

Habitat Suitability Modeling for Landbird Species at Risk in Southwestern Nova Scotia

Final Report for Year 1 (2012-2013) to the Nova Scotia Habitat Conservation Fund

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Background, goal and objectives

The main goal of this research project was to identify breeding habitat for five recently-listed (Schedule 1 SARA) species: Canada Warbler (*Cardellina canadensis*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Olive-sided Flycatcher (*Contopus cooperi*), and Rusty Blackbird (*Euphagus carolinus*). Loss of habitat is a main threat on their breeding grounds. Identification of suitable breeding habitat is a first step towards conserving these landbird Species at Risk (SAR). This two-year project sought to quantify the characteristics of, and location of, available habitat for these species. The scope of the study is the five counties in Southwestern Nova Scotia. This project is part of Alana Westwood's PhD research project that focuses on modeling habitat for three SAR (Canada Warbler, Olive-sided Flycatcher, and Rusty Blackbird) at the site, landscape and regional scale. This report summarizes the first year of the field study.

Objectives were: (1) to build habitat suitability models for landbird SAR using GIS; (2) to compile location data on these species from this and other bird surveys in Southwestern NS since 2006; (3) to find new locations for these species; and (4) to quantify the vegetation at sites occupied by three SAR that inhabit treed wetlands (Canada Warbler, Olive-sided Flycatcher, and Rusty Blackbird) in order to determine their habitat requirements.

Work completed

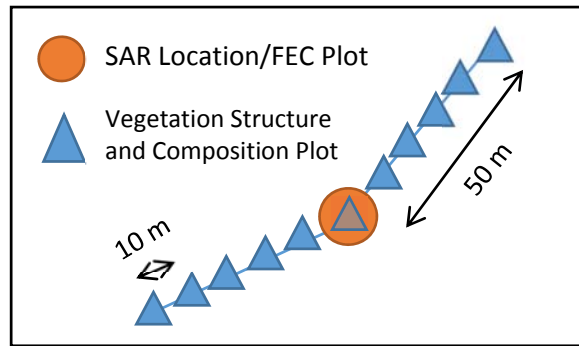
(1) Habitat suitability maps were created for the treed-wetland bird species and used to target polygons for field sampling. The GIS models included forest inventory data, wetlands, digital elevation, and wet areas mapping (for detailed methods see Westwood 2012). The Ecological Land Classification was included to ensure that field sampling took place across the different ecodistricts.

(2) For all five species, location data was compiled for southwest NS from 2006-2012. The data included observations from the Maritimes Breeding Bird Atlas, Breeding Bird surveys, many other volunteers, and research data from our lab at Dalhousie University.

(3) From mid-May to mid-July 2012, bird surveys were conducted in 36 polygons of potential habitat. Each polygon contained three sampling sites, for a total of 108 surveys. The survey protocol was a 5-minute point count to record all bird species present followed by 30 seconds of playback of conspecific vocalisations for Canada Warbler, Olive-sided Flycatcher, and Rusty Blackbird, in that sequence. Playback was utilized to increase likelihood of detecting these SAR.

(4) From mid-July and early September 2012, habitat surveys were conducted at 61 known SAR locations. The Nova Scotia Department of Natural Resources Forest Ecosystem Classification (FEC) system <http://novascotia.ca/natr/forestry/veg-types/> was followed at each SAR location. In addition, vegetation structure was quantified along two 50-m long transects extending through the habitat in randomly chosen directions from the SAR location (Figure 1).

Figure 1: Layout of the habitat plot. An FEC plot was established at the SAR location. Vegetation composition and structure (canopy cover and per cent cover of foliage in different vegetation layers) were quantified every 10 m along two 50-m transects extending from the centre.



Results of field surveys

Of the 108 sites surveyed for SARs (see Figure 2), Canada Warblers, Olive-Sided Flycatchers, and Rusty Blackbirds were found in 7, 26, and 8 of the sites, respectively. Several sites had more than one species, suggesting that habitat requirements of the species overlap to some extent.

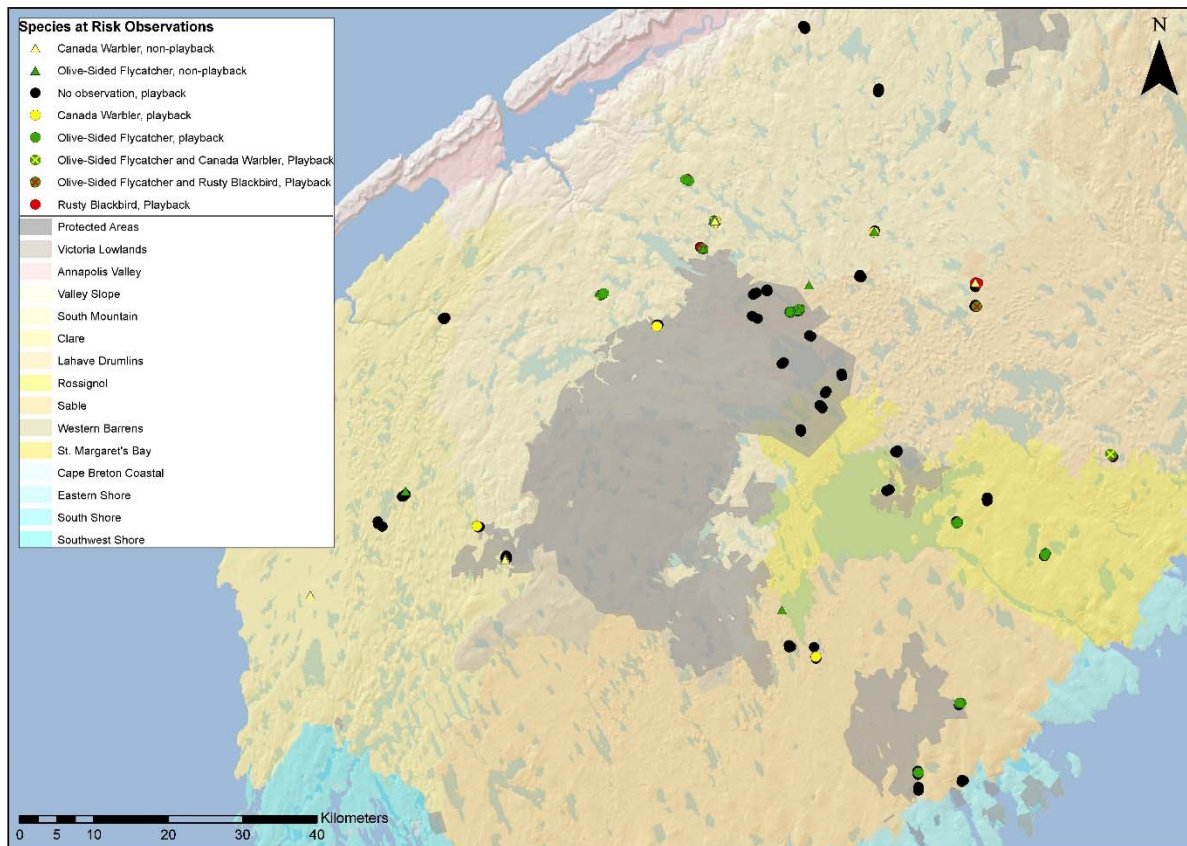


Figure 2: Sites surveyed for Canada Warbler, Olive-Sided Flycatcher, and Rusty Blackbird in Southwest Nova Scotia in 2012. Playbacks were completed at sites marked by filled circles (colour-coded by species of SAR found; black circles indicate no SARs found). Triangles mark new sites where SARs were found opportunistically, without playback. Protected areas are shown in gray, ecodistricts in pastel shades, as indicated in the key.

Habitat was quantified at 61 SAR sites (Table 1, Figure 3) distributed across protected and managed landscapes. Of these, 21 had CAWA, 18 had OSFL, 14 had RUBL, and 8 had two or more species (2 had CAWA plus OSFL, 4 had OSFL plus RUBL, 1 had CAWA plus RUBL, and 1 had all three species). Sites with multiple species were included in the samples for each individual species.

Table 1: Land type and ecodistrict of habitat samples obtained in the field in 2012.

SAR species	Samples per species	Landscape type		Ecodistrict				
		Protected	Managed	720	730	740	750	760
Canada Warbler	25	11	14	8	3	10	1	4
Olive-sided Flycatcher	25	12	13	6	1	13	3	2
Rusty Blackbird	20	10	10	4	2	11	3	0

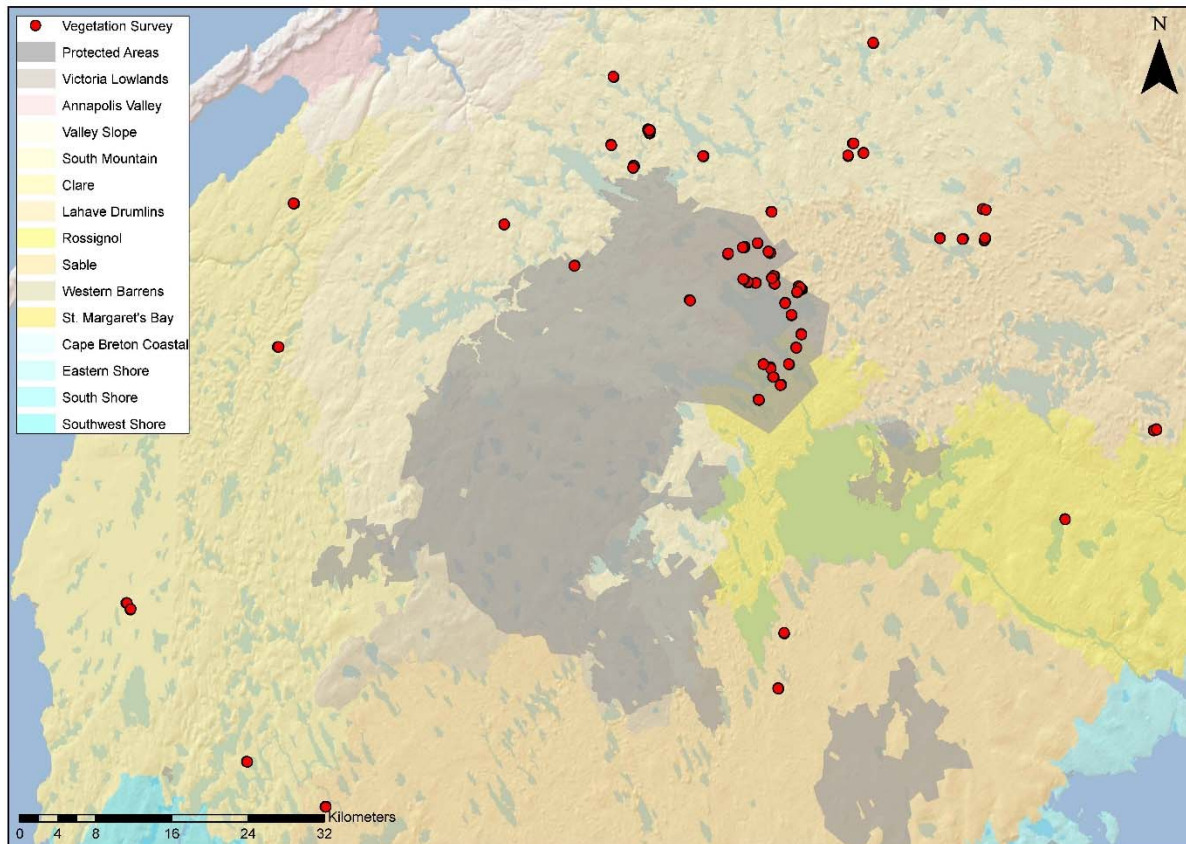


Figure 3: Habitat surveys were conducted in 2012 at 61 locations occupied by Canada Warblers, Olive-sided Flycatchers, or Rusty Blackbirds in Southwestern Nova Scotia.

Habitat survey data from the FEC plots were analyzed to compare habitat features for the three SAR landbird species. Averages for trees and vegetation types are shown in Table 2. The distribution of FEC plots in the different ecosites (nutrient-moisture regimes) is shown in Figure 4.

Table 2. Results of Forest Ecosystem Classification (FEC) plots at landbird SAR-occupied sites.

FEC plot data	Canada Warbler (n=25)	Olive-sided Flycatcher (n=25)	Rusty Blackbird (n=20)
Average per cent of total trees in plots			
Live coniferous Trees	53	54	46
Live deciduous Trees	25	20	31
Snags (standing dead trees)	22	26	23
Average per cent of trees per species or group in plots			
Spruce (mainly Black Spruce)	34	42	21
Balsam Fir	15	16	8
Red Maple	23	24	35
Birch (mainly Paper Birch)	2	2	3
Tamarack	4	7	9
Pine (mainly White Pine)	6	9	10
Other Hardwoods	2	1	5
Eastern White Cedar	4	0	0
Eastern Hemlock	11	1	8
Average per cent of sites classified to FEC Veg Type			
WD2 — Red maple / Cinnamon fern / Sphagnum	36	12	5
WD3 — Red maple / Sensitive fern – Lady fern / Sphagnum	0	4	5
WD4 — Red maple / Poison ivy / Sphagnum	16	8	5
WD6 — Red maple – Balsam fir / Wood aster / Sphagnum	4	0	0
WD8 — Red spruce – Red maple / Wood sorrel – Sensitive fern / Sphagnum	4	4	10
MW2 — Red spruce – Red maple – White birch / Goldthread	0	4	0
WC1 — Black spruce / Cinnamon fern / Sphagnum	16	8	5
WC2 — Black spruce / Lambkill – Labrador tea / Sphagnum	0	8	0
WC7 — Tamarack – Black spruce / Lambkill / Sphagnum	8	12	10
SH1 — Hemlock / Pin cushion moss / Needle carpet	0	0	5
SH3 — Red spruce – Hemlock / Wild lily-of-the-valley	8	0	0
SH5 — Red spruce – Balsam fir / Schreber's moss	0	0	5
SP5 — Black spruce / Lambkill / Bracken	4	20	10
SP6 — Black spruce – Red maple / Bracken	0	4	0
SP7 — Black spruce / False holly / Ladies' tresses sphagnum	0	0	5
CE1 — Eastern white cedar / Speckled alder / Cinnamon fern / Sphagnum	4	0	0
IH1 — Large-tooth aspen / Lambkill / Bracken	0	0	5
IH2 — Red oak – Red maple / Witch-hazel	0	0	5
IH7 — Red maple / Hay-scented fern - Wood sorrel	0	0	5
TH5 — Beech / Sarsaparilla / Leaf litter	0	0	5
Too few trees in the FEC plot to determine Vegetation Type	0	16	15

Tree data from the FEC plots revealed many similarities among the three species of landbird SARs (Table 2). Overall, about half of the trees were live conifers, one-quarter were live deciduous trees, and one-quarter were snags (standing dead trees). Spruce and fir together made up 58% of the trees in Olive-sided Flycatcher plots, 49% in Canada Warbler plots, and 29% in Rusty Blackbird plots. Red maple was common in the plots of all three SAR but most abundant in Rusty Blackbird plots. Other hardwoods were uncommon in the FEC plots. Eastern white cedars occurred in one Canada Warbler plot, in the Hectanooga cedar swamp, a forest that supported several pairs of this bird.

Vegetation type as determined by FEC plot data further distinguished the sites occupied by the three landbird SARs (Table 2). The majority of Canada Warblers sites were wet deciduous (WD2 or WD4) or wet coniferous (WC1) forest, often with red maple, cinnamon fern and sphagnum moss. The majority of Olive-sided Flycatcher sites were spruce or wet coniferous forest (SP5, WC7, WD2), most often with black spruce and lambkill. Rusty Blackbirds were found across a wider range of vegetation types, suggesting that particular tree species are less important for this bird. Both Rusty Blackbirds and Olive-sided Flycatchers have large territories or home ranges whereas the Canada Warbler territory is closer to the size of the habitat plot (FEC plus two 50-m transects).

The ecosites occupied by the three landbird SARs were remarkably similar (Figure 4). Out of the 17 different Acadian ecosite types in NS DNR’s Forest Ecosystem Classification (FEC), the majority of plots for all three species were categorized as AC8 (wet to moist/wet sites that are poor in nutrients). Canada Warbler and Rusty Blackbird were also common in ecosite type AC4 (sites that are very poor in nutrients and wet to moist/wet) while Olive-sided Flycatchers were also common in ecosite type AC12 (wet to moist/wet sites with medium nutrients). A few Canada Warblers and Olive-sided Flycatchers occurred in drier areas (ecosite types AC1, AC5, or AC9).

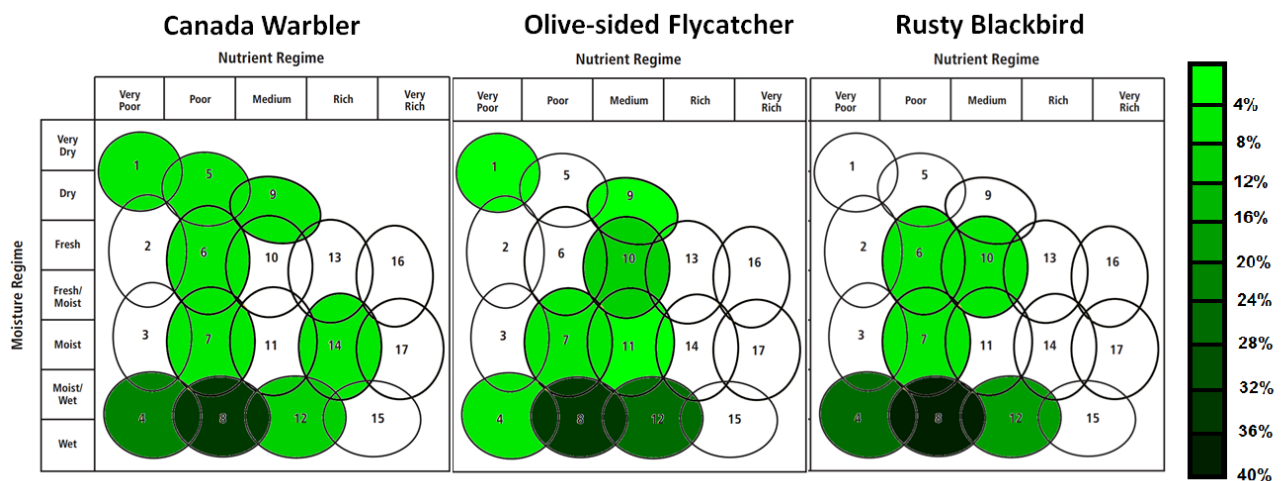


Figure 4: Ecosite classification of the SAR habitat FEC plots sampled in 2012. Sites are placed on the province’s FEC edatopic grid on the basis of soil moisture (increasing towards the bottom of each diagram) and nutrients (increasing to the right of each diagram). Ellipses identify the 17 different Acadian (AC) ecosites. The darker the colour, the more sites fell into a given ecosite type. Uncoloured ellipses indicate no FEC plots were categorized as those ecosites.

Achievements and lessons learned

Despite conducting SAR playback surveys at more than 100 sites across Southwestern Nova Scotia, few Canada Warblers and Rusty Blackbirds were found. Only about 7% of the sites visited had one or both species. Olive-sided Flycatchers were found more frequently, at 24% of the sites. Possible explanations for these results are discussed below.

According to breeding bird survey trends, the Canada Warbler and Rusty Blackbird have declined more steeply than the Olive-sided Flycatcher in Nova Scotia, so the latter may be more abundant. Olive-sided Flycatcher was the species most often detected opportunistically (without playback) when traveling between sampling sites. Their loud songs carry much farther than those of the other two species. These species differ in their detectability, the likelihood a bird is found if actually present. The Olive-sided Flycatcher is more detectable, but whether it is more abundant is unclear.

For efficiency, SAR field survey sites were selected based on the combined habitat suitability index (HSI) models for the three species and playbacks for all three species were conducted at each site. The combined models may have worked better for Olive-sided Flycatcher than the other two species. Features important to Olive-sided Flycatchers are more easily captured in GIS layers. Their habitat, the edges of conifer stands, including harvest edges, may also be more abundant and widespread in Southwestern Nova Scotia. These models may have been less effective at predicting habitat for Canada Warblers and Rusty Blackbirds because key habitat features are not captured in available GIS layers. For example, forest with shallow water and mud is important for Rusty Blackbirds and wet forest with a tall shrub layer is important for Canada Warbler.

Lastly, because populations of these species have declined greatly in the region, it is possible that much suitable habitat remains unoccupied. This is an important but difficult question to answer.

Habitat survey results suggest that the Nova Scotia Forest Ecosystem Classification (FEC) system has much potential for identifying breeding habitat for these three species on the ground, even if it is not easily mapped in GIS. The proportions of softwoods/hardwoods/snags were similar for the three species of SAR. Most Canada Warblers sites were in FEC Veg Types characterized by red maple, cinnamon fern and/or sphagnum moss. Most Olive-sided flycatcher sites were in FEC Veg Types characterized by black spruce and lambkill. Furthermore, all three species were most often found in sites with moist to wet poor soils, and sphagnum moss is common on such sites.

Next steps

This was the first year of a multi-year field research and habitat modelling project. Further field work will be undertaken and volunteers recruited to obtain a larger sample size of SAR detections. With this information, improved habitat models will be built for the five species. The next step in modelling, is to use GIS information about the actual locations documented for each species. The software program MaxEnt will be used to create these models because it requires only presence data (i.e., documented locations of species). Absence data is often lacking in studies of rare species.

Work in the second year will include additional habitat surveys conducted to build a larger sample size to answer questions such as ‘does habitat for these species differ in protected and managed landscapes?’ and ‘what is the relative contribution of protected and managed lands for these species?’

In addition, FEC data from our surveys will be compared to GIS information at each plot, in order to determine how well the GIS layer predicts what is found on the ground. Models that map habitat across the landscape can only be as good as the GIS data on which they are based.

Our field surveys targeted the three species of landbird SAR that inhabit treed wetlands and are diurnal (active in the daytime), territorial birds, that respond to playback – the Canada Warbler, Olive-sided Flycatcher, and Rusty Blackbird. Other strategies are needed for the other two species of interest. SwiftWatch (Bird Studies Canada) uses volunteers to gather data on Chimney Swifts. We will explore ways to engage volunteers in surveys for Common Nighthawks.

This project has laid the groundwork for a Landbirds at Risk program in Nova Scotia. Our ultimate goal is to enhance the ability of government, industry, ENGOs, and private landowners to conserve habitat for landbird SAR in Nova Scotia. Much remains to be done and the work of many partners will be required to achieve this goal.

Acknowledgements

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Public presentations on the results this project in year 1

Staicer, C. and Cormier, D. 2013. Landbird species at risk in forested landscapes. Public workshop presented twice at the Mersey Tobeatic Research Institute. March 2013. Kempt, NS.

Westwood, A., Staicer, C. 2012a. A comparison of Rusty Blackbird habitat on managed and protected lands in the Southwest Nova Biosphere Reserve. Oral presentation at the International Rusty Blackbird Working Group Meeting, hosted at the Northeast Bird Conservation Conference (international). October 16-18. Plymouth, MA, U.S.A.

Westwood, A., Staicer, C. 2012b. A comparison of Rusty Blackbird habitat on managed and protected lands in the Southwest Nova Biosphere Reserve. Oral presentation at the Mersey-Tobeatic Research Institute Conference. November 1-2. Caledonia, NS, Canada.

Westwood, A., Staicer, C., Bush, P. 2012. Preliminary habitat suitability models for three forest-dwelling bird species at risk in the Southwest Nova Biosphere Reserve. Poster presented at Geomatics Atlantic (regional). June 12-14. Halifax, Canada.

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Westwood, A. 2012. Habitat Suitability Index (HSI) Models in Kejimikujik and Fundy National Parks: Canada Warbler, Olive-Sided Flycatcher, Rusty Blackbird, and Eastern Wood-Pewee. Report prepared for Parks Canada. Dalhousie University, Halifax.