Upland Game Bird Management Plan 2018-2028

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Cover photos (l to R)

1. Ruffed grouse (*Bonasa umbellus*)
2. Sharp-tailed grouse (*Tympanuchus phasianellus*)
3. Spruce grouse (*Falcipennis canadensis)*
4. Willow ptarmigan (*Lagopus lagopus*)
5. Rock ptarmigan (*Lagopus muta*)
6. Gray partridge (*Perdix perdix*)
7. Ring-necked pheasant (*Phasianus colchicus*)

Acknowledgements

Current upland game bird management in Saskatchewan would not be possible without the contributions made by Fish, Wildlife and Lands and Compliance and Field Services staff who have conducted population and harvest surveys, collected biological samples, and provided extensive qualitative information on the state of upland game bird populations regionally in advance of season setting each year. In particular, special thanks to Adam Schmidt, Jim Hines, Ross Melinchuk, Hugh Hunt, Wayne Pepper and Syd Barber, who all dedicated considerable time and effort to researching various aspects of upland game bird life histories in Saskatchewan, as well as to those who authored *The Saskatchewan Game Bird Management Objectives and Strategies for the 80s* report and the annual Game Management Reports. This information was fundamental to developing and evaluating the potential of the proposed management strategies and thresholds identified in this plan. Special thanks also to Mike Gollop, Brad Tokaruk and Tom Perry for their time and expertise throughout the many technical discussions and brain storming sessions as this plan developed and for acting as a review panel once it was completed.

Additionally, many stakeholders have been integral to the success of upland game bird management in the province by their direct participation in surveys, as well as the perspective they provide on the state of their local upland game bird populations. In particular, we acknowledge the contributions of upland game bird hunters for providing hunting, harvest and population information on an annual basis. This information is critical to upland game bird population monitoring and management. Thank you for your continued engagement in and contribution to upland game bird management!

Executive Summary

The Saskatchewan Upland Game Bird Management Plan outlines a framework for how upland game birds will be managed in the province over the next 10 years, with particular emphasis on the thresholds developed to trigger a change in management strategy. These thresholds are based on a three-year running average of annual harvest rate, as harvest is well-correlated with population trends, and will dictate whether a liberal/base, restrictive or closed season is implemented.

The priority actions required for achieving management objectives for these species are detailed and largely focused on:

- monitoring bird populations annually to ensure all management decisions are science-based and made with the best available information to ensure sustainable population for future generations;
- maintaining adequate habitat to support sustainable populations into the future; and
- ensuring the allocation of any harvest does not jeopardize the sustainability of these populations and is fairly allocated among users.

In order to develop additional management thresholds and improve how upland game birds are managed in the province, future research priorities include improving our understanding of the relationship between weather severity and productivity, and developing land cover maps that reliably depict present-day habitats that are important to upland game bird species.

This plan is a living document and management strategies will be adapted as new information and techniques become available.

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1.0 Plan Overview

1.1 Purpose and Management Goal

The goal is to sustainably manage upland game birds and their habitats in Saskatchewan. This plan provides a framework for achieving this goal, and establishes thresholds that will trigger management actions that maintain populations at desirable levels. Adaptive management principles will be implemented, such that the uncertainty inherent in wildlife management is acknowledged and that flexible decision-making allows management strategies to be adjusted as outcomes from management actions and other events are better understood. Therefore, the plan is intended to be adaptive to changes in environmental and societal factors of the landscape, as well as to an evolving understanding of the factors acting on upland game bird populations over time. Allocation of upland game bird harvest will be in accordance with the Saskatchewan Game Allocation Framework.

1.2 Time frame

This plan is a living companion document to the Saskatchewan Game Management Plan 2018 – 2028 and is intended to guide species management over a 10-year period, with a five-year review.

2.0 Species Status in Saskatchewan

2.1 Biology

Saskatchewan is home to seven species of upland game birds, including sharp-tailed grouse, ruffed grouse, spruce grouse, willow ptarmigan, rock ptarmigan, gray partridge and ring-necked pheasant. Wild turkey, although not currently a game bird in Saskatchewan, inhabits the province and is considered an upland game bird in neighbouring jurisdictions, so is included in this plan. Greater sage-grouse was historically a game species, but hunting has been prohibited since the 1930s due to concerns regarding population declines (Weiss and Prieto 2014). Currently, sage-grouse are listed as endangered in Schedule 1 of the federal *Species at Risk Act* and are not included in this plan.

The eight species included are part of the Galliforme order and are mainly terrestrial with short, rounded wings for short-distance flight. As such, these species are non-migratory and are year-round residents to the areas they inhabit, making relatively few large-scale movements. They are highly reproductive, laying anywhere from three to 22 eggs (approximately eight to 12 on average) and are all ground-nesting species. The young are precocious and are mobile within hours of hatching. These species are stoutly built and have short, thick bills primarily adapted to foraging, although young birds will also consume insects. They feed on a variety of plant and

animal material, allowing them to capitalize on available food resources. Their large size, additional plumage and lower activity levels makes them well adapted to regions with cold winters. In the winter months they change their feeding strategy to that of a ruminant, feeding and extracting energy and nutrients from coarse, fibrous plant material, such as buds, twigs and conifer needles. This provides a highly accessible food source that requires little energy to harvest.

Of these eight species, sharp-tailed grouse, ring-necked pheasant and gray partridge are commonly found in the prairies. Sharp-tailed grouse is native to the province and the other two are Asian and Eurasian species, respectively, that were translocated to the province in the early 1900s and have become naturalized. The sharp-tailed grouse is Saskatchewan's provincial bird and various aspects of sharp-tailed grouse and gray partridge ecology have been formally studied in Saskatchewan (Barber and Pepper 1971, Pepper 1972, Hunt 1974, Melinchuk 1981, Schmidt 1992). Additional information on these three species can be found in Connelly et al. (1998), Carroll (1993) and Giudice and Ratti (2001).

Ruffed grouse, spruce grouse, willow ptarmigan and rock ptarmigan are most commonly found in the northern half of the province. Little research has been done on these species in Saskatchewan, with the exception of research on the fall and winter habitats of ruffed grouse in the Qu'Appelle Valley (Hines 1984). Further information on these species can be found in Rusch et al. (2000), Boag and Schroeder (1992), Hannon et al. (1998) and Montgomerie and Holder (2008).

Wild turkey is native to North America and is found in pockets in the southeast and southwest corners of the province, having moved in from neighbouring jurisdictions and historic introductions. The status of this species in Saskatchewan is largely unknown, as there has been no formalized data collected and wildlife managers rely exclusively on field reports. Further information on this species can be found in McRoberts et al. (2014).

2.2 Characteristics Relevant to Management

One of the key guiding principles in upland game bird management is that upland game birds generally comply with the compensatory mortality hypothesis. This hypothesis predicts that low rates of harvest mortality should have no effect on annual survival rates up to a threshold set by the natural mortality rates, above which harvest mortality should be additive (Sandercock et al. 2011). Put simply, natural mortality occurs every year and at low harvest rates, the number of individuals taken by hunting is less than or equal to those that would have succumbed to natural mortality and does not add to the overall mortality that occurs annually.

There are four factors that predict the response of a population to harvest under natural conditions (Sandercock et al. 2011): speed of life history, status of the population, timing of the harvest and how animals disperse across the landscape. Species with relatively fast life histories (high fecundity or high reproductive capacity and low survival) are more likely to produce a surplus of offspring, leading to a compensatory response to harvest. Similarly, if populations are at or above carrying capacity, harvest mortality is more likely to be compensatory than if the population is low-density or declining. Seasonally, if populations are harvested before most natural mortality occurs, harvest tends to be more compensatory to natural mortality than additive. Finally, populations that have the ability to disperse are more likely to have a compensatory response to harvest. Upland game bird populations exhibit all of these traits to varying degrees and therefore it is expected that harvest at current levels is compensatory, not additive, to natural mortality.

Another key principle of upland game bird management in Saskatchewan is that management decisions should follow the precautionary principle. The precautionary principle outlines a basis for taking management action to protect a resource when outcomes are irreversible and/or widespread, even if not all cause and effect relationships have been fully established scientifically (deFur and Kaszuba 2002). This simply means that when a population is threatened at a large scale, a lack of scientific data cannot be used as rationale for not implementing actions to protect the population.

Upland game bird populations can be influenced by a variety of factors, but the most important relate to habitat quality and availability and environmental conditions during key periods of their lifecycle. Long-term fluctuations in populations are often related to changes in the quality and quantity of habitat, while dramatic short-term fluctuations are often the result of environmental conditions (i.e. weather). While these short-term fluctuations often cannot be predicted, changed or controlled, the resulting effect on the population is usually not long-lasting. Conversely, the long-term fluctuations often can be predicted, changed or controlled and can have lasting impacts on bird populations. Consequently, upland game bird populations tend to be quite variable.

Part of successful upland game bird management includes cooperating with land managers in any management activities. Given the importance of quality habitat in the long-term sustainability of upland game bird populations, it is imperative to engage those managing the land in the management process. Furthermore, in southern Saskatchewan, much of the land is under private control and to ensure continued access for hunting, land managers need to understand the ecology of these species and the impact of hunting.

Finally, there is a strong heritage around upland game bird hunting in Saskatchewan and all hunters are afforded the opportunity to hunt upland game birds each year by purchasing a game bird licence. The Ministry of Environment recognizes the importance of maintaining harvest opportunities for upland game birds and endeavors to provide these opportunities unless there is a significant conservation concern.

2.3 Historic Population Status

Upland game bird populations have been highly variable through time. This is largely related to their vulnerability to inclement environmental conditions and their high reproductive capacity that allows populations to rebound quickly after they have experienced significant declines. *The Saskatchewan Game Bird Management Objectives and Strategies for the 80s* report (Department of Tourism and Renewable Resources, 1980) detailed the status of all game bird species from the 1960s forward to that point. Population surveys were occurring for sharp-tailed grouse, grey partridge and ring-necked pheasant, alongside harvest surveys, during this time. From this data, it was apparent that harvest surveys could approximate population trends relatively well and after these populations surveys were discontinued, the ministry continued to use harvest estimates as a way to monitor populations going forward. Harvest data from 1984 to present is depicted below (Figure 1).

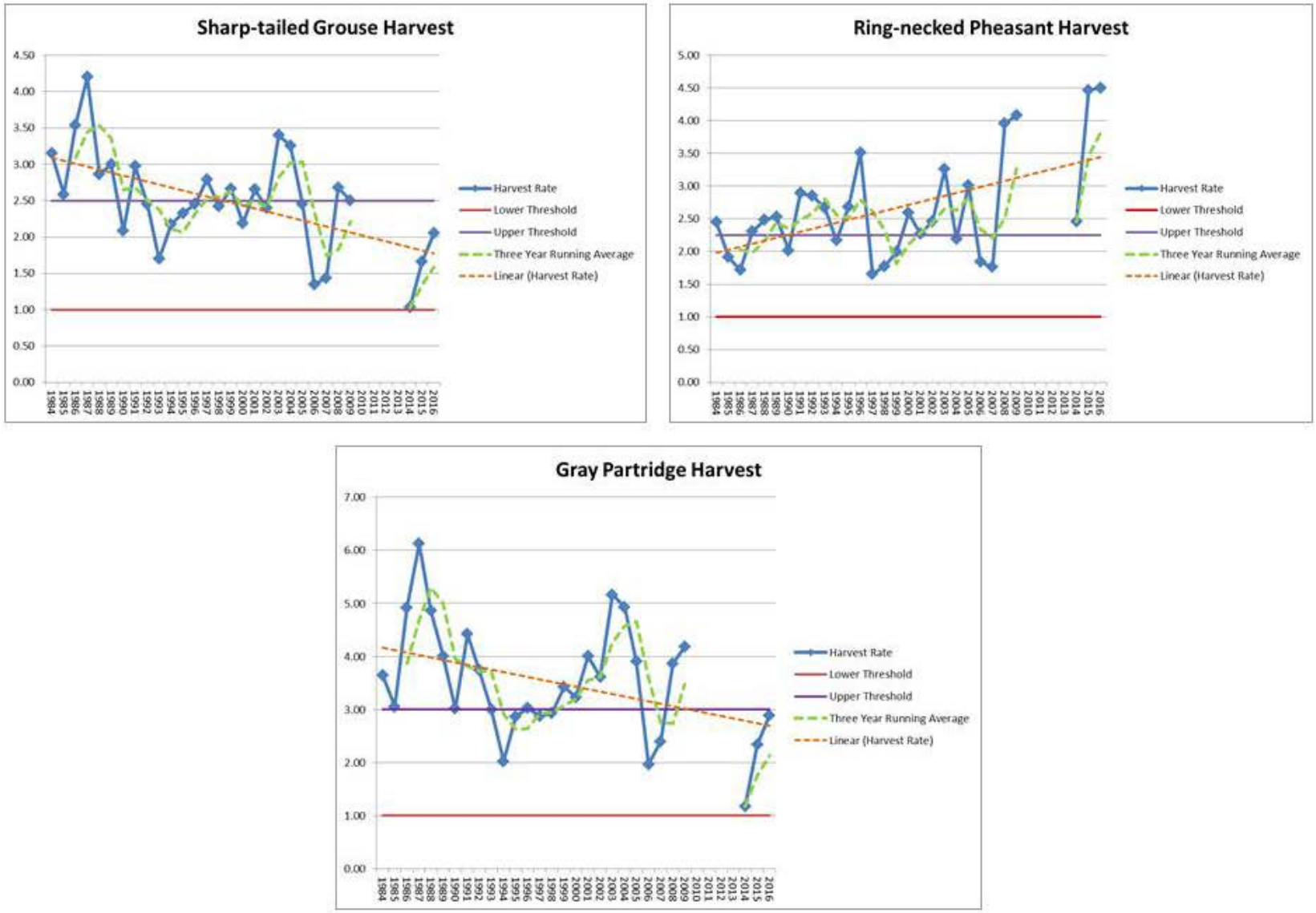

Figure 1. Saskatchewan resident harvest data for prairie upland game bird species (1984-2016). Upper and lower harvest management thresholds, as defined in Table 1, are included and indicate the points at which the harvest strategy for each species will be adjusted. Linear trend line is indicated in orange. The Hunter Harvest Survey was discontinued in 2010 and reinstated in 2014.

Harvest rate (i.e. the number of birds harvested per hunter per year) is used to allow for comparison between years with vastly different hunter numbers. This data suggests that sharp-tailed grouse and gray partridge have been declining over the past 30 years, a trend that is common in jurisdictions across their range and has largely been attributed to habitat loss, fragmentation and degradation, coupled with adverse environmental conditions (Carroll 1993, Connelly et al. 1998, Giudice and Ratti 2001, Aldridge et al. 2004, Silvy & Hagen 2004, Norton et al. 2010), while ring-necked pheasant populations have been slightly increasing. Caution should be used when interpreting the ring-necked pheasant harvest data. Although stocking of captive-reared birds does not enhance the wild bird population, it will enhance the harvest in the year they were stocked. Understanding the extent of stocking activities in the province will help wildlife managers better understand the harvest data. Efforts are underway to ensure information regarding all stocking activities is provided to the ministry as a condition of any permits allowing the release of captive-reared birds.

While all populations are driven by a variety of external factors, ruffed grouse and spruce grouse are known to experience population cycles above and beyond these external factors (Keith 1963; Moss and Watson 2001). Not all populations of a given species are cyclic, but the ones that are tend to be fairly symmetrical, with decline and increase phases in any one fluctuation taking a similar number of years. North America is well known for its 10-year cycle period (Watson and Moss 1979) and in Saskatchewan, ruffed grouse and spruce grouse cycle every eight to 10 years (Figure 2), which supports evidence that cycles in the boreal show some geographical variation in period (Moss and Watson 2001). There are a number of hypotheses for why these species experience population cycles, although most relate to delayed density-dependence theory, where a steep decline occurs following a period of high density. Density-dependent interactions can be driven by the relationships of different organisms in a food chain (i.e. trophic interactions) or the interactions between different segments of the population that are unrelated to nutrition (e.g. spatial organization and kinship). In both cases, when the density of one segment increases, it can have a negative effect on a related segment. An example of this would be when predator populations increase, prey populations decrease. Anecdotal evidence suggests that populations that cycle most often occur in homogenous habitat and the disappearance of cycles has been associated with fragmentation of habitat (Moss and Watson 2001). Regardless of why cycles occur, the fluctuation in grouse numbers is a function of the variation in the survival and recruitment of young birds into the breeding population (Moss and Watson 2001). Evidence from other regions suggests that ptarmigan may also undergo population cycles (Keith 1963, Andreev 1988, Krebs et al. 2001, Moss and Watson 2001).

Historic information for both ptarmigan species and wild turkey in Saskatchewan is currently lacking and information regarding their population status is gleaned annually from field reports.

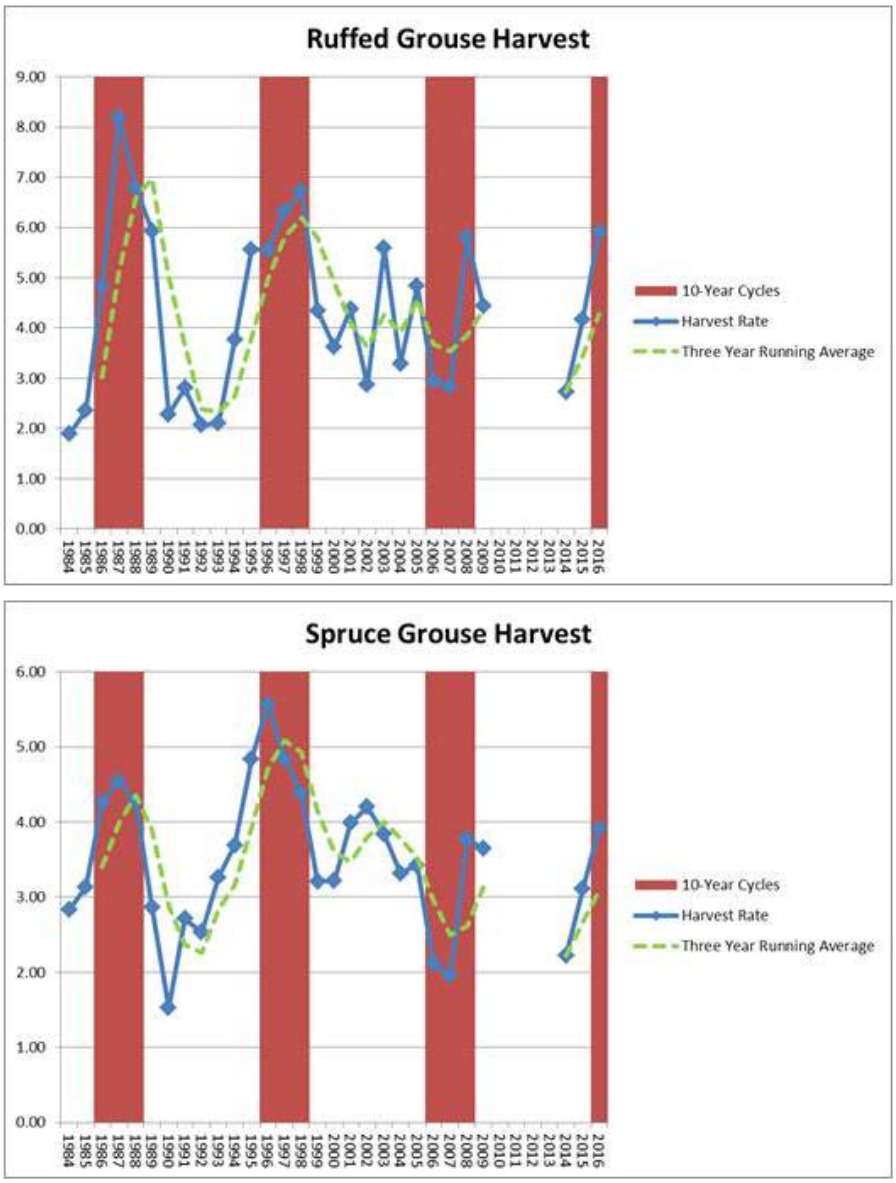

Figure 2. Saskatchewan resident harvest data for forest grouse (1984-2016). Red sections outline the historic 10-year cycles plus and minus one year to illustrate variation in the cycle. Actual variation may differ from cycle to cycle. The Hunter Harvest Survey was discontinued in 2010 and reinstated in 2014.

2.4 Distribution/Range

Upland game birds are found throughout the province, although the range of each species is largely related to the location of its preferred habitat. Several species ranges cover the province, four species are most commonly found in the southern portion of the province, while the other four species are more commonly found in the northern portion. The extent of each species range is depicted in Figure 3.

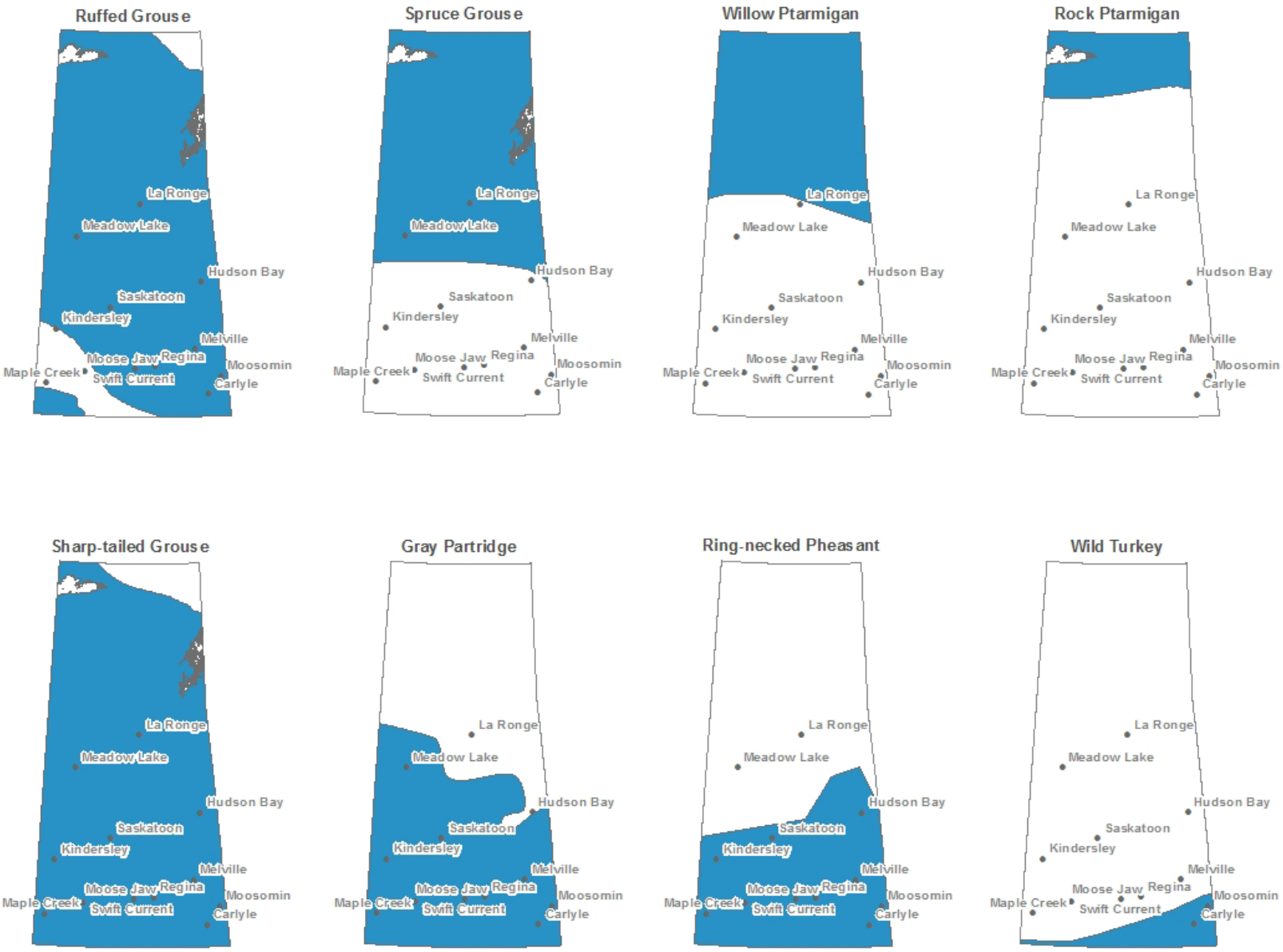

Figure 3. Upland game bird ranges across the province (BirdLife International and Handbook of the Birds of the World 2016). Please note the ring-necked pheasant range is likely artificial north of the South Saskatchewan River and Qu'Appelle River system due to temporary presence of released birds.

2.5 Habitat Description

Upland game birds use a wide variety of habitats in Saskatchewan. Each species utilizes a unique combination of native and non-native habitats, which can also vary seasonally.

2.5.1 Sharp-tailed Grouse

Sharp-tailed grouse are native grassland specialists (Barber and Pepper 1971), although they can be found in other habitats that offer similar structure (e.g. open muskeg). Their breeding habitats are dominated by relatively dense herbaceous cover and some shrubs, but the dominant species of vegetation may vary. Leks (or dancing grounds), a key feature of the breeding habitat, often occur on elevated ground with less vegetation than the surrounding area. Nesting occurs in close proximity to the lek location, and nests are usually located in relatively heavy cover (Pepper 1972), often with vegetation at least 30 centimetres high with dense foliage (Connelly et al. 1998). Lek locations are relatively stable from year-to-year, although the location can change and move within the general region over time. Once the young have hatched, the broods depend on locally-abundant food sources (such as forbs and insects), resulting in a preference for areas with diverse cover types. In winter, sharp-tailed grouse rely on a variety of habitats (Schmidt 1992), including riparian areas, deciduous hardwood shrub draws and forest (both deciduous and open coniferous).

2.5.2 Gray Partridge and Ring-necked Pheasant

Gray partridge and ring-necked pheasant both capitalize on non-native habitats. Partridge rely heavily on agricultural fields and grasslands in the summer and crop stubble and wooded cover in the winter. Abandoned farmyards, shelterbelts and roadsides are all preferred partridge habitat, particularly in areas where cereal grains dominate. Similarly, ring-necked pheasant are highly adapted to agricultural areas, especially those where cultivated lands are interspersed with ditches, shelterbelts, marshes and woody vegetation. Pheasants nest in areas with high levels of residual cover (i.e. dry vegetation from the previous fall). In Saskatchewan, alfalfa and grassy roadsides may provide adequate nesting habitat. As with other species, food availability drives habitat use once the young are born (Melinchuk 1981) and herbaceous cover is often sought out. In winter, dense vegetation is often used to provide shelter from inclement weather and these non-native species may rely on food found in farm and ranch yards to survive through winter.

2.5.3 Ruffed Grouse and Spruce Grouse

Ruffed grouse and spruce grouse generally occupy the same habitats year-round. Both are found primarily in the boreal forest, with ruffed grouse being closely associated with aspen-dominated forests (Hines 1984), and spruce grouse with conifer-dominated forests. Ruffed grouse utilize drumming sites, often in early-seral stage hardwood forest, where visibility is

good at ground level and adequate overhead cover protects the individual from predators. Drumming logs are typically 20 cm in diameter and greater than two metres in length (Rusch et al. 2000), although other objects may be used. Nests are located in hardwood or aspen stands with open understories for similar reasons. In winter, food may become more important than cover and birds are associated with fruit- and berry-producing vegetation (chokecherry, rose and hawthorn; Hines 1984). Spruce grouse prefer relatively young successional stands, adjust their selection of microhabitats to compromise between food acquisition and predator avoidance and will move from more open stands to denser stands with increasing snow (Boag and Schroeder 1992).

2.5.4 Ptarmigan

Little is known about willow and rock ptarmigan in Saskatchewan, although these species are both better known to occur in subarctic or subalpine zones and migrate south into the boreal forest in the winter. In winter, willow ptarmigan are often found in areas with patches of dense vegetation, where willow and birch are abundant and where winter ranges overlap. Rock ptarmigan occur in less shrubby habitats than willow ptarmigan (Montgomerie and Holder 2008).

2.5.5 Wild Turkey

Wild turkey are often associated with mature hardwood trees in close proximity to open pastures. In Saskatchewan, this habitat is limited and largely found in creek beds (e.g. Pipestone Creek) and yard sites in the southeastern portion of the province and the Cypress Hills in the southwest. Since yard sites often provide the only roosting habitat for this species in an area, there can be some conflict with landowners.

2.6 Limiting Factors

i. Habitat

Habitat loss, fragmentation and degradation pose the biggest threat to long-term sustainability of upland game bird populations (Aldridge et al. 2004, Silvy & Hagen 2004, Norton et al. 2010, Environment Canada 2013, North American Bird Conservation Initiative 2016). The majority of upland species rely primarily on native habitats and may utilize non-native habitats (e.g. crop) to supplement their resource needs. However, without that native habitat, the species would have difficulty persisting (Pepper 1982, Gossman and Stavne 2005). This is particularly true of sharp-tailed grouse, which rely heavily on native grassland, a habitat that has been particularly vulnerable to loss and degradation over the last century. While the majority of native habitat loss occurred decades ago, it is important to retain the remaining native habitat to ensure persistence of these species. Furthermore, developments and human activities can pose a

threat to the conservation of native habitat. It is important to put policies in place to avoid or mitigate damage to native habitat.

In contrast, gray partridge rely extensively on non-native habitats (Department of Tourism and Renewable Resources 1980), such as abandoned farmyards and shelterbelts (Hunt 1974) that offer woody cover near crop interface. Interestingly, these unconventional habitats are being lost to support mechanized agricultural practices that utilize large machinery and have difficulty navigating smaller features on the landscape. The extent to which this is occurring is unknown, but anecdotal evidence suggests that it may be contributing to the gray partridge populations remaining below long-term averages in recent years.

ii. Weather

Annual variation in upland game bird populations is largely driven by weather severity (Pepper 1972; Flanders-Wanner 2004b) and weather influences survival and reproduction in a variety of different ways. From the point of view of sustaining populations, the key period in the upland game bird lifecycle is during the spring, when breeding occurs. Maternal nutrition during the egg-laying period has been linked to a hen's success in rearing young and a late green up period could prevent a hen from acquiring sufficient nutrients (Moss et al. 1975). Inclement weather can also impact the survival of the hen while brooding. These conditions force the hen to expend additional energy while incubating the eggs and to leave the nest more frequently to find food to fuel this energy expenditure. Additional movements between the nest and food sources make the hen and the nest more vulnerable to predation. Similarly, inclement weather conditions may facilitate predators finding nests because the ability to detect the nest by scent may be enhanced under certain temperatures, moisture levels and air movements (Webb 2012). More frequent exposure of the nest to the elements while the hen feeds, particularly during severe weather events, can reduce the clutch's survival rate. Once the eggs hatch, severe weather can reduce the survival of the chicks by directly reducing their fitness due to their poorly developed ability to regulate temperature or indirectly by altering the food sources (particularly insects) available to them or making them more vulnerable to predation as a result of their reduced fitness. Overall, cool, wet springs have the largest impact on recruitment (Erikstad and Spidso 1982; Swenson et al. 1994). Another important period is during the winter, when inclement weather can similarly directly or indirectly impact the survival of individual birds. In particular, cold winters with lots of snow and/or extensive snow crust (Zimmerman et al. 2007) are detrimental to the survival of birds, as they expend more energy and have a more difficult time accessing food.

Given the effect weather severity can have on the survival and reproduction of upland game bird populations, it is expected that these species may be particularly vulnerable to climate change (Fletcher et al. 2013; Chamberlain and Pearce-Higgins 2013). For example, climate

change has the potential to disrupt or alter time-sensitive relationships, such as the synchronization between the hatch period and the peak availability of food sources (e.g. insects), which could ultimately have implications for species survival and reproduction (Miller-Rushing et al. 2010). The National Audubon Society predicts that climate change will trigger sharp-tailed grouse and ruffed grouse to undergo significant shifts in their range northward by 2080 (National Audubon Society 2015).

iii. Predators

Upland game bird eggs, chicks and adults are susceptible to a variety of mammalian and avian predators. Although little research has been done on upland game bird predation in Saskatchewan, common upland game bird predators are likely to include skunk, red fox, raccoon, coyote, black-billed magpie, American crow, common raven, northern harrier, red-tailed hawk, sharp-shinned hawk, Cooper's hawk, broad-winged hawk, great horned owl and northern hawk owl. For those species in northern Saskatchewan, mink and fisher may also take eggs. Gray partridge, which rely extensively on abandoned farmyards, may also be susceptible to domestic cats if they are in close proximity to inhabited farmyards. Wild turkey are known to undergo predation by cougars in the Cypress Hills. Many of the avian predators are likely to have remained relatively constant over time, with the exception of the common raven which has expanded the southern extent of its wintering range considerably over the past 20 years (National Audubon Society 2010). As settlement began in the now-agricultural regions of Saskatchewan, mammalian predators may have capitalized on the newly fragmented landscape and become a larger threat to upland game bird populations post-settlement, but predator populations have not likely undergone significant changes in the more recent past. While predators can have an impact on upland game bird populations locally, particularly when they are already vulnerable as a result of inclement weather conditions, one of the best ways to reduce predation is to provide suitable habitat to reduce predator efficiency and improve the bird's ability to hide or escape from predators.

iv. Disease

There have been no documented cases of a major disease outbreak in Saskatchewan upland game bird populations and the Canadian Wildlife Health Cooperative has only received 44 upland game bird submissions in the last 25 years. Recently, a single grouse was diagnosed with avian turberculosis, although the extent of the disease in the wider population is unknown (Marnie Zimmer, pers. comm.). West Nile is potentially a concern for upland game bird species and has been detected in greater sage grouse, ruffed grouse and wild turkey in other jurisdictions (Naugle et al. 2005, Chambers and Monath 2003). Avian influenza has been detected in Saskatchewan and may be present in upland game bird populations. Many other diseases have the potential to affect upland game bird species and further information can be found in Shillinger and Morley (1937) and Friend and Franson (1999). Disease in Saskatchewan's

upland game bird populations will continue to be monitored through submissions to the Canadian Wildlife Health Cooperative.

v. Other Mortality

Pesticides may have implications for upland game bird populations (Mineau and Whiteside 2013), although the extent of mortality as a result of pesticide use is largely unknown in Saskatchewan. Most recently, the use of neonicotinoids has been linked to declines in bird populations and direct pesticide poisoning of gray partridge by imidacloprid has been observed in France (Health Canada Pest Management Regulatory Agency 2016). Research linking pesticides to large scale population declines is ongoing around the world and continues to be monitored to determine the potential for impact on Saskatchewan's upland game bird populations.

2.7 Human Elements

A strong heritage exists around upland game bird hunting and viewing in Saskatchewan. The number of resident hunters varies from year-to-year and species-to-species, but has been estimated as high as 20,250 for a single species (sharp-tailed grouse in 1990). Accurate estimates of total upland hunters from historic data are difficult because waterfowl and upland game bird hunting require a game bird licence, so licence sales are not a true indicator of the number of upland game bird hunters. More recent estimates, derived from new data collected on the hunter harvest survey that asks hunters to identify if they hunted waterfowl, upland game birds or both with their game bird licence, suggest approximately 17,000 individuals hunted upland game birds in 2017 and has been relatively stable since the new data collection began (2014). While it is difficult to quantify the importance of upland game birds to wildlife viewers, this is often cited as having high value to individuals concerned about upland game bird populations and maintaining birds on the landscape for viewing is regularly mentioned by hunting and non-hunting stakeholder groups, alike. Additionally, viewing sharp-tailed grouse on their dancing grounds is a popular activity among naturalists, educators, photographers and others seeking a unique opportunity on the prairies.

Game bird licence sales in 2017 generated $2.35 million in revenue, approximately $531,000 of which is attributed to upland game bird hunters. Unlike waterfowl hunting, Saskatchewan is not an upland game bird hunting destination and the majority of upland game bird hunters are Saskatchewan residents. That said, many hunters will travel across the province to hunt particular species, such as ring-necked pheasant, and contribute to local economies along the way. Additionally, at time of writing, 234 outfitters were endorsed to guide for birds, which includes upland and migratory game birds. The vast majority of them are guiding for migratory birds, but the Saskatchewan Commission of Professional Outfitters members suggest that there are outfitters that guide exclusively for upland game birds and others that offer upland game

bird hunts in addition to waterfowl hunts.

Finally, there are a small number of people in the province that have permits to hold upland game birds. These include operating a commercial shoot farm for ring-necked pheasants, holding upland game birds in captivity for personal use (e.g. consumption or viewing) or to raise for sale and importing birds for release to the wild. Permits to hold in captivity and/or release to the wild are restricted to ring-necked pheasants and gray partridge. The handful of individuals importing captive-reared ring-necked pheasant and/or gray partridge for the purpose of releasing birds to the wild tend to be hunting organizations who release the birds in advance of hunting season to improve their hunting opportunities. Very few of these released birds survive the winter and go on to reproduce, therefore, this activity is not an efficient means of improving wild bird populations (Leif 1994, Musil and Connelly 2009).

3.0 Monitoring and Management

In the absence of extensive population surveys, game birds are monitored using harvest and observational surveys, information provided by staff and stakeholders and through the understanding of life history traits and responses to outside variables. Hunter Harvest Survey data has historically been shown to reflect population trends quite well and continues to be a key data source in assessing the magnitude and direction of population change. Citizen-based observation surveys, such as the Christmas Bird Count, Co-operative Wildlife Management Survey and Saskatchewan Breeding Bird Atlas, and information provided by ministry staff and stakeholder groups, are used to corroborate these assessments. Upland game birds are monitored at the Game Bird Management Unit level. Game Bird Management Units were derived by grouping regions of the province with similar habitat types that experience similar climatic conditions.

Upland game birds are primarily managed through harvest. There are three ways to modify the harvest: daily bag limit, possession or season limit and season length and timing. Saskatchewan generally maintains all three of these variables at liberal levels and these three variables have been held relatively constant over time, with only slight modifications made to address low populations or high hunting pressure. The most recent modifications were made in response to several years of severe weather, which reduced populations well below normal levels.

Although monitored by Game Bird Management Units, upland game birds are managed by the North and South Game Bird Districts (refer to Figure 4; the South Game Bird District includes Game Bird Management Units 1 through 4 and the North Game Bird District includes Game Bird Management Units 5 and 6). These two units have been in place since 1995 and allow wildlife managers to set bag limits and season dates for the northern and southern regions of the

province differently. At the time, this distinction was made to simplify regulations when it was determined that often the zones in these regions had similar bag limits and seasons. Managing upland birds using larger regions than Wildlife Management Zones is appropriate because populations are largely driven by large-scale environmental conditions and many zones in a region are similarly affected.

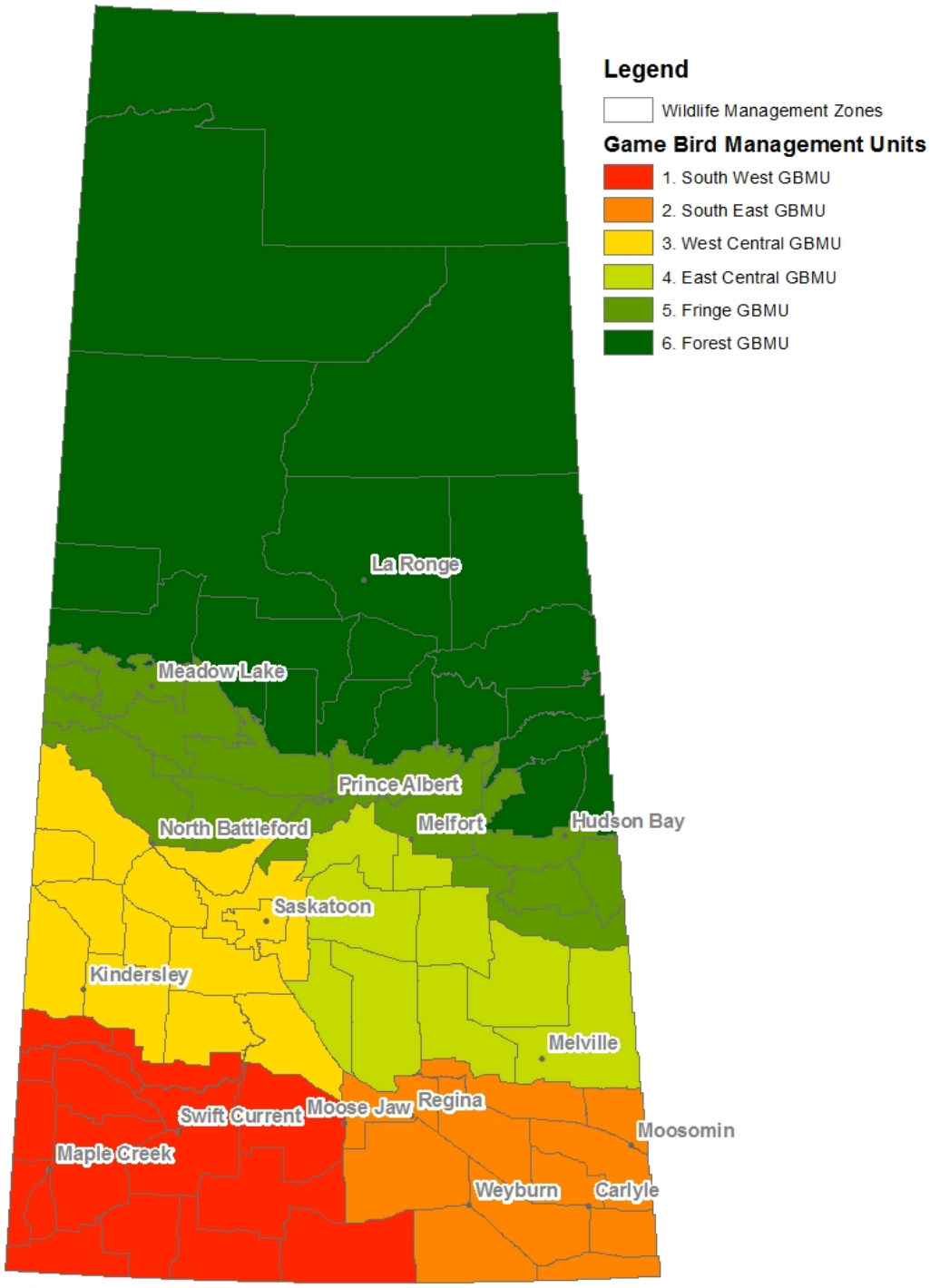

Figure 4. Game Bird Management Units in relation to Wildlife Management Zones.

3.1 Management Objectives and Actions

Objective 1: Monitor upland game bird populations annually to understand the direction and magnitude of population trends and develop management actions that maintain sustainable populations for future generations.

Actions:

- Continue to improve understanding of population levels and distribution within the province using data from the Hunter Harvest Survey, Christmas Bird Count, Cooperative Wildlife Management Survey and Saskatchewan Breeding Bird Atlas.
- Develop predictive models to estimate the impact of weather severity during key stages of upland game bird lifecycles and, in particular, the impact weather variables have on productivity.
- Work cooperatively with the Galliformes Specialist Group, Prairie Grouse Technical Council and National Wild Pheasant Technical Committee to ensure best available monitoring methods and management strategies are implemented in Saskatchewan.
- Ensure any birds translocated into the province have undergone adequate health checks to prevent disease transmission to wild populations.
- Monitor literature to identify current and emerging pesticide issues and where appropriate, develop actions to mitigate effects on upland game birds.
- Ensure policy governing activities around use of upland game birds does not affect game bird populations.
- Engage universities and non-government agencies to undertake research on upland game birds focused on upland game bird biology, habitat and/or factors that affect survival.

Objective 2: Management of native habitat will be viewed as an integral piece to ensuring sustainable upland game bird populations and efforts will be made to maintain the amount of native habitat available. This includes expanding or enhancing policies or programs already in place.

Actions:

- Identify current land cover across the province and determine location and distribution of available habitat for upland game bird species, particularly sharp-tailed grouse.
- Utilize presence/absence population data to validate land cover map layers.
- Develop spatial land cover models to predict upland game bird occurrence.

- Work with conservation partners and associated landowners to protect native habitat deemed important for native upland game bird species.
- Work in conjunction with partner agencies to develop communications that encourage landowners to retain non-native habitat that supports naturalized upland game bird species.
- Use change in habitat availability within Game Bird Management Units to better understand and manage expectations of species population levels.
- Work with industry to develop and implement policies to avoid, minimize or mitigate development impacts on or near crucial habitats for upland game bird species.
- Develop a policy and regulatory framework to ensure crucial habitats are protected.

Objective 3: Allocate harvestable surplus through a sustainable and transparent harvest strategy.

Actions:

- Continue to monitor hunter interest, harvest and effort by reviewing licence sales and Hunter Harvest Survey data annually.
- Utilize harvest rate thresholds over a running three-year period to determine appropriate harvest strategies in each district.
- Develop weather severity thresholds to adjust harvest strategies based on significant changes in productivity in a given year.
- Review Game Bird Districts to ensure management decisions made to respond to significant changes in populations can occur at appropriate scales. Game Bird Management Units are being considered as a basis for potential changes and will be evaluated by 2020.
- Analyze the Hunter Harvest Survey data to determine harvest and effort differences by residency, range of variation in harvest and effort and factors influencing hunter effort that could help refine management.
- Data obtained from annual surveys and reports of population abundance from additional sources will be used in conjunction with thresholds laid out in this document, and the Game Allocation Framework, to determine bag limits, possession/season limits and season dates.

3.2 Management Thresholds and Considerations

Management thresholds have been set to suggest when to implement a liberal, base, restrictive or closed harvest strategy. Variations exist among species but in general these thresholds can be described as follows:

Liberal Harvest Strategy (Generally Used in Conjunction with High Populations):

A liberal harvest strategy provides more hunting opportunity and is implemented when populations are able to sustain considerable harvest pressure. Examples of management actions under a liberal strategy might include increased bag limits and longer seasons dates.

Base Harvest Strategy (Generally Used in Conjunction with Normal Populations):

A base harvest strategy is utilized when populations are in the range of the long-term average. Wildlife managers generally aim to maintain populations at a base level in order to provide consistent harvest opportunity within social tolerance limits. The objective of base harvest strategies is to maintain populations at or near the existing levels.

Restrictive Harvest Strategy (Generally Used in Conjunction with Low Populations)

A restrictive harvest strategy provides less hunting opportunity, is often implemented when populations are in decline or hunter demand exceeds supply of game. Restrictive strategies will employ actions such as more restrictive bag limits or shorter season dates.

Closed Season (Generally Used in Conjunction with Critically Low Populations)

A closed harvest strategy limits recreational hunting completely and is implemented when a population can no longer maintain a harvestable surplus. Closed seasons remain in effect until populations have recovered to where a meaningful recreational harvest can be implemented.

Historically, a liberal harvest strategy has been maintained for sharp-tailed grouse, gray partridge and ring-necked pheasant, and wildlife managers will continue with the goal of optimizing harvest opportunity whenever possible. For these species, the base and liberal harvest strategy have been combined to indicate this intention.

Past population surveys in Saskatchewan indicated that harvest trends approximated population trends quite well for sharp-tailed grouse, gray partridge and ring-necked pheasant. That is, the harvest rate or number of birds harvested per hunter per year has tended to increase or decrease proportional to the population levels. Therefore, management of these species has focused primarily on harvest statistics and an understanding of the life history traits of the species.

In an effort to manage game birds in a more consistent manner, thresholds to implement changes to harvest strategies have been set for sharp-tailed grouse, gray partridge and ring-necked pheasant using the annual harvest rate for Saskatchewan resident hunters (Table 1). The threshold values were determined following a review of harvest over 30 years and will form the foundation for a management framework in Saskatchewan. Additionally, these

harvest thresholds are triggered by evaluating harvest rates over a three-year period, in an effort to reduce the annual variation in harvest strategy. Therefore, the harvest strategy (and subsequent daily and possession limits) is unlikely to change on an annual basis unless exceptional circumstances occur. In the case of a season closure, the reopening of a harvest opportunity will be at the discretion of the ministry and based on field reports of upland game bird populations until additional thresholds unrelated to harvest data can be developed.

Table 1. Harvest strategies for sharp-tailed grouse, gray partridge and ring-necked pheasant with associated management thresholds identified.

Sharp-tailed grouse			
Recommended Harvest Strategy	***Associated Management Actions****	***Thresholds***	
		Harvest Rate Threshold**	**Weather Severity Threshold**
Liberal/Base	Daily Bag Limit: 3 Possession Limit: 6	>2.50 (3 Year Average)	To Be Determined
Restrictive	Daily Bag Limit: 2 Possession Limit: 4	1.0 – 2.50 (3 Year Average)	To Be Determined
Closed	No Season	<1.00 (3 Year Average)	To Be Determined

Gray partridge			
Recommended Harvest Strategy	***Associated Management Actions****	***Thresholds***	
		Harvest Rate Threshold**	**Weather Severity Threshold**
Liberal/Base	Daily Bag Limit: 8 Possession Limit: 16	>3.00 (3 Year Average)	To Be Determined
Restrictive	Daily Bag Limit: 4 Possession Limit: 8	1.00 – 3.00 (3 Year Average)	To Be Determined
Closed	No Season	<1.00 (3 Year Average)	To Be Determined

Ring-necked pheasant			
Recommended Harvest Strategy	***Associated Management Actions****	***Thresholds***	
		Harvest Rate Threshold**	**Weather Severity Threshold**
Liberal/Base	Daily Bag Limit: 3 Possession Limit: 6	>2.25 (3 Year Average)	To Be Determined
Restrictive	Daily Bag Limit: 2 Possession Limit: 4	1.00 – 2.25 (3 Year Average)	To Be Determined
Closed	No Season	<1.00 (3 Year Average)	To Be Determined

*While adjusting bag limit (and associated possession) will most often be the management action taken, adjustments to additional variables, such as season dates, hunting times and opportunities for non-residents of Saskatchewan, may also be considered. At the time of writing, these additional variables align with the liberal/base harvest strategy for all species.

**Harvest rate is defined as the total number of birds harvested per resident hunters per year.

This management framework will be evaluated periodically and may be adjusted to ensure the goals of the harvest strategies are being met. As with all management frameworks, the precautionary principle still applies and the ministry retains the option to default to a more restrictive harvest strategy if exceptional circumstances are encountered.

Due to the cyclic nature of ruffed grouse and spruce grouse, populations will be monitored through harvest data, but harvest thresholds will not be identified. Instead, the current harvest strategies for these species will be maintained as long as populations continue to cycle as expected (Table 2). If there was a significant deviance from historical cycles, then further investigation into possible causes would be undertaken and adjustments to the harvest strategy may occur. Ptarmigan species are currently data deficient, but undergo minimal harvest pressure and like the forest grouse species, will be monitored through harvest data (when available) and reports from staff and stakeholders living in ptarmigan range.

Table 2. Harvest strategies for ruffed grouse, spruce grouse and ptarmigan species.

Ruffed grouse			
Recommended Harvest Strategy	***Associated Management Actions***	***Threshold***	***Justification***
Base	Daily Bag Limit: 10 Possession Limit: 20	None	Cyclic Population

Spruce grouse			
Recommended Harvest Strategy	***Associated Management Actions***	***Threshold***	***Justification***
Base	Daily Bag Limit: 10 Possession Limit: 20	None	Cyclic Population

Ptarmigan (Willow and Rock Ptarmigan Combined)			
Recommended Harvest Strategy	***Associated Management Actions***	***Threshold***	***Justification***
Base	Daily Bag Limit: 10 Possession Limit: 20	None	Data Deficient/Cyclic Population

At this time, wild turkey is not a game species and therefore no harvest strategy is identified.

Should self-sustaining populations continue to grow and expand to other areas of the province, it is conceivable hunting seasons would be considered in the future.

4.0 Future Research and Monitoring Needs

Current upland game bird management relies extensively on Hunter Harvest Survey information, information provided by field reports, observation surveys and a general understanding of life history traits. While these data give a reasonable understanding of the state of upland game bird populations, additional information would greatly improve upland game bird management, allowing wildlife managers to be responsive to population changes at finer scales and proactively mitigate threats to populations wherever possible. The following initiatives are a top priority.

Initiative 1: Develop a model of the relationship between weather severity and productivity.

It is well understood that weather severity causes significant variation in upland game bird populations from year to year, with the key impact being on annual productivity. However, the nuances of that relationship and the weather variables (e.g. temperature, precipitation) that are most important are not well understood for Saskatchewan. Flanders-Wanner et al. (2004b) demonstrated that modelling weather variables could predict productivity in Nebraska. Similar efforts to model weather variables to predict productivity and abundance are underway in South Dakota and Montana, respectively (T. Runia and R. Northrup, pers. comm.; additional information found in Brewster 2012). A reliable model of the relationship between weather variables and productivity for Saskatchewan would allow wildlife managers to predict productivity annually from monitoring weather variables and set harvest strategies accordingly.

This has the potential to be a cost-effective way to monitor upland game bird populations, alongside the Hunter Harvest Survey. Additionally, this would facilitate more refined upland game bird management, as additional science-based thresholds could be developed to trigger the movement between harvest strategies. Finally, this would provide wildlife managers with a science-based method to reopen a season should upland game bird hunting be closed due to conservation concerns, as harvest rate would be unavailable if there were no sport harvest of the birds.

Initiative 2: Develop land cover maps for the province which reliably identify preferred habitats for upland game bird species.

Current land cover maps for the province are outdated, which is challenging for wildlife managers trying to determine the amount and distribution of presently available habitat for specific species. This information is critical to understanding the carrying capacity of the landscape and the threats faced by species where they occur. An improved land cover map would allow wildlife managers to better understand and have realistic expectations of the populations that could occur in any given region and mitigate any potential threats to the sustainability of those species. A key product would be a map outlining the probability of occurrence for each species in a given location, which would allow conservation efforts to be targeted to where they would make the most impact. Making this product available to industry in advance of planning developments would allow industry to plan developments in a way that reduces the impact on sensitive species. Most importantly, there is a need to develop a low-cost process to assess current land cover efficiently and effectively that could be repeated at intervals to facilitate the evaluation of change over time.

5.0 Summary

The framework outlined in this document uses the best available information to make science-based decisions regarding upland game bird populations to ensure these species and their habitats are sustained into the future. This approach will be regularly reviewed and continue to adapt as better information becomes available and additional biological and social thresholds are developed. Continued engagement of hunters, landowners, naturalists and the general public is crucial to ensuring there is an understanding of the management actions required and support for the harvest strategies implemented. All interested individuals are encouraged to become engaged in the process by participating in wildlife surveys, including the Hunter Harvest Survey and Cooperative Wildlife Management Survey, and communicating any additional information or concerns to the provincial game bird biologist.

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