Wildlife Management Report ADF&G/DWC/WMR-2013-3

Status of Grouse, Ptarmigan, and Hare in Alaska, 2013

Richard A. Merizon

August 2013

Alaska Department of Fish and Game Division of Wildlife Conservation

Wildlife Management Report, ADF&G/DWC/WMR-2013-3

Status of Grouse, Ptarmigan, and Hare in Alaska, 2013

Richard A. Merizon
Small Game Biologist
Alaska Department of Fish and Game
1800 Glenn Highway, Palmer, AK. 99645
Richard.Merizon@alaska.gov
(907) 746-6333

August 2013

Alaska Department of Fish and Game
Division of Wildlife Conservation, Region IV Office
1800 Glenn Highway
Palmer, AK. 99645

Wildlife Management Reports are used to document general wildlife management issues or information.They typically summarize information related to a specific management issue, review management activities, and/or provide information about why a particular management approach has been taken or is recommended. They may be produced primarily for general or technical audiences. These reports are professionally reviewed by staff in the Division of Wildlife Conservation.

This Wildlife Management Report was approved for publication by Richard Merizon, program coordinator for the Alaska Department of Fish and Game's Small Game Program.

Wildlife Management Reports are available from the Alaska Department of Fish and Game's Division of Wildlife Conservation, PO Box 115526, Juneau, Alaska 99811-5526; phone (907) 465-4190; email: dfg.dwc.publications@alaska.gov; website: www.adfg.alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Service (www.arlis.org).

This report was produced as an electronic-only document and should be cited as:

Merizon, R. A. 2013. Status of grouse, ptarmigan, and hare in Alaska, 2013. Alaska Department of Fish and Game, Wildlife Management Report, ADF&G/DWC/WMR-2013-3. Palmer, Alaska.

Cover Photo: Radiocollared female rock ptarmigan, *Lagopus muta,* Denali Highway. ©2013 ADF&G, photo by Rick Merizon.

Table of Contents

List of Figures

List of Tables

Introduction

Species considered small game in Alaska are defined by the Alaska Department of Fish and Game, 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*), spruce (*Falcipennis canadensis*), sharp-tailed (*Tympanuchus phasianellus*), and sooty grouse (*Dendragapus fuliginosus*); and willow (*Lagopus lagopus*), rock (*L. muta*), and white-tailed ptarmigan (*L. leucurus*). In addition, Alaska has two species of hare (Leporidae) including snowshoe hare (*Lepus americanus*) and Alaska hare (*L. othus*). All 9 species of small game can be legally harvested in Alaska with liberal seasons and bag limits for all game management units (GMU, Fig. 1).

Starting in the 1960s, the DWC began studying small game, particularly rock and willow ptarmigan, in the Interior (Weeden 1965). However, by the late 1970s funding to support such efforts waned and the emphasis shifted toward big game management. Not until the late 1980s did DWC become more involved in small game research and management. As the human population steadily grew through the 1980s interest also grew in promoting the state's small game resources. In the late 1980s through the mid-1990s ruffed grouse were translocated from Anderson, Alaska to the Matanuska–Susitna (Mat-Su) Valley and the Kenai Peninsula (Steen 1995, 1999). Additional abundance surveys that began throughout the 1990s were continued through 2011 (Taylor 2013). Harvested grouse and ptarmigan wings were also collected from hunters along the populated road system and examined to estimate juvenile production in Southcentral and Interior Alaska. The road system includes all of the major highways from Fairbanks to the Kenai Peninsula and east to the Canada–U.S. border in addition to the Dalton Highway (Fig. 2). In the summer of 2011, the DWC hired a full-time, statewide, small game biologist to further develop statewide grouse, ptarmigan, and hare population monitoring and to promote this valuable resource. The new small game program objectives are diverse and comprehensive. In addition to education and outreach, the primary objectives of the program are to 1) better understand harvest composition and abundance trends of statewide small game populations particularly those that are heavily used by hunters along road systems, and 2) develop research efforts to better inform management concerns.

This report details the activities conducted by the small game program during the 2012 regulatory year (RY12; 1 July 2012–30 June 2013). Specifically, it will address: 1) the harvest composition from the past season, 2) status of grouse, ptarmigan, and snowshoe hare populations, 3) management concerns, 4) Board of Game (BOG) regulatory changes, and 5) future work.

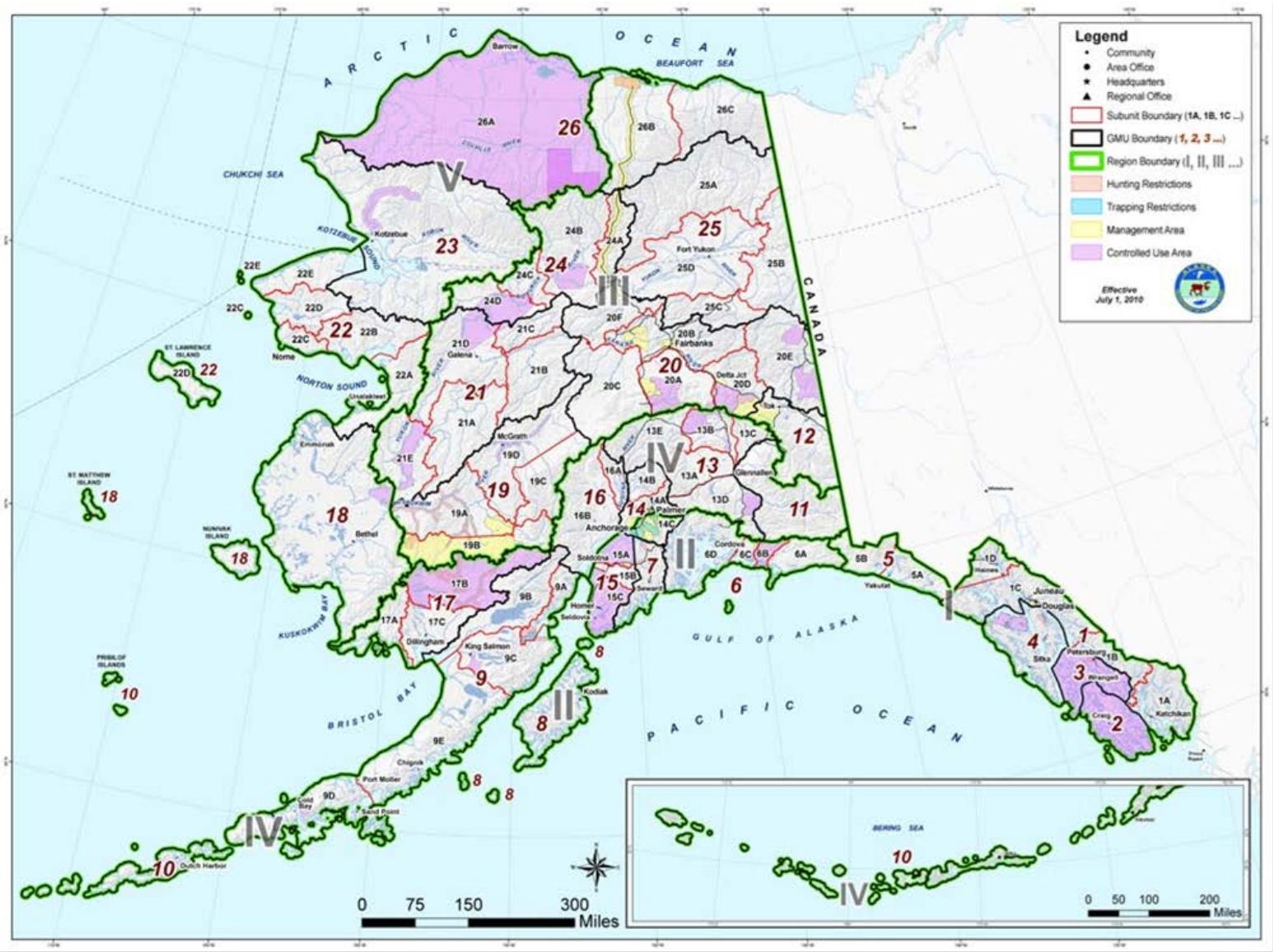

Figure 1. State of Alaska game management units.

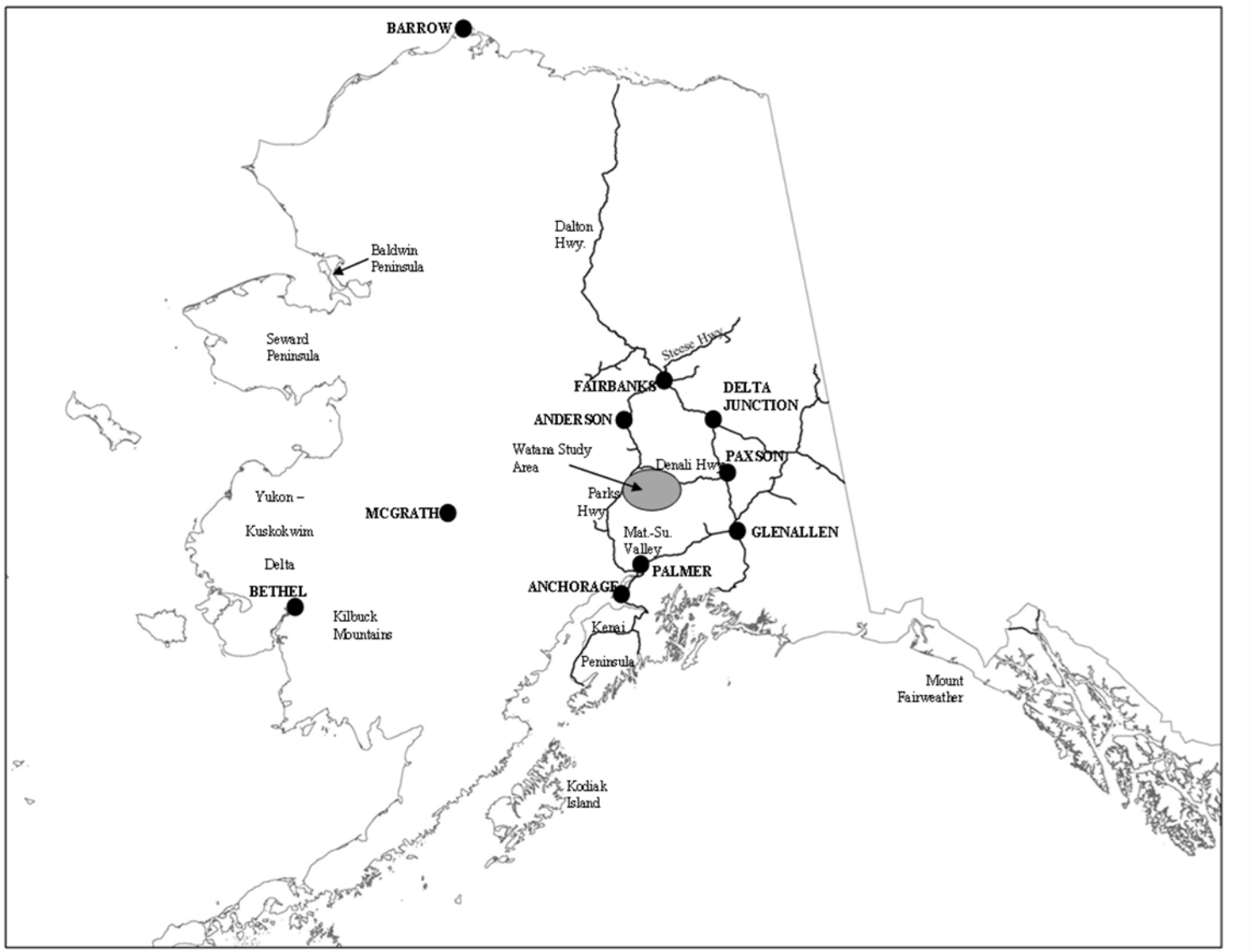

Figure 2. Alaska road system and general locations at which abundance surveys or research studies were completed or field observations were made. Locations are referred to in this report.

Methods

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 (Table 1, Fig. 3). By examining these samples, biologists can determine age (juvenile or adult) and sex of harvested birds (Bergerud et al. 1963; Weeden and Watson 1967; Szuba et al. 1987; Gullion 1989). This is a very cost- and time-effective way for the DWC to index harvest composition and estimate brood production from the previous breeding season.

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 several purposes: 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, particularly those of ptarmigan, were used to verify species and estimate sex by examining the supercilium (eyelid) or coloration of feathers.

Table 1. Total number of wings collected from grouse and ptarmigan by game management unit across Alaska during regulatory year 2012.

Game Mngt.	Grouse				Ptarmigan			
Unit (GMU)	Ruffed	Spruce	Sharp-tailed	Sooty	Willow	Rock	White-tailed	Total
1	0	3	0	39	2	0	0	44
3	0	0	0	1	0	0	0	1
7	0	85	0	0	23	0	2	110
8	0	0	0	0	3	1	0	4
9	0	0	0	0	61	0	0	61
10	0	0	0	0	0	24	0	24
13	0	10	0	0	105	9	4	128
14	4	62	0	0	96	10	7	179
15	0	7	0	0	3	0	1	11
16	0	6	0	0	16	0	0	22
18	0	5	0	0	0	0	0	5
20	21	42	45	0	4	17	0	129
22	0	0	0	0	117	12	0	129
23	0	2	0	0	8	2	0	12
24	0	11	0	0	0	0	0	11
25	0	3	0	0	5	1	0	9
26	0	0	0	0	31	33	0	64
NA	0	7	0	0	0	0	0	7
Total	25	243	45	40	474	109	14	950

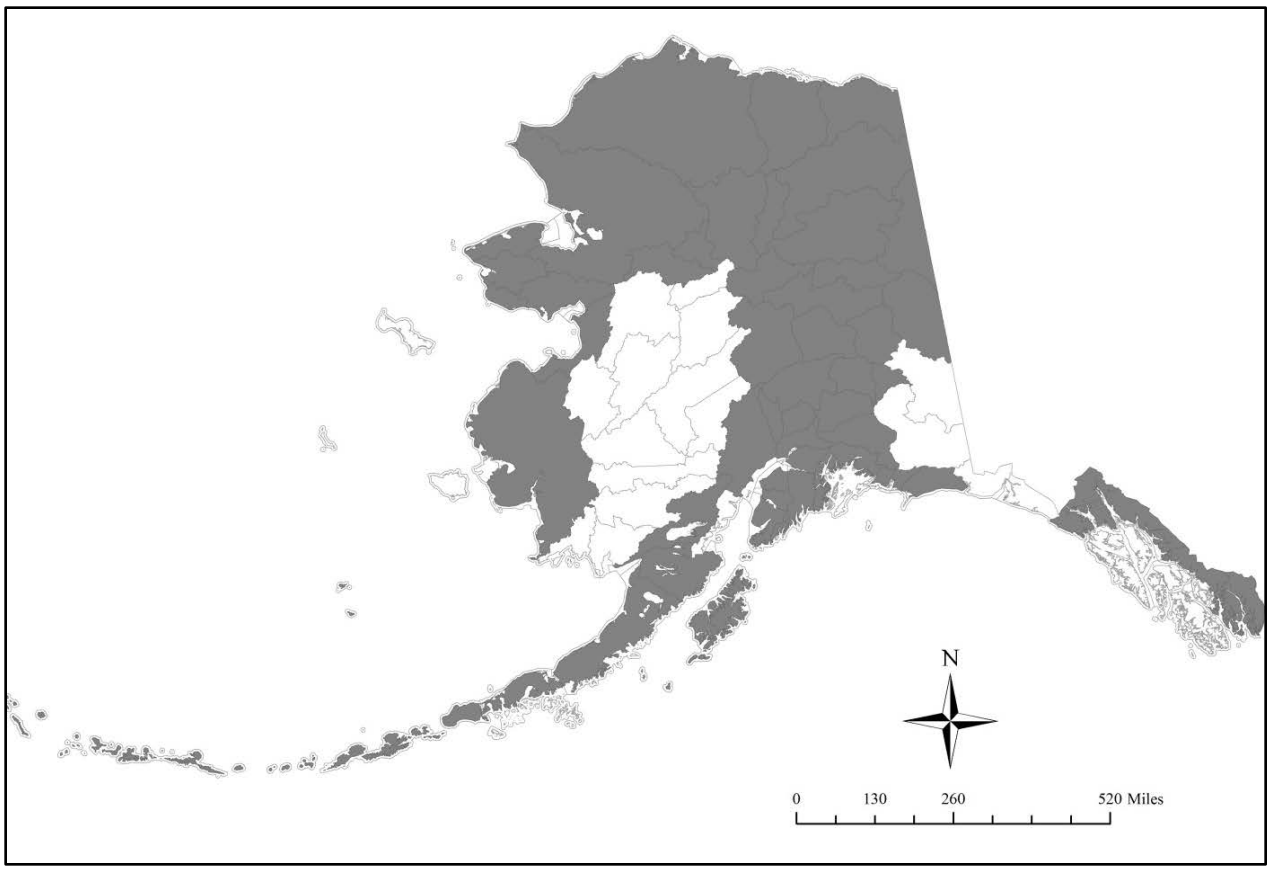

Figure 3. Gray shaded game management units and subunits from within which grouse and ptarmigan wings, tails, and heads were collected from hunters during regulatory year 2012.

SPRINGTIME ABUNDANCE SURVEYS

Critical to the management of Alaska's small game is an understanding of population abundance, particularly 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 from the Steese Highway to the Kenai Peninsula (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.

Springtime 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). 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.

The spring breeding season for grouse and ptarmigan in Alaska occurs from late 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 assessed. 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 and will continue to be 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 greater population trend. A more detailed description of the methods used for each specific species is included under the appropriate species section.

Population fluctuations of snowshoe hare were also assessed by counting adults and conducting pellet surveys along the road system by DWC, other agencies, and private individuals. Assessing trends in Alaska hare populations poses unique challenges due to the inaccessible areas in which the specie lives and its range-wide low abundance. Despite the challenges during the winter of 2012–13 DWC staff in cooperation with University of Fairbanks (UAF) personnel began a study examining distribution throughout its range in Western and Southwestern Alaska.

2013 Climate Patterns and Breeding Season

In April and May 2013, large portions of Interior and Southcentral Alaska experienced one of, if not the, longest and coldest spring in recorded history for certain portions of the state. Unseasonably cold temperatures, with deep and unseasonably late snowfall was repeatedly documented and often caused delayed field work this spring in Southcentral and much of Interior Alaska (Fig. 4). This also caused a delayed, abbreviated, or unusual breeding season for numerous grouse and ptarmigan populations. In April on the Delta Junction Agricultural Project (DJAP) persistent snow covered all but one sharp-tailed grouse lek (communal breeding display areas) and females were infrequently observed near or on leks until mid-May. In many locations throughout the Mat–Su Valley and Interior, ruffed grouse delayed their breeding displays until the first week of May. Along portions of the Denali Highway, Alaska Range, and Chugach and Talkeetna mountains above 2,500 ft traditional willow and rock ptarmigan breeding and nesting habitat remained 80–100% snow covered through 5–10 June.

Persistent spring snow has been known to cause lower food availability (Arcese and Smith 1988) and increased thermoregulatory costs (Wiebe and Martin 2000). The late spring is known to cause delayed nesting and subsequent smaller clutch sizes for grouse and ptarmigan (Erikstad and Anderson 1983; Wilson and Martin 2010). However, a Fairbanks resident observed 11–12 feathered grouse (presumably ruffed grouse) chicks on 7 May in Fairbanks. Also, between 10 and 11 June, DWC staff located 6 previously radiocollared female willow and rock ptarmigan (see “Research” in each species section) along the Denali Highway to assess whether hens were nesting. Four (4) of the hens were found sitting on a nest, 1 rock ptarmigan hen was out foraging with no sign of a nest nearby, and 1 willow ptarmigan hen had been killed. Three (3) willow ptarmigan nests were examined and 8–9 eggs were observed in each, suggesting average clutch sizes (Hannon et al. 1998). Despite these field observations, impacts to various grouse and ptarmigan populations may and likely will be observed during the RY13 hunting season.

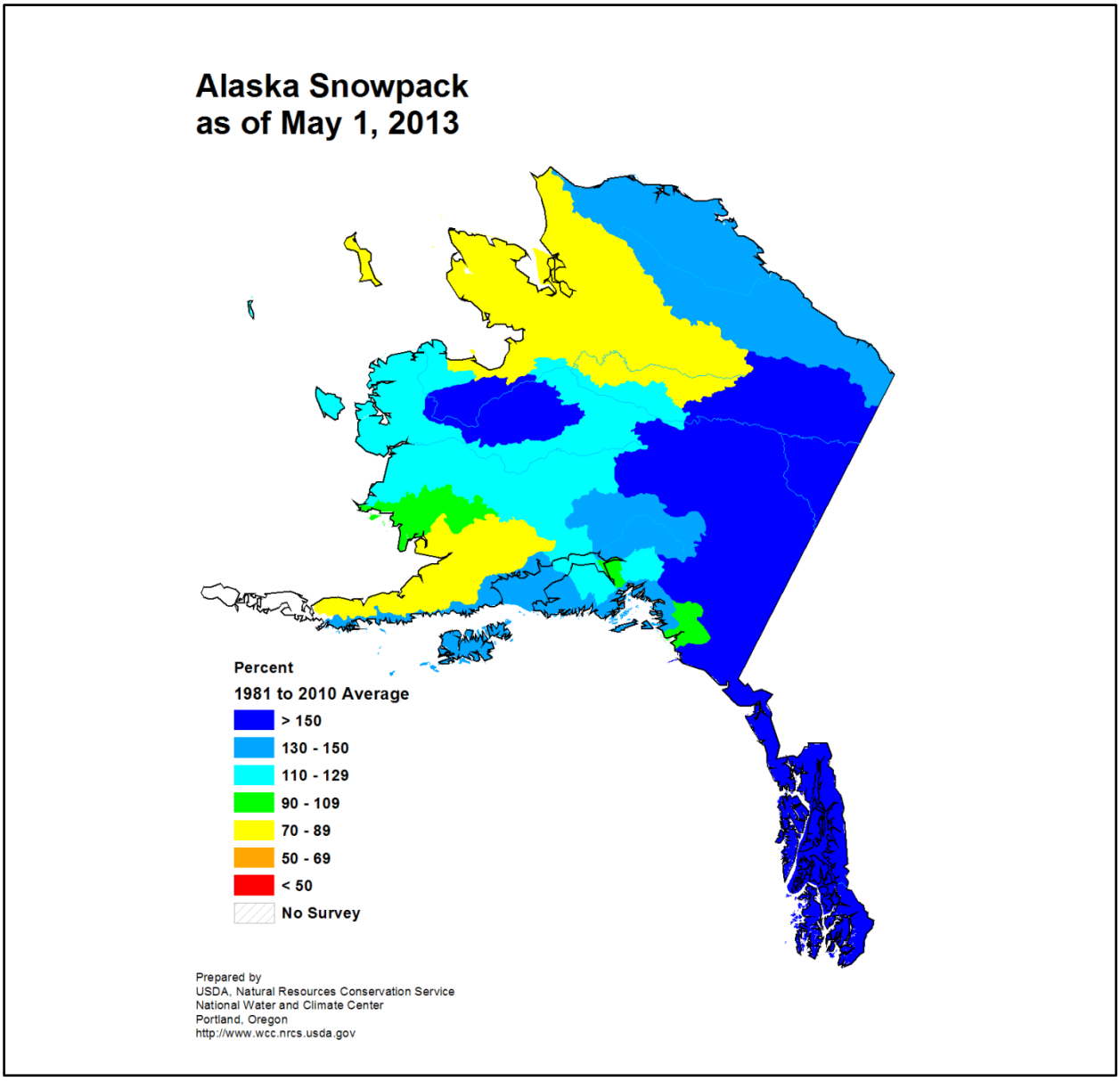

Figure 4. Percent of normal Alaska snowpack for 1 May, 2013. Prepared by the National Weather and Climate Center, Portland, Oregon.

As a result of the late spring, plant phenology was delayed. Leaf out in the larger metropolitan areas occurred around 25 May. On 11 June along the Denali Highway, only 50% of plants below 2,000 ft and only 0–20% above 2,000 ft were leafing out. Snow covered much of the small flowering herbaceous plants along the tundra through the first 7–10 days of June within the Alaska Range and other higher elevation areas in the Interior. In addition to delayed plant phenology this spring, alpine transitional plant species like willow (*Salix* spp.) and dwarf birch (*Betula glandulosa*) in the Copper River and Mat–Su valleys, and the Kenai Peninsula have been impacted by several seasons of Bruce spanworm (*Operophtera bruceata*) and autumnal moth (*Epirrita autumnata*) infestations. The larval stage of these insects defoliates several species of deciduous shrubs. In June of both 2011 and 2012, moderate to complete defoliation was observed within a several hundred vertical foot band in Chugach State Park, southern Talkeetna

Mountains, western Copper River Valley, and various locations on the Kenai Peninsula. In June 2013, a 20–80% lack of bud and subsequent leaf production was observed in the same areas. The overall impact to grouse, ptarmigan, and hares by the delayed plant phenology and insect infestations is uncertain. However, willow and dwarf birch are the primary overwintering forage species for willow and rock ptarmigan and snowshoe hare in these same areas. Despite the cold and record length of the snow cover the month of June was very warm and dry throughout the state. This weather pattern didn't reduce the effects of the spring weather pattern but may have allowed higher chick production than may have otherwise been expected.

Ruffed Grouse

METHODS

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. However, ruffed grouse were translocated to the Mat-Su Valley 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 to 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 2 to 3 years. The cause of this is unknown; however, the more maritime climate and predominance of spruce may be influencing population growth and range expansion.

From late April to early 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 beat their wings against their 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 utilized for ruffed grouse are consistent with state and national techniques (McBurney 1989; Taylor 1992). Drumming typically begins in late April and continues through mid-May and our surveys were planned 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; however, the total numbers of ruffed grouse were reported rather than the total number of drums. Roadside and trail transects through known ruffed grouse habitat were established in Anderson (1993, GMU 20C), Delta Junction (2008, GMU 20D), Copper Landing (2007, GMU 7), and Palmer (1992, GMU 14A) and have been completed annually since their inception (Merizon 2012; Taylor 2013).

On 5–6 May, 2013, DWC staff completed surveys on the route along the Skilak Lake Road on the Kenai Peninsula. This route was also surveyed in 2007, 2008, and 2012. Staff also identified

other good ruffed grouse habitat near Cooper Landing and listened at several points early in the morning and late in the evening for drumming.

In May 2012, the DWC reestablished a drumming count route in McGrath that had been created in the late 1980s and not repeated for over a decade (GMU 19D, R. Seavoy, ADF&G McGrath Area Biologist, personal communication). This route was along a 2.5-mile reach of the Kuskokwim River east of McGrath. Unfortunately this route was not completed in 2013 but DWC staff plan to continue surveying this route next year.

In late April and early May 2013, DWC and UAF Cooperative Extension staff searched for and created several ruffed grouse drumming routes near Tok and adjacent to the Taylor Highway. The DWC staff will continue to monitor these routes in the future.

In May 2013, volunteers also searched and listened for drumming ruffed grouse south of Wasilla and near Big Lake in an attempt to establish new drumming routes.

In addition to the ruffed grouse survey routes established and completed by the DWC, other organizations and government agencies conduct drumming counts. Contractors for the U.S. Army completed drumming counts on Fort Wainwright near Fairbanks and south of Delta Junction on the Donnelly Training Area (Haddix 2007). The Ruffed Grouse Society (RGS, Anchorage Chapter) completed drumming counts near Kepler-Bradley Lakes Recreation Area in the Mat-Su Valley (GMU 14A) near Palmer.

STATUS

Twenty-five ruffed grouse wing samples were collected from hunters this season (Table 2). Despite very small sample sizes, Interior samples yielded a good percentage of juveniles (62%), suggesting good brood production during summer 2012.

Table 2. Total number and percent juvenile ruffed grouse from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Number of Samples				Percent
Region	Unit(s)	Adult	Juvenile	Unknown	Total	Juvenile
Southcentral	6, 13, 14, 16	2	2	0	4	50%
Kenai Peninsula	7, 15	0	0	0	0	0%
Interior	12, 19, 20, 21, 25	8	13	0	21	62%
Total		10	15	0	25	

In 2013 the DWC drumming counts occurred between 1 and 19 May (Table 3). Drumming counts in Anderson were canceled in 2013 due to late, deep snow, and unseasonably cold temperatures through 19 May. In Delta Junction and Palmer, drumming counts were intentionally delayed after reconnaissance in late April heard zero drumming males. In Delta Junction, a drumming ruffed grouse was not heard until 8 May. When surveys occurred conditions were generally good with no wind and very little human noise in Palmer and Delta Junction. Southern Interior populations surveyed in Delta Junction, Fort Greely, and Wainwright

remain relatively low. Populations are expected to be rising; however, spring weather conditions may be confounding survey results.

Populations of ruffed grouse in the Mat-Su Valley increased modestly in 2013. Surveys in 2013 were delayed by 10 days due to persistent snow and cold morning temperatures (<25ºF) however conditions were good when surveys were performed. Since the translocated ruffed grouse were released in the early 1990s, a typical population cycle has not been observed based on the ongoing springtime drumming counts. Yet, the Mat-Su population continues to maintain a low but stable population despite modest annual variation.

Table 3. Ruffed grouse drumming count totals at survey locations in the Interior and Southcentral, 2004–2013.

	Geographic	Survey	Year									
GMU	Area	Location	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
20A	Interior	Anderson	25	33	22	14	16	8	1	9	8	NS
20D	Interior	Delta Junction					7	3	3	3	7	4
19D	Interior	McGrath									12	NS
14A	Southcentral	Palmer	3	6	12	11	9	7	12	10	5	8
15B	Kenai Pen.	Cooper Landing				0	0	NS	NS	NS	0	0

Increasing human noise (vehicle traffic, barking dogs, motorcycles, etc.) has been a problem along all 4 of the existing routes in Palmer. As a result the DWC has begun to look for new areas in which to begin monitoring ruffed grouse. Volunteers in the Mat-Su Valley did not hear any drumming activity south of Wasilla or near Big Lake despite good listening conditions. However, efforts will continue next year to find additional areas at which future drumming counts can be performed in the Mat-Su Valley.

This May, DWC staff completed a route established on the Skilak Lake Road; however, the tea was unable to hear or observe any ruffed grouse. Ruffed grouse have never been heard or observed on this route despite the proximity to the original release site and the very good habitat quality. Other efforts to observe ruffed grouse on the Kenai Peninsula this spring were unsuccessful due to deep snow and inaccessible roads during the optimal time period to conduct a drumming count or hear drumming males. 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 the 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 on the Alaska Department of Fish and Game (ADF&G) Web site (www.smallgame.adfg.alaska.gov).

No ruffed grouse were heard drumming when DWC and UAF Cooperative Extension staff were in the field in early May despite identification and surveying of several good habitat areas around

Tok. However, several ruffed grouse were spotted in close proximity to listening posts. DWC will continue ruffed grouse monitoring efforts in Tok in 2014.

Early successional hardwood forest plays a critical role in the life history of ruffed grouse. Several proposals have been submitted to the Department of Natural Resources (DNR) Division of Forestry for industrial scale timber harvesting portions of the Interior, including parts of the Tanana Valley State Forest and private holdings. The common objective of the proposals is to reduce heating costs and increase energy independence for residents and for federal facilities, including Fort Greely in Delta Junction. Approval of these proposals could result in industrial scale logging operations on portions of the southern Interior near each facility. Through sound forest management this could increase the aspen and mixed hardwood composition of the forest and thus produce more breeding and nesting habitat for ruffed grouse. This could also increase hunter access to portions of the Interior that are near the road system but have not been accessible by vehicle. The DWC is working with DNR Forestry to provide input on the best harvesting practices to encourage regeneration of aspen, a preferred forage species for ruffed grouse.

The RGS continues to actively support ruffed grouse habitat improvement and raise money to support habitat manipulation and hunter education and participation in the Mat-Su Valley and the Interior. During the winter of 2012–13 a 34-acre stand was harvested north of 58-mile road near Sutton. To date, the RGS has contributed to cutting over 560 acres in the Matanuska Valley Moose Range for the benefit of wildlife species that forage on early serial growth like moose (*Alces alces*) snowshoe hare, and ruffed grouse.

REGULATORY YEAR 2013 HUNTING PROJECTION

Hunting projections are based on springtime abundance surveys, field observations, spring and summer weather patterns, other related factors like avian predator observations, and professional judgment.

Late spring weather conditions in April and May likely caused delayed nesting by 7 to10 days throughout portions of their range. The actual impact of potential delayed nesting is unknown although smaller broods are possible. However, due to a warm, dry weather pattern throughout June early chick survival was likely good. In the Mat-Su Valley populations of ruffed grouse are expected to remain at relatively low densities. On the Kenai Peninsula, continued, long-term, very low density populations persist and are expected to remain very low in RY13. However, in the Interior ruffed grouse populations are expected to be higher than during RY12.

Spruce Grouse

METHODS

Spruce grouse is the most ubiquitous grouse species in Alaska. These grouse are found throughout most of forested Alaska, with the exception of Southeast Alaska where spruce grouse occur only occur on Prince of Wales Island (POW) and immediately adjacent islands.

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 manpower, 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 field work, and these observations have proven to correlate with fall abundance.

STATUS

A total of 243 spruce grouse wing samples were collected from hunters during RY12 (Table 4). Based on samples from the Interior there appeared to be a good percentage of juveniles (61%) in the fall harvest. Based on DWC field observations this spring, overall densities appear to be modestly higher during May than the recent past in the Interior.

In Southcentral and the Kenai Peninsula the percentages of juveniles were low (36% – Kenai; and 56% – Southcentral). This was also reflected in reports of poor hunting from fall 2012 particularly adjacent to the road system. Hunters throughout Southcentral reported finding few spruce grouse in areas where they have traditionally been observed. Hunters off the road system, including along the Yentna and Skwentna rivers and remote trail systems, reported relatively high densities of spruce grouse during fall 2012. This is a theme that has been repeated for many of our road-inaccessible small game species for several years. This spring in the Interior spruce grouse were observed at higher frequency than in past years, particularly during mid-May. Based on wing samples from the Interior it appears that juvenile production was good during the summer of 2012. Interior spruce grouse populations are anticipated to be modestly higher than during RY12.

All other portions of the state had too few samples from which to make any inferences.

Table 4. Total number and percent juvenile spruce grouse based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Number of Samples				Percent
Region	Unit(s) [a]	Adult	Juvenile	Unknown	Total	Juvenile
Southcentral	6, 13, 14, 16	34	44	0	78	56%
Southeast	1, 2, 3, 4	1	2	0	3	67%
Kenai Peninsula	7, 15	59	33	0	92	36%
Interior	12, 19, 20, 21,24, 25	21	34	1	56	61%
SW Alaska	9, 17, 18	1	4	0	5	80%
NW Alaska	22, 23, 26	1	1	0	2	50%
Total		117	118	1	236	

[a] Seven (7) samples were not identified to a GMU

Hunters also saved whole carcasses and crops (a small food storage pouch along the neck) for examination. Whole carcasses were weighed prior to field dressing. Adult males averaged 629g (n=2), 1 adult female was 605g, juvenile males averaged 648g (n=2), and juvenile females averaged 550g (n=2). Fourteen (14) crops were sampled during RY12 and all had between 5% to 100% white spruce (*Picea glauca*) needles. Other common forage species were high-bush cranberry (*Vibernum edule*), horsetail (*Equisetum* spp.), creeping raspberry (*Rubus pedatus*), and watermelon berries (*Streptopus amplexifolius);* one juvenile spruce grouse harvested along the Yentna River (Mat-Su Valley) was nearly full of terrestrial snails (*Vertigo* spp.). After 18 October, all examined crops were 100% full of spruce needles.

REGULATORY YEAR 2013 HUNTING PROJECTION

Spruce grouse are one of the most popular and most hunted small game species in Alaska (Merizon and Carson 2013). In 2013, road-accessible populations of spruce grouse in Southcentral and the Kenai Peninsula are expected to remain at low density. The late cold spring in April and May likely caused delayed nesting; however similar to ruffed grouse, early chick survival was likely good due to the warm dry weather pattern in June. Due to delayed nesting juveniles are expected to be physically smaller than normal for the first several weeks of the season. In road-inaccessible areas of Southcentral, the Kenai Peninsula, and in the Interior, populations should remain at moderate and stable to even high densities.

Sharp-tailed Grouse

METHODS

Sharp-tailed grouse reside in the Interior 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 also have been made of sharp-tailed grouse in the upper Nenana River, west of Glennallen, and areas in southwest Alaska, where they are much less abundant.

Male and female sharp-tailed grouse return to lek sites (communal breeding display areas) during the breeding season from late April through early May. Females were often observed, though their presence was highly variable; they may be hidden in nearby vegetation while watching displaying males. Male counts form the basis of springtime abundance estimates as they consistently return to lek sites every spring. Males were distinguished from females by their engorged yellow supercilium (eyelids), vocalizations, foot stomping, tail rattling, and body posturing. Lek sites were typically in open areas, including recent burns, cleared agricultural fields, or even roads. In Alaska, sharp-tailed grouse have been found to have leks located in 1–2 m balsam poplar (*P. balsamifera*), willow, or aspen regeneration that occurs after a burn or clearing. During lek visits the peak of daily activity occurred 1 hour prior to sunrise and generally continued for 2 to 3 hours. Leks were approached quietly on foot and males were counted. The DJAP (GMU 20D) has been used as the primary survey location to assess Interior populations of sharp-tailed grouse from 2000 through 2013 (Merizon 2012; Taylor 2013).

In April and early May of 2013, DWC staff in Tok worked with UAF Cooperative Extension and DNR Division of Forestry staff and searched for sharp-tailed grouse leks around Tok. Specifically, they searched the southern Taylor Highway, the north end of the Glenn Highway south of Tok, and areas west of Tok on the Alaska Highway.

On 10 May, DWC staff also listened for activity along the Steese Highway (Eagle Summit to Circle) early in the morning between Eagle Summit and Circle.

Contractors for the U.S. Army also performed lek surveys on Fort Greely south of Delta Junction.

STATUS

Forty-five sharp-tailed grouse wing samples were collected from hunters in RY12 (Table 5). Despite a small sample size in the Interior (Delta Junction), it appears brood production in 2012 was good. However, despite sporadic reports of good hunting in Delta Junction, most hunters reported poor hunting in areas with traditionally high harvest levels.

Table 5. Total number and percent juvenile sharp-tailed grouse based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Number of Samples				Percent
Region	Unit(s)	Adult	Juvenile	Unknown	Total	Juvenile
Interior	12, 19, 20, 21, 25	17	28	0	45	62%
Total		17	28	0	45	

In 2013, springtime lek survey counts occurred from 24 April to 17 May in the DJAP. Twenty-one (21) leks were visited and 12 leks had males present or actively dancing (Table 6). A total of 67 displaying males were counted between the 21 leks (3.19 males/lek). This is a modest increase in abundance of sharp-tailed grouse and higher abundance than has been observed over the recent past. On 29 April, 11 male sharp-tailed grouse were observed actively dancing along the Alaska Highway; however, this observation was not included in the total number of leks and males/lek. This was likely a lose aggregation of males and not a consistent lek site.

Table 6. Total number of male sharp-tailed grouse documented on the Delta Junction Agricultural Project, 2008–2013.

	Year					
Description	2008	2009	2010	2011	2012	2013
Total	82	54	62	67	65	67
Leks Counted	30	32	33	32	31	21
Males/Lek	2.73	1.69	1.88	2.09	2.10	3.19

Survey conditions were very challenging during the survey period. Despite persistently cold temperatures (-3 to 20ºF) occurring every morning during our lek inspections, temperature did not appear to affect male breeding display activity. On 24 April, intermittent snow appeared to diminish or halt male breeding displays. With the exception of 26 and 28 April, 5–20 mph wind also affected male breeding displays. However, all lek sites were visited at least once with decent survey conditions. Females normally begin to appear on or in close proximity to active lek sites by late April. However, likely due to the unseasonably cold temperatures and periodic snow, very few females were observed near the lek sites until mid-May. This suggests that nesting was delayed. Despite the poor survey conditions, the spring 2013 count of sharp-tailed grouse on the DJAP was up modestly from the spring of 2012.

On nearby Fort Greely, lek sites had an average of 3.8 males/lek. This is down slightly from 2012 and similar to that on the DJAP (E. Neipert, Wildlife Biologist, Colorado State University, personal communication). For the recent past (5 years) there have been nearly twice as many males observed on leks at Ft. Greely than on the DJAP.

Other DWC staff and residents of the Interior all reported seeing more sharp-tailed grouse this spring than in the past. Sharp-tailed grouse were routinely observed along the Alaska Highway between Beaver Creek and Tok as well as along the Taylor Highway south of Chicken. Dancing males were also observed along the Glenn Highway west of Glenallen and along the Richardson Highway north of Glenallen.

Despite easy and consistent access to lek sites on the DJAP the highly human-manipulated environment may not offer an accurate reflection of the greater Interior population status. So, in May 2013 the DWC began working with volunteers from UAF Cooperative Extension to begin looking for lek sites away from human-manipulated environments along the Steese, Taylor and Alaska highways. Several active leks were located near Tok adjacent to the Taylor Highway and males were frequently observed. No sharp-tailed grouse were observed or heard along the Steese Highway within what appears to be high quality habitat created from recent large burns. However, DWC staff reported deep snow and cold temperatures during these inspections in mid-May. Efforts will continue to locate leks adjacent to the Steese Highway.

Three sharp-tailed grouse crops were examined from September 2012. All samples contained 100% kinnikinnick (*Astrostaphylos uva-ursi*) berries. No body weight data were collected.

REGULATORY YEAR 2013 HUNTING PROJECTION

Sharp-tailed grouse nesting and subsequent brood rearing were likely delayed, due to the very late spring throughout much of Interior Alaska and the eastern Alaska Range this year. This may have resulted in smaller clutches. However, due to warm and dry weather throughout June and high insect production including grasshoppers (*Melanoplus* spp.), early sharp-tailed grouse chick survival should be good.

Despite a modest increase in the number of males/lek in April on the DJAP, potentially smaller clutches may result in low densities in Delta Junction (GMU 20D) during RY13. Sharp-tailed populations along the Richardson and Taylor highways (GMU 11, 12, 13B, 13C, and 20E) were also affected by the late, cold spring, and densities are expected to be moderate to low in RY13.

In the western Interior (GMU 19, 21, and 24) less persistent snow may have lessened the impact of the late spring and populations will likely remain at similar densities as observed during RY12.

Sooty Grouse

METHODS

Sooty grouse (formerly known as blue grouse) reside in the coastal rainforest of Southeast Alaska from approximately Mount Fairweather south, including GMUs 1–4 (Zwickel and Bendall 2004). However, they are not found on POW or immediately adjacent islands where the only Southeast population of spruce grouse resides.

Like other Alaska tetraonids, male sooty grouse exhibit their breeding display most vigorously between late April and late May. Males emit a low, guttural "hoot," typically from off the ground in Sitka spruce (*Picea sitchensis*), mountain (*Tsuga mertensiana*) and western hemlock (*T. heterophylla*), or an elevated surface near the alpine (Zwickel and Bendall 2004).

Beginning in 2012, DWC staff conducting Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) spring pellet count surveys recorded the presence of sooty grouse. In 2012, surveys occurred on Gravina, Douglas, Sullivan, POW, Mitkof, Kupreanof, and Baranof islands (K. McCoy, ADF&G biologist, personal communication). While conducting these surveys, crews recorded individual sooty grouse both heard and observed along a transect at designated stations. At the time of this report, observations from spring 2013 were not available.

Prior to 2012, sporadic data collection efforts were completed which included wing and tail collections from hunters and a regional grouse hunter survey (D. Rabe, ADF&G Deputy Director, personal communication).

STATUS

Forty sooty grouse wing samples were collected from hunters in RY12 (Table 7). Overall, it appears that juvenile production was low in 2012. Most of the sooty grouse harvested were and have historically been males and many of them were adults. These samples allow the DWC to monitor the ratio of males to females in the harvest as well as track the proportion of juveniles. Most hunters reported good numbers of "hooting" males during the spring portion of the RY12 season. Male "hooting" vocalizations are normally heard through late May; however hunters reported those vocalization were noticeably absent by mid-May.

Table 7. Total number and percent juvenile sooty grouse based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Males			Females			Grand	Percent
Region	Unit(s)	Adult	Juvenile	Total	Adult	Juvenile	Total	Total	Juvenile
Southeast	1 - 5	23	13	36	0	4	4	40	43%

It remains difficult to estimate overall population trends of sooty grouse in Southeast. However, in April and May 2012, DWC staff recorded sooty grouse calls and sightings in 10 watersheds; 9 were fully completed (3 on POW) and 1 (Baranof) was partially completed. Sooty grouse were recorded at 5 of the 10 survey sites, including Douglas, Gravina, Kupreanof, Sullivan, and Woewodski islands. Most grouse heard or observed were 150–400 m in elevation. The DWC staff will continue to make sooty grouse observations this spring.

No crop or weight data were collected during RY12.

Overall hunting effort and harvest is greatest in areas adjacent to large population centers and decreases considerably on remote islands or more distant locations from population centers. However, based on field observations and hunter reports, sooty grouse populations in Southeast Alaska appear to be stable.

Board of Game (BOG) Proposals

A proposal went before the BOG to close the taking of female grouse in the spring in Southeast Alaska (GMU 1-4). The vast majority of grouse taken in Southeast are sooty grouse. The overwhelming majority of sooty grouse that are taken are breeding males taken in the spring. Based on wing samples and hunter reports very few females are harvested. Currently, there is no conservation concern for male or female sooty grouse in Southeast. The BOG did not adopt this proposal and the take of both male and female will remain legal during RY13.

REGULATORY YEAR 2013 HUNTING PROJECTION

Considering the lack of available spring observations from RY11 or RY12 it is difficult to make projections for RY13. However, based on DWC staff observations, sooty grouse hunting in areas away from large population centers or on remote islands should remain productive. However, near large human populations, sooty grouse densities are expected to be low with isolated pockets of moderate densities.

Willow Ptarmigan

METHODS

Willow ptarmigan are the most ubiquitous ptarmigan species in Alaska, occurring in most sub-alpine nonforested habitats. They are also among the most popular and most hunted species of small game in Alaska (Merizon and Carson 2013). Willow ptarmigan are not found in the Aleutian Islands west of Unimak Island or the islands off the west coast of Alaska.

Age of willow ptarmigan was determined by examination of the degree of outer primary feather pigmentation (Bergerud et al. 1963; Weeden and Watson 1967). In RY12, willow ptarmigan wings composed 50% of all hunter-harvested wings collected. However, most hunter samples included only 1 wing, allowing age estimation but not sex determination. Because of the popularity of this game bird and the abundance of wing samples collected, DWC determined that

it would be extremely useful if alternative sex determination methods could be gleaned from wing samples. Therefore, throughout the RY11 and 12 seasons, when hunters salvaged whole carcasses, sex, total wing chord and P8 length were recorded to test for and examine possible differences between sexes. This technique has proven to be very useful in determining sex from individual wings (Merizon 2012; Taylor 2013).

Beginning in late 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 (*B. nana*) stands (Weeden 1965).

To assess statewide population abundance of willow ptarmigan we used accepted methods of counting territorial males using a broadcast recording of a territorial male at a set distance along a survey route to elicit a response from adjacent males (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. This method provided total counts for small areas (≤ 2 mi^2).

Surveys were conducted along the Richardson (GMU 13B), Parks (GMU 13E), and Denali (GMU 13B and 13E) highways, and in Chugach State Park (GMU 14C). Survey routes occur along or within 2 miles of the highway or nearest road. In 2012, a remote location was created near Goose Creek (GMU 13A) as a complement to regionally adjacent survey routes on the Denali Highway (40 miles north). In 2013, 3 new routes were established on the southern Kenai Peninsula (GMU 15) and will be monitored annually by DWC staff in Homer.

In addition to the willow ptarmigan surveys established and completed by DWC, contractors for the U.S. Army completed a territorial male count on Fort Greely in Delta Junction.

STATUS

Wing Collections

A total of 474 willow ptarmigan wing samples were collected from hunters during RY12 (Table 8). Large sample sizes were collected from Southcentral (n=154) and Northwest Alaska (n=156). Overall percent of juveniles was highly variable based on regions of the state (38–76%).

Overall percent of juveniles was low in Southcentral (45%) and the Alaska Range (38%) populations. This likely was the result of cold temperatures, snow, and wet conditions during a critical period 1–3 weeks post-hatch in 2012. Freezing rain was observed along the Denali Highway in late June 2012 and snow (4–6 in) was reported by several pilots in the eastern Talkeetna Mountains and throughout the Chugach Mountains during the first week of July 2012.

Many hunters took note of the absence of ptarmigan along the Denali Highway and generally throughout Southcentral in the fall and early winter portion of RY12 (December 2012 through early February 2013). Most hunters reported poor to very poor hunting in these areas. Several reports were received regarding very low willow ptarmigan densities along the western Denali

Highway (GMU 13E). However, beginning in late February through March, large flocks of ptarmigan (likely most were willow ptarmigan) were observed near Paxson, Summit Lake, and Isabel Pass (GMU 13B). This was likely some kind of movement toward the Richardson Highway that make birds more visible than normal. However, the ptarmigan season closes on 30 November and with no hunting no wing samples were collected.

On the Alaska Peninsula, all of the wing samples were collected near Cold Bay (GMU 9D) in September and October 2012. Fewer willow ptarmigan and fair to poor hunting were reported from the southern Alaska Peninsula. Populations appear to be stable despite a low percent of juveniles (52%) in the harvest.

In Northwest Alaska, samples were collected from around Barrow (GMU 26), southern Seward Peninsula (GMU 22), Baldwin Peninsula, and Noatak River drainage (GMU 23). Overall, the percent of juveniles from RY12 was very good (76%). Temperatures during the summer of 2012 were near normal throughout much of Northwest Alaska and likely resulted in favorable conditions for chick production. Precipitation was below normal during the majority of the 2012–13 winter; however, there were 10–12 days of snow and fog in the first half of May 2013 significantly delaying the spring melt (T. Gorn, ADF&G Nome Area Biologist, personal communication).

Weeden (1965) and Irving et al. (1967) found that male willow ptarmigan often separate from female and juvenile groups elevationally and/or geographically in the fall. This separation continues through the winter and into the spring, when males begin to define and defend their breeding territory. Weeden (1965) found males typically inhabit higher elevations or more exposed habitats adjacent to spring breeding grounds throughout the fall and winter, whereas females and juveniles tend to spend time at lower elevation or more protected habitats during that same time period. These behavioral characteristics may bias the harvest composition and estimation of overall brood production from wing collections in these populations. Despite the potentially biased brood production estimates for willow ptarmigan these data are still valuable for managers as indicators of which demographic groupings are being harvested.

Hunters saved whole carcasses and crops for examination. Whole carcasses were weighed prior to field dressing. Adult males averaged 576 g (n=13), adult females 524 g (n=4), juvenile males 533 g (n=4), and juvenile females 489 g (n=2). Twenty eight (28) crops were sampled during the RY12 season and all had between 70-100% willow stems and buds. Willow species included net (*S. reticulata*), round-leaf (*S. rotundifolia*), arctic (*S. arctica*), felt-leaf (*S. alaxensis*), and diamond-leaf (*S. pulchra*) to name a few. Other species found in lesser quantities included dwarf birch buds and stems, crowberries (*Empetrum nigrum*) leaves and berries, and blueberry (*Vaccinium* spp.) leaves and berries.

Table 8. Total number and percent juvenile willow ptarmigan, based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Adult				Juvenile				Grand	Percent
Region	Unit(s)	Male	Female	Unknown	Total	Male	Female	Unknown	Total	Total	Juvenile
Southeast	1-5	0	0	1	1	0	0	1	1	2	50%
Southcentral	6, 13A, 13D, 14, 16A	38	20	27	85	26	15	28	69	154	45%
Interior	12, 19, 21, 20B, 20E, 20F, 24, 25	1	0	2	3	2	0	2	4	7	57%
Kenai Pen.	7, 15	5	2	1	8	8	6	4	18	26	69%
Alaska Range	13B, 13C, 13E, 16B, 20A, 20C, 20D	16	6	18	40	9	9	7	25	65	38%
Alaska Pen.	9, 10	21	6	2	29	8	22	2	32	61	52%
NW Alaska	22, 23, 26	20	14	3	37	47	36	36	119	156	76%
SW Alaska	17, 18	0	0	0	0	0	0	0	0	0	NA
Kodiak	8	0	0	0	0	0	0	3	3	3	NA
Total		101	48	54	203	100	88	83	271	474	

Abundance Survey Results

In 2013 willow ptarmigan surveys occurred between 1 and 31 May. Survey locations included 2 locations in Chugach State Park (GMU 14C), 1 location along the Richardson Highway (GMU 13B), 7 locations along the Denali Highway (GMU 13B and 13E), 1 location along the Parks Highway (GMU 13E), 1 location off the road system in the upper Susitna River basin (GMU 13A), and 3 new locations on the southern Kenai Peninsula (GMU 15C; Table 9).

Due to late deep snow and delayed melting along the Denali Highway we were unable to complete the mile 52–58 survey route before breeding behavior ceased. The completion of several other routes was delayed to the end of the breeding season due to the late and deep snow including the mile 29.5-36 survey. The Powerline Pass survey was completed early in the breeding season (1 May). It could not be officially completed a second time officially; however, DWC staff visited the area in mid-May and heard and observed considerably more territorial males than were observed when the survey was completed.

Table 9. Territorial male willow ptarmigan count data by survey location, 2004–2013.

			Year									
GMU	Highway	Site / Milepost	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
13B	Richardson	McCallum		11		6	10	13	14	18	20	14
13B	Denali	Mi 10-14	10	10	11	6	8	6	9	8	11	8
13B	Denali	Mi 15					6	4	6	9	14	17
13B	Denali	Mi 29-33.5	10	9	13	7	8	4	12	3	11	1
13B	Denali	Mi 34-36	2	1	6	1	2	2	3	0	2	0
13B	Denali	Mi 52-58						1	6	2	7	NS
13E	Denali	Mi 90 - 93.5				5	5	7	3	5	5	3
13E	Denali	Mi 94-97		5	6	3	3	4	3	3	5	3
13E	Parks	Mi 194-208	2	4	9	3	5	5	2	5	4	8
14C	ANC Bowl	Powerline					12	11	15	18	20	7
14C	ANC Bowl	S. Fork ER					4	3	5	6	7	6
13A	Remote	Goose Creek									12	8
15C	Homer	Ohlson Mtn.										0
15C	Homer	Bald Mtn.										3
15C	Homer	Eagle Lake										8

Along all but 2 survey locations, male willow ptarmigan abundance was lower or the same as 2012. At the mile 15 Denali Highway and Parks Highway survey locations abundance of males was up modestly. Due to the late, deep snow, and windy conditions during the peak of the breeding season (mid-May) we were delayed in accessing many of our survey locations. When we finally were able to access the locations (27–31 May) 80–100% of the area was covered with snow and there was a noticeable absence of not only willow ptarmigan but other migratory passerines, waterfowl, raptors, and numerous other wildlife species including caribou that are usually observed at that time of year (Fig. 5).

It is difficult to draw strong inferences from this year's abundance surveys for willow ptarmigan particularly along the Denali and Richardson Highway locations. Normally, during the month of May, male willow ptarmigan are spaced out over breeding areas and vigorously defend their

territory from potential intruder males. Often 1 female is observed near or in close proximity to a territorial male. However, this spring, along the length of the Denali Highway and near Summit Lake, willow ptarmigan were observed in large mixed sex flocks (40–60 individuals) on 20 May during the traditional peak of the breeding season. Since males were not spread out and actively vocalizing and defending territories it is difficult to interpret survey results. Fewer males were heard or observed along survey routes in May 2013; however, flocks of nonvocalizing, nonterritorial males were observed within or adjacent to survey routes but not recorded, confounding survey results. This flocking behavior is typically observed only during the winter months and not during the spring breeding season. It is quite likely the late spring and deep, persistent snow played a role in this unusual behavior.

Figure 5. Near Maclaren Summit along the Denali Highway, 31 May 2013.

The survey results suggest a decrease in overall abundance along survey routes along the Denali and Richardson highways; however, willow ptarmigan were abundant and observed frequently along the road, while flying to and from remote locations, and by other DWC staff. As a result of the conditions, hens (particularly south of the Alaska Range) were delayed in nesting by 1–3 weeks as snow covered the vast majority of the nesting habitat until 31 May above 2,500 ft elevation (Fig. 5).

Although existing survey locations were adjacent to the road system, reports and DWC staff observations elsewhere in Alaska suggest willow ptarmigan populations were highly variable. Along the southern Alaska Peninsula (GMU 9D) willow ptarmigan were less abundant and lower densities than in 2012 or 2011. On the northern Alaska Peninsula, willow ptarmigan abundance

was quite variable based on location (S. Savage; USFWS Wildlife Biologist, personal communication). In Southwest Alaska (GMU 18) willow ptarmigan were abundant this spring (P. Jones, ADF&G Assistant Area Biologist, personal communication). However, due to the late, cold spring birds seemed to pass through some of the noncoastal communities (e.g., areas north and east of Bethel) much quicker than normal on their way to more costal breeding areas. North of the Brooks Range, willow ptarmigan were also quite abundant and were frequently observed in large flocks throughout the area (G. Carroll, ADF&G Barrow Area Biologist, personal communication). Winter and spring temperatures were also very near normal with early and mid-winter snow depth slightly below normal north of the Brooks Range.

Nesting and Chick Survival

In early June, 3 radiocollared hens (see "Research"), that are a part of a study for the Alaska Energy Authority (AEA), were located along the Denali Highway. All 3 hens were nesting in clumps of dwarf birch adjacent to white spruce. Hens were generally exposed to view; however, cryptic plumage made them incredibly difficult to spot. Hens had clutches of 8–9 eggs, which is an average clutch size (Hannon et al. 1998). Two of the same hens were again located on 2 July 2013. All of the hens were with males that either defended or brooded the chicks. Each pair had chicks present that were estimated to be 3 to 7 days old based on feather growth patterns (Weeden 1965), making the time of hatch between 25 and 29 June. In Alaska, Weeden (1965) found that the majority of hatching took place between 18 and 23 June at Eagle Creek north of Fairbanks. However, Roberts (1963) found a more protracted hatch period between 5 June and 8 July. Despite the very cold and late spring, it appears that timing of nesting, hatch, and brood rearing are nearly on time but up to 2–5 days late. The chicks were not feathered but were capable of short runs to cover.

Research

In cooperation with UAF and AEA, the DWC in May began a large 3-year research study examining the ecology and distribution of willow ptarmigan adjacent to the proposed Watana Hydroelectric site in the upper Susitna River. A UAF graduate student is leading the project. At the time of this report nearly 40 radio necklace collars had been deployed on male and female willow ptarmigan at multiple locations north and south of the proposed hydroelectric project site in May 2013. Their annual movements, distribution, survival, and habitat use will be mapped to understand the value of the proposed hydroelectric project site and access corridors to the local willow ptarmigan population. As more results of this study become available, information will be accessible at the DWC website and in future reports.

In anticipation of this large joint project, the DWC deployed 6 radio necklace collars on ptarmigan (5 male willow and 1 male rock ptarmigan) in May 2012 at one of the current capture locations near Goose Creek. The batteries in the necklace transmitters have lasted more than 12 months and allowed frequent and repeated locations on each individual. This small pilot study was used to test various capture methods, understand basic movement patterns from a select number of individual males, and generally increase our efficiency for the effort initiated this spring. Two ptarmigan (1 male willow and 1 male rock) were still alive at the time of this report and we were able to gain some valuable information on the other 4 willow ptarmigan. The remaining male willow ptarmigan was located on the same territory in May 2013 as in May

2012, suggesting strong breeding site fidelity from this individual. Collared ptarmigan (rock and willow) were never located farther than 13 miles from the original capture location; 4 willow ptarmigan were never located >6 miles from the capture location. Collared male willow ptarmigan spent the winter months (October through late March) within 4 miles of the breeding areas but in large riverine willow stands. The rock ptarmigan was commonly located over a broader geographic area and at higher elevation than the male willows but also within close proximity to the same riverine areas where dwarf birch was exposed.

Other research through UAF, independent of ADF&G, has been ongoing examining the role rock and willow ptarmigan play as herbivores on the landscape (Christie et al. 2013). The research has been examining the ability of rock and willow ptarmigans to influence the growth and architecture of expanding willow shrub communities along the northern and western slopes of the Brooks Range. They have found that distribution and migration of both species are linked to the changing shrub community over a large geographic area and may be influencing the rate at which these shrub communities are changing.

Board of Game Proposals

During the winter of 2012–2013, the Alaska BOG heard several regulatory proposals for ptarmigan. One asked to open the season in GMU 13B between 30 November and 31 March with a reduced bag limit. The late season (30 November to 31 March) in GMU 13B had been closed beginning fall 2009 by the BOG due to concerns for low rock ptarmigan abundance. After the 2012 abundance surveys in GMU 13B, concern for low rock ptarmigan abundance continued. The BOG did not adopt this proposal and the GMU 13B season will continue to close on 30 November. Two proposals on the Kenai Peninsula (GMUs 7 and 15) asked to extend the season closure date from 31 March to 30 April with a reduced bag limit for that period. By the end of March male willow and rock ptarmigan begin to exhibit territorial behavior and can become quite vulnerable to harvest pressure. The BOG did not adopt this proposal and the season closure date will remain 31 March in GMUs 7 and 15.

REGULATORY YEAR 2013 HUNTING PROJECTION

Despite the late and cold spring, it appears that timing of nesting and hatching may have been only slightly delayed throughout the Alaska Range and Southcentral populations, based on observations of radiocollared hens. It is unknown whether timing of these events was delayed in the Interior. Provided weather patterns in the first half of July remain conducive to chick survival (warm and dry) willow ptarmigan densities along the eastern Denali Highway (GMU 13B) will be higher than in RY12; however, the populations are expected to remain low along the western Denali Highway. Juveniles are expected to be physically smaller than normal for the first several weeks of the season due to the delayed nesting caused by the late spring. Populations in the Chugach and Kenai mountains also likely experienced similar nesting and hatch timing as those observed along the Denali Highway and will likely be similar to RY12. In the Interior and western Alaska, willow ptarmigan densities are expected to be at moderate levels.

Rock Ptarmigan

METHODS

Rock ptarmigan are the second most abundant ptarmigan in Alaska and can also be found throughout the state, including the Aleutian Islands. Rock ptarmigan typically inhabit higher elevation, more exposed rock faces, scree slopes, and alpine ridges.

Beginning in late April and continuing into early June, male rock ptarmigan defend breeding territories through vocalizations and display flights. These territories are set up in high elevation alpine areas, often adjacent to stands of dwarf birch (Weeden 1965).

Methods used to index rock ptarmigan abundance were the same as those described in this report for willow ptarmigan.

Surveys were conducted along the Richardson (GMU 13B), Steese (GMU 20B), and Denali (GMUs 13B and 13E) highways, and in Chugach State Park (GMU 14C). Survey routes occur along or within 2 miles of the highway or nearest road. In 2012, a remote survey location was created near Goose Creek (GMU 13A) to assess willow and rock ptarmigan abundance as a complement to regionally adjacent survey routes on the Denali Highway (40 miles north).

STATUS

A total of 109 rock ptarmigan wing samples were collected from hunters during RY12 (Table 10). Due to the low sample size in every region of the state it is difficult to make meaningful inferences about brood production by region. However, both Southcentral (21%; n=19) and Northwest Alaska (45%; n=47) samples suggest low to very low brood production in 2012. Other regions had too small of a sample from which to infer any meaning. The high percent juveniles along the Alaska Peninsula (GMU 9 and 10) was largely driven by samples of rock ptarmigan from Adak Island in late fall 2012 and may not be reflective of the greater population. However hunter reports from the Aleutian Islands suggest abundant rock ptarmigan. Despite very low samples sizes, the high percent juveniles in the Alaska Range (70%) was reflected in higher abundance during the spring surveys.

Hunters saved crops for examination. Four (4) crops were sampled during the RY12 season. All 4 contained dwarf birch buds and stems and 2 contained a small amount of round-leaf willow leaves and stems.

Table 10. Total number and percent juvenile rock ptarmigan based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Adult				Juveniles				Grand	Percent
Region	Unit(s)	Male	Female	Unknown	Total	Male	Female	Unknown	Total	Total	Juvenile
Southcentral	6, 13A, 13D, 14, 16A	7	8	0	15	1	3	0	4	19	21%
Interior	12, 19, 21, 20B, 20E, 20F, 24, 25	1	0	2	3	0	0	5	5	8	63%
Kenai Pen.	7, 15	0	0	0	0	0	0	0	0	0	NA
Alaska Range	13B, 13C, 13E, 16B, 20A, 20C, 20D	0	0	3	3	0	0	7	7	10	70%
Alaska Pen.	9, 10	4	1	0	5	11	8	0	19	24	79%
NW Alaska	22, 23, 26	6	3	17	26	4	4	13	21	47	45%
SW Alaska	17, 18	0	0	0	0	0	0	0	0	0	NA
Kodiak	8	0	0	1	1	0	0	0	0	1	NA
Total		18	12	23	53	16	15	25	56	109	

Abundance Surveys

In 2012, rock ptarmigan surveys occurred between 9 and 31 May at 1 location in Chugach State Park (GMU 14C), 2 locations along the Richardson Highway (GMU 13B and 20D), 4 locations along the Denali Highway (GMU 13E), 2 locations along the Steese Highway (GMU 20B), and 1 off the road-system in the upper Susitna River basin (GMU 13A; Table 11).

Table 11. Territorial male rock ptarmigan count data by survey location, 2004–2013.

			Year									
GMU	Highway	Site / Milepost	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
13B	Richardson	McCallum		2		1	0	1	0	0	2	4
13B	Denali Hwy	Mi 10-14	0	0	1	1	0	2	0	0	0	4
13B	Denali Hwy	Mi 12.5 N							6	7	7	8
13B	Denali Hwy	Mi 29-33.5	0	0	0	0	0	1	1	2	0	1
13B	Denali Hwy	Mi 34-36	1	0	2	0	0	0	1	3	1	2
14C	ANC Bowl	S. Fork ER Trail								6	5	7
20D	Richardson	Donnelly				1	1	0	1	1	2	2
25C	Steese	12-Mile Summit				1	0	0	0	1	0	2
25C	Steese	Eagle Summit				5	5	5	4	4	3	5
13A	Remote	Goose Creek									2	8

Overall, based on territorial male counts of rock ptarmigan along the road system, it appears that monitored populations have increased modestly. Although total counts by survey location varied, locations in GMUs 13A and B had the largest increase in abundance since 2010 (Table 11). Based on field observations throughout the remainder of Alaska, rock ptarmigan abundance appears to be near the long-term average.

In addition to assessing willow ptarmigan, the survey location established in 2012 at Goose Creek (GMU 13A) is also used to assess rock ptarmigan abundance trends. In May 2013, rock ptarmigan were as abundant as willow ptarmigan. Rock ptarmigan were commingled with willow ptarmigan in mixed dwarf birch and willow shrub habitats as well as at higher elevation scree slope habitats.

Unlike the unusual, nonterritorial behavior observed for willow ptarmigan, rock ptarmigan exhibited more typical and predictable breeding behavior in May 2013 along all of the survey routes. Male rock ptarmigan were very responsive and often flew in to the listening post while vocalizing.

Hunters and DWC staff alike made some interesting observations of rock ptarmigan along the Steese Highway between January and June 2013. Between January and March 2013, hunters reported increasing numbers of rock ptarmigan near 12-mile and Eagle summits. Small to moderate flocks were observed with some regularity in these areas through mid to late March. However, beginning in April, overall abundance of rock ptarmigan began to decrease. When surveys were completed at both locations in mid-May overall densities of territorial males were quite low. Attempts were made to locate birds in early June at both 12-mile and Eagle summits; however, zero rock ptarmigan were observed. It is possible that hens were on a nest and males

were foraging or otherwise being less conspicuous than during the breeding season. However, it is surprising that no birds were observed. Movement patterns of rock ptarmigan in these areas is unknown and is a research priority for the small game program.

DWC staff hoped to establish several new rock ptarmigan abundance survey routes away from the road system this spring. However, we were unable to access those sites prior to the end of breeding season due to the late and persistent deep snow. The DWC will continue to try and establish new routes away from the system in the future to continue to evaluate whether road-side surveys adequately reflect the GMU population trends or not.

Nesting and Chick Survival

In June all of the radiocollared rock ptarmigan (see "Research" below) were located and all were alive. Two (2) hens were located in early June and 1 was on a nest while the other was found out foraging with no sign of a nest nearby. One (1) hen was relocated on 1 July and was found with at least 3 chicks estimated to be 4–7 days old, making the hatch date between 25 and 28 June. Also, a hen rock ptarmigan was observed in the Chugach Mountains (GMU 14C) on 9 July with 5 chicks. Based on feather growth (Weeden 1965) the chicks were estimated to be 10–14 days old, making the hatch date between 26 and 30 June.

Research

Ptarmigan hunting has been closed in GMU 13B after 30 November since 2009 as a result of low rock ptarmigan abundance. Due to the similarities in winter plumage between the more abundant willow ptarmigan and rock ptarmigan it would be impossible to manage the species separately. During the March 2013 meeting, the BOG opted to maintain the season closure date of 30 November (see "Board of Game Proposals" in the willow ptarmigan section). To better understand the rock ptarmigan population in relation to hunting, the small game program began a study with two primary objectives: 1) better understand rock ptarmigan movement patterns relative to the road system and points of access for hunters, and 2) set up additional remote (road-inaccessible) survey locations to assess whether our roadside surveys reflect the greater GMU 13B population. Beginning in May 2013, DWC staff was able to successfully radio collar 8 rock ptarmigan (2 females, 6 males) along the Denali Highway. We plan to radio collar additional birds at several remote locations later this summer to increase our sample size. Males averaged 430 g while females averaged 455 g. Females were heavier likely because they were captured in late May and preparing to lay eggs.

REGULATORY YEAR 2013 HUNTING PROJECTION

Despite the late and cold spring, it appears that timing of nesting and hatching were on time or only slightly delayed throughout the Alaska Range and Southcentral populations, based on observations and data from radiocollared hens. It is unknown whether timing of these events was delayed in the Interior. Provided weather patterns in the first half of July remain conducive to chick survival (warm and dry), rock ptarmigan densities along the eastern Denali Highway (GMU 13B) will be as high as in RY12. Juveniles may be physically smaller than normal for the first several weeks of the season in populations that experienced delayed nesting caused by the

late spring. Populations in the Chugach and Kenai mountains likely also experienced similar nesting and hatch timing as those observed along the Denali Highway and population densities will likely be similar to RY12. In the Interior and western Alaska, rock ptarmigan densities are expected to be at moderate levels.

White-tailed Ptarmigan

METHODS

White-tailed ptarmigan are the smallest species of ptarmigan and inhabit high elevation alpine habitat within the Alaska Range and south through the southeastern panhandle of the state. No white-tailed ptarmigan have been confirmed in Alaska north or west of the Alaska Range. This species is endemic to North America and small scattered populations can be found throughout the western United States.

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. Male and female white-tailed ptarmigan disperse during the summer months (post breeding) and are rarely found in close proximity to one another. However, based on field observations and hunter reports, moderate to large flocks of white-tailed ptarmigan are found in the alpine in late September and October.

During July 2012, two walking survey routes were created in areas used by hunters in the fall to monitor white-tailed abundance using a pointing dog. Individuals or family groups were located and counted (male, female, and number of chicks). One route was established in the northwest Chugach Mountains near Peters Creek (GMU 14C) and one in the southern Talkeetna Mountains near Hatcher Pass (GMU 14A). These routes will be walked each summer and used to index population trends in these areas.

STATUS

A total of 14 white-tailed ptarmigan wing samples were collected from hunters during RY12 (Table 12). It is difficult to estimate juvenile production from the few wing samples collected during the RY12 season. Most of the samples were harvested from the southern Talkeetna Mountains during the early fall. Few other reports from hunters or outdoor enthusiasts were available regarding abundance and presence of white-tailed ptarmigan.

One (1) crop was examined from a white-tailed ptarmigan harvested near Hatcher Pass in September 2012. The crop contained 100% round-leaf willow. No weights were collected during the RY12 season.

Table 12. Total number and percent juvenile white-tailed ptarmigan based on wing samples from the statewide harvest collection during regulatory year 2012.

	Game Mngt.	Number of Samples				Percent
Region	Unit(s)	Adult	Juvenile	Unknown	Total	Juvenile
Southcentral	13, 14, 16, 6	8	3	0	11	27%
Kenai Peninsula	7, 15	1	2	0	3	67%
Total		9	5	0	14	

Wing samples and whole carcasses (when available) were sent to researchers working in the Colorado State genetics lab this winter. Samples will be analyzed to examine genetic differences of white-tailed ptarmigan throughout their range (S. Oyler-McCance, USGS, Research Geneticist, personal communication). Sample locations within Alaska include the Alaska Range, and the Talkeetna and Chugach mountains. Findings from this research will be available in the next 1–2 years.

White-tailed ptarmigan survey routes were created in early July 2012. High alpine walking routes were established and will be repeated annually in July using dogs to assist locating birds. Three (3) white-tailed ptarmigan were found along a 3.5 mile route in Hatcher Pass (GMU 14A). Although zero white-tailed ptarmigan were observed in 2012 along the 5.0 mile Vista Peak route (GMU 14C), 2 separate and recent kills were found along the route. These routes will be completed again in July 2013.

Other than the recently established monitoring effort and genetic sample submissions very little scientific information on white-tailed ptarmigan in Alaska is available, and there are no population trend data available (B. Taylor, retired ADF&G veterinarian, personal communication). 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, Grouse Inc., Wildlife Biologist, personal communication).

To date, it appears the white-tailed ptarmigan's mostly inaccessible habitat has protected them in most of their historical 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 exploitation 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.

REGULATORY YEAR 2013 HUNTING PROJECTION

A hunting projection for white-tailed ptarmigan is difficult due to the limited population monitoring effort and small sample sizes for our wing collection efforts. It is likely that isolated areas with road access (e.g., Hatcher, Turnagain, and Thompson passes) will have lower densities than most populations more distant from access points, due to increased hunting pressure.

Snowshoe Hare

METHODS

Snowshoe hares are found throughout Alaska although they are much less abundant throughout Southeast Alaska. Their populations are subject to large cyclic fluctuations that normally occur over a 10-year period (Krebs et al. 1987, 2001). The DWC does not estimate population size but rather monitors population fluctuations. The DWC has relied upon several methods and numerous partners, including the National Park Service (NPS), U. S. Fish and Wildlife Service (USFWS), and private individuals, to obtain data and other information.

The DWC assesses population fluctuations by using twilight roadside hare counts along the Richardson, Parks, Steese, and Denali highways (Table 14). Snowshoe hare roadside counts provide an index for comparison between years. They are cost-effective and efficient and can be completed while transiting to other small game survey locations prior to sunrise. Twilight road counts of hares have been completed by DWC staff while traveling to grouse and ptarmigan survey locations 1 hour prior to sunrise (Merizon 2012; Taylor 2013).

The DWC also assesses statewide population trends by working with cooperators. USFWS staff on the Kenai Wildlife Refuge (GMU 15) completes hare pellet counts on the Kenai Peninsula. The USFWS has been completing pellet counts (Krebs et al. 1987) in the refuge since 1983 (T. Burke, USFWS Wildlife Biologist, personal communication). These counts have provided a reliable method of monitoring the fluctuating populations on the Kenai Peninsula. However, habitat change may be influencing the future reliability of existing survey methods. The NPS has been indexing hare abundance in Denali National Park (GMU 20C) since 1988 (C. McIntyre, NPS Wildlife Biologist, personal communication) by compiling an average count over the course of the summer. Finally, ADF&G, contract biologists, and volunteers have counted hares while completing the annual Breeding Bird Survey in Delta Junction (GMU 20D) since 2000.

STATUS

Roadside counts were attempted from 24 April to 26 May. However, due to the persistent roadside snow, counts were very difficult at low light periods while transiting to grouse or ptarmigan survey locations. Despite the poor conditions, very few hare signs (tracks, fresh droppings, kill sites, etc.) were observed while conducting other field work. Roadside counts were not attempted in Delta Junction or Anderson due to persistent snow.

Based on hare pellet counts on the Kenai Peninsula, population density peaked in 2011, remained high during the winter of 2011–2012 and began to drop in the summer of 2012. Hare densities are expected to decline for the next 2–4 years before beginning the growth phase of the population cycle.

In Denali National Park the snowshoe hare index peaked in 2009 and began to decline in 2010. Population density in the park and surrounding areas of the Alaska Range likely reached the low of the population cycle in 2012. Populations may remain low through 2013; however, densities are expected to begin increasing through 2014 and 2015.

Based on DWC staff observations in the southern Interior, hare populations have reached very low densities and are expected to begin increasing over the next 1 to 2 years. North of the Brooks Range, hare populations appear to exhibit lower amplitude cycles and continued to persist at moderate levels in spring 2013 (G. Carroll, ADF&G Barrow Area Biologist, personal communication).

Table 13. Statewide snowshoe hare population survey data, 2004–2013.

			Breeding Bird Survey		Road-side Counts			
Year	Kenai Pen.[a]	Denali Nat. Park[b]	Delta Jct.[c]	Donnelly[d]	Delta Jct.[e]	Anderson[f]	Steese Hwy.[g]	Cantwell[h]
2004	1.5	1.2	11	4				
2005	1.6	6.3	57	10				
2006	2.4	25.2	129					
2007	4.2	26.2	96	50	109	24[i]	21	25
2008	8.5	28.3	89	21	91	82	14	16
2009	13.1	40.6	87	14	54	27	8	6
2010	13.8	32.9	18	12	37	10	3	4
2011	22.9	9.6	7	3	16	4	1	4
2012	19.1	0.5	12	3	27	3	0	0
2013	Ongoing	Ongoing	5	NS	NS	NS	0	1

[a] Kenai Peninsula pellet survey is conducted by the Kenai National Wildlife Refuge (T. Burke pers. comm.). Methods used are described in Krebs et al. (1986); pellets/m^2.

[b] Denali National Park count survey is conducted by the National Park Service (C. McIntyre pers. comm.). Methods include indexing hare numbers per site within Denali Nat. Park.

[c] The Delta Junction Breeding Bird Survey (BBS) hare count is conducted by retired ADF&G biologist S. DuBois. Hares are counted while conducting the BBS.

[d] The Donnely Dome Breeding Bird Survey (BBS) hare count is conducted by Fort Greely biologist J. Mason. Beginning in 2012 this survey will no longer occur. Hares are counted while conducting the BBS.

[e] Hare counts in Delta Junction include 3 road-side count areas.

[f] Hare counts in Anderson include 4 road-side count areas.

[g] Hare counts along the Steese highway include 1 road-side count area.

[h] Hare counts in Cantwell include 1 road-side count area.

[i] In 2007 only 3 of the 4 survey areas were counted.

REGULATORY YEAR 2013 HUNTING PROJECTION

During RY13 hunters can expect low to very low snowshoe hare densities in the Interior, Southcentral, and areas of Northwest Alaska; however small isolated pockets of higher densities will be found. Population densities in the Interior are expected to begin growing over the next 1-2 years. In Southcentral, the low will likely persist through 2014. On the Kenai Peninsula

hunters can expect moderate to low densities of snowshoe hare this season, however, the population is expected to decline quickly and reach its low over the next 1 to 2 years.

Alaska Hare

METHODS

The 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. It is larger than the snowshoe hare and often dwells on the open tundra.

Beginning in the fall of 2012, DWC, in cooperation with UAF, began a study on Alaska hare examining the genetic variability of the species throughout its range (T. Booms, ADF&G Wildlife Biologist, personal communication). So far, samples have been collected from the Seward and Alaska peninsulas and areas around Bethel and Dillingham. This study may begin to reveal the movement patterns, distribution, and abundance of this unique species. This study will provide a strong first step toward documenting and understanding the basic life history and important management issues facing this species. Hunter participation is encouraged and sample collection details can be found by contacting the Fairbanks or Palmer ADF&G offices.

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.

STATUS

Based on field observations throughout its range, populations continue to remain well below what was historically observed in the 1950s and 1960s. It remains uncertain whether this has been a long-term decline or a mid-century crash with a continued low but stable population in recent years. In 2012, several individuals reported observing more Alaska hare between Bethel and the Ahklun Mountains than have been observed in the recent past. However, many long-term residents within their range report much lower abundance throughout the entire range than was present in the 1980s (P. Jones, ADF&G Assistant Area Biologist, personal communication). During late winter and spring of 2013, Alaska hare were also observed along the coastline of GMU 18, along the Kisaralik River, and on ridge tops and areas with little snow in the Kilbuck Mountains.

REGULATORY YEAR 2013 HUNTING PROJECTION

Due to the lack of population monitoring, and unknown population status and distribution, making a hunting projection is not practical.

Other Small Game Program Projects

In April and May of 2012 the small game program initiated the first statewide small game hunter survey (Merizon and Carson 2013). The objectives of this survey were to 1) understand who is hunting small game, 2) estimate number of adult and child (>16 years old) hunters in Alaska, 3) which species are most hunted, 4) in which GMUs are they being hunted, and 5) methods of transportation. Despite a low response rate (11%) to the online survey the DWC was able to learn a great deal about small game hunters in Alaska. Spruce grouse, ptarmigan (likely willow ptarmigan), and snowshoe hare were the most hunted species in Alaska. Most hunters hunted within the GMU in which they lived. The full report can be viewed and downloaded at the small game program web page (www.smallgame.adfg.alaska.gov).

Management Implications

Populations of grouse, ptarmigan, and hare are likely more heavily exploited throughout geographic areas along the road system from Fairbanks to the Kenai Peninsula than populations off the road system. Spring survey data are consistently reflecting this trend for a variety of species. The potential effect of hunting on readily accessible populations is among the greatest management concern along the road system. Road densities are relatively low along the main population corridor and centers in the state, between Fairbanks and the Kenai Peninsula. However, the technological improvements of off-road vehicles over the past 10 to 15 years, including four-wheelers, snowmachines, and jet boats, have provided a great deal of access away from the primary roads. Game management units 13, 14, 15, and 16 are accessible on almost every side by highways, trails, or large river corridors, allowing access to what have become very popular hunting areas. Hunters frequently complain, however, that easily accessible hunt areas have resulted in reduced small game hunter success in many places. These areas include roads and trails near urban centers in Anchorage, the Mat–Su Valley, and Fairbanks. Density estimates of willow and rock ptarmigan in GMU 13 suggest hunting may be reducing population abundance along road corridors like the Denali Highway, though limited data exist for more remote portions of the unit.

In addition to accessible hunting, late winter hunting may also be further reducing the abundance of grouse and ptarmigan. In GMU 13B, late winter (December through March) ptarmigan hunting has been closed for 3 seasons and willow ptarmigan densities are twice as high as in adjacent GMU 13E. In virtually every other state, winter and particularly spring (February through April) hunting is not allowed for grouse or ptarmigan species because of the additive mortality to the breeding individuals that survive winter (Sandercock et al. 2011).

As the human population in Alaska continues to grow, additional harvest and disturbance pressures will be placed on small game populations that may already be nearing or have surpassed their ability to absorb that pressure. This is why in 2013 the small game program has initiated several research studies on ptarmigan along the Denali Highway. Focused research will be required to fully examine and understand these impacts. Through additional public outreach and active monitoring of abundance trends, we will continue to increase our understanding of population dynamics and what impacts these populations the most. Also, as the DWC better

understands what the public would like from small game hunting areas, it will be better prepared to make appropriate recommendations to the BOG.

Future Work

This fall and winter the small game program will begin the process of hiring an additional full-time biologist. This position will be based in the Interior of Alaska and will begin to further explore the management concerns and research questions throughout the Interior, West, and Northwest Alaska.

The DWC hopes to replicate the small game hunter survey that was performed in spring 2012. That effort allowed great insight into how best to implement a future hunter survey effort. Any future effort will likely involve a mail-out paper response form as well as an online option. This mail-out option will hopefully increase our response rate and thus provide more meaningful information for the DWC, members of the public, and hunters.

Improving technological advancements in small radio transmitters may open up new opportunities for documenting grouse and ptarmigan movement in the next 1–2 years. Transmitters equipped with an onboard Global Positioning System (GPS) data logger have been available for large terrestrial mammals for some time and allow multiple positions on an animal per day if desired. This can avoid expensive fixed-wing aerial surveys to locate collared animals. Large mammals are capable of carrying the heavy collar that holds both the battery and GPS unit onboard. For grouse and ptarmigan a collar cannot weigh more than 10–12 g and, thus, these birds have not been able to carry both a battery and GPS data logger unless it was solar rechargeable. Long Alaska winters make solar recharging impossible. The DWC will be testing several prototype radio collar transmitters this summer and fall that do not require solar recharging of the battery. Each unit will be equipped with a GPS data logger onboard storing a position as often as 2 to 3 times daily for up to 2 to 3 months. Once these units are recovered they can be downloaded and provide very discrete location information. Although this will only be a test it has the potential to be used in the future to document long distance migrations observed in North Slope or Yukon-Kuskokwim Delta willow ptarmigan populations. There are also many other intriguing questions this technology may have the potential to answer.

Acknowledgments

Thank you to B. Taylor and N. Cassara for their hard work, sleepless days, and dedication to collect the data used to monitor these species. Thank you to all of the hunters who voluntarily collected and returned wings for the small game program and others who provided observations and reports from the field. Thank you to the landowners in Delta Junction that allowed us to continue monitoring sharp-tailed grouse leks on their property. Thank you to the Department of Transportation along the Steese Highway for their support. Finally, thank you to all of the DWC staff that assisted in collecting these data and provided insight and assistance to the small game program: Your efforts are greatly appreciated.

This project was funded in part by Federal Aid in Wildlife Restoration Grant F12AF00050.

Literature Cited

Arcese, P. and J. N. M. Smith. 1988. Effects of population density and supplemental food on reproduction in song sparrows. Journal of Animal Ecology 57:119-136.

Bergerud, A. T., S. S. Peters, and R. McGrath. 1963. Determining sex and age of willow ptarmigan in Newfoundland. Journal of Wildlife Management 27(4):700-711.

Bergerud, A. T. and W. E. Mercer. 1966. Census of willow ptarmigan in Newfoundland. Journal of Wildlife Management 30:101-113.

Bergerud, A. T. 1970. Population dynamics of the willow ptarmigan *Lagopus lagopuss alloni* L. in Newfoundland, 1955-1965. Oikos 21:299-325.

Braun, C. E. and G. E. Rogers. 1971. The white-tailed ptarmigan in Colorado. Colorado Div. Game, Fish and Parks Tech. Publ. No 27.

Choate, T. S. 1963. Ecology and population dynamics of white-tailed ptarmigan (*Lagopus leucurus*) in Glacier Park, Montana. PhD Thesis. Montana State Univ., Missoula.

Christie, K, M. S. Lindberg, R. W. Ruess, and J. A. Schmutz. *In Prep*. Distribution and migration of an important arctic herbivore, with implications for shrub expansion. Polar Biology.

Erikstad, K. E. and R. Anderson. 1983. The effects of weather on survival, growth rate and feeding time in different sized willow grouse. Ornis Scandinavia 14:249-252.

Gullion, G. W. 1989. Determining Age. The Wildlife Series: Ruffed Grouse. Stackpole Books. Pp.64-71.

Haddix, J. 2007. Sharp-tailed grouse monitoring project report Donnelly Training Area, Alaska. USAG Alaska Natural Resources Report. 7pp.

Hannon, S. J., P. K. Eason, and K. Martin. 1998. Willow ptarmigan (*Lagopus lagopus*). *In* The Birds of North America. No 369 (A. Poole and F. Gill, eds.). The Birds of North America, Inc. Philadelphia, PA.

Henderson, F. R., F. W. Brooks, R. E. Wood, and R. B. Dahlgren. 1967. Sexing of prairie grouse by crown feather patterns. . Journal of Wildlife Management 31(4):764-769.

Irving, L., G. C. West, L. J. Peyton, and S. Paneak. 1967. Migration of willow ptarmigan in arctic Alaska. Arctic 20(2):77-86.

Krebs, C. J., B. S. Gilbert, S. Boutin, and R. Boonstra. 1987. Estimation of snowshoe hare population density from turd transects. Canadian Journal of Zoology 65:565-567.

Krebs, C. J., R. Boonstra, S. Boutin, and A.R.E. Sinclair. 2001. What drives the 10-year cycle of snowshoe hares? BioScience 51(1):25-35.

McBurney R. S. 1989. Ruffed Grouse: Roadside drumming counts. Stackpole Books. 370pp.

Merizon, R. A. 2012. Status of grouse, ptarmigan, and hare in Alaska, 2012. Alaska Department of Fish and Game. Wildlife Management Report, ADF&G/DWC/WMR-2012-1. Anchorage.

Merizon, R. A. and S. J. Carson. 2013. Statewide small game hunter survey, 2012. Alaska Department of Fish and Game. Division of Wildlife Conservation, Wildlife Management Report, ADF&G/DWC/WMR-2013-2, Anchorage, Alaska.

Roberts, H. 1963. Aspects of the life history and food habits of rock and willow ptarmigan. Unpublished M. Sc. Thesis, University of Alaska. 108pp.

Sandercock, B. K., E. B. Nilsen, H. Broseth, and H. C. Pederson. 2011. Is hunting mortality additive or compensatory to natural mortality? Effects of experimental harvest on the survival and cause-specific mortality of willow ptarmigan. Journal of Animal Ecology 80:244-258.

Schulz, J. W. 1983. Determining the sex and age of ruffed grouse. North Dakota Outdoors. 46(3):9-11.

Steen, N. C. 1995. Matanuska Valley ruffed grouse transplant, 1988–1990. Final Report. Alaska Department of Fish and Game, Juneau. 9pp.

Steen, N. C. 1999. Kenai Peninsula ruffed grouse transplant, 1995–1997. Unpublished final project report to the Alaska Waterfowl Association, The Ruffed Grouse Society, and Safari Club International. Alaska Department of Fish and Game, Juneau, Alaska. 8pp.

Storch, I. 2000. Grouse: status and conservation action plan 2000–2004. WPA/Birdlife/SSC Grouse Specialist Group. IUCN, Gland. Switzerland and Cambridge, UK and the World Pheasant Association, Reading, UK. X+112pp.

Szuba, K. J., J. F. Bendall, B. J. Naylor. 1987. Age determination of Hudsonian spruce grouse using primary feathers. Wildlife Society Bulletin 15:539-543.

Taylor, W. P. 1992. 1992 Ruffed Grouse Report. Alaska Department of Fish and Game, Anchorage, Alaska. 14pp.

Taylor, W. P. 2000. Game management unit 13 ptarmigan population studies. Alaska Dept. of Fish and Game. Federal Aid in Wildlife Restoration final research performance report, August 1997-30 June 1999. Grants W-27-1 and W-27-2, study 10.70. Juneau, Alaska 12pp.

Taylor, W. P. 2013. The status of upland game within Alaska's highway system: a comprehensive report focusing on 2007–2011. Alaska Department of Fish and Game, Division of Wildlife Conservation, Wildlife Management Report 2013-1. ADF&G/DWC/WMR-2013-1, Palmer, Alaska.

Watson, A. 1965. A population study of ptarmigan (*Lagopus muta*) in Scotland. Journal of Animal Ecology 34:135-172.

Weeden, R. B. 1965. Grouse and Ptarmigan in Alaska. Alaska Department of Fish and Game Project W-6-R-5.

Weeden, R. B. and A. Watson. 1967. Determining the age of rock ptarmigan in Alaska and Scotland. . Journal of Wildlife Management 31(4):825-826.

Wiebe K. L. and K. Martin. 2000. The use of incubation behavior to adjust avian reproductive costs after egg laying. Behavioral Ecology and Sociobiology 48: 463-470.

Wilson S. and K. Martin. 2010. Variable reproductive effort for two ptarmigan species in response to spring weather in a northern alpine ecosystem. Journal of Avian Biology 41:319-326.

Zwickel, F. C. and J. F. Bendell. 2004. Blue Grouse: their biology and natural history. NRC Research Press, Ottawa, Ontario, Canada. 284pp.


ALASKA
DEPARTMENT OF FISH AND GAME