

Monitoring Butterfly Abundance and Diversity Along an Urban Gradient in the Region of Waterloo, Ontario



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INTRODUCTION

- Butterflies are recognized as useful indicators, both for their rapid and sensitive responses to subtle habitat or climatic changes, as well as what changes in their community structure represent for overall biodiversity (UKBMS 2006; Pollard & Yates 1993; Kremen 1994; New 1997).
- This study is examining changes in butterfly abundance and diversity along a gradient of urbanization within the Region of Waterloo to determine how different land uses are affecting butterfly communities.
- Information collected can then be used to guide conservation management decisions and land-use planning.

PURPOSE OF STUDY

- This study is intended to provide detailed base-line data on current butterfly abundance and diversity in the Region of Waterloo and a comparative analysis of changes in species composition along an urban gradient.
- The information collected will allow the prediction of how different land-use activities are potentially affecting biodiversity.



RESEARCH QUESTIONS

- How do different land-use activities affect butterfly abundance and diversity?
- What does this indicate about ecological integrity (i.e. integrity of native components and processes) and biodiversity in different parts of the Region?
- Are Environmentally Sensitive Policy Area designations effective in protecting and preserving rare species and/or overall species diversity of butterflies?
- What species of butterfly are uncommon or rare within the Region? How has their presence/absence changed over the last 50 or so years?

METHODS

Building the Database

- An Excel database has been created with all known historical butterfly presence/absence data from the Region of Waterloo.

Transect Counts

- Transect routes, approximately 500m long, were designated at 15 sites selected to represent the different land uses (Figure 1).

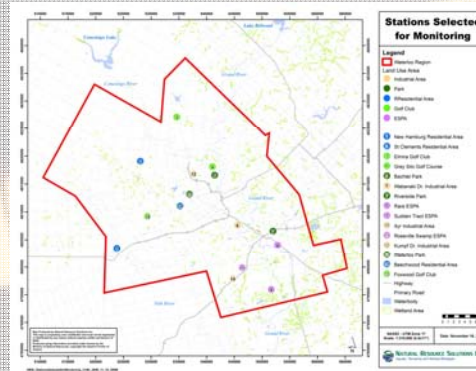


Figure 1. Stations Selected for Monitoring along the Urban Gradient

- Transects were walked 1x per week between May and October and butterfly abundance and diversity was recorded.
- Data on temperature, wind speed, cloud cover, percent vegetation cover and flowering plants was also recorded.

RESULTS: YEAR 1

General Trends

- Overall, butterfly species diversity within the Region of Waterloo has decreased over the past 70 years. Several species have experienced a decline in abundance or are absent all together. Others have become more common.

Ordering the Urban Gradient

- The gradient was ordered from the 'most natural' to the 'most urban' as follows: 1) ESPA 2) Golf Course 3) Urban Park 4) Residential Area 5) Industrial Area

Transect Count Results: Year 1

- The highest average diversity of species was observed at ESPA areas while the lowest was at industrial areas (Figure 2). However overall species diversity between sites was variable (Figure 3).
- Urban parks and industrial areas had the highest abundance of individual butterflies.

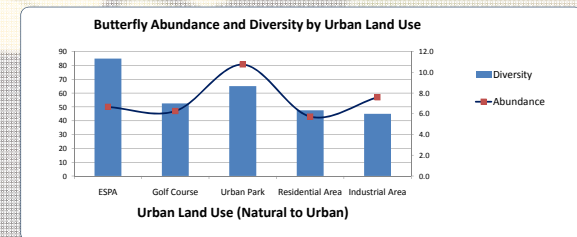


Figure 2. Average Butterfly Abundance and Diversity by Land Use

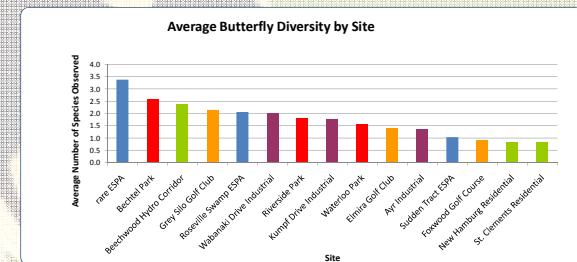


Figure 3. Average Butterfly Diversity by Site

CONCLUSIONS

- Differences in butterfly abundance and diversity between sites appear to be more dependent on the types of habitat available than the type of urban land.
- A second year of data collection and detailed statistical analysis will be completed by Fall 2010.

References

- Kremen, C. 1994. Biological Inventory Using Target Taxa A Case Study of the Butterflies of Madagascar. *Ecological Applications* 4(3): 407-422.
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- Pollard, E. and T.J. Yates. 1993. *Monitoring Butterflies for Ecology and Conservation*. London, United Kingdom, Chapman and Hall.
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