Rocky View County – Springbank Area Structure Plan (ASP) Review Project

Environmental Constraints Review

Submitted To:

Rocky View County

Submitted By:

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1 Introduction

1.1 Report Objectives

Tannas Conservation Services Ltd. (TCS) was contracted by Rocky View County to perform a desktop Environmental Constraints Review for the Springbank Area Structure Plan (ASP) Review Project. As requested, the constraints map includes environmentally significant areas (provincial data), floodway and flood fringe, slopes over 15%, environmental reserve lands, riparian policy areas, and wetlands (Appendix A, Figure A1). Additional maps were provided separately in order to present the data more clearly, and include patches of native vegetation (Appendix A, Figure A2), provincial wildlife sensitivity layers (Appendix A, Figure A3), and wildlife habitat connectivity maps (Appendix B). The aim of the desktop study was to produce updated maps showing important environmental features within the study area with an accompanying overview to inform the ASP policy writing process.

1.2 Project Location and Description

The ASP area is located in Rocky View County, Alberta within townships T25-R3-M5, T24-R3-M5, and T24-R2-M5 (Appendix A).

2 Methods

2.1 GIS

2.1.1 Environmentally Significant Areas

The most current version of the Environmentally Significant Areas (Fiera Biological Consulting 2014) shapefile was obtained from Alberta Environment and Parks (2019) and is presented on the map “as is”.

2.1.2 Floodway and Flood Fringe

The most current version of the Flood Hazard Mapping (Alberta Environment and Parks 2015) shapefile was obtained from Alberta Environment and Parks via GeoDiscover Alberta and presented on the map “as is”. Files included in the study are Floodway, Flood Fringe, Flood Area Under Review.

2.1.3 Slopes Over 15% and Other Topographical Features

Steep slopes were mapped using a slopes raster file, provided by Rocky View County and is presented on the map “as is”.

2.1.4 Environmental Reserve Lands

The Environmental Reserve Lands shapefile was provided by Rocky View County and is presented on the map “as is”.

2.1.5 Riparian Policy Area

The Riparian Policy Area shapefile was provided by Rocky View County and is presented on the map “as is”.

2.1.6 Native Grassland/Shrubland

The Grassland Vegetation Inventory (Government of Alberta 2011a) shapefile was obtained from AEP and used to identify areas with native grassland/shrubland cover. Recent air photos (2018) and field verification (where access was possible) were used to update this data to as current as possible.

2.1.7 Significant Tree Cover Areas

The Grassland Vegetation Inventory (Government of Alberta 2011a) shapefile was obtained from AEP and used to identify large patches of tree cover. Recent air photos (2018) and field verification (where access was possible) were used to update this data to as current as possible.

2.1.8 Hydrology (Wetlands and Water Bodies)

TCS used the following base layers to delineate hydrology for the ASP area:

- The hydrology shapefile provided by Rocky View County, which provides a line file of watercourses.
- Two-meter contour shapefile provided by Rocky View County, displays the contours that show sloped areas and basins.
- Alberta Merged Wetland Inventory (AMWI; Alberta Environment and Parks 2018a), has polygon files classified into either open water or marsh (no swamps). It does not generally include anthropogenic water bodies, except for backed up reservoirs forming open water areas along creeks.
- 2018 and 2012 orthophotos provided by the County. Imagery from 2018 was used because it was the most recent available, and imagery from 2012 was used because it was an average year for precipitation.

Classification of wetlands

Wetlands were classified to one of the following codes:

- M-G-II: Temporary Graminoid Marsh,
- M-G-III: Seasonal Graminoid Marsh,
- M-G-IV: Semi-Permanent Graminoid Marsh,
- W-A-V: Permanent Shallow Open Water,
- W-A-III: Seasonal Shallow Open Water,
- S-S: Shrubby Swamps,
- DUG: Dugouts, industrial ponds, ponds formed in disturbed lands, and ponds formed by backing up creeks with a dam,
- RIV: River areas in the study boundary.
- UWL: Unknown wetlands outside the ASP boundary but within the model boundary.

Wetland Delineation Process

1. The AMWI file was checked to determine if the wetland boundaries were close to what was observable on the 2018 or 2012 orthophotos. If the match was very close, the polygon was used in the newly created shapefile.

2. If the polygons were not a good match, they were copied to the new shape file and then edited to cover the correct area.
3. Where several small basins were connected with intervening wetland vegetation, one large boundary was drawn around all of these basins.
4. When wetlands were observed on the 2018 or 2012 orthophotos but not on the AMWI, the contour lines and/or the observed outer wetland boundary was used to freehand draw a new polygon.
5. Close attention was paid to developed areas to delineate all anthropogenic ponds and dugouts.
6. The hydrology file was used to identify creeks. The length of the creeks was searched for flat areas (as identified in the contour mapping, or areas already pulled out in the AMWI) with taller marshy vegetation. These were separately mapped and classified.
7. Along creeks, small open water areas within marshy areas were not delineated separately unless these were substantially large polygons.

Wetland Class Determination Methods

- A conservative estimate of wetland class was generally used by looking at the two years of imagery and classifying by the largest/most wet condition among these years.
- If small basins occurred in cropland and looked to be cropped through, or if they appeared flat with no visible open water or tall emergent vegetation, they were classed as a Temporary Graminoid Marsh.
- Relatively small basins (approximately < 50 m) and basins with open water areas of a small size (typically < 5% if the area or small areas likely to dry out in dry summers) or basins with evident tall emergent vegetation covering most of the area were classed as a Seasonal Graminoid Marsh.
- Small to moderate sized basins (up to 100 m) with moderate sized (up to 25 - 50% of basin area) open water areas intermixed with large areas of emergent vegetation were generally classed as a Semi-Permanent Graminoid Marsh.
- Larger basins of mainly open water or moderate sized basins with large open water areas (> 25 - 50% of the area) were classified as Permanent Shallow Open Water. If the large basins appeared dry or drying, they were classed as seasonal shallow open water.
- If shrubs or larger vegetation that looked like shrubs were visible (mostly along creeks) the area was classed as a Shrubby Swamp.
- Areas along creeks with no shrubs evident but with backed up open water were classed as Permanent Shallow Open Water.
- Areas along creeks with no shrubs in low flat areas with distinctly different herbaceous vegetation were compared to surrounding lands, and generally classified as Seasonal Graminoid Marshes. Contour lines were used to confirm these were not steep gradient creeks. These areas should be ground-truthed to see if they are riparian grass areas that differ from the surrounding areas and are not actually wetlands.
- Creeks that met the following criteria were not classified as wetlands:
    - Did not have backed up open water and had a narrow band of riparian vegetation,
    - Did not look like a low area,
    - Were in steep areas.

Quality Control Methods While Searching

- Areas with no or few wetlands in the merged wetland inventory were searched thoroughly to ensure these were not missing wetlands due to poor imagery.
- Dugout areas change rapidly, so may not appear in both years of imagery. 2018 imagery was generally used as the base reference for these features.

2.2 Wildlife

2.2.1 Sensitive Species Review

Wildlife data records were requested from AEP and the Fish and Wildlife Information Management System (FWMIS) to investigate if any sensitive species had been previously found in or near the ASP area. Past Biophysical Assessments conducted in the ASP area were also reviewed to see if any sensitive species had been previously recorded. The BIAs that were reviewed included those conducted by Athena Environmental Consulting (2017), EnviroConsult Inc. (2006), Ghostpine Environmental Services Ltd. (2018), HAB-TECH Environmental Ltd. (2009), and Sweetgrass Consultants Ltd. (2007). This information was used to aid in deciding which species to use as target species for the wildlife connectivity modelling exercise. A species was considered to be sensitive if it was listed in the General Status of Alberta Wild Species report (Government of Alberta 2017a) as “Sensitive”, “May be at Risk”, or “at Risk”; or listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the federal Species at Risk Act (SARA) as “Special Concern”, “Threatened”, or “Endangered” (Government of Canada 2018).

The Fish & Wildlife Internet Mapping Tool (FWIMT; AEP 2018b) was used to identify if the ASP area is within any provincially designated Wildlife Sensitivity Layers. Wildlife Sensitivity Layers are developed from current scientific knowledge of wildlife range extents, and are based on data from aerial surveys, historical information, telemetry, and habitat types. These areas have been identified as important locations for the viability and productivity of Alberta’s wildlife. Specific operating conditions and mitigation strategies may have to be followed for industrial activities in these layers to help mitigate any adverse effects on wildlife populations or their habitat.

The information about sensitive species that may be present in the ASP area was used to assist in deciding which habitats to focus the habitat modelling exercise on, as well as tailoring recommendations to protect wildlife habitat in the ASP area.

2.2.2 Wildlife Habitat Modelling

Structural landscape connectivity for wildlife in the ASP area was modelled using Circuitscape version 4.0.5 (McRae et al. 2013). Circuitscape uses circuit theory to model movement routes of organisms across fragmented landscapes and identify areas important for habitat connectivity (McRae et al. 2016). To use Circuitscape, the landscape is modelled into a large “circuit board” with each individual pixel being assigned a resistance value (reflecting how difficult it is for a wildlife species to move through the space). A theoretical “current” is then applied to randomly placed “nodes” and the current moves through the landscape according to how “conductive” different parts of the landscape are. The resulting current density of each pixel represents the likelihood that that pixel will be used by a randomly walking animal (Bowman & Cordes 2015). Areas with high current density represent the most connective

corridors that support movement of the target wildlife species of the model (and other species which share the same habitat). Protecting these corridors can help to mitigate the negative effects of habitat loss and fragmentation in human-modified landscapes and conserve biodiversity (McRae et al. 2016).

A combination of multiple habitat and disturbance databases was used to make a shapefile converted to a raster file that was then used as the base map for Circuitscape modelling. These included (1) Habitat Classes – comprising of the Grassland Vegetation Inventory (GVI; Government of Alberta 2011a), (2) Anthropogenic Disturbance – comprising of the Human Footprint data (ABMI 2018a) and City of Calgary Land Use Districts (City of Calgary 2019), and (3) Wetlands – comprising of the Alberta Merged Wetland Inventory (AEP 2018a) and TCS delineated wetlands. In two of the three main data categories, the GVI database did not fully cover the ASP area and 20% buffer (see below). In those cases, the GVI and City of Calgary Land Use Districts databases were merged together to provide full coverage of the modelling area. A full description of the land-use classes used for modelling and their sources is located in Appendix C.

Movement simulations were based on the habitat preferences of several focal species: (1) Moose (*Alces alces*), (2) Deer (*Odocoileus* sp.), and (3) Short-eared Owl (*Asio flammeus*) (Table 1). The barrier effect of different land-use types was also taken into account. These species were chosen because of the availability of distribution and habitat data, their presence in or near the ASP area, the fact that they can function as "umbrella species" for other wildlife, and their relatively contrasting habitat preferences. Due to the lack of detailed habitat information for many sensitive species identified in the ASP area, sensitive species were not used as the target species for the models, but their habitat preferences are often similar to other species that were chosen as the target species.

A literature review of habitat preferences was used to assign resistance values to the land-use map categories using a 1-100 scale with 1 being optimal habitat with little resistance and 100 being impermeable habitat (Table 2).

Table 1: Target species used for wildlife habitat modelling with their general habitat preferences.

Target Species for Model	General Habitat Preferences
Moose	Prefers forested, shrubland, and wetland habitat types. Avoids agricultural and urban areas. Relevant associated species could include: black bear, cougar, bobcat, Western Wood-peewee, and Olive-sided Flycatcher.
Deer	A generalist species that prefers deciduous and mixedwood forests, and shrublands. Positive association with agricultural areas and rural/urban features. Relevant associated species could include: coyote and other disturbance tolerant species.
Short-eared Owl	Prefers native prairie or tame pasture and avoids annual cropland, urban areas, and forests. Relevant associated species could include: Sprague's Pipit, American badger, and other grassland obligate species.

Table 2: Resistance values assigned to each land-use type for each target species model.

Land-use Type	Resistance Values		
Forest and Shrubland:	**Moose**	**Deer**	**Owl**
Deciduous forest	1	1	75
Coniferous forest	25	25	100
Mixedwood forest	1	1	75
Shrubland	50	1	50
Grassland and Agriculture:			
Native Grass/Low Shrub	75	1	1
Modified Native Grass	75	1	1
Tame Pasture/Hayland	75	1	25
Annual Cropland	75	25	50
Hydrology:			
M-G-II (temporary marsh)	25	50	25
M-G-III (seasonal marsh)	25	50	25
M-G-IV (semi-permanent marsh)	25	50	25
S-S (shrubby swamp)	1	50	50
W-A-V (permanent shallow open water)	25	50	50
DUG (Dugouts)	50	50	50
Reservoirs	50	50	50
Rivers	75	75	75
Streams	50	50	50
Ditch	50	50	50
Draw	25	50	25
Unknown Wetland	50	50	50
Anthropogenic:			
Industrial Lands and Buildings	100	100	100
Rural Residential	50	25	50
Urban Residential	100	75	100
Minor Roads/Trails	50	25	50
Major Roads	75	75	75
Road Ditch	50	25	50
Misc. Disturbance	50	25	50
Other Linear Disturbance	50	25	50
Recreational Land	75	25	75

***Habitat preferences assigned using literature review of several sources (ABMI 2018b; ABMI 2018c; ABMI and Boreal Avian Modelling Project 2018; Bjorge et al. 2018; Clayton 2000; Environment Canada 2016; Timmermann & McNicol 1988).**

A patch-free model was used in Circuitscape with starting and ending nodes outside of the ASP area, which is suitable for showing the broad movement of individuals across the landscape. A 20% (by area) rectangular buffer zone was created around the ASP boundary to define the model boundary and place the nodes. Enough space between the ASP area and the nodes is needed to remove any artificially

biased data, or create data "hotspots". A buffer of 20% of the ASP area, corresponding to 1,200 meters, with node focal points spaced of 5,000 meters apart, was applied outside the ASP area to mitigate for hotspots and provide a realistic result. A total of 12 node focal points were created and a buffer area of 20% was selected because it is standard in Circuitscape modelling. See Table 3 for the full Circuitscape model specifications.

Table 3: Circuitscape specifications.

Option	Input
Input Data Type:	Raster
Modelling Mode:	Pairwise: iterate across all pairs in focal node file
Input Resistance Data:	ASP Boundary + 20% buffer raster file
Pairwise Mode Options:	.txt file containing 12 focal node points spaced 5,000 meters apart in the 20% buffer area
Advanced Mode Options:	None
Output Options:	Current Maps by species
Options - Calculation Options:	None
Options - Mapping Options:	Write cumulative & max current maps only
Options - Optional Input Files:	None

2.3 Ground-Truthing

TCS staff ground-truthed the ASP area on July 11, 2019 to verify if major land-use classifications matched the categories that were determined during the desktop delineation. Only areas that were publicly accessible by roadway were examined. Only polygons that were over 5 ha in size were checked for accuracy.

3 Results/Discussion

The maps outlining (1) Environmentally Significant Areas, (2) Floodway and Flood Fringe, (3) Slopes Over 15%, (4) Environmental Reserve Lands, (5) Riparian Policy Area, (6) Hydrology (Wetlands and Water Bodies), (7) Native Vegetation Types (including forest, grassland, and shrubland), and (8) Wildlife Sensitivity Layers are provided in Appendix A.

3.1 Hydrology

Wetlands and water bodies within the ASP area were delineated using existing databases and two years of air photos to provide the County with a database of wetland location, class, size, and amount (Table 4; Appendix D, Figures 1-173; Supplied shapefiles). A total of 732 wetlands were found in the ASP area, along with 166 dugouts. These numbers do not include ephemeral wetlands and/or wetlands or dugouts not detectable in the two years of imagery used to delineate (2012 and 2018). It is recommended that since this was a coarse-scale desktop assessment using only two years of air photos, all parcels considering development require a Biophysical Impact Assessment (BIA) to be completed using the Rocky View County Servicing Standards (2013) and conduct field-based wetland assessment using all of the appropriate AEP Directives (Government of Alberta 2015a, 2015b, 2015c, 2016, 2017b, 2018).

Table 4: Wetlands and Water Bodies within the Study Area

Wetland/Water Body Type	Number Within Study Area
M-G-II (Temporary Graminoid Marsh)	365
M-G-III (Seasonal Graminoid Marsh)	252
M-G-IV (Semi-Permanent Graminoid Marsh)	41
S-S (Shrubby Swamp)	28
W-A-V (Permanent Shallow Open Water)	46
Dugout	166

3.2 Wildlife

3.2.1 Sensitive Species Review

A total of 13 species were documented in the ASP area that were considered sensitive (Table 5): one amphibian species, 10 bird species, and two mammal species. None of the species are listed under the Alberta *Wildlife Act*. Two species are listed as "Special Concern" under COSEWIC and SARA: western tiger salamander (*Ambystoma mavortium*) and American badger (*Taxidea taxus).* Two species are listed as "Threatened" under COSEWIC and SARA: Bank Swallow (*Riparia riparia)* and Sprague's Pipit *(Anthus spragueii).*

Using the FWIMT, it was determined that the following Wildlife Sensitivity Layers are located within the ASP area boundary (Appendix A, Figure A3):

- Sensitive Raptor Range – Bald Eagle, Golden Eagle, Prairie Falcon (covers entire ASP area)
- Sharp-tailed Grouse Survey Area (covers entire ASP area)
- Leopard Frogs (covers entire ASP area)
- Key Wildlife and Biodiversity Zones (Along the Bow River valley and Elbow River valley)
- Endangered and Threatened Plants Ranges (Northwest corner of the ASP area)

Table 5: Species at Risk detected in the ASP area either in FWMIS or a previous BIA.

Source	Common Name	Scientific Name	AB General[1]	Wildlife Act[2]	COSEWIC status[3]	SARA status[4]
Amphibians						
FWMIS	Western Tiger Salamander	*Ambystoma mavortium*	Secure	N/A	Special Concern	Special Concern
Birds						
FWMIS	Bank Swallow	*Riparia riparia*	Sensitive	N/A	Threatened	Threatened
FWMIS	Clark's Nutcracker	*Nucifraga columbiana*	Sensitive	N/A	N/A	N/A
HAB-TECH Environmental Ltd. (2009)	Common Yellowthroat	*Geothlypis trichas*	Sensitive	N/A	N/A	N/A
FWMIS	Eastern Phoebe	*Sayornis phoebe*	Sensitive	N/A	N/A	N/A
FWMIS, EnviroConsult Inc. (2006)	Great Blue Heron	*Ardea herodias*	Sensitive	N/A	N/A	N/A
FWMIS	Least Flycatcher	*Empidonax minimus*	Sensitive	N/A	N/A	N/A
HAB-TECH Environmental Ltd. (2009)	Sora	*Porzana carolina*	Sensitive	N/A	N/A	N/A
FWMIS	Sprague's Pipit	*Anthus spragueii*	Sensitive	N/A	Threatened	Threatened
HAB-TECH Environmental Ltd. (2009)	Swainson's Hawk	*Buteo swainsoni*	Secure	N/A	N/A	N/A
FWMIS	Western Wood-pewee	*Contopus sordidulus*	May Be at Risk	N/A	N/A	N/A
Mammals						
EnviroConsult Inc. (2006)	American Badger	*Taxidea taxus*	Sensitive	N/A	Special Concern	Special Concern
FWMIS	Bobcat	*Lynx rufus*	Sensitive	N/A	N/A	N/A

1) General Status of Alberta's Wild Species (Government of Alberta 2017a)
2) Alberta Wildlife Regulation (Government of Alberta 1997)
3) Status listed by the Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2018)
4) Status under the federal Species at Risk Act (Government of Canada 2018)

3.2.2 Wildlife Habitat Modelling

The following are a few guidelines on interpreting the wildlife habitat mapping provided:

- Wildlife habitat corridors do not indicate the direction in which the wildlife species move. Circuitscape modelling does not provide direction of use. Instead, it provides areas through which wildlife likely move and/or utilize.
- Wildlife habitat corridors shown in Appendix B reveal the areas that are most likely to be used by each species type based on their habitat preferences.
- Modelling was not able to be verified using FWMIS or BIA data, as very little location specific data was available for the ASP area.

3.2.2.1 Moose (and Forest/Wetland/Shrubland Species)

In general, the habitat connectivity for moose and other forest/wetland/shrubland species is of low quality in the ASP area (Appendix B, Figure B1 - Resistance map, Figure B2 - Connectivity Model). Moose tend to favour forest and treed wetland habitats, of which there is very little of in the ASP area. When these habitats do exist, they tend to be fairly small and not fully connected. If moose were to travel through the ASP area, the areas of highest habitat connectivity are primarily in the forested area in the south that runs alongside the Elbow River, and the forested area that runs north alongside the Bow River. The Elbow River corridor is more continuous than the Bow River corridor, which is broken up by patches of residential and agricultural development. There are some areas of forest connectivity on the east side of the ASP area which moose could also utilize to move in a north-south direction between the river valleys.

3.2.2.2 Deer (and other Generalist Species)

Habitat connectivity throughout the ASP area is much stronger for deer and other generalist species than moose (Appendix B, Figure B3 - Resistance map, Figure B4 - Connectivity Model). Like moose, there is an area of high connectivity in the forested area along the Elbow River in the south of the ASP area, but they are less restricted to the river valleys than moose. There are many other areas of high connectivity throughout the ASP area, where deer can utilize a network of connected native grassland, modified native grasslands, tame pastures, and deciduous forest. It is important to note that while deer may utilize more open habitats for foraging in the spring and summer, they tend to rely on more forested and sheltered habitats during the critical winter period, meaning that their habitat map would more closely resemble the one for moose during this time.

3.2.2.3 Short-eared Owl (and Grassland Species)

Availability of suitable habitat for grassland species is mainly concentrated in several paths travelling through the ASP area and avoiding the forested river valley areas to the north and south (Appendix B, Figure B5 - Resistance map, Figure B6 - Connectivity Model). One of the areas with the highest connectivity is a continuous stretch of native grassland interspersed with wetlands located in the northwest portion of the ASP area. There are also several areas of tame pasture that may be utilized by grassland species to move through the project area while avoiding residential and industrial areas.

3.2.3 Wildlife Habitat Mitigation Recommendations

3.2.3.1 Wetlands

Wetlands provide many valuable functions including: suitable habitat for a wide variety of flora and fauna, stopover areas for migratory waterfowl, improving water quality, and improving water retention to prevent flooding (Government of Alberta 2013a). It is recommended that high value wetlands in the ASP area be retained in order to utilize the many benefits they provide. The Government of Alberta has developed a process for assessing the value of wetlands in terms of their relative abundance on the landscape, supported biodiversity, ability to improve water quality, importance to flood reduction, and human uses (Government of Alberta 2013a). It is recommended that any developments intending to impact wetlands in the ASP area perform a detailed assessment of the value of wetlands on the property by using the Alberta Wetland Rapid Evaluation Tool – Actual (ABWRET-A) or Alberta Wetland Rapid Evaluation Tool – Desktop (ABWRET-D), depending on the level of disturbance.

The ABWRET assigns wetlands a value category (A, B, C, or D) based on different functions, including: hydrologic functions, water quality functions, ecological (habitat) functions, and human use functions. Each wetland is assigned a final value based on how its functions compare to other wetlands in the region, with Class A being the highest value and Class D being the lowest value. Where high valued wetlands (Class A) are identified, they should be protected wherever possible. Determining the ABWRET value of the wetlands in the ASP area is not possible from the coarse review that was done for this report, but high value wetlands tend to be larger, more permanent waterbodies (semi-permanent or permanent) that provide a high hydrological and water quality value, and/or provide high quality wildlife habitat and human uses. Basic principles of the Alberta Wetland Policy should be followed, meaning minimization and avoidance of wetlands is the primary strategy for their protection, and wetland replacement is only used where impacts cannot be avoided.

3.2.3.2 Sensitive Raptor Recommendations

The entire ASP Area is located in a Sensitive Raptor Range for Bald Eagle, Golden Eagle, and Prairie Falcon. Before new development occurs in areas likely to contain suitable nesting habitat, it is recommended that a sensitive raptor survey should be conducted by a qualified biologist according to standards in the Sensitive Species Inventory Guidelines for prairie raptors (Government of Alberta 2013b). Survey efforts should focus on areas that can act as potential nesting sites such as trees, cliffs, or holes in cliffs. If an active nest is identified, a setback distance of 50 – 1000 m should be applied around the nest where activity is restricted (Government of Alberta 2011b). The distance of the setback depends on the time of year and level of disturbance. For more details refer to the *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* (Government of Alberta 2011b).

3.2.3.3 Sharp-tailed Grouse Recommendations

The entire ASP Area is located in a Sharp-tailed Grouse Survey Area. If development is to occur in an area with suitable Sharp-tailed Grouse habitat, it is recommended that a survey for active leks should be conducted by a qualified biologist according to standards in the Sensitive Species Inventory Guidelines (Government of Alberta 2013b). Leks are patches of ground where male birds gather in the spring to perform mating displays. Suitable habitat in the ASP Area could include: open prairie, shrubby sandhills, coulees, margins of watercourses, margins of farmland, shrublands, and open aspen groves. If an active lek is identified, a setback distance of 100 – 500 m should be applied around the lek where activity is restricted (Government of Alberta 2011b). The distance of the setback depends on the time of year and level of disturbance. For more details refer to the *Recommended Land Use Guidelines for Protection of Selected Wildlife Species and Habitat within Grassland and Parkland Natural Regions of Alberta* (Government of Alberta 2011b).

3.2.3.4 Key Wildlife and Biodiversity Zone Recommendations

Key Wildlife and Biodiversity Zones are located in portions of the ASP Area (Along the Bow River valley and Elbow River valley). Key Wildlife Biodiversity Zones are considered to be important for winter ungulate habitat as well as having higher potential for biodiversity, and typically occur along major river valleys. The Government of Alberta (Government of Alberta 2015d) has developed a set of recommended guidelines for industrial land use within these zones which are summarized below:

1. New permanent access is not recommended. Where permanent access is essential, an access management plan and associate approval from AEP will be required. The access management plan should aid in minimizing disturbance to wildlife and habitat degradation and limit public vehicle traffic.
2. Where temporary access is required, it should be designed and managed to minimize disturbance to wildlife and degradation of associated habitat.
3. No construction is permitted within the applicable restricted period, which varies depending on the project location:
    - No construction between January 15th and April 30th in Key Wildlife and Biodiversity Zones north of Highway #1 (Along the Bow River valley).
    - No construction between December 15th and April 30th in Key Wildlife and Biodiversity Zones south of Highway #1 (Along the Elbow River valley).
4. Relaxation of the restricted activity period requires approval from AEP, but it still expected that other mitigation measures are put in place to protect the wildlife resource.

It is recommended that any new industrial developments taking place within Key Wildlife and Biodiversity Zones in the ASP Area should follow all of the government recommended guidelines. If construction must take place within the restricted time window, then consultation with AEP and associated approval is required before work proceeds.

3.2.3.5 Wildlife Corridors

The wildlife corridors for moose identified by the modelling exercise in this report (Appendix B, Figure B1) largely overlap with the Key Wildlife and Biodiversity Zones located along the river valleys in the ASP Area; therefore, many of the recommendations for industrial activity in Key Wildlife and Biodiversity Zones will also inherently apply to the identified moose corridors. Areas with high connectivity for moose (and other forest species) coincide with connected forest areas; therefore, it is recommended that tree clearing is limited these areas, especially where clearing would segment the forest into unconnected patches. Where feasible, re-forestation in areas where forest patches have been segmented would aid in improving connectivity for these species. Protecting forested areas is also beneficial for retaining winter habitat for deer species.

Habitat connectivity for Short-eared Owls will be less effected by forest protection, as they are mainly associated with grassland habitats. It is recommended that the continuous stretches of native grassland associated with areas of high connectivity in the Short-eared Owl habitat model are protected from cultivation and development where feasible. Many grassland species depend on the structural diversity that native grassland provides for nesting and foraging, which is lost in tame grassland monoculture habitats.

Because deer and other generalist species readily use habitat that is anthropogenically influenced, habitat protection is not required to maintain areas of high connectivity identified in the model; however, other mitigation measures can be implemented to protect wildlife and reduce human-wildlife conflicts in these areas. Wildlife corridors identified in this report can be combined with traffic data to identify areas where corridors cross roadways and have a high likelihood of wildlife-vehicle collisions. The City of Edmonton *Wildlife Passage Engineering Design Guidelines* (2010) describe several options to mitigate for human-wildlife conflicts and improve habitat connectivity, including: road design

considerations, signage and/or reflectors, fencing, altered lighting, altered sight lines, public education, traffic calmed areas, reduced speed limits, wildlife "crosswalks", roadkill removal, diversionary methods, vegetation management, noise barriers, curb improvements, culverts, bridges, and tunnels/overpasses. The best options for mitigation depend on the roadway characteristics and the specific species of concern. The City of Edmonton *Wildlife Passage Engineering Design Guidelines* (2010) should be consulted to determine the best option for each individual project.

3.2.3.6 Migratory Birds

According to the Map of Nesting Zones in Canada (Government of Canada 2017), the ASP Area is located in Nesting Zone B4 within the Prairie Potholes (BCR 11) Bird Conservation Region. In this nesting zone, birds are actively nesting between April 14 and August 28 (Government of Canada 2017), with some variation between different bird species and habitat types. Habitat destruction activities in areas attractive to migratory birds carry a particularly high risk of disturbing or destroying migratory bird nests or eggs during this timing window; therefore, it is recommended that any development disturbance (e.g. stripping and grading) should not be conducted between April 14 and August 28 in order to comply with the Migratory Birds Convention Act (Government of Canada 1994).

If it is necessary to disturb potential nesting habitat within the restricted activity period (RAP), a nest sweep should be conducted by a qualified wildlife biologist to ensure that nesting habitat will be avoided and nesting birds or other species will not be disturbed. If a nest is observed during the nest sweep, an appropriate disturbance setback around the nest should be determined in consultation with AEP and this setback must be maintained until the nest is no longer occupied.

Some wildlife protected under provincial or federal legislation may begin breeding prior to April 14. Appropriate setbacks remain in effect if an active nest, or other wildlife feature (e.g. den, hibernaculum, etc.), is identified, regardless of the time of year. Notably, owls and some waterfowl may begin nesting before April 14, especially in forested or wetland areas.

3.3 Ground-Truthing

A total of 156 separate polygons were ground-truthed during the July 11, 2019 field visit. The majority of polygons that were examined were types of grassland vegetation (82 polygons), as these were easily accessible and visible from roadways. It was determined that many polygons that were originally mapped as "Native Grassland" using GVI (Government of Alberta 2011a) did not match this definition in the field. The majority of these areas were actually composed of monocultures of non-native grasses that were managed in some way either for grazing or hay. Ground-truthing resulted in many of these areas being re-classified to "Modified Native Grass".

The second most common polygon type that was examined was "Country Residence" using the ABMI Human Footprint data (ABMI 2019) due to it being highly accessible by vehicle and one of the most common polygon types in the ASP area (27 polygons). During ground-truthing, it was discovered that many polygons that were classified as "Urban Residence" were much more accurately described as a "Country Residence" because of the large amount of space and natural features between residences, and were therefore reclassified. This change likely resulted in some changes to the wildlife habitat mapping results as "Urban Residence" polygons were assigned higher resistance values than "Country Residence" polygons.

The next most common polygon type that was examined was forest polygons (22 polygons) that was mapped using GVI (Government of Alberta 2011a). Several areas had forest types that needed to be adjusted based on field evidence, and were either assigned to coniferous, deciduous, or mixedwood forests. Accessing forest areas in order to examine them properly was a challenge, as most areas were inaccessible by public road. The areas that were accessible were compared with the available imagery and used to refine forest classifications in the same general area.

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Certification Page

I hereby certify that:

The requested surveys and reporting were completed by qualified professionals (Jamie Kalla, Jesse Bird, Steven Tannas, and Krista Bird) who considered all factors and influences that are within the scope of this assessment.

No person at Tannas Conservation Services Ltd., or associated sub-consultant working on this project have any contemplated interest in the property being assessed.

This report has been completed in conformity with the standards and ethics of the Alberta Society of Professional Biologists.

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APPENDIX A

Site Maps

A1 – Environmental Constraints Map

A2 – Native Vegetation Types

A3 – Wildlife Sensitivity Map

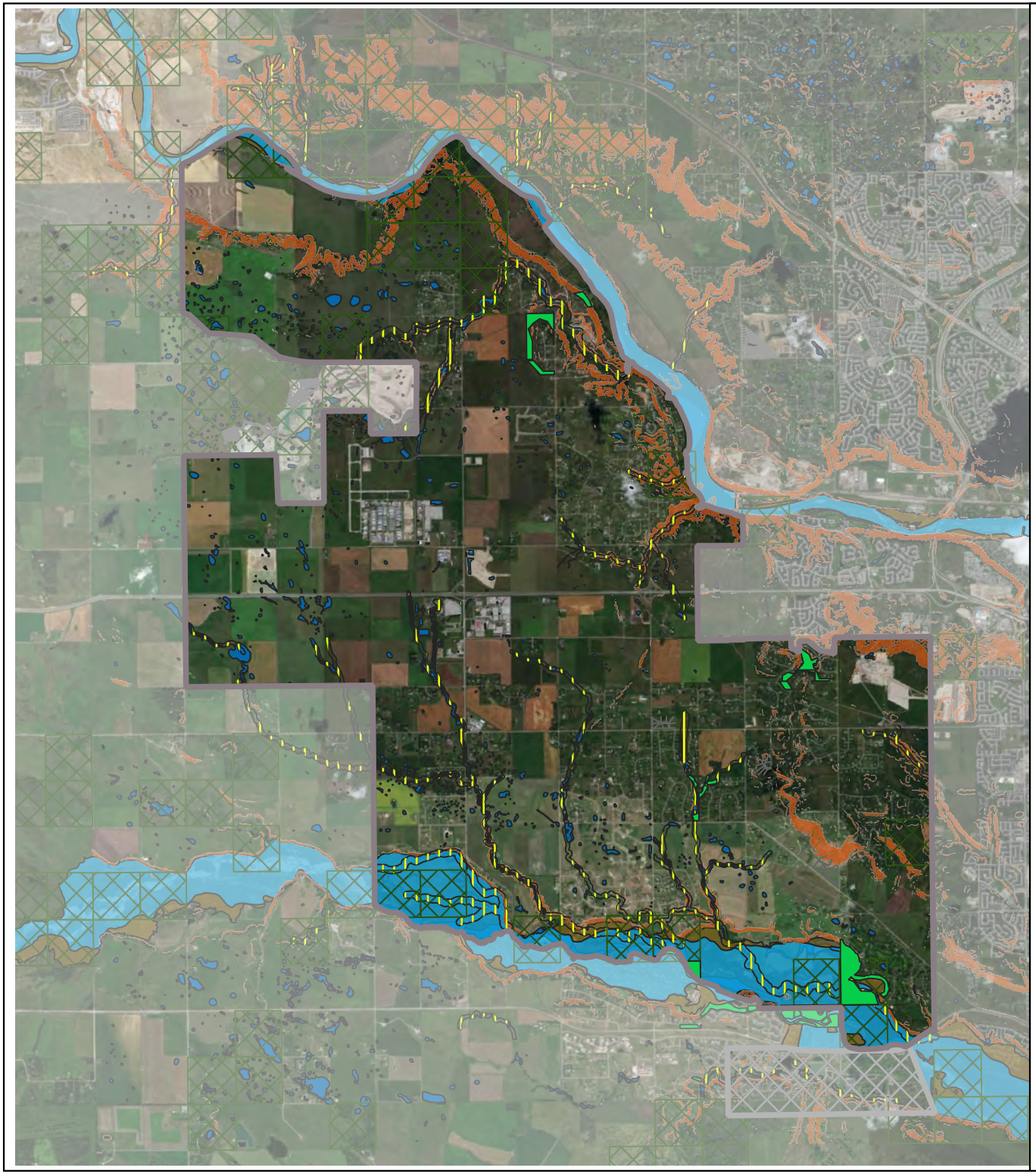

Figure A1
Environmental Constraints Map - Springbank ASP

Area Structure Plan

- Riparian Policy Areas
- Environmental Reserve
- Environmentally Significant Areas
- Slopes 15% or greater
- Wetlands
- Floodway
- Flood Fringe
- Flood Area Under Review

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS.
Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

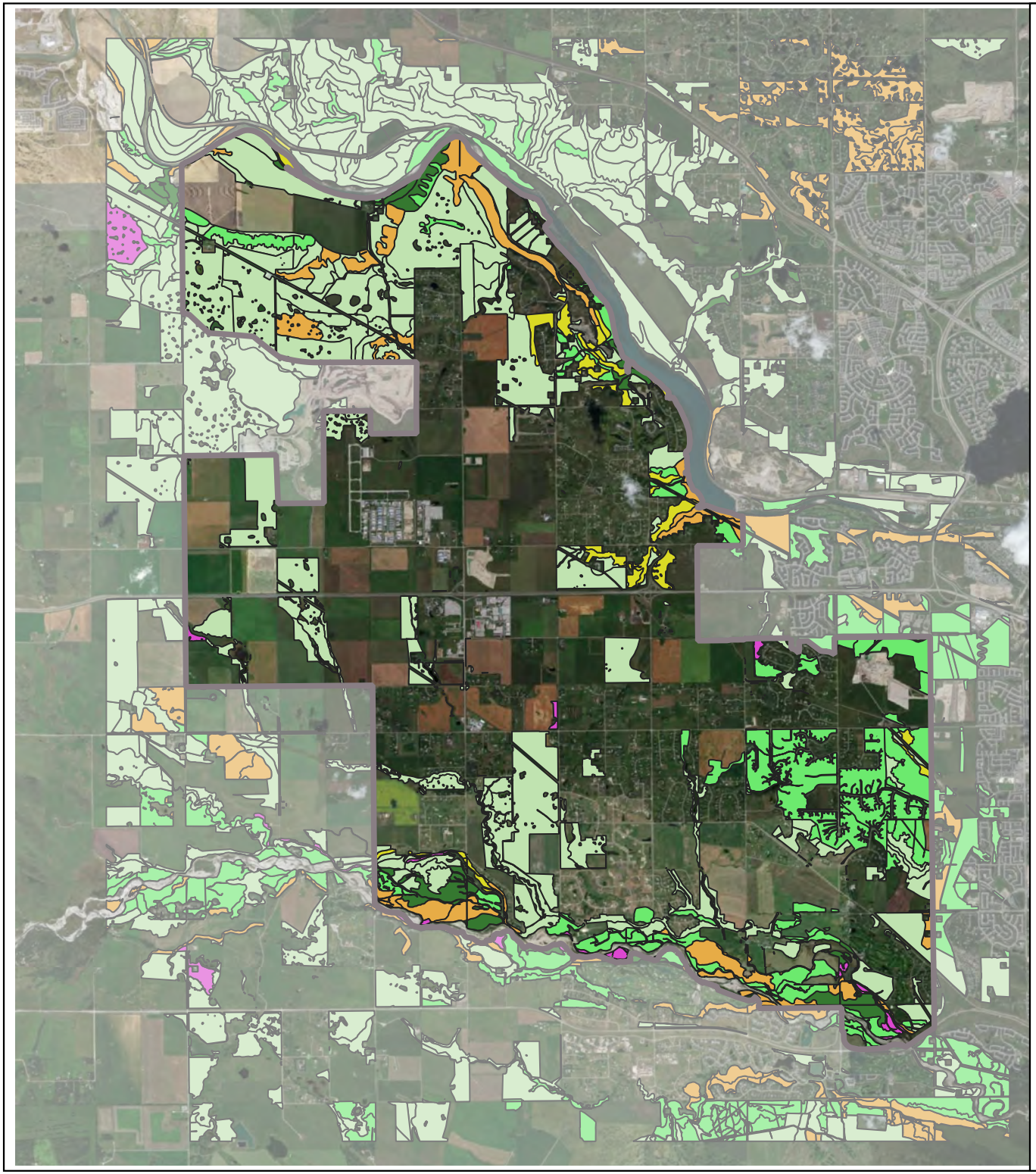

Figure A2
Native Vegetation Types
Springbank ASP

Native Habitat Types

- Coniferous Forest
- Deciduous Forest
- Modifed Native Grassland
- Native Grassland / Low Shrub
- Mixedwood Forest
- Shrubland

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

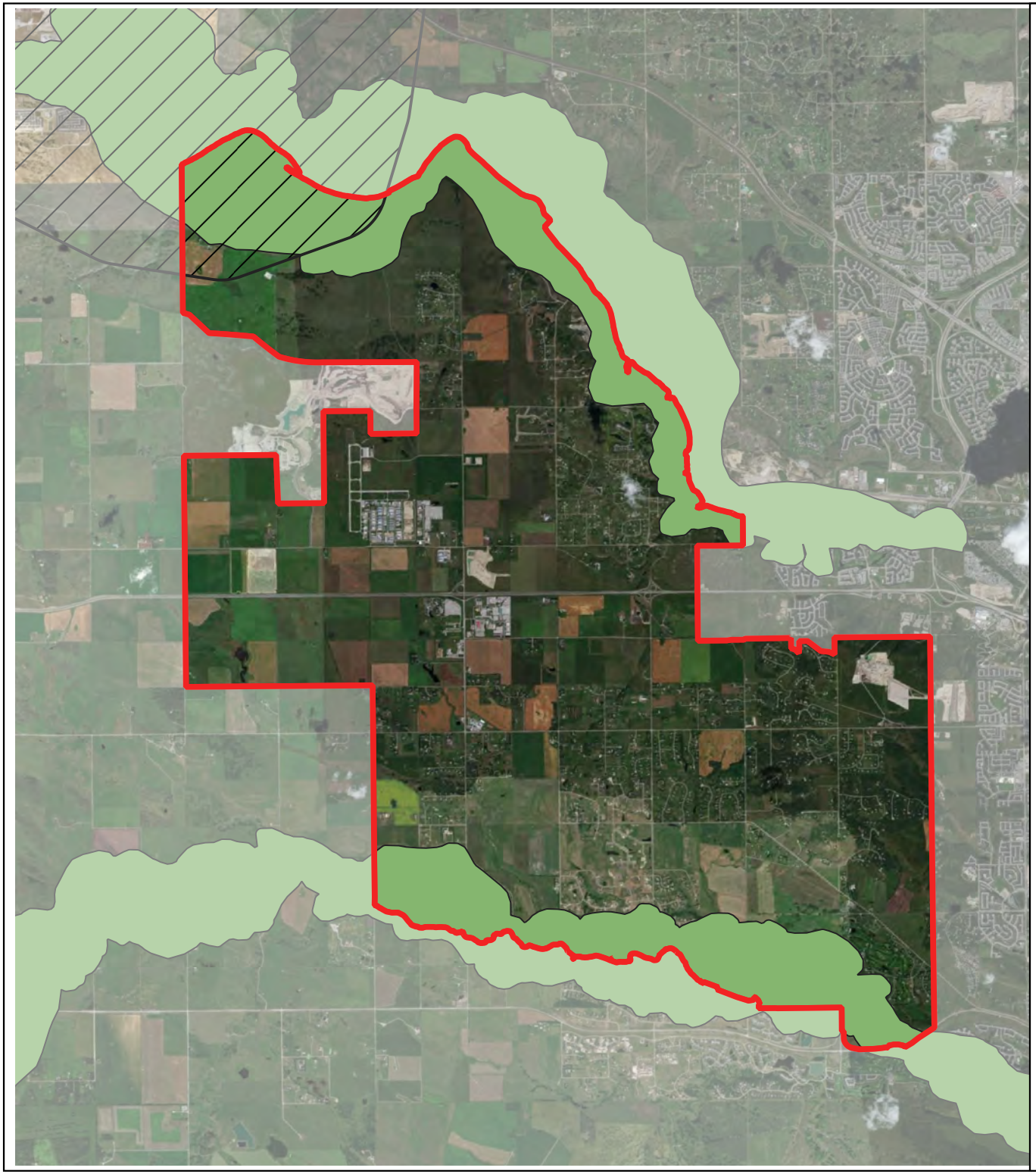

Figure A3
Wildlife Sensitivity Map
Springbank ASP

Endangered and Threatened Plants Ranges

Key Wildlife and Biodiversity Zones

Wildlife Sensitivity Layers Covering Entire ASP

- **Bald Eagle**
- **Golden Eagle**
- **Leopard Frog**
- **Prairie Falcon**
- **Sharp-tailed Grouse**

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

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APPENDIX B

Wildlife Habitat Connectivity Maps

B1 – Moose (and Forest/Wetland/Shrubland Species) Habitat Resistance
B2 – Moose (and Forest/Wetland/Shrubland Species) Habitat Connectivity
B3 – Deer (and Generalist Species) Habitat Resistance
B4- Deer (and Generalist Species) Habitat Connectivity
B5 – Short-eared Owl (and Grassland Species) Habitat Resistance
B6 – Short-eared Owl (and Grassland Species) Habitat Connectivity

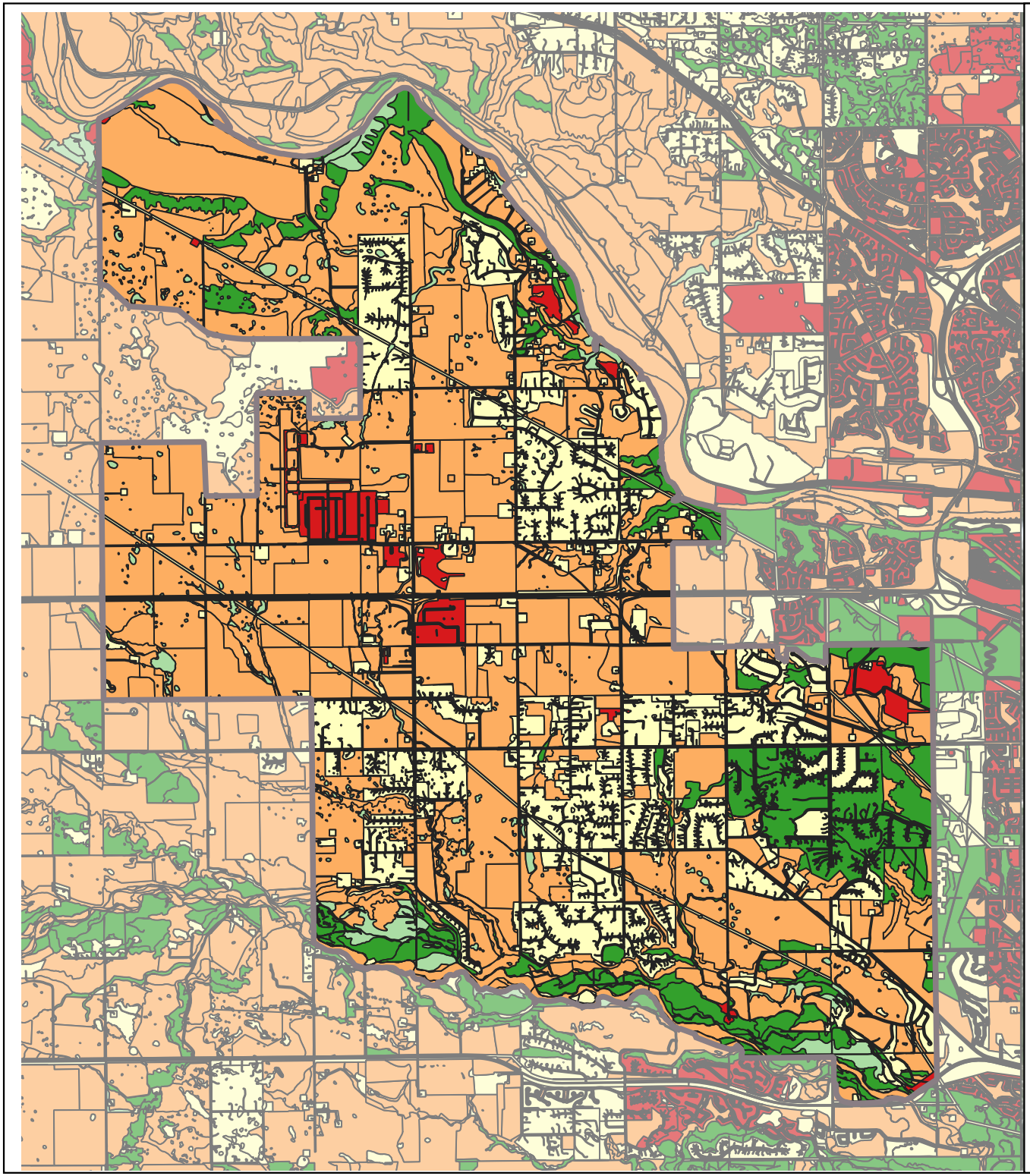

Figure B1
Wildlife Habitat Resistance
Moose

Area Structure Plan

Resistance

- 1
- 25
- 50
- 75
- 100

Scale: 1 to 90,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

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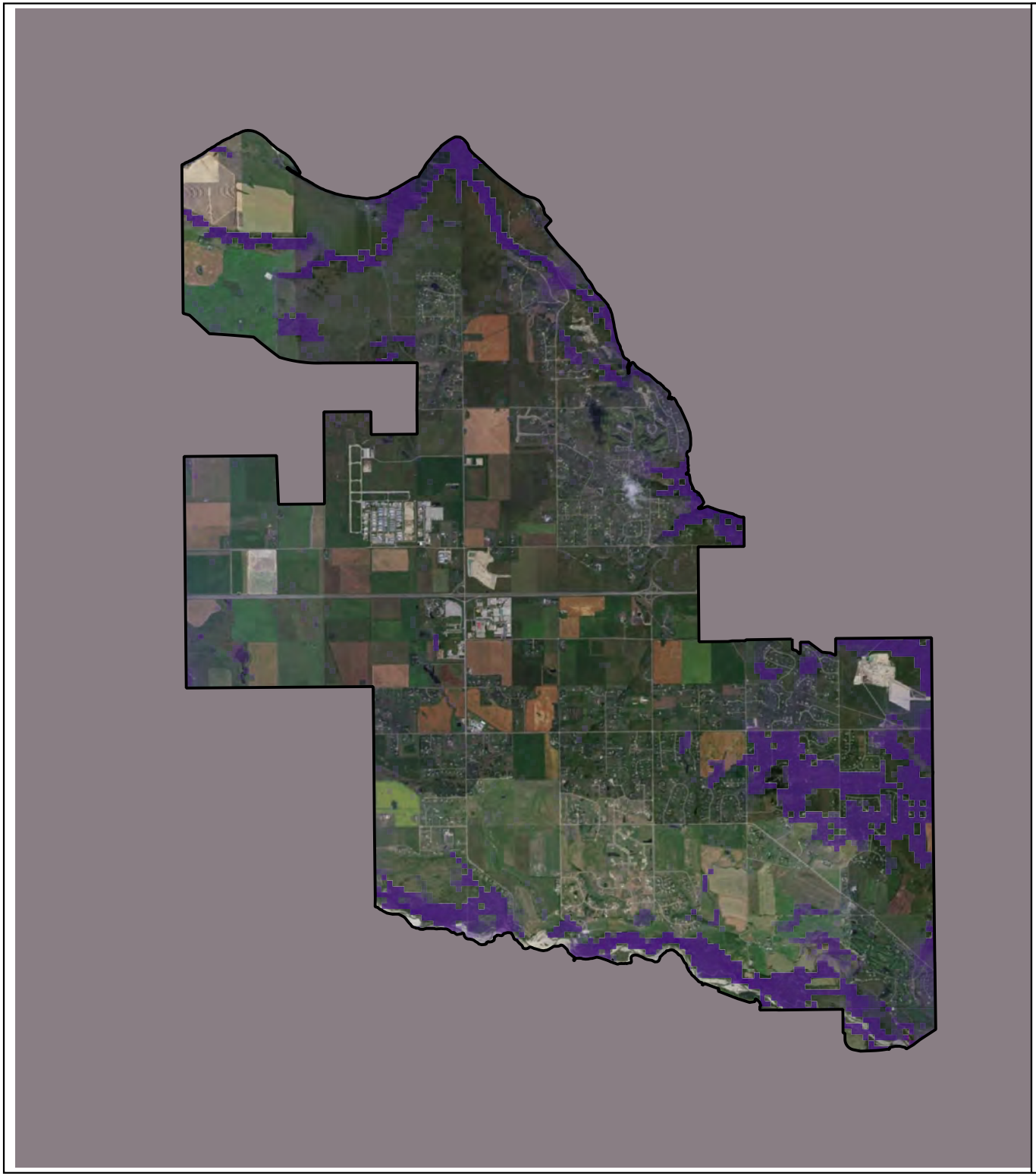

Figure B2
Wildlife Habitat Connectivity Model
Moose

Legend

Connnectivity Scale

Lowest Connectivity

Highest Connectivity

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

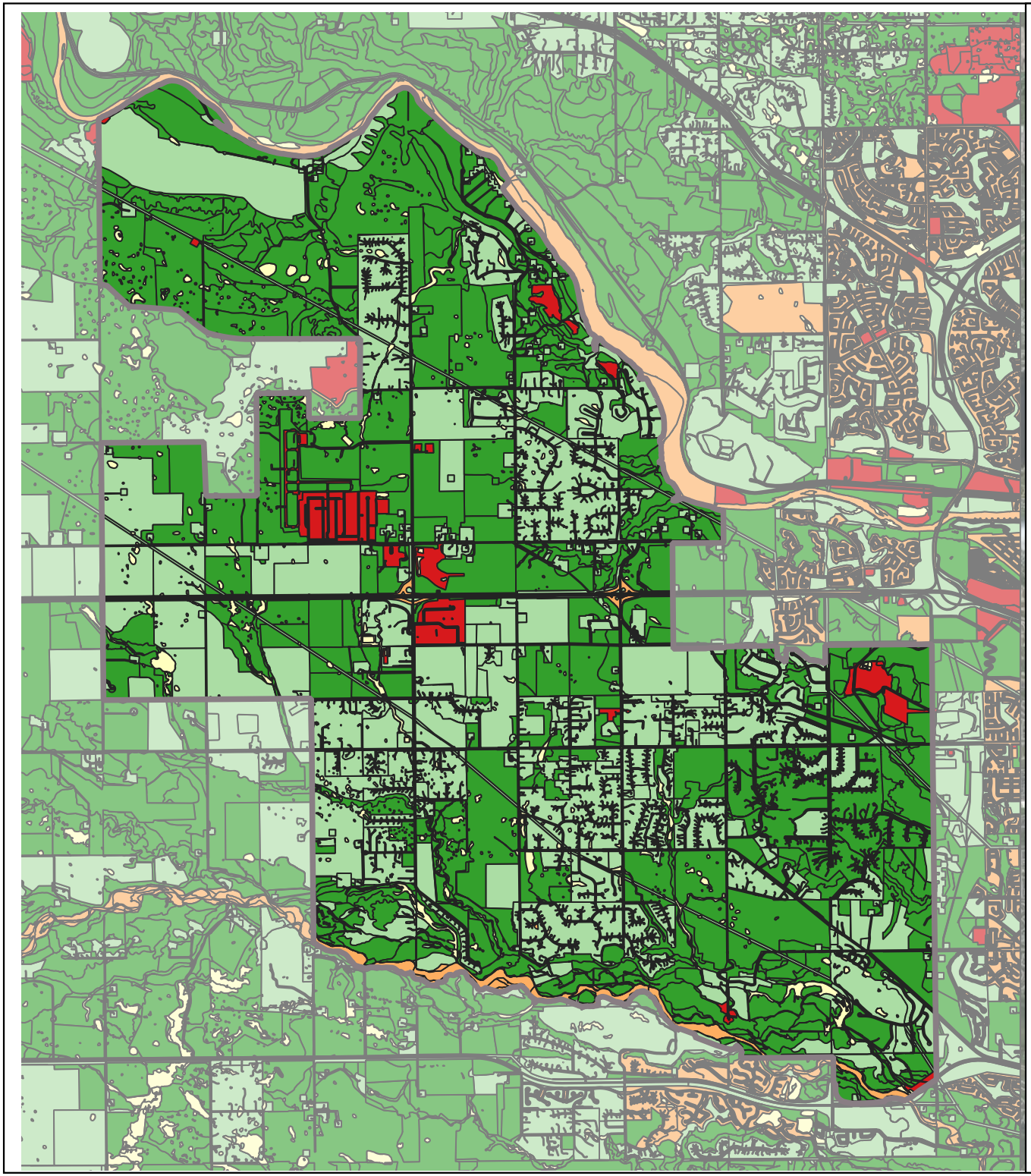

Figure B3
Wildlife Habitat Resistance
Deer

Area Structure Plan

Resistance

- 1
- 25
- 50
- 75
- 100

Scale: 1 to 90,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

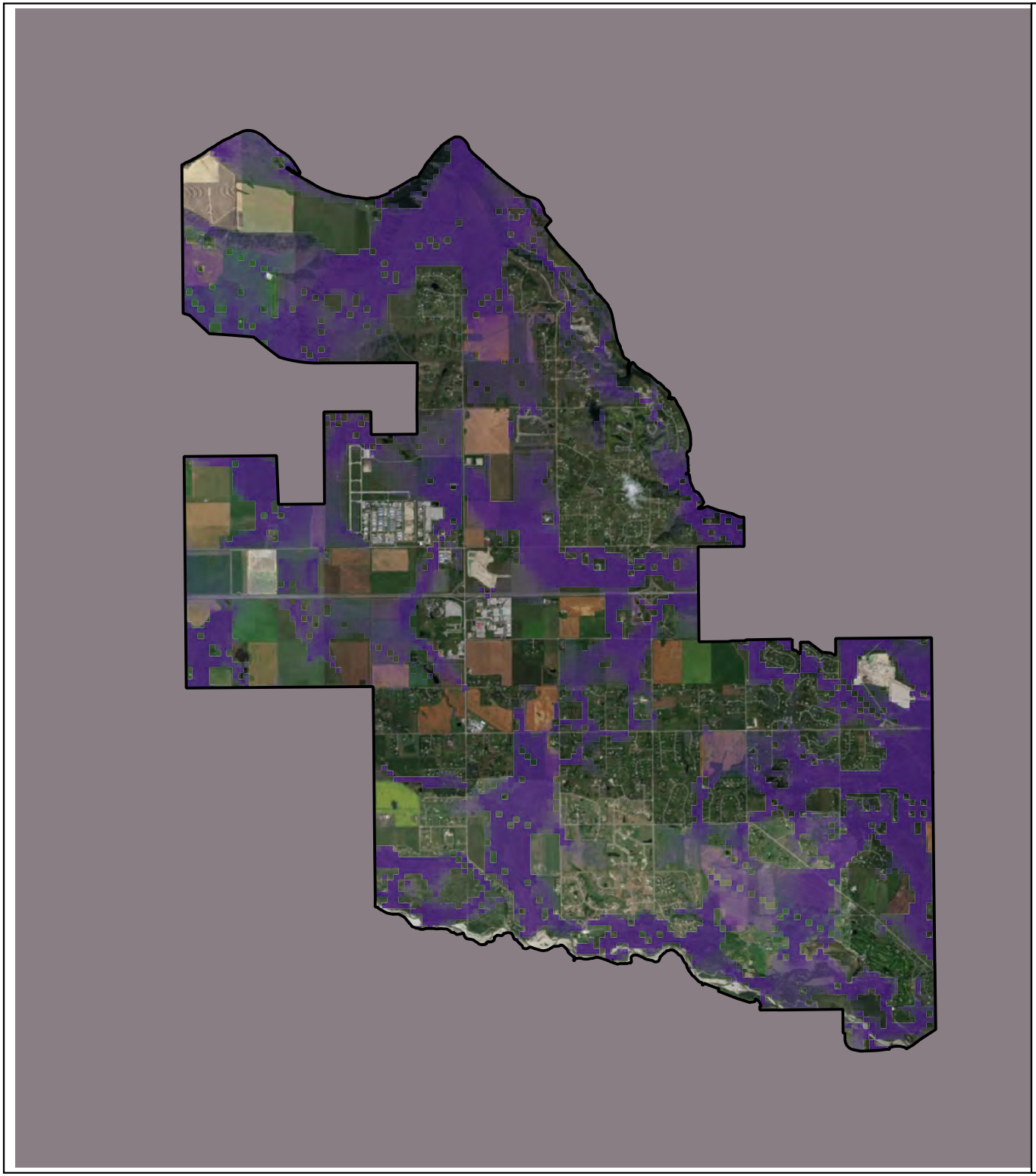

Figure B4
Wildlife Habitat Connectivity Model
Deer

Legend

Connnectivity Scale

Lowest Connectivity

Highest Connectivity

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

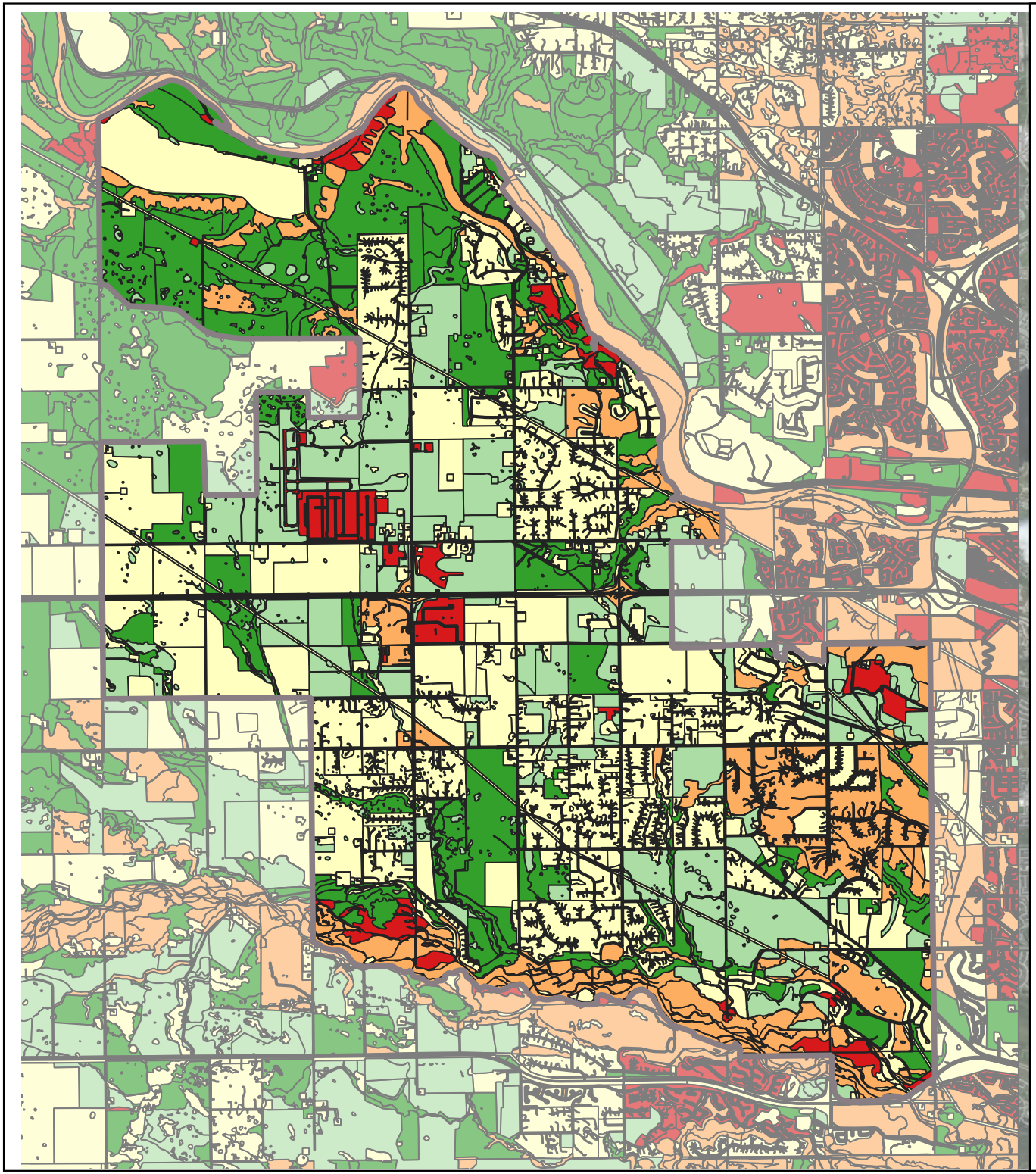

Figure B5
Wildlife Habitat Resistance
Short-eared Owl

Area Structure Plan

Resistance

- 1
- 25
- 50
- 75
- 100

Scale: 1 to 90,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

Tannas Conservation Services Ltd

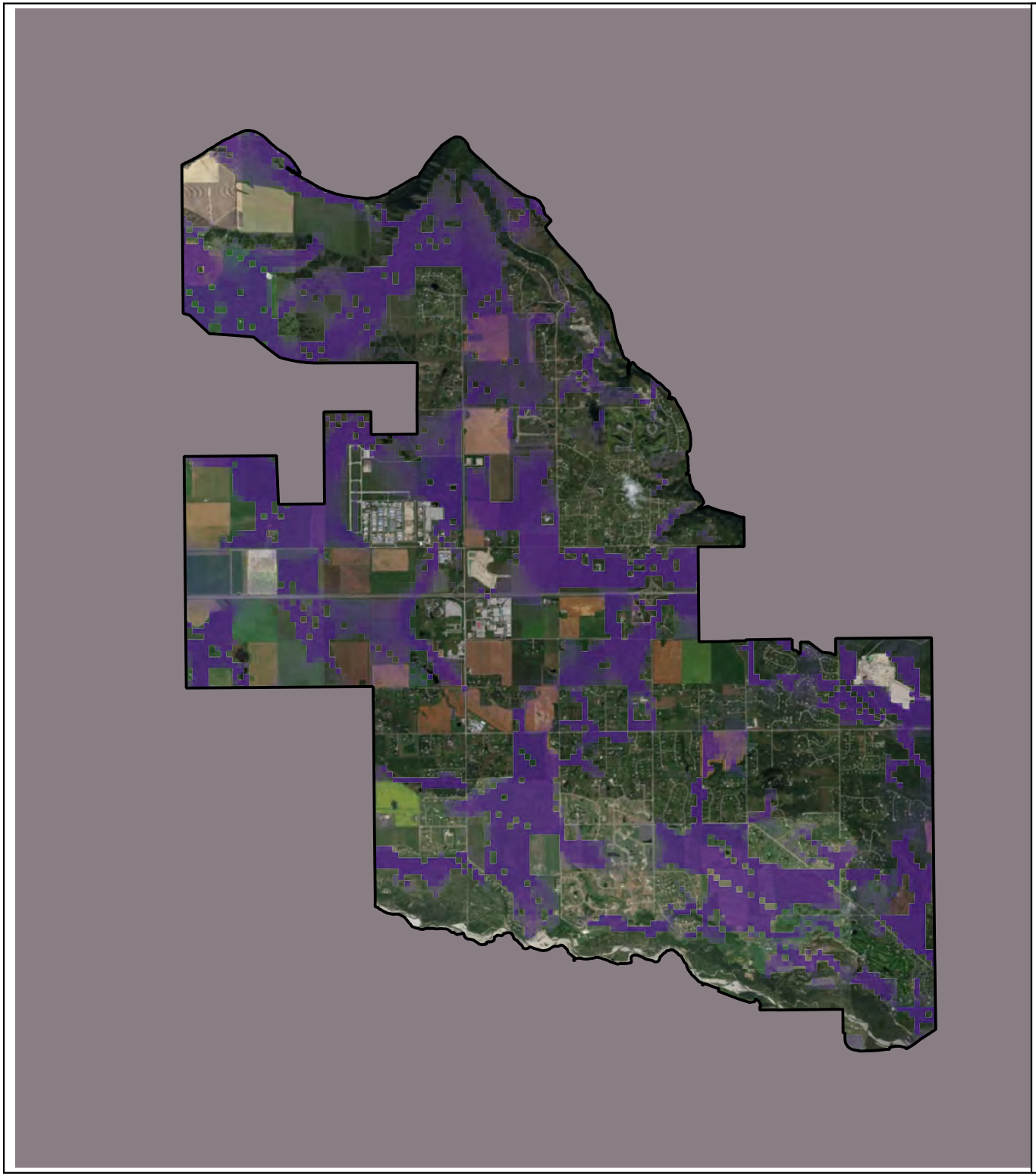

Figure B6
Wildlife Habitat Connectivity Model
Short-eared Owl

Legend

Connnectivity Scale

Lowest Connectivity

Highest Connectivity

Scale: 1 to 100,000

0 1 2 3 4 5 km

Coordinate System: NAD83 / Alberta 10-TM (Forest) (ESPG 3400)

Wetlands within Springbank ASP boundary delinated by TCS. Wetlands outside Springbank ASP are from Alberta Wetland Inventory.

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APPENDIX C

Habitat Mapping Categories

Table C-1: Habitat Types used for Wildlife Modeling

Group	Class	Map Code	Included Classes in Current Map	Defining Characteristics
Forest and Shrubland	Deciduous forest	DEC	Forest-Deciduous [1,4]	Among trees, >80% Aspen or Balsam Poplar. Trees >8m tall. Tree Patches cover > 20% of the land area
	Coniferous forest	CON	Forest-Conifer [1,4]	Among trees, >80% Spruce or Pine. Trees >8 m tall
	Mixedwood forest	MIX	Forest-Mixedwood [1,4]	Among trees, 20-80% Coniferous and Deciduous Species. Trees >8 m tall
	Shrubland	SHR	Shrubland [1,4]	<20% coverage trees over 5 m, > 20% coverage shrubs or low trees (2-8 m height)
Grassland and Agriculture	Native Grass/Low Shrub	GRN	Grassland-Native (in part) [1,4]	No evidence of past or present soil cultivation or harvest patterns, except perhaps minor linear or small patch areas. Often hummocky, low lying (ephemerally wet) or steep sloped areas. Dominated by a mix of native low shrubs (<1 m), grasses, or other herbaceous plants
	Modified Native Grass	GRM	Grassland-Native (in part) [1,4]	Past or present soil cultivation on less than 50% of a site. Often hummocky, low lying (ephemerally wet) or steep sloped areas. Dominated by non-native grasses, plus a mix of native low shrubs (<1 m), grasses, and other herbaceous plants.
	Tame Pasture/Hayland	PAS	Grassland-Managed [1,4] Grassland-TamePasture [1,4] ROUGH_PASTURE [1,4] GREENSPACE Managed -Grass [1,4] TAME_PASTURE [1,4]	Cultivated Perennial Crop or Grass areas with a mix of grasses and/or legumes

Group	Class	Map Code	Included Classes in Current Map	Defining Characteristics
	Annual Cropland	CRP	Crop [1,4]	Fallow fields, growing annual crops, or harvested fields as identified by smooth surface, evidence of harvest, linear edges/rectangular shape,
Hydrology:	M-G-II (temporary marsh)	MGII	M-G-II [1,4]	Small basins: in cropland and/or cropped through or flat with no visible open water or tall emergent vegetation
	M-G-III (seasonal marsh)	MGIII	M-G-III [1,4]	Relatively small basins (approx. < 50 m) and basins with small size open water areas (typically < 5% if the area or small areas likely to dry out in dry summers) or basins with evident tall emergent vegetation covering most of the area
	M-G-IV (semi-permanent marsh)	MGIV	M-G-IV [1,4]	Small to moderate sized basins (up to 100 m) with moderate sized (up to 25-50% of basin area) open water areas intermixed with large areas of emergent vegetation
	S-S (shrubby swamp)	SS	S-S [1,4]	Shrubs , > 25% cover, visible along creeks
	W-A-V (permanent shallow open water)	WAV	W-A-V [1,4]	Larger basins of mainly open water or moderate sized basins with large open water areas >25-50% of the area, progressively smaller areas classed as WAIV and WAIII
	DUG (Dugouts)	DUG	DUG DUGOUT [1,2,4]	Rectangular, small to medium sized in areas without a creek feature (generally), with evident spoil piles and steep walls.
	Reservoirs	RES	LAGOON RESERVOIR [1,2,4]	Odd shaped open water bodies along creeks with evidence of a dam, and generally much larger than dugouts (>100 m long)
	Rivers	RIV	Bow-River [1,4,5] Gravel-Bar [1,4] River [1,4,5]	Floodplain and inner banks of the Bow or Elbow rivers, including gravel bars and flowing channels
	Streams	STR	LtcH [1] LtcR [1]	Smaller flowing water systems with or without gravel floodplains
	Ditch	DITCH	Ditch [4]	Linear water channels with evident steep walls and water at base (if visible)
	Draw	DRAW	S-S [4]	Vegetated areas of depressed terrain in a general downslope pattern or network, likely to support ephemeral

Group	Class	Map Code	Included Classes in Current Map	Defining Characteristics
				flows, often with darker colour than surrounding terrain indicating higher soil moisture
	Unknown Wetland	UWL	WL_unknown [1,3,4]	Used for some wetlands outside of the project area
Anthropogenic:	Industrial Lands and Buildings	IND	Development-Cleared [2,4] Dev FACILITY-OTHER [2,4] FACILITY-UNKNOWN [2,4] GRVL-SAND-PIT Pit [2,4] URBAN-INDUSTRIAL [2,4] WELL-ABAND [2,4] WELL-OIL [2,4] WELL-OTHER [2,4]	Well pads, not vegetated, buildings, gravel pits, etc., generally > 1 ha
	Rural Residential	RUR	COUNTRY-RESIDENCE [2,4] Rural [2,4]	Low-density housing
	Urban Residential	URES	URBAN-RESIDENCE [2,4]	Medium to high density housing
	Minor Roads/Trails	TRL	ROAD-GRAVEL-1L [2,4] ROAD-GRAVEL-2L [2,4] ROAD-UNIMPROVED [2,4] ROAD-UNPAVED-2L [2,4] TRAIL [2,4] TRUCK-TRAIL [2,4] ROAD-UNCLASSIFIED [2,4]	Linear or winding trails in trees or grasslands (< 5 m wide)
	Major Roads	ROAD	INTERCHANGE-RAMP [2,4] ROAD-PAVED-2L [2,4] ROAD-PAVED-DIV [2,4] ROAD-PAVED-UNDIV-1L [2,4] ROAD-PAVED-UNDIV-2L [2,4]	Large Roads (>5 m wide) and transportation infrastructure
	Road Ditch	RDIT	VEGETATED-EDGE-ROADS [2,4]	Non-native vegetation, edge of roads

Group	Class	Map Code	Included Classes in Current Map	Defining Characteristics
	Misc Disturbance	DIS	CLEARING-UNKNOWN [2,4] RESIDENCE_CLEARING [2,4]	Small clearings <1 ha
	Other Linear Disturbance	LIN	PRE-LOW-IMPACT-SEISMIC [2,4] TRANSMISSION-LINE [2,4]	Linear areas cutting through forests or across grasses, with a notable change in land use/vegetation cover. Where the land use is the same as surrounding land, the surrounding land has precedence and the linear disturbance is not separated
	Recreational Land	REC	GOLFCOURSE [2,4] RECREATION [2,4] Horse paddocks [4] Sports fields [4] GREENSPACE [2,4] Urban Trees [4]	Observed by special land facilities Undisturbed urban land

Data Source for Each Data Category Used in the Wildlife Habitat Mapping

[1] Government of Alberta. 2011a. Grassland Vegetation Inventory (GVI) Specifications. 88 pp.

[2] Alberta Biodiversity Monitoring Institute (ABMI). 2019. Human Footprint Inventory 2017. 138pp.

[3] Alberta Environment and Parks. 2018a. Alberta Merged Wetland Inventory.

[4] Tannas Conservation Services Ltd. 2019. Interpretation of Rocky View County 2012 and 2018 air photos.

[5] City of Calgary. 2018. Calgary Open Data – Hydrology.

APPENDIX D

Springbank ASP Wetland Maps