Integrating Research and Outreach at Georgian Bay Islands National Park

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Abstract

*At the last PRFO conference, Georgian Bay Islands National Park presented initial results of a habitat modeling project entitled "Landscape Ecology Evaluation of the Massasauga (LEEMA)". LEEMA applied multi-variate logistic regression analysis to generate a "habitat potential" probability surface for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*) based on habitat structure and human use patterns derived from satellite data at a landscape scale. During the summer of 2000, Georgian Bay Islands National Park undertook a comprehensive field study to ground truth LEEMA throughout the greater park ecosystem. Since a large portion of the study area included private lands, the park undertook a complementary land owner contact and outreach program that was implemented in parallel with the field study. The results of these activities provided the park with an improved understanding of habitat potential for the Massasauga and, through communication and education, an increased capacity for effective recovery for this threatened species. This experience supports the park's multi-disciplinary approach of integrating research with environmental education for effective ecosystem conservation.*

Introduction

A predictive model was developed to assess habitat suitability for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*) (Zorn & Quirouette, 1999). A model for this species is of particular importance for several reasons. The Eastern Massasauga Rattlesnake is listed as a threatened species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It's main threats are human persecution and habitat destruction (Eastern Massasauga Rattlesnake Recovery Team, 1996). The general ecology of this snake makes it difficult to evaluate population status and subsequently the health of the species. Since searching for these snakes is challenging we sought a model to help focus in on areas that may be of particular importance to the snake. The information could be used to initiate focussed monitoring programmes in identified areas or potentially inform development initiatives within the range of the Massasauga.

Ground-truthing The Model

After the initial model design was completed (Quirouette & Zorn, 2000) a process of ground-truthing was required. This would attempt to determine the validity of the model based on its application on the ground. The focus was on answering the following two questions:

Is there a difference on the ground between what the model predicts to be high habitat suitability verses what it predicts to be low habitat suitability?

What combination of landscape and local scale attributes best described Eastern Massasauga habitat in the greater ecosystem?

This project required a team of people to organize the scientific and outreach facets of the project. The scientific methodology required several steps. First a series of random plots were generated in high and low probability areas of the model. This process used GIS to ensure random plots were not in the middle of lakes or places that were inaccessible. Fifty-four habitat variables were selected to be measured. These included everything from under-story and ground structure to temperature and humidity measures. In order to complete the work a crew of people were required for the summer. The Parks Canada Young Canada Works program was accessed for this project. It allows for the hiring of a university level supervisor and students aged 16-18 years of age. An objective sampling method was developed and tested for repeatability. A training manual was developed and the supervisor was brought on early in the project for training. Finally a database was developed so data could be entered as the project progressed to ensure a statistically acceptable sample size was attained.

Beyond the science there was a huge investment in outreach needed to complete this project. The majority of plots (approximately 70) selected occurred on private land. As well some plots required the traversing of multiple properties. Once random plots were generated a landowner database was created. Pre-information packages were sent to landowners explaining the project and stating they would be called for permission to sample on their land. Landowners were then contacted to seek permission and to determine what species of snakes have historically been observed on their property. This information was included in the project database. In total 66 landowners were contacted formally. Many more were contacted informally as the project went on. There were four refusals (6%) to access property for varied reasons. People were contacted a couple of weeks in advance of sampling and then again the day before a visit to their site. At 10 sites crews had assistance from landowners and their families. Active participation of landowners contributed to a strong sense of the project and its importance. Follow-up packages were then sent in the fall. These included a summary of the results to date, a formal thank you and a Snakes of Ontario poster produced by the Massasauga Rattlesnake Recovery Team and its partner.

Results

There were 54 variables measured and of those 14 varied significantly between the high and low probability using a Mann-Whitney U Test and Kilmogorov-

Smirnov Z Test. These 14 variables were aggregated using Principal Components Analysis (varimax rotation) to form 5 non-collinear factors that were used as independents in logistic regression (Figure 1). The loadings on these factors are as follows:

Factor 1 "Bedrock" = ground cover-rock, ground structure-fissured rock, ground cover-boulder, community type-bedrock.
Factor 2 "Mean Temp" = mean air temperature, mean ground temperature.
Factor 3 - "Agricult" = community type-agriculture, ground cover-soil.
Factor 4 "SD Temp" = stand. dev. air temperature.
Factor 5 "Structure" = ground structure-shrub, ground cover-other.

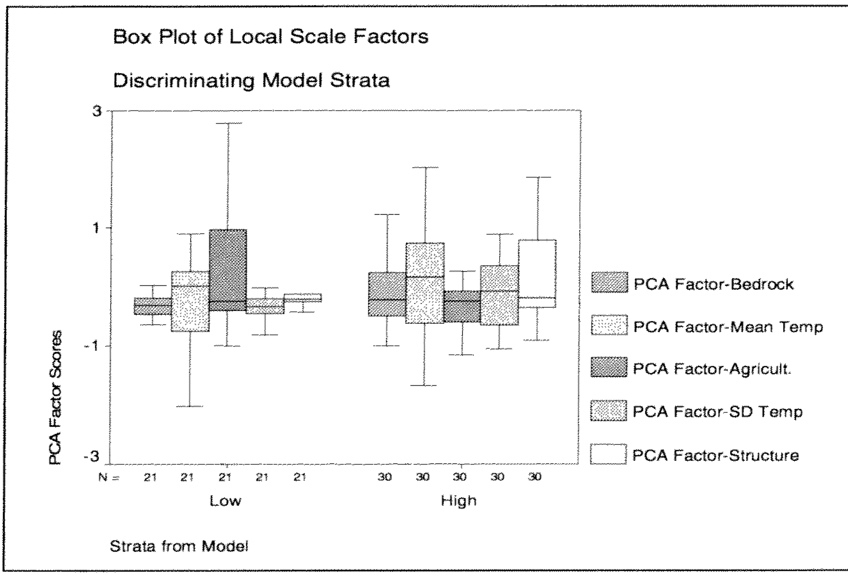

Figure 1. Local Scale Factors that Best Discriminate Landscape Scale Model

The largest positive difference between high and low areas is Factor 1-Bedrock. Ecologically this makes sense, the more fissured rock, exposed bedrock, and boulders there are, the higher the probability of there being high habitat suitability. The largest negative difference is from Factor 3-Agriculture. This also makes perfect sense from an ecology point-of-view. The more agricultural field, the lower the probability of there being high habitat suitability. In all cases the statistical output can be explained ecologically. From logistic regression, these differences are able to correctly classify low and high areas of habitat suitability 81.6% of the time.

Results therefore suggest a measurable difference between the high and low habitat suitability classes as measured through the ground-truthing project. As well a combination of attributes from both the landscape and the local scale may be better at predicting habitat than attributes from one scale alone. In terms of outreach people were found to be very receptive and open to, at a minimum, allowing research on their land, and in many cases (15%) participating in the study.

Challenges Along The Way

Success on this project was not without challenge and there still remains work to do. Despite all efforts, some selected sites were inaccessible resulting in lost sampling time. Covering a representative study area was a challenge due to accessibility. Time in general represented a challenge. The actual work required before a site visit was substantial. There were roughly 7 people working full-time on this project for a period of approximately 10 weeks. On going analysis of data allowed for statistical confidence that there was a difference between high probability and low probability on the ground. The next questions was to determine whether the rattlesnake was actually using what the model predicted as high probability habitat. New confirmed rattlesnake locations required habitat data to be collected. Historical observations were used to build the model and therefore could not be used to test the model. Unfortunately, few of these existed in our study area. A partnership with the Ministry of Natural Resources has recently resulted in having access to more known sites and the habitat variables will be collected for them in the summer 2001 ground-truthing.

In terms of outreach several challenges were faced. Not all landowners were reachable. In some cases permission was requested the day of the site visit. Although this was not ideal it was necessary for several plots. In some cases multiple landowners had to be contacted because of either needing to cross their property, or not knowing exactly where the plot would be. Finally, human perception of snakes and the lack of importance some people put on them resulted in negative attitudes towards the study. In general however, this project served as a good catalyst to engage landowners and provide some education on the species.

Next steps will involve visiting more known snake locations to increase our sample size. A process that could be greatly enhanced by having landowners trained on the identification of snakes and other wildlife of interest, and submitting observational data. Analysis will determine if there is a grade within the high habitat suitability category. Depending on results, the model may be refined to a point where it is truly predictive. Where a site visit will result in collecting habitat variables which then get plugged into the model and the probability of suitable habitat is given.

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References

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