

**Natural Heritage Background Study
West Road
Municipalities of Northern Bruce Peninsula
and South Bruce Peninsula**

Prepared for:

Highways Department

Prepared by:

*SPL now WSP
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1.0 EXECUTIVE SUMMARY

SPL Consultants Limited was retained by the County of Bruce on March 27, 2015 to conduct a background study on road improvements being considered for West Road from Oliphant (Bruce Road 13) to Ferndale (Bruce Road 9), Ontario.

The background study stage is a high level of review over a 29 kilometer stretch of road with a lower focus on the northerly 4 kilometers.

This summary of documented natural heritage, bolstered by broad reconnaissance in the field, scopes the level of future environmental impact studies (EIS) required.

Maps were generated from reconnaissance that illustrate the location of sensitive natural areas with special future study needs such as wetlands with breeding amphibian activity and grasslands with breeding grassland birds. The expected level of future studies was identified based on SPL reconnaissance.

Involvement of the Saugeen Ojibway Nation in the future studies will ensure that the unique perspective of traditional Aboriginal values for natural heritage is part of the process.

2.0 POLICY

The study area is 29 kilometers of West Road with an adjacent land zone of 120 metres. This will be referred to as the Site.

The Site will be subject to lower level environmental impact study. Such study will have regard for existing environments identified in the Provincial Policy Statement (PPS), the County of Bruce Official Plan, the Municipal Official Plan, applicable Acts and Saugeen Ojibway Nations (SON).

The natural heritage review used the framework of the County's EIS Guideline document.

The environment is summarized below and reported on within the study area findings.

2.1 PROVINCIAL POLICY STATEMENT

Provincial tests are outlined in a policy statement under the Ontario Planning Act known as the Provincial Policy Statement (PPS) and respective upper and lower tier Official Plans.

The natural heritage section of the PPS are used to describe the various possible key natural features and functions for consistency with environmental policy during future lower level EIS.

The PPS recognizes key natural environment attributes below, detailed in Appendix C.

- *significant areas of natural and scientific interest*
- *significant wetlands and coastal wetlands*
- *significant woodlands*
- *significant valleylands*
- *significant wildlife habitat*
- *significant habitat of rare, threatened or endangered species*
- *Significant woodlands in Ecoregions 6E,7E(excluding islands in Lake Huron, St.Mary's River)*
- *Significant valleylands in Ecoregions 6E,7E(excluding islands in Lake Huron, St.Mary's River)*
- *fish habitat*

2.2 COUNTY OF BRUCE OFFICIAL PLAN

The local County of Bruce Official Plan (2010) adds local attributes for Bruce County:

- *100 metre buffer zone or 2 year time of Travel (WHPA-B) for Wellhead Protection Areas*
- *Intake Protection Zone 1 or 2 for Intake Protection Zones*
- *Karst topography*
- *Hazard lands as identified by Grey Sauble Conservation Authority*
- *Locally significant wetlands*

The importance of the protection of the natural environment is acknowledged in Section 4.3.2 of the County of Bruce's Official Plan (2010) which states "*the natural resources of the County shall be protected and managed in order to maintain the preserve a healthy living environment for existing and future generations*".

Alternate solutions through the Class EA proposed by the County of Bruce for the West Road improvements will satisfy the same requirements asked of proponents through their standards for environmental studies:

4.3.3 Requirements for Environmental Impact Studies

In order to achieve County objectives for the protection of the natural environment, development proponents shall be required to prepare an EIS for any proposal that is:

- i) In, or within 120 metres of, a provincially significant wetland;*
- ii) In, or within 60 metres of, a locally significant wetland;*
- iii) In, or within 120 metres of, the habitat of threatened or endangered species;*
- iv) In, or within, 120 metres of, a significant woodland, significant valleyland, significant wildlife habitat, deer wintering areas;*
- v) In, or within 120 metres of, fish habitat;*
- vi) Within the '100 Metre Buffer Zone' or '2 Year Time of Travel (WHPA-B)' for Wellhead Protection Areas or within a 'Intake Protection Zone 1 (IPZ-1)' or 'Intake Protection Zone 2 (IPZ-2)' for Intake Protection Zones;*
- vii) Within known areas of karst topography;*
- viii) In, or within 50 metres of Areas of Natural and Scientific Interest (ANSI) Earth Science.*

2.3 SAUGEEN OJIBWAY NATION

The Saugeen Ojibway Nation outlined interests to the County of Bruce (Ritchie, 2015) in a letter noting the following key areas of concern.

- *Land Claim*
- *Commercial Fishery*
- *Traditional Harvest*
- *Natural Environment*
- *Cultural Heritage*

Examples of the natural environment were provided and included provincial wetlands, ANSI and impact on local animal populations with black bear prominent as well as Bald Eagle, Spotted Turtle as examples of concern for local animal populations.

The consultant can also inquire about SON guidelines to conduct environmental studies; e.g. draft internal guidelines (SAAR, 2010) and/or more recent guidelines if/as required from the SON Environmental Office.

2.4 GENERAL POLICY

Lower and upper tier Official Plans (OP) are quite consistent with the structure of the Provincial Planning Statement (PPS) on natural heritage matters while bringing the unique character of the municipalities to light through goals and policy.

2.4.1 MUNICIPALITY OF NORTHERN BRUCE PENINSULA

The Northern Bruce Peninsula (NBP) Official Plan identifies policy areas below, and outlines requirements for conducting an Environmental Impact Study (EIS) consistent with the County OP.

- Tobermory and Lion's Head Secondary and Urban Areas
- The Hamlet of Ferndale

The remainder of NBP is covered by the County Official Plan.

2.5 MUNICIPALITY OF SOUTH BRUCE PENINSULA OFFICIAL PLAN

The Official Plan five year review is in progress. We will therefore report on the adopted 2001 Official Plan with office consolidations to October 2012. We note that future lower level EIA need to be consistent with any future adopted plan policy on natural heritage matters.

The OP outlines requirements for conducting an EIS consistent with the County OP.

- Provincial and locally significant wetlands where development is prohibited due to the ecological importance of the resources
- Valleyland, woodland and fish or wildlife habitat owned by the Crown or
- Environmental hazard land areas susceptible to flood or erosion

The Official Plan provides criteria for the consultant to assess the level of significance and apply the appropriate level of development control.

2.6 FEDERAL FISHERIES ACT

Fisheries interests are shared by all policy directives at Provincial and Federal levels. Future EIS must be consistent with the most recent Federal Fisheries Act changes as summarized below, with liaison amongst the EIS consultant and SON Fisheries Office to incorporate concerns regarding the commercial fishery.

Guiding policy for fish habitat and management underwent recent change when Federal Bills C-38 and C-45 received royal assent (2012), amending Section 35 of the Fisheries Act. Changes came into effect on November 25, 2013.

Rather than prohibiting harmful alteration, disruption or destruction of fish habitat (HADD), the prohibition is against carrying out works or activities resulting in "serious harm" to fish. The serious harm is defined as "death of fish or any permanent alteration to, or destruction of, fish habitat part

of a commercial, recreational or Aboriginal fishery. “

The shift from all fish to only identified fisheries and respective value of the fishery to First Nation changes the way fish habitat is defined and urges lower level discussions with Saugeen Ojibway Nation on what areas they consider to be valued Aboriginal fisheries.

We are to use the new factors below:

- Contribution to a productive commercial, recreational or Aboriginal fishery
- Meeting MNR fisheries management objectives;
- Public interest

Department of Fisheries and Oceans (DFO) Burlington should be contacted to ensure the most up to date reports on fisheries resources including any new rare mussel locations are documented and assessed in the field if/as required.

The SON (Saugeen Ojibway Nation) Fisheries Department should also be contacted to discuss their level of concerns and documentation of fisheries resources such as mitigation during any creek culvert replacements for tributaries crossing West Road that outlet to Lake Huron nearshore habitat of value for early stages of the Whitefish life cycle.

3.0 STUDY AREA

3.1 PROJECT DESCRIPTION

The County of Bruce is conducting a natural heritage review of the 29 kilometer segment of West Road. SPL was retained to compile existing environmental information and conduct initial reconnaissance surveys to guide the future level and extent of environmental impact studies to assist with the Class Environmental Assessment process.

3.2 LANDFORM

3.2.1 PHYSIOGRAPHIC REGION

The Huron Fringe physiographic region and the Bruce Peninsula physiographic region straddle the study area.

The Huron Fringe flanks Lake Huron shoreland, characterized by shorelines, terraces, gravel bars and sand dunes formed by Lake Algonquin and subsequent postglacial lakes Nipissing, Algoma, and Huron (Chapman and Putnam, 1973).

The remaining physiographic region is known as the Bruce Peninsula. Dominated by a limestone (dolostone) bedrock plain with shallow or no soil cover. The Eastnor Swamp lies northwest of a small clay plain and drumlins localized near Mar. Distributed in various densities across the fissured Guelph Formation dolostone bedrock are dolostone and igneous boulders, and patches of small, waterworn dolostone slabs that presently form pavement alvar vegetation communities.

Vegetation and support wildlife living in response to the harsh climatic conditions often represent transitional species here, with boreal more northerly birds for instance mingled with warmer southern Ontario species living at the extent of their range limits.

3.2.2 ECOLOGICAL REGION

The Bruce Peninsula and study area of West Road falls into the broad ecological region known as site region 6E and a smaller sub unit of lands known as site district 6E-14. This is an area with common patterns of plants and animals adapted to local landform and climate. The north Bruce Peninsula experiences some of the coolest summer temperatures in southern Ontario; average daily temperatures range from 21.3-23.9 degrees Celcius in July. The cool summers may partially account for disjunct boreal and subarctic species. Site district 6E-14 is characterized by open rocky pavement alvars, shallow fen wetland habitats, swamps, marshes and mixed forest cover. Wildlife exhibit specialized affinity to these growing conditions on limestone, often with annual drought and flood at shorelines. An example background information source for alvar distribution is found in Appendix A.

Fire swept the peninsula in the late 1800's and early 1900's burning most of the peninsula rim and talus forests and much bedrock plain forest, thus a large portion of the modern day forest is young. Forest loss was also due to aggressive timber harvest that historically provided tannin for southern Ontario to tan sole leather for boots and shoes (Capen, 1852).

Modern day forests cover almost 80% of the Bruce Peninsula with two of the largest regional and mega-woodlands on the escarpment portion, one area covering 50,000 hectares and linking Cameron Lake Dunes, Cameron Lake Fen, Little Cove-Cave Point, Cabot Head, Crane Lake, Otter Lake and Smokey Head-White Bluff. Another large woodland in the south part of the peninsula reaches 35,000 hectares and captures Hope Bay Forest, Cape Dundas, Barrow Bay South and Lion's Head Peninsula with the Chippewas of Nawash Unceded First Nation. These 'core' woodlands are contiguous corridors from Wiarton to Lion's Head and from Whip-poorwill Bay to the tip of the Bruce Peninsula. These linear corridors are bolstered by lateral corridors also connecting escarpment corridors to inland bedrock plains and Lake Huron shores, providing healthy wildlife corridors and connections across the Bruce Peninsula. Mixed tree types of Sugar Maple- Yellow Birch-Hemlock-White Pine are present as well as coniferous forests in cooler lowlands of White Spruce-Balsam Fir and gradations of Black Spruce-Tamarack on saturated soils.

An overview of the Bruce Peninsula wildlife provides context for the site specific level findings in Section 3.0.

Vegetation: Vegetation reflects the character of the north Bruce Peninsula, exhibiting open bedrock pavement that supports alvar vegetation, surrounded by boreal forests of White Spruce and Balsam Fir. On the exposed rock pavements, shrubs give way to open vegetation communities that are dominated by herbs such as Eastern Bracken, Balsam Ragwort and Canada Blue Grass.

Breeding Birds: Avifauna is northern in this transitional zone between northern and southern Ontario. The mosaic of wetland, shoreland and island habitat supports a n array of birds. Boreal affinity bird species that breed in the cooler conifer forests and swamps on the Bruce Peninsula include the Olive-sided Flycatcher, Yellow-bellied Flycatcher, Ruby-crowned Kinglet, Swainson's Thrush, Philadelphia Vireo, Rusty Blackbird, and finches associated with conifer forests, such as Red Crossbill, Pine Siskin and Evening Grosbeak. Other species with northern affinities, include Common and Red-breasted Mergansers, Northern Goshawk, Common Raven, Golden-crowned Kinglet, Hermit Thrush, Solitary Vireo and Magnolia, Yellow-rumped and Blackburnian warblers, Dark-eyed Junco and Purple Finch as well as Black-throated Blue Warbler, Chestnut-sided Warbler and Yellow-bellied Sapsucker.

Wildlife: The large tracts of land on the northern Bruce Peninsula provide undisturbed range for at least 39 mammal species including the Canada Lynx, Black Bear, Fisher, River Otter, Snowshoe Hare, Eastern Cottontail, Gray Squirrel, Masked Shrew, Eastern Chipmunk, Woodchuck, Red Squirrel, Beaver, Deer Mouse, White-footed Mouse, Porcupine, Coyote, Red Fox, Raccoon, White-tailed Deer, Northern Short-tailed Shrew, Star-nosed Mole, Northern Flying Squirrel, Muskrat, Meadow Vole, Ermine, Long-tailed Weasel, Mink and Striped Skunk. The less common Southern Bog Lemming and Meadow Jumping Mouse also range on the Bruce Peninsula as well as potential Lynx.

Sheltered shoreland wetlands provide breeding habitat for amphibians. Ephemeral ponds in forests and swamps are important breeding sites for salamanders of the *Ambystoma* genus, as well as Wood Frogs, Spring Peepers and Gray Treefrogs. Drier habitats, such as regenerating fields and thickets, are important to snake species such as the Smooth Green Snake, Eastern Garter Snake and Milk Snake.

Section 4 summarizes how SPL sampled the site at the appropriate seasons and the appropriate times to obtain reconnaissance detail for constraint mapping.

4.0 STUDY APPROACH

4.1 BACKGROUND DATA AND REVIEW

The County of Bruce provided map layers for the following potential environmental constraints:

- Provincially Significant Wetlands (PSW) and Unevaluated Wetlands
- Hazard Lands
- Life Science Areas of Natural and Scientific Interest (ANSI)
- NHIC Vulnerable, Critically Imperiled Species Observations
- Woodlands
- Karst

County of Bruce background mapping is found in Appendix A.

Our senior ecologist inspected the West Road study area at peak times for wildlife congregation. This included two inspections in April for herptiles and migrant birds. Northern four kilometers received greater detail with specific searches for spring ephemerals such as Dwarf Lake Iris, Hill's and Pitcher's Thistle, early morning bird surveys for grassland birds in decline, moonlit surveys for Whip-poor-will and dusk herptile surveys. This was followed by two final inspections in September and October to assess wildlife corridor potential.

SPL reconnaissance was undertaken in 2015 in April, June, August and September with a follow up inspection in October. Inspections confirmed the following sensitivities:

- Grassland breeding birds in decline (Bobolink, Eastern Meadowlark)
- Rare Whip-poor-will, Common Nighthawk, American Woodcock, Piping Plover
- Rare Eastern Massasauga Rattlesnake, Western Chorus Frog, Spotted Turtle
- Rare flora including mapping of potential conifer patches for rare orchid support
- Bat foraging at treed swamp edges
- Neo-tropical breeding birds mapped as indicators of functioning interior forest patch

NATURAL HERITAGE MAPPING

Two sets of mapping are provided at this background study level.

One is a summary of existing environmental map layers from Official Plan schedules. These layers include such features as wetlands (local and provincial) and areas of natural and scientific interest (ANSI) as well as surfacewater drainage and forest cover.

The second set of maps charts our 2015 field reconnaissance and directs future lower level EA study to particular areas of sensitivity uncovered during the reconnaissance.

The area of study extends to 2000 metres, 1000 metres from either side of West Road.

Note that the entire study area must be inventoried using a boots on the ground approach, however we have directed field crews to specific areas of interest as well, based upon our reconnaissance findings.

We map both confirmed, and potential, habitat of wildlife to guide the EA wildlife surveys.

Terrestrial Surveys

Reconnaissance mapping, for instance, guides terrestrial survey. This includes, but is not meant to be limited to, areas we observed and mapped of high potential for salamander studies, amphibian studies, turtle studies on sand dunes, areas of rare species support including Dwarf Lake Iris and Orchid flora. Areas of sand dunes where we noted tail drag marks and/or predated turtle egg shells for instance were outlined and mapped for lower level turtle surveys. We documented wetland habitat supporting herptiles in particular conservation status Chorus Frog), and specific potential habitats for salamander searches. Note that any salamander inspections require and benefit from coordination and discussion with MNRF and SON before undertaking the April-May surveys.

Breeding Bird Surveys

Reconnaissance mapping indicates areas where we confirmed grassland birds such as grassland birds in decline including the Eastern Meadowlark and Grasshopper Sparrow, Bobolink for follow up breeding bird survey. Areas of high potential for other bird species of concern, such as the Whip-poor-will, Piping Plover, Bald Eagle, Barn and Bank Swallows, for example, are also identified on the reconnaissance mapping.

Neo-tropical Breeding Birds

Areas where we heard early morning bird song of neo-tropical breeding birds and forest area sensitive breeding birds were red flagged for future 2016 survey. Species included Pileated Woodpecker and interior forest warblers.

WSP notes that the base maps will develop over time as the future additional studies are completed and the EA process moves forward with alternatives and preferred solutions.

Further, the traditional knowledge component of surveys will be an interactive part of the ground searches provided through a recommended liaison with SON.

4.1 ABORIGINAL FISHERY

The new amended Act stating purpose of the above factors in our assessment, is to “provide for the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries.”

The commercial Whitefish fishery is a confirmed valuable Aboriginal fishery using this legal provincial current description and personal accounts of fishermen and observation of a significant fisheries department and liaison research at the SON Environmental Office.

Drainage crossing West Road ranges in fish content from cyprinids in weaker drainage channels to larger sunfish (e.g. Smallmouth Bass, Pumpkinseed) and any activity proposed at the existing culvert crossings such as culvert replacement or upgrade would also require circulation and approval from the Department of Fisheries and Oceans in addition to consultation with SON.

Tributaries with outflow to the Lake Huron Aboriginal Whitefish fishery have been highlighted on our mapping for best management practices mitigating for silt entry into the tributaries since outflow at the shorelines of Lake Huron can impact spawning shoals and overwintering young of the year Whitefish in shallow waters the following spring before seeking deeper waters at age.

The Fisheries Office at SON can assist in detailing their recommended level of mitigation at existing creek crossings.

5.0 RESULTS AND CONCERNS

5.1 AREAS OF NATURAL AND SCIENTIFIC INTEREST

Life science areas of natural and scientific interest (ANSI) mapping is found in Appendix A.

ANSI are lands and waters containing natural landscape or features identified by the Province as having valued life and/or earth science that have been identified as having life science or earth science values.

There are three ANSI in the study area namely Sauble Falls North, Sucker Creek and Howdenvale and their boundaries with potential for wildlife linkages across the West Road project require consideration at the next stage of Class Environmental Assessment study.

General information and location of ANSIs can be found on the NHIC website (http://nhic.mnr.gov.on.ca/nhic_.cfm). Information obtained from the NHIC website should be verified with MNR district staff for any updates in 2016 to current files.

Based on EA alternatives, limits of the setbacks will be verified.

5.2 SIGNIFICANT WETLAND AND COASTAL WETLANDS

Wetlands are areas that have been saturated with water long enough for soil to become waterlogged allowing water tolerant plants to grow. Wetlands can occur where the water table is close to or at the surface and are usually in low-lying areas or along edges of lakes and rivers. Wetlands provide a number of benefits such as flood prevention, improvement of water quality and provide wildlife habitat (MNRF).

Wetland habitat types are marshes, swamps, fens and bogs, with coastal fens of potential in the study area of rare conservation status acknowledged in the new PPS.

The study area supports 88 provincial wetlands and 9 local wetlands mapped by the Province as well as hazard lands identified by the Grey Sauble Conservation Authority.

Wetland status should be checked periodically for MNRF updates in evaluations for wetland within the study site range such as for Eastnor Swamp.

The majority of lands noted during reconnaissance survey were mixed and coniferous forests and farmlands with intermittent swamp and treed swamp wetland pockets. Since exposed fen could occur where West Road is most proximate to Lake Huron coastal habitat, ultimate confirmation would occur during lower level field studies. SPL observations to date suggest that this will not be a habitat at risk due to roadwork.

Wetland habitat adjacent to West Road was inventoried by SPL during evening April herptile surveys and confirmed areas supporting rare Western Chorus Frog were mapped.

This background reconnaissance assists in scoping future greater attention to these herpetofaunal breeding areas to establish best management practices, mitigation including setback and best management practices for any proposed road improvements based on the outcome of the Class EA.

5.3 SIGNIFICANT WOODLANDS

Woodlands are treed areas that provide environmental and economic benefit including erosion prevention, water retention, provision of habitat, recreation and the sustainable harvest of woodland products. The study area supports a mixture of agricultural land, meadow, dune and forest. The tree cover does not meet provincial criteria for “significance” in the PPS because the large amount of regional forest cover is not at threshold levels to assign forest patch sizes for conservation.

This does not mean portions of core, corridors and the linkages between them are not significant and worthy of identification and protection consistent with PPS sections on wildlife linkage.

Lower level studies should investigate whether wildlife and vehicular traffic data stored at the MNRF can be useful in illustrating any key nodes of wildlife travel across West Road.

5.4 SIGNIFICANT VALLEYLANDS

Valleylands are natural areas that occur in a valley or other landform depression that supports water flowing through or standing for a period of the year. Valleylands can act as wildlife movement corridors.

SPL reconnaissance did not discover any significant valleyland features using existing topographical contours and site inspections. This should be confirmed during the lower level surveys to ensure maintained conveyance of wildlife in the natural heritage system.

5.5 SIGNIFICANT WILDLIFE HABITAT

The study area supports potentially significant wildlife habitats including fens, dunes and coastal meadow marshes that will require lower level EIS to delineate the habitats and provide where required development setbacks, mitigation and further recommendations such as enhancement plantings through native species planting plans. Breeding bird surveys for instance, found within Appendix B, note a potential 144 different bird species in the region.

5.6 SIGNIFICANT HABITAT OF RARE, THREATENED AND ENDANGERED SPECIES

Examples of significant wildlife habitat observed to date by SPL in 2015 within 200 metres of the study area qualifying as significant wildlife habitat include:

- the portion of land used by nesting grassland birds such as the Bobolink and Eastern Meadowlark to breed and fledge their young
- the portion of land used by Western Chorus Frog to complete their life cycle including the vernal pool SPL censused them in, and linkage to upland treed habitat used after breeding
- the portion of land required by the Snapping Turtle on the sand dunes with nest evidence and safe linkage to travel from the nest habitat to adjacent lands
- the portion of land required by the Bald Eagle further to migration (SPL noted Eagle on migration but no breeding evidence within the Site)

Potential significant wildlife habitat to be discerned at EA survey level for high candidate species:

Based on Sober's archive field surveys on the Bruce Peninsula suggests one of the areas that should receive more focused ground surveys is near Petrel Point for rare coastal flora. Sand dunes along portions of the study area also have potential for rare species and determination of significant wildlife habitat area. Some vulnerable flora of potential could occur where West Road is proximate to Lake Huron and include Tuberous Indian-plantain, Great Plains ladies'-tresses, Beaked Spike Rush among others.

West Road gets closer to the lake for example near Petrel Point. Potential flora include Species of Concern Dwarf Lake Iris, Endangered Prairie Fringed Orchid, Threatened Conservation Status Hill's Thistle and Pitcher's Thistle on alvar habitat fringed with White Cedar and/or Tamarack.

6.0 FINDINGS AND MITIGATION

6.1 HERPETOFAUNA

Documented examples of herptiles that characterize this part of the Bruce Peninsula include the Eastern Massasauga Rattlesnake, Northern Ribbonsnake, Northern Watersnake, Eastern Newt, Yellow-spotted Salamander, Eastern Redback Salamander, Western Chorus Frog, Wood frog, Gray Treefrog, Spring Peeper, Northern Leopard Frog, Snapping Turtle and Spotted Turtle. SPL dusk and midnight surveys in the spring for herptiles confirmed Wood Frog and Western Chorus Frog breeding habitat (Appendix B Maps).

Linkage from these core breeding areas will require discussion and evaluation during future EA survey stages through ground truthing to build on the 2015 reconnaissance.

MITIGATION

Any road improvements to West Road would require providing resilience in the future road improvement detail and design to accommodate for key areas of wildlife crossing.

Future detail may be required to include appropriate eco-passages such as the open concrete grated culvert installed at Cypress Provincial Park between wetland habitat for passage of amphibians and small mammals.

Dune habitat in particular should be assessed for turtle breeding and movement to determine whether mitigation is required for safe passage. Similarly areas of known Spotted Turtle breeding, if near any proposed road or culvert work crossing wetland habitat should be assessed in the same manner to match appropriate existing mitigation measures with any field observations of a significant wildlife corridor.

Sensitive herptile areas should be constrained from potentially incompatible road construction activity using mitigation not limited to the suggested:

1. Direct constraint
2. Conduct roadwork outside of documented critical breeding habitat
3. Restrict night lighting to downward directed path lights
4. Restrict the extent of vegetation clearing
5. Include appropriate native plants when replanting

6.2 AVIFAUNA

SPL attended the site for migration observations in early spring (April-May) then again in June for early morning bird song surveys, consistent with the Canada Wildlife Survey standards of attending on two separate occasions in June, 15 days apart, to discern breeding birds from incidental observations of birds simply flying over the site. Summer work was supplemented with fall migration in September and October.

A moonlight survey was also conducted in tandem with early herpetofaunal surveys in May for the potential Whip-poor-will. Areas of courtship are mapped.

Incidental observations were also recorded for migrating species and resident bat species. Future EIS will provide additional bat observation in particular for any significant wildlife habitat gauged in part by the number of roost trees (MNRF 2015 Guidelines).

FINDINGS

Breeding and migrating birds along the Lake Huron shoreline are diverse, including September observations of migrating Bald Eagle. Summer nesters on the site included the Upland and Spotted Sandpiper, Common Snipe, American Woodcock and more boreal affinity forest birds. Grassland breeders were more prevalent in the northerly farmed portion of the study area. As well the Piping Plover was a migrant observed in late April at the limit of the northerly four kilometers of study area.

MITIGATION

Future studies should address the conservation status grassland bird nesting habitat observed in the north four kilometers (Appendix B Maps). Conservation strategies that benefit the observed Eastern Meadowlark, Bobolink, Grasshopper and Vesper Sparrows as well as the Upland Sandpiper is found in Appendix E.

6.3 VEGETATION SURVEYS

Vegetation is described broadly by the ecological land classification units FOM and FOC (Mixed Forest and Coniferous Forest respectively) on reconnaissance mapping. Future lower level survey will be required to provide refined sub classification of these forests.

Sensitive herptile areas noted by SPL will require constraint from roadwork during critical breeding periods. Mitigation can include:

1. Direct constraint
2. Conducting roadwork outside of documented critical breeding habitat
3. Restricting night lighting to downward directed path lights if required
4. Restricting the extent of adjacent lands vegetation brushing for sight lines
5. Including appropriate traditional plants in replanting plans by liaison with elders

6.3.1 FUTURE SURVEY TIMING

Conducting surveys at the right seasonal moments will ensure that time sensitive unique wildlife congregation periods are not missed. A number of rare plants in the area for instance have a very short bloom period and can be overlooked. These include Hill's Thistle, Pitcher's Thistle, Dwarf Lake Iris and others.

VERNAL POOLS

Vernal pool function should be undertaken in the spring of 2016 for species noted during our reconnaissance including the imperiled Western Chorus Frog.

Vernal pools can also support regionally significant salamanders and contain high levels of biodiversity with crustose and foliose lichen as well as algae and bryophytes at edges and mosses (e.g. *Placynthium nigrum*).

REGIONALLY RARE FLORA

Low Calamint is a potential species at portions of West Road proximate to Lake Huron shoreland as well as Stiff Yellow Flax. Class EA Study surveys should include searches for such sensitive habitats including meadow marsh, fen and alvar (e.g. ALS1-1 Common Juniper Shrub Alvar present near Petrel Point. Alvar communities of the Bruce Peninsula are characterized often by repeat patterns of plants including Creeping Juniper, Common Juniper, Shrubby Cinquefoil amidst Poverty Grass with ground cover that can include Bearberry, Bristle-leaf, St. John's Wort, Rough Hair Grass, Tufted Hairgrass, White Camass, Balsam Ragwort.

6.4 FAUNA SURVEY

Large mammals were noted through binoculars, close direct visual observation and indirectly by animal signs including their track, scat, rubs and prey.

Studies must describe how continued wildlife passage as per the PPS newer sections on linkage is maintained post construction. Wildlife observed on and near the Site included moles, voles, shrews, beaver, snow-shoe hare, red squirrel, raccoon, White-tailed deer, Black bear, mink, least weasel, fisher and red fox.

6.4.1 EASTERN MASSASAUGA RATTLESNAKE

This snake species could potentially cross any portion of West Road. Mitigation for significant wildlife corridor crossing areas is required at the future EA stage.

The sub-species is listed as threatened in the province and threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Massasaugas are known to persist in Ontario in four geographically distinct population segments of unequal size and extent in the isolated ecosystems/natural communities of Wainfleet Marsh (1500 ha, peatland), Ojibway Prairie (4 parcels totaling 456 ha, primarily tallgrass prairie) with moderately large regional populations on the Bruce Peninsula and along the islands, shores, and inland portions of eastern Georgian Bay (mixed wood shield ecoregion).

The provincial recovery team notes that moderately large regional populations occur on the Bruce Peninsula and a goal of the recovery plan is to retain current distribution, structure and connectivity among local (sub) populations throughout the Peninsula (MNR, 2005). Additional detail in the document should be consulted.

Guidelines note the key habitats required by the snake to complete life cycle stages are:

- *Hibernation sites*
- *Gestation sites*
- *Foraging and mating sites*
- *Corridors linking the above*

Hibernation and gestation sites are considered significant portions of the habitat of endangered and threatened species since EMR return to these areas and have less resilience to disruption. Feeding, breeding and corridor areas bring greater flexibility and the Recovery Team considered these parts of the EMR habitat to be “significant wildlife habitat” under the PPS.

6.4.2 SURVEY TIMING

Mitigation is required for any future locations of EMR. The snake is cryptic and thus difficult to see outside of their most active movement during migration to and from hibernaculæ in the fall and spring. Thus the timing of future ground surveys is critical.

Our field observations throughout their known range on the Bruce Peninsula confirm that there is a significant timing difference in these events on the north vs. south Bruce governed by local weather patterns. North Bruce Peninsula sites we have documented EMR returning to winter hibernaculæ as early as October 15, vs. November at more southerly locations. This is also respectively the case in the later spring on the North Bruce with snakes returning later to open foraging range and basking sites in May vs. April southerly.

MITIGATION

EMR activity at West Road ROW would require response in construction drawings to monitor road improvements relative to sensitive habitats where/if present. Mitigation can include the use of drift fences for instance to guide herptiles through eco-passages such as the eco-passage installed at Cypress Lake Provincial Park (SAAR past audit for SON).

GENERAL HERPTILE ECOPASSAGE BENEFIT

Herptile crossings would also benefit small mammal passage beneath West Road and would be reviewed and considered during Class EA stages of study to ensure that wildlife corridor movement across identified *significant wildlife habitat* such as for Snapping turtle, and *significant portions of habitat* supporting threatened and endangered species such as the Spotted turtle and Western Chorus Frog consistent with the PPS, SARO (Species at Risk Act) and ESA (Endangered Species Act).

Larger ranging wildlife such as the Black Bear also cross West Road and are detailed further in the next section.

6.5 BLACK BEAR

Both the Saugeen Ojibway Nation and the Ministry of Natural Resources and Forestry (MNRF) have an expressed conservation interest for the Black Bear, a large ranging species associated with the healthy forest cover on the Bruce Peninsula.

According to the SON and the MNRF the Bruce Peninsula supports an isolated and distinct population of black bear. Discussions with SON confirm black bear carries special significance and value.

6.5.1 AGENCY LIAISON

Although MNRF or SON do not have public maps for Black Bear summer or winter range areas MNRF did provide Draft Eco-District Guidelines helpful in characterizing general bear habitat by tree assemblages. We include excerpts as an example to initiate discussion with SON

members experienced in hunting this animal. The intent isto assist in the scoping of future ground truthing movement corridors and denning area within 120 metres of the potential West Road road improvements.

This is one recommended approach to incorporate both SON value perspectives andMNRF significant wildlife habitat (SWH) measurement. MNRF candidate SWH use thevegetation community typing of Ecological Land Classification which notes: FOM1-1,FOM2-1, FOM3-1 ELC types.

The technical manual associated with the EcoRegion 6E Schedule for Significant Wildlife Habitat provides detail on many subsets of FOD. Sober notes no pure deciduous forest stands along West Road however; conifer mixture and dominant conifer forest patches do prevail. However FOM mixed forest ELC types with a high percentage of mast at West Road ROW should be noted. Recent final version EcoRegion Schedules (MNRF, 2015) should be consulted for detailed information on candidate significant wildlife habitat.

The Schedules describe potential habitats of Black Bear by ecological land classification (ELC) vegetation types:

FOM1-1

FOM2-1

FOM3-1

FOD subsets as well, however pure deciduous forest was not observed.

6.5.2 BEAR HABITAT

Our reconnaissance confirms that the peninsula does supply abundant and sufficient large woodland tracts that offer these mast producing tree species. Lower level survey will assist in scoping where any significant wildlife movement corridors exist and where mast trees such as Oak and Beech are present in sufficient quantity

Evaluating the potential impact of West Road improvements and prescribing mitigation will be an important component of consultation with SON and MNRF.

6.5.3 BEAR DEN SURVEYS

SPL recommends that lower level bear den surveys be undertaken with a combination of SON environmental monitors and SPL if/as possible. A number of the SON environmental staff are skilled in traditional harvest of bear and knowledgeable regarding bear habitat.

MITIGATION

Mitigation prescriptions will range from highest to standard levels of mitigation:

1. Direct constraint of the environmental sensitivity (habitat and/or species)
2. Special eco-passage design and detail at EA stage of investigation if/as required
3. Construction phase best management practices such as timing for heavy equipment, lighting and disturbance
4. Eco-signage if/as required to warn motorists at wildlife crossings
5. Larger sight line provision for motorists through ROW low to no vegetation to allow for greater warning time to avoid vehicle-bear collisions

6.6 FISH HABITAT

Fish habitat means fish spawning ground, nursery, rearing and mitigation area that fish depend upon to perform their life cycle stages, and the study area supports several unnamed warmwater tributaries that would require lower level information due to upgrade and replacement of creek culverts.

According to Department of Fisheries and Oceans (DFO) mapping there are no aquatic fish or mussel species at risk within the study area. Documented rarities for fish, mussels and other species should be updated during lower level EIS surveys using both DFO and NHIC web site databases.

The new amended Act stating purpose of the above factors in our assessment, is to “provide for the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries.” The commercial Whitefish fishery is a confirmed valuable Aboriginal fishery using this legal provincial current description and personal accounts of fishermen and observation of a significant fisheries department and liaison research activities at the SON Environmental Office.

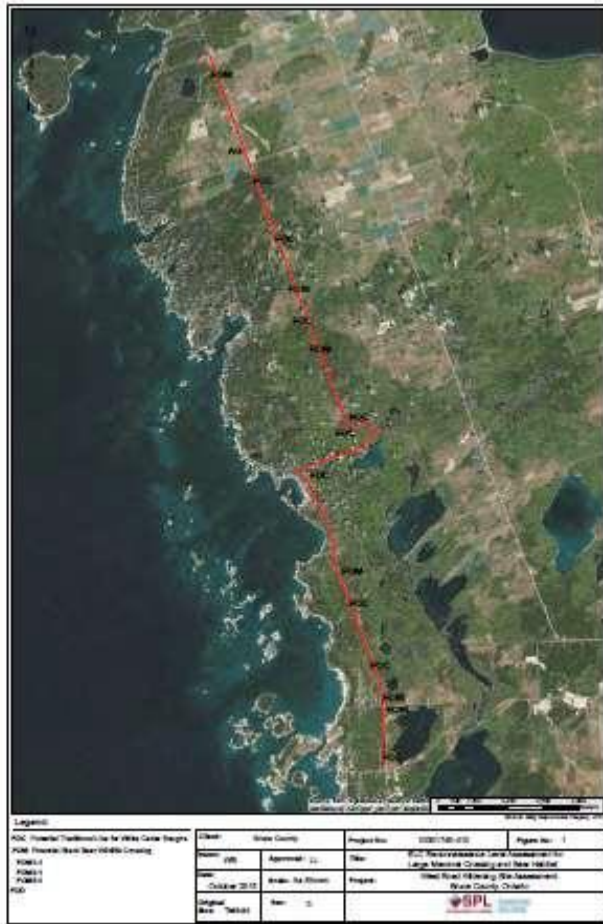
6.6.1 SON COMMERCIAL WHITEFISH FISHERY

Drainage crossing West Road ranges in fish content from cyprinids in weaker drainage channels to larger sunfish (e.g. Smallmouth Bass, Pumpkinseed) and any activity proposed at the existing culvert crossings such as culvert replacement or upgrade would also require circulation and approval of the Department of Fisheries and Oceans in addition to consultation with SON.

Tributaries with outflow to the Lake Huron Aboriginal Whitefish fishery have been highlighted on our mapping for best management practices mitigating for silt entry into the tributaries since outflow at the shorelines of Lake Huron can impact spawning shoals and overwintering young of the year Whitefish in shallow waters the following spring before seeking deeper waters at age.

The Fisheries Office at SON can assist in detailing their recommended level of mitigation at existing creek crossings. The Key Map below of the Site illustrates the local drainage patterns.

Correspondence from SON to the County of Bruce on the scope of consultation notes this concern for SON's commercial fishing rights and provides examples such as drainage changes such as ditching and the construction of culverts. SON (2014) also confirms that areas off the west coast of the peninsula are critical larval nurseries for Lake Whitefish, very sensitive areas that could be affected by increased traffic or road salting.



Proposed West Road Study Area

7.0 TRADITIONAL HARVEST

SPL proposes liaison for information sharing for instance with our senior ecologist (Sober) meeting on Site with elders (Thompson, Roote).

There are many species honoured by SON in traditional crafts, useful for medicines, ceremony and sustenance.

These sensitive areas need to be respected outside of the typical standards of a Class EA, ensuring continued sustainability of the resources while honouring confidentiality as required.

7.1 CONFIDENTIALITY

Rare and/or useful species can sometimes be coveted by collectors and at risk when their location is disclosed. This could be particularly harmful to small patches of fungi that are harvested annually by SON and require respect to avoid overharvest. For that reason the location of some specific species would **not** be disclosed or illustrated on map layers, much like the MNRF natural heritage information centre database treats findings by disclosing only the 10km block for the occurrence record of the species.

8.0 CONCLUSIONS

The Background Study provides a synthesis of documented natural science information and a three season biophysical reconnaissance of natural heritage along 29 kilometers of the West Road, County of Bruce.

The 2015 ground truthing of the Site was conducted by our senior ecologist Sober with a more detailed ground inspection of the northerly four kilometers, identifying and mapping some key areas of natural heritage features and functions.

These areas are mapped and found in Appendix B. They are not intended to be finite but rather starting point to scope Class EA study.

A two tiered approach has been recommended for future studies with varying levels of investigation from a Scoped to Full EIS with a strong community partnering element suggested between the Saugeen Ojibway Nation and the County of Bruce.

Some future EIS ground truthing can be conducted alongside members of the SON Environmental Office similar to protocols employed by SON and SAAR for the Hydro One Biodiversity Program. A combination of natural heritage constraint, hydro-electric tower location refinement and native species transplant were conducted successfully. We welcome an opportunity to discuss this further.

The Assessment of available mitigation for West Road improvements, ranging from setback limits and habitat enhancement through Native Planting plans, will be based on the outcome of the EA.

Sincerely

A handwritten signature in cursive script that reads "Linda Sober".

Linda Sober, H.B.Sc.

Senior Ecologist

SPL Consultants Limited

14 Ronell Crescent

Collingwood, ON L9Y 4J7 Canada

T +1 705-445-0064

F +1 705-445-0067

C +1 519-378-5311

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APPENDIX A COUNTY OF BRUCE ENVIRONMENTAL MAP LAYERS

APPENDIX B: SPL 2015 RECONNAISSANCE MAPPING

APPENDIX C POTENTIAL RARE FLORA

Dwarf Lake Iris and Hill's Thistle are two examples of conservation status species





The rare Hairy Puccoon is a valuable medicinal plant previously documented on Lake Huron shores (SAAR for SON). There is potential on inland dunes for the Hairy Puccoon, and it should form part of the survey of dunes already identified by SPL due to turtle nesting activity on lands adjacent to West Road.



Wetland identified at the reconnaissance level in the Background Study would receive lower level field survey during the Class EA investigations. Treed swamp edges are candidates to support red brown sphagnum moss and insect eating plants such as Pitcher Plant, Sundew and Labrador Tea. Labrador Tea is an example of a plant with cultural value and any locations should be shared with SON, as well as audited in the field with SON natural heritage staff pending future discussions.

APPENDIX D GRASSLAND BIRD CONSERVATION STRATEGIES

Grassland birds are historically documented in this agrarian matrix. They are in decline, therefore we have reviewed the Draft Recovery Strategies authored by Bird Studies Canada for consistency with the Endangered Species Act (2007) and current science to inform conservation, mitigation and potential restoration strategies.

Bobolink

Egg Dates 19 May to 16 July (n= 102 nests, Peck and James)

Bobolink are a strong presence around parts of the north 4 kilometers. They have a heightened conservation rank and management strategy (COSEWIC).

A landscape view is recommended by SPL for grassland bird mitigation since published field surveys indicate the birds require at least 4ha (10 acres) of grassland.

Mitigation Framework

What kind of grass?

Native Switchgrass and Big Bluestem are recommended vs. fescues and alfalfa, tall enough to hide the birds.

When to cut?

Later than traditional first cut in June, which lowers mortality risks. If the first cut is delayed into late July nestlings can fledge and fly away from the machinery.

How to keep it grassland?

Brush hog every 2-5 years after bird season in fall (September-October).

Habitat studies

Field research on this bird shows they have used hayfield 8+ years old that is cut annually, and in lesser order of preference, lightly grazed pasture, fallow field, old field and young hayfield (Bollinger and Gavin, 1992; Bollinger, 1995), commonly nesting in old abandoned field (cultural meadow) with less use of grain fields (Martin 1971, Bollinger et al. 1990, Van Damme 1999, Dechant et al. 2001, Norment et al. 2010).

Bobolinks don't appear to select row crops such as corn and soybean (Sample 1989, Jobin et al. 1996) but have in southwestern Ontario (Norfolk, Chatham-Kent, Essex, Durham) nested in fields larger than 50 hectares with winter wheat and rye (D. Martin and J. Holdsworth, pers. comms. 2011, J. McCracken, pers. obs. 2012, Sober, pers. obs.). Other field researchers in the draft recovery strategy provincial document suggest the bird may nest in the wheat when the grain is underplanted with clover, alfalfa or supports a wet grassy section (J. McCracken, pers. obs. 2012).

Mean territory size ranges from 0.4ha - 2ha (Wiens 1969, Martin 1971, Wittenberger 1978, Bollinger and Gavin 1992, Lavallée 1998). Nests are built on the ground usually at the base of tall forbs (Martin and Gavin 1995).

In the uncut hayfields of Ontario and Quebec nest success rates are 43% (Frei 2009).

During the breeding season, adults feed on 57% insects and 43% seeds (Martin and Gavin 1995). Bobolinks now nest primarily in hayfields and pastures (Bollinger and Gavin 1992, Bollinger 1995, Martin and Gavin 1995, Jobin et al. 1996, Cadman et al. 2007).

These habitats are typically dominated by *Phleum pratense*, *Poa pratensis*, and *Trifolium* spp (Dale et al. 1997, VanDamme 1999, Frei 2009). Microhabitat preferences best matched in regularly maintained hayfields that are not cut early in the season and grasslands (McCracken et al. 2013).

Other grassland birds breeding on and near the study site:

Upland Sandpiper

Egg Dates 12 May to 9 July (n = 38 nests, Peck & James)

These regional birds adapt to traditional agrarian uses such as hay and pasture, but are impacted by intensive farming such as corn and soybean crop.

Proactive mitigation for this bird is suggested with plantings of Jack Pine (3-4) clusters at periphery of the grassland conservation zone.

- a. Plant clusters of Jack Pine (3-4) at edges of grassland dedication zone
- b. Confirm nest territory defense area for the birds during 2016 bird surveys

The Upland sandpiper (*Bartramia longicauda*) migrates, and is an area-sensitive shorebird requiring large pasture, prairie, hayfield, savannah and Jack Pine (*Pinus banksiana*) barrens (Korte, 2013). They are confirmed breeders in some atlas squares, therefore SPL recommends a landscape approach to selecting connecting patches of conservation habitat across the adjacent landform of the study site.

Available Mitigation

Plant clusters of Jack Pine as a barrens with native Switchgrasses (*Deschampsia caespitosa*) within created grassy openings.

Monitor and cut on a 3-5 year rotation. Cut after critical fledging weather dependent; northern portions of West Road in early September.

Nidology in Ontario includes 44 nests in hayfield, unused pasture, hawthorn meadow and occasionally as well on airport grassland. Grasses were at least 6-10" tall and nests were scraped into the ground, lined sparsely with grass and sometimes with feather, close to others (30-200' for two observed nests, Peck and James, 1983).

MITIGATION RATIONALE

- Since this bird breeds successfully on sand and gravel (Korte, 2013) representative of the region, and on this site (Ontario Geological Survey notes with thanks to MNR), conserve representative portions of grassland
- A mosaic of preferred habitats is a conservation strategy Korte's solid thesis work pointed to; the birds nested long term when habitat consisted of a mix of deciduous forest (27%), coniferous (16%), crop (11%) and open grassland (Korte, 2013)
- Any conservation areas for grassland birds requires harvest every 2-5 years to keep successional woody growth from taking over. Typical nesting grassland habitat was made up of 39% grass, 19% woody plants, 16% bare ground, 11% moss and lichen, 5% woody debris, and 6% forbs (Korte 2013)

Other Grassland Birds in Decline Observed

Eastern Meadowlark

Egg Dates: 2 May to 3 August (n=322 nests, Peck & James, 1987)

Field Surveys

SPL documented active nesting of Eastern Meadowlark within 200 metres of the proposed road improvement activity at the north limit of the study area.

Habitat Requirements

Territory sizes average 0.4ha - 2ha (Wiens 1969, Martin 1971, Wittenberger 1978, Bollinger and Gavin 1992, Lavallée 1998) with smaller nesting areas within that. Nests are built on the ground usually at the base of tall forbs (Martin and Gavin 1995).

The Meadowlark nests in hayfields, grasslands and savannahs (Roseberry and Klimstra 1970, Lanyon 1995) and also in weedy meadows, orchards, golf courses, restored grassland of surface mines, grassy roadsides, young oak plantations, grain fields, herbaceous fencerows, and grassy airfields (Peck and James 1987, Bryan and Best 1991, Warner 1992, Lanyon 1995, Kershner and Bollinger 1996, DeVault et al. 2002, Hull 2003, Galligan et al. 2006).

Like the Bobolink, it rarely nests in row crops such as corn and soybean (Cadman et al. 2007), except perhaps when grassed waterways are present (Bryan and Best 1991).

Hull (2003) found grasses in the grasslands were generally 25-50cm with abundant litter cover and 80% or more grass cover. When grass cover dipped below 20% it was found to have less use. Forbs and woody growth by definition of grasslands were scarce, at 5%,

with areas greater than 35% being too dense. An interesting variable was the amount of bare ground (Wiens 1969, Roseberry and Klimstra 1970, Rotenberry and Wiens 1980, Schroeder and Sousa 1982, Askins 1993, Vickery et al. 1994, Granfors et al. 1996, Kershner et al. 2004a, Warren and Anderson 2005, Coppedge et al. 2008) so shielding from predators appears paramount for nest habitat selection.

Perches continue to be important for grassland birds including the Eastern Meadowlark, with use of scattered trees, shrubs, telephone poles, and fence posts for elevated song perches (Wiens 1969, Sample 1989, Hull 2003 *in* Draft Recovery Strategy).

Site Conditions

Cropland currently supporting grassland birds in decline requires lower level study to delineate active nest site area and setback from any road improvement activity.

Some uncut hayfields of Ontario and Quebec had a recorded nest success rate of 43% (Frei, 2009). As with Bobolink, older hayfields are preferred by Eastern Meadowlarks. As fields age, litter cover, plant diversity and vegetation patchiness increase, whereas total plant cover, legume cover, and vegetation height decrease (Zimmerman 1992, Bollinger 1995). Grass-dominated hayfields are preferred over Alfalfa fields, at least in part because Eastern Meadowlarks require grass as nesting material (Roseberry and Klimstra 1970). Fields that lack a grass component are generally not occupied.

Grassland Mowing

None of the grassland birds tolerate repeated hay cutting during May-July breeding.

Infrequent mowing at 3-5 year intervals keeps grassland from woody shrub changes and elicits positive response (Hays and Farmer 1990, Granfors et al. 1996, Jones and Vickery 1997).

We have observed nest success on other sites that are grazed by cattle but low intensity with less than 50 head of cattle (Sober, pers. Observ.), grazing that maintains grass at 10-30 cm (Risser et al. 1981, Jones and Vickery 1997).

Eastern Meadowlarks also respond positively to periodic, prescribed burning conducted at intervals of two to four years (Skinner 1975 in Lanyon 1995, Jones and Vickery 1997, Walk and Warner 2000, Hull 2003, Powell 2008, Coppedge et al. 2008). Response to fire varies, however, depending on soil type, climate, grassland type (native vs non-native), fire frequency, and time elapsed between burns (Zimmerman 1992, Hull 2003).

The suitability of grassland habitat for Eastern Meadowlark involves a combination of landscape and patch characteristics (Herkert 1991, Vickery et al. 1994, Renfrew and Ribic 2008). Studies conducted in Missouri and New York suggest that the Eastern Meadowlark is not especially area-sensitive; breeding density was not influenced by patch size and the species was not found to be affected by edge density, distance to another patch of grassland or forest, or by cover, patch size or core area of grassland (Bollinger 1995, Winter 1998, Horn et al. 2000). Nevertheless, large tracts of grasslands are generally preferred over smaller ones (Herkert 1991, 1994, Vickery et al. 1994, O'Leary and Nyberg 2000). The minimum size required is about five hectares (Herkert 1994).

There appear to be regional differences in the degree of sensitivity of Eastern Meadowlarks to habitat fragmentation. For example, in Illinois, the species was considered moderately sensitive to grassland habitat fragmentation attributes (O'Leary and Nyberg 2000, Hull 2003). In Wisconsin, relative abundance was greatest in pastures with more grassland core area (i.e., area of grassland occurring >25 m from the edge of a patch) and in landscapes having greater amounts of grassland cover (Renfrew and Ribic 2008).

Bobolinks appear to prefer larger fields than Eastern Meadowlarks.

Bobolinks tolerate and may even prefer wetter portions of fields, and are most apt to select nesting sites that are closer to field centres. Eastern Meadowlarks prefer to nest in drier sites, and will frequently nest around field margins.

Bobolinks are more closely associated with hayfields than Eastern Meadowlarks, and less closely associated with pasture (e.g., Ribic et al. 2009). Forb composition in grass-dominated fields occupied by Eastern Meadowlarks tends to be slightly lower (e.g., 11-15% forb cover; Kershner et al. 2004a, 11.1%; Jensen 1999) than for Bobolinks (e.g., 22.6%; Winter et al. 2004).

Bobolinks tend to nest in patches of denser and taller herbaceous vegetation (Martin 1971, Schneider 1998) than Eastern Meadowlarks (Sample 1989, McCoy 1996).

Eastern Meadowlarks have a higher tolerance to shrub encroachment (e.g., up to 35% shrub cover; Schroeder and Sousa 1982) than Bobolinks (less than 25% shrub cover; Bollinger 1988, Bollinger and Gavin 1992).

Bobolinks have a lower tolerance to patches of bare ground (e.g., 0.3%; Schneider 1998, Winter et al. 2004, Warren and Anderson 2005) than Eastern Meadowlarks (e.g., 8.5%; Jensen 1999, 0.5-3%; Kershner et al. 2004a).

For Bobolinks, microhabitat preferences are best matched in regularly maintained hayfields and grasslands. If not maintained, Bobolinks may decline significantly due to accumulation of litter and shrub encroachment (Johnson 1997). The species responds positively to properly-timed mowing and burning, with abundance peaking one to three years after disturbance (Bollinger and Gavin 1992, Johnson 1997, Madden et al. 1999).

Eastern Meadowlark densities are higher in heterogeneous vegetation habitat than homogenous (Risser et al. 1981, Schroeder and Sousa 1982). These preferences are best matched with periodically mowed and burned grasslands (3-5 years; Hays and Farmer 1990, King and Savidge 1995), lightly to moderately grazed pastures (Skinner et al. 1984), and idle grasslands. Bank Swallows are also potential nesters in creekbanks.