harvested wing collections within the western rural region, Alaska, regulatory years[a] 2012–2015.

Regulatory year	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

[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.

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.

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 midcentury crash with a continued low but stable population in recent years. In 2012, several individuals reported observing more Alaska hares between Bethel and the Ahklun Mountains than have been observed in the recent past. However, many long-term residents report much lower abundance throughout the species' entire range than was present in the 1980s (P. Jones, personal communication). During late winter and spring of 2013, Alaska hares were also observed along the coastline of Unit 18, along the Kisaralik River, and on ridge tops and areas with little snow in the Kilbuck Mountains.

DWC initiated a research project with a graduate student at UAF to study distribution and genetic variability of Alaska hare throughout its range (Cason et al. 2016). Previous work on Alaska hare suggested their distribution to be the limited to the western coast of Alaska spanning from the southern parts of the Alaska Peninsula to Kotzebue Sound (Anderson 1978). Cason et al. (2016) revises the historical distribution to the north of Kotzebue within the Noatak National

Preserve and south to Cold Bay on the Alaska Peninsula and suggests potential gene flow of the species between Russia and Alaska. To better understand this species' life history and behavior DWC plans on initiating a pilot study in Unit 17 in spring 2017.

Hunter participation is encouraged and sample collection details can be found by contacting the Fairbanks or Palmer ADF&G offices.

SNOWSHOE HARE

Currently there are no snowshoe hare population assessment projects being conducted in this region. However, staff reports suggest numbers are on the increase with much higher snowshoe hare observations near Nome this year than in the previous few years. Staff observations also suggest that snowshoe hare numbers are on the rise near Bethel.

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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 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. Sharp-tailed and sooty grouse and white-tailed ptarmigan are not found in the Alaska Peninsula region.

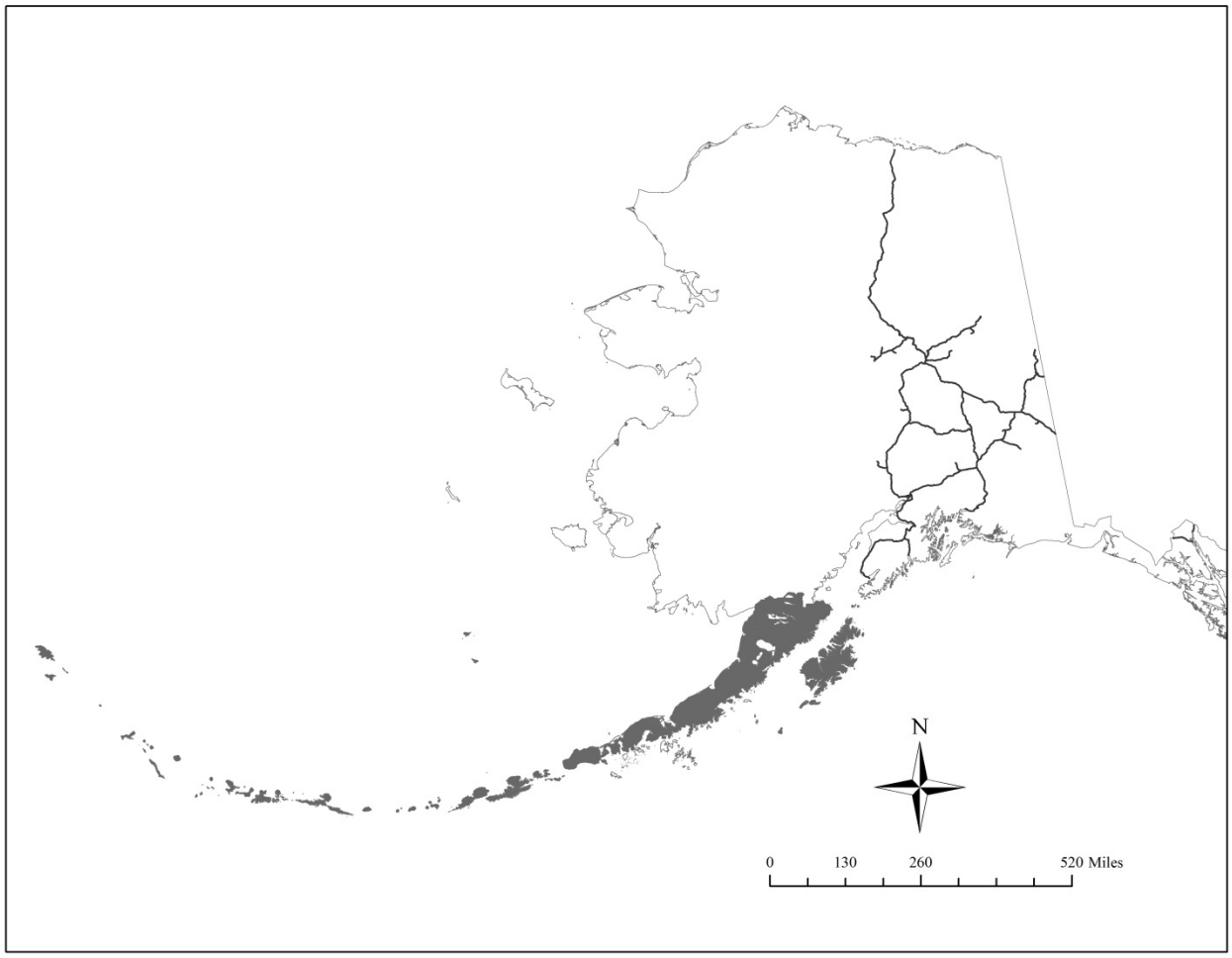

Figure 8. Map of the Alaska Peninsula region.

RUFFED GROUSE AND SPRUCE GROUSE

The extent of ruffed and spruce grouse distribution in this region is currently unknown and DWC does not have any population assessment projects within the Alaska Peninsula region.

ROCK PTARMIGAN

Spring Breeding Surveys

Currently there are no rock ptarmigan spring breeding or brood survey efforts within this region. However, based on local DWC staff observations for Unit 9 it appears that overall rock ptarmigan abundance is low to very low throughout most of the Alaska Peninsula.

In June 2015, independent researchers and the USFWS Alaska Maritime National Wildlife Refuge created and completed several spring breeding surveys for rock ptarmigan on Adak, Amchitka, and Attu islands (Unit 10). Adak Island surveys were repeated in 2016 with hopes that staff can visit most or all 3 islands and survey locations annually. In 2015, surveys were completed between 29 May and 10 June and in 2016 between 18 May and 3 June. In 2015, numbers of breeding male rock ptarmigan decreased from east to west on the Aleutian Island chain. Data presented for the 2015 and 2016 Aleutian Island rock ptarmigan surveys were made available by USFWS (Table 30).

Table 30. Average number of spring breeding male rock ptarmigan per survey stop by location in the Alaska Peninsula region, 2015–2016.

			Year	
Unit	Site	Stops	2015[a]	2016[b]
10	Adak Island	39	1.7	1.2
10	Amchitka Island	42	0.3	NS[c]
10	Attu Island	17	0.0	NS[c]

[a] Completed by C. Braun, W. Taylor with the assistance of the U.S. Fish and Wildlife Service (USFWS) *RV Tiglax*.
[b] Completed by USFWS (L. Spitler) and USFWS *RV Tiglax*.
[c] NS = no survey.

Throughout October and November 2015 local hunters on Akutan Island (Unit 10) reported seeing higher than average numbers of rock ptarmigan and frequently seeing flocks of 30–50. Hunters on Unalaska Island reported seeing fewer rock ptarmigan than normal.

Wing Collections

Only 3 rock ptarmigan hunter harvest wing samples were provided in RY14 and 18 in RY15, making inferences about juvenile production impossible.

WILLOW PTARMIGAN

Spring Breeding Surveys

Currently there are no willow ptarmigan spring breeding or brood survey efforts within this region. However, based on local DWC staff observations for Unit 9 it appears that overall willow ptarmigan abundance is very low throughout most of the Alaska Peninsula including Cold Bay, King Salmon, and Becharof Lake. Reports indicate willow ptarmigan abundance was higher 3 years ago; however the past 2 summers have had wet, cool periods immediately post hatch which may have caused high chick mortality in most locations of the Alaska Peninsula. In addition, the past 2 winters have largely been snow-free which greatly reduces the ability of ptarmigan to seek thermal protection and camouflage concealment through the winter. Red fox (*Vulpes vulpes*) abundance has also been reported as high to very high through the Alaska Peninsula region by local residents and trappers.

Wing Collections

Only 24 willow ptarmigan hunter-harvested wing samples were provided in RY14 and 0 in RY15, making inferences about juvenile production impossible.

ALASKA HARE

Currently, DWC has no population assessment project for Alaska hare from the Alaska Peninsula region. Alaska hares occur throughout the Alaska Peninsula and are periodically harvested there; however, their density and distribution are currently unknown. A UAF graduate student working in collaboration with DWC recently published a paper detailing the findings from her study on the distribution and genetic variability of Alaska hare throughout its range (Cason et al. 2016; see Alaska Hare in the Western Rural section).

SNOWSHOE HARE

Currently, DWC has no population assessment project for snowshoe hare in the Alaska Peninsula region. It is believed that snowshoe hares on the Alaska Peninsula are currently experiencing the same low but increasing population abundance found throughout southern 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 are 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. Snowshoe hare only occur 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.

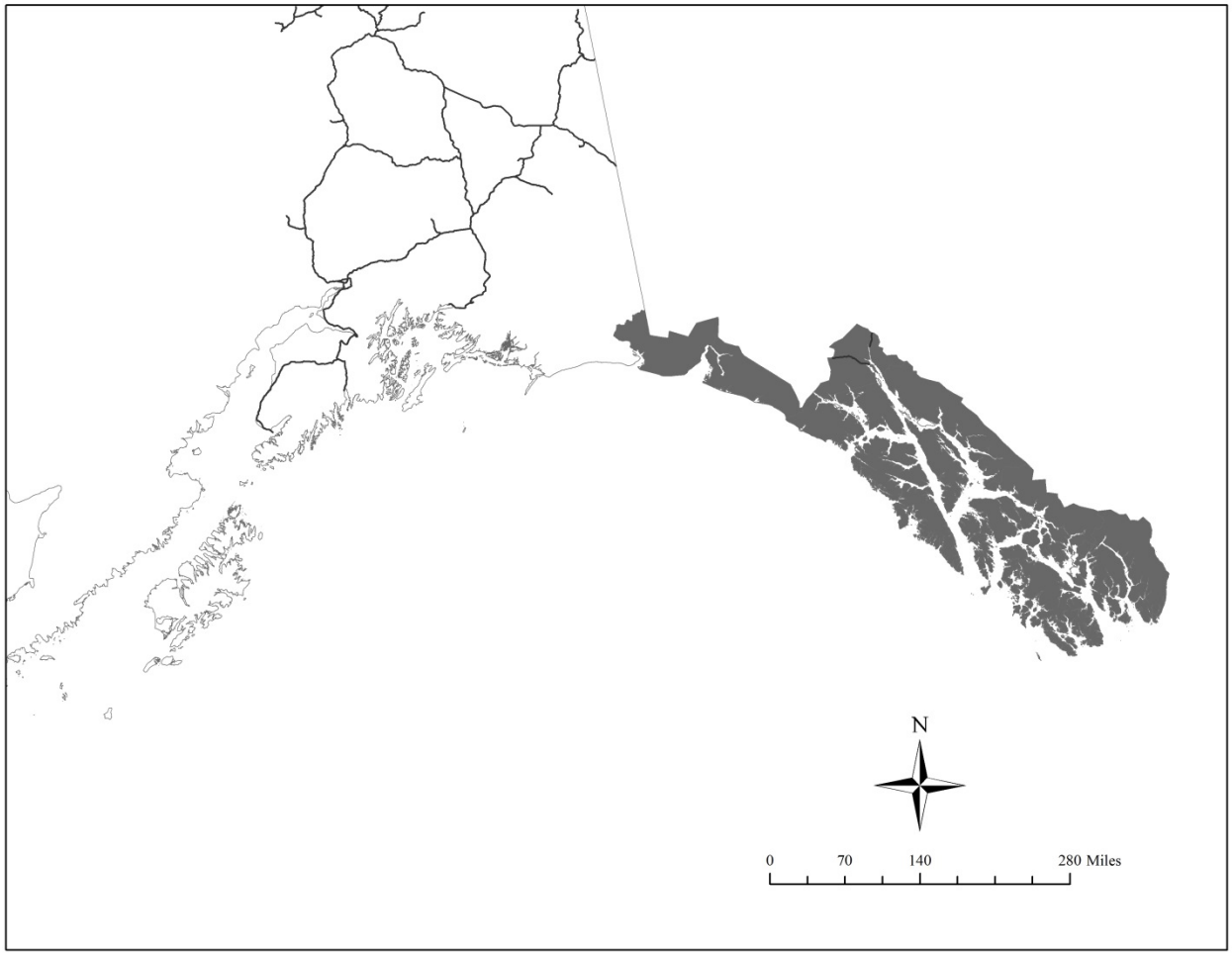

Figure 9. Map of the Southeast region, Alaska.

RUFFED GROUSE

Currently there are no ruffed grouse spring breeding or brood survey efforts within this region. Although ruffed grouse exist in the Southeast region, their distribution is likely 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

Beginning in April 2015, DWC initiated systematic spring breeding surveys for sooty grouse in Juneau and on Douglas, Kupreanof, and Mitkof islands. Surveys occurred during 13 April–22 May 2015 and 8–15 April 2016 (Table 31). Due to personnel constraints in 2016 DWC was only able to complete a single survey on each route. Overall, survey conditions were good and access to each transect was not a problem. Overall abundance of male sooty grouse appeared to be up in both Unit 1C and Unit 3. The increase from 2015 to 2016 was not statistically significant for Unit 1C ($t_{0.05(2),\,65} = -0.570$, $P = 0.6$) but it was a statistically significant increase in the number of males observed per stop in Unit 3 ($t_{0.05(2),\,192} = -5.501$, $P = 0.0001$), with the increase most noticeable on Kupreanof Island.

Table 31. 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, 2015–2016.

	Unit 1C (38 stops)		Unit 3 (81 stops)	
Year	Mean (males/stop)	95% CI[a]	Mean (males/stop)	95% CI[a]
2015	1.84	1.45–2.34	1.51	1.03–1.99
2016	1.93	1.43–2.43	2.41	2.00–2.83

[a] CI = confidence interval.

Wing Collections

There were 43 sooty grouse wings collected during RY14 and 17 wings collected in RY15 (Table 32). Between RY14 and RY15 there was no significant change in the proportion of juveniles in the harvest ($z_{0.05(2)} = 0.164$, $P = 0.7$). Both of these details are consistent with historical harvest patterns. Most hunters reported large abundance of "hooting" males during spring 2015 and 2016.

Table 32. 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] 2012–2015.

Regulatory year	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

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2012 = 1 July 2012–30 June 2013).
[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, DWC has no population assessment project in or wing collections from spruce grouse in the Southeast region.

ROCK, WHITE-TAILED, AND WILLOW PTARMIGAN

Currently, DWC has no spring breeding or brood survey efforts for rock, white-tailed, or willow ptarmigan in this region. The extent and distribution of these 3 species within the Southeast region is unknown; however, they are routinely observed by hunters and hikers 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 small game program. DWC staff are 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, over 100 volunteer hours were accrued and in 2016 nearly 500 hours through spring breeding, and summer brood surveys. If you are interested in assisting the small game program please contact your nearest small game biologist in Palmer or Fairbanks.

The small game program has continued its partnership with local conservation organizations to continue habitat manipulation projects near Tok for the benefit of ruffed and sharp-tailed grouse as well as moose. This work has been given further financial support to continue through 2018 in Tok and Delta Junction. Hunters can locate maps of these locations on the small game website (www.smallgame.adfg.alaska.gov). The Founding Forty has also provided financial support to increase small game educational opportunities across the state as well as fund a project that will look at correlations between winter weather indices and grouse and ptarmigan abundance.

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 Valley and Fairbanks. These courses include a lecture that covers species, regulations, tactics, equipment, as well as field dressing actual grouse and ptarmigan. A second component of the class includes a 2–3 hour field trip that highlights various habitat features used by Alaskan grouse and ptarmigan. If you are interested in participating in a future class please visit the ADF&G homepage and look under the Education tab.

Work has concluded on a grouse and ptarmigan blood parasite project in cooperation with the United States Geological Survey (Smith et al., *In prep*). This work examined the rates of various parasites in hunted populations of Alaskan grouse and ptarmigan species. The study helped document the rates of infection and species diversity of blood parasites for these species and populations.

Management Implications

Former DWC small game biologist Robert Weeden began documenting (Weeden 1965) the dramatic and consistent patterns between ruffed grouse and snowshoe hare population cycles beginning in 1960. Based on responses published in ADF&G's annual trapper questionnaire reports he was able to document the closely related peak of ruffed grouse population density followed 1–2 years later by snowshoe hare. Taylor (2013) continued this evaluation and documented the same pattern.

Within Unit 20, DWC examined ruffed grouse spring breeding data and roadside counts of snowshoe hare and documented the same relationship in recent years. Lynx trapper sealing data were then added into the analysis and a more complex relationship was revealed (Fig. 10). Very high amplitude snowshoe hare population cycles appear to peak 1–3 years after the peak of the ruffed grouse population peak in Unit 20. Not surprising, lynx population peaks generally occur 1–2 years after the hare peak.

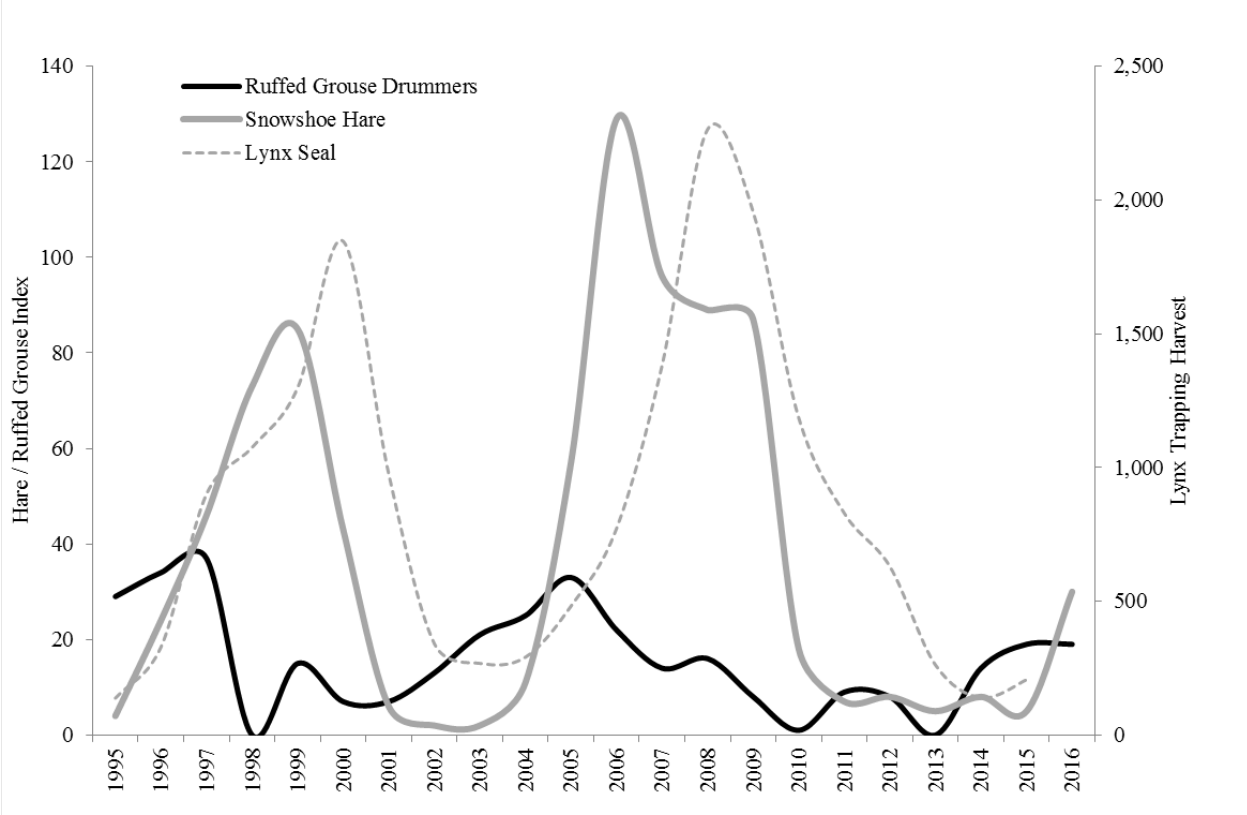

Figure 10. Relationship between ruffed grouse (spring breeding counts), snowshoe hare (spring counts), and lynx (trapper sealing records) population cycles in Unit 20, 1995–2016.

It appears from this rudimentary analysis that the sheer biomass of snowshoe hare is likely a major driver in Alaska's grouse (and possibly ptarmigan) population cycles. Data shows that since 1995 ruffed grouse population indices begin to decrease as snowshoe hare populations begin to increase. This is very quickly followed by an increase in the lynx abundance. Assuming lynx are an indicator of specialist and generalist predators (including avian) it appears that predator abundance begins to increase as grouse abundance increases. As the hare abundance also increases predator abundance increases rapidly to take advantage of this growing resource. These predators are likely taking advantage of the sheer biomass of hares while also taking grouse when available. Thus grouse (and possibly ptarmigan) populations begin a noticeable decline. Only after hare and predator populations decline are grouse populations able to rebound.

There are other significant contributors to grouse population cycles; however, generally those are over a much shorter time span. Those contributors include cold and wet conditions within 2–3 weeks post hatch in late June, arthropod and other forage availability, and habitat quality. However, it is likely that snowshoe hares are significant contributors to long-term population fluctuations for Alaska's grouse and possibly ptarmigan populations.

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