



Saskatchewan
Prairie Conservation
Action Plan

Guide to Managing for Optimal Habitat **Attributes:**

Baird's Sparrow **(*Centronyx bairdii*)**



ACKNOWLEDGEMENTS

This guide was developed by Sue Michalsky, Brenda Dale and Heather Peat Hamm, with technical and editorial input from Stephen Davis and Nicola Koper. The authors would also like to thank the assistance of Sarah Ludlow, Dorothy Hill, Barbara Bleho, Ryan Dudragne, Carolyn Gaudet, Orin Balas, Rebecca Magnus and Diego Steinaker, who provided useful comments that greatly improved the manuscript.

The project was financially supported by the Department of the Environment of the Government of Canada (Environment and Climate Change Canada), through the Habitat Stewardship Program (HSP) funding granted to the Saskatchewan Prairie Conservation Action Plan (PCAP). Ce projet a été réalisé avec l'appui financier du gouvernement du Canada agissant par l'entremise du ministère fédéral de l'Environnement (Environnement et Changement climatique Canada).

Thank you also to all the PCAP Partners and other organizations who provided support for this project: Paskwa Consultants Inc., Nature Saskatchewan, Nature Conservancy of Canada, Parks Canada, Ranchers Stewardship Alliance Inc., SaskPower, Saskatchewan Stock Growers Association, Saskatchewan Cattlemen's Association, Saskatchewan Ministry of Environment, Saskatchewan Ministry of Agriculture, and Simply Ag Solutions.

Many sources of information were used in compiling this document including expert opinions and both published and unpublished literature. References used in compiling this review are provided.

April, 2019.

Front cover photo: Rick Bohn

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ABOUT THIS GUIDE

A New Approach to Managing For Species At Risk

The intent of this guide is to determine site and landscape-scale habitat features that are optimal for species at risk at different life stages, as well as important non-habitat-related beneficial management practices. As habitat for species at risk declines and threats to populations increase in jurisdictions outside Canada, it becomes critical to provide optimal conditions on what habitat remains if we are to conserve or recover a species.

This First Approximation of the guide for Baird's Sparrow should be considered a living or dynamic document that will continually evolve. As our knowledge of prairie species at risk improves with research and monitoring, this guide will need to be periodically revisited and updated.

Who Should Use This Guide?

Most grassland species at risk in Saskatchewan exist on working agricultural lands that most often support grazing livestock and sometimes support annual or perennial crops. This guide provides habitat targets and non-habitat-related beneficial management practices (BMPs) 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 and BMPs may be used by conservation organizations in designing results-based agreements with land managers.

The Environmental Benefit Index is designed to be used by any stakeholder to prioritize sites and/or projects for conservation and recovery programs, or by land managers to evaluate the value of their property for a single species.

How to Use This Guide

This guide is presented in two parts. The first part summarizes the important spatial and temporal needs of the species and presents habitat targets and non-habitat related BMPs. Habitat targets are presented at two major spatial scales: landscape and site. Landscape scale habitat targets are those attributes that an individual opts for when choosing a breeding location or home range. These targets are often land cover or topography-related, but may also include such factors as whether or not there are other individuals of the same species already in the area. Site scale targets are those attributes that the individual prefers at a certain time (e.g., breeding, brood rearing, hunting or foraging) or in a certain portion of their home range. Site habitat targets are most commonly physical vegetation, water, soil and/or topography parameters, but may also include such attributes as configuration of land cover, block size, or presence/absence of human infrastructure, among others. The rationale for each target or BMP is also provided so land managers can readily understand the relationship between the target and use of habitat by the

species.

Guides have been prepared for individual species. Habitat targets for individual species give the land manager information about the species they could benefit. Managing for a single species may result in habitat that is undesirable for another species. Conflicts between species are addressed in the Environmental Benefit Index.

The second part of the guide presents an index (Environmental Benefit Index) that places values on the habitat targets and BMPs in combination with other considerations. An Environmental Benefit Index (EBI) is a compound index that considers multiple environmental factors when determining an ecological outcome. EBIs can be used to evaluate and prioritize opportunities for conservation programs. An EBI is of considerable importance in determining priority sites to invest in, particularly when funds are limited.

The overall goal of the EBIs for species-at-risk habitat is to ensure maximum environmental value for an investment in results-based conservation programming. The EBI has several potential uses including:

- To geographically target the most important locations;
- To evaluate and rank candidate properties or projects for their environmental benefit;
- To rank the environmental benefit of candidate properties or projects by cost (or bid);
- To evaluate projects over time to determine if environmental values are being improved or maintained, or to evaluate the efficiency of the investment over time.

EBIs were identified as a method to target programming and prioritize participation in the design of the Prairie Beef & Biodiversity program (Commission for Environmental Cooperation, 2013). EBIs were subsequently developed for the Greater Sage-Grouse (Ranchers Stewardship Alliance Inc., 2014), Piping Plover (PCAP SK, 2017), Burrowing Owl (PCAP SK, unpublished), Northern Leopard Frog (PCAP SK, 2018a), and Loggerhead Shrike (PCAP SK, 2018b).

BAIRD'S SPARROW MODULE

Baird's Sparrow Identification

Size - Length: 4.7" (12 cm), Wingspan: 9.1" (23 cm)

Features – Male and Female: Baird's Sparrow is a small brown bird; yellowish ochre face with two dark spots behind the cheeks; thin mustache marks; clear breast with a necklace of thin streaks.

Similar species – Savannah Sparrow has generalized streaking on breast; Grasshopper Sparrow has completely clear breast and lacks ochre face except forward of the eye; Vesper Sparrow has generalized streaking on upper breast, a whitish eye ring, chestnut shoulder patch when plumage is fresh and white outer tail feathers; Clay-colored Sparrow is very petite with a clear breast, gray collar, and a long tail.

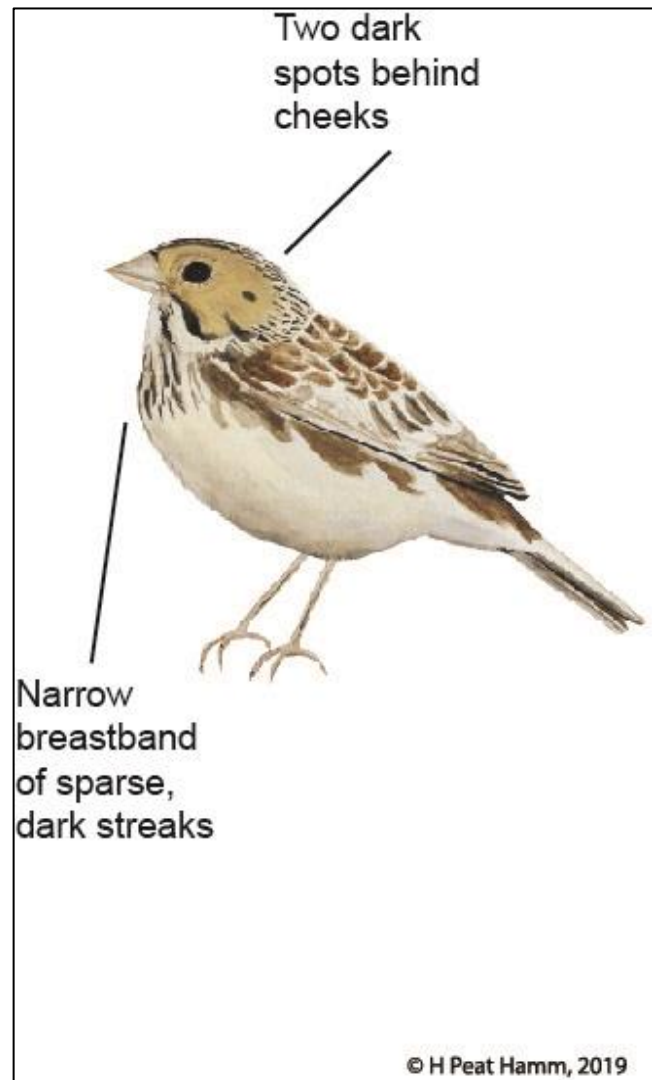
Song - Song types begin with few introductory syllables, usually followed by a slow trill and often, but not always, a final lower note or syllable. It is distinctive because most other grassland sparrows have insect-like calls. There are thirteen distinct song types and each male sings just one of them and tends to settle near birds that sing different song types. Therefore, individual males in one locale can often be distinguished from one another. Baird's Sparrows can adjust the frequency at which they sing in response to ambient noise.

To help identify birds by sound, you can visit the following websites to listen to audio clips of their songs:

Nature Instruct - www.natureinstruct.org/

Cornell Online Guide to Birds -
www.allaboutbirds.org

Xeno-Canto worldwide birdsong database–
www.xeno-canto-org



Where Do Baird's Sparrows Live?

Once considered among the most common of grassland birds, Baird's Sparrow is now considered rare throughout its entire range. The Canadian Prairie Provinces represent about 45% of its breeding range but support at least 60% of its population. Figure 1 shows habitat suitability for Baird's Sparrow in Saskatchewan.

Behaviour and Habitat Use in Canada

Baird's Sparrows breed in the Mixed-grass, Moist Mixed-grass, Fescue Grassland, and to a lesser extent the Aspen Parkland ecoregions of the northern Great Plains including Alberta, Saskatchewan, and Manitoba.

The breeding territory for nesting, foraging, and hunting ranges from approximately 1.2 to 1.5 ha. Baird's Sparrows forage by walking on the ground, moving about slowly among grass clumps and picking up insects and seeds. During nesting, their diet is entirely insects (mainly grasshoppers). Young birds are fed mostly grasshoppers and caterpillars. In summer, their diet is mainly insects with some seeds. During migration and in their winter habitat, their diet is entirely or mainly seeds.

In general, the nests (a scrape in the ground lined with fine grasses) of Baird's Sparrows are well hidden in denser and/or taller vegetation than is generally available (Figure 2). Baird's Sparrows tend to select nesting sites that are more heavily vegetated than the surrounding ground cover, which may contain higher relative amounts of bare ground or biocrust (mosses, lichens and/or little club moss). Three generalized nest locations have been described: in a tuft of grass supported by a shrub; in a depression beneath an overhanging tuft of grass; and, in a deep depression with no overhead concealment. Commonly, nests are placed in a depression at the base of a clump of live and dead, narrow-leaved grass.

A typical clutch is 4 or 5 eggs. They will initiate second clutches or re-nest if the first nest fails or if conditions are favourable enough to support a second brood. Eggs are incubated for about 11 - 12 days. Nestlings stay in the nest and are fed by both parents for 8 - 10 days. Young leave the nest and continue to be fed, mainly by the male parent, for at least 1 to 2 weeks until they can fly and forage for themselves.

These summer residents use grasslands with vegetation of medium height and density, with moderate levels of litter and minimal bare ground (Figure 2). They tend to avoid extensive areas of short, sparse vegetation or tall, dense vegetation. They also avoid areas with extensive woody vegetation cover.

Baird's Sparrows select territories within patches of suitable vegetation as small as 14 ha, but prefer much larger patches. In dryer regions or in dry years, they tend to prefer idled or lightly grazed native grasslands. In moist regions, or in wet years, they tend to prefer lightly to moderately grazed native grassland. Baird's Sparrows will also use tame grasslands if the

Baird's Sparrow *Centronyx bairdii*

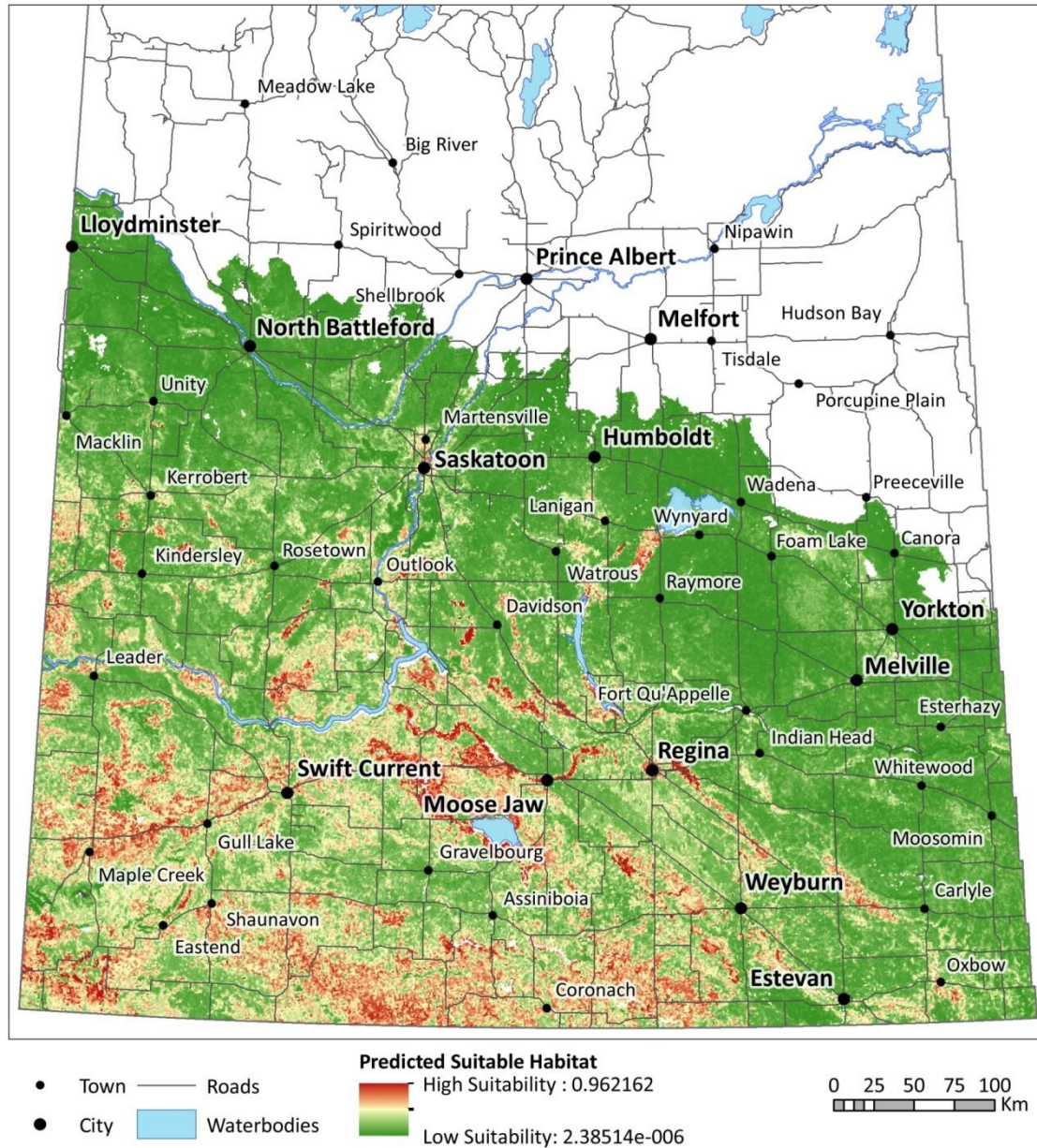


Figure 1. Distribution map of habitat suitability for Baird’s Sparrow (Saskatchewan Conservation Data Centre, 2019). This map is not intended to be a definitive statement on the presence, absence or status of a species within a given area, nor as a substitute for onsite surveys. Models predict if a species might occur in areas based on characteristics of the landscape and species observations.

vegetation structure is suitable; however, recent studies suggest that Baird's Sparrows may have lower reproductive success in tame grassland. Rangelands in Good to Excellent range condition are preferred.

Baird's Sparrows are lower in abundance near edges, such as wetland boundaries and roadsides, within otherwise suitable habitat. They also tend to avoid oil wells and large infrastructure.

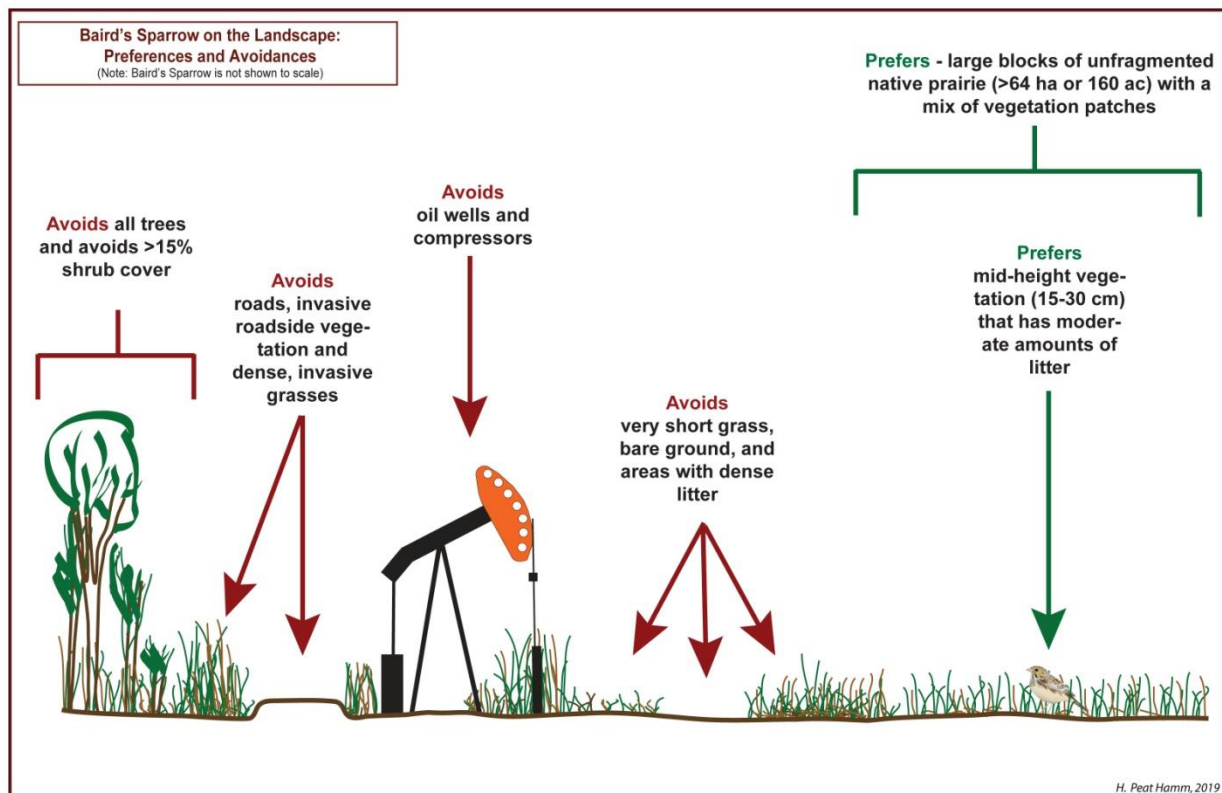


Figure 2. Habitat Diagram for Baird's Sparrow (Peat Hamm, H. 2019).

Threats to Baird's Sparrow in Canada

Baird's Sparrow was common and perhaps even abundant historically. It suffered declines stemming primarily from the loss and degradation of its native grassland habitat across the Great Plains of North America. Over 75% of native grassland in the Baird's Sparrow's breeding range has been eliminated since the 1800s, mainly through conversion to cropland or urban development.

HABITAT LOSS AND DEGRADATION

Activities that remove or fragment native grassland cover, or alter the desired structural characteristics, are deleterious to the abundance and/ or productivity of Baird's Sparrow.

Loss of native grassland is detrimental because Baird's Sparrows are rare or absent in crops and do not normally nest on cultivated land. In general, Baird's Sparrow numbers decline as the amount of grassland on the landscape declines. Habitat loss and fragmentation may eliminate or degrade suitable habitat by reducing block size and increasing the amount of habitat edges (e.g., cropland boundaries or roadsides).

INFRASTRUCTURE

Transportation, utility and energy infrastructure and activities may reduce either abundance or productivity of Baird's Sparrow in their vicinity.

Some studies have shown that Baird's Sparrows avoid using and/or nesting near roads, or decline with road or disturbance footprint on the landscape, while others found no effect. Given their preference for a vegetation structure of moderate height and thickness, they may be avoiding the dense vegetation found in ditches. However, one recent study showed elevated physiological stress levels in Baird's Sparrows with territories near roads indicating that they are avoiding the road itself or the associated human activity.

Oil wells have consistently negative impacts for Baird's Sparrow, with all studies showing fewer Baird's Sparrows near wells. Density of Baird's Sparrows has also been found to be lower near large infrastructure such as compressor stations. Recent research indicates that Baird's Sparrows may experience physiological stress in the vicinity of some types of oil wells (e.g., screw pump oil wells).

Baird's Sparrow response to natural gas wells has been inconsistent in studies to date. Studies have found decreased abundance with increased well density, non-significant avoidance and no effect on abundance. Studies finding an observed/measured decrease tend to suggest indirect effects such as habitat alteration rather than the well structure itself, or other variables not examined within the scope of the study. Productivity of Baird's Sparrow, however, may be lower near gas wells.

PREDATORS AND BROOD PARASITES

Vegetation and infrastructure that support predators and brood parasites reduce the productivity of Baird's Sparrow.

Predation is the greatest cause of nest failure for Baird's Sparrows. Therefore, increases in predator abundance may be a threat. Probable nest predators include Thirteen-lined Ground Squirrel and Striped Skunk. Suspected predators of Baird's Sparrows include Richardson's Ground Squirrel, Northern Grasshopper Mouse, Meadow Vole, Deer Mouse, Meadow Jumping Mouse, Harvest Mouse, American Badger, Coyote, Black-tailed Prairie Dog, garter snakes, Western Rattlesnake, Bull Snake, Northern Harrier, Swainson's Hawk, Short-eared Owl, Long-billed Curlew, Loggerhead Shrike, American Crow, Black-billed Magpie, Western Meadowlark, and gulls. In areas near farmsteads or buildings Red Fox and Raccoon are also suspected. Many of these predators benefit from human habitation including buildings, fences, shelterbelts and edge habitat, thus increasing the potential for predation of Baird's Sparrow nests.

The Brown-headed Cowbird is a nest parasite, laying its eggs in the nests of other bird species. Reported parasitism rates for Baird's Sparrow nests range from 0 to 36%. However, parasitism rates are commonly less than 20%. Cowbirds often use perches to watch the activities of host birds so that they can find their nests. The presence of perches such as fences, oil and gas infrastructure, shrubs and shelterbelts may consequently increase the probability of nest parasitism.

PESTICIDES

Baird's Sparrows may be susceptible to both direct and indirect effects of certain pesticides.

Baird's Sparrows eat seeds as a portion of their diet. Studies have identified direct toxic effects to grassland songbirds from various strengths of Chlorophacinone /strychnine used for rodent control on rangelands. The total number of unintended mortalities in songbirds may be considerable.

Grassland birds are vulnerable to grasshopper insecticides, because these birds eat primarily grasshoppers (often consuming some species considered to be pests). One study noted that Baird's Sparrow territories were abandoned in plots treated with insecticides indicating that, at minimum, habitat quality may be degraded by the application of insecticides. However, it should be noted that native and tame grasslands rarely receive insecticide applications.

OTHER

Woody Species Encroachment – expansion of woody vegetation into grasslands is likely to reduce available habitat for Baird's Sparrows. This is most likely to occur in the Aspen Parkland, Moist Mixedgrass and Fescue Grassland ecoregions.

Invasive grasses- Invasion of tall grasses or vegetation with a shrub-like form, such as alfalfa into grasslands may reduce quality or availability of habitat for Baird's Sparrow.

Renewable Energy – The large footprint of solar farms renders habitat unusable by endemic grassland birds. Wind turbines may have negative effects on Baird's Sparrow by removing native grassland habitat (estimated 1.23 ha per turbine) and could cause habitat avoidance in a similar manner to oil wells.

HABITAT REQUIREMENTS OF BAIRD’S SPARROW IN CANADA

Baird’s Sparrows leave their wintering grounds in northern Mexico and the southern U.S. between March and May. They migrate north and arrive at their breeding range in Canada in early to mid-May. Peak breeding season occurs from early May to mid-June. Egg-laying is commonly initiated in late May and peaks in early June to mid-June. Baird’s Sparrows can initiate second clutches or re-nest well into July. They migrate south in late summer or early fall.

The critical dates related to the various habitats required by Baird’s Sparrows are listed in Table 1.

Table 1. Critical dates of habitat use by Baird’s Sparrow in Saskatchewan.

Life Stage	Critical dates for Baird’s Sparrow in Saskatchewan
Breeding	<ul style="list-style-type: none">• Arrive in breeding grounds first two weeks in May• Peak breeding occurs early May to mid-June
Nesting	<ul style="list-style-type: none">• Late May to mid-June• A second clutch may occur mid to late July
Brood-rearing	<ul style="list-style-type: none">• Mid-June to mid-August (includes the potential for rearing of a second brood)

Landscape Scale Features Important to Baird’s Sparrows

Recent studies suggest that large-scale factors (e.g., weather or land cover) which are generally not under the control of a single land manager are the best predictors of habitat selection by Baird’s Sparrows. Baird’s Sparrows rarely return to the same place to breed each year, but instead settle wherever conditions are suitable for breeding. Weather-related variables such as drought and previous year’s rainfall have a large impact on breeding locations on a landscape scale in a given year. Land cover is the most important predictor of suitable habitat on a landscape scale, with increasing amounts of native or tame grassland being increasingly attractive to Baird’s Sparrow.

Preferred habitat features on the landscape scale include the following:

- Land cover of predominantly grassland within a 400 m radius of habitat block: >50% (>70% optimal).
- Topography - flat to gently rolling: <16% slope (<9% is optimal).
- Soil type – fine textured Solonetzic or Chernozemic soils.
- Loam and Thin Ecosites in Saskatchewan.
- Little or no shrub (<20% cover) or tree cover (<15%) 2 m high or taller. Somewhat more than 20% shrub cover on the landscape may be tolerated if the shrub cover is clumped into dense and sparse patches rather than having uniform or diffuse distribution.

Site Characteristics of Baird's Sparrow Habitat

Birds may select breeding sites based on a variety of signals such as resource availability, conspecific attraction and cues that suggest minimized predation.

Baird's Sparrows occur primarily in native grasslands but also use tame pasture or hayland. Studies have found that Baird's Sparrow will use tame forages and hayland that is grazed or mowed annually, or during years of drought when vegetation structure is suitable, but productivity is lower in these cover types compared to native grassland.

They avoid areas of suitable habitat smaller than about 14 ha in extent and average abundance increases with block size.

Baird's Sparrows will tolerate a small amount of scattered shrub, but anything more than sparse shrub cover is not attractive. They prefer vegetation of moderate height, and tend to avoid low-growing and very tall herbaceous vegetation. Because of the need for both hiding cover and foraging capability, visual obstruction is an important site feature. Visual obstruction, which is a measure of vegetation height and density, is comprised of both live and dead grasses. They also appear to prefer structural variability in the vegetation within their territory. In mesic sites, Baird's Sparrows have been found to prefer less than what is available of these desired vegetation characteristics (e.g., lower vegetation heights, lower visual obstruction, etc.), whereas in drier sites they will select for vegetation characteristics at the high end of the available spectrum, especially around nests. Because Baird's Sparrow abundance is associated with high residual cover, they conversely do not tolerate much bare ground and biocrust.

Baird's Sparrows were found to prefer Good to Excellent range condition at the pasture level. Burning reduces the attractiveness of all but mesic sites, where it may help to reduce shrub, litter and vegetation density in idled sites. It takes two or more years (less time in mesic sites, longer periods in arid sites) for grassland habitat to recover after burning to the point that it will attract and support Baird's Sparrows.

Baird's Sparrows tend to avoid edge habitat, especially when the vegetation structure changes substantially. Studies have shown that they may avoid edge habitats such as roadsides, cropland borders, and wetland and water body boundaries.

They also consistently avoid or experience stress near oil wells, roads and large infrastructure such as compressor stations. Gas wells may also negatively affect Baird's Sparrows, but this may be because they are perceiving edge habitat rather than the infrastructure itself.

Preferred habitat features on the site scale include the following:

- Blocks of suitable grassland a quarter section (64 ha or 160 acres) or larger in size are optimal; blocks of suitable grassland 14 ha (35 acres) to 64 ha (160 acres) are suboptimal.
- Native grassland is optimal; tame grassland with vegetative structure similar to native grassland in the same ecoregion is suboptimal.
- No tree cover; and shrub cover <25% (<15% is optimal).
- Residual vegetation cover (represented by dead grass) 20 – 80% (40 – 60% optimal).

- Vegetation height 10 – 40 cm (15 – 30 cm is optimal).
- Visual obstruction 3 – 24 cm (7-15 cm optimal).
- Combined biocrust and bare soil cover <40% (<20% optimal).
- Range condition Good to Excellent is optimal.
- Habitat edges such as roadsides, cropland edges and possibly edges of wetlands, water bodies and gas wells > 200 m from suitable habitat block optimal (100 – 200 m suboptimal).
- Infrastructure such as oil wells, major roads and compressor stations >400 m from suitable habitat block.

Optimal habitat targets are listed in Table 2. Many of these habitat targets, particularly site scale targets, may be created through management of vegetation (e.g., timing of grazing, stocking rates). Management using controlled fire is only recommended in situations where the amount of woody vegetation or invasive tame grasses needs to be reduced. Burning makes habitat unsuitable for Baird's Sparrows for a minimum of two years following burning, and other management tools can be used to create more consistently suitable habitat. Baird's Sparrow's consistent response to habitat structure created by grazing suggests that their distribution can be managed using livestock.

Table 2. Optimal habitat targets for Baird's Sparrow at landscape and site scales.

HABITAT	HABITAT FEATURE	HABITAT TARGET
Landscape Scale Habitat	Land Cover	70 - 100% grassland within minimum 400 m radius of habitat block 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 textures Solonetzic and Chernozemic soils
	Woody Vegetation (2 m high and taller)	<20% shrub cover AND <15% tree cover
Site Scale Habitat	Ecosites	Loam; Thin
	Block Size	>64 ha (160 ac) optimal; suboptimal 14 – 64 ha (35-160)
	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	15 – 30 cm optimal; 10 – 15 cm OR 30 – 40 cm suboptimal
	Visual Obstruction Reading ¹	7 – 15 cm optimal; 3 – 7 cm OR 15 – 24 cm suboptimal
	Dead (Residual) Grass Cover	40 – 60% optimal; 20 – 40% OR 60 – 80% suboptimal
	Combined Biocrust ² and Bare Soil Cover	<20% optimal; 20 – 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 infrastructure

¹ Visual Obstruction Reading is an index of vegetation height and density.

² Biocrust includes mosses, lichens and little club moss.

OTHER MANAGEMENT PRACTICES FOR BAIRD’S SPARROW

There are some management issues unrelated to habitat characteristics that should be taken into consideration when managing for Baird’s Sparrows. These beneficial management practices are as follows:

- Avoid placing wind turbines, oil wells or large infrastructure such as compressor stations or solar farms within large blocks of native grassland. Encourage directional drilling from a single site rather than spaced wells. Gas wells in large blocks of native grassland may also negatively affect Baird’s Sparrows, but mixed research results indicate we do not fully understand the impacts.
- Avoid the creation of roads. They may influence the density or productivity of birds. Trails likely have minimal impact.

ENVIRONMENTAL BENEFIT INDEX FOR BAIRD'S SPARROW HABITAT

Criteria and Scoring

The Environmental Benefit Index (EBI) was developed by compiling comprehensive categories of criteria based on available knowledge, such as Baird's Sparrow population and habitat research, expert opinion and species recovery documents.

The EBI begins with five screening criteria. These criteria are either met, in which case the user continues to the next criterion, or not met, in which case the property or potential project is eliminated from further consideration. The remaining criteria are grouped into landscape and site scale habitat features.

A scoring system was devised for the EBI. Each criterion is weighted out of 600, 300, 200, or 100 based on relative importance to the species.

The total scores are calculated based on the following formula:

$$\text{EBI} = \{(1)(2)(3)(4)(5)[(6.1+6.2)+(7.1+7.2+7.3+7.4+7.5+7.6+7.7+7.8+7.9)+(8)]\}$$

The EBI result may then be divided by the costs of the proposed project or the bid for the project to determine cost effectiveness. The cost to achieve the habitat requirements could include added management, added infrastructure or inputs or lost opportunities.

The range of possible scores for candidates that pass the screening criteria is quite wide. The lowest possible total score is 450 and the highest possible score is 2200. When evaluating candidate properties for a project or program, it may be possible to divide the scores into more general High, Moderate and Low priorities. There are many uses for a general ranking. For example, a more general ranking could be used to determine the total cost of implementing results-based programming on all high priority sites.

SCREENING CRITERIA

1. The landscape is topographically flat or gently rolling with slopes under 17% (10 degrees).
Yes=1, No=0.
2. The landscape supports less than 15% tree cover, and less than 20% shrub cover, 2m high or taller. If shrub cover is clumped rather than widespread, up to 25% can be tolerated.
Yes=1, No=0.
3. The landscape is composed of at least 50% native and/or tame grassland within at least 400 m of, and including, the area of consideration. Native and tame grasslands are combined at the landscape scale because current remote sensing technology does not allow us to accurately distinguish between these two cover types. However, because of lower reproductive success in tame grasslands, a higher weighting is given to native grassland.
Yes=1, No=0.
4. The area of consideration is greater than 14 ha (35 acres) in size.
Yes=1, No=0.
5. The area of consideration is free of, and distant (>400m) from oil wells, major roads, wind turbines and large infrastructure such as compressor stations or solar farms.
Yes=1, No=0.

LANDSCAPE SCALE HABITAT CRITERIA

6. Baird's Sparrows are thought to rarely return to the same place to breed each year, but instead settle wherever conditions are suitable for breeding. They are attracted by other individuals of the same species. Various risks and threats associated with Baird's Sparrow recovery may be outside the decision-making capability of a single land manager, but because of location and proximity to certain landscape features, environmental benefits can be impacted.

- 6.1. Land cover is the most critical landscape feature predicting potential habitat for Baird's Sparrow. Generally, the more grassland a landscape supports, the more attractive it will be to Baird's Sparrow. Grassland may be comprised of native vegetation or tame forages. These thresholds were derived from models using a 400 m radius, but this relationship has been measured up to 1492 km². Baird's Sparrows are sensitive to landscape scale grassland habitat amount even though suitable habitat might be locally available. **(Max 600 points)**

Land Cover

600	70 - 100% grassland within 400 m of, and within, the area of consideration
300	50 - 70% grassland within 400 m of, and within, the area of consideration

- 6.2. Baird's Sparrow prefer flat to gently rolling grassland. **(Max 300 points)**

Topography - Slope

300	Slopes mainly less than 9% (5 degrees)
200	Slopes mainly 11 – 16% (6 – 9 degrees)

SITE LEVEL CRITERIA

7. Site scale targets for Baird's Sparrows are those attributes that the individual prefers when selecting their home range or territory. They also include habitat attributes that maximize productivity of the species.
- 7.1. Baird's Sparrows select for a minimum block of suitable habitat of about 14 ha (35 acres) in size, but are most abundant when that block size is a quarter section (64 ha/ 160 acres) or larger. **(Max points 200)**

Block Size

200	Candidate area supports a minimum of 64 ha (160 acres) of continuous, suitable grassland habitat.
50	Candidate area supports 14 - 64 ha (35 - 160 acres) of continuous, suitable grassland habitat.

- 7.2. Baird's Sparrow will use native grassland and tame grassland, including both pasture and hayland. However, the tame forages must have a comparable vegetative structure to native grassland. For example, crested wheatgrass pastures would be suitable, but grasslands dominated by smooth brome grass or with a substantial alfalfa component would not. Also, some studies indicate that reproductive success of Baird's Sparrow is as much as four times higher in native grassland than tame grassland.

(Max points 100)

Habitat Quality – Type of Vegetation

100	Native grassland with no tame forage invasion
50	Tame pastures or hayland with similar structure to native grassland in the same Ecoregion OR Native grassland invaded by tame forages
0	Tame pastures or hayland supporting tall grasses or dense shrub-like vegetation.

- 7.3. Baird's Sparrows can tolerate some shrubs within their territories and may even place their nest near a low growing shrub. However, they tend to avoid areas where trees grow and where shrub cover is relatively high. This criterion includes woody vegetation of all heights.

(Max points 200)

Habitat Quality – Woody Vegetation

200	Tree cover = 0% AND shrub cover <15%
50	Tree cover = 0% AND shrub cover between 15 – 25%
0	Tree cover >0% OR shrub cover >25%

- 1.1. Residual vegetation is one of the most important habitat features that attract Baird's Sparrows. Residual vegetation would include litter, but is represented in this module by

the measurement of dead grass (carry over). Percent foliar cover was measured using quadrats.

(Max points 200)

Habitat Quality – Residual Vegetation

200	Residual vegetation cover between 40 - 60%
100	Residual vegetation cover between 20 – 40% OR between 60 – 80%
0	Residual vegetation cover <20% OR >80%

- 7.5. Visual obstruction readings are a combined measurement of vegetation height and density. The values used here are measured using a Robel pole. Visual obstruction is a measurement that can be related to foraging efficiency and predation risk for Baird's Sparrows. Lower visual obstruction is thought to enhance foraging efficiency, although dense vegetation often produces more insects. The relationship between visual obstruction and predation risk depends on how the predator hunts. Baird's Sparrows prefer to have patches of denser vegetation to hide nests and prefer moderate visual obstruction for foraging.

(Max points 100)

Habitat Quality – Visual Obstruction

100	Visual obstruction reading between 7 and 15 cm
50	Visual obstruction reading between 3 and 7 cm OR between 15 and 24 cm
0	Visual obstruction reading under 3 cm OR over 24 cm

- 7.6. Baird's Sparrows have a low tolerance for high amounts of biocrust (mosses, lichens and little club moss) and bare soil cover. This low tolerance is related to their preference for moderately tall and dense vegetation.

(Max points 100)

Habitat Quality – Biocrust and Bare Soil

100	Biocrust and bare soil cover <20%
50	Biocrust and bare soil cover between 20 - 40%
0	Biocrust and bare soil cover >40%

- 7.7. Baird's Sparrows have a low tolerance for low growing or very tall vegetation. In low growing vegetation, they are unable to hide their nests and their young from predators and nest parasites. Very tall vegetation may be perceived as unsuitable because it is too similar to the heights of woody vegetation, or it may make movement more difficult. Heights should be variable within the range of optimal or suboptimal as opposed to uniform.

(Max points 100)

Habitat Quality – Vegetation Height

100	Vegetation height between 15 and 30 cm
50	Vegetation height between 10 and 15 cm OR between 30 and 40 cm
0	Vegetation height under 10 cm OR over 40 cm

- 7.8. Range condition indicates the status or composition of the present plant community in relation to the potential, or climax and expresses changes in vegetation composition, productivity, and land stability. The relative contribution of decreasers, increasers and invaders to the composition of the range ecosite determines its condition rating. Range condition ratings are not interchangeable with range health ratings.

(Max points 100)

Habitat Quality – Range Condition

100	Range condition Good to Excellent
50	Range condition Fair
0	Range Condition Poor

- 7.9. Baird's Sparrows tend to avoid habitat edges where vegetation structure makes relatively sharp and substantial changes. Research has shown reduced abundance of Baird's Sparrows close to roadside ditches, cropland and areas where tame grasses are invading native grasslands. Some studies have demonstrated lower abundance of Baird's Sparrows near fencelines, water bodies, and natural gas wells. This avoidance may be related to the presence of habitat edge as other studies show no effect.
(Max points 100)

Distance to Habitat Edge

100	Habitat edge > 200 m from area of consideration.
50	Habitat edge 100 – 200 m from area of consideration.
0	Habitat edge within OR <100 m from area of consideration.

OTHER CRITERIA

8. Interaction with other species at risk (SAR): Other SAR may exist in the area. The presence of optimal Baird's Sparrow habitat may have a positive, negative or neutral effect on the other SAR found in the area of consideration. For example, optimal habitat for Baird's Sparrow may reduce the suitability of habitat for other endemic grassland birds such as Chestnut-collared Longspur. In the event of multiple species and both positive and negative impacts, this criteria should be applied for each Species at Risk.
(Max points 100)

Interaction with other Species at Risk

100	Baird's Sparrow habitat contributes positively to other area SAR.
0	Baird's Sparrow habitat has no impact on other area SAR.
-100	Baird's Sparrow habitat has a negative impact on other area SAR

EBI=

$$\{(1)(2)(3)(4)(5)[(6.1+6.2)+(7.1+7.2+7.3+7.4+7.5+7.6+7.7+7.8+7.9)+(8)]\}$$

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