

# Floristic Quality Assessment for natural area management in Lake Simcoe watershed

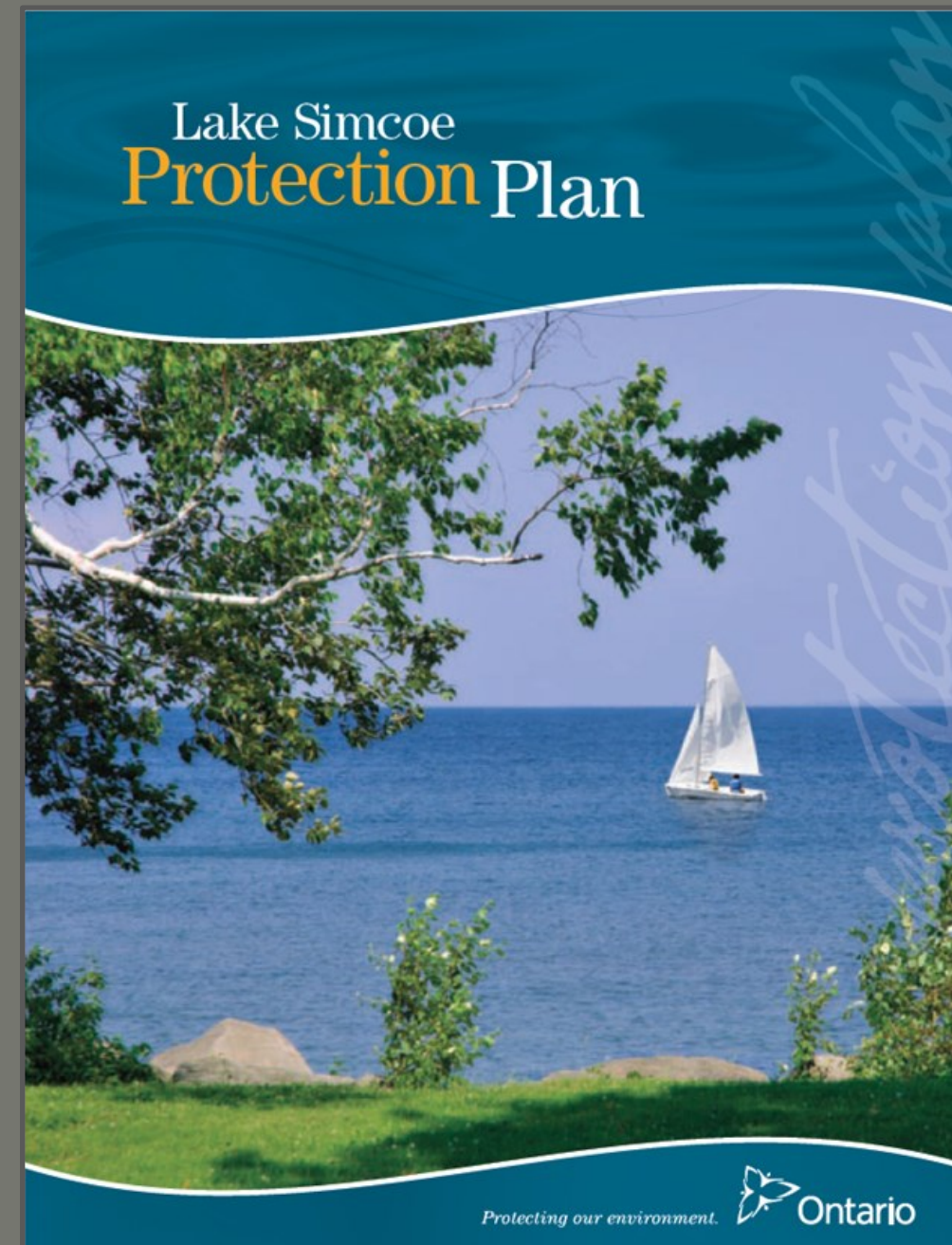
Katherine Baird<sup>1</sup>, Danijela Puric-Mladenovic<sup>1,2</sup>

## Introduction

Floristic quality has been identified as one of the indicators of natural cover quality for Lake Simcoe (LS) watershed (1).

**Floristic Quality Assessment (FQA)**, based on plant species composition data, describes the quality of natural cover based on species' fidelity to natural habitats and sensitivity to disturbance (2).

Despite widespread application of FQA in the United States, much less research exists in Ontario.



LSP target: "minimum 40 percent high quality natural vegetation cover in the watershed" (Ontario 2009)

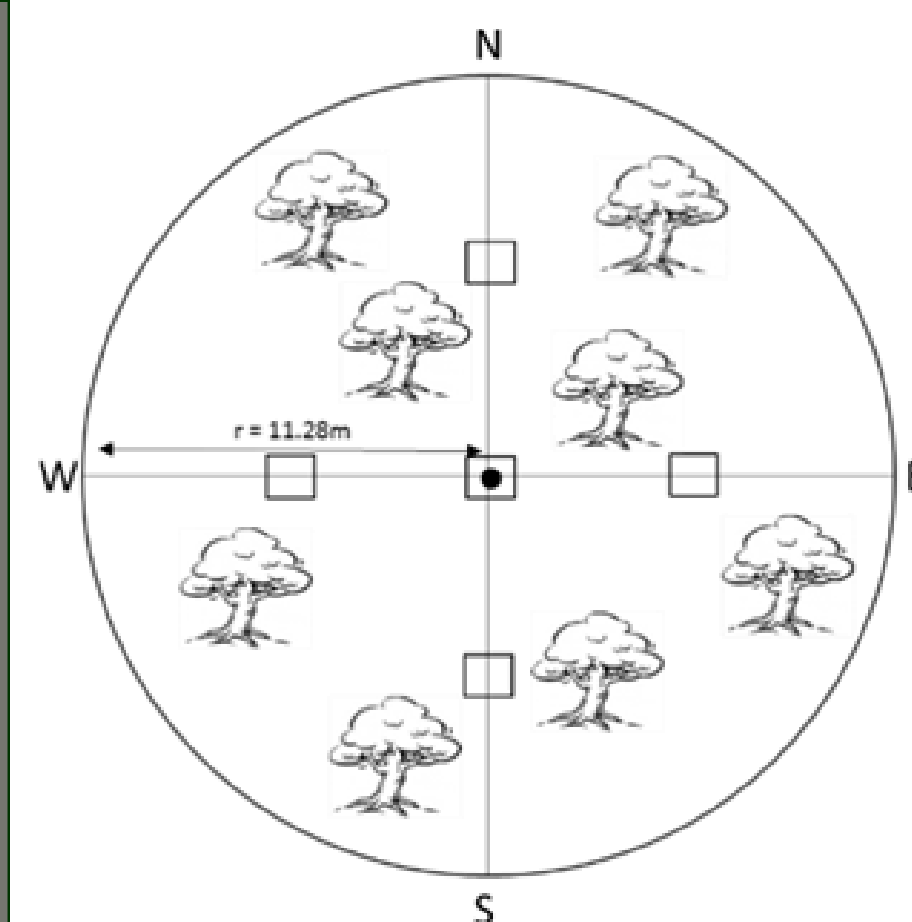
We investigate the applicability of FQA to LS watershed and explore its properties relevant to management:

- 1) performance of FQA metrics against anthropogenic disturbance gradient;
- 2) differences in FQA among different vegetation communities; and,
- 3) sensitivity of metrics to variation in species detection levels

## Methodology

Natural cover monitoring based on 422 plots sampled using **Vegetation Sampling Protocol (3)**:

- Abundance of all flora species
- Coefficients of Conservatism assigned to species according to Oldham et al. (1995) are the basis of FQA (Table 1)
- Analysis using: *R*, *ArcGIS*



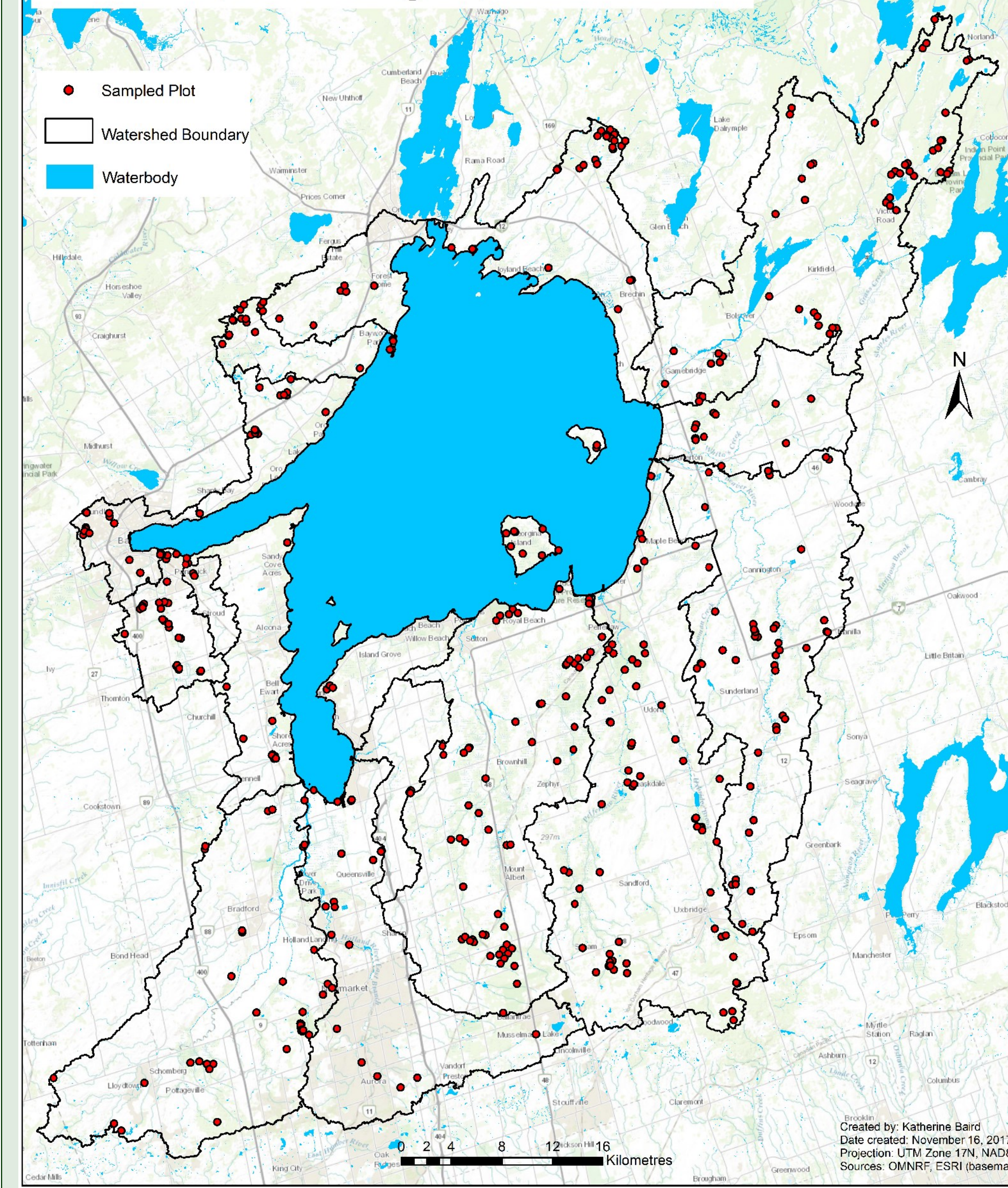
**Figure 1.** VSP fixed-area georeferenced sampling plot (400 m<sup>2</sup>). Plots were sampled in both forested and non-forested natural areas.

## Methodology

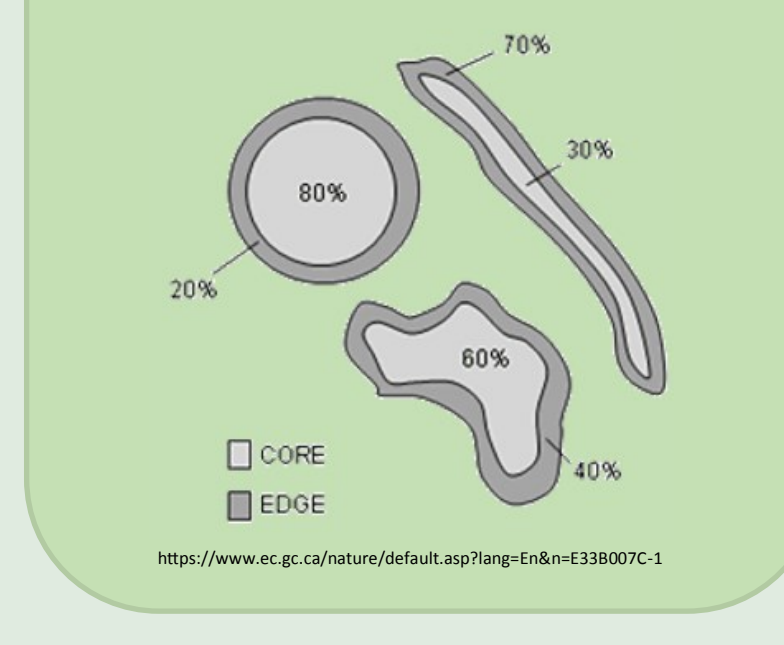
Disturbance variables condensed into a single composite disturbance gradient using PCA & CCA

- Proxy for habitat condition
- As disturbance ↑, floristic quality should ↓

Vegetation Plots Sampled in Lake Simcoe Watershed, June - August, 2017



**1) Patch variables** (size, shape, distance from edge, edge density)



**2) Landscape variables** (road density, land use in surrounding area, distance from urban land, agriculture etc.)



**3) Site-specific sources of human disturbance** (trails, tree cutting etc.)



PCA & CCA  
Composite disturbance gradient

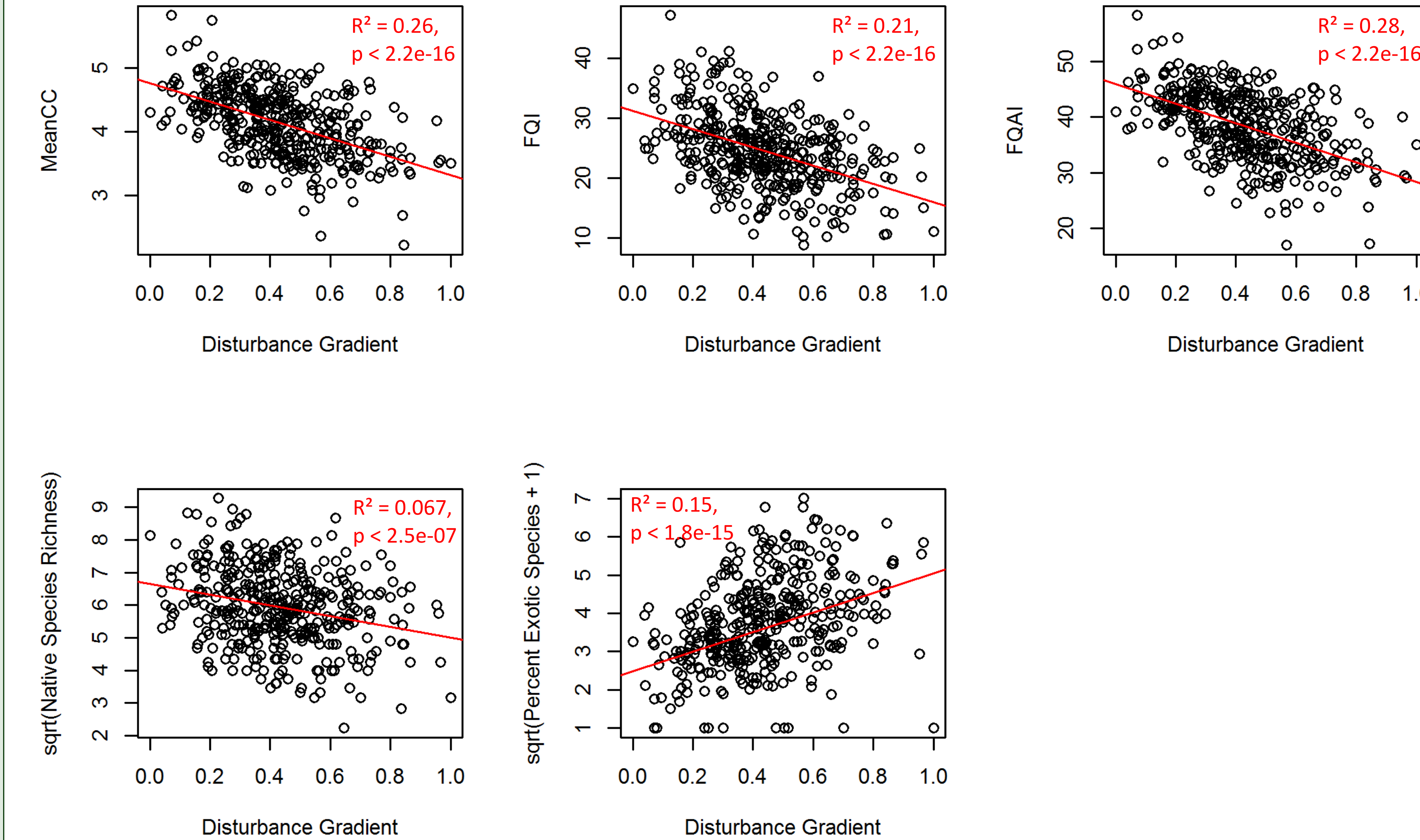
**Table 1.** FQA metrics calculated at the plot level. High values indicate high floristic quality.

Index	Equation	Description
MeanCC	$\frac{\sum_{i=1}^N CC_i}{N}$	Average coefficient of conservatism (CC) scores of all native species at a sampling plot.
FQI	$MeanCC \cdot \sqrt{N}$	Measure of the floristic quality at a sampling plot, using MeanCC and native species richness (N).
FQAI	$\left(\frac{MeanCC}{10} \times \frac{\sqrt{N}}{\sqrt{N+A}}\right) \times 100$	Adjusted measure of the floristic quality at a sampling plot, using MeanCC, and both native richness (N) and adventive (exotic) richness (A).

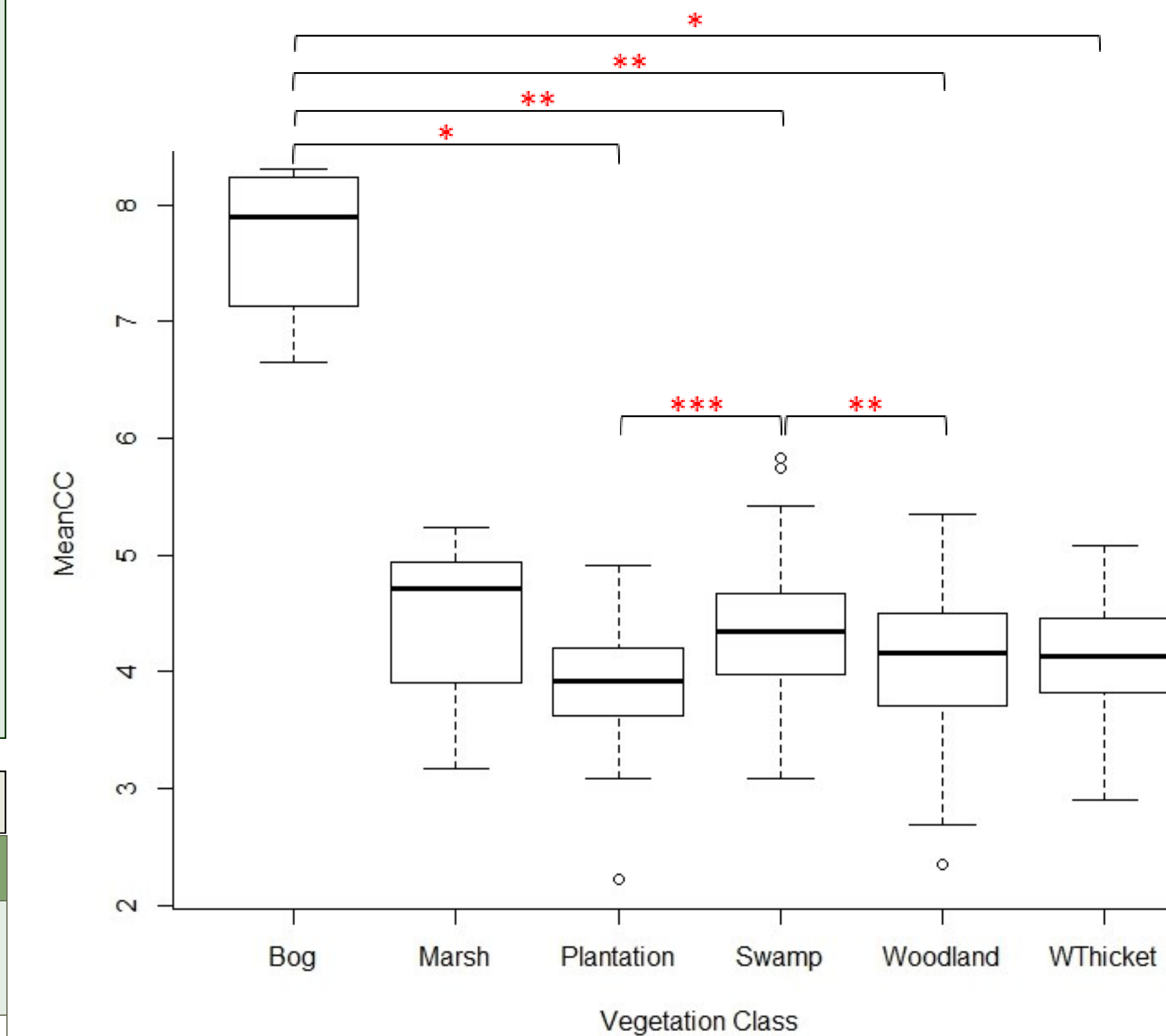
## Preliminary Results

- Increase in disturbance significantly correlated with a decrease in all FQA metric scores (Fig. 2)
- FQA metrics performed better than native species richness and percent exotic species (Fig. 2)
- FQA metric scores vary by vegetation class (Fig. 3)

## Preliminary Results



**Figure 2.** Linear regression showing the relationship between the composite disturbance gradient and metrics of vegetation quality for forest plots (n = 387). Native species richness and percent exotic species transformed to meet statistical assumptions. The composite disturbance gradient is normalized on a scale from 0 (least stress) to 1 (highest stress). Line of best fit shown in red.



**Figure 3.** Variation in MeanCC between vegetation communities (Kruskal-Wallis rank sum test, H = 34.95, df = 5, p < 0.001). Asterisks indicate significant difference using Pairwise Wilcoxon Rank Sum Test with Holm adjustment (\* = p ≤ 0.05; \*\* = p ≤ 0.01; \*\*\* = p ≤ 0.001).

**Literature Cited:**

1. Ontario. (2009). Lake Simcoe Protection Plan. Retrieved from Ontario: <https://www.ontario.ca/page/lake-simcoe-protection-plan>
2. Swink, F., & Wilhelm, G. (1994). Plants of the Chicago region: Indiana Academy of Science.
3. Puric-Mladenovic, D. & Kenney, W.A. (2015). The VSP Field Inventory and Monitoring Pocket Guide. Version 1 (May 2015). Ontario Ministry of Natural Resources and Forestry, Science and Research Branch and Faculty of Forestry, University of Toronto.
4. Oldham, M. J., Bakowsky, W. D., & Sutherland, D. A. (1995). Floristic Quality Assessment System for Southern Ontario. Ontario, Canada: Queen's Printer for Ontario. 102 pp.

Research supported by:



For more information contact:  
Katherine Baird, MScF, Faculty of Forestry, U of T  
[katherine.baird@utoronto.ca](mailto:katherine.baird@utoronto.ca)

<sup>1</sup>Faculty of Forestry, University of Toronto, Toronto, ON, Canada, M5S 3E8  
<sup>2</sup>Science & Research Branch, Natural Heritage Information Center, OMNRF, Peterborough, ON, Canada, K9J 3C7

## Conclusions

- MeanCC and FQAI were the best indicators of habitat condition at sites in LS watershed
- Vegetation quality standards for FQA should be ecoregion and community specific
- FQA applications: monitor habitat quality, set restoration targets, environmental assessments, identify high quality sites for protection in S. Ontario