Guide to Habitat Attributes by Ecosite for Multiple Species at Risk

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PURPOSE OF THIS GUIDE

The Saskatchewan Prairie Conservation Action Plan (SK PCAP)'s focus is to empower land managers; including agricultural producers, agrologists, conservation practitioners and others; to assist with conservation of ecological goods and services provided by grasslands. In order to help land managers support the conservation and recovery of species at risk, SK PCAP developed a new approach to multi-species at risk habitat management that links species habitat requirements to existing land classification systems (i.e., ecosite/range type and plant community type). These classification systems are already in use as the basis of land management. This guide is designed to help manage synergies and conflicts between habitat requirements of different imperiled species. This approach to multi-species habitat management should be considered complimentary to other efforts to recover species at risk.

WHO SHOULD USE THIS GUIDE?

Most species at risk in Saskatchewan exist on working agricultural lands that typically support grazing livestock and sometimes support annual or perennial crops. Some occur in forested areas that are managed for industrial forest products or local use of poles, posts or firewood. This guide is designed for land managers who may have the opportunity to aid in the conservation of species at risk on the land under their control. Additionally, the habitat targets may be used by conservation organizations in designing results-based projects with land managers.

1 ABOUT THIS GUIDE

1.1 Managing For Multiple Species At Risk

One of the largest challenges facing the conservation community is attempting to manage multiple habitats for the effective maintenance and recovery of multiple species (Marini et al. 2019). Species have explicit and unique habitat niches and use different habitats at different life stages (Block et al. 1995). Habitat attributes preferred by species may overlap creating a competitive situation (Verberk 2011), and conflicting needs of species are difficult to address in multi-species approaches (Vogel and Hicks 2001). Yet, multi-species management is desirable because single species management can reduce habitat quality for numerous other species (Block et al. 1995).

Multi-species conservation approaches are most often implemented on a landscape or ecosystem scale. There are three basic types of multi-species approaches (Block et al. 1995):

1. Indicator or Umbrella Species approach –a single species approach that assumes species ecologically similar to the umbrella or indicator species will also benefit.
2. Guild or Species Assemblages approach – species are grouped because they respond similarly to various management interventions or are grouped by similar attributes such as resource use or genetic similarity.
3. Ecosystem approach – goal is to provide diverse environmental conditions and desired future conditions within the normal range of variation which are assumed to sustain ecosystem structure and function and a full range of biodiversity.

There is no perfect method of multi-species management (Block et al. 1995). Indicator/umbrella species approaches are common in multi-species conservation, but many have been found to be too limited in the number of similar species they support (Block et al. 1995, Timmer et al 2019, Koper and Schmiegelow 2006). The species guild or assemblage approach is less common but has similar drawbacks as there is considerable difficulty in selecting the appropriate species to include in the assemblage. At finer scales, habitat requirements are often very different between the species and empirical data is frequently not available to assist grouping of species (Block et al. 1995, Sheppard et al. 2005). Ecosystem approaches are preferred because they are easier to implement (Vogel and Hicks 2001). However, the main issues with ecosystem approaches are that the desired conditions are rarely defined due to deficient habitat data, and even when monitoring results show species continuing to decline, changes to habitat are rarely made (Block et al. 1995).

Marini et al. (2019) describe the shortcomings of these approaches as the result of a gap between theory and applied ecological science. The information needed to manage landscapes to maximize biodiversity and ecosystem services is lacking (Marini et al. 2019, Block et al. 1995).

To effectively implement multiple species management, it is important to have a robust understanding of the variables associated with the spatial and behavioral ecology of sympatric species (Wildermann et al. 2019) because species overlap in both space and time. Marini et al. (2019) proposed the use of Species-Habitat Networks that explicitly link multiple species and habitat resources, estimate the importance of particular species or specific habitat in a given landscape, and quantify emerging properties of habitat networks.

Verberk (2011) suggests that addressing multiple species at the community level is most appropriate. Species assemblages tend to be associated with specific plant communities or ecosites. Habitat selection by individuals and sometimes even populations takes place at a finer, site scale. Habitat management is also conducted at the site scale, making site scale habitat information more useful than landscape level information for management interventions.

This guide uses Species-Habitat Networks to address habitat management benefiting multiple species. The basic habitat unit used in the networks is the Ecosite. We chose to present information at the Ecosite level for several reasons. First, it is the scale at which land management is most often conducted. It is also the scale at which many wildlife species respond to changes in habitat. For example, Lwiwski (2013) found heterogeneity of attributes different from the findings of other studies and concluded that the effects of grazing may vary regionally. Therefore, she recommended that management strategies to optimize habitat must be site specific. Davis et al. (2020) found that the effect of grazing on grassland birds depended on the ecosite, and that bird abundance varied across ecological sites. Ideally, the basic habitat unit would be the plant community. However, detailed plant community information for associations between species at risk and plant communities is limited in Saskatchewan and elsewhere. Therefore, we have used the next most detailed level of classification which is the ecosite.

A review of multi-species recovery strategies and ecosystem-based approaches (Sheppard et al. 2005) concluded that the largest shortcoming of multi-species planning was the lack of adequate detail paid to individual species. Due to this lack of detailed information, species in multi-species conservation plans were found to be four times less likely to improve in status compared to species in single species plans (Sheppard et al. 2005). Rahn et al. (2006) also found multi-species management to be less effective than single species management. Data-deficient plans have a high risk of resulting in inappropriate actions because subjective decisions are made in the absence of complete information, and there is a high level of uncertainty among scientists when implementing management actions (Rahn et al. 2006). Sheppard et al. (2005) further recommended that single species strategies be developed first and scaled up into multi-species strategies. We have taken that approach in this guide.

Saskatchewan Prairie Conservation Action Plan has prepared guides describing habitat attributes for nine species at risk (SK PCAP 2020a,b,c, 2019a,b, 2018a,b, 2017, unpublished), based on the concept originally developed by the Ranchers Stewardship Alliance Inc. (RSAI 2014). In all, 12 guides have been developed that address detailed habitat requirements for individual species. The information from these individual guides is the foundation for the species portion of the Species-Habitat Network in this guide.

1.2 Habitat Quality

Loss and degradation of habitat are thought to be the largest threats to biodiversity (Bijl and Salisbury 2019, Johnson 2005, Jeltsch et al. 2011, Marini et al. 2019, Steinacker 2019). Recent studies suggest that habitat quality may be more important than habitat quantity for species survival and recovery (Häkkilä et al. 2018, Hering et al. 2015, Jeltsch et al. 2011, Soga and Koike 2011, Dures and Cumming 2010, COSEWIC 2001), especially in highly altered landscapes. Joubert-van der Merwe and Pryke (2018) found that specific habitat attributes such as bare ground, grass height and total vegetation cover were more important than landscape heterogeneity for all measures of grasshopper biodiversity in a study that evaluated the effects of livestock grazing and fire regime. Despite the importance of habitat quality in conservation, there has been limited effort directed toward defining, quantifying and measuring habitat quality (Johnson 2005). **Habitat quality** can be defined as *the ability of the environment to provide conditions appropriate for persistence of individuals and populations* (Hall et al 1997, Johnson 2005).

Optimal habitat can be defined as *the high quality resources selected for by individuals of a species*. We assume that individuals select for optimal habitat because it maximizes their reproductive success (Johnson 2005). **Suboptimal habitat** can be defined as *lower quality resources accepted by individuals of a species*. Suboptimal habitat may not maximize the reproductive success of the individual but may be important for supporting the overall population of a species (Johnson 2005).

Habitat quality can be explained using Shelford's Law of Tolerance. Shelford's Law of Tolerance (Figure 1) states that the abundance or distribution of a species can be controlled by certain factors (e.g., the climatic, topographic, and biological requirements) where levels of these are within the limits of tolerance for that species. Where possible in this guide, we have used optimal and suboptimal metrics for species at risk.

Vegetation is the core component of habitat for terrestrial wildlife and is typically the main factor that is managed when attempting to maintain or improve habitat quality. **Habitat management** can be defined as *influencing the successional stage and physical structure of vegetation to benefit a particular species considered to be of high value* (Bijl and Saslisbury 2019).

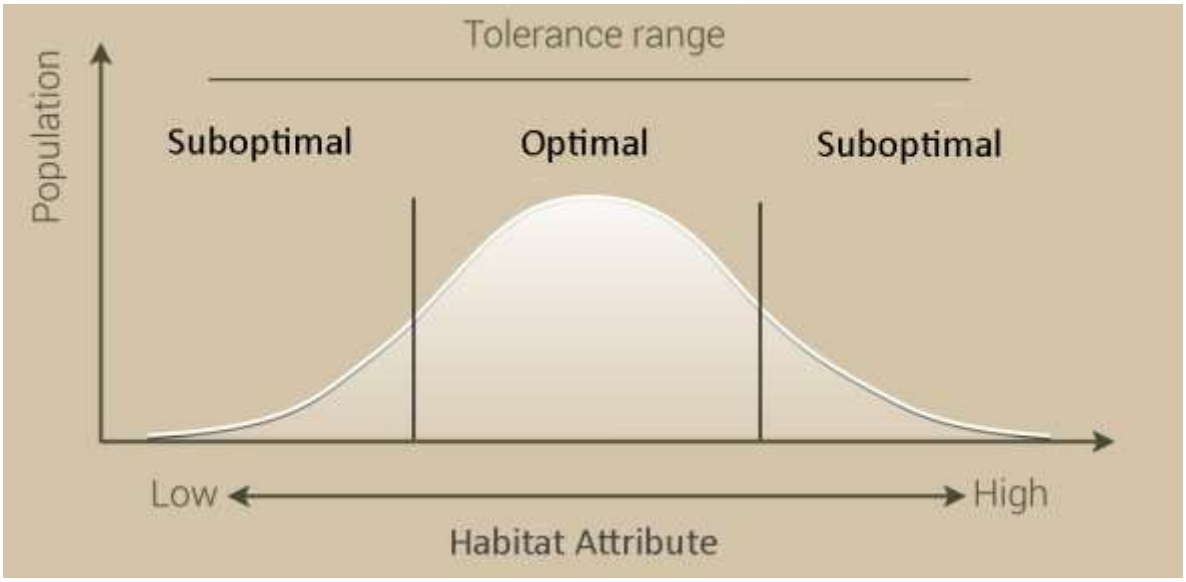


Figure 1. Applying Shelford's Law of Tolerance to habitat attributes.

Climate change is expected to become a threat to habitat quality for species at risk through increased potential for drought and increased risk of inclement or extreme weather (ECCC 2017). One of the biggest potential consequences of climate change in prairie Canada may be range shifting for species at risk. Range shifts tend to occur more rapidly in species using range margins (Platts et al. 2019). Many prairie species at risk in Saskatchewan are at the northern edge of their range. Specialized species tend to shift their range more slowly than other species (Platts et al. 2019), placing them at greater risk in the face of climate change. Future habitat availability at range margins is critical in facilitating species' ability to respond to changes in climate (Platts et al. 2019). Because species such as endemic grassland birds require specific habitat attributes, it is important to maintain and optimize these attributes both within and adjacent to habitat currently utilized by specialist species at risk.

1.3 The Data Used in This Guide

The ecosite and plant community data in this document are compiled mainly from Thorpe (2007, 2014a - k), Thorpe and Godwin (2008) and supplemented with information from Alberta's plant community guides.

Habitat attributes have been compiled from SK PCAPs guides to habitat attributes for individual species (SK PCAP 2020a,b,c, 2019a,b, 2018a,b, 2017, unpublished), the guide to habitat attributes for Greater Sage Grouse (RSAI 2014), and supplemented with data from the South of the Divide Conservation Action Program (SODCAP), recent literature and expert opinion on individual species. Dr. Stephen Davis analyzed habitat measurements associated with bird research for Baird's Sparrow, Sprague's Pipit, Chestnut-collared Longspur and Thick-billed Longspur. The data collected for certain individual species, such as Loggerhead Shrike, Piping

Plover and Northern Leopard Frog were not sufficient to develop optimal and suboptimal metrics.

Ecosite maps for Saskatchewan were overlain with suitable habitat models to predict which species could occur on which ecosite. The results of this analysis, along with ecosite maps, were completed by SODCAP using GIS data available from the Saskatchewan Conservation Data Centre. Species lists were then adjusted based on grassland bird observation data (Davis unpublished).

1.4 How To Use This Guide

This guide provides habitat attribute metrics on an ecosite scale for multiple species at risk. Use of this guide will aid land managers in monitoring and evaluating the benefit to species at risk of different parcels of land under variable, adaptive management. Ecosites included are those that occur within the four ecoregions in the Prairie Ecozone. Twelve species at risk are included in this guide: Baird's Sparrow, Burrowing Owl, Chestnut-collared Longspur, Greater Sage Grouse, Little Brown Bat, Loggerhead Shrike, Monarch Butterfly, Northern Leopard Frog, Piping Plover, Sprague's Pipit, Swift Fox and Thick-billed Longspur. Some species have unique habitat requirements that are not needed by other species. Therefore, we have also included habitat attributes specific to individual species (Appendix B).

Users of this guide should begin by determining what ecosites are present on the land to be managed. This information can be found in the section titled *Use of Ecosites by Multiple Species at Risk* (page 8). The maps presented in this section are intended to give a general indication of the location of Saskatchewan ecosites. They are not detailed enough to inform land management of a specific parcel of land. Users of this guide should contact the Saskatchewan Prairie Conservation Action Plan to obtain ecosite maps of sufficient scale to be used in land management planning for specific properties. This section also provides a list of potential species at risk that may occur on that ecosite by ecoregion. Once the user has determined which species have the potential to occur on a site, the section titled *Important Habitat Attributes Influencing Multiple Species at Risk* (page 41) can be used to determine which habitat attributes will benefit multiple species. Depending on the size of a property, different sites could be managed for different species groups, potentially creating optimal habitat for all species that may occur on the property.

Some of the species that may occur on a given ecosite do not appear on the graphs of multiple species habitat attributes. This means that the species' habitat requirements are attributes not important to other species, and in this situation the user should refer to Appendix B: *Important Habitat Attributes for Individual Species at Risk* which contains the habitat attribute targets for all 12 of the species included in this guide.

2 ECOSITES OF THE SASKATCHEWAN PRAIRIES

Within the grasslands of Saskatchewan (the Prairie Ecozone), there are four ecoregions (Thorpe 2007), which are closely related to the soil zones and based on broad climactic patterns:

- Aspen Parkland - similar to the Black Soil Zone
- Moist Mixed Grassland - similar to the Dark Brown Soil Zone
- Mixed Grassland - similar to the Brown Soil Zone
- Cypress Upland - local area with strong elevation changes, rising from Brown to Dark Brown to Black soil

Within these ecoregions, rangeland is divided into ecological sites or ecosites, which are defined by more local factors. An **ecosite** can be defined as *a kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and to respond to management* (adapted from Thorpe 2007). Differences in physical site factors, such as topography, soil texture, and soil moisture regime create different environments for plant growth. Within a local area, it can be assumed that the climate is more or less uniform. Therefore, the variation in growing conditions is mainly related to ecosite and influenced by management.

The ecosite names used in this guide are those used by the Saskatchewan Conservation Data Centre, which follow the naming protocols from Thorpe (2014a-k).

A first approximation of plant communities associated with different ecosites has been completed by Saskatchewan PCAP (Thorpe 2014a-k). Plant communities have generally not been identified in field surveys of species at risk in Saskatchewan and are not commonly mapped. Therefore, we only describe representative plant communities for each ecosite in this guide. The plant communities are labeled with their successional status under the influence of disturbance. Thorpe (Thorpe 2014a-k) labeled plant communities as reference communities and altered communities (minor, moderate, significant and severe). Reference plant communities represent the potential natural community for the ecosite that existed at the time of European immigration and settlement. Altered communities reflect the impact in variation in frequency and intensity of disturbance to the reference community (Adams et al. 2013). Research in Saskatchewan has been too limited to determine the stage of disturbance at which alteration of the communities become irreversible.

Table 1. Classification of range ecosites for grasslands of southern Saskatchewan.

Group	Ecosite	Subcategory
Dry	Badlands (BD)	
	Thin (TH)	
	Gravelly (GR)	
	Dunes (DN)	Low Dunes (LDN)
		High Dunes (HDN)
	Solonetzic (SO)	
Zonal	Sand (SD)	
	Sandy Loam (SL)	
	Loam (LM)	
	Clay (CY)	
Moist	Overflow (OV	Overflow (OV)
		Solontezic Overflow (OVSO)
		Saline Overflow (OVSA)
	Meadow (MD)	Subirrigated
		Wet Meadow (WM)
	Marsh (MH)	Shallow Marsh (SMH)
		Deep Marsh (DMH)
Saline	Saline Upland (UPSA)	
	Saline Meadow (MDSA)	Saline Subirrigated
		Saline Wet Meadow (WMDSA)
	Saline Marsh (MHSA)	Shallow Saline Marsh (SMHSA)
		Deep Saline Marsh (DMHSA)

3 USE OF ECOSITES BY MULTIPLE SPECIES AT RISK

This section describes the major ecosites within the Prairie Ecozone of Saskatchewan. Maps of the ecosite locations are included along with a listing of typical natural and modified plant communities that can be expected to occur on each ecosite. Ecosite maps were provided by the South of the Divide Conservation Action Program Inc. from spatial data developed by the Saskatchewan Research Council. Plant community listings are sourced from a series of PCAP documents developed by Jeff Thorpe (Thorpe 2014a-k).

A listing of species at risk that have the potential to occur on each ecosite has also been included. Because species occurrence differs by ecoregion, the listings are subdivided according to the four ecoregions found in the Prairie Ecozone: Cypress Upland, Mixed Grassland, Moist Mixed Grassland and Aspen Parkland. The species listing was initially populated first from predictive models developed by the Saskatchewan Ministry of Environment (unpublished). Adjustments to the listings were then made for the grassland bird species based on a substantial database of bird occurrences provided by Dr. Stephen Davis, Canadian Wildlife Service (unpublished).

3.1 Clay

The Clay Ecosite is a zonal ecosite that occurs on stable well-drained upland sites with fine to very fine-textured soils (clay, heavy clay).

Table 2. Species at Risk found on the Clay Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Chestnut-collared Longspur		Chestnut-collared Longspur	
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Piping Plover			
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	
Swift Fox		Swift Fox	
Thick-billed Longspur			

Typical Plant Communities on the Clay Ecosite

Northern Wheat-grass (reference community)
Northern Wheat-grass - Western Wheat-grass - June Grass - Sedge (minor alteration)
Pasture Sage - Northern Wheat-grass - Sedge - Western Wheat-grass (moderate alteration)

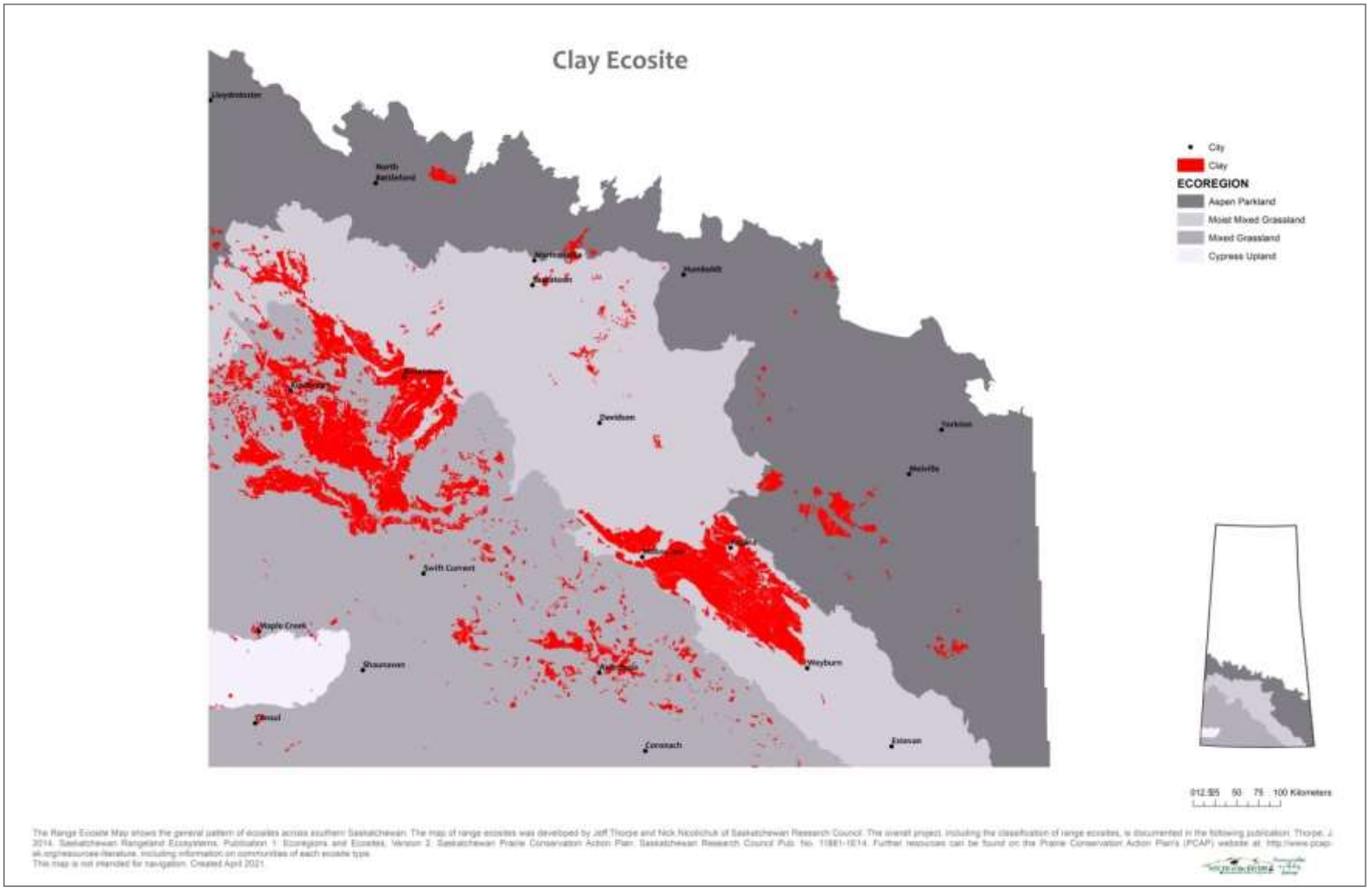


Figure 2. Predicted distribution of Clay Ecosites across the Prairie Ecozone.

3.2 Loam

The Loam Ecosite is a zonal ecosite found on stable, well-drained upland ecosites with medium to moderately fine textured soils (loam, silt loam, clay loam).

Table 3. Species at Risk found on the Loam Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Burrowing Owl			
Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur	
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Loggerhead Shrike			
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Piping Plover	Piping Plover		
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Swift Fox		Swift Fox	
Thick-billed Longspur		Thick-billed Longspur	

Typical Plant Communities on the Loam Ecosite

Mixed Grassland Ecoregion

Northern Wheat-grass – Needle-and-thread (reference community)
Needle-and-thread – Wheat-grass – June Grass – Blue Grama (minor alteration)
June Grass – Needle-and-thread – Pasture Sage – Blue Grama (moderate alteration)
Blue Grama – Needle-and-thread – June Grass – Western Wheat-grass (moderate alteration)

Moist Mixed Grassland and Lower Elevation Cypress Upland Ecoregions

Western Porcupine-grass – Northern Wheat-grass (reference community)
Western Porcupine-grass – Northern Wheat-grass – Sedge – Pasture Sage (minor alteration)
Needle-and-thread – Northern Wheat-grass (moderate alteration or reference community on dryer sites)
Needle-and-thread – Sedge – Pasture Sage (minor to significant alteration)
Blue Grama – Pasture Sage – June Grass (moderate to significant alteration)
Pasture Sage – Needle-and-thread – Northern Wheat-grass (moderate to significant alteration)

Cypress Upland Ecoregion – Higher Elevations

Rough Fescue (reference community)
Rough Fescue – Kentucky Bluegrass (moderate alteration)
Sedge – Kentucky Blue-grass – Dandelion (severe alteration)

Aspen Parkland Ecoregion

Aspen / Saskatoon / Rose (reference community)
Aspen / Snowberry – Rose (significant alteration)
Aspen / Snowberry - Rose / Kentucky Blue-grass (significant alteration)
Plains Rough Fescue – Northern Wheat-grass – Western Porcupine-grass (reference community)
Western Porcupine-grass - Northern Wheat-grass – Sedge – Pasture Sage (moderate alteration)
Sedge – Pasture Sage – Western Porcupine-grass – Northern Wheat-grass (moderate alteration)
Needle-and-thread – Wheat-grass – Pasture Sage (significant alteration)
Kentucky Blue-grass – Sedge (severe alteration)

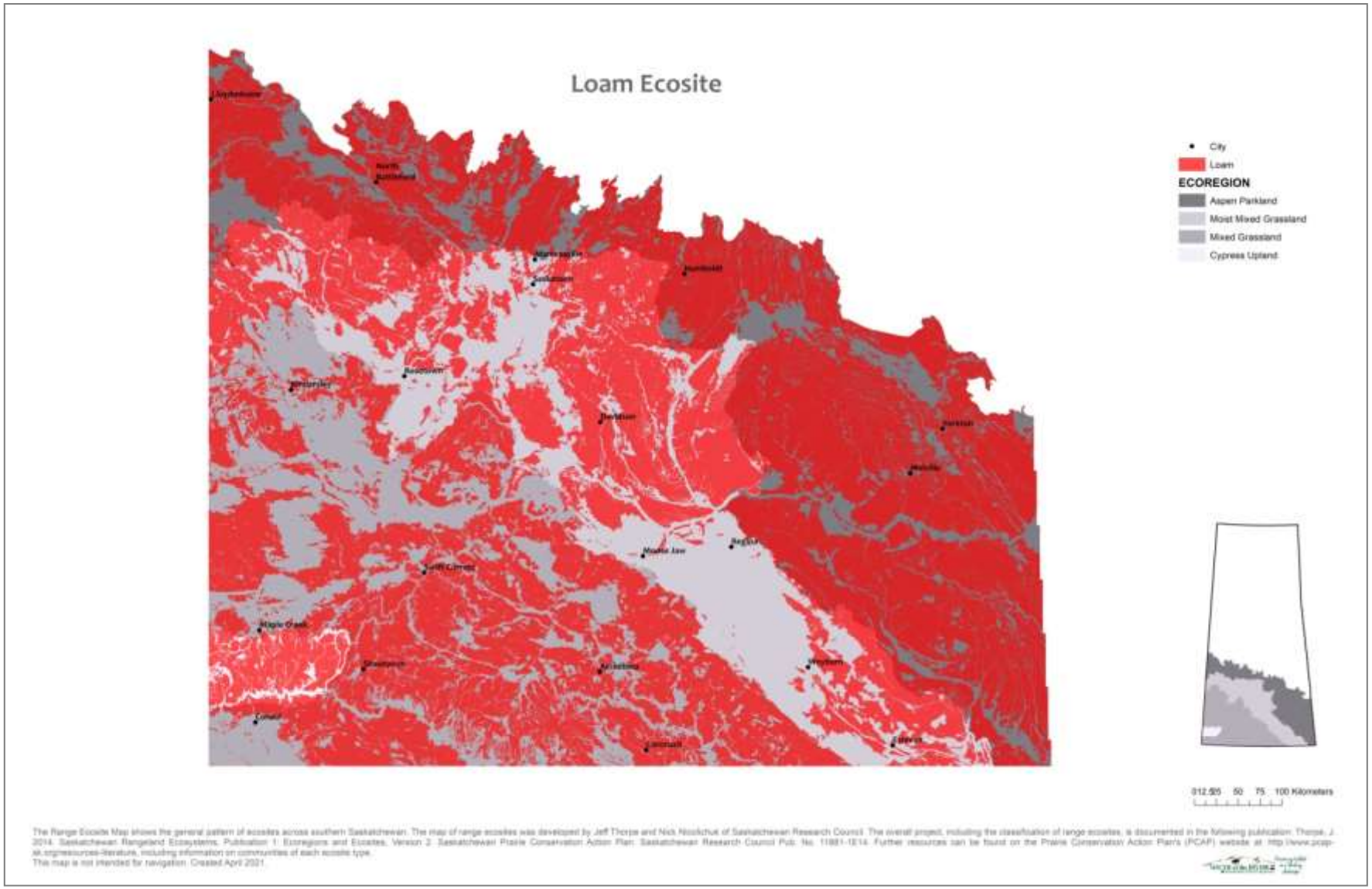


Figure 3. Predicted distribution of Loam Ecosites across the Prairie Ecozone.

3.3 Sandy Loam

The Sandy Loam Ecosite is a zonal ecosite which occurs on stable, well-drained upland ecosites with moderately coarse-textured soils (sandy loam).

Table 4. Species at Risk found on the Sandy Loam Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	
Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Swift Fox			
Thick-billed Longspur			

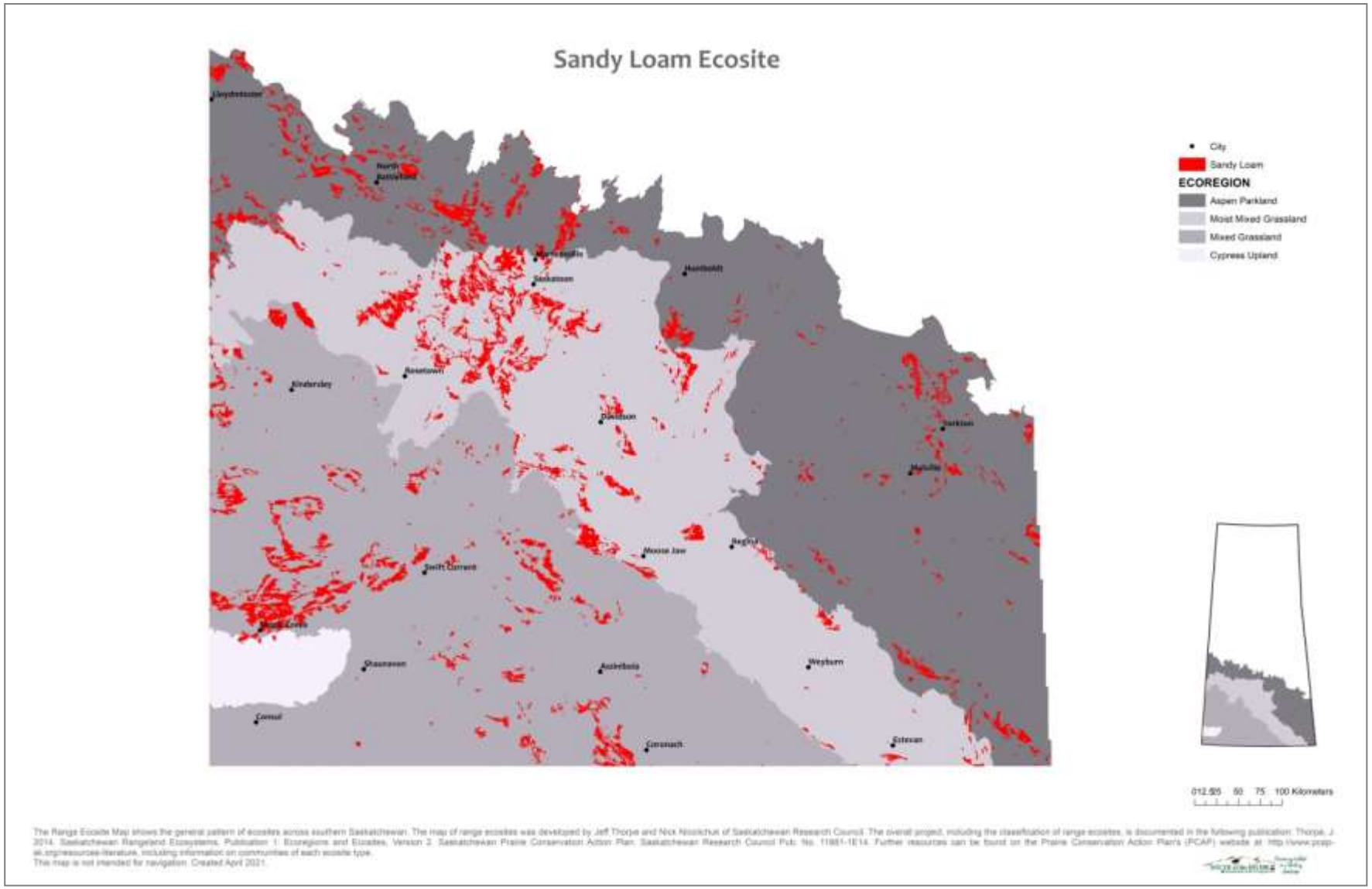
Typical Plant Communities on the Sandy Loam Ecosite

Mixed Grassland and Moist Mixed Grassland Ecoregions

Needle-and-thread - Sand Grass (reference community)
Needle-and-thread - Wheat-grass - Sedge (reference community)
Needle-and-thread - June Grass - Sedge - Blue Grama (minor alteration)
Pasture Sage - June Grass - Sedge - Needle-and-thread - Blue Grama (moderate alteration)
Crested Wheat-grass (severe alteration)

Aspen Parkland Ecoregion

Aspen / Choke-cherry - Saskatoon / Rose - Snowberry/ Sedge (reference community)
Aspen / Choke-cherry / Snowberry - Rose (moderate alteration)
Aspen / Sedge - Purple Oat-grass (moderate alteration)
Aspen / Snowberry - Rose / Kentucky Blue-grass – Purple Oat-grass (significant alteration)
Western Porcupine-grass (reference community)
Western Porcupine-grass – Sedge (minor alteration)
Sedge - Western Porcupine-grass - June Grass (moderate alteration)
Needle-and-thread - June Grass (moderate alteration)
Pasture Sage - Sedge - Needle-and-thread - June Grass (significant alteration)



The Range Ecosite Map shows the general pattern of ecosites across southern Saskatchewan. The map of range ecosites was developed by Jeff Thorpe and Nick Nicolichuk of Saskatchewan Research Council. The overall project, including the classification of range ecosites, is documented in the following publication: Thorpe, J. 2014. Saskatchewan Rangeland Ecosystems. Publication 1: Ecoregions and Ecosites, Version 2. Saskatchewan Prairie Conservation Action Plan. Saskatchewan Research Council Pub. No. 11881-1E14. Further resources can be found on the Prairie Conservation Action Plan's (PCAP) website at: http://www.pcap-alc.org/resources-literature, including information on communities of each ecosite type.
This map is not intended for navigation. Created April 2021.

Figure 4. Predicted distribution of Sandy Loam Ecosites across the Prairie Ecozone

3.4 Sand

The Sand Ecosite is a zonal ecosite found on stable, well-drained upland ecosites with coarse-textured soils (sand, loamy sand), but without dune topography.

Table 5. Species at Risk found on the Sand Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow		
Chestnut-collared Longspur	Chestnut-collared Longspur		
Monarch Butterfly	Monarch Butterfly		Monarch Butterfly
Sprague's Pipit	Sprague's Pipit		
Thick-billed Longspur			

Typical Plant Communities on the Sand Ecosite

Mixed Grassland and Moist Mixed Grassland Ecoregions

Aspen / Choke-cherry / Snowberry / Sedge (reference community)
Creeping Juniper / Sedge – Sand Grass (reference community)
Needle-and-thread - Sand Grass (reference community)
Needle-and-thread - June Grass - Sedge - Blue Grama (minor alteration)
Pasture Sage - June Grass - Sedge - Needle-and-thread - Blue Grama (moderate alteration)

Aspen Parkland Ecoregion

Aspen / Choke-cherry - Saskatoon / Rose - Snowberry/ Sedge (reference community)
Aspen / Choke-cherry / Snowberry - Rose (moderate alteration)
Aspen / Sedge - Purple Oat-grass (moderate alteration)
Aspen / Snowberry - Rose / Kentucky Blue-grass – Purple Oat-grass (significant alteration)
Western Porcupine-grass (reference community)
Western Porcupine-grass – Sedge (minor alteration)
Sedge - Western Porcupine-grass - June Grass (moderate alteration)
Needle-and-thread - June Grass (moderate alteration)
Pasture Sage - Sedge - Needle-and-thread - June Grass (significant alteration)

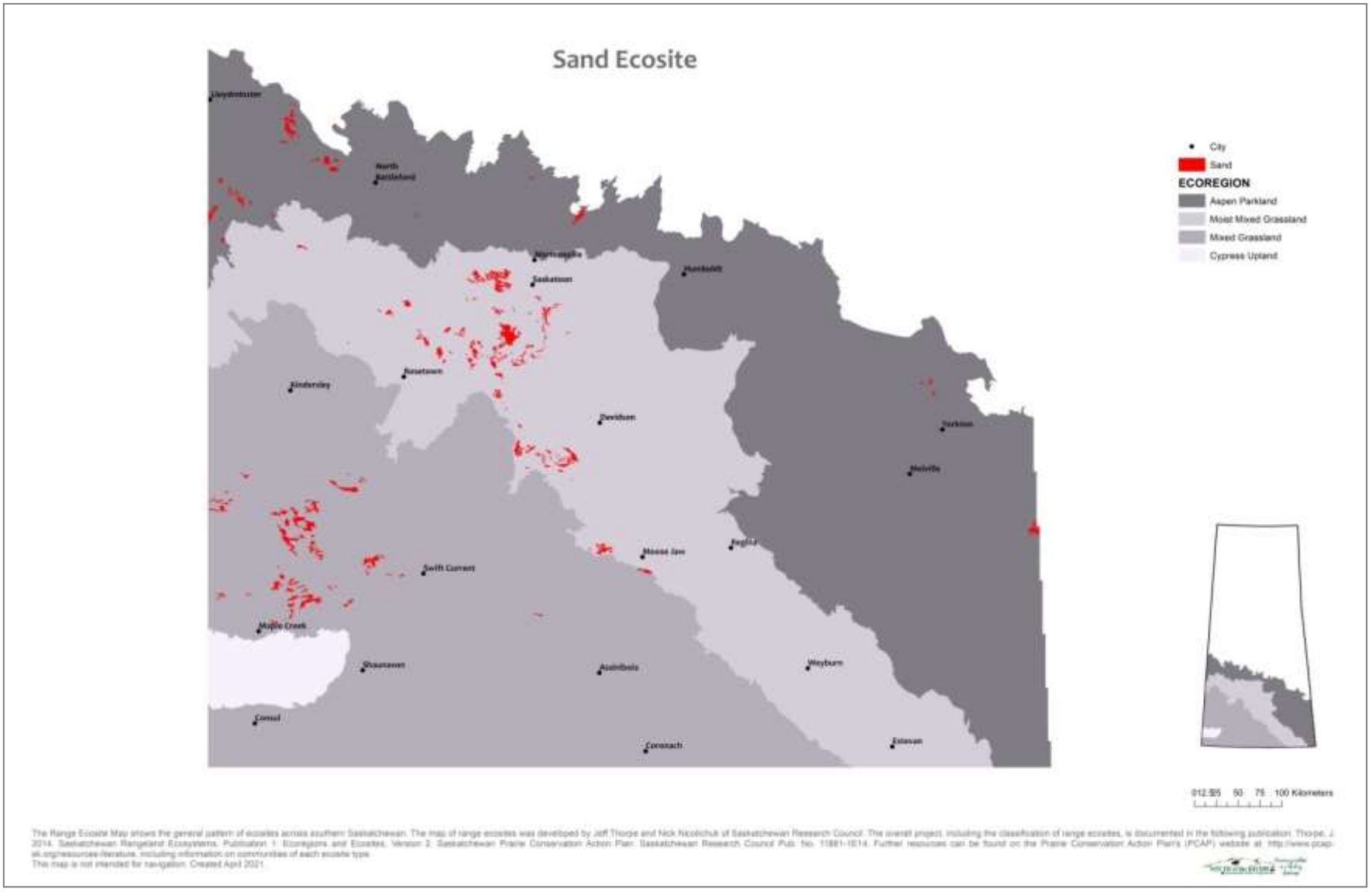


Figure 5. Predicted distribution of Sand Ecosites across the Prairie Ecozone.

3.5 Dunes

The Dunes Ecosite is a dry ecosite found on landscapes where sand dunes create local relief. It can be further divided into subcategories based on topography:

- *High Dunes:* relief of more than 3 metres, and/or slope steepness >15%. Potential vegetation includes a mosaic of cover types (grassland, shrubland, woodland) associated with aspect and slope position. South-facing slopes and ridges often have sparse vegetation or bare sand.
- *Low Dunes:* relief of 1 to 3 metres, and/or slope steepness of 5% to 15%. Potential vegetation includes a mosaic of cover types (grassland, shrubland, woodland) associated with aspect and slope position. Usually with complete plant cover on all slope positions.

Table 6. Species at Risk found on the Dunes Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow		
Monarch Butterfly	Monarch Butterfly		Monarch Butterfly
Sprague's Pipit	Sprague's Pipit		Sprague's Pipit

Typical Plant Communities on the Dunes Ecosite

Mixed Grassland and Moist Mixed Grassland Ecoregions

Aspen / Choke-cherry / Snowberry / Sedge (reference community)
Choke-cherry / Sedge (reference community)
Creeping Juniper – Blunt Sedge – Sand Grass (reference community)
Needle-and-thread – Sedge (reference community)
Sedge – Needle-and-thread – June Grass (minor alteration)
Lance-leaved Psoralea – Sand Grass – Pasture Sage – Needle-and-thread (moderate alteration)
Sedge – June Grass – Needle-and-thread (moderate alteration)

Aspen Parkland Ecoregion

Aspen / Choke-cherry - Saskatoon / Rose - Snowberry/ Sedge (reference community)
Choke-cherry / Sedge (reference community)
Grassland reference community unknown
Sedge – Sand Grass – Needle-and-thread (moderate alteration)
Sedge – Pasture Sage – June Grass (significant alteration)

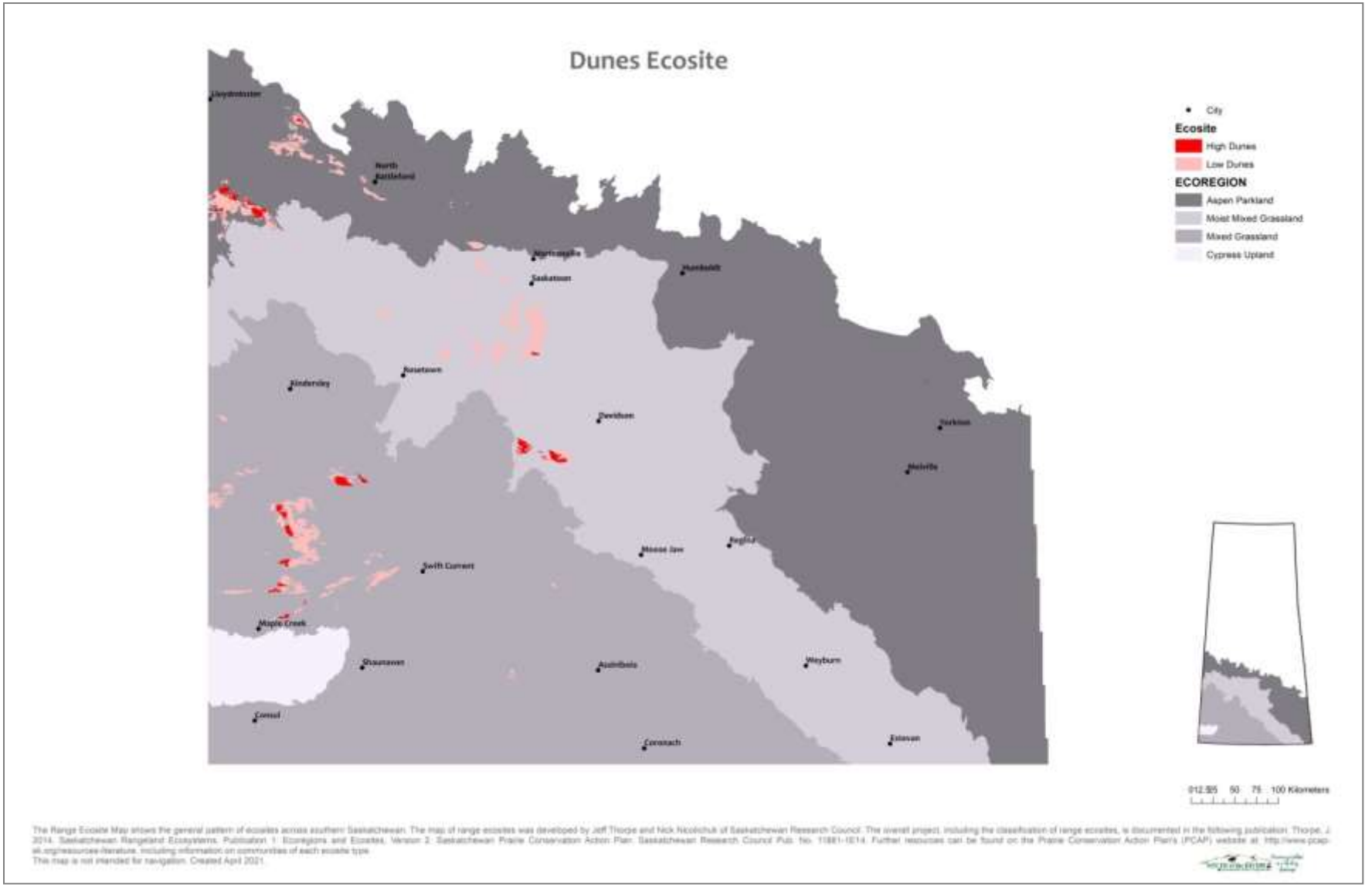


Figure 6. Predicted distribution of Dunes Ecosites across the Prairie Ecozone.

3.6 Gravelly

The Gravelly Ecosite is a dry ecosite that occurs on landscapes with gravelly soils at the surface, or with a thin surface layer of finer material over a gravel substrate.

Table 7. Species at Risk found on the Gravelly Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Chestnut-collared Longspur	Chestnut-collared Longspur		Chestnut-collared Longspur
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Piping Plover			
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Swift Fox			
Thick-billed Longspur			

Typical Plant Communities on the Gravelly Ecosite

Mixed Grassland and Moist Mixed Grassland Ecoregions

Western Porcupine-grass - Northern Wheat-grass – Needle-and-thread (reference community)
Needle-and-thread - June Grass - Pasture Sage (moderate alteration)
Pasture Sage - June Grass – Needle-and-thread - Blue Grama (significant alteration)

Aspen Parkland and Cypress Upland Ecoregions

Western Porcupine-grass - Sedge - Needle-and-thread (minor alteration)
Pasture Sage - Needle-and-thread - June Grass – Sedge (moderate alteration)

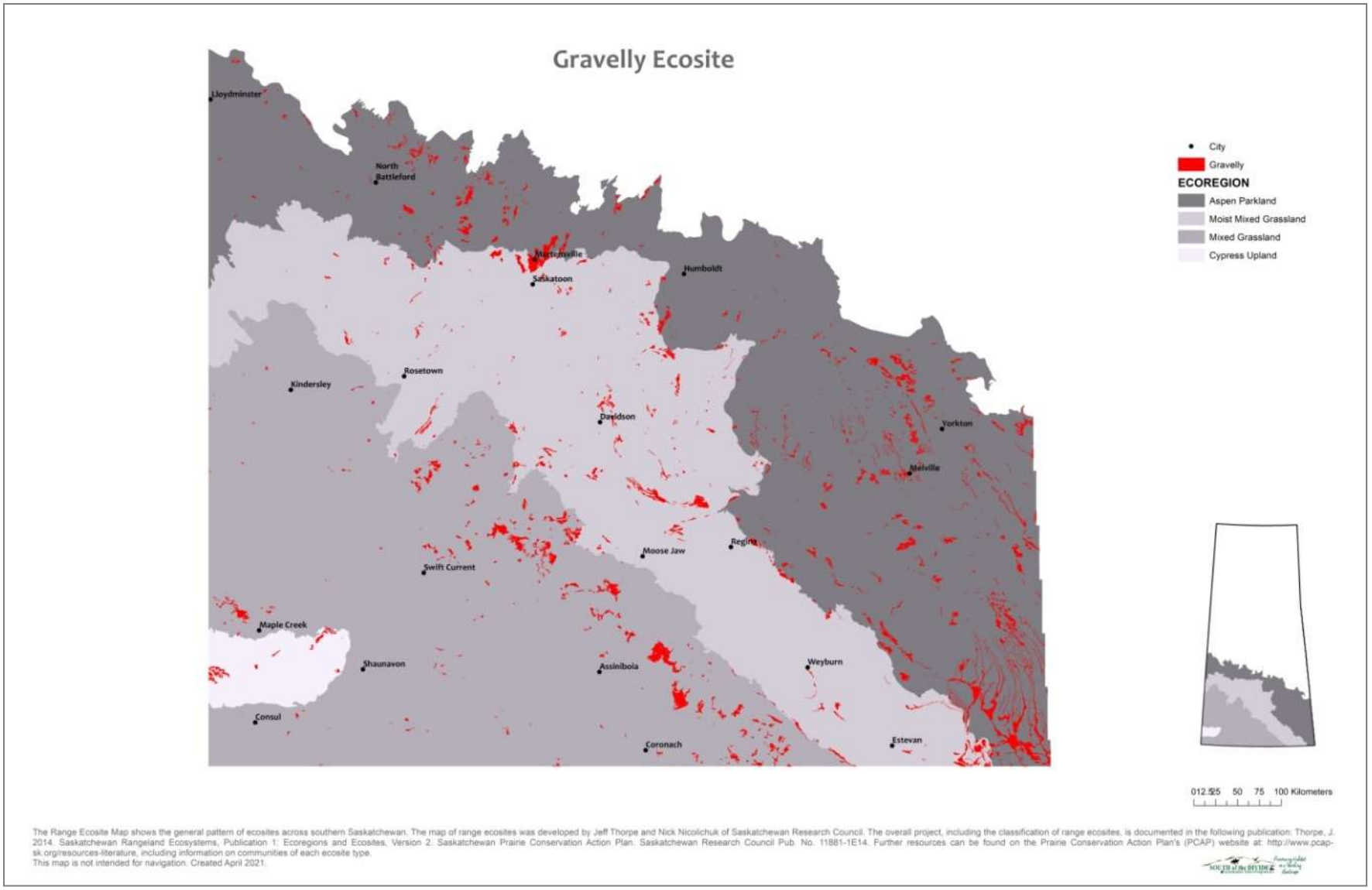


Figure 7. Predicted distribution of Gravelly Ecosites across the Prairie Ecozone.

3.7 Solonetzic

The Solonetzic Ecosite is a dry ecosite that occurs on landscapes with soils in the Solonetzic Order. This ecosite is characterized by a hard, impermeable B-horizon which is high in sodium, often with scattered depressions ("burnouts" or "blowouts") where the soil has been eroded down to the B-horizon.

Table 8. Species at Risk found on the Solontzic Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	
Burrowing Owl			
Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur	
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Loggerhead Shrike			
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog	Northern Leopard Frog		
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	
Swift Fox	Swift Fox		
Thick-billed Longspur		Thick-billed Longspur	

Typical Plant Communities on the Solonetzic Ecosite

Mixed Grassland Ecoregion

Northern Wheat-grass - Needle-and-thread - June Grass (reference community)
Northern Wheat-grass - June Grass – Pasture Sage - Blue Grama (minor alteration)
June Grass - Northern Wheat-grass – Pasture Sage - Blue Grama (moderate alteration)
June Grass - Pasture Sage - Blue Grama - Northern Wheat-grass (moderate alteration)

Moist Mixed Grassland Ecoregion

Wheat-grass - Western Porcupine-grass - June Grass (reference community)
Western Wheat-grass - Sedge - June Grass (minor alteration)
June Grass - Pasture Sage - Sedge (moderate alteration)

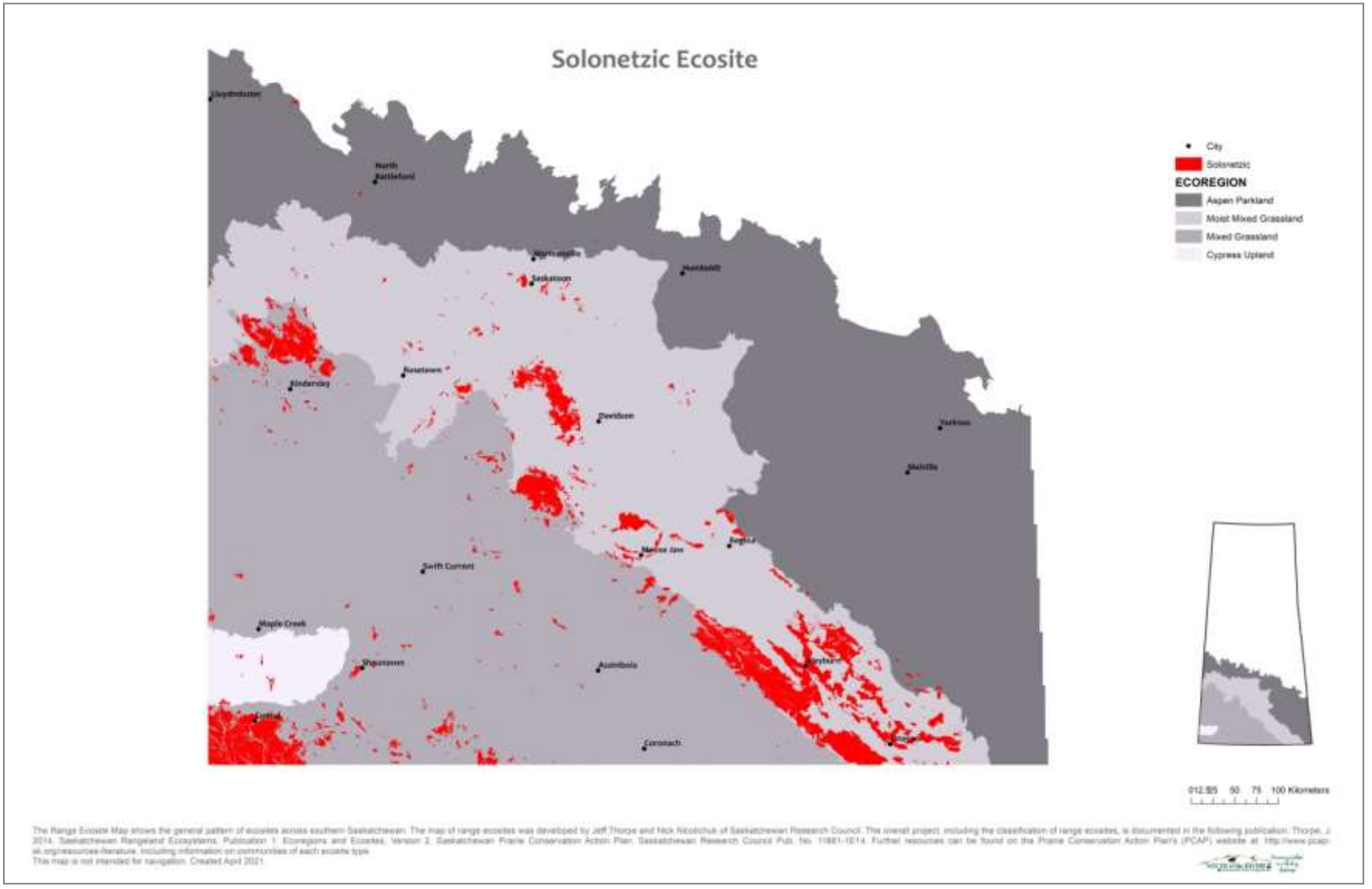


Figure 8. Predicted distribution of Solonetzic Ecosites across the Prairie Ecozone.

3.8 Thin

The Thin Ecosite is a dry ecosite that occurs on two types of landscapes: sites with predominantly steep slopes (>20%) (excluding Badlands or Dunes); and/or sites with truncated soil profiles resulting from high natural levels of erosion (excluding Badlands or Dunes).

Table 9. Species at Risk found on the Thin Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Burrowing Owl			
Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur	
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Loggerhead Shrike			Loggerhead Shrike
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	
Northern Leopard Frog		Northern Leopard Frog	
Swift Fox		Swift Fox	
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Thick-billed Longspur		Thick-billed Longspur	

Typical Plant Communities on the Thin Ecosite

Mixed Grassland Ecoregion

Needle-and-thread – Northern Wheat-grass – June Grass (reference community)
June Grass – Needle-and-thread – Northern Wheat-grass – Blue Grama (minor alteration)

Moist Mixed Grassland Ecoregion

Western Porcupine-grass – Northern Wheat-grass – Green Needle-grass (reference community)
Northern Wheat-grass – Needle-and-thread – Blue Grama – Western Wheat-grass (moderate alteration)
Needle-and-thread – Blue Grama – June Grass (significant alteration)

Aspen Parkland Ecoregion

Needle-and-thread – Northern Wheat-grass – Western Porcupine-grass (moderate alteration)
Needle-and-thread – Blue Grama (significant alteration)

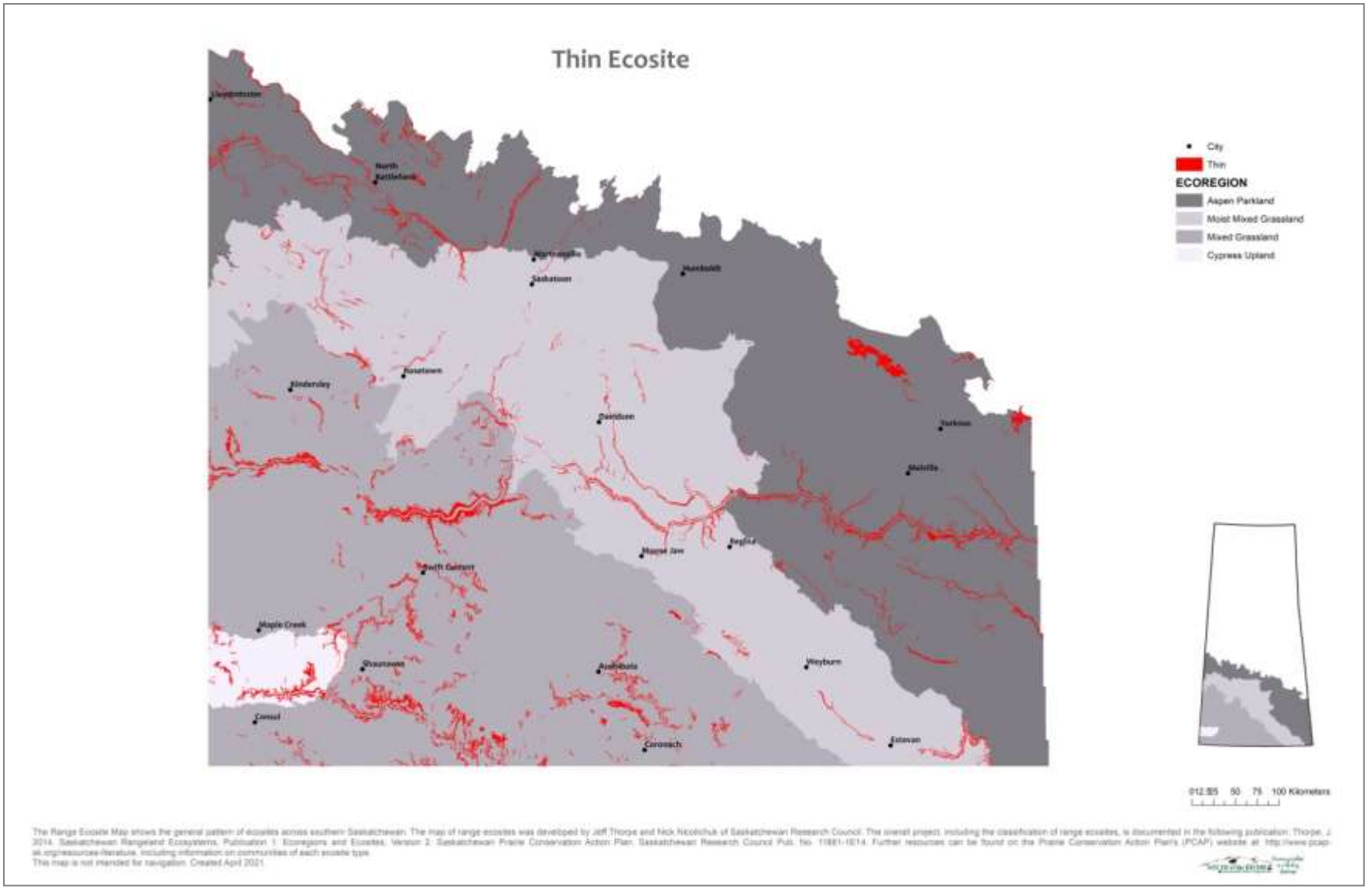


Figure 9. Predicted distribution of Thin Ecosites across the Prairie Ecozone.

3.9 Badlands

The Badlands Ecosite is a dry ecosite that occurs on sparsely vegetated landscapes with >10% exposure of bedrock.

Table 10. Species at Risk found on the Badland Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow		
Burrowing Owl			
Chestnut-collared Longspur			
Greater Sage Grouse			
Loggerhead Shrike			
Monarch Butterfly		Monarch Butterfly	
Northern Leopard Frog			
Swift Fox			
Sprague's Pipit	Sprague's Pipit		
Thick-billed Longspur			

Typical Plant Communities on the Badlands Ecosite

Northern Wheat-grass – Western Wheat-grass – Pasture Sage (reference community)
Western Wheat-grass (reference community)

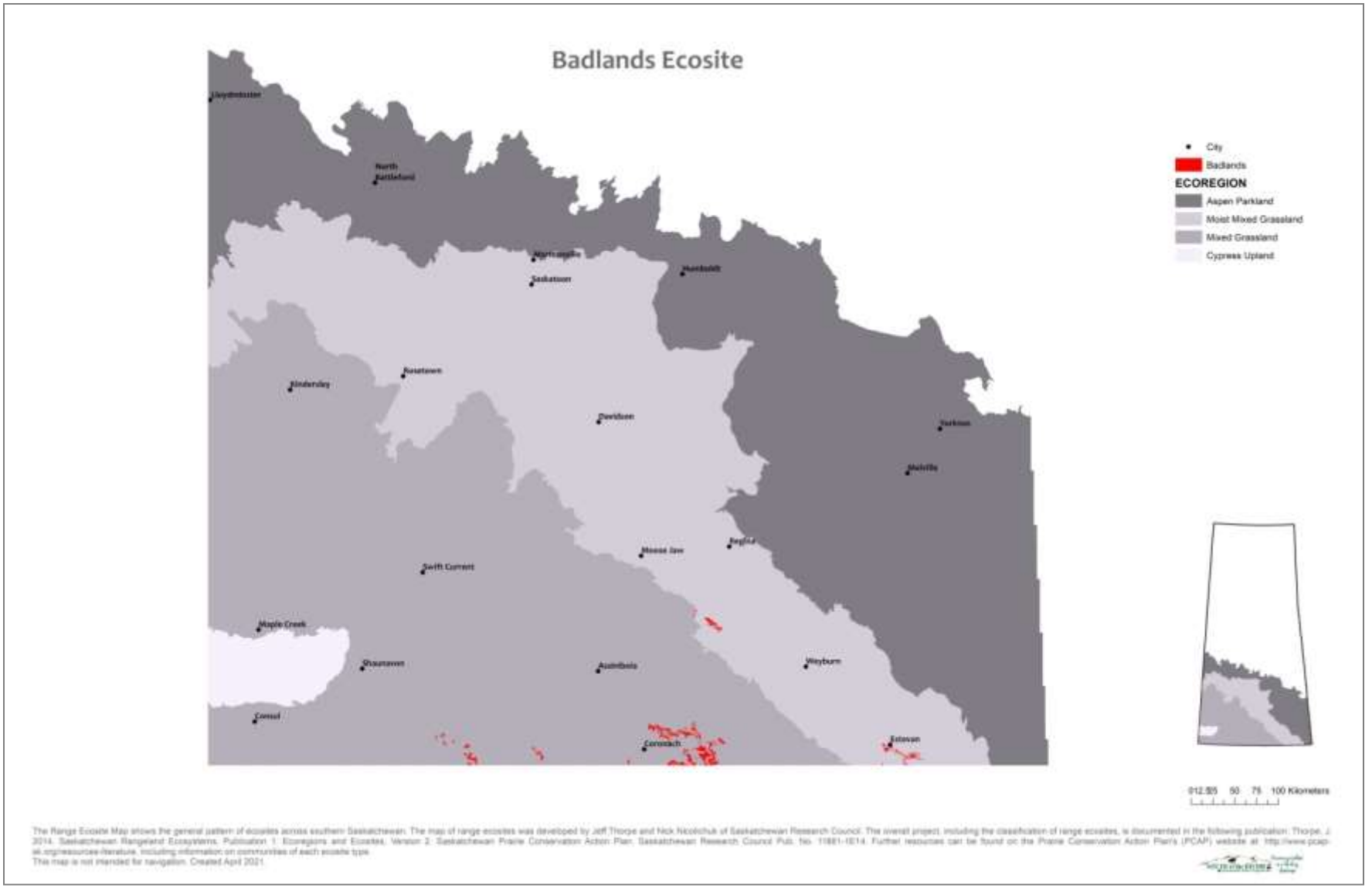


Figure 10. Predicted distribution of Badlands Ecosites across the Prairie Ecozone.

3.10 Overflow

The Overflow Ecosite is a moist ecosite where moisture additional to precipitation is received from overland flow or flooding. It can be further subdivided into three subcategories including:

- *Overflow*: Well-drained sites on alluvial landforms (floodplains, alluvial fans)
- *Solonetzic Overflow*: Overflow sites on Solonetzic soils
- *Saline Overflow*: Overflow sites on saline soils

Table 11. Species at Risk found on the Overflow Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Burrowing Owl	Burrowing Owl	Burrowing Owl	Burrowing Owl
Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur	Chestnut-collared Longspur
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Loggerhead Shrike	Loggerhead Shrike	Loggerhead Shrike	Loggerhead Shrike
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	
Northern Leopard Frog	Northern Leopard Frog	Northern Leopard Frog	Northern Leopard Frog
Piping Plover	Piping Plover	Piping Plover	Piping Plover
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Swift Fox	Swift Fox	Swift Fox	
Thick-billed Longspur		Thick-billed Longspur	

Typical Plant Communities on the Overflow Ecosite

Non-Saline Communities

Basket Willow – Dogwood (reference community)
Basket Willow – Dogwood / Rose / Smooth Brome (moderate alteration)
Western Wheat-grass – Western Porcupine-grass – Northern Wheat-grass (reference community)
Pasture Sage – Western Wheat-grass (moderate alteration)
Silver Sagebrush – Wheat-grass (reference community)

Saline Communities

Greasewood – Northern Wheat-grass (reference community)
Salt Grass – Slender Wheat-grass (reference community)
Sedge – Western Wheat-grass – Needle-and-thread (reference community)
Western Wheat-grass – Blue Grama (minor alteration)

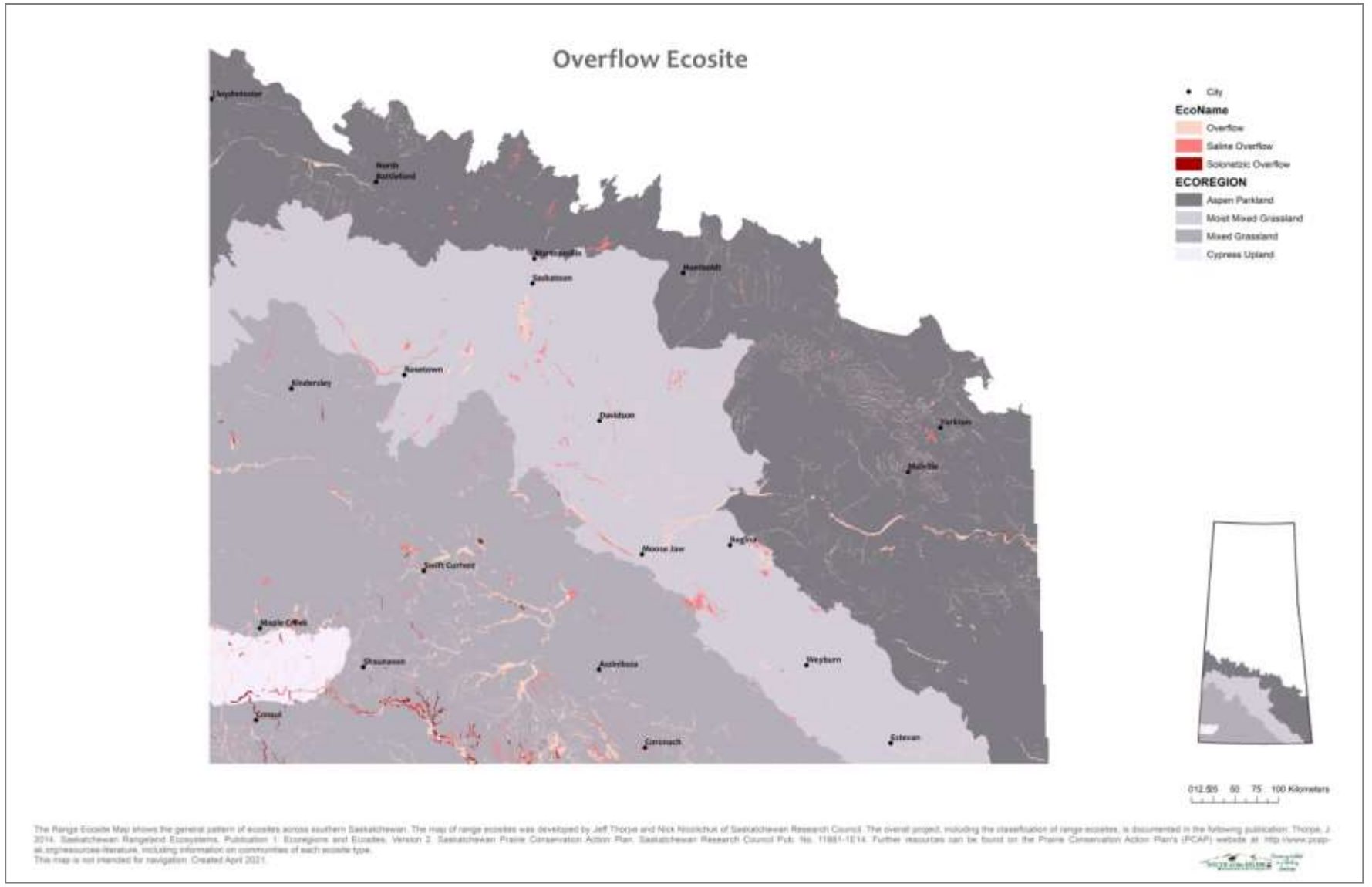


Figure 11. Predicted distribution of Overflow Ecosites across the Prairie Ecozone.

3.11 Saline Upland

The Saline Upland Ecosite is found on drier transitional or upland sites with saline soils. Salt may appear on the surface in dry periods. Potential vegetation includes a mixture of salt-tolerant plants and plants typical of non-saline upland ecosites.

Table 12. Species at Risk found on the Saline Upland Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
	Baird's Sparrow		Baird's Sparrow
Chestnut-collared Longspur			
Greater Sage Grouse			
Monarch Butterfly	Monarch Butterfly		
Northern Leopard Frog			
Swift Fox			
	Sprague's Pipit		Sprague's Pipit

Typical Plant Communities on the Saline Upland Ecosite

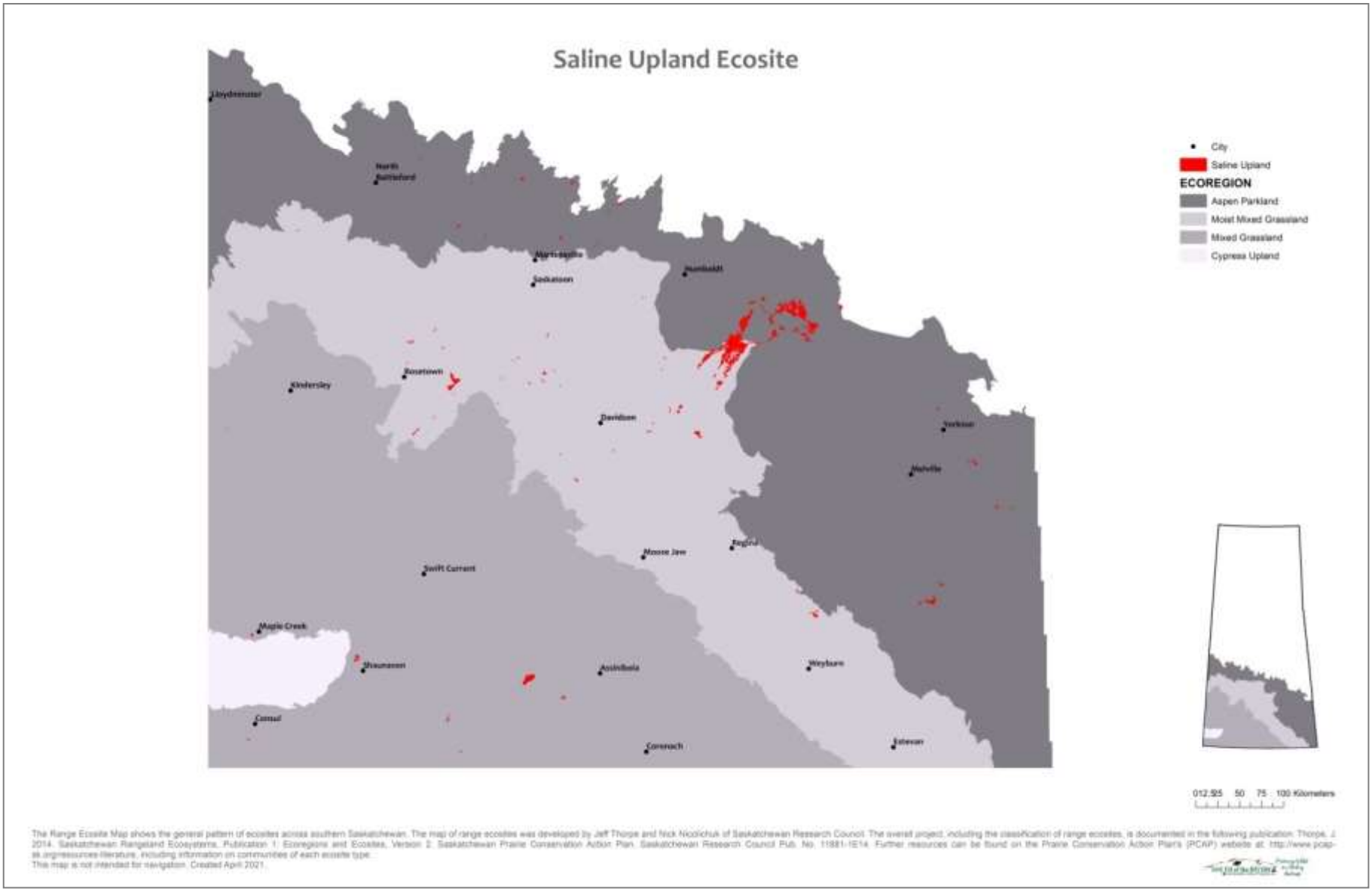
Mixed Grassland and Moist Mixed Grass Ecoregions

Northern Wheat-grass – June Grass – Pasture Sage (reference community)

Blue Grama – Northern Wheat-grass – Western Wheat-grass (moderate alteration)

Aspen Parkland Ecoregion

Western Porcupine-grass – Slender wheat-grass – Sedge – Salt Grass – Pasture Sage (reference community)



The Range Ecosite Map shows the general pattern of ecosites across southern Saskatchewan. The map of range ecosites was developed by Jeff Thorpe and Nick Nicolichuk of Saskatchewan Research Council. The overall project, including the classification of range ecosites, is documented in the following publication: Thorpe, J. 2014. Saskatchewan Rangeland Ecosystems. Publication 1: Ecoregions and Ecosites, Version 2. Saskatchewan Prairie Conservation Action Plan. Saskatchewan Research Council Pub. No. 11881-1E14. Further resources can be found on the Prairie Conservation Action Plan's (PCAP) website at: http://www.pcap-pcia.org/resources-literature, including information on communities of each ecosite type.
This map is not intended for navigation. Created April 2021.

Figure 12. Predicted distribution of Saline Upland Ecosites across the Prairie Ecozone.

3.12 Subirrigated

The Subirrigated Ecosite is a moist ecosite that is found in sites where the water table is close, but rarely above the surface during the growing season. It can be further subdivided into two categories:

- *Subirrigated*: Moist low-lying sites that are rarely flooded. Imperfectly drained soils show signs of occasional saturation, such as faint to distinct mottles (e.g., Gleyed Chernozems).
- *Saline Subirrigated*: Moist low-lying sites that are rarely flooded, with saline soils. Potential vegetation is dominated by salt-tolerant plants.

Note: Thorpe (2007) classifies this ecosite as Dry Meadow and Saline Dry Meadow.

Table 13. Species at Risk found on the Subirrigated Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Subirrigated			
	Baird's Sparrow		
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly		Monarch Butterfly
Northern Leopard Frog			
Swift Fox			
	Sprague's Pipit		Sprague's Pipit
Saline Subirrigated			
Baird's Sparrow	Baird's Sparrow		Baird's Sparrow
Chestnut-collared Longspur			
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Swift Fox			
Sprague's Pipit	Sprague's Pipit		Sprague's Pipit
Thick-billed Longspur			

Typical Plant Communities on the Subirrigated Ecosite

Non-Saline Communities

Aspen / Dogwood – Saskatoon – Choke-cherry (reference community)
Aspen / Dogwood / Snowberry – Rose / Smooth Brome – Kentucky Blue-grass (moderate alteration)
Balsam Poplar – Aspen /Dogwood / Sarsaparilla (reference community)
Balsam Poplar – Aspen /Snowberry – Rose (significant alteration)
Aspen - Balsam Poplar /Smooth Brome – Kentucky Blue-grass (severe alteration)
Ash – Maple / Choke-cherry (reference community)
Ash – Maple / Smooth Brome (significant alteration)
River Birch / Wolf-willow / Creeping Juniper – Bearberry (reference community)
Basket Willow – Dogwood (reference community)
Basket Willow – Dogwood / Rose / Smooth Brome (moderate alteration)
Silver Sagebrush – Wheat-grass (reference community)

Saline Communities

Greasewood – Northern Wheat-grass (reference community)
Salt Grass – Slender Wheat-grass (reference community)
Sedge – Western Wheat-grass – Needle-and-thread (reference community)
Western Wheat-grass – Blue Grama (minor alteration)

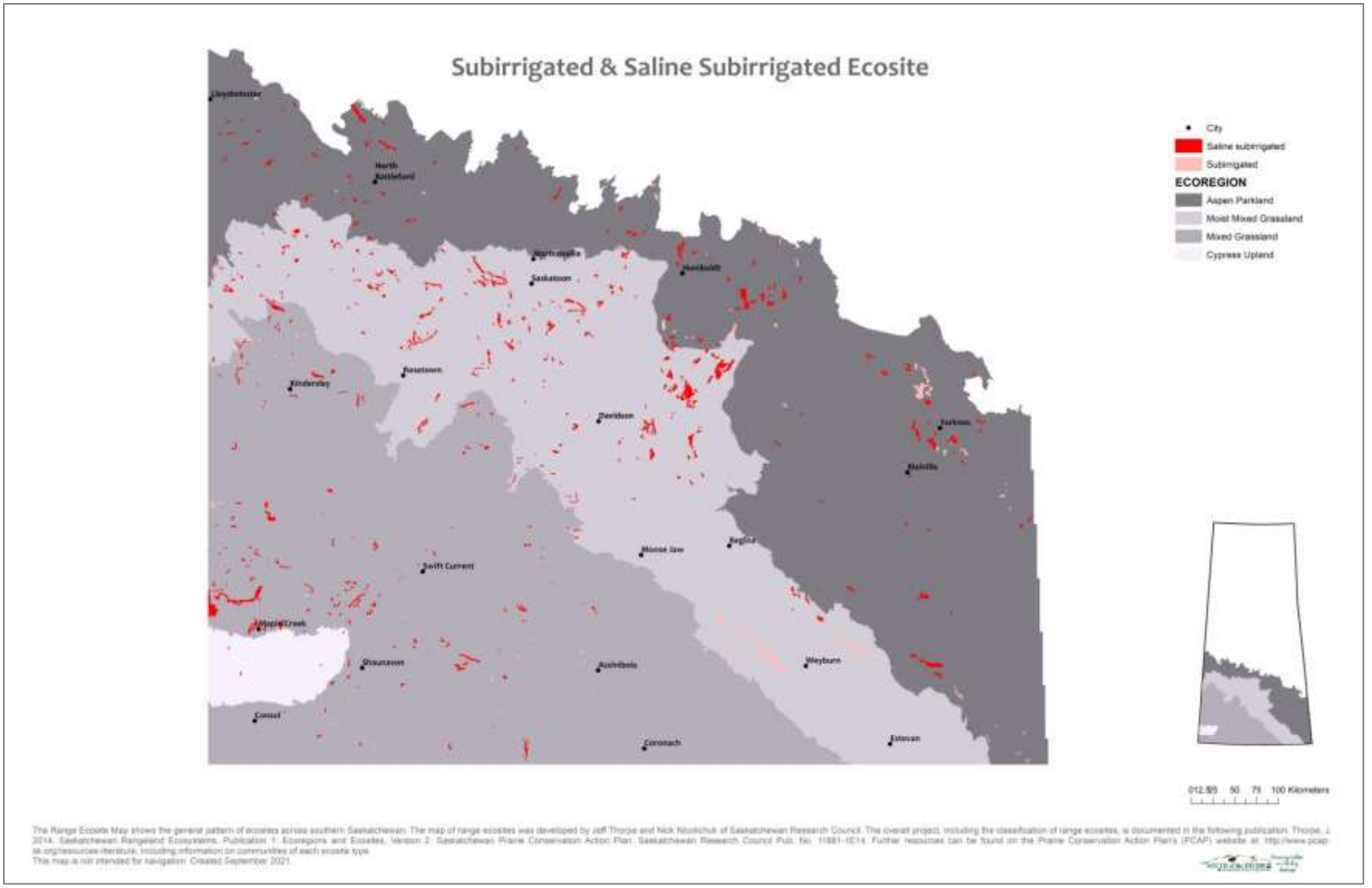


Figure 13. Predicted distribution of Subirrigated Ecosites across the Prairie Ecozone.

3.13 Wet Meadow

The Wet Meadow Ecosite is a moist ecosite that occurs in wet low-lying sites that are normally flooded for 3-4 weeks in spring. It can be further subdivided into two categories:

- *Wet Meadow*: Poorly drained soils show signs of prolonged saturation, such as dull colours or prominent mottles (Gleysolic soils). Potential vegetation includes diverse communities of fine-textured grasses, sedges, and forbs, sometimes with tall willows.
- *Saline Wet Meadow*: Saline soils with potential vegetation dominated by salt-tolerant plants.

Table 14. Species at Risk found on the Wet Meadow Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Wet Meadow			
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Chestnut-collared Longspur			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Swift Fox			
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Saline Wet Meadow			
Baird's Sparrow	Baird's Sparrow	Baird's Sparrow	Baird's Sparrow
Burrowing Owl			
Chestnut-collared Longspur			
Greater Sage Grouse			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly		Monarch Butterfly
Northern Leopard Frog			
Swift Fox		Swift Fox	
Sprague's Pipit	Sprague's Pipit	Sprague's Pipit	Sprague's Pipit
Thick-billed Longspur			

Typical Plant Communities on the Wet Meadow Ecosite

Non-Saline Communities

Basket Willow / Awned Sedge (reference community)
Basket Willow / Awned Sedge - Sow-thistle (moderate alteration)
Beaked Willow / Awned Sedge – Beaked Sedge (reference community)
Beaked Willow / Beaked Sedge – Field Horsetail (moderate alteration)
Reed-grass – Baltic Rush (reference community)
Woolly Sedge (reference community)
Woolly Sedge – Baltic Rush (moderate alteration)
Tufted Hair-grass (reference community)
Tufted Hair-grass – Forbs (minor alteration)

Saline Communities

Northern Reed-grass – Salt Grass (reference community)
Salt Grass – Northern Reed-grass (reference community)
Nuttall's Alkali-grass – Salt Grass – Foxtail Barley (reference community)

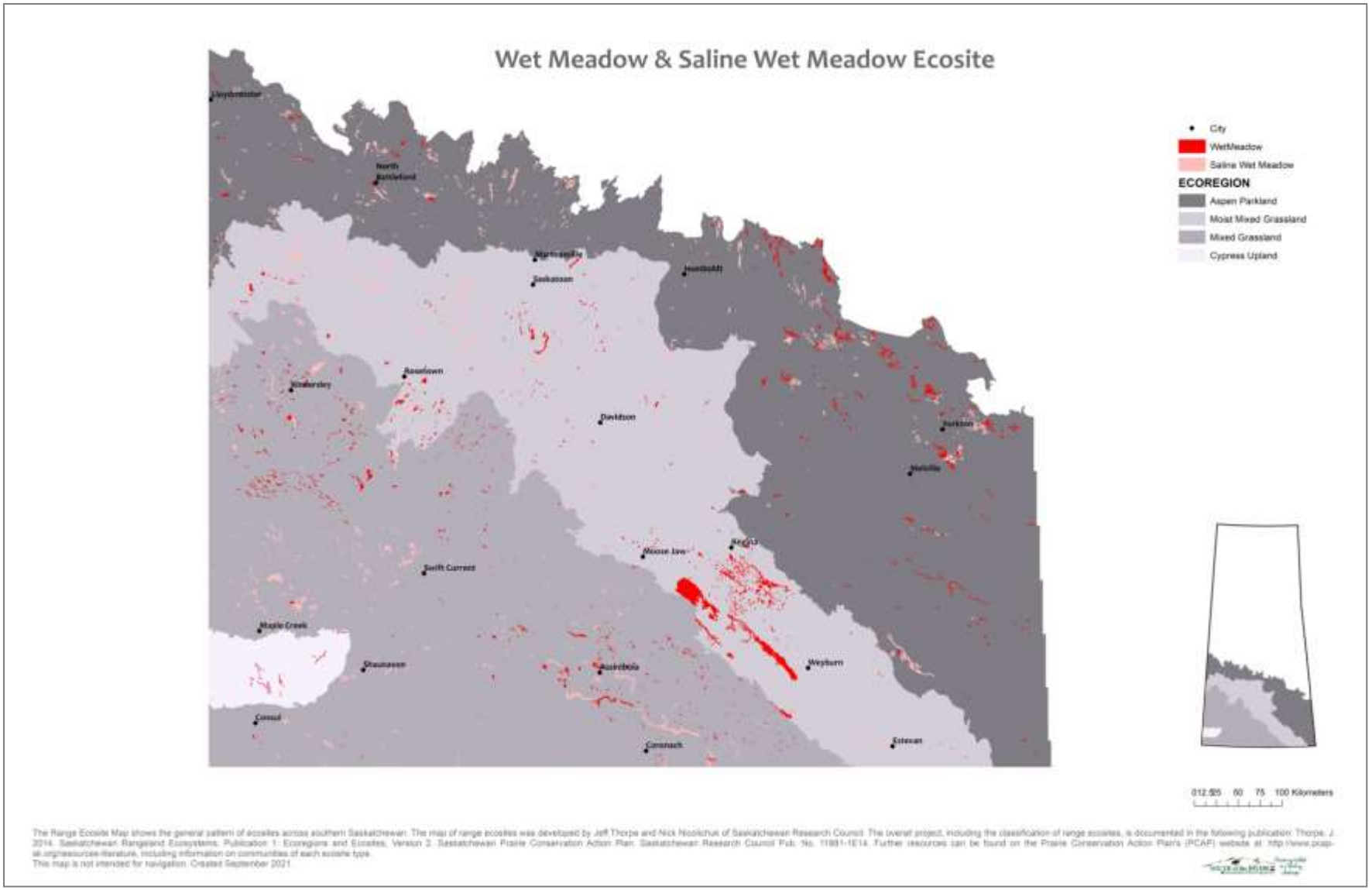


Figure 14. Predicted distribution of Wet Meadow Ecosites across the Prairie Ecozone.

3.14 Marsh

The Marsh Ecosite is a moist ecosite that includes both shallow wetlands that are normally flooded until July or early August, and deep wetlands that are normally flooded throughout the growing season. It can be further subdivided into four categories:

- *Shallow Marsh*: Gleysolic or Organic Soils. Potential vegetation includes simpler communities of intermediate-sized grasses and sedges.
- *Deep Marsh*: Potential vegetation consists of a few species of tall, coarse graminoids (e.g., cattails, bulrushes).
- *Shallow Saline Marsh*: Saline soils with potential vegetation dominated by salt-tolerant plants.
- *Deep Saline Marsh*: Saline soils with potential vegetation consisting of a few species of salt-tolerant plants.

Table 15. Species at Risk found on the Marsh Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
Marsh			
Little Brown Bat	Little Brown Bat	Little Brown Bat	Little Brown Bat
Monarch Butterfly	Monarch Butterfly	Monarch Butterfly	Monarch Butterfly
Northern Leopard Frog		Northern Leopard Frog	
Piping Plover			
Swift Fox			
Saline Marsh			
	Little Brown Bat		Little Brown Bat
	Monarch Butterfly		Monarch Butterfly

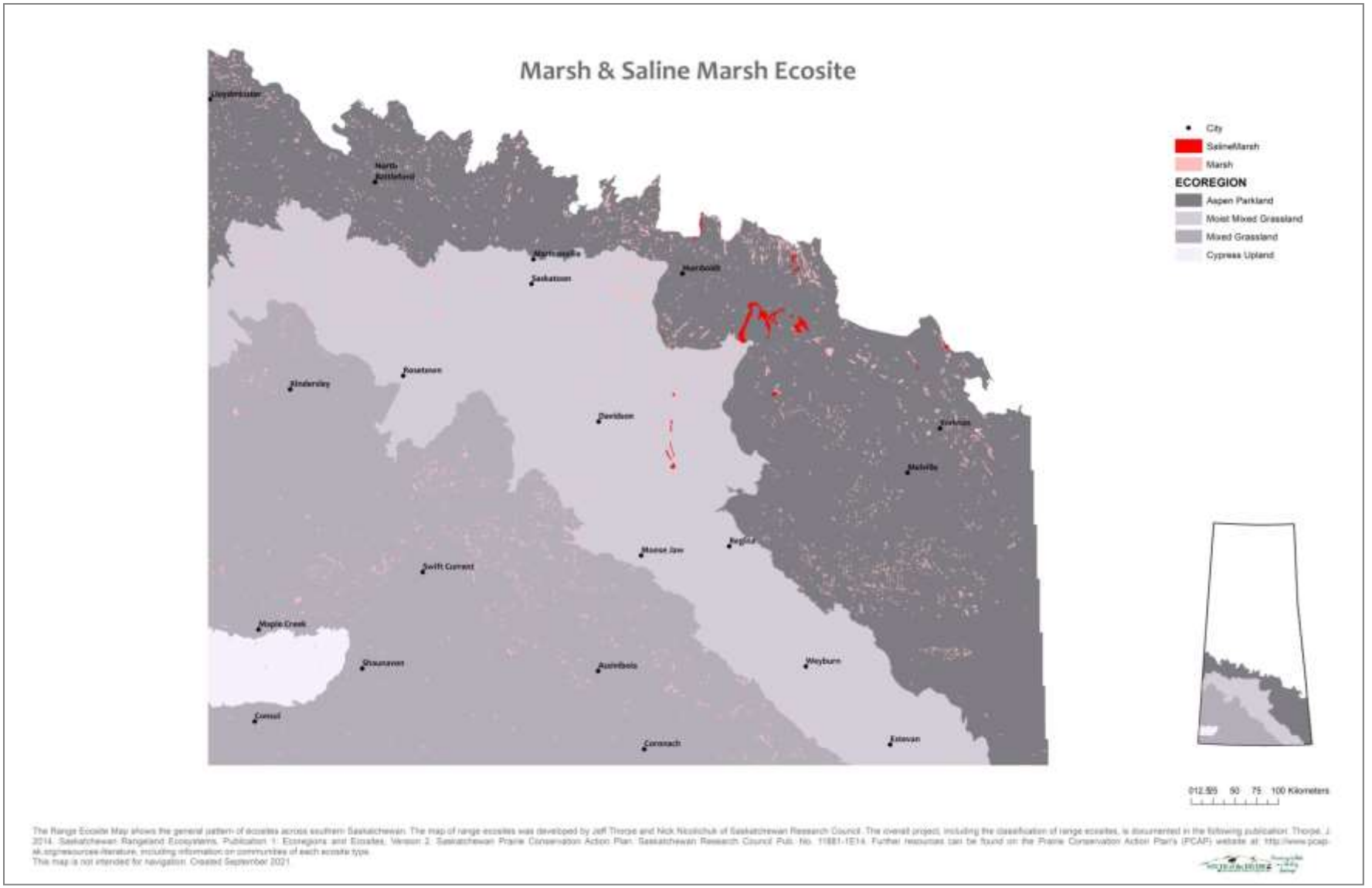
Typical Plant Communities on the Marsh Ecosite

Non-Saline Communities

Cattail (reference community)
Water Sedge – Beaked Sedge (reference community)
Awned Sedge (reference community)
Manna-grass (reference community)
Reed Canary-grass (invaded)

Saline Communities

Awned Sedge (reference community)
Creeping Spike-rush (reference community)
Spangletop (reference community)
Three-square Bulrush (reference community)
Hardstem and Softstem Bulrush (reference community)
Hardstem Bulrush – Foxtail Barley (minor alteration)
Common Reed (reference community)



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This map is not intended for navigation. Created September 2021

Figure 15. Predicted distribution of Marsh Ecosites across the Prairie Ecozone.

3.15 Organic

The Organic Ecosite is more typical of forested ecosites. It occurs on soils in the Organic Order which are rare in the prairie and parkland ecoregions where it occurs in association with bogs and fens.

Table 16. Species at Risk found on the Organic Ecosite

Mixed Grassland	Moist Mixed Grassland	Cypress Upland	Aspen Parkland
			Baird's Sparrow
			Monarch Butterfly

Typical Plant Communities on the Organic Ecosite

Beaked Willow / Awned Sedge – Beaked Sedge (reference community)
Water Sedge – Beaked Sedge (reference community)

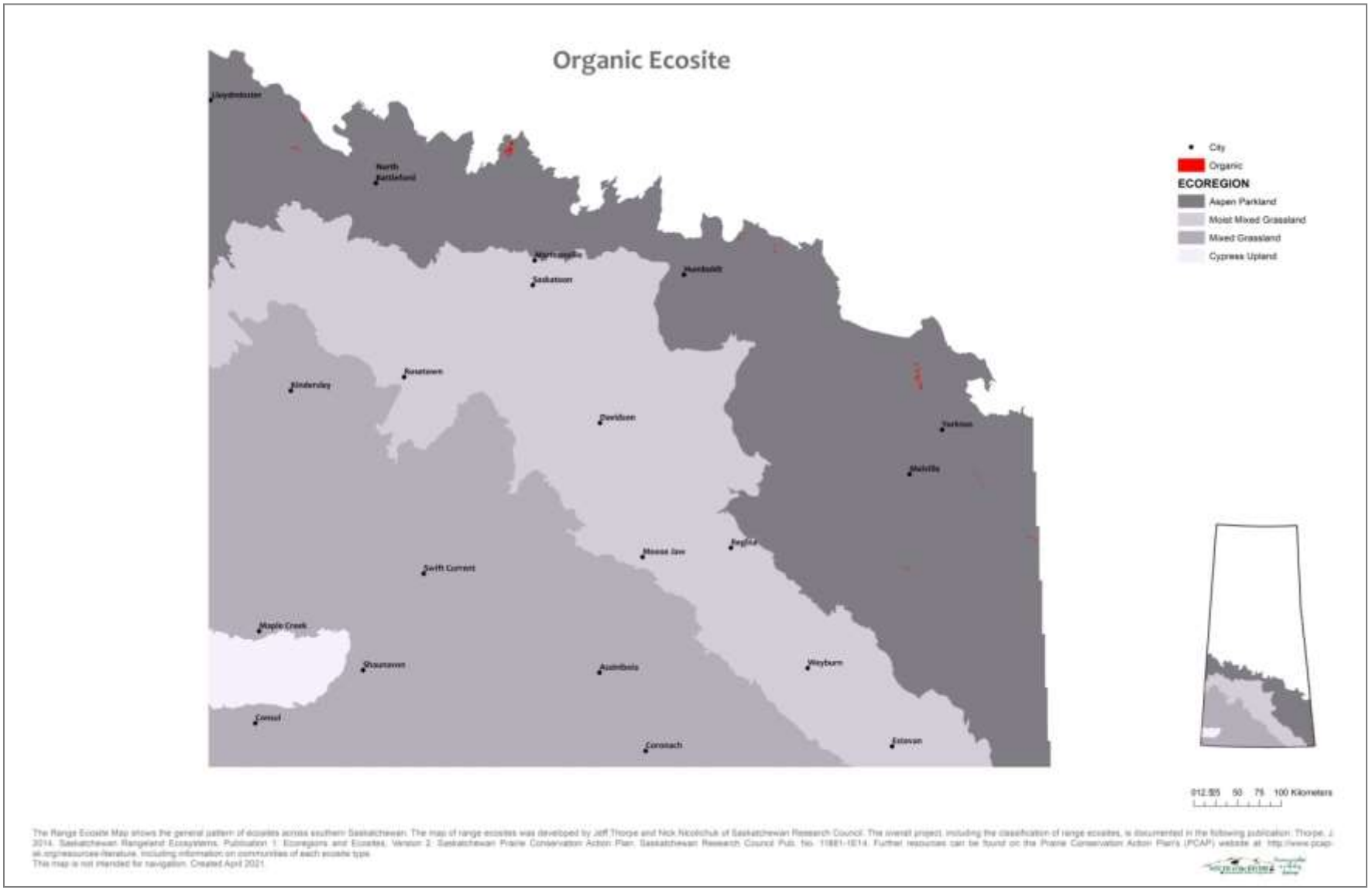


Figure 16. Predicted distribution of Organic Ecosites across the Prairie Ecozone.

4 IMPORTANT HABITAT ATTRIBUTES INFLUENCING MULTIPLE SPECIES AT RISK

This section presents habitat attributes that are important to more than one species and provides illustrations of attribute requirements which allow the user to easily identify which species use similar habitat and which species have conflicting requirements. Most of these requirements are structural vegetation attributes or associated variables that are commonly measured in habitat surveys.

Use of these habitat attributes by species at risk sometimes varies by ecoregion. Therefore, the data are presented by ecoregion. Use of habitat attributes may vary on a finer scale such as ecosite or plant community type, but at this stage there are inadequate data to determine statistical differences in use on a finer scale. Data are currently deficient for many attributes for the Cypress Upland and the Aspen Parkland. Until data are available for those ecoregions, it is recommended that users apply the attribute data presented for the Moist Mixed Grassland to the Cypress Upland and Aspen Parklands ecoregions. Numerical data tables containing the range and weights of optimal and suboptimal values by species and ecoregion are found in Appendix A.

The multi-species habitat attribute graphics can be interpreted using the legend below. Green lines represent optimal habitat, yellow represents suboptimal habitat and red represents unutilized, avoided or sink habitat. The delineation between green, yellow and red is sometimes discreet, based on statistically significant data, and sometimes presented as a gradient if data are limited or information is based on expert opinion.

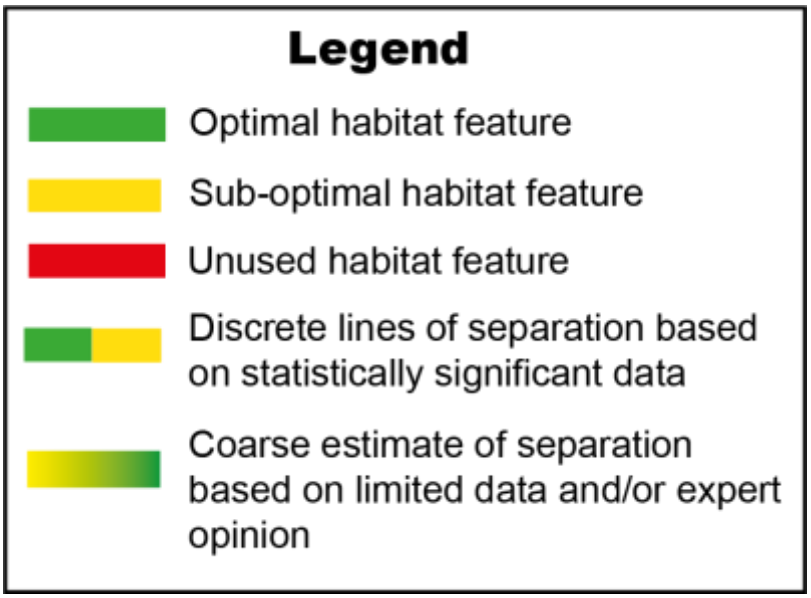
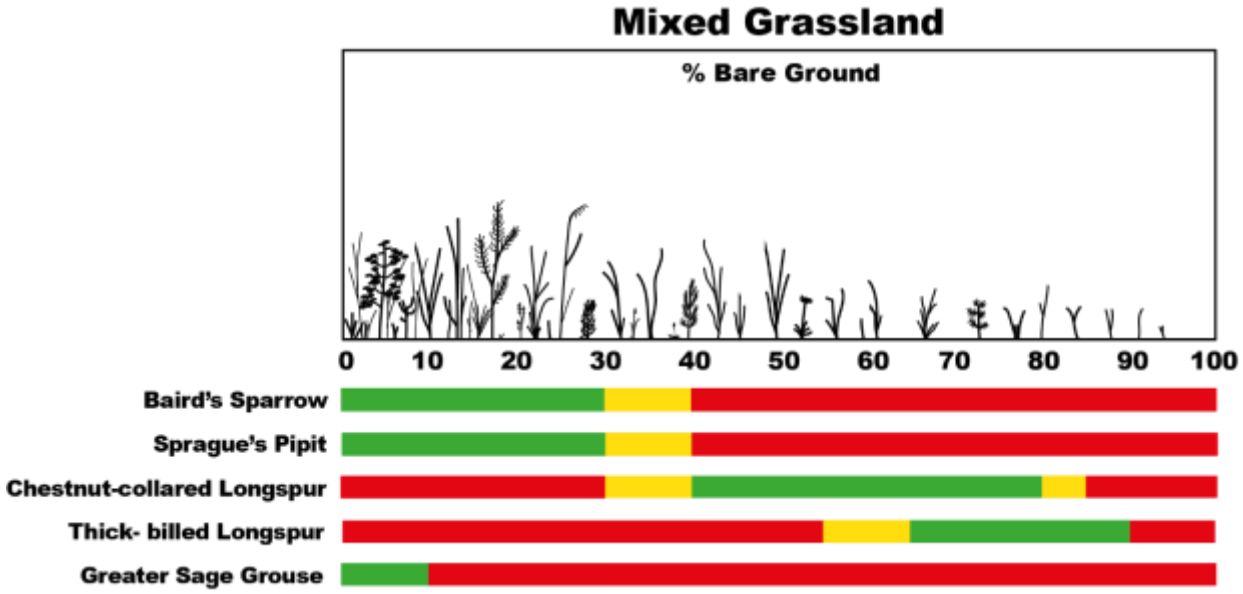
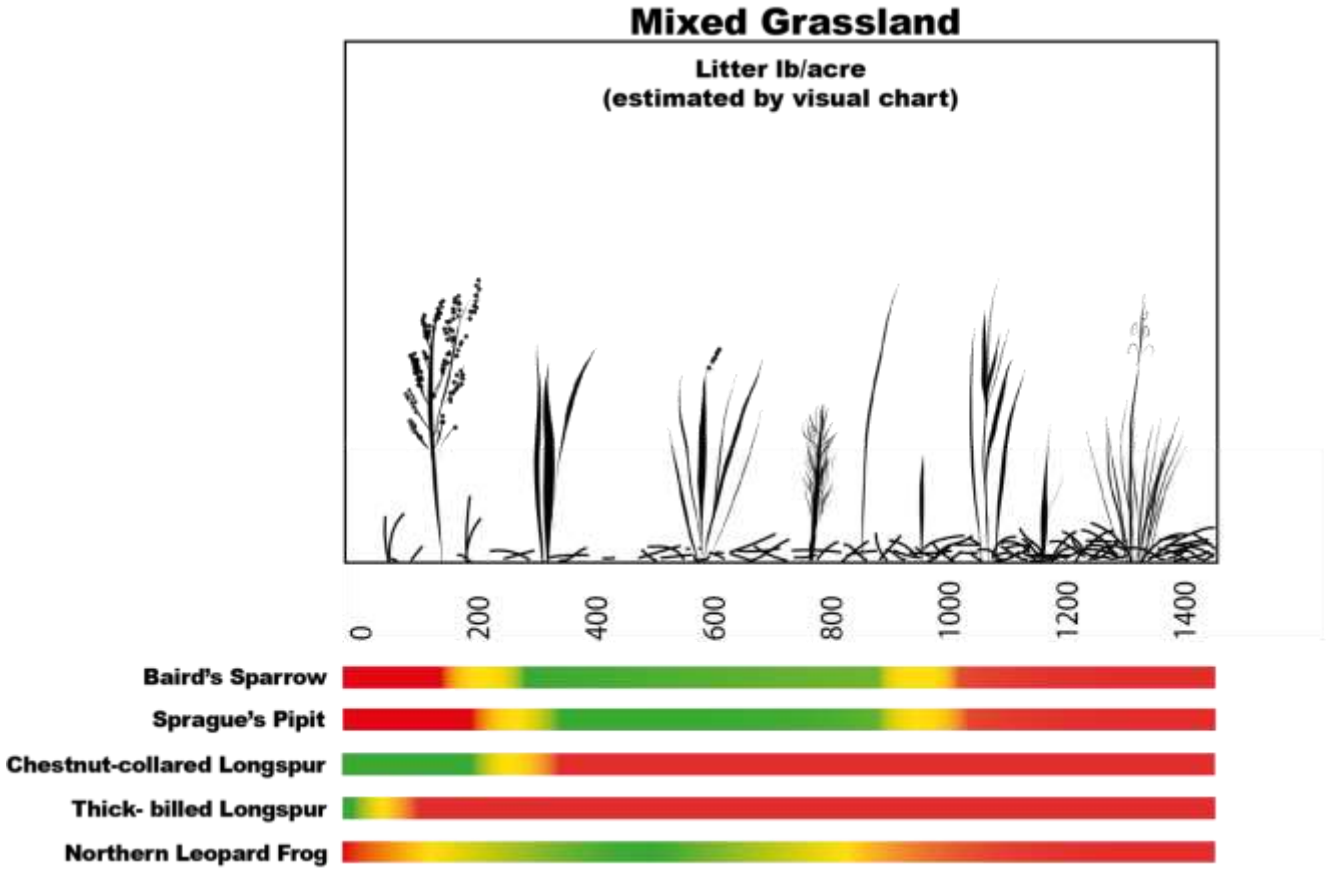
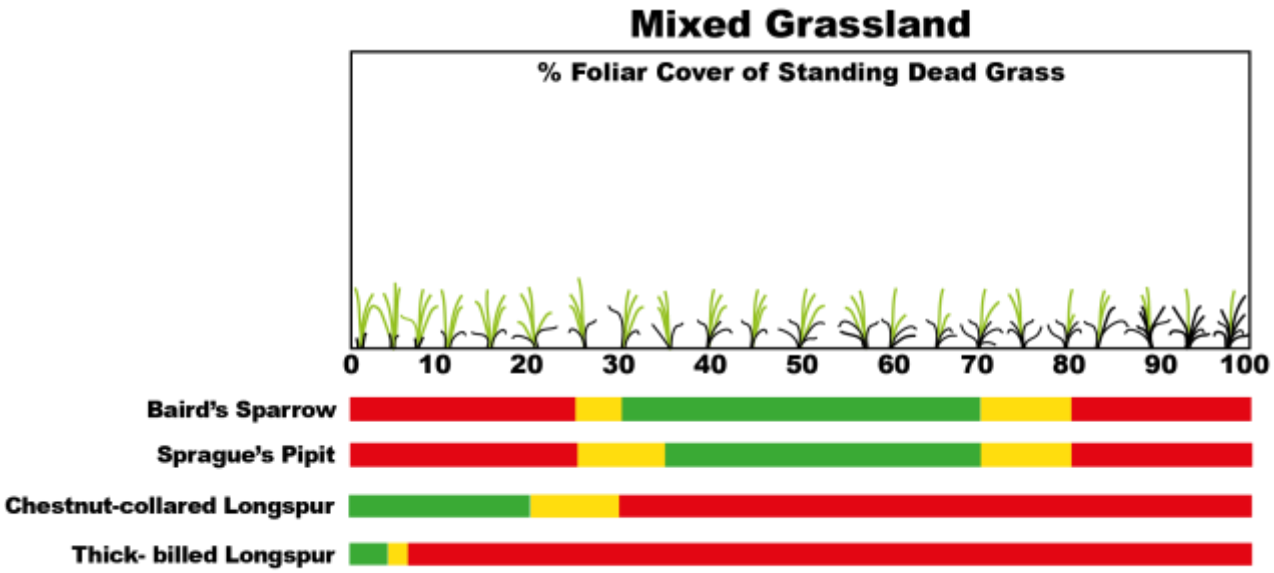


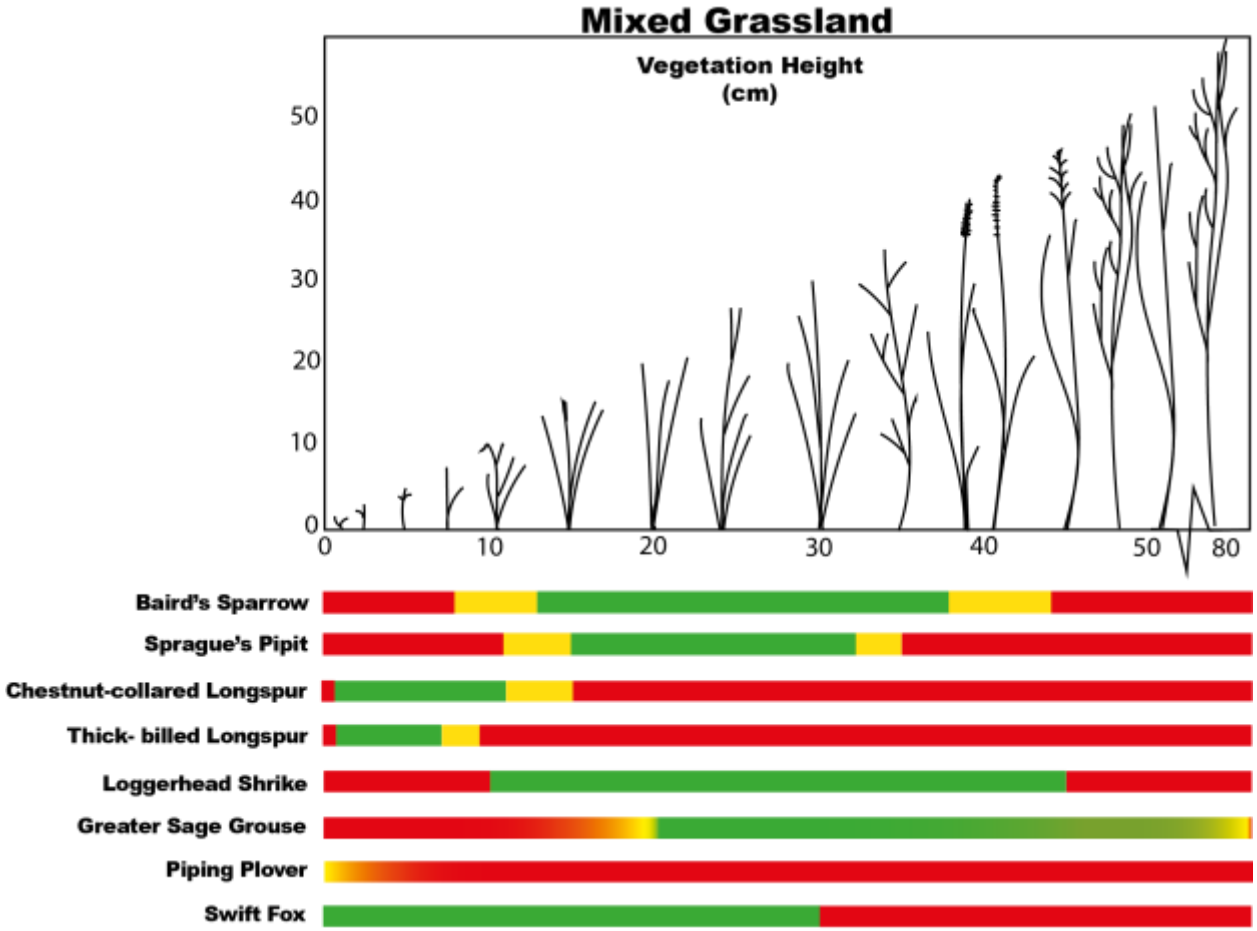
Figure 17. Legend for the multi-species habitat attribute graphics.

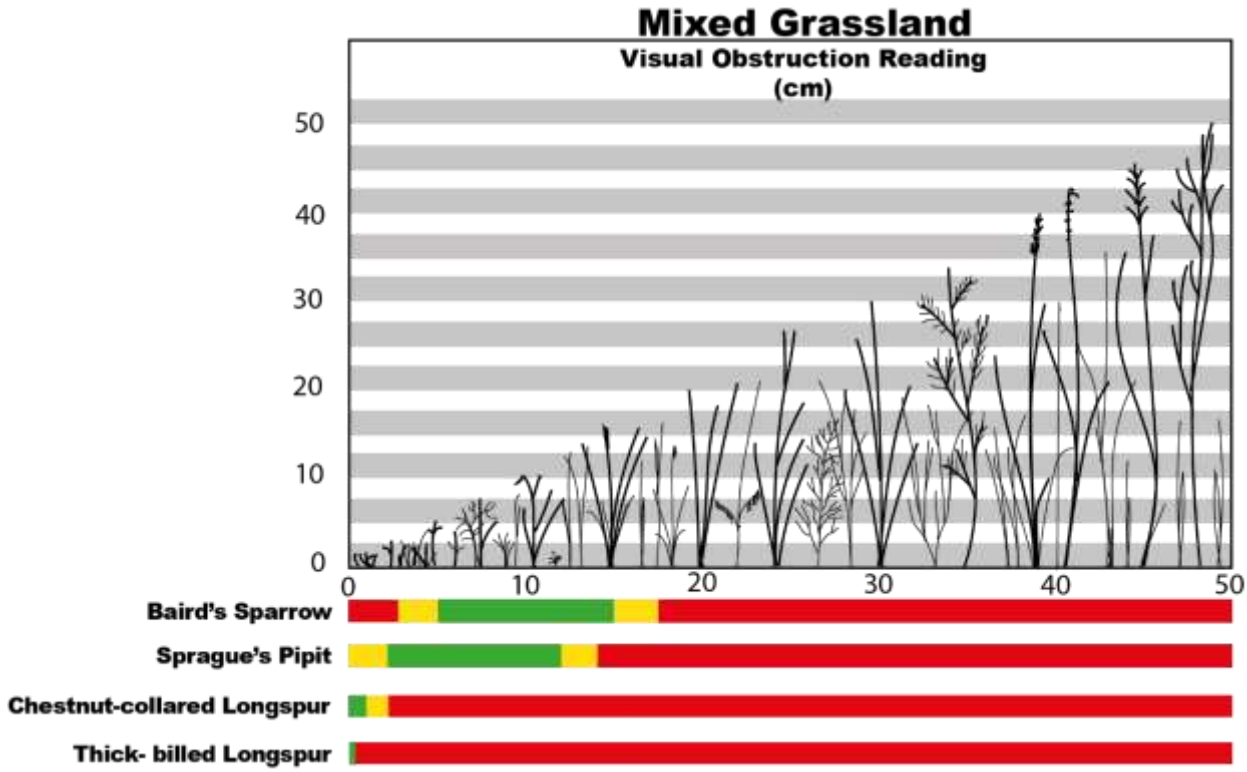
4.1 Mixed Grassland

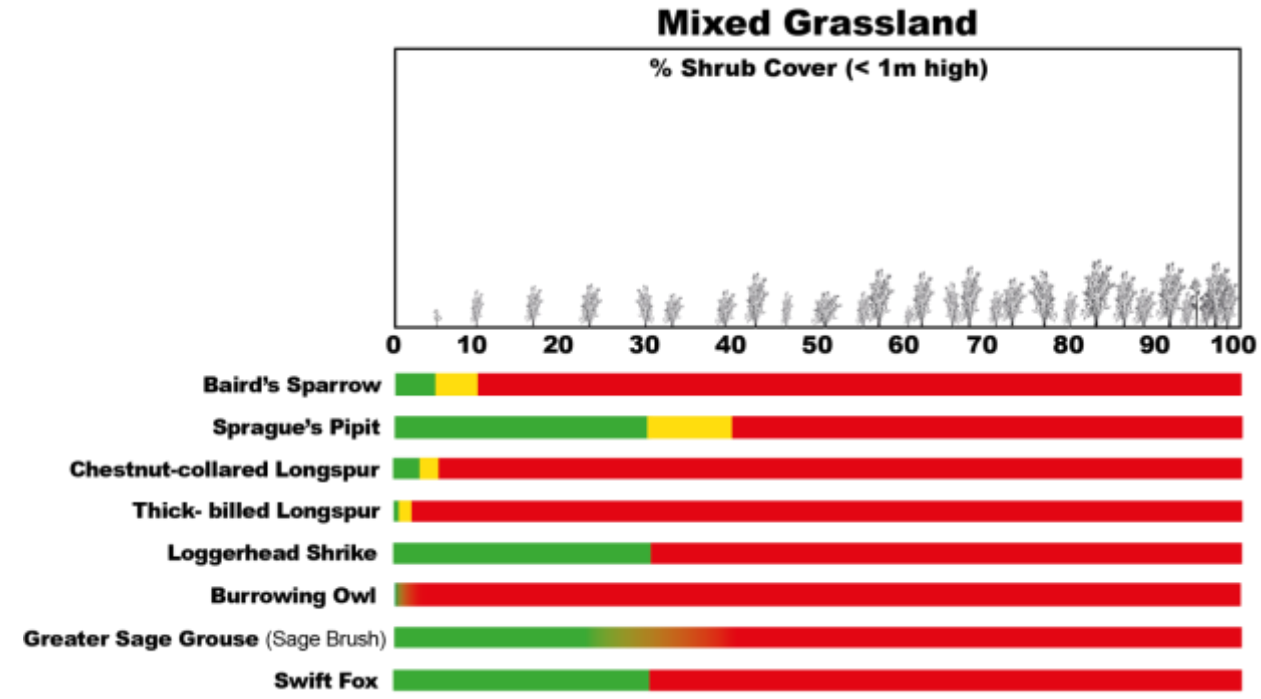




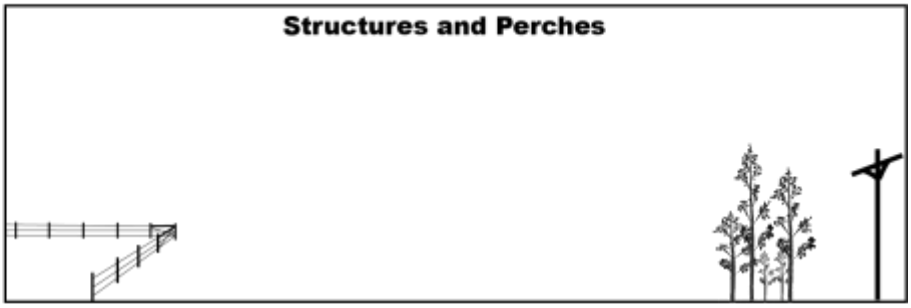

Mixed Grassland
% Foliar Cover of Standing Dead Grass
0
10
20
30
40
50
60
70
80
90
100
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur


Mixed Grassland
Vegetation Height
(cm)
50
40
30
20
10
0
0
10
20
30
40
50
80
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur
Loggerhead Shrike
Greater Sage Grouse
Piping Plover
Swift Fox

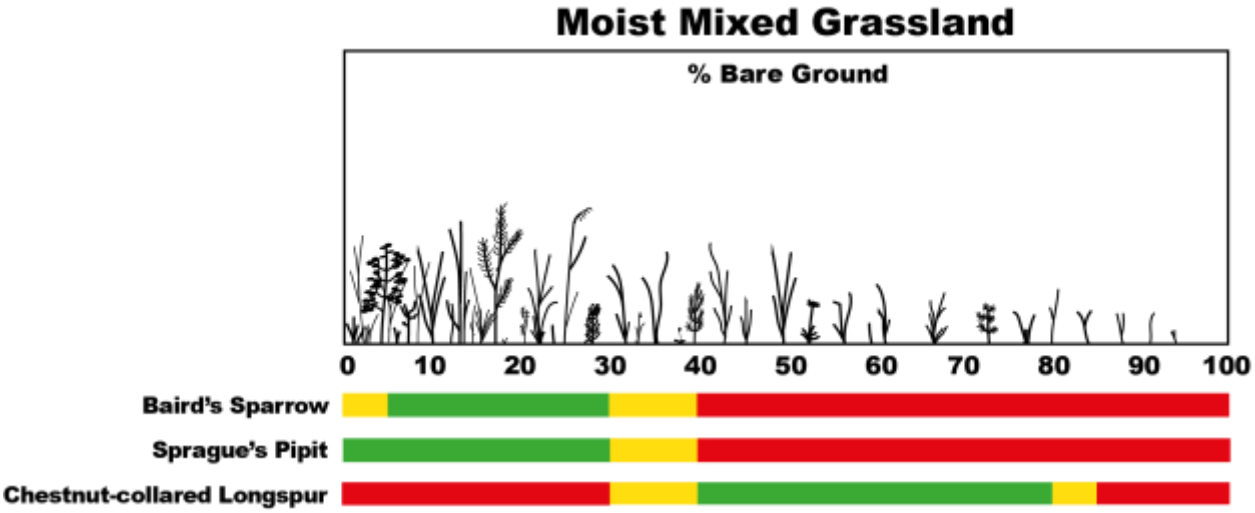

Mixed Grassland
Visual Obstruction Reading
(cm)
50
40
30
20
10
0
0
10
20
30
40
50
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur

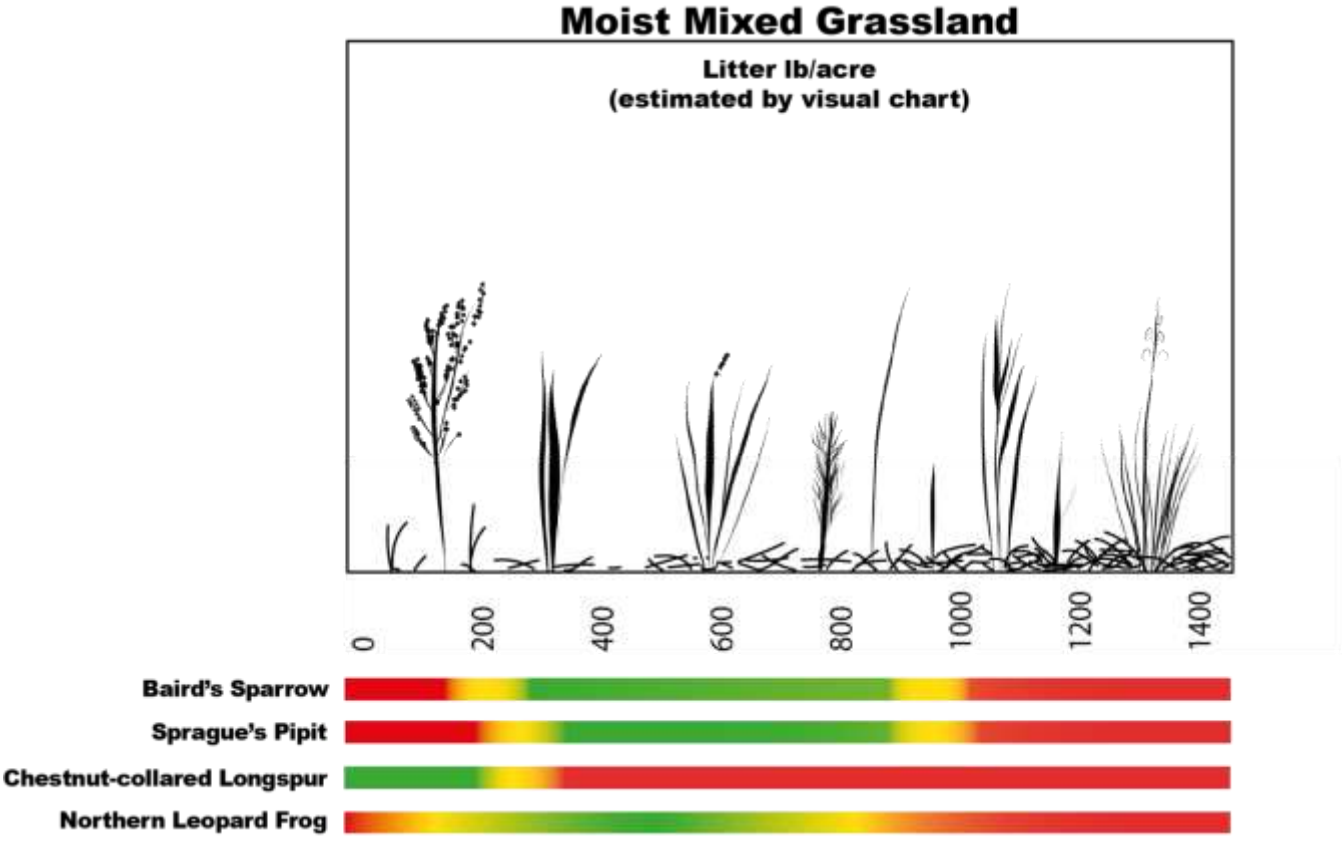

Mixed Grassland
% Shrub Cover (< 1m high)
0
10
20
30
40
50
60
70
80
90
100
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur
Loggerhead Shrike
Burrowing Owl
Greater Sage Grouse (Sage Brush)
Swift Fox

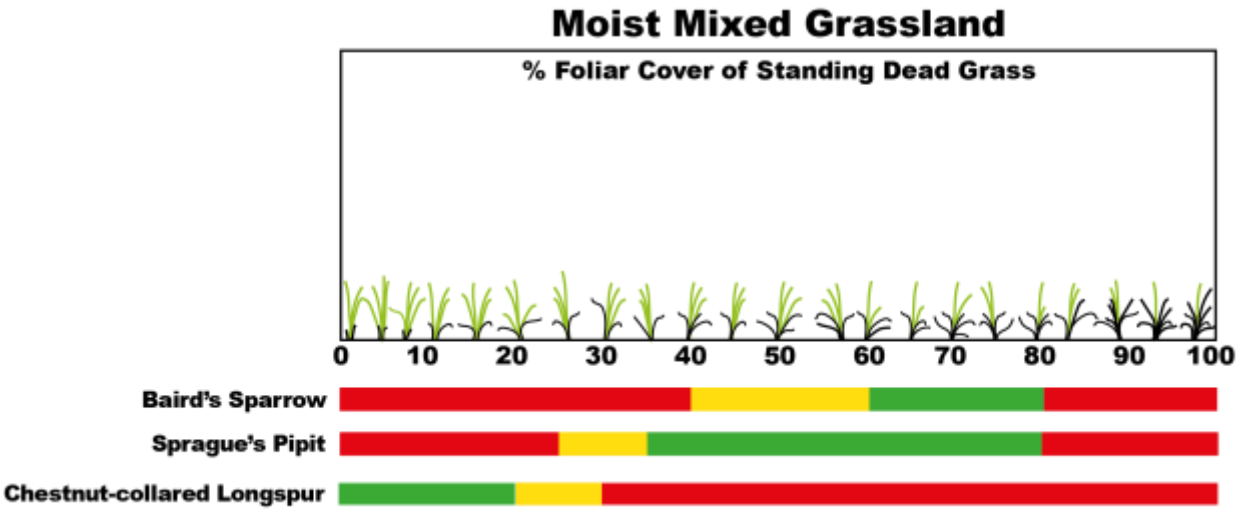
Mixed Grassland

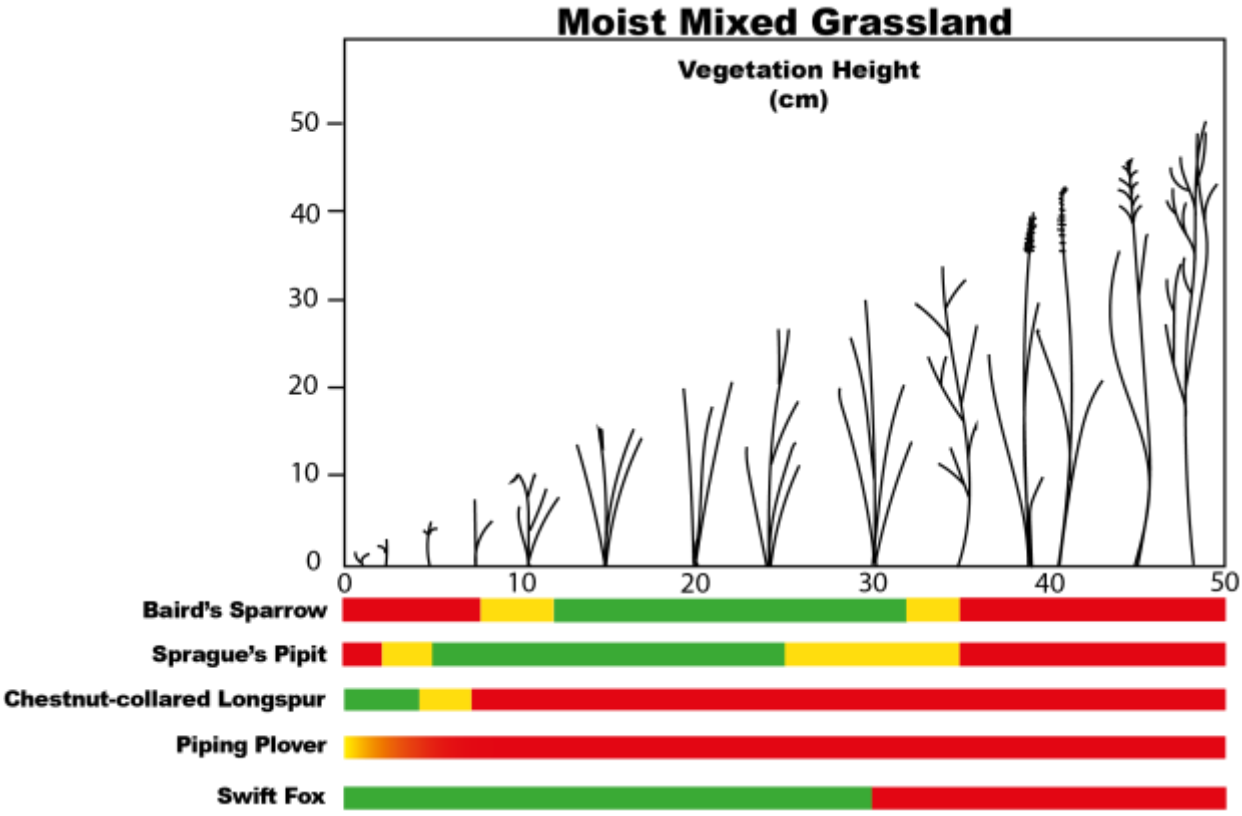


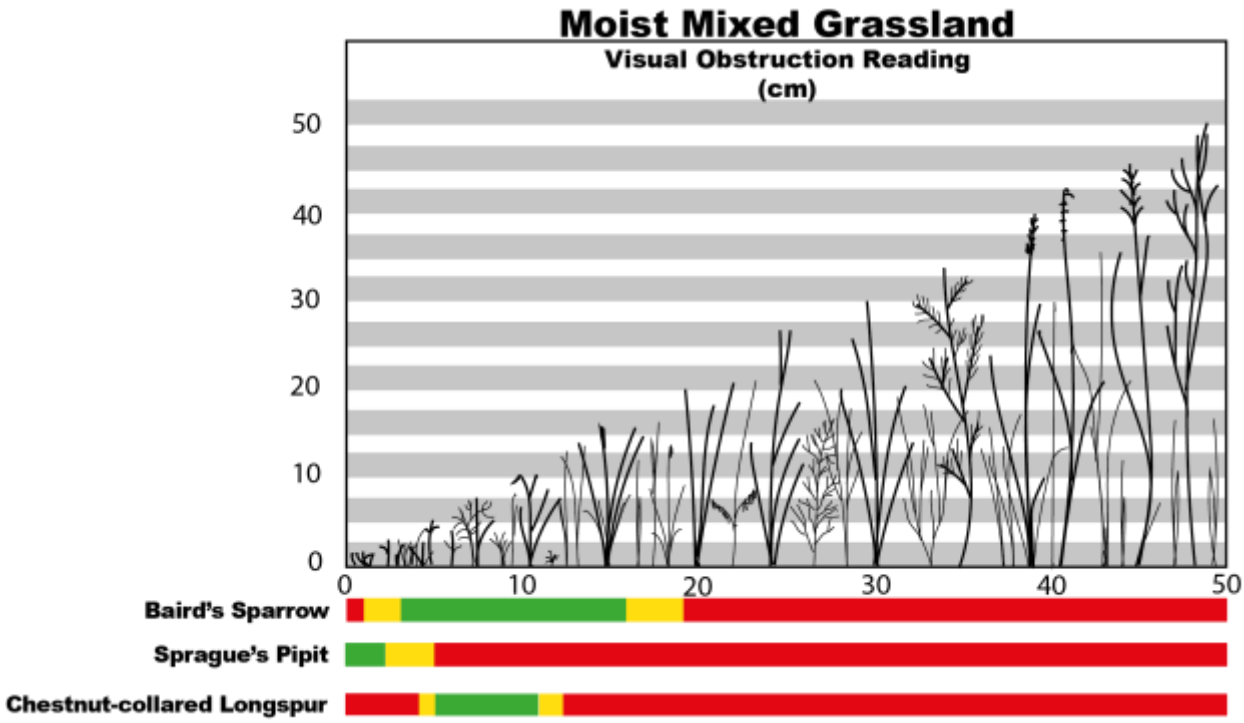
4.2 Moist Mixed Grassland

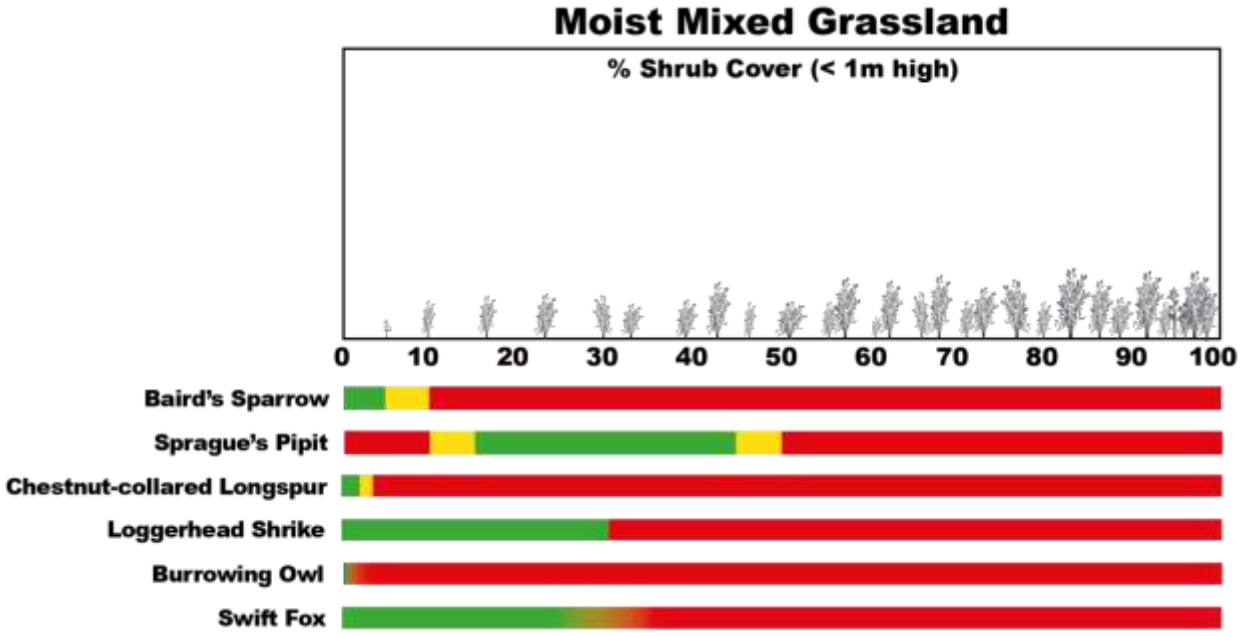




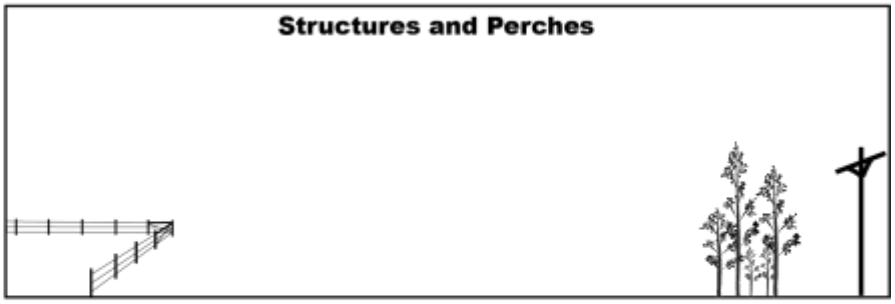

Moist Mixed Grassland
% Foliar Cover of Standing Dead Grass
0
10
20
30
40
50
60
70
80
90
100
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur


Moist Mixed Grassland
Vegetation Height
(cm)
0
10
20
30
40
50
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Piping Plover
Swift Fox

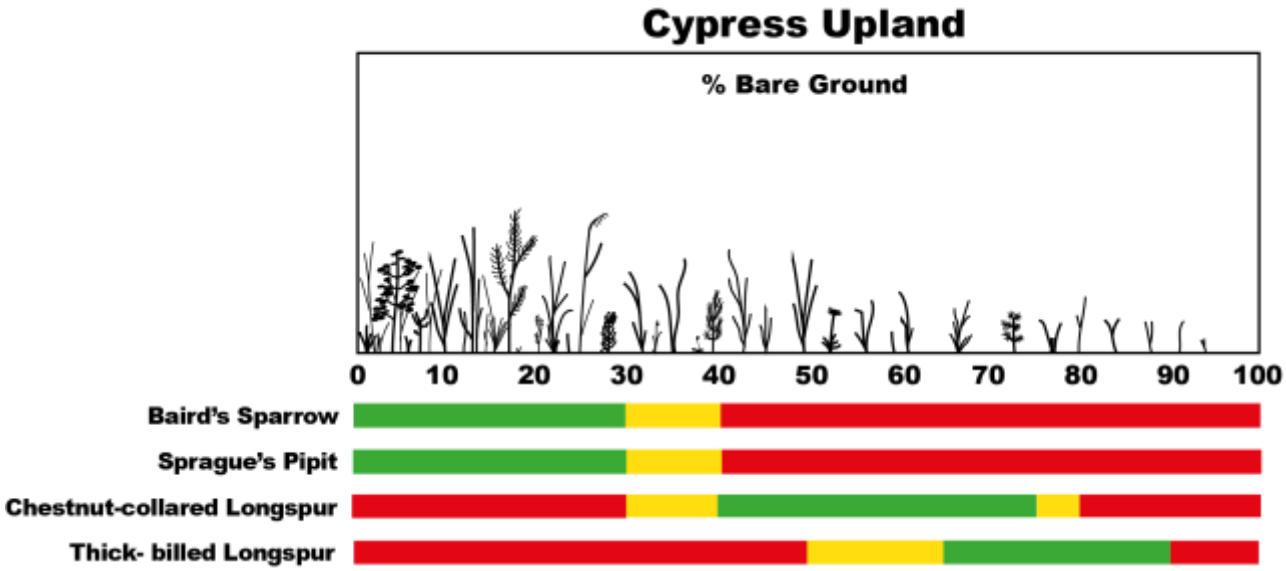

Moist Mixed Grassland
Visual Obstruction Reading
(cm)
50
40
30
20
10
0
0
10
20
30
40
50
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur

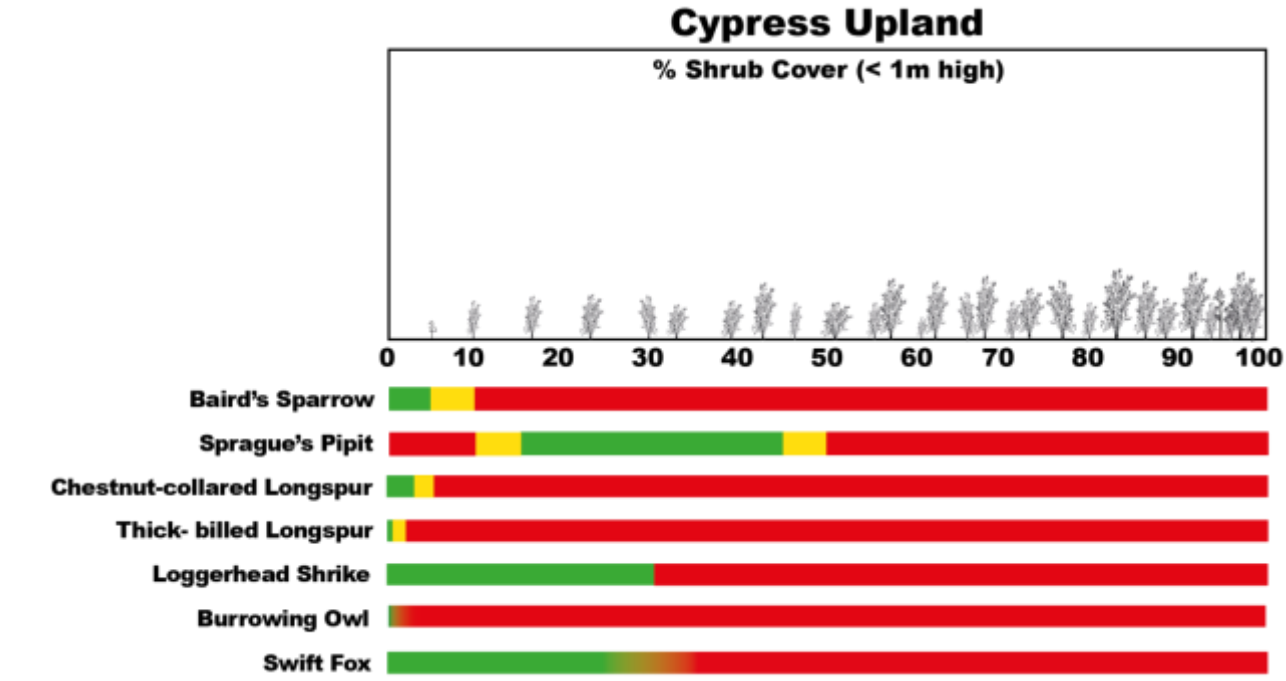

Moist Mixed Grassland
% Shrub Cover (< 1m high)
0
10
20
30
40
50
60
70
80
90
100
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Loggerhead Shrike
Burrowing Owl
Swift Fox

Moist Mixed Grassland

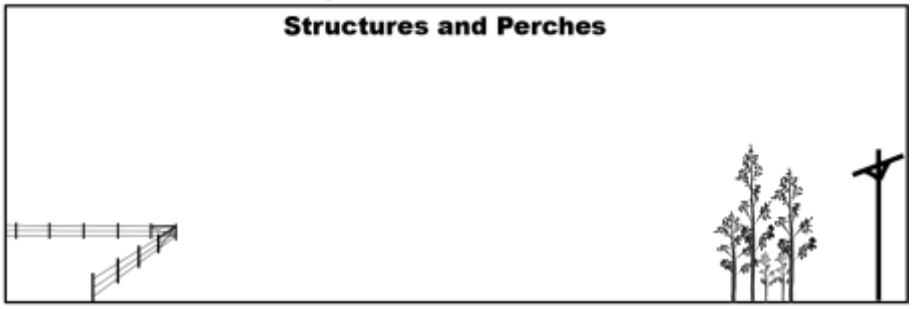


4.3 Cypress Upland

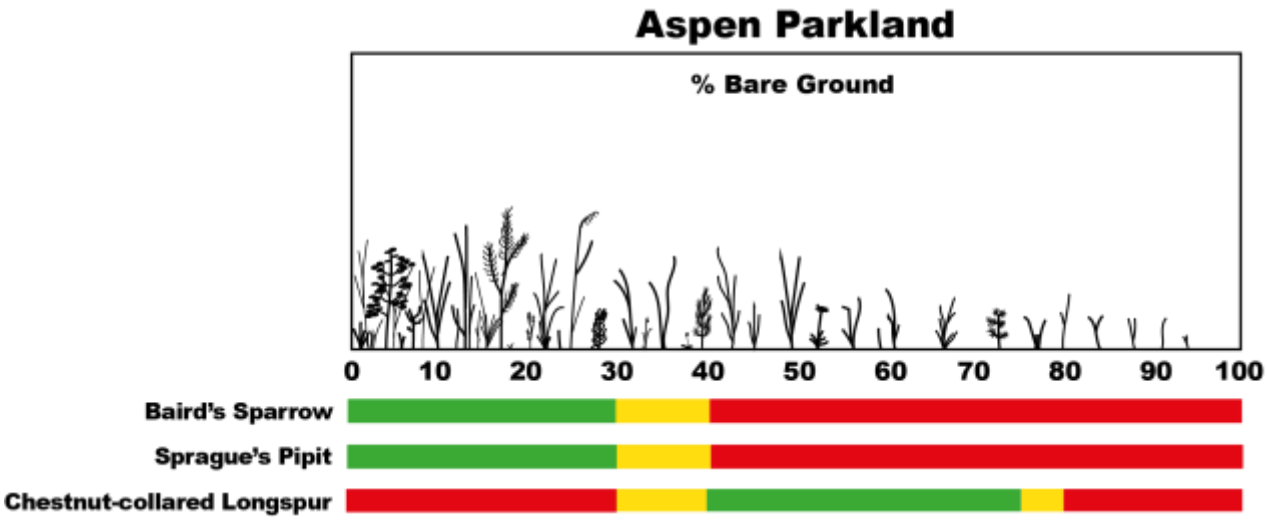


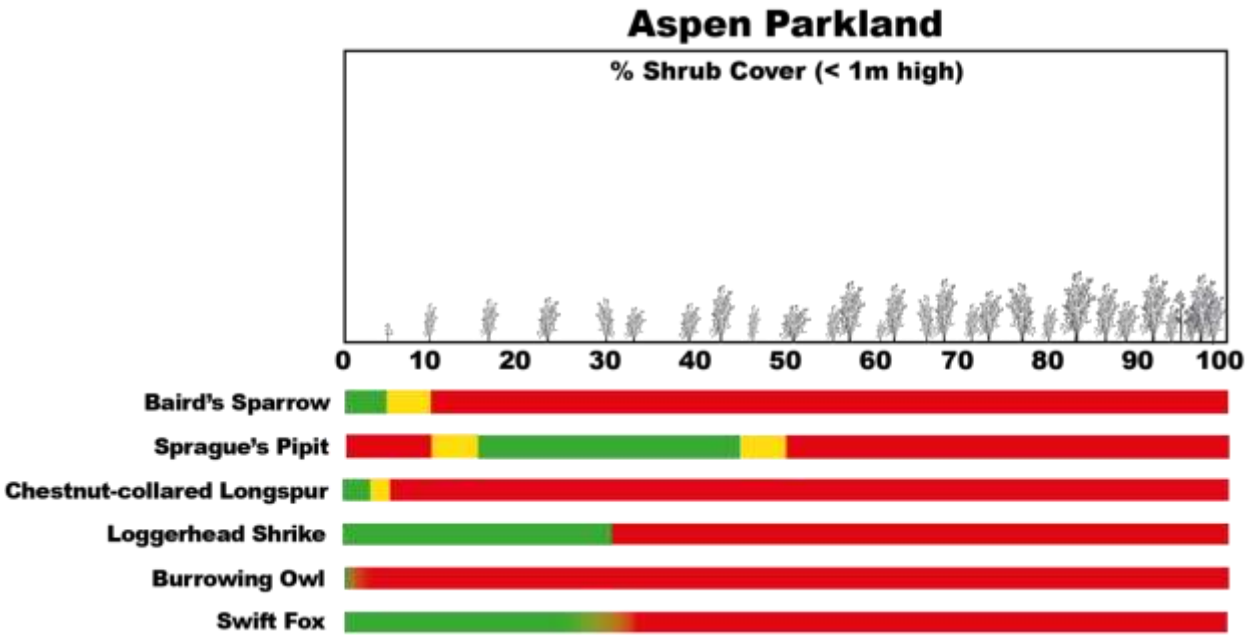


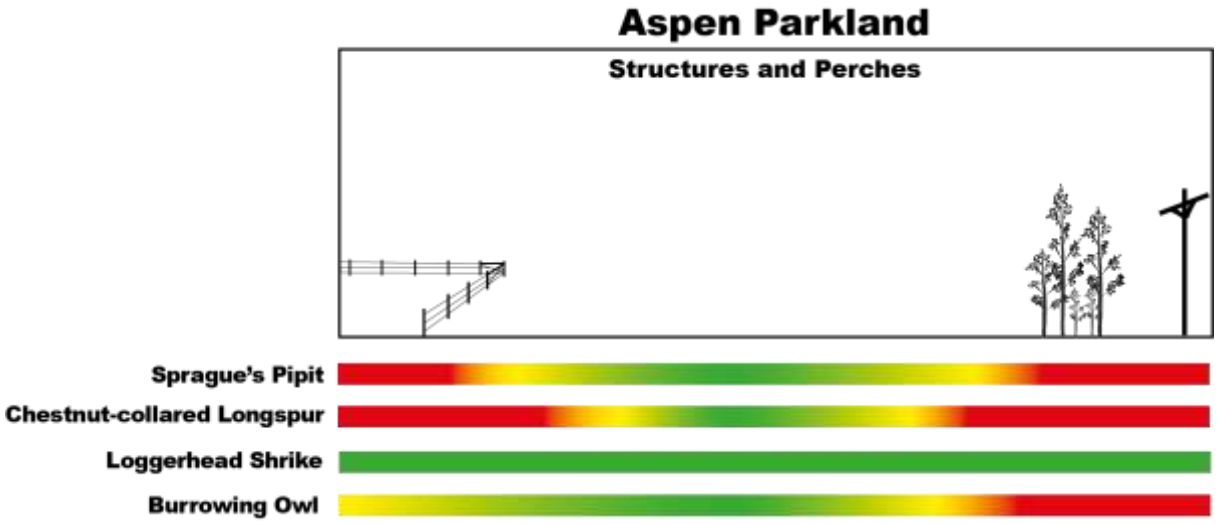
Cypress Upland



4.4 Aspen Parkland






Aspen Parkland
Structures and Perches
Sprague's Pipit
Chestnut-collared Longspur
Loggerhead Shrike
Burrowing Owl

5 ASSESSING HABITAT ATTRIBUTES FOR MULTIPLE SPECIES AT RISK

When assessing habitat attributes in the field, it will first be necessary to determine the ecoregion in which property is located. Next a map of ecosites or soil polygons for the property should be obtained from PCAP or another source. Map the fenced fields/pastures or management units on the ecosite or soil polygon map.

5.1 Measuring Multi-species Habitat Attributes

Each of the multi-species habitat attributes in this guide are commonly measured habitat variables with well-established measurement protocols. Measurement guidelines are presented in this document. However, for more detailed information the user should refer to the documents referenced in this section.

Percent Bare Ground: Bare ground is defined as soil that is not protected by plants (including lichens and moss), litter, standing dead vegetation, gravel, or rocks. Percent bare ground may be measured using the Braun Blanquet qualitative estimate method or estimated within a quadrat. Bare soil is commonly estimated within a quadrat that vary in size from 1/10th of a square metre to a square metre. If using transects associated with range health or condition assessments, bare ground is estimated for 15 quadrats along the transect. For the purposes of this assessment, total percent bare soil is used as opposed to management-caused bare soil.

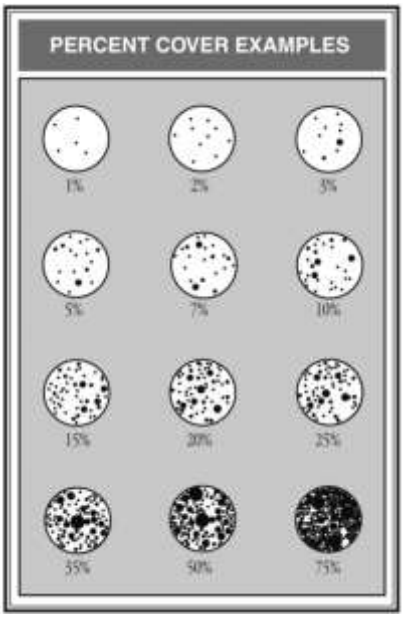


Figure 18. Braun Blanquet percent cover method (adapted from PCAP 2008).

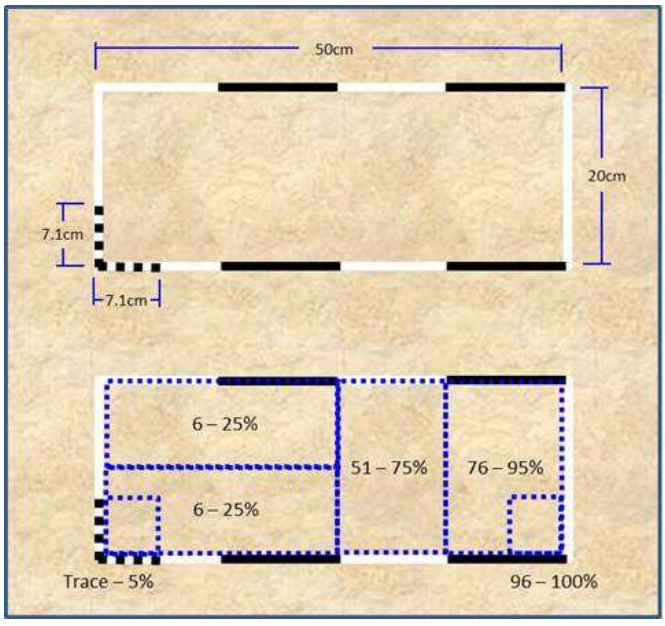


Figure 19. Quadrat percent cover method (adapted from Range Science Education Council, Landscape Toolbox Learning Center).

Litter: Litter is defined as the uppermost layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material. Any vegetal matter that is recognizable as part of a plant (e.g., leaf, stem) is considered litter. Litter is typically measured as weight per area (e.g., lbs/acre or kg/ha). Litter amounts may be measured by collecting, drying and weighing field samples, or by visual estimates. Visual estimates involve hand combing litter from a ¼ m^2 area and comparing to the chart below.

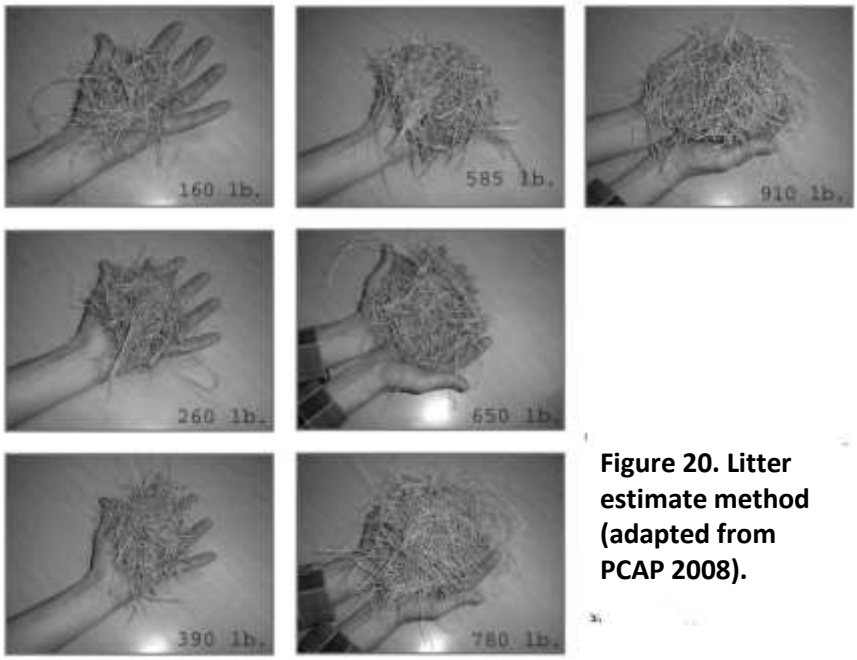


Figure 20. Litter estimate method (adapted from PCAP 2008).

Standing Dead Grass: Standing dead grass is defined as the grass from previous years' growth that has not fallen to the soil surface and is not litter. Standing dead grass is measured as percent foliar cover using either the Braun Blanquet percent cover method or the quadrat percent cover method.

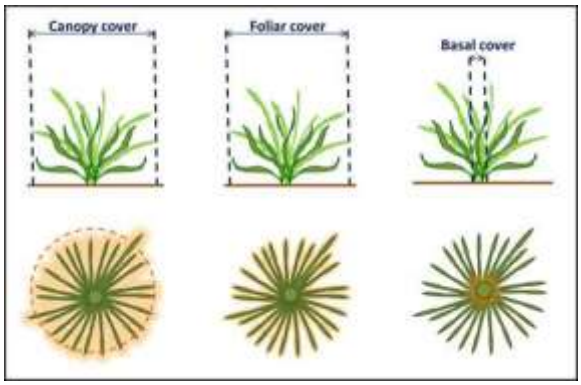


Figure 21. Foliar cover estimate method compared to canopy or basal cover estimates (adapted from Range Science Education Council, Landscape Toolbox Learning Center).

Vegetation Height: Vegetation height is defined as the height from the ground to the top of a herbaceous plant or grass, or to the base of the flower or seedhead. Vegetation height is typically measured using a measuring rod or Robel's pole at various intervals along a transect. The tallest portion of plants touching the pole or rod is recorded.

Visual Obstruction Reading: Visual obstruction reading (VOR) is defined as the amount of standing biomass measured as a combination of height and vertical density. VOR is typically measured with a Robel's pole along a transect varying in length from 50-200m with sample points located at 10 m intervals along the transect. At each sample point, up to four readings may be taken from different sides of the pole from a distance of four metres from the pole. Readings are recorded of all bands which are ≥ 50% obscured by vegetation (live or dead) at 0-60cm, and all bands obscured ≥ 25% at 60-150cm.

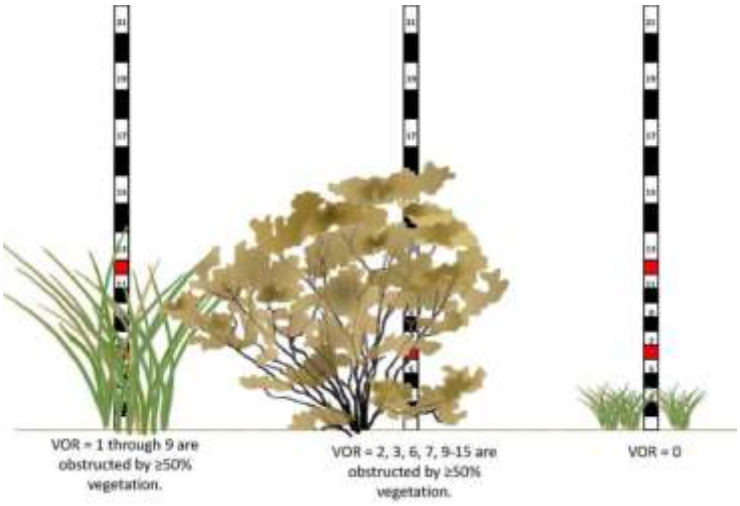


Figure 22. Visual obstruction reading measurement example (adapted from NRCS 2012).

Percent Shrub Cover: For this multi-species assessment, shrub cover is defined as the percent cover of shrubs under 1 metre in height. Shrub cover grass is measured as percent foliar cover using either the Braun Blanquet percent cover method or the quadrat percent cover method.

Structures and Perches: For this multi-species assessment, structures and perches include vertical structures such as trees and shrubs (taller than 1 m), fences, oil and gas wells, transmission lines, and wind turbines. For these structures, the type of structure and the distance from the sampling location should be recorded.

5.2 Photographs

Reference photographs can provide visual support for written observations and help document changes over time. Two photos should be taken at every sample point or transect. The first photograph should be taken looking directly down on the plot. The second photo should be taken at a low angle with the horizon positioned close to the top of the picture.

5.3 Sampling Equipment Required

Equipment required to conduct the multi-species assessment includes:

- Digital camera/ smartphone
- Quadrat / sampling frame
- Robel's pole
- Measuring tape
- Assessment sheets
- Pencils

5.4 Using the Assessment Sheets

At least one assessment should be completed on each representative ecosite within a field or management unit.

On each graph, simply circle the habitat attribute result from your sample measurements. Where transects or multiple measurements are taken within a field or ecosite, circle the high, low and average values on the assessment sheet.

Note that assessment sheets display all species to which each attribute is important and the graphics are not stratified by ecoregion. Therefore, following the field assessment it will be necessary to use the earlier sections of this guide determine which species have the potential to occur on your ecosite within your ecoregion.

Also note that habitat attributes differ somewhat for some species between ecoregions. Following the field assessment, it will be necessary to refer to the attribute graphics stratified by ecoregion to ensure attributes are within the optimal or suboptimal range for a specific species in the given ecosite. Gradients, rather than discrete delineations, are displayed on the graphics in the assessment sheet in situations where habitat attributes differ between ecoregions for a species.

Multi – Species at Risk Habitat Assessment Score Sheet can be found at the end of the guide, starting on page 111, in Appendix B.

6 WHAT DO THE HABITAT ATTRIBUTE ASSESSMENTS TELL YOU?

The multi-species habitat assessment will determine the type of habitat currently existing on a property. This information can be used in conjunction with the rest of the guide to determine which species at risk are likely to use different portions of the property.

The assessment also provides information on how much habitat variability is present on the property, and therefore the overall number of species at risk that it has the potential to support. The assessment does not provide information on how many individuals of a species a property will support.

Using this information, the land manager is then able to make annual and long-term management decisions that may increase habitat for species at higher risk or to increase habitat variability to support a greater number of species.

6.1 Habitat Attributes Unique to an Individual Species

For species at risk to thrive, it is important to manage for all habitat attributes important to a species. Not all habitat attributes are required by multiple species. In many cases, a species has at least some unique habitat requirements that should be considered when managing habitat to benefit that species. Therefore we have included basic habitat attribute information (Appendix B) adapted from Saskatchewan PCAP's guides to individual species at risk habitat attributes (SK PCAP 2017, 2018a&b, 2019a&b, 2020a,b&c, unpublished), the Rancher's Stewardship Alliance Inc.'s Prairie Beef and Biodiversity project (RSAI 2014), and information from the South of the Divide Conservation Action Program's Results Based programming. The information provided is based on a combination of empirical data and expert opinion.

The maps provided give an indication of where suitable habitat may be expected. The majority of maps are based on predicted suitable habitat models provided by the Saskatchewan Ministry of Environment (unpublished). These maps are not intended to be a definitive statement on the presence, absence or status of a species within a given area, or as a substitute for onsite surveys. Models predict if a species might occur in areas based on characteristics of the landscape and species observations. In situations where predictive habitat models were not available for a species, Critical Habitat maps or species occurrence maps were used.

7 CONCLUSION

As threats to grasslands continue to increase, whether from economic pressures or climate change, the remaining grasslands need to provide quality habitat, which may be more important than the quantity of suitable habitat available for species at risk survival and recovery. Landowners and managers are in the best position to manage multiple habitats for the effective maintenance and recovery of multiple species. Using Species-Habitat Networks that link multiple species and habitat resources, in this case ecosites, are intended to help land managers support the conservation and recovery of species at risk. This method is meant to be complimentary to other existing or developing methods as it deals with actual habitat attributes of the species, which may not be included in other methods. Each land manager will decide what works best for their land and this multi-species at risk habitat attribute guide is another tool in their tool kit for grassland management.

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9 GLOSSARY

Altered Landscapes – physical and living elements of the landscape that have been anthropogenically changed (i.e., changed by humans) from their original composition.

Bare ground – soil surface that is not covered by vegetation (including biocrust), rocks, or litter

Biocrust – the community of lichens, mosses and cyanobacteria that live on the soil surface

Ecosite – Society for Range Management (1989) defined an ecological site (or ecosite) as: "A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and to respond to management." Differences in physical site factors, such as topography, soil texture, and soil moisture regime, create different environments for plant growth.

Grassbank – a tool that incentivizes ranchers to adopt conservation practices on their property in exchange for grazing access on another property.

Habitat attributes – commonly physical vegetation, water, soil and/or topography parameters, but may also include such attributes as configuration of land cover, block size, and presence/absence of human infrastructure.

Habitat Management – actions that influence land and its associated resources/features, (e.g., successional stage of plant communities, physical structure of vegetation, vegetation species diversity and the physical, chemical and biological components of soil) to maintain species in suitable habitats within their natural geographic distribution

Habitat quality – the ability of the environment to provide conditions appropriate for persistence of individuals and populations.

Litter – layer of mainly dead plant material, including standing stems, fallen stems and leaf material, and partially decomposed plant material at the mineral soil surface.

Optimal habitat – Habitat that is the best or most favourable and therefore selected for by individuals of a species.

Resource quality – a resource is a substance that is required by a living organism for normal growth, maintenance, and reproduction, such as food, water and shelter. Optimal habitat has high quality resources, such as calorie and nutrient dense food, accessible clean water and territories in vegetation that meets the needs of the species with limited competition. Suboptimal habitat has low quality resources such as less calorie and nutrient dense food, limited water and vegetation that does not meet the needs of the species.

Soil infiltration – the soil's ability to allow water movement into and through the soil profile, allowing the soil to temporarily store water, making it available for uptake by plants and soil organisms.

Species-Habitat Networks – a multi-species conservation approach that explicitly links multiple species and habitat resources, provides tools to estimate the importance of a particular species or specific habitat in a given landscape, and quantifies emerging properties of entire habitat networks.

Suboptimal habitat –Lower quality resources accepted by individuals of a species. Suboptimal habitat may not maximize the reproductive success of the individual but may be important for supporting the overall population of a species.

Sympatric species – two related species or populations are considered sympatric when they exist in the same geographic area and thus frequently encounter one another.

Zonal Ecosite – ecosites that best reflect the regional climate and are least influenced by the local topography and/or soil properties.

10 APPENDIX A – RANGE OF OPTIMAL AND SUBOPTIMAL VALUES BY SPECIES AND ECOREGION

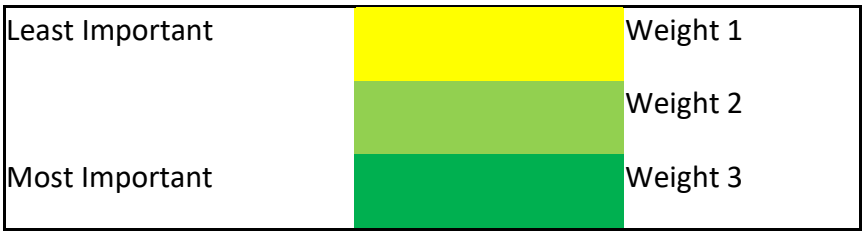


Figure 23. Weights of habitat attributes legend.

Weights for Baird's Sparrow, Chestnut Collared-Longspur and Sprague's Pipit are derived from empirical data analysis. Weights for all other species are based on expert opinion.

Ecoregion	Mixed Grassland											
Attribute	Bare Ground (% Cover)		Litter (estimated lbs/ac)		Standing Dead Grass (% Foliar Cover)		Vegetation Height (cm)		Visual Obstruction Reading (cm)		Shrub Cover (%)	
	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal
Baird's Sparrow	0 - 30	30 - 40	260 - 890	160 - 260 OR 890 - 990	30 - 70	25 - 30 OR 70 - 80	13 - 38	8 - 13 OR 35 - 44	5 - 15	3 - 5 OR 15 - 17	0 - 5	5 - 10
Sprague's Pipit	0 - 30	30 - 40	300 - 900	200 - 300 OR 900 - 1000	35 - 70	25 - 35 OR 70 - 80	15 - 32	11 - 15 OR 30 - 35	2 - 12	0 - 2 OR 12 - 14	0 - 30	30 - 40
Chestnut Collared Longspur	40 - 80	30-40 OR 80-85	0 - 200	200 - 300	0 - 20	20 - 30	1 - 12	12 - 15	0 - 1	1 - 2	0 - 3	3 - 5
Thick-billed Longspur	65 - 90	55 - 65	0 - 10	10 - 45	0 - 4	4 - 6	1 - 7	7 - 9	0		0	0 - 1
Burrowing Owl	variable (see individual species attributes)		n/a	n/a	n/a	n/a	variable (see individual species attributes)		n/a	n/a	0 - 1	
Greater Sage Grouse	0 - 10		n/a	n/a	n/a	n/a	> 18	14 - 18	n/a	n/a	10 - 25	7 - 10 OR 25 - 30
Loggerhead Shrike	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30	
Piping Plover	n/a	n/a	n/a	n/a	n/a	n/a	10 - 45		n/a	n/a	n/a	n/a
Swift Fox	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30		11 - 12	9 - 11	0 - 30	
Little Brown Bat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northern Leopard Frog	n/a	n/a	400 - 600	200 - 400 OR 600 - 800	n/a	n/a	15 - 30		n/a	n/a	n/a	n/a
Monarch Butterfly	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

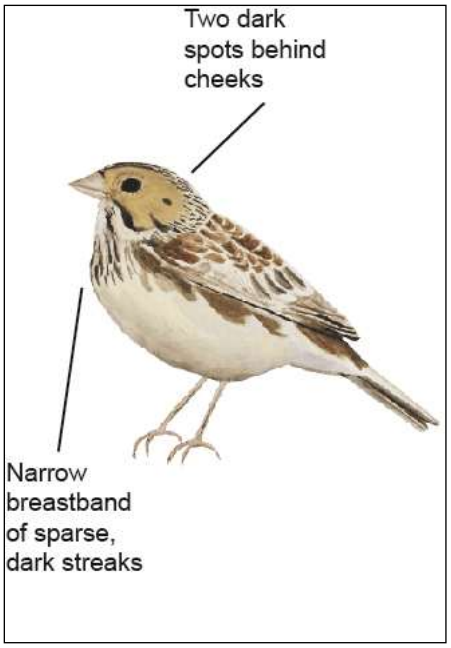
Ecoregion	Moist Mixed Grassland											
Attribute	Bare Ground (% Cover)		Litter (estimated lbs/ac)		Standing Dead Grass (% Foliar Cover)		Vegetation Height (cm)		Visual Obstruction Reading (cm)		Shrub Cover (% Foliar Cover)	
	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal
Baird's Sparrow	5 - 30	0 - 5 OR 30 - 40	260 - 890	160 - 260 OR 890 - 990	60 - 80	40 - 60	12 - 32	8 - 12 OR 32 - 35	3 - 16	1 - 3 OR 16 - 19	0 - 5	5 - 10
Sprague's Pipit	0 - 30	30 - 40	300 - 900	200 - 300 OR 900 - 1000	35 - 80	25 - 35	5 - 25	2 - 5 OR 25 - 35	0 - 2	2 - 5	15 - 45	10 - 15 OR 45 - 50
Chestnut Collared Longspur	40 - 80	30-40, 80-85	0 - 200	200 - 300	0 - 20	20 - 30	1 - 4	4 - 7	5 - 11	4 - 5 OR 11 - 12	0 - 2	2 - 3
Burrowing Owl	variable (see individual species attributes)		n/a	n/a	n/a	n/a	variable (see individual species attributes)		n/a	n/a	0 - 1	
Loggerhead Shrike	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30	
Piping Plover	n/a	n/a	n/a	n/a	n/a	n/a	10 - 45		n/a	n/a	n/a	n/a
Little Brown Bat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northern Leopard Frog	n/a	n/a	400 - 600	200 - 400 OR 600 - 800	n/a	n/a	15 - 30		n/a	n/a	n/a	n/a
Monarch Butterfly	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

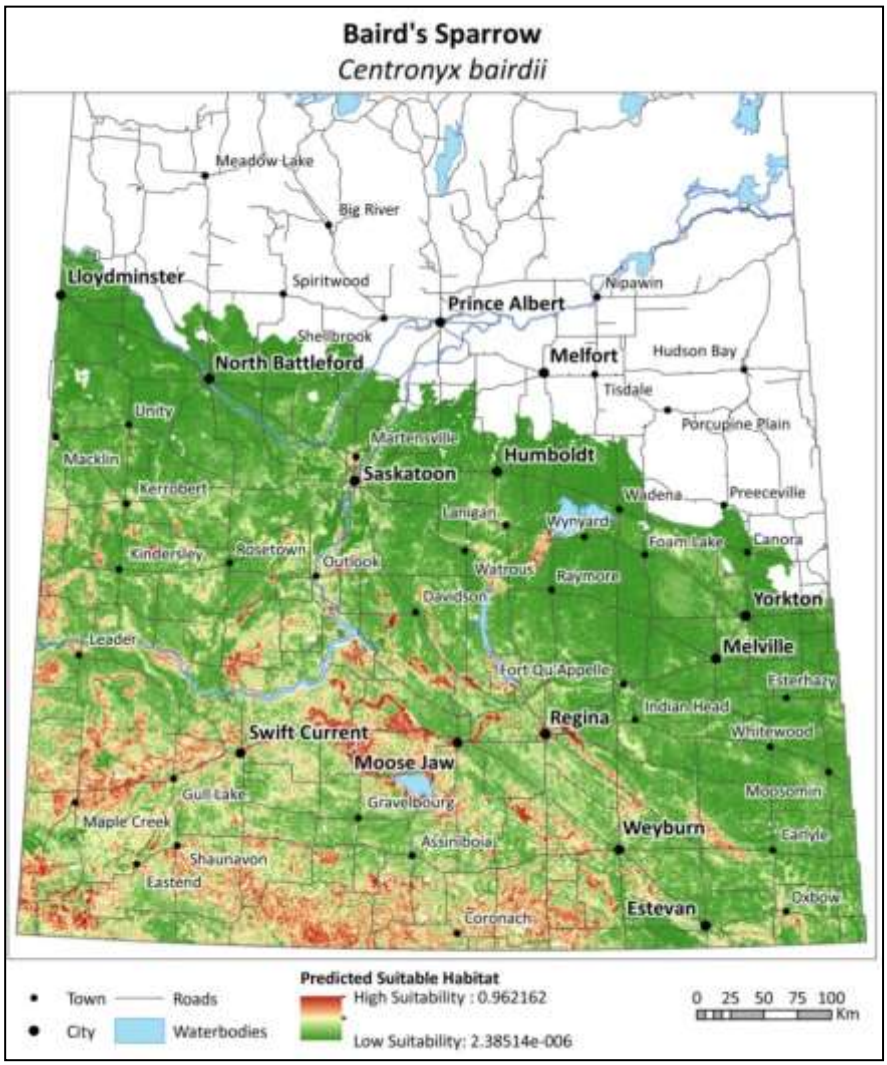
Ecoregion	Cypress Uplands											
Attribute	Bare Ground (% Cover)		Litter (estimated lbs/ac)		Standing Dead Grass (% Foliar Cover)		Vegetation Height (cm)		Visual Obstruction Reading (cm)		Shrub Cover (% Foliar Cover)	
	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal
Baird's Sparrow	5 - 30	0 - 5 OR 30 - 40	260 - 890	160 - 260 OR 890 - 990	60 - 80	40 - 60	12 - 32	8 - 12 OR 32 - 35	3 - 16	1 - 3 OR 16 - 19	0 - 5	5 - 10
Sprague's Pipit	0 - 30	30 - 40	300 - 900	200 - 300 OR 900 - 1000	35 - 80	25 - 35	5 - 25	2 - 5 OR 25 - 35	0 - 2	2 - 5	15 - 45	10 - 15 OR 45 - 50
Chestnut Collared Longspur	40 - 80	30-40, 80-85	0 - 200	200 - 300	0 - 20	20 - 30	1 - 4	4 - 7	5 - 11	4 - 5 OR 11 - 12	0 - 2	2 - 3
Thick-billed Longspur	65 - 90	55 - 65	0 - 10	10 - 45	0 - 4	4 - 6	1 - 7	7 - 9	0		0	0 - 1
Burrowing Owl	variable (see individual species attributes)		n/a	n/a	n/a	n/a	variable (see individual species attributes)		n/a	n/a	0 - 1	
Loggerhead Shrike	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30	
Piping Plover	n/a	n/a	n/a	n/a	n/a	n/a	10 - 45		n/a	n/a	n/a	n/a
Swift Fox	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30		11 - 12	9 - 11	0 - 30	
Little Brown Bat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northern Leopard Frog	n/a	n/a	400 - 600	200 - 400 OR 600 - 800	n/a	n/a	15 - 30		n/a	n/a	n/a	n/a
Monarch Butterfly	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Ecoregion	Aspen Parkland											
Attribute	Bare Ground (% Cover)		Litter (estimated lbs/ac)		Standing Dead Grass (% Foliar Cover)		Vegetation Height (cm)		Visual Obstruction Reading (cm)		Shrub Cover (% Foliar Cover)	
	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal	Optimal	Suboptimal
Baird's Sparrow	5 - 30	0 - 5 OR 30 - 40	260 - 890	160 - 260 OR 890 - 990	60 - 80	40 - 60	12 - 32	8 - 12 OR 32 - 35	3 - 16	1 - 3 OR 16 - 19	0 - 5	5 - 10
Sprague's Pipit	0 - 30	30 - 40	300 - 900	200 - 300 OR 900 - 1000	35 - 80	25 - 35	5 - 25	2 - 5 OR 25 - 35	0 - 2	2 - 5	15 - 45	10 - 15 OR 45 - 50
Chestnut Collared Longspur	40 - 80	30-40, 80-85	0 - 200	200 - 300	0 - 20	20 - 30	1 - 4	4 - 7	5 - 11	4 - 5 OR 11 - 12	0 - 2	2 - 3
Burrowing Owl	variable (see individual species attributes)		n/a	n/a	n/a	n/a	variable (see individual species attributes)		n/a	n/a	0 - 1	
Loggerhead Shrike	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30	
Piping Plover	n/a	n/a	n/a	n/a	n/a	n/a	10 - 45		n/a	n/a	n/a	n/a
Swift Fox	n/a	n/a	n/a	n/a	n/a	n/a	0 - 30		11 - 12	9 - 11	0 - 30	
Little Brown Bat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northern Leopard Frog	n/a	n/a	400 - 600	200 - 400 OR 600 - 800	n/a	n/a	15 - 30		n/a	n/a	n/a	n/a
Monarch Butterfly	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

11 APPENDIX B – HABITAT SUITABILITY AND ATTRIBUTES FOR INDIVIDUAL SPECIES AT RISK

11.1.1 Baird's Sparrow





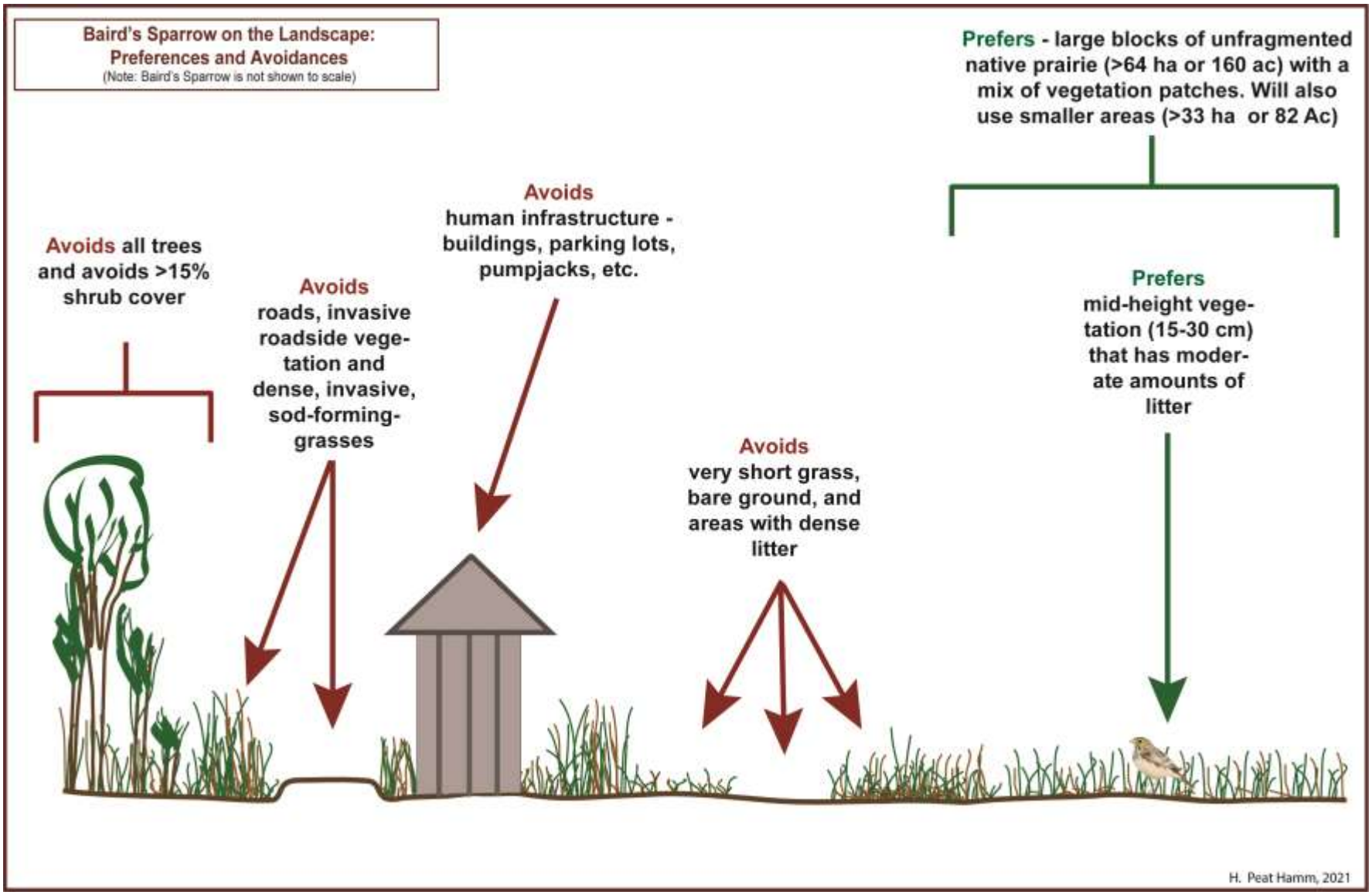
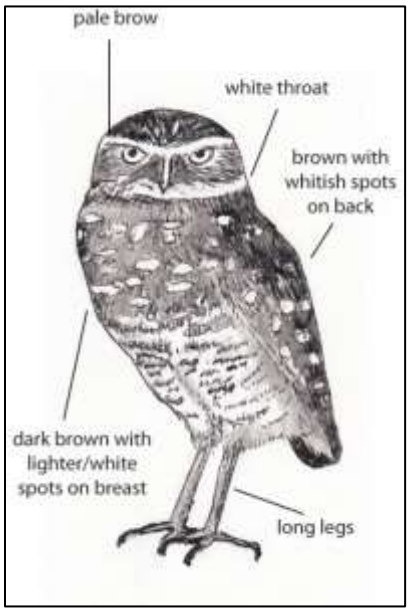
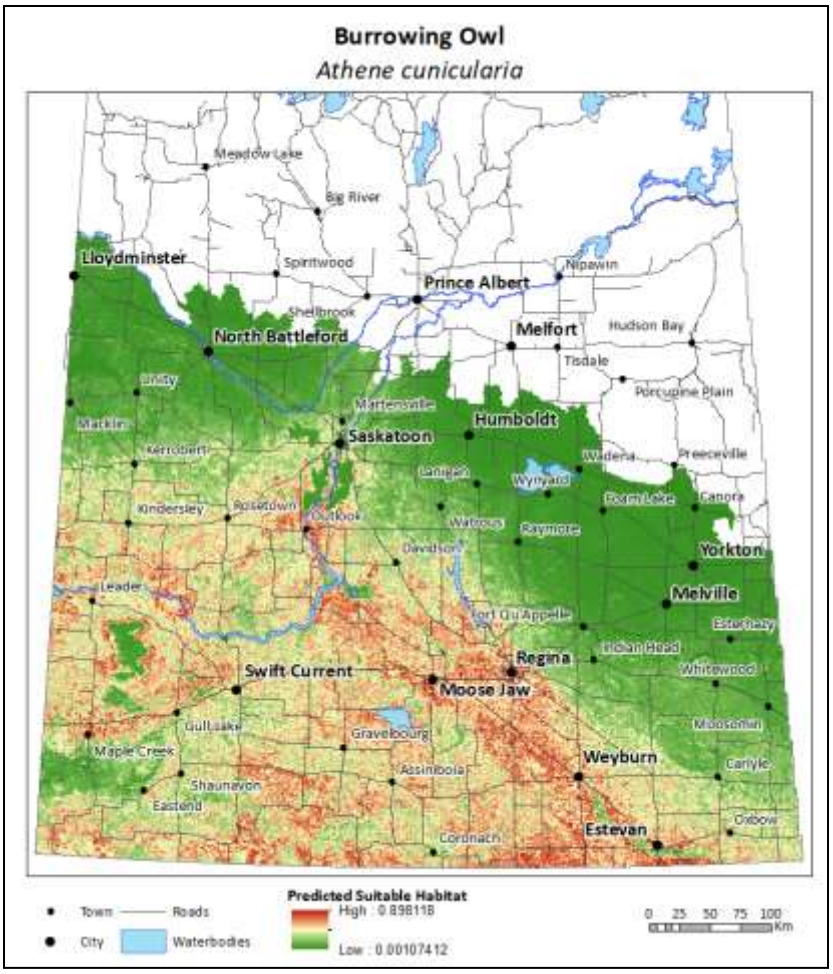

Baird's Sparrow on the Landscape:
Preferences and Avoidances
(Note: Baird's Sparrow is not shown to scale)
Prefers - large blocks of unfragmented native prairie (>64 ha or 160 ac) with a mix of vegetation patches. Will also use smaller areas (>33 ha or 82 Ac)
Avoids all trees and avoids >15% shrub cover
Avoids roads, invasive roadside vegetation and dense, invasive, sod-forming-grasses
Avoids human infrastructure - buildings, parking lots, pumpjacks, etc.
Avoids very short grass, bare ground, and areas with dense litter
Prefers mid-height vegetation (15-30 cm) that has moderate amounts of litter
H. Peat Hamm, 2021

Table 17. Optimal habitat targets for Baird's Sparrows.

Habitat	Habitat Feature	Habitat Target
Landscape Scale Habitat	Land Cover	70-100% grassland within minimum 400 m radius optimal; 50-70% grassland within minimum 400 m radius suboptimal
	Topography	Optimal slope <9% (5 degrees); suboptimal slope 11-16% (6-9 degrees)
	Soil Type	Fine textured Solonetzic and Chernozemic soils
	Woody Vegetation	<20% shrub cover AND <15% tree cover
Site Scale Habitat	Patch Size	>64 ha (160 ac) optimal; suboptimal 14-64 ha (35-160 ac)
	Plant Community	Native grassland is optimal; tame grassland with vegetation structure similar to native grassland in the same ecoregion is suboptimal
	Shrub Cover	<15% optimal; 15-25% suboptimal
	Vegetation Height	Mixed Grassland: 13-38 cm optimal; 8-13 cm OR 35-44 cm suboptimal All other ecoregions: 12-32 cm optimal; 8-12 OR 32-35 cm suboptimal
	Visual Obstruction Reading	Mixed Grassland: 5-15 cm optimal; 3-5 cm OR 15-17 cm suboptimal All other ecoregions: 3-16 cm optimal; 1-3 OR 16-19 cm suboptimal
	Dead (Residual) Grass Cover	Mixed Grassland: 30-70% optimal; 25-30% OR 70-80% suboptimal All other ecoregions: 60-80% optimal; 40-60% suboptimal
	Litter (Estimated lb/ac)	260-890 lb/ac optimal; 160-260 OR 890-990 lb/ac suboptimal
	Bare Soil Cover	Mixed Grassland: <30% optimal; 30-40% suboptimal All other ecoregions: 5-30% optimal; 0-5% OR 30-40% suboptimal
	Range Condition	Good to Excellent optimal; Fair suboptimal
	Habitat Edge	>200 m from edge is optimal; 100-200 m from edge is suboptimal
	Infrastructure	>400 m from human infrastructure such as buildings, oil wells, etc.

11.1.2 Burrowing Owl





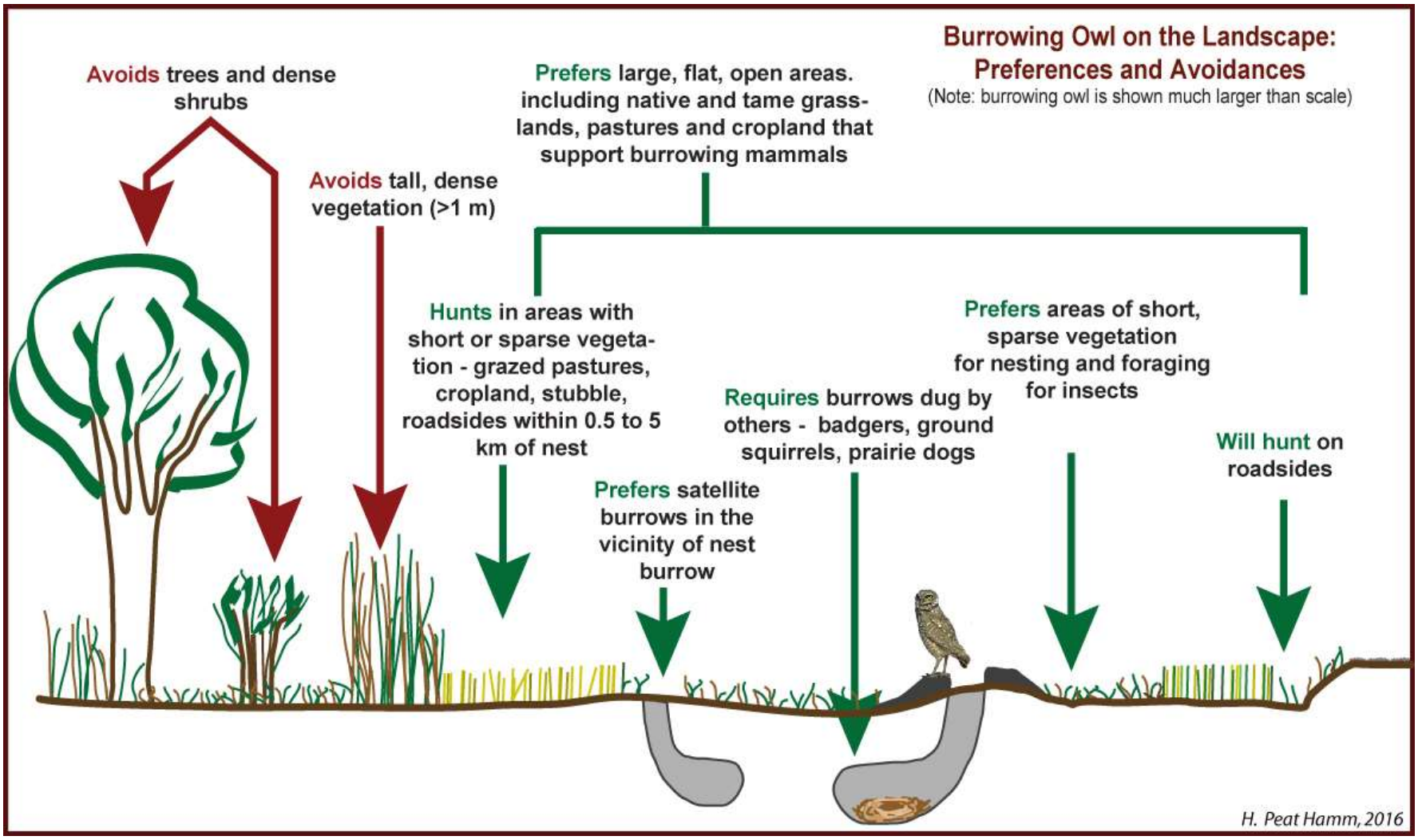
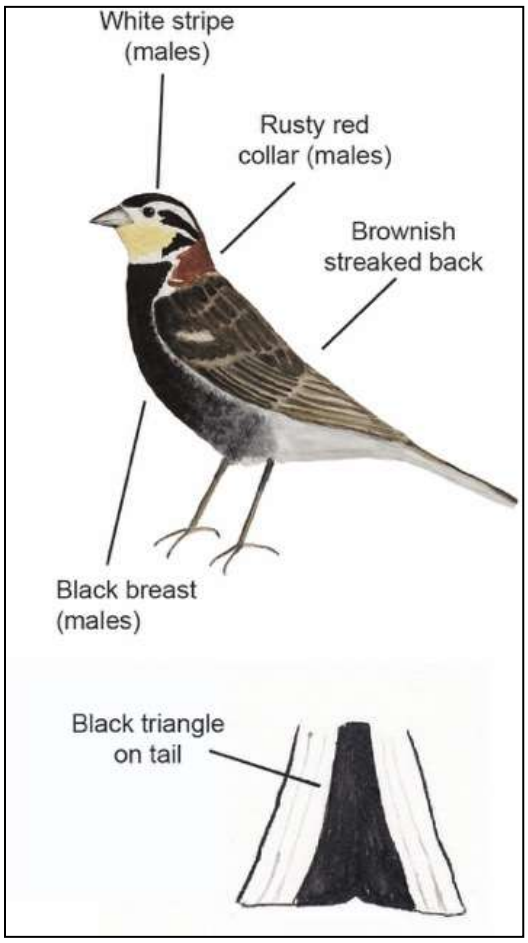
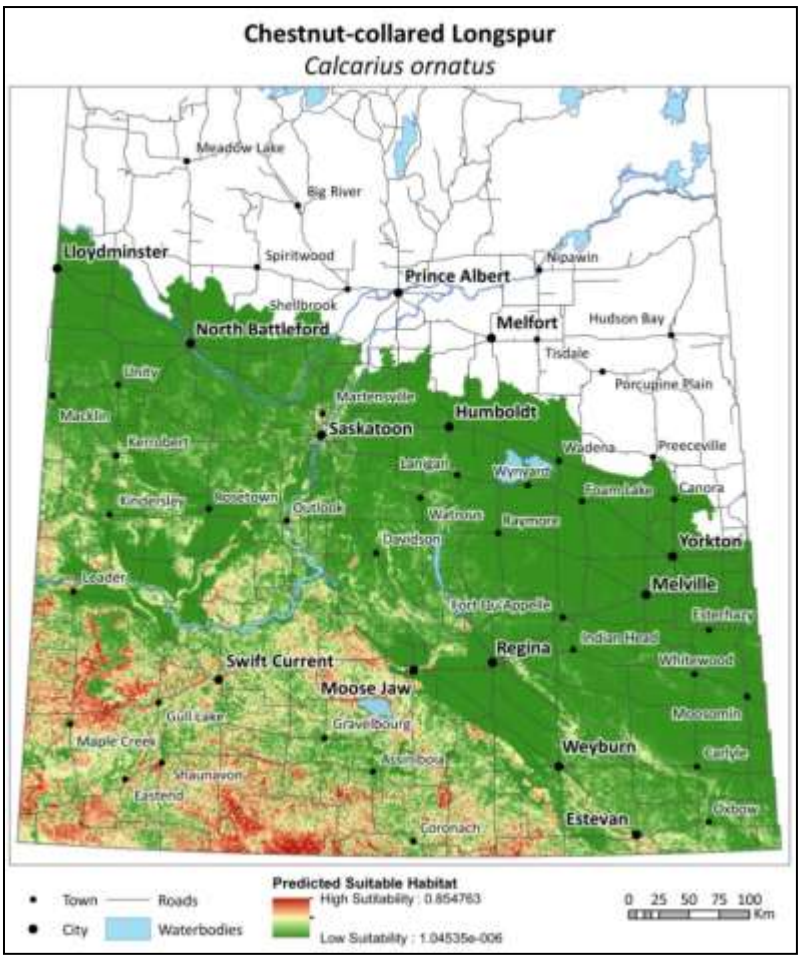

Burrowing Owl on the Landscape:
Preferences and Avoidances
(Note: burrowing owl is shown much larger than scale)
Avoids trees and dense shrubs
Avoids tall, dense vegetation (>1 m)
Prefers large, flat, open areas. including native and tame grass-lands, pastures and cropland that support burrowing mammals
Hunts in areas with short or sparse vegeta-tion - grazed pastures, cropland, stubble, roadsides within 0.5 to 5 km of nest
Prefers satellite burrows in the vicinity of nest burrow
Requires burrows dug by others - badgers, ground squirrels, prairie dogs
Prefers areas of short, sparse vegetation for nesting and foraging for insects
Will hunt on roadsides
H. Peat Hamm, 2016

Table 18. Optimal habitat targets for Burrowing Owls.

Habitat	Spatial Scale	Habitat Target
Burrow (nest or satellite)	5-10 m radius	Vegetation < 10 cm high Bare Ground approximately 50%
Foraging sites	10-50 m radius around nest burrows	Mix of lush, moist vegetation and short, sparse vegetation in close proximity. (Native grassland: maintain heterogeneity Stubble: maintain litter Cropland: leave unplanted strips Hayland/Roadsides: leave unharvested strips)
Diurnal nest territory	75-250 m radius around nest burrow	Mix of lush, moist vegetation and short, sparse vegetation in moderate or close proximity
Nocturnal foraging	Up to approximately 1500 m (1.5 km) from the nest burrow	Mix of lush, moist vegetation and short, sparse vegetation. May exist on a broad scale.

11.1.3 Chestnut-collared Longspur





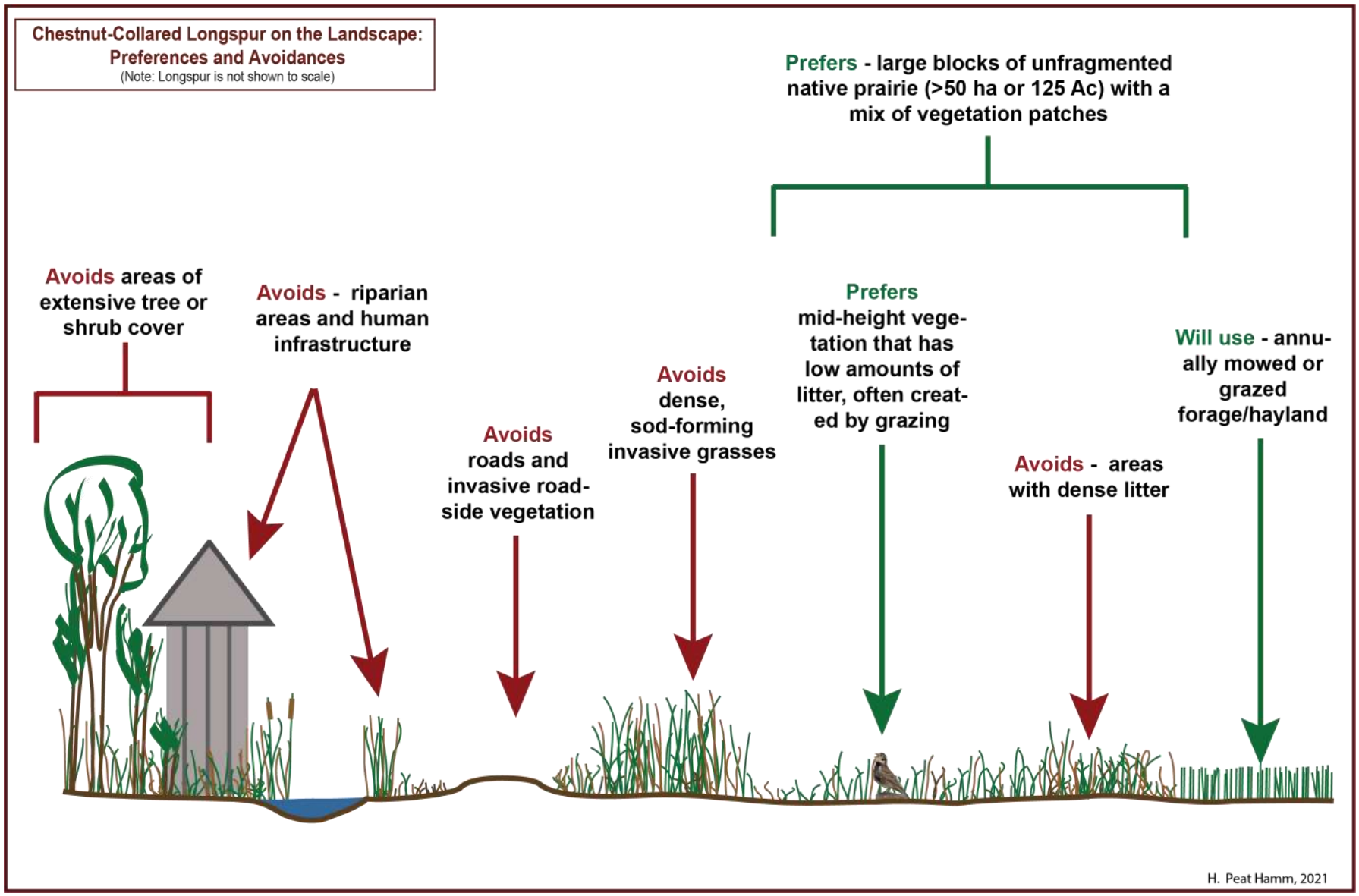
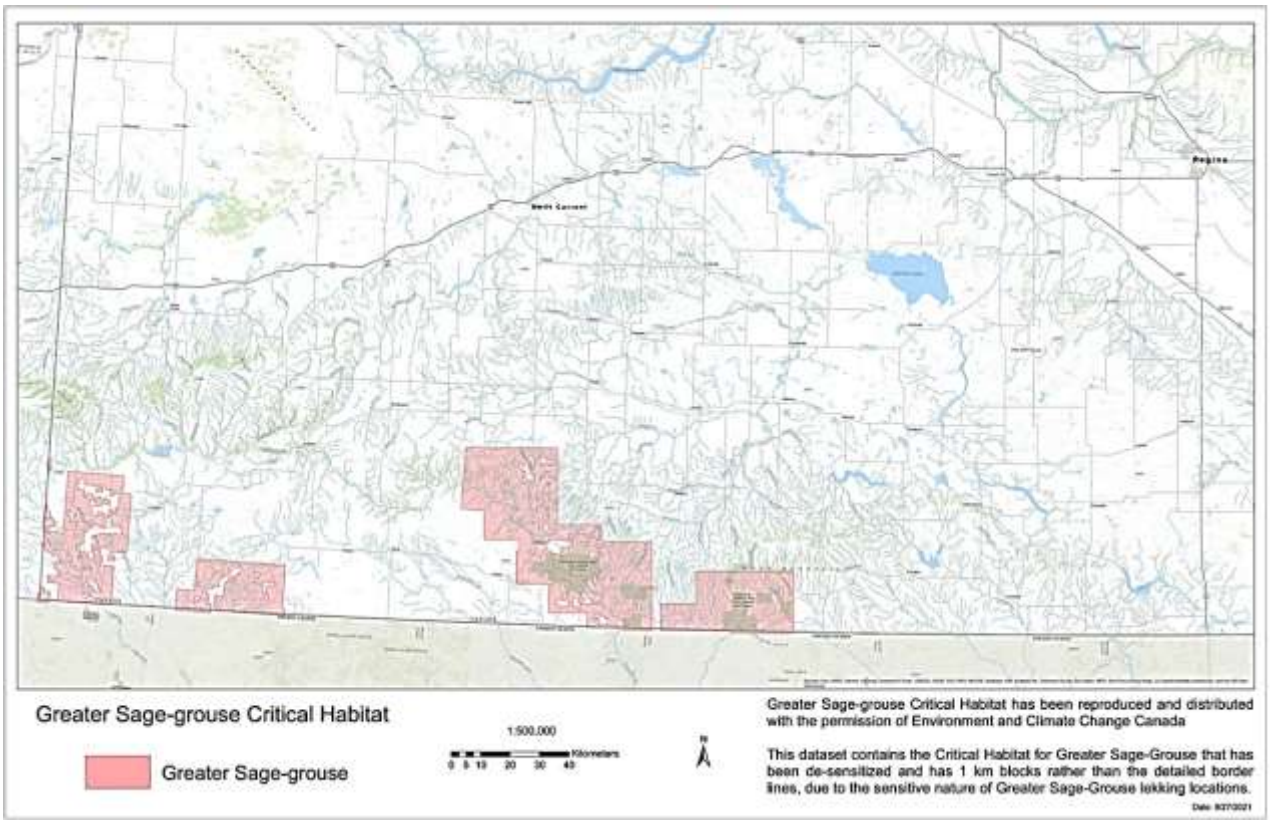

Chestnut-Collared Longspur on the Landscape:
Preferences and Avoidances
(Note: Longspur is not shown to scale)
Prefers - large blocks of unfragmented native prairie (>50 ha or 125 Ac) with a mix of vegetation patches
Avoids areas of extensive tree or shrub cover
Avoids - riparian areas and human infrastructure
Avoids roads and invasive road-side vegetation
Avoids dense, sod-forming invasive grasses
Prefers mid-height vege-tation that has low amounts of litter, often creat-ed by grazing
Avoids - areas with dense litter
Will use - annu-ally mowed or grazed forage/hayland
H. Peat Hamm, 2021

Table 19. Optimal habitat targets for Chestnut-collared Longspurs.

Habitat	Habitat Feature	Habitat Target
Landscape Scale Habitat	Land Cover	70-100% grassland within minimum 400 m radius optimal; 50-70% grassland within minimum 400 m radius suboptimal
	Topography	Optimal slope <14% (8 degrees); suboptimal slope 15-27% (9-15 degrees)
	Soil Type	Solonetzic and loamy Chernozemic soils
	Woody Vegetation	<20% shrub cover AND 0% tree cover
Site Scale Habitat	Patch Size	>64 ha (160 ac) optimal; suboptimal 18-64 ha (45-160 ac)
	Plant Community	Native grassland with less than 15% cover of invasive tame forages is optimal; tame grassland with vegetation structure similar to native grassland in the same ecoregion or native grassland with more than 15% cover of invasive tame grasses is suboptimal
	Shrub Cover	Mixed Grassland: 0-3% optimal; 3-25% suboptimal All other ecoregions: 0-2% optimal; 2-3% suboptimal
	Vegetation Height	Mixed Grassland: 1-12 cm optimal; 12-15 cm suboptimal All other ecoregions: 1-4 cm optimal; 4-7 cm suboptimal
	Visual Obstruction Reading	Mixed Grassland: 2-12 cm optimal; 0-2 cm OR 12-14 cm suboptimal All other ecoregions: 0-1 cm optimal; 1-2 cm suboptimal
	Residual (Dead) Grass Cover	10-20% optimal; 20-30% suboptimal
	Litter (estimated lb/ac	0-200 lb/ac optimal; 200-300 lb/ac suboptimal
	Bare Soil Cover	40-80% optimal; 30-40 OR 80-85% suboptimal
	Range Condition	Fair to Good optimal; Poor or Excellent suboptimal
	Habitat Edge	>200 m from edge is optimal; 100-200 m from edge is suboptimal
	Infrastructure	>400 m from human infrastructure such as buildings, oil wells, etc.

11.1.4 Greater Sage Grouse



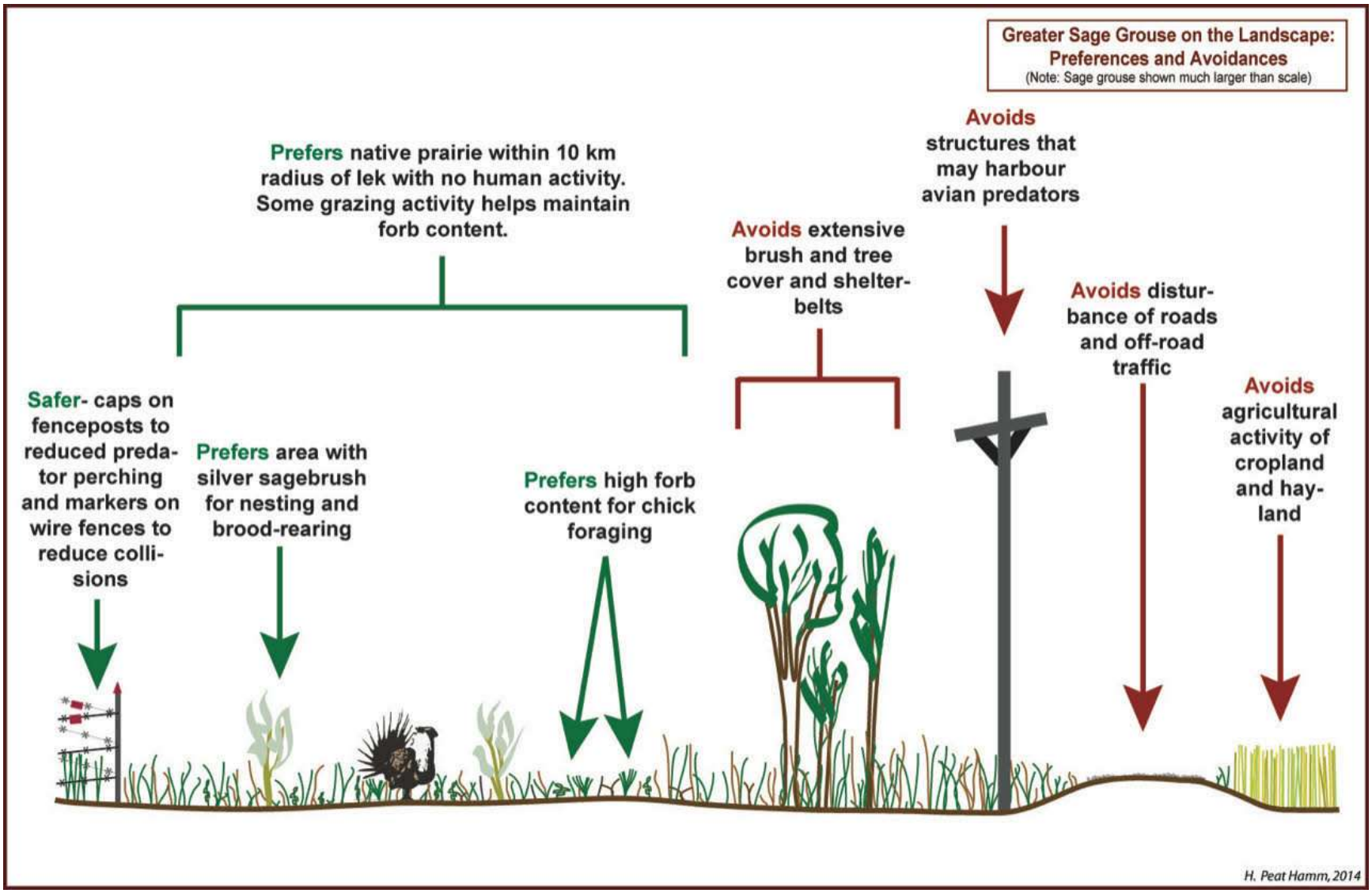
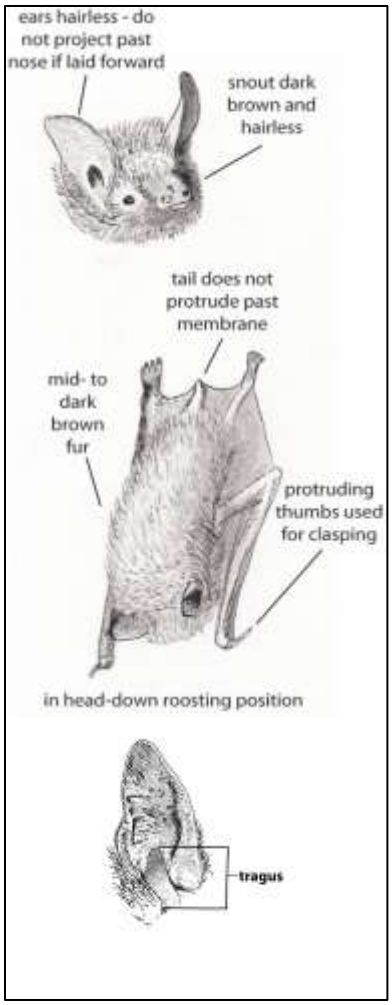
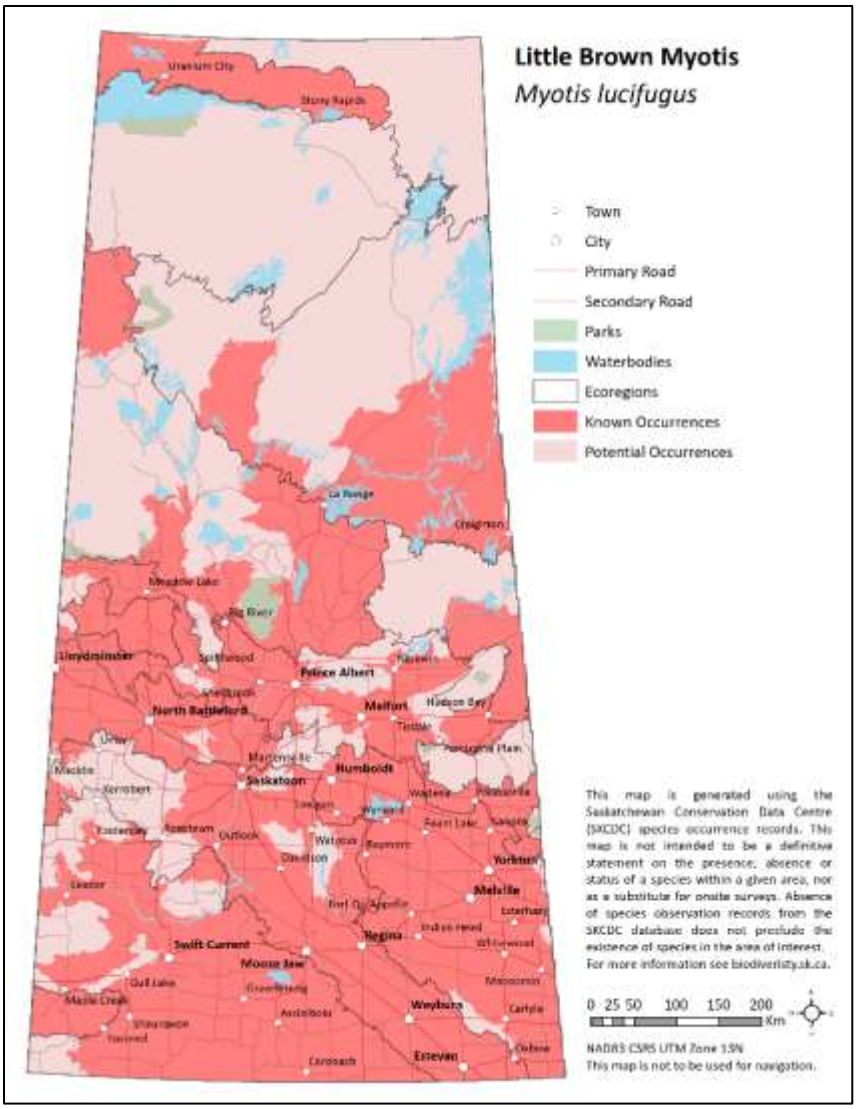

Greater Sage Grouse on the Landscape:
Preferences and Avoidances
(Note: Sage grouse shown much larger than scale)
Prefers native prairie within 10 km radius of lek with no human activity. Some grazing activity helps maintain forb content.
Avoids structures that may harbour avian predators
Avoids extensive brush and tree cover and shelter-belts
Avoids distur-bance of roads and off-road traffic
Avoids agricultural activity of cropland and hay-land
Safer- caps on fenceposts to reduced preda-tor perching and markers on wire fences to reduce colli-sions
Prefers area with silver sagebrush for nesting and brood-rearing
Prefers high forb content for chick foraging
H. Peat Hamm, 2014

Table 20. Optimal habitat targets for Greater Sage Grouse.

Life Stage	Critical Dates for SK	Area Requirements	Diet	Optimal Habitat Targets (related to protection from predators and availability of food)
Breeding / Lekking	March-April	.04-16 ha	Sagebrush	• Adjacent Sagebrush • Distance to sonic and physical disturbance (5-18 km) • Proximity to trees and other tall structures (3 km)
Nesting	April – mid-May	Average 7850 ha Max 70,600 ha	Sagebrush	• Canopy cover SB (7-25%) • Height SB (30-80 cm = 12-30”) • Height grass/forb (> 18 cm = 7”) • Canopy cover grass (>10%) • Canopy cover forb (>5% • Forb availability relative to site potential (>7% overflow; >8% upland) • Exposed soil (<10%)
	Mid-May - June		Forbs and insects	
Brood Rearing	June		Insects (first week of life for chicks)	• Canopy cover SB (10-25%) • Height SB (40-80 cm = 15-30”) • SB proximity • Canopy cover grass/forb (15%) • Forb availability relative to site potential (>7% overflow; >8% upland) • Exposed soil <10%
	July - Sept		Forbs	
Overwintering	Dec. – Feb.		Sagebrush	• Canopy cover SB (exposed above snow) – 10-30% • Height SB (exposed above snow) 25-35 cm = 10-14”

11.1.5 Little Brown Bat





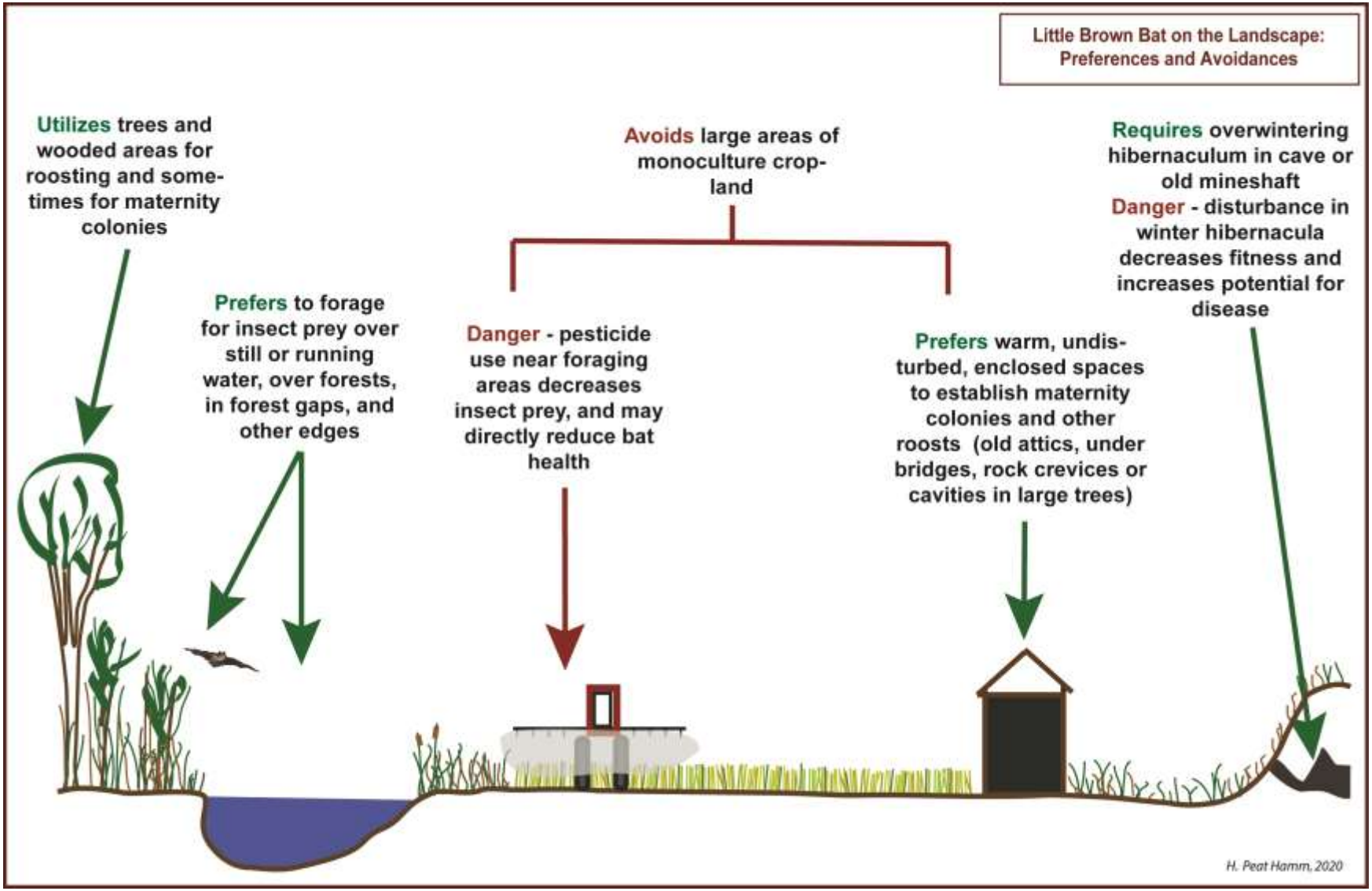

Little Brown Bat on the Landscape:
Preferences and Avoidances
Utilizes trees and wooded areas for roosting and sometimes for maternity colonies
Prefers to forage for insect prey over still or running water, over forests, in forest gaps, and other edges
Avoids large areas of monoculture cropland
Danger - pesticide use near foraging areas decreases insect prey, and may directly reduce bat health
Prefers warm, undisturbed, enclosed spaces to establish maternity colonies and other roosts (old attics, under bridges, rock crevices or cavities in large trees)
Requires overwintering hibernaculum in cave or old mineshaft
Danger - disturbance in winter hibernacula decreases fitness and increases potential for disease
H. Peat Hamm, 2020

Table 21. Critical dates for Little Brown Bats in Saskatchewan.

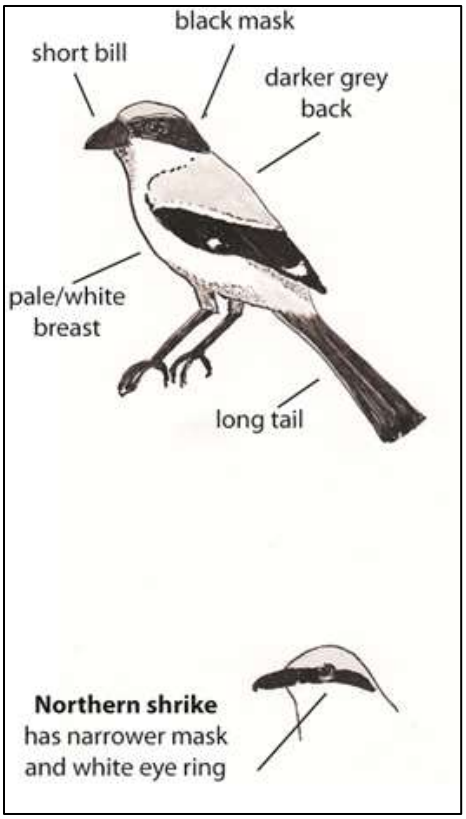
Life Stage	Critical dates
Emergence from winter hibernacula	• Late April to early June • Females emerged before males in MB study: females early May, males late May • Females in better shape (body fat) emerge earlier than those that are not. • Move to summer habitat or maternity colony sites – the time between emergence and arriving in maternity colonies can take up to 6 weeks
Brood-rearing	• Pups born early June to late July (earlier in warmer areas of the province) • Pups weaned at ~26 days; during lactation, females need close access to foraging areas to be able to return and feed pups.
Foraging	• Males migrate and roost in separate locations from maternity colonies, spending their entire summer in foraging habitat. • Key foraging period for females is during lactation when time is a constraint (need to feed pups between foraging trips). Critical time to have good prey biomass available. • Key foraging period for males is late summer when they produce mature sperm cells requiring high energy. • Flying juveniles emerge mid-July to August.
Swarming	• Begin moving to hibernacula • Late summer/fall (August), prior to settling into hibernacula; individuals may swarm at sites different from the hibernation site. • Breeding occurs during this period
Re-enter winter hibernacula	• September - October

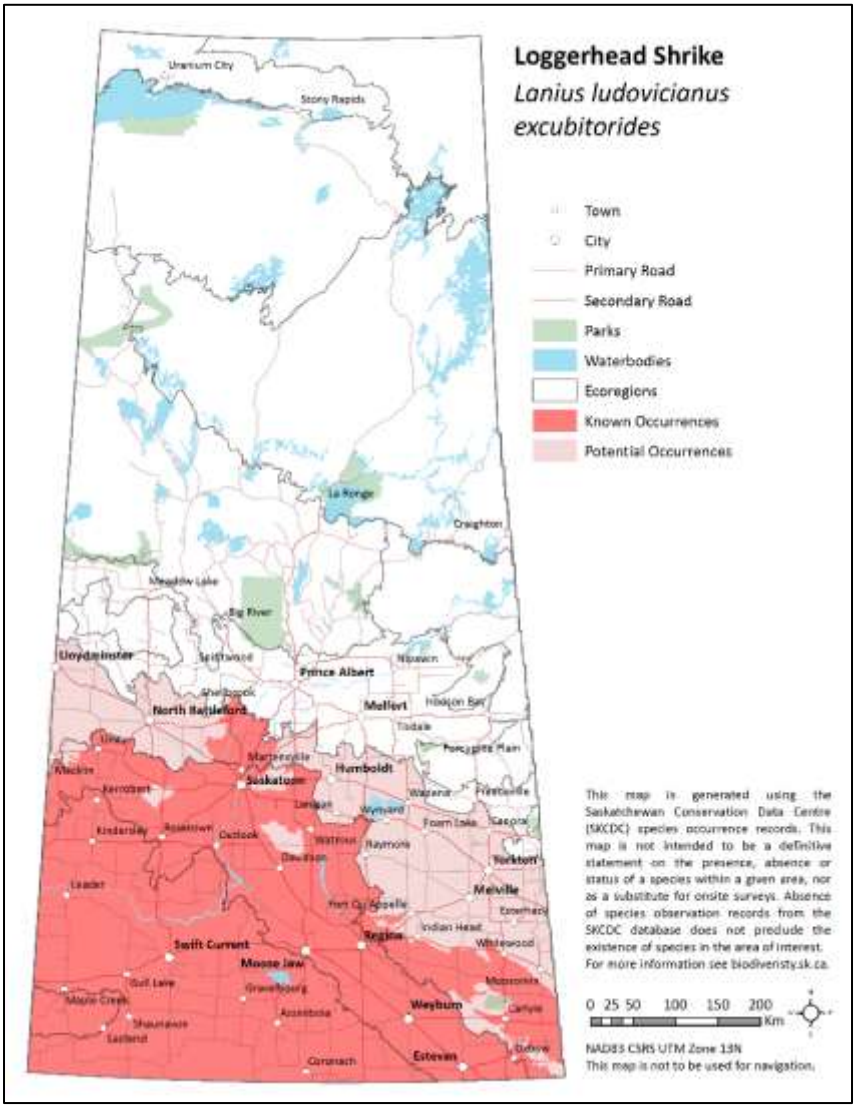
Table 22. Optimal habitat targets for Little Brown Bats.

<table>
<tr><th>Seasonal Habitat Feature</th><th>Habitat Feature</th><th colspan="2">Habitat Target</th></tr>
<tr><td>Overwintering</td><td>Hibernacula</td><td colspan="2">Rock crevices, caves or abandoned mines; internal temperatures between 0 and 13°C; humidity ≥90%</td></tr>
<tr><td colspan="2">Summer Home Range Size</td><td colspan="2">Variable, but can be quite large – up to several thousand ha. Commonly travel 6-8 km from summer roosts when foraging.</td></tr>
<tr><td colspan="2"></td><td>Grassland Ecoregions</td><td>Forest Ecoregions</td></tr>
<tr><td rowspan="3">Summer Roosts</td><td rowspan="2">Woody vegetation</td><td>Woody vegetation is not critical in grassland ecoregions but is used if available. Deciduous trees (Trembling Aspen, Balsam Poplar and other cottonwoods) in towns, farmyards, graveyards, etc. old enough to support roosting cavities</td><td>Trees such as Balsam Poplar and Trembling Aspen with advanced heart rot creating hollow space inside the tree trunk</td></tr>
<tr><td colspan="2">Optimal # of roosts available: ≥ 10
Suboptimal # of roosts: 5-10</td></tr>
<tr><td>Cavity or</td><td colspan="2">Very small openings to roosting cavities. Not larger than about 3</td></tr>
</table>

Seasonal Habitat Feature	Habitat Feature	Habitat Target	
	chamber entrances	cm in diameter.	
		Optimal: > 2 m above ground level Suboptimal: 1.5-2 m above ground level	
	Other natural roost locations	Rock crevices, possibly rock outcrops	
	Anthropogenic structures	Buildings (occupied or unoccupied), bridges and bat houses	
	Exposure	Full sunlight on roosts	
Foraging	Water bodies	Permanent still waterbodies or slow-moving watercourses within about 2 km of summer roosts	
		At minimum 3m long by 1 m wide	
		Free of emergent vegetation and surface debris	
		Free from obstacles such as fences	
		Sheltered from wind	
	Land cover (Landscape scale)	Optimal: Native grassland Suboptimal: Tame pasture	Optimal: Mixedwood forests (White spruce, Trembling Aspen, Balsam Poplar) Suboptimal: Deciduous forests
	Habitat types (Site scale)	Optimal: Riparian areas and water Suboptimal: Forest openings, transitions between land cover types, shelterbelts, fencerows, roadsides and other structural vegetation edges.	
	Vegetation buffers	≥200 m of perennial vegetation from crop or forest treated with insecticide (including neonicotinoids and biological control agents)	
	Artificial light sources	Optimal: Free of artificial light sources, especially those that shine throughout the night. Suboptimal: lights within the yellow spectrum, fixtures that direct light downward and reduce light spillage, timer-controlled light.	
	Distance to highways and active logging haul roads	≥ 200 m from foraging area to minimize light and noise disturbance and dust ≥2 km from maternity roosts and other primary roosts	
	Distance to industrial infrastructure	≥ 200 m from foraging area or roosts to minimize light and noise disturbance	

11.1.6 Loggerhead Shrike





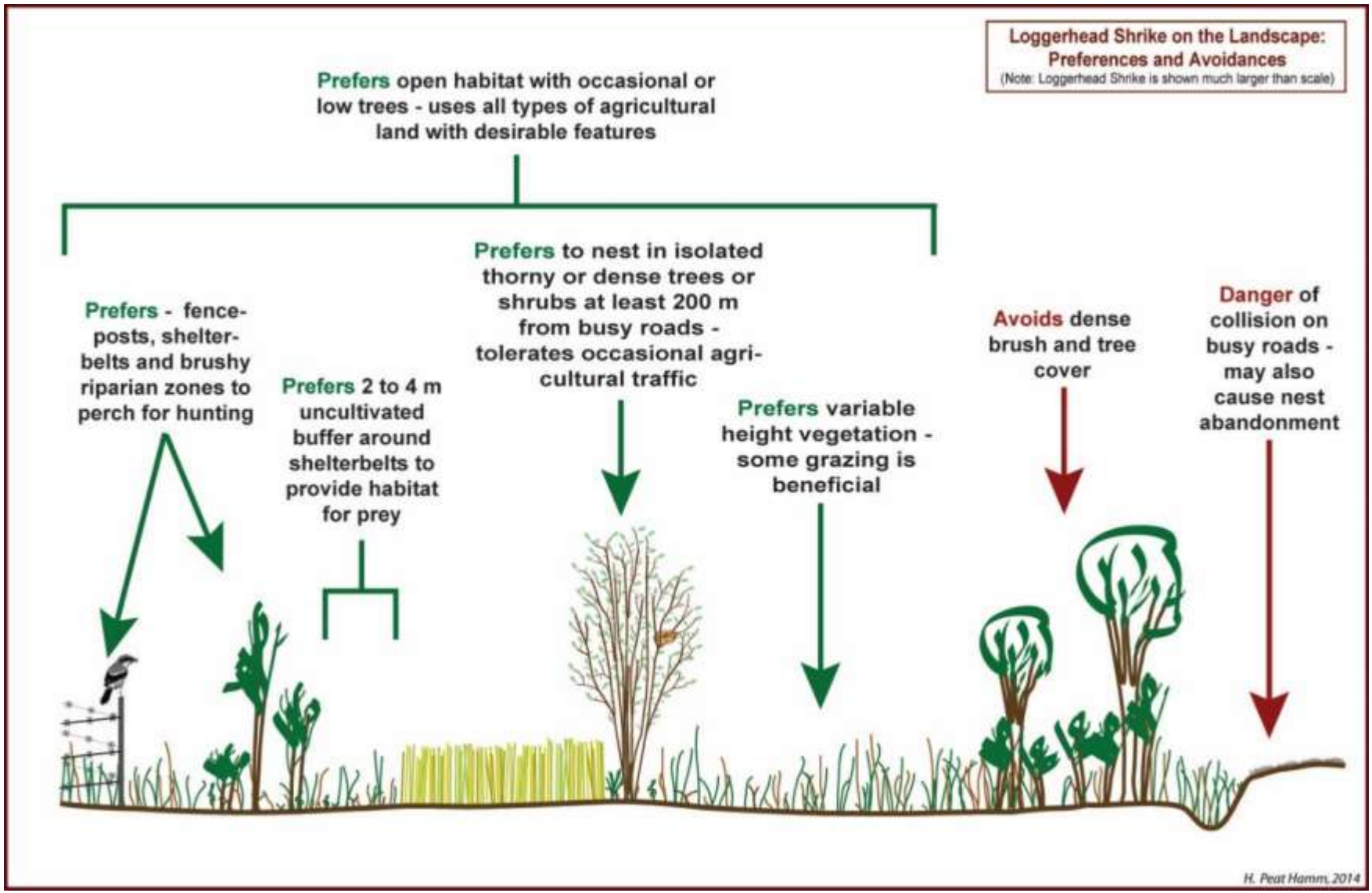

Loggerhead Shrike on the Landscape:
Preferences and Avoidances
(Note: Loggerhead Shrike is shown much larger than scale)
Prefers open habitat with occasional or low trees - uses all types of agricultural land with desirable features
Prefers - fence-posts, shelter-belts and brushy riparian zones to perch for hunting
Prefers 2 to 4 m uncultivated buffer around shelterbelts to provide habitat for prey
Prefers to nest in isolated thorny or dense trees or shrubs at least 200 m from busy roads - tolerates occasional agri-cultural traffic
Prefers variable height vegetation - some grazing is beneficial
Avoids dense brush and tree cover
Danger of collision on busy roads - may also cause nest abandonment
H. Peat Hamm, 2014

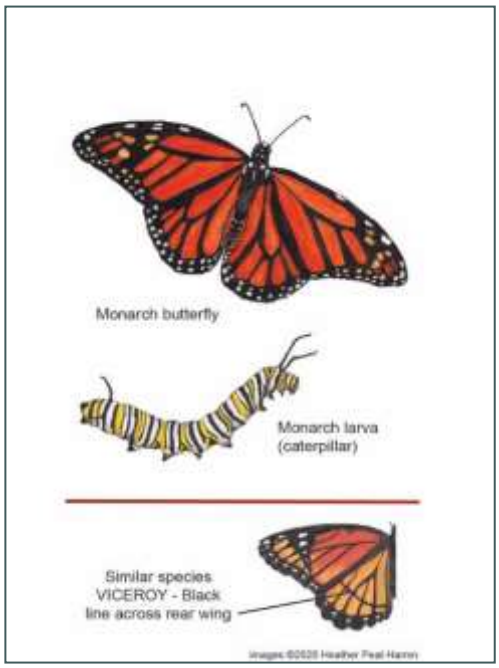
Table 23. Critical dates for Loggerhead Shrikes in Saskatchewan.

Life Stage	Critical dates
Breeding	Arrive late April, early May
Nesting	Nest building commonly occurs in late May. Incubation 5-17 days – early June to early July; 16-20 days to fledging – mid July to early August.
Brood-rearing	Fledglings fed for another 30 days by parents. Dispersal occurs mid-late August. Migration occurs early September.

Table 24. Optimal habitat targets for Loggerhead Shrikes.

Habitat	Spatial Scale	Habitat Target
Landscape	Landscape	Aeolian dunes supporting shrub savannah; glacial outwash plain supporting linear riparian shrubland
		Sparse, patchy or linear shrubland with shrubs > 2 m high
		Woody vegetation <30% cover
		At least 2 vegetation cover types, one of which must be dispersed shrubs >2 m high
Site - Nesting Habitat	10 m radius of nest; 200 m radius of nest for sight lines	No obstruction of sight lines for at least 200 m from the nest on at least 3 sides
		Nesting shrub >2 m high with dense foliage and/or thorny branches
		Woody vegetation within 10 m of the nest on average <2 m high
		Minimum of 5 perches higher than the surrounding vegetation within 10 m of the nest
		Understory index (vegetation % cover X herbaceous vegetation height in cm) of <10 within 10 m of the nest
Site - Foraging Habitat	Territory (6 to 50 ha); 400 m radius of nest	Dispersed native or introduced shrubs with a large, contiguous area of native grassland within 400 m of the nest
		Cover of shrubs > 2 m high within 400 m (linear or dispersed) of the nest 1- 5% if the density distribution consists of classes 4-6; or less than 30% if the density distribution consists of classes 7-10.
		Herbaceous vegetation with a heterogeneous structure ranging from 10-45 cm high within 400 m of the nest
		If foraging habitat is primarily cropland, a small buffer of permanent cover adjacent to nesting habitat: 2-4 m or more for shelterbelts; 10 m or more for linear riparian shrubland.

11.1.7 Monarch Butterfly



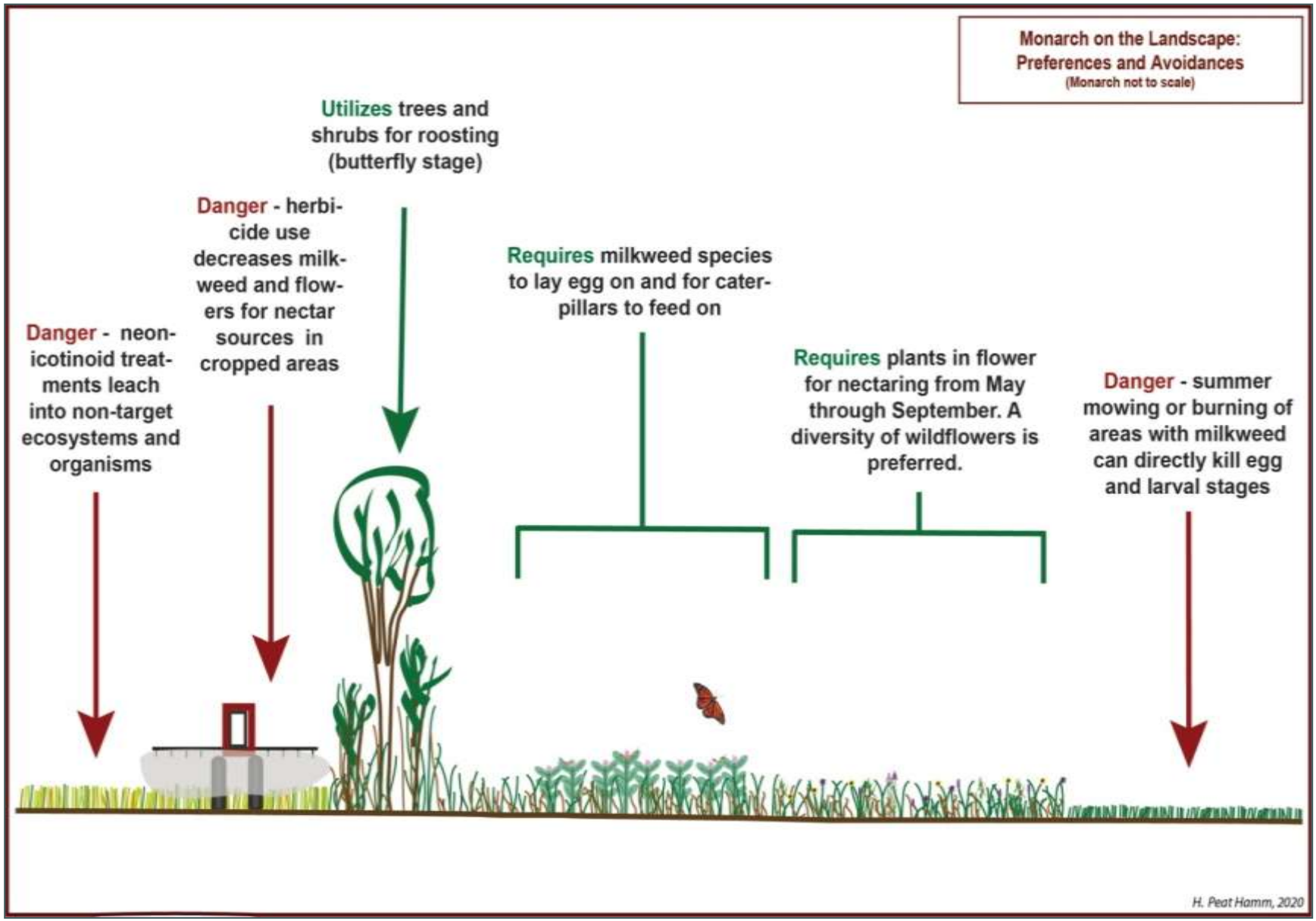

Monarch on the Landscape:
Preferences and Avoidances
(Monarch not to scale)
Utilizes trees and shrubs for roosting (butterfly stage)
Danger - herbicide use decreases milkweed and flowers for nectar sources in cropped areas
Requires milkweed species to lay egg on and for caterpillars to feed on
Danger - neonicotinoid treatments leach into non-target ecosystems and organisms
Requires plants in flower for nectaring from May through September. A diversity of wildflowers is preferred.
Danger - summer mowing or burning of areas with milkweed can directly kill egg and larval stages
H. Peat Hamm, 2020

Table 25. Critical dates for Monarch Butterflies in Saskatchewan.

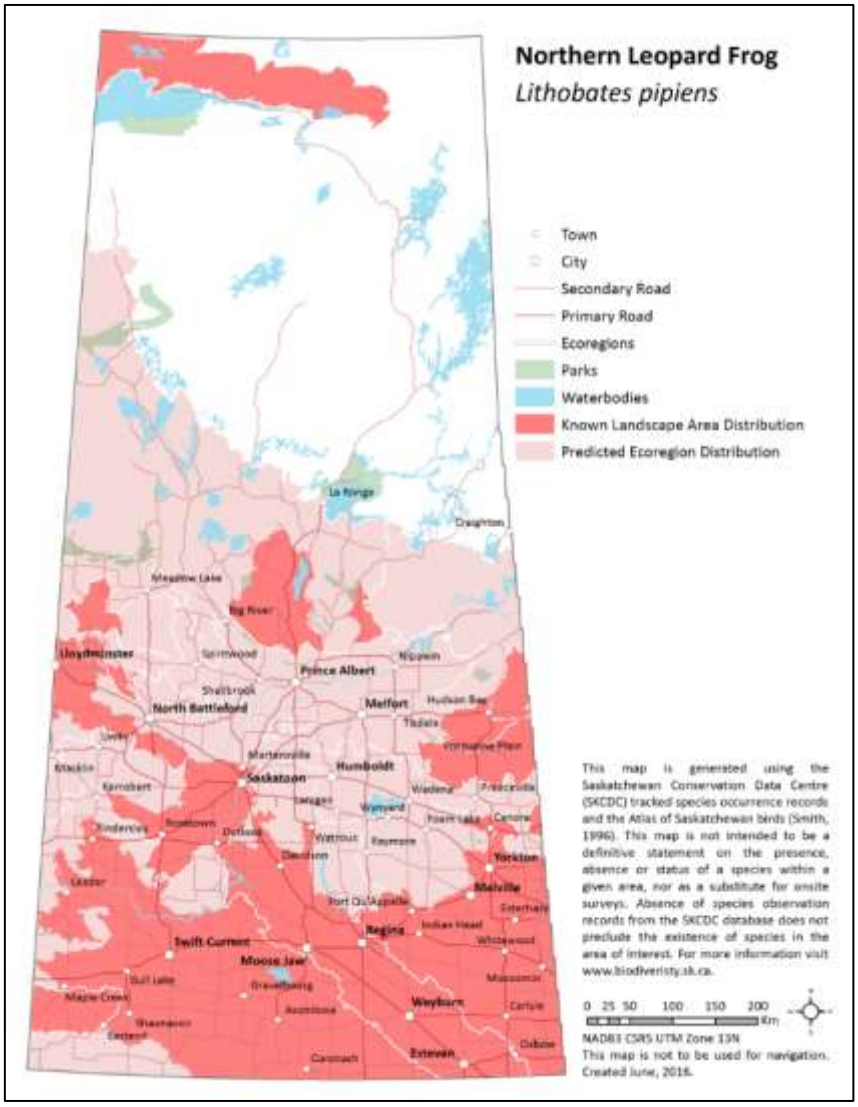
Month	Critical Dates
May - June	Monarchs may reach Saskatchewan as early as late May and begin nectaring and breeding.
July	Monarchs begin laying eggs. Caterpillars feed on milkweeds. Larval stage takes 8-15 days to complete all five instar stages.
August	There may be Monarchs in all life stages during this period.
August - September	Monarchs begin staging, shifting metabolic activity from reproduction to storing energy for migration. The timing of migration depends largely on annual weather patterns and can begin as early as late July.

Table 26. Optimal habitat targets for Monarch Butterflies.

Habitat Features	Habitat Targets		
	Natural Habitat	**Agricultural Habitat**	**Restored Habitat**
Breeding Habitat (Egg Laying and Larval Stages)			
Patch Configuration	Optimal: Many small patches (≤5m^2) of milkweed Suboptimal: Large patches of milkweed	Optimal: Many small patches (≤16m^2) of milkweed Suboptimal: Large patches of milkweed	Optimal: Many small patches (≤5m^2) of milkweed Suboptimal: Large patches of milkweed
	Optimal: Milkweed patches shaded on one side by trees, topography or structures Suboptimal: Milkweed patches not shaded		
Habitat Isolation	Optimal: Suitable milkweed patches separated by not more than 7 km Suboptimal: Suitable milkweed patches separated by 7-15 km		
Native Milkweed Density	Optimal: >0.15 stems/m^2	Optimal: 0.5-2 stems/m^2 Suboptimal: 0.12-0.49 stems/m^2	Optimal: >0.15 stems/m^2
Native Milkweed Abundance	More than 10 stems/patch of any combination of native milkweed species		
Native Milkweed Diversity	Optimal: 2 species of milkweed/patch Suboptimal: 1 species of milkweed/patch		
Nectaring Forb Abundance	Optimal: Milkweed patches containing > 8 nectaring plants additional to milkweed Suboptimal: Milkweed patches containing 4-8 nectaring plants additional to milkweed		

Vegetation buffers	Optimal: Milkweed patches surrounded by at least 200 m of perennial herbaceous vegetation Suboptimal: Milkweed patches surrounded by 38-200 m of perennial herbaceous vegetation	N/A	N/A
Nectaring Habitat (Adult Foraging)			
Nectaring Forb Diversity	Optimal: ≥ 6 species blooming between May 15 and July 1 AND ≥ 10 species blooming between July 1 and September 30 Suboptimal: 2-5 species blooming between May 15 and July 1 AND/OR 4-9 species blooming between July 1 and September 30		
Blooming Forb Frequency	Optimal: 6-16 stems/m^2 Suboptimal: 4-6 OR 16-25 stems/m^2		
Vegetation Buffers	Optimal: Nectaring patches surrounded by at least 200 m of perennial herbaceous vegetation Suboptimal: Nectaring patches surrounded by 38 - 200 m of perennial herbaceous vegetation	N/A	N/A
Migrating and Staging Habitat (Adult Migrating)			
Nectaring Forb Diversity	Optimal: ≥6 stems/m^2 of high quality, late blooming nectar plants Suboptimal: 4-6 stems/m^2 of high quality, late blooming nectar plants		
Roosting Locations	Optimal: Occasional sheltered shrubs or trees within 1 km of late season nectaring habitat		

11.1.8 Northern Leopard Frog



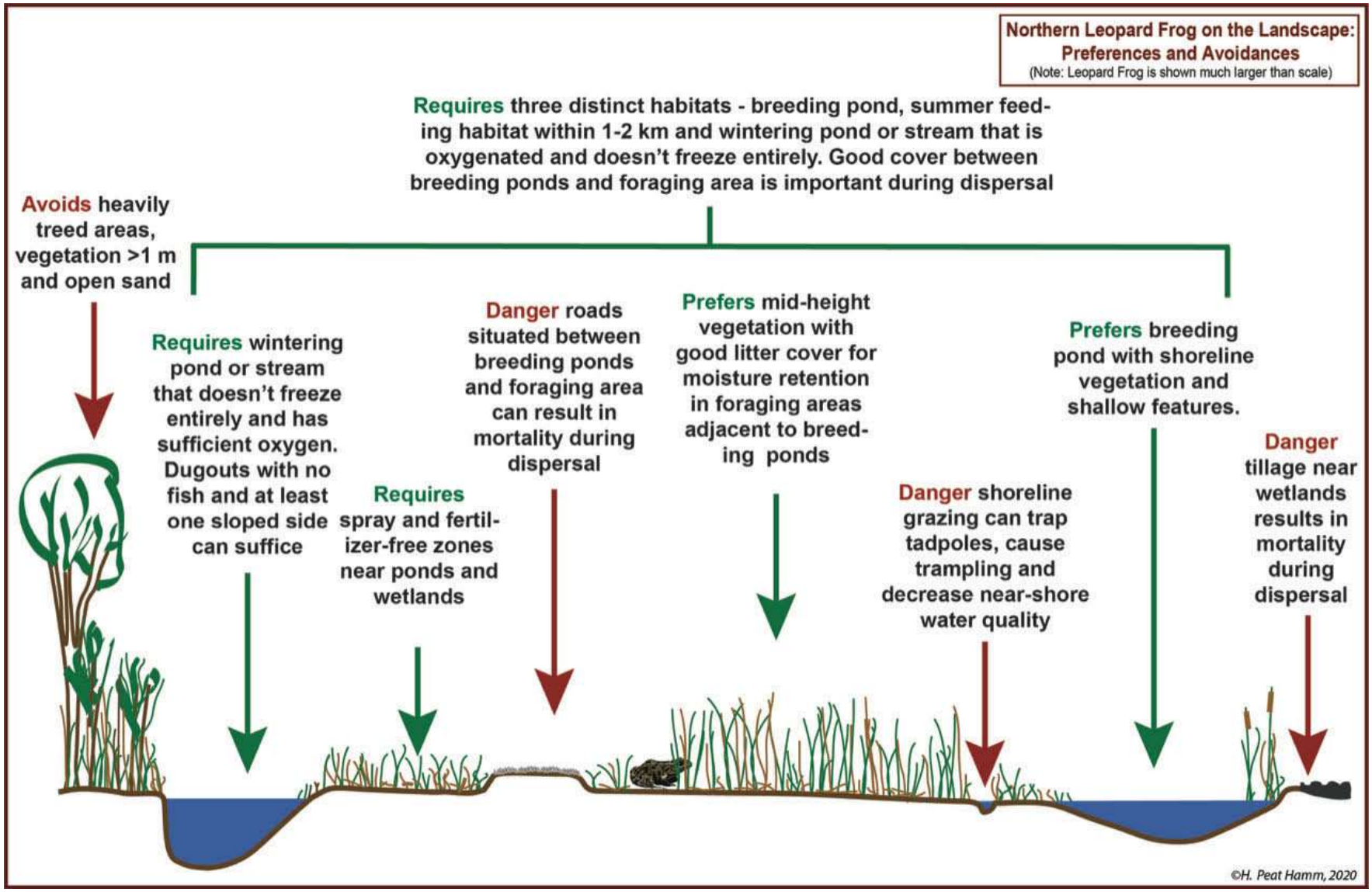

Northern Leopard Frog on the Landscape:
Preferences and Avoidances
(Note: Leopard Frog is shown much larger than scale)
Requires three distinct habitats - breeding pond, summer feeding habitat within 1-2 km and wintering pond or stream that is oxygenated and doesn't freeze entirely. Good cover between breeding ponds and foraging area is important during dispersal
Avoids heavily treed areas, vegetation >1 m and open sand
Requires wintering pond or stream that doesn't freeze entirely and has sufficient oxygen. Dugouts with no fish and at least one sloped side can suffice
Requires spray and fertilizer-free zones near ponds and wetlands
Danger roads situated between breeding ponds and foraging area can result in mortality during dispersal
Prefers mid-height vegetation with good litter cover for moisture retention in foraging areas adjacent to breeding ponds
Danger shoreline grazing can trap tadpoles, cause trampling and decrease near-shore water quality
Prefers breeding pond with shoreline vegetation and shallow features.
Danger tillage near wetlands results in mortality during dispersal
©H. Peat Hamm, 2020

Table 27. Critical dates for Northern Leopard Frogs in Saskatchewan.

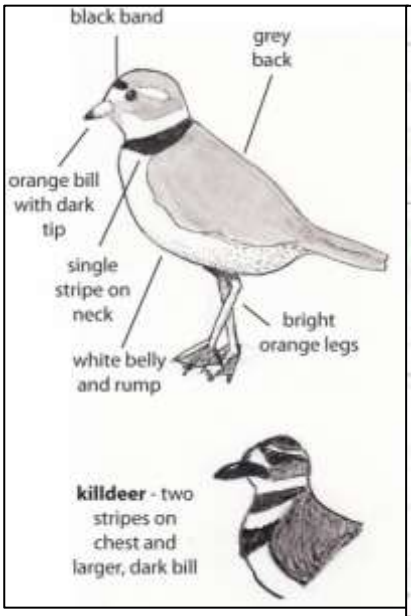
Life Stage	Critical dates for SK
Breeding	Late April to June. At higher elevations and latitudes, breeding occurs later in the season. Eggs take ~ 4-30 days to hatch.
Metamorphosis	Late July to September. 60 to 90 days after hatching.
Dispersal of Young of Year	Late July to September.
Foraging	Adults – May to early October; Young of Year – Late July to early October.
Overwintering	Early October to April. Move to overwintering waterbodies and eventually into hibernation.

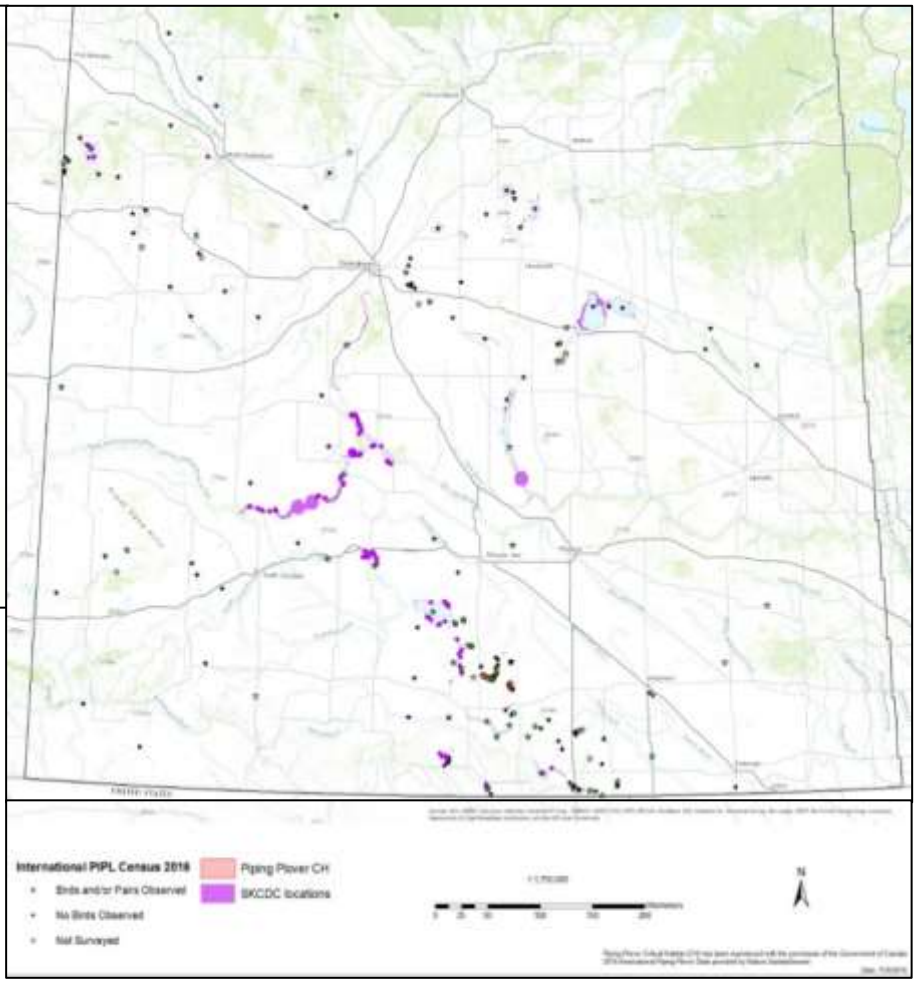
Table 28. Optimal habitat targets for Northern Leopard Frogs.

Habitat	Temporal Scale	Habitat Target
Overwintering Habitat	Early October - late April	Waterbody with inflow or throughflow of water, or standing water >4m deep
		Dissolved oxygen content of water 8 ppm or higher
		Waterbody free of trees or shrubs, spoil piles or other features near enough to the shoreline to shade the water especially in early morning. Banks sloped at 20^{o} (36%) or lower. At least the south side of the waterbody sloped and free of obstruction of sunlight
		Cobble or clay substrate on bottom of standing waterbody with low amounts of organic matter
		Waterbody surrounded by at least 10 m of permanent cover of grass and/or forbs
		Total dissolved solids <250 ppm
		Riparian Area Assessment = Healthy
Breeding Habitat	Late April - September	Depth of water in the deepest part of the littoral zone 30-45 cm
		Water levels and hydroperiod near natural and standing water maintained through July into mid-August. No large influxes or drawdowns of water during the breeding period
		Water temperature in littoral zone 20^{o}-30^{o}C at mid-day
		Sparse or intermediate densities (Classes 5-10 density distribution from SK PCAP Rangeland Health Assessment manual) of emergent vegetation
		Waterbody free of trees or shrubs, spoil piles or other features near enough to the shoreline to shade the water especially in early morning. Banks sloped at 25^{o} (47%) or lower. At least the south side of the waterbody sloped and free of obstruction of sunlight
		Waterbody surrounded by at least 200 m of permanent cover of grass and/or forbs
		Total dissolved solids <250 ppm
		Riparian Area Assessment = Healthy

Habitat	Temporal Scale	Habitat Target
Foraging Habitat	May - October	Intermediate density (Classes 8-10 density distribution from SK PCAP Rangeland Health Assessment manual) of emergent vegetation
		Water depth >50 cm adjacent to littoral zone
		Minimum of 200 m of permanent cover of grasses and/or forbs adjacent to breeding pond
		Vegetation adjacent to breeding pond between 15 and 30 cm in height
		Patchiness / heterogeneity of vegetation height and density
		Moderate amounts of litter for the Ecosite. Litter patchy in distribution
Corridor Habitat	April - November	Lush vegetation and moist soil occurring in association with the following features: gullies, seeps, riparian corridors, ephemeral streams etc.
		Vegetation height and density, and amount of litter vary to provide open and semi-open areas (heterogeneity)
		Moderate amounts of litter for the Ecosite. Litter patchy in distribution

11.1.9 Piping Plover





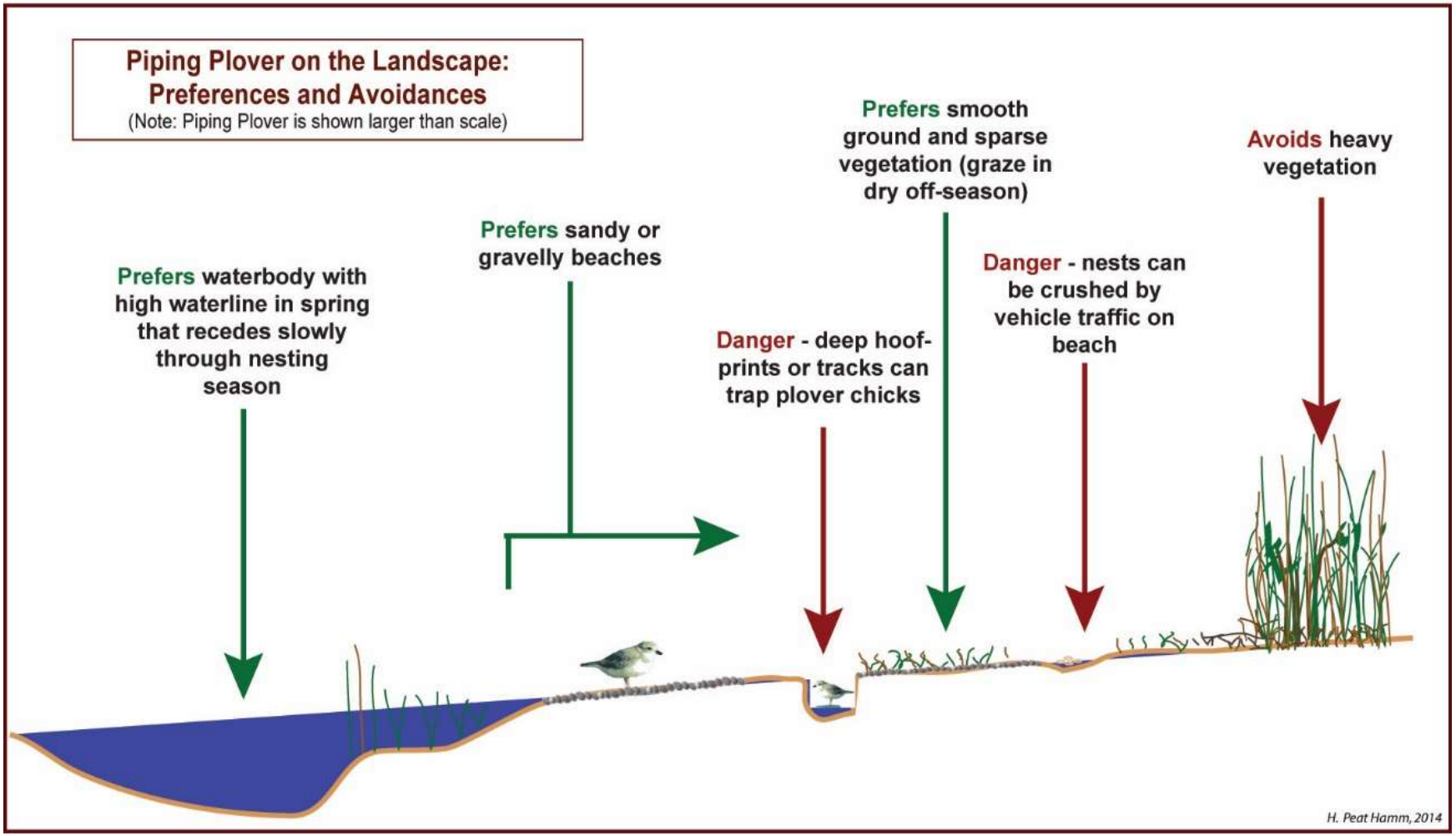

Piping Plover on the Landscape:
Preferences and Avoidances
(Note: Piping Plover is shown larger than scale)
Prefers waterbody with high waterline in spring that recedes slowly through nesting season
Prefers sandy or gravelly beaches
Danger - deep hoof-prints or tracks can trap plover chicks
Prefers smooth ground and sparse vegetation (graze in dry off-season)
Danger - nests can be crushed by vehicle traffic on beach
Avoids heavy vegetation
H. Peat Hamm, 2014

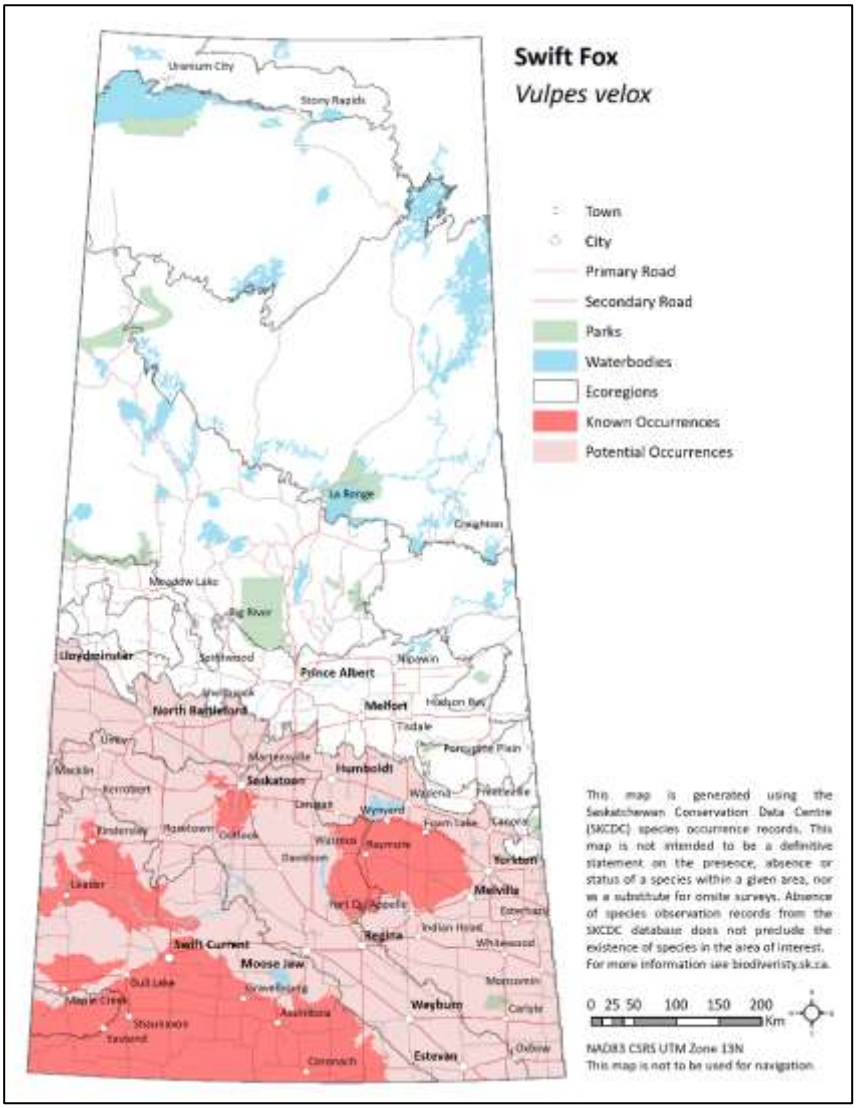
Table 29. Critical dates for Piping Plovers in Saskatchewan.

Life Stage	Critical dates
Breeding	early May
Nesting	May through the end of July
Brood-rearing	until late August

Table 30. Optimal habitat targets for Piping Plovers.

Habitat	Temporal Scale	Habitat Target
Nesting Habitat	Early May – mid July	<15% vegetation cover within 200 m of nest
		<30% obstruction of bare substrate
		Riparian Health Assessment (SK PCAP, 2008) vegetation cover question score = 0
		No invasive plant species present
		Riparian Health Assessment invasive plant species question score = 3 (maximum points)
		Riparian Health Assessment undesirable herbaceous plants question score = 3 (maximum points)
		Riparian Health Assessment woody vegetation canopy cover question score = 0
		<10% slope of beach or shoreline
		Gravel multicoloured
		Gravel size ~ 25 mm and smooth
Brood Rearing Habitat	Mid July – late August	<50% vegetation cover over entire beach or basin
		Riparian Health Assessment vegetation cover question score = 0
		No invasive plant species present
		Riparian Health Assessment invasive plant species question score = 3 (maximum points)
		Riparian Health Assessment undesirable herbaceous plants question score = 3 (maximum points)
		Riparian Health Assessment woody vegetation canopy cover question score = 0
		Smooth surface of beach (no rocks, pugging, vehicle tracks etc.)
		Riparian Health Assessment physical alteration of beach question score = 12 (maximum points)
		< 10% slope of beach
Upland Habitat	Growing season	Free of avian stick nests
		Healthy vegetation buffer between beach and cropland or cattle winter feeding area

11.1.10 Swift Fox



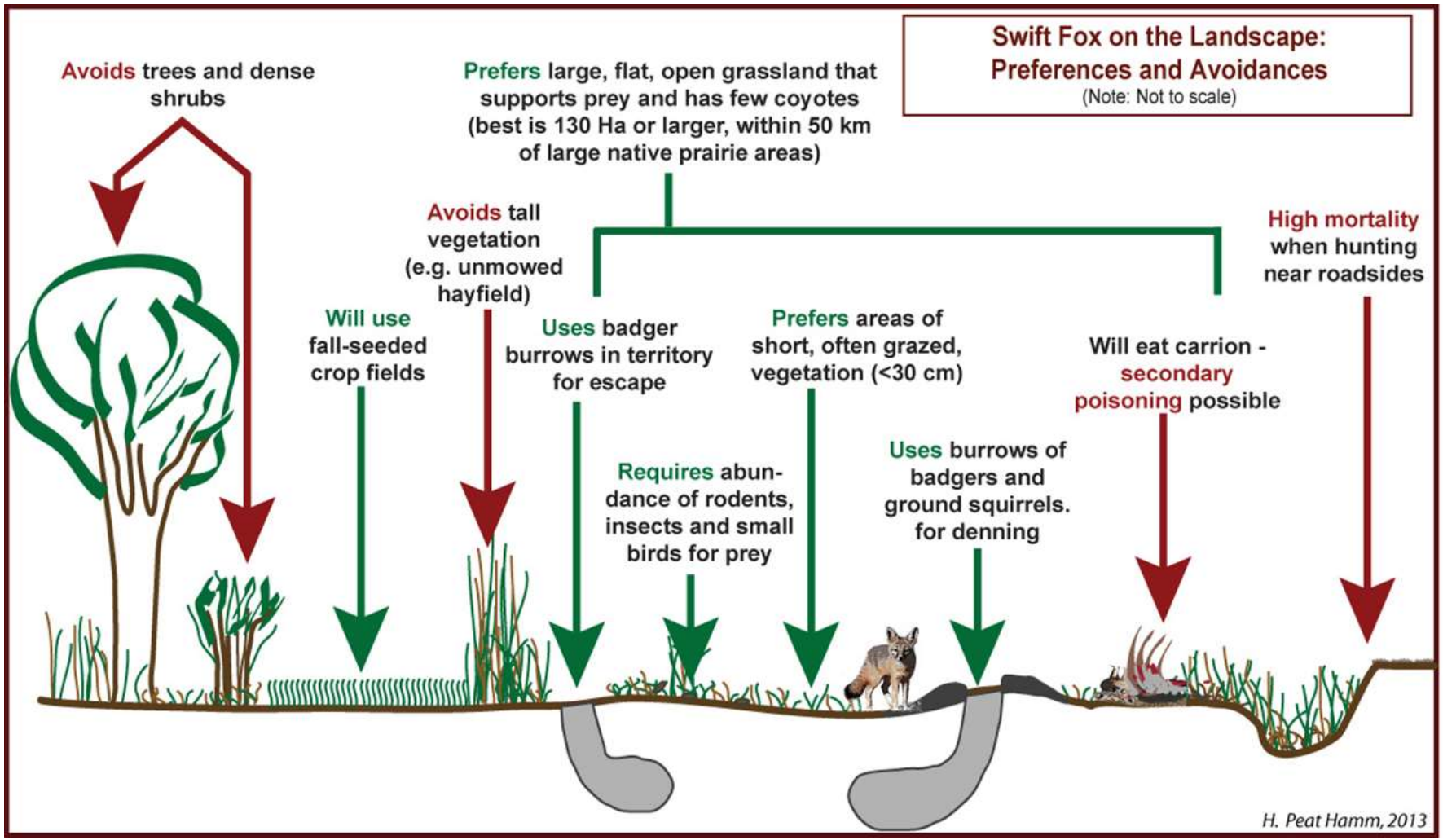

Swift Fox on the Landscape:
Preferences and Avoidances
(Note: Not to scale)
Avoids trees and dense shrubs
Prefers large, flat, open grassland that supports prey and has few coyotes (best is 130 Ha or larger, within 50 km of large native prairie areas)
Avoids tall vegetation (e.g. unmowed hayfield)
High mortality when hunting near roadsides
Will use fall-seeded crop fields
Uses badger burrows in territory for escape
Prefers areas of short, often grazed, vegetation (<30 cm)
Will eat carrion - secondary poisoning possible
Requires abundance of rodents, insects and small birds for prey
Uses burrows of badgers and ground squirrels. for denning
H. Peat Hamm, 2013

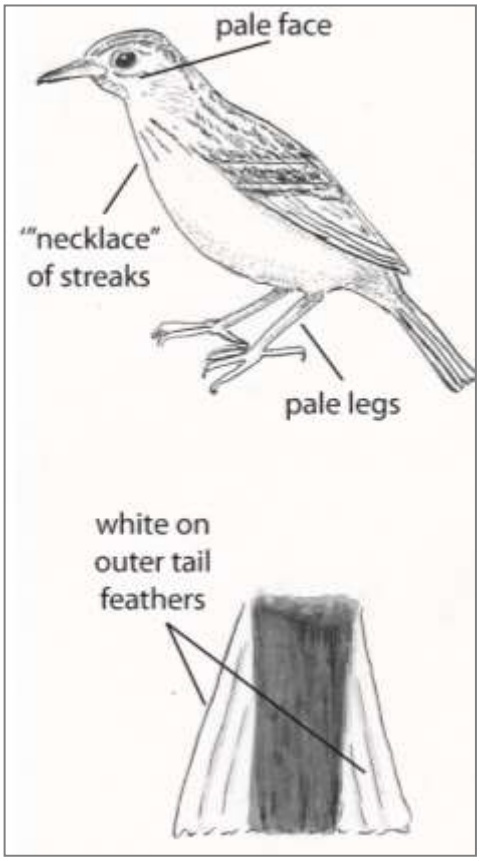
Table 31. Critical dates for Swift Foxes in Saskatchewan.

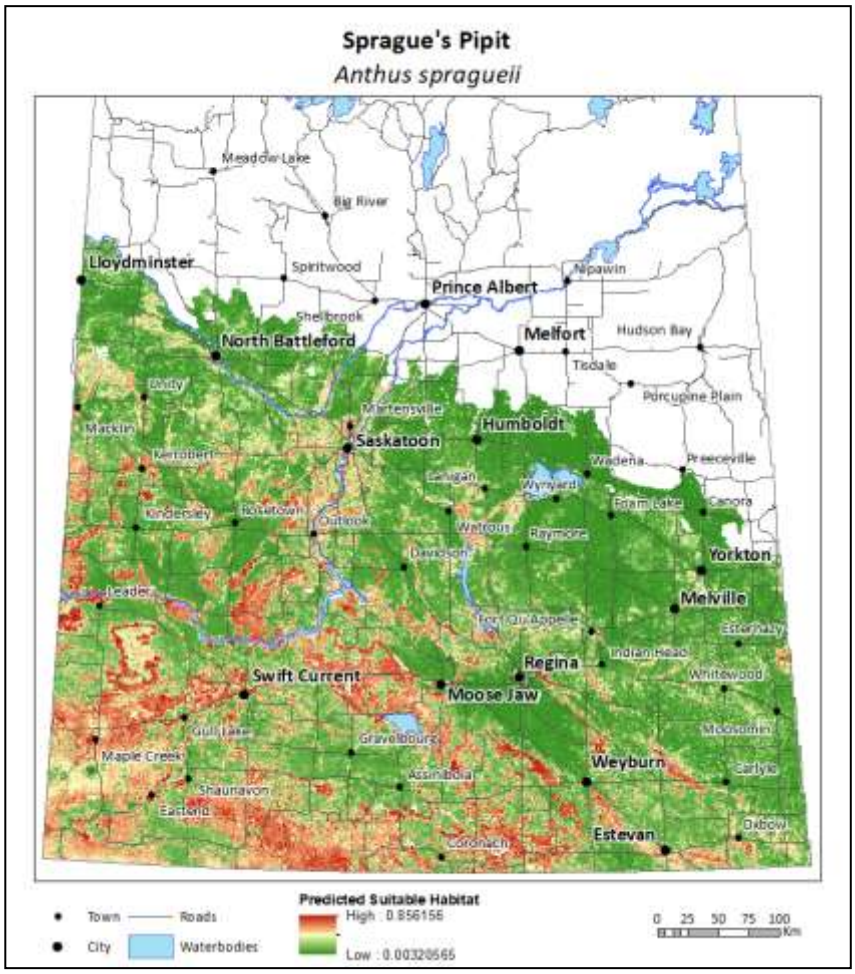
Life Stage	Critical Dates
Pup-rearing	May-August
Dispersal	September to November
Pair formation	December to March

Table 32. Optimal habitat targets for Swift Foxes.

Habitat Feature	Habitat Target
Landscape Scale	
Land Cover	Semi-arid mixedgrass
	Natural, homogenous grassland
	Limited cropland (Optimal <15%; suboptimal 15-30%)
Area required for home range	31.9 ± 4.8 km^2
Topography	Open, flat to gently rolling: Optimal <2° (3.5%); Suboptimal 2-4° (3.6-7%)
Wetness	Dry sites with low variability in moisture
	Wetness: Optimal -.31 to -.38; Suboptimal -.25 to -.31
	Standard deviation of wetness: Optimal <.04; Suboptimal 0.041-0.6
Site Scale	
Ecosites	*Saskatchewan:* Badlands, Clay, Dry Meadow, Gravelly, Loam, Overflow, Saline Dry Meadow, Sand, Solometzic, and Thin *Alberta*: Badlands/Bedrock, Blowouts/Solonetzic, Choppy Sandhills, Clayey, Gravel, Limy, Loamy, Overflow, Saline Lowland, Sandy, Shallow to Gravel, Subirrigated and Thin Breaks
Patch Size	Suitable grassland habitat within 20 km of occupied habitat
Woody vegetation	Low cover (<2%) of trees or shrubs > 1 m high. Cover of shrubs < 1m high <30%
Burrow Density	Optimal suitable burrow density: >2/ha Suboptimal suitable burrow density: 0.6-2/ha
Vegetation height	<30 cm
Visual Obstruction Reading	Optimal: 11-12 cm; Suboptimal: 9-11 cm
Distance to Roads	No roads, or only two-track trails and roads smaller than provincially numbered grid roads within 2 km of area of consideration.
Distance to Water	Optimal: No water bodies within a 1 km radius of area of consideration. Suboptimal: No water bodies within a 500 m radius of area of consideration.

11.1.11 Sprague's Pipit





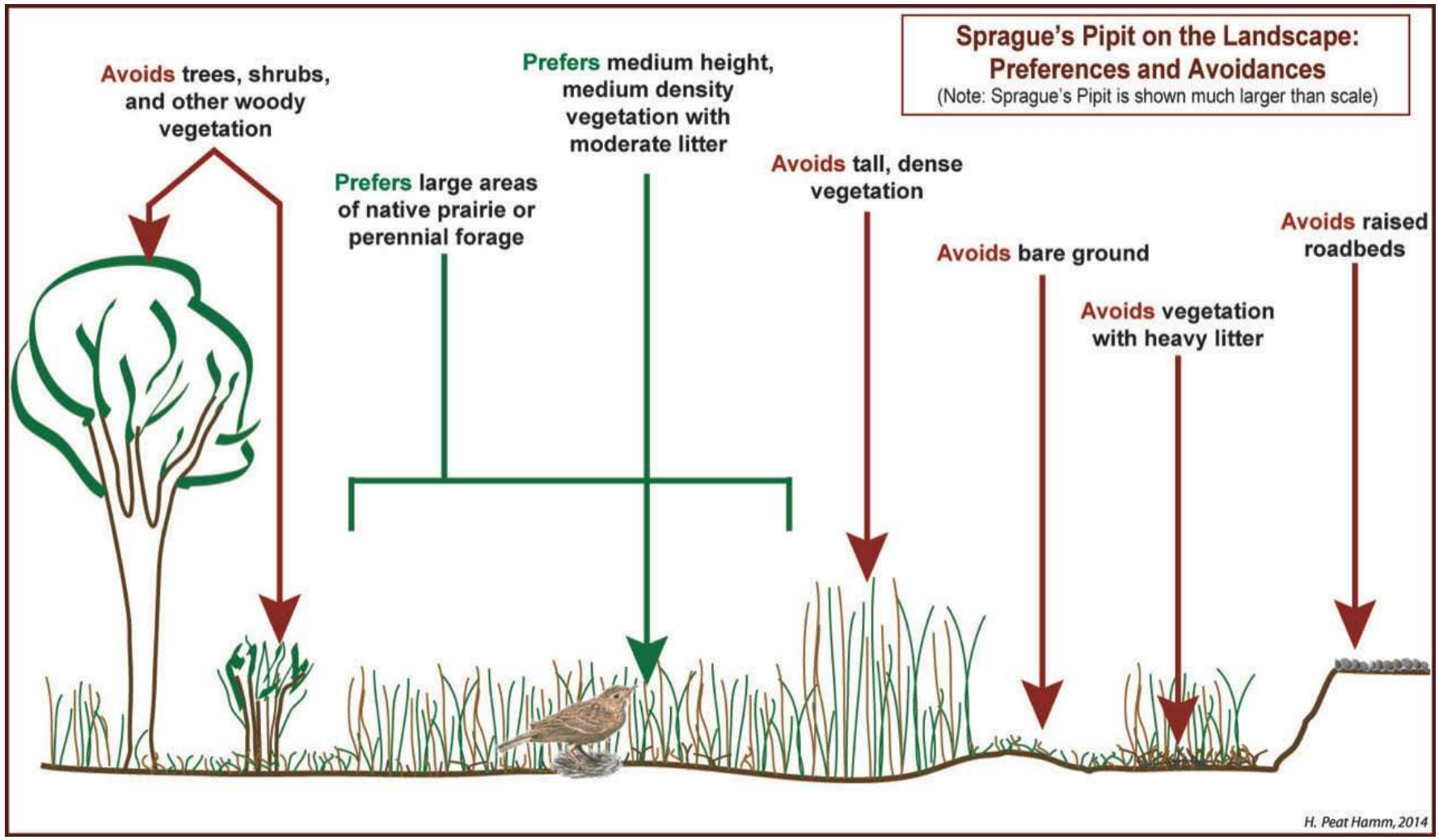
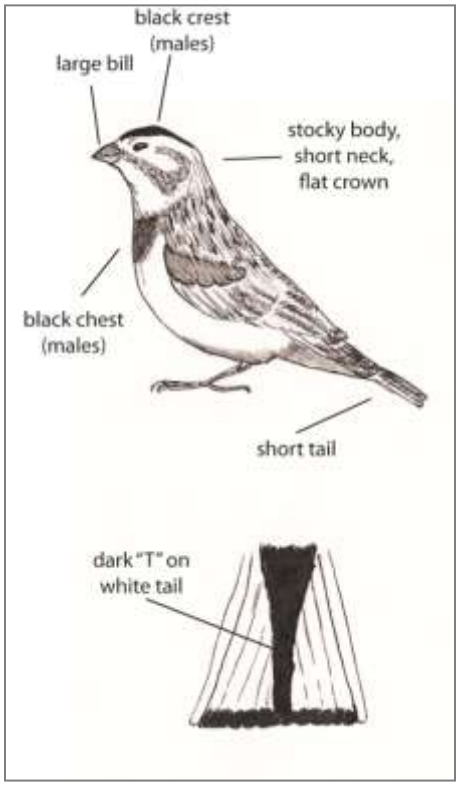
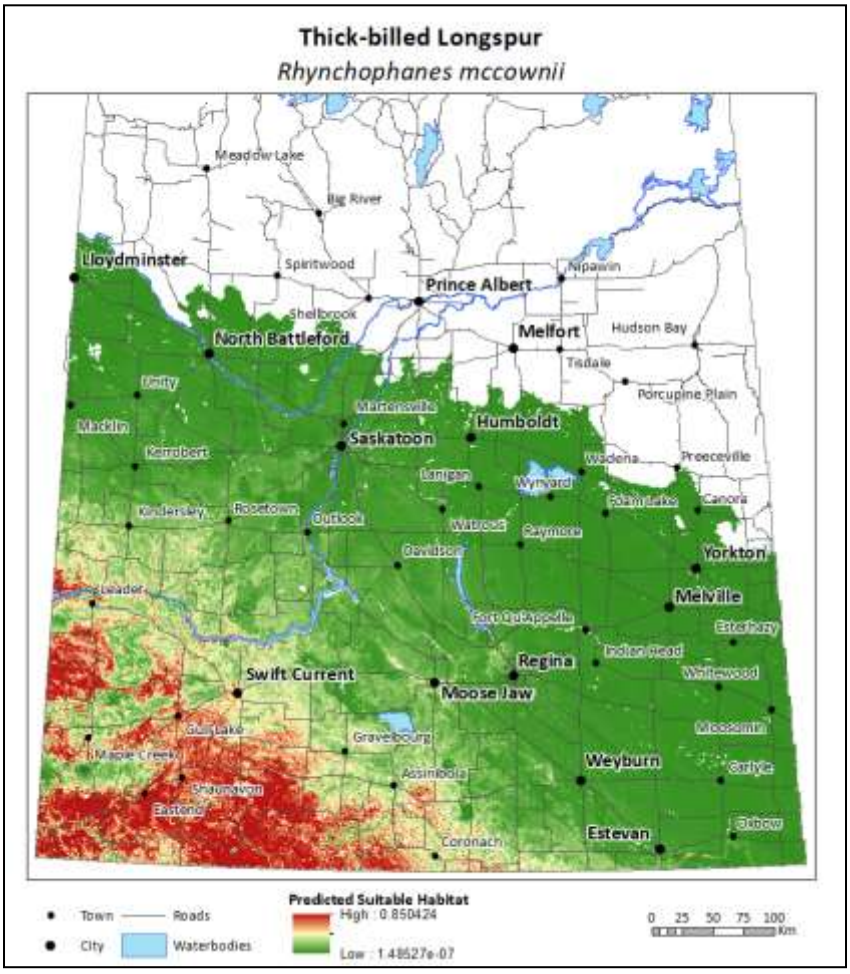

Sprague's Pipit on the Landscape:
Preferences and Avoidances
(Note: Sprague's Pipit is shown much larger than scale)
Avoids trees, shrubs, and other woody vegetation
Prefers large areas of native prairie or perennial forage
Prefers medium height, medium density vegetation with moderate litter
Avoids tall, dense vegetation
Avoids bare ground
Avoids vegetation with heavy litter
Avoids raised roadbeds
H. Peat Hamm, 2014

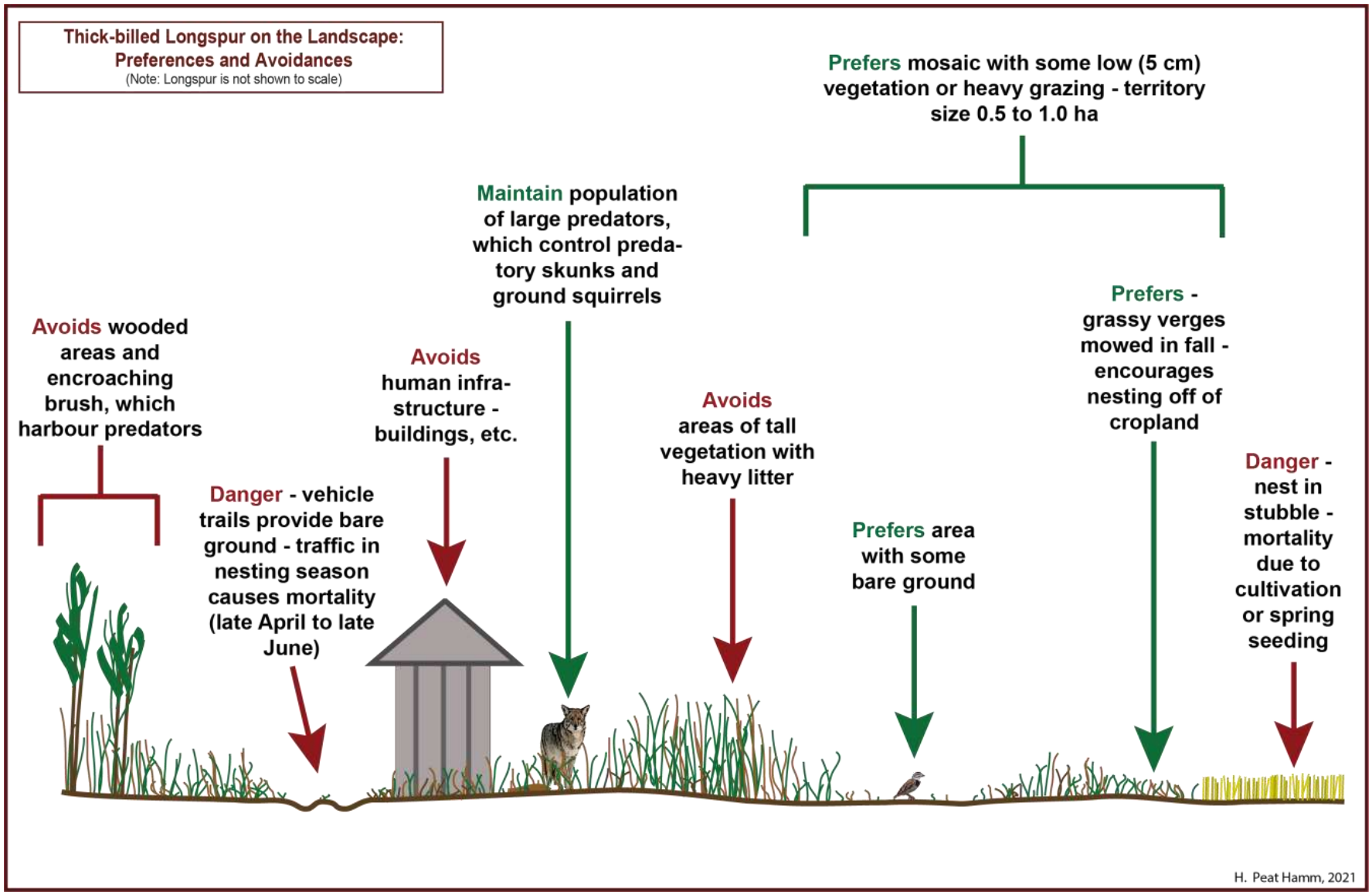
Table 33. Optimal habitat targets for Sprague's Pipits.

Habitat	Habitat Feature	Habitat Target
Landscape Scale Habitat	Land Cover	70-100% grassland within minimum 400 m radius optimal; 55-70% grassland within minimum 400 m radius suboptimal
	Topography	Optimal slope <15% (8 degrees); suboptimal slope 15-21% (8-12 degrees)
	Soil Type	Fine textured clay optimal; medium textured loam suboptimal
	Woody Vegetation	<10% shrub cover optimal; 10-20% suboptimal
Site Scale Habitat	Plant Community	Native grassland is optimal
	Shrub Cover	Mixed Grassland: 0-30% optimal; 30-40% suboptimal All other ecoregions: 15-45% optimal; 10-15% OR 45-50% suboptimal
	Vegetation Height	Mixed Grassland: 15-32 cm optimal; 11-15 cm OR 30-35 cm suboptimal All other ecoregions: 5-25 cm optimal; 2-5 cm OR 25-35 cm suboptimal
	Visual Obstruction Reading	Mixed Grassland: 2-12 cm optimal; 0-2 cm OR 12-14 cm suboptimal All other ecoregions: 0-2 cm optimal; 2-5 cm suboptimal
	Dead (Residual) Grass Cover	Mixed Grassland: 35-70% optimal; 25-35% OR 75-80% suboptimal All other ecoregions: 35 -80% optimal; 25-35% suboptimal
	Litter (lb/acre - estimated)	300-900 optimal; 200-300 OR 900-1000 suboptimal
	Bare Soil Cover	<30% optimal; 30-40% suboptimal
	Range Condition	Excellent (75-100%) optimal; High Good (63-74%) suboptimal
	Distance to Water	>450 m from edge is optimal; 300-450 m from edge is suboptimal

11.1.12 Thick-billed Longspur





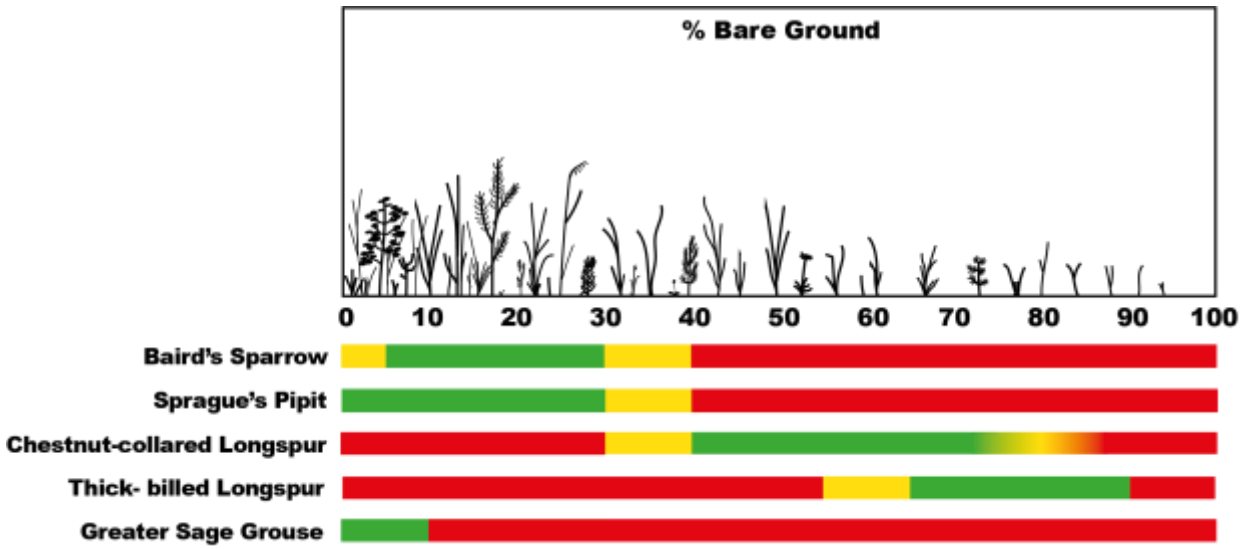

Thick-billed Longspur on the Landscape:
Preferences and Avoidances
(Note: Longspur is not shown to scale)
Prefers mosaic with some low (5 cm) vegetation or heavy grazing - territory size 0.5 to 1.0 ha
Maintain population of large predators, which control predatory skunks and ground squirrels
Avoids wooded areas and encroaching brush, which harbour predators
Avoids human infrastructure - buildings, etc.
Avoids areas of tall vegetation with heavy litter
Prefers - grassy verges mowed in fall - encourages nesting off of cropland
Danger - nest in stubble - mortality due to cultivation or spring seeding
Danger - vehicle trails provide bare ground - traffic in nesting season causes mortality (late April to late June)
Prefers area with some bare ground
H. Peat Hamm, 2021

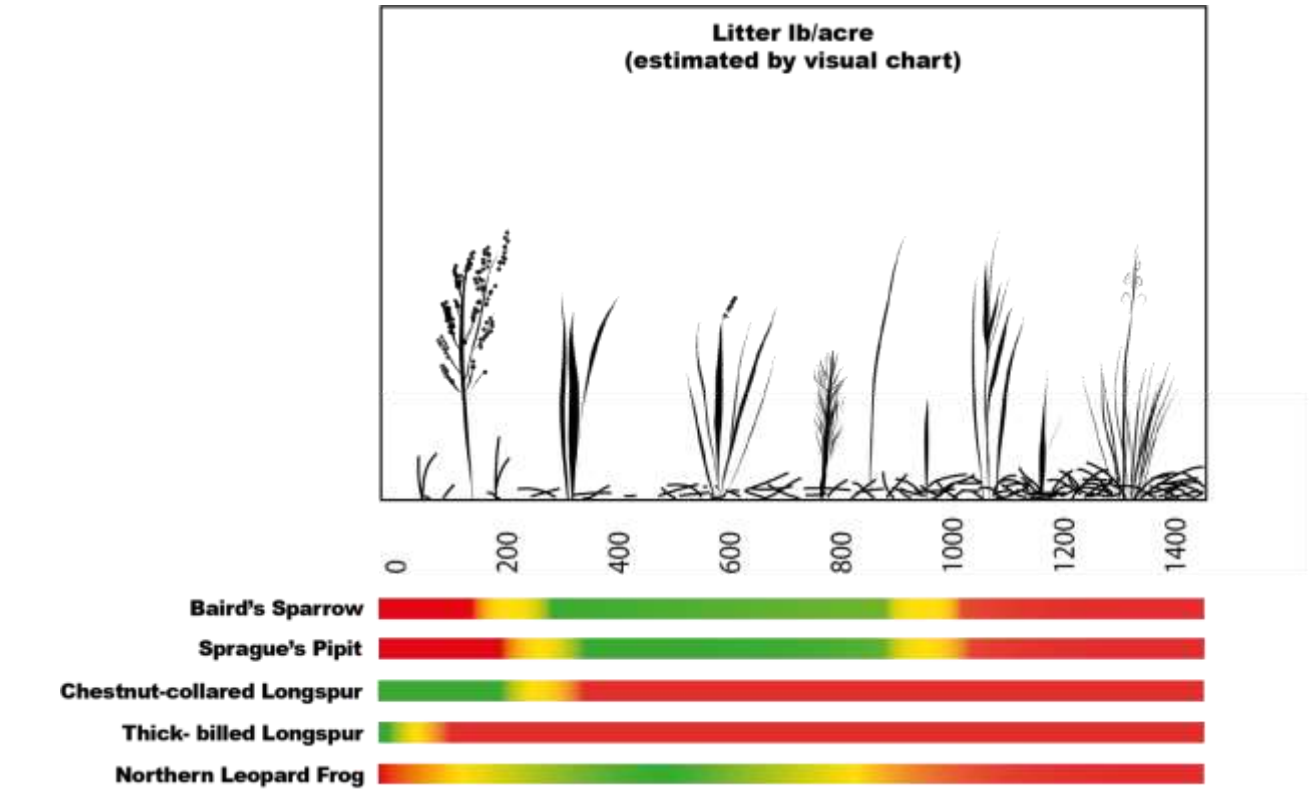
Habitat	Habitat Feature	Habitat Target
Landscape Scale Habitat	Land Cover	75-100% grassland within minimum 400 m radius optimal; 55-75% grassland within minimum 400 m radius suboptimal
	Topography	Optimal slope <4% (2 degrees); suboptimal slope 4-7 (2-4 degrees)
	Woody Vegetation	<2% shrub cover optimal; 2-5% suboptimal
	Plant Community	Native grassland is optimal
Site Scale Habitat	Shrub Cover	< 0% optimal; 0-1% suboptimal
	Vegetation Height	1-7 cm optimal; 7-9 suboptimal
	Visual Obstruction Reading	0 cm optimal
	Dead (Residual) Grass Cover	0-4% optimal; 4-6% suboptimal
	Bare Soil Cover	65-90% optimal; 55-65% suboptimal
	Litter (lb/acre-weighed)	0-10 optimal; 10-45 suboptimal

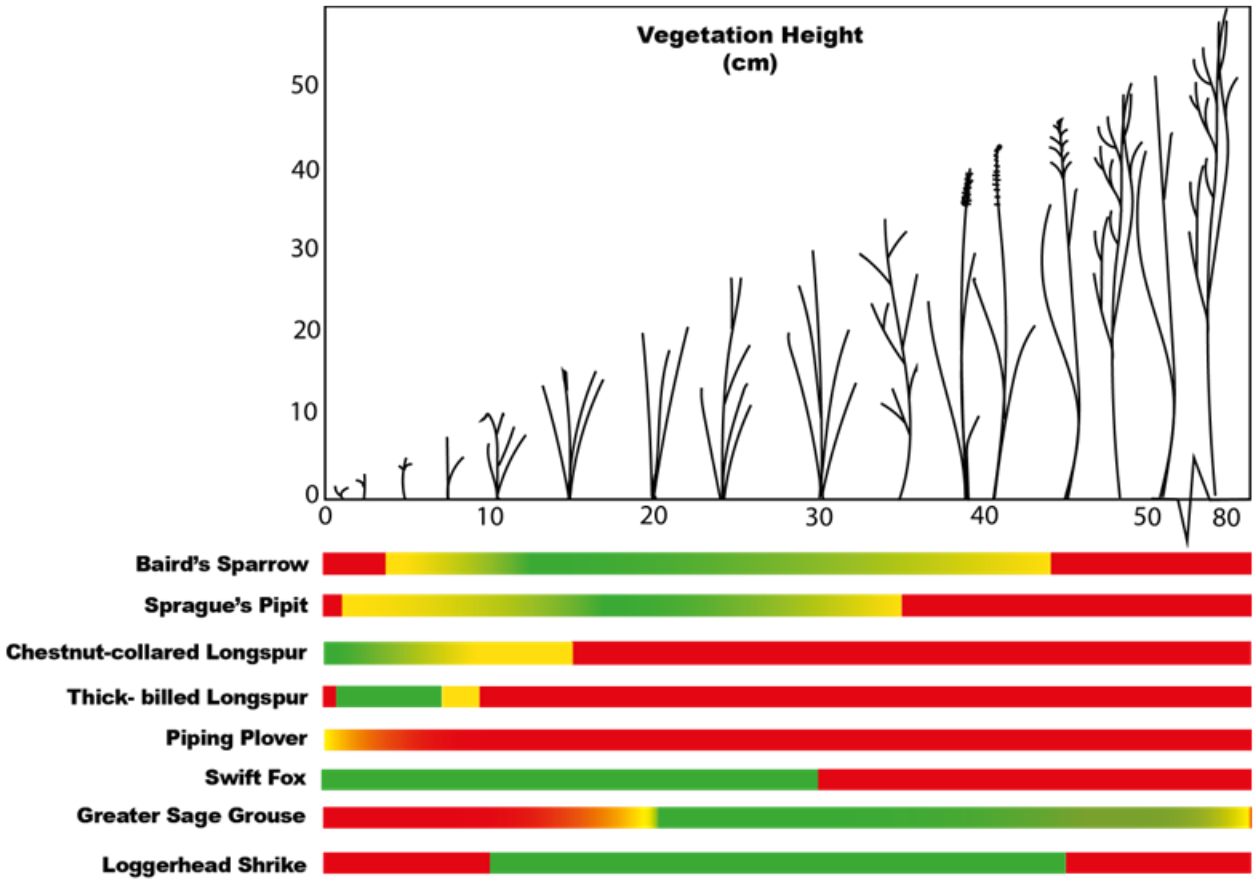
Table 34. Optimal habitat targets for Thick-billed Longspurs.

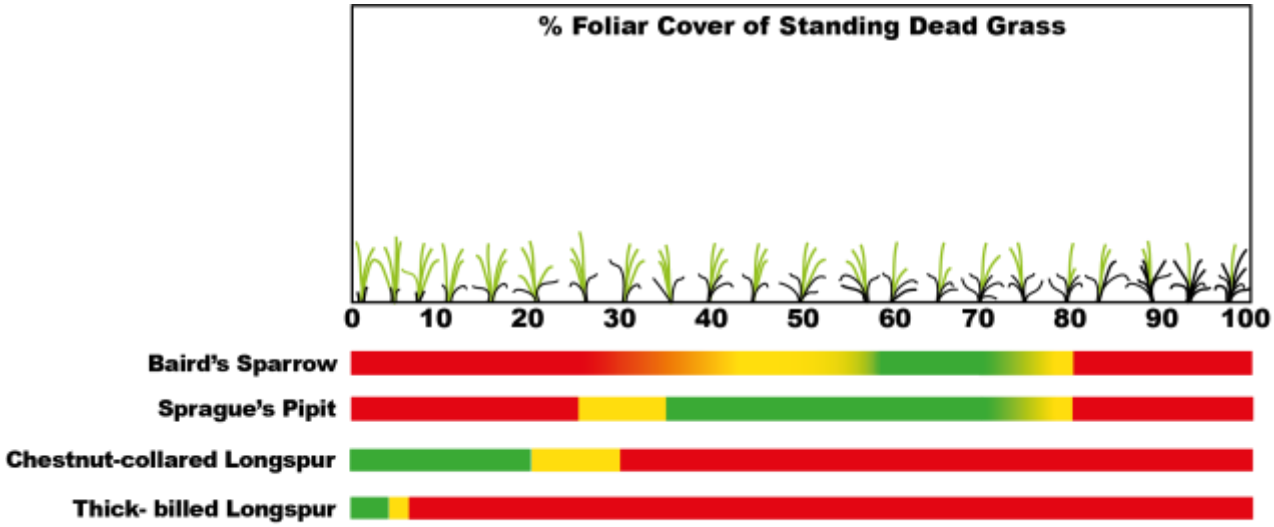
Multi – Species at Risk Habitat Assessment Score Sheet (page 1 of 4)

Photocopy for use in the field

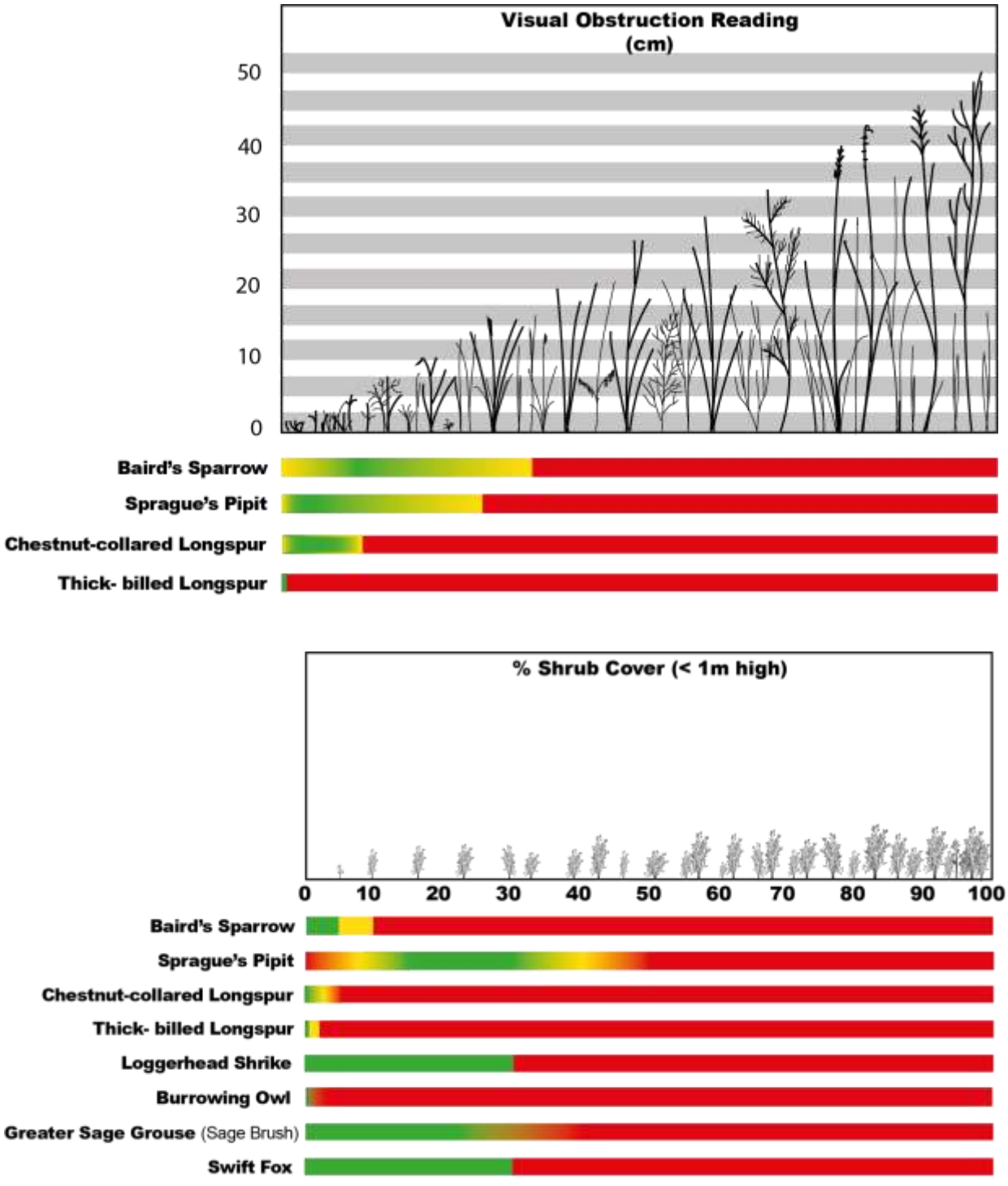


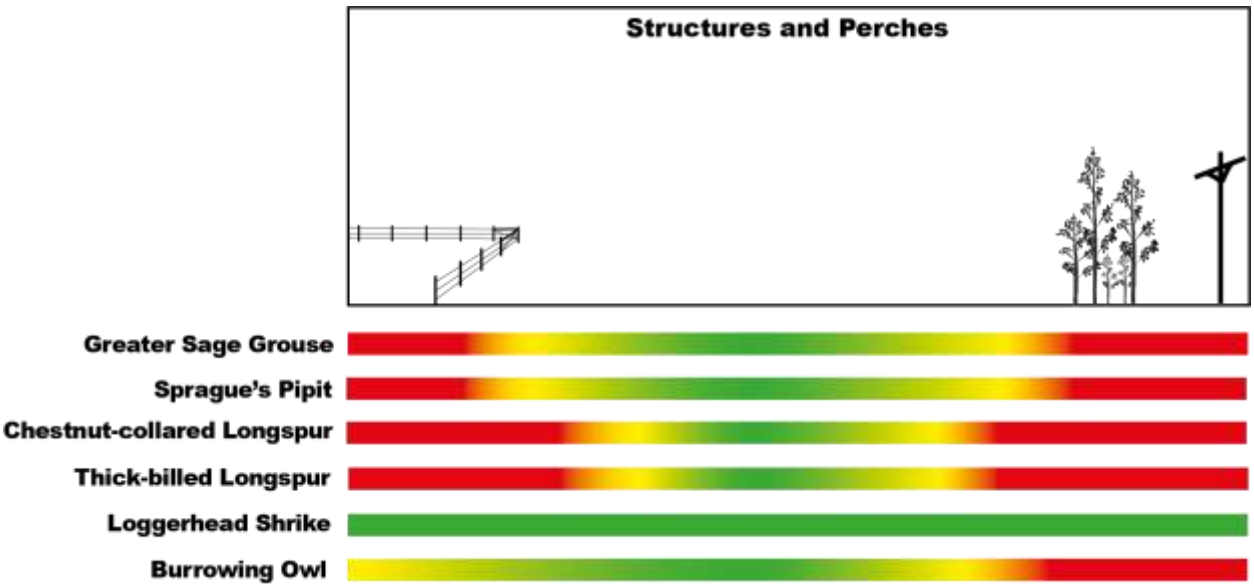



Vegetation Height
(cm)
50
40
30
20
10
0
0
10
20
30
40
50
80
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur
Piping Plover
Swift Fox
Greater Sage Grouse
Loggerhead Shrike


% Foliar Cover of Standing Dead Grass
0
10
20
30
40
50
60
70
80
90
100
Baird's Sparrow
Sprague's Pipit
Chestnut-collared Longspur
Thick- billed Longspur

Multi – Species at Risk Habitat Assessment Score Sheet (page 3 of 4)





Type of Structure	Distance

Field or Management Unit Name	
Ecoregion	
Ecosite	
Plant Community	
Date	
Assessor	