

# Floristic Quality Analysis

An Under-Appreciated Metric in Ontario

# By Many Accounts, A Useful Measure

- ▶ 1988 paper by Wilhelm and Ladd
- ▶ Protocols were developed in Ontario in 1995
- ▶ Used extensively in the U.S. to judge success of restoration, inform priority for protection, etc.
- ▶ Recent (2019) paper by Spyreas concluded it provides a bridge between quantitative and judgement-based assessment

**FLORISTIC QUALITY ASSESSMENT SYSTEM**

**FOR SOUTHERN ONTARIO**

**M.J. Oldham, W.D. Bakowsky and D.A. Sutherland**

Natural Heritage Information Centre  
Ontario Ministry of Natural Resources  
Box 7000, Peterborough  
Ontario K9J 8M5  
Canada

December 1995



# How Does it Work?

- ▶ Based on the premise that native plant species vary in their degree of fidelity to specific habitats, and by extension, tolerance of disturbance



# Coefficient of Conservatism: “C”

- ▶ Each native species in the flora is assigned a numerical value between 0 and 10 indicating how faithful it is to certain habitats
- ▶ Plants that occur only in specific habitats are assigned a high value, while plants that occur in a wide variety of habitats are assigned a low value.
- ▶ They were derived by committee, and have changed over the years; NHIC provides up-to-date Cs for > 2000 native Ontario plants
- ▶ One simple measure used often to measure vegetation quality is Native Mean C – the average C of all native plants



# How Accurate is C?



If in the first act you have hung a pistol on the wall, then in the following one it should be fired. Otherwise don't put it there.

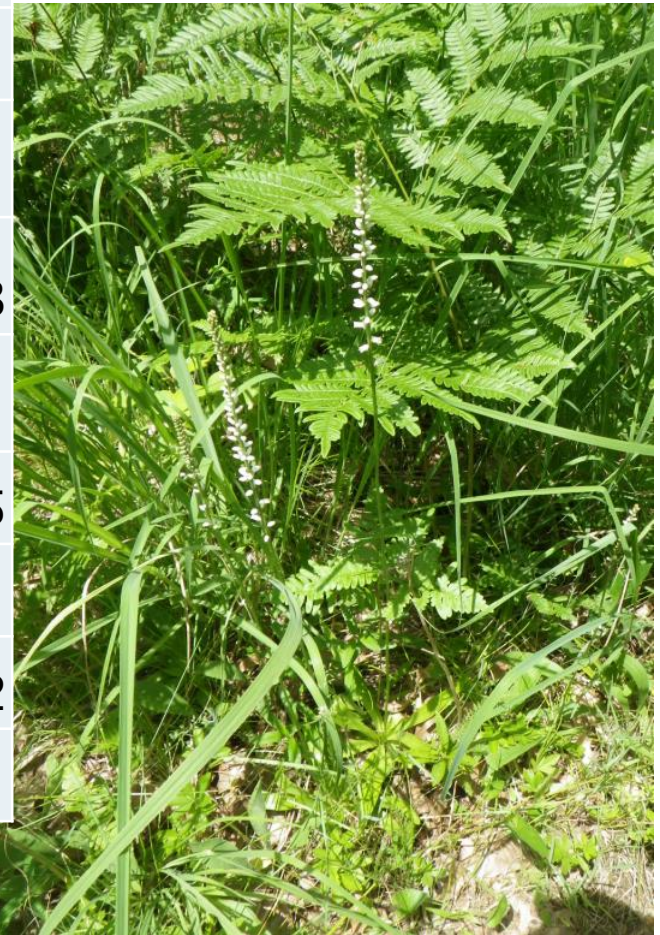
(Anton Chekhov)

# Examples of Low Coefficients of Conservatism (0)

<i>Equisetum arvense</i>	Field Horsetail	S5
	Common	
<i>Oenothera biennis</i>	Evening-primrose	S5
<i>Chenopodium berlandieri</i> var. <i>bushianum</i>	Bush's Goosefoot	S1 S2
<i>Eragrostis pectinacea</i>	Tufted Lovegrass	S5
<i>Hordeum jubatum</i>	Foxtail Barley	S5?
	Reed Canary	
<i>Phalaris arundinacea</i>	Grass	S5
<i>Phragmites australis</i>	Common Reed	S4?
	Kentucky	
<i>Poa pratensis</i>	Bluegrass	S5
<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	Tufted Lovegrass	S5
<i>Juncus tenuis</i>	Path Rush	S5

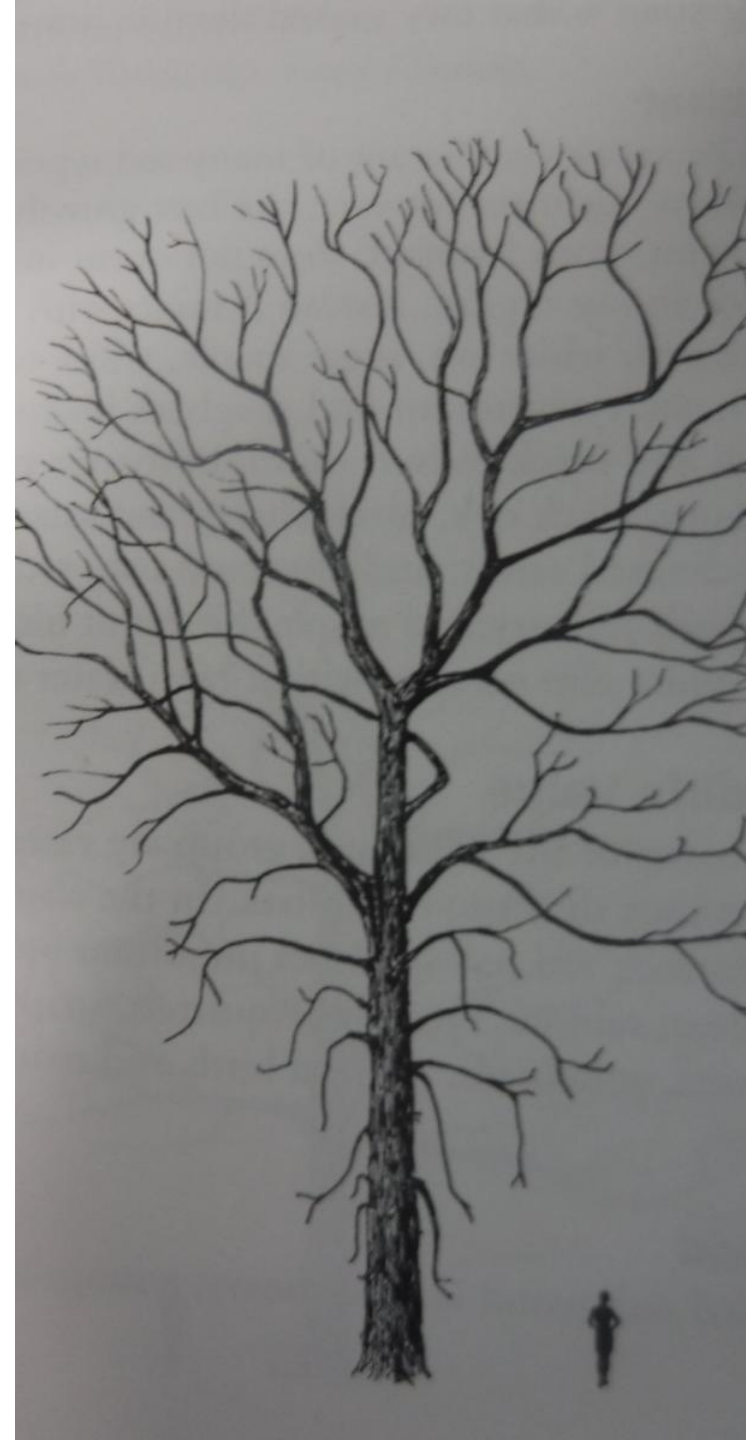
# Examples of High Coefficients of Conservatism (10)

<i>Aletris farinosa</i>	White Colicroot	S2
<i>Camassia scilloides</i>	Eastern Camas	S1
<i>Chamaelirium luteum</i>	Devil's-bit	SX
<i>Hypoxis hirsuta</i>	Eastern Yellow Stargrass	S2S3
<i>Streptopus amplexifolius</i>	Clasping-leaved Twisted-stalk	S5
<i>Triantha glutinosa</i>	Sticky False Asphodel	S4S5
<i>Trillium flexipes</i>	Drooping Trillium	S1
<i>Uvularia perfoliata</i>	Perfoliate Bellwort	S1S2
<i>Anticlea elegans</i>	Mountain Death Camas	S4



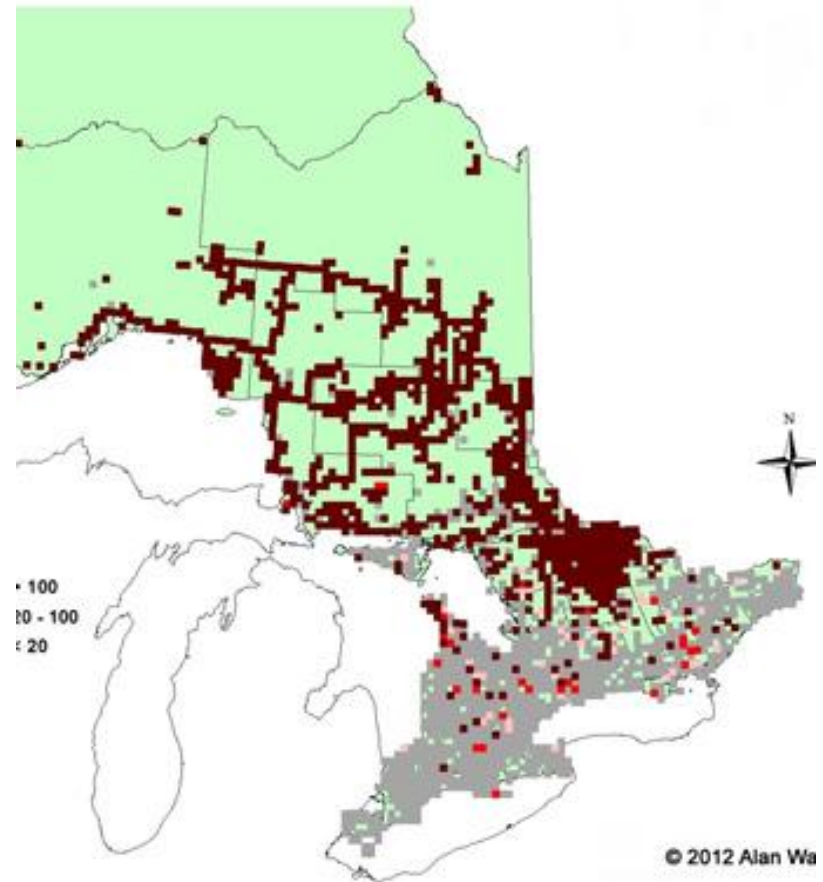
# Robust for Many Species

- ▶ High coefficients cover many different types of species' conservatism, e.g.:
  - Species that grow only in narrow range of soil moistures (e.g. Pin Oak *Quercus palustris*), so are confined to certain regions
  - Species that grow only where light levels are high (Indian Grass *Sorghastrum nutans*)
  - Species that are competition-averse (e.g. quillworts *Isoetes* spp.)



# Some Differences Between Cs in Different Areas

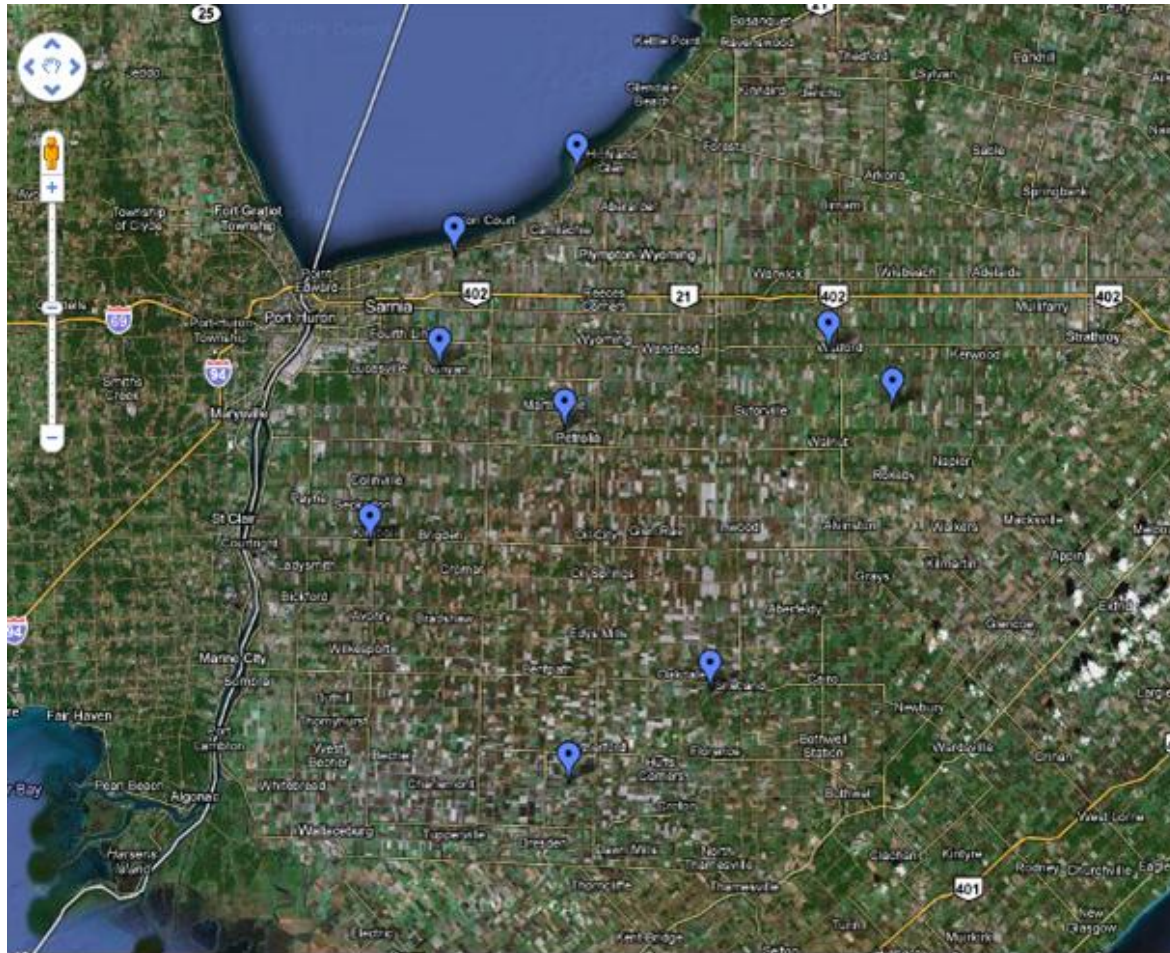
- ▶ Black Spruce (*Picea mariana*): highly conservative in southern Ontario (confined to fens and bogs)
- ▶ Widespread in both upland and wetland habitats in northern Ontario
- ▶ Ontario CoC (8) is higher than Michigan CoC (6)



# Floristic Quality Index

- ▶ The FQI is the square root of the number of native species present in an area multiplied by the average Coefficient of Conservatism (C) for the native species present.
- ▶ The square root is intended to prevent species number from influencing the FQI unduly

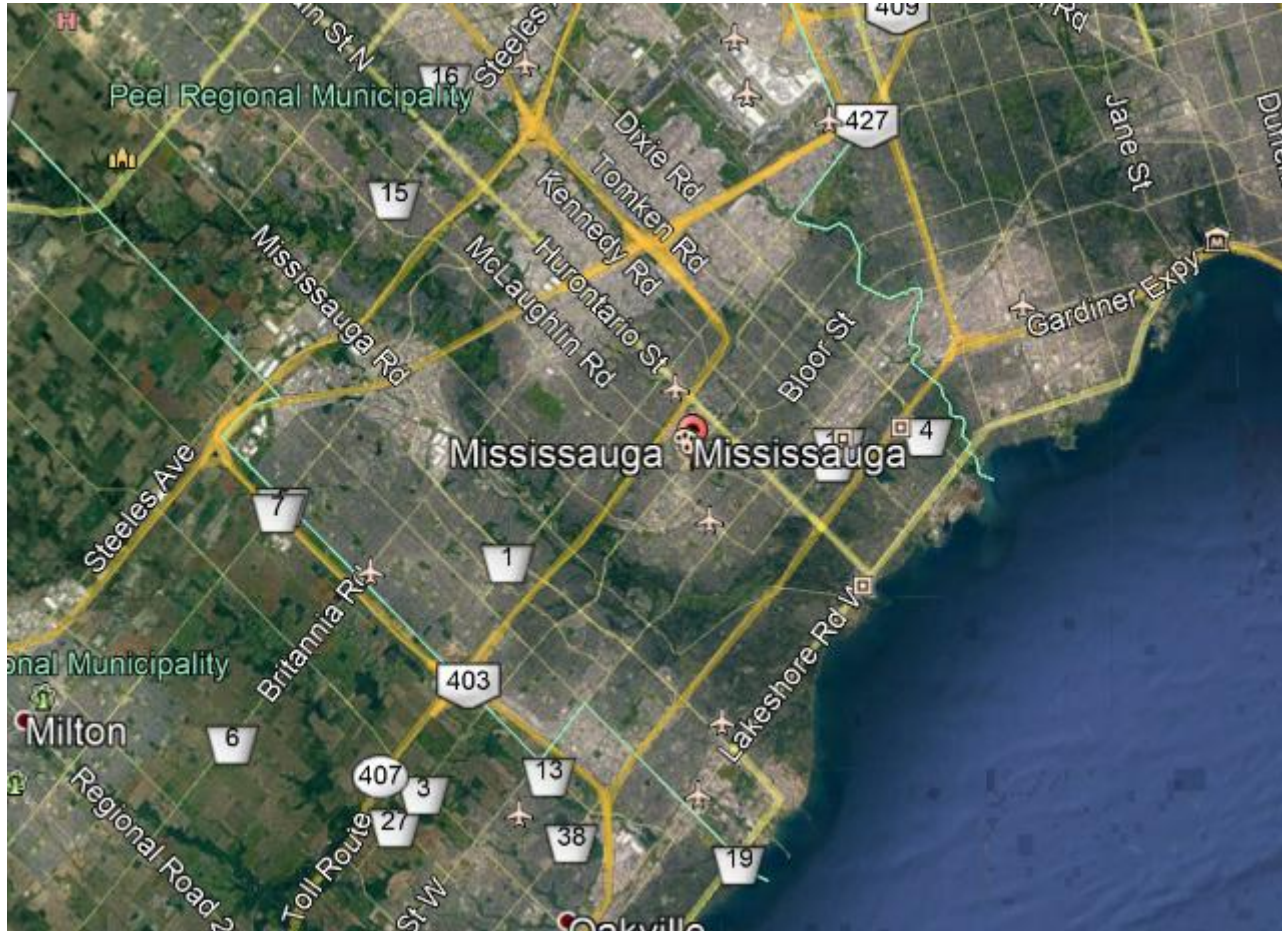
# Regional Context Important for FQI



# Lambton: Relatively High FQIs

- ▶ N = 30 sites
- ▶ FQI = 45.71
- ▶ Mean CoC = 4.19
- ▶ Min : FQI = 27.29    Mean CoC = 3.01
- ▶ Max : FQI = 68.57    Mean CoC = 4.84

# Regional Context: Mississauga



# Mississauga: Lower FQIs

- ▶ N = 132 sites
- ▶ Average FQI = 31.2
- ▶ Average C = 3.4
- ▶ Min: FQI = 4.1, Mean C = 2
- ▶ Max: FQI = 92.7, Mean C = 4.5

# Rough Measures:

- ▶ Native mean C
  - remnant landscape  $> 4.5$
  - high  $> 4.00$
  - medium = 3.3 to 3.99
  - low  $< 3.3$
- ▶ Floristic Quality Indices
  - high  $> 40$
  - medium = 30 to 39.99
  - low  $< 30$

# Other Examples

High

- ▶ Central Ontario

Low to Moderate

- ▶ Toronto
- ▶ Kitchener

Ecosite	Number of Native Plant Species	Number of Non-Native Plant Species	Native FQI	Native Mean C
Fen/Bog	46	1	47.70	7.11
Coniferous Forest	92	0	56.01	5.57
Deciduous Forest	128	5	60.19	5.32
Mixed Forest	120	2	60.39	5.51
Meadow Marsh	94	5	51.32	5.29
Marsh	27	2	26.17	5.04
Rock Barren	20	2	29.73	6.65
Coniferous Swamp	41	0	42.69	6.67
Deciduous Swamp	101	1	54.76	5.45
Mixed Swamp	56	0	46.59	6.23
Thicket Swamp	55	1	43.46	5.86



# Effect of Size

- ▶ FQI is strongly influenced by species richness
- ▶ Richness tends to increase with size of area, especially if it is associated with diversity of habitat and microclimates
- ▶ Mean C is not as affected by richness
- ▶ This might be the story you want to tell



# Effect of Community Type

- ▶ Wetlands are generally higher than forests, especially considering relative size of forested area and wetland area in southern Ontario
- ▶ Cultural areas are generally lower
- ▶ High community diversity = high FQI



# Effect of Inventory Effort

- ▶ Mississauga examples where 1996 values were similar to 2018 cumulative values, but others where they were not:
  - average increase in total native species was 98.2;
  - Average increase in FQI was 11.6 (max 36.7)
  - Average increase in Mean C was 0 (max 1.8)

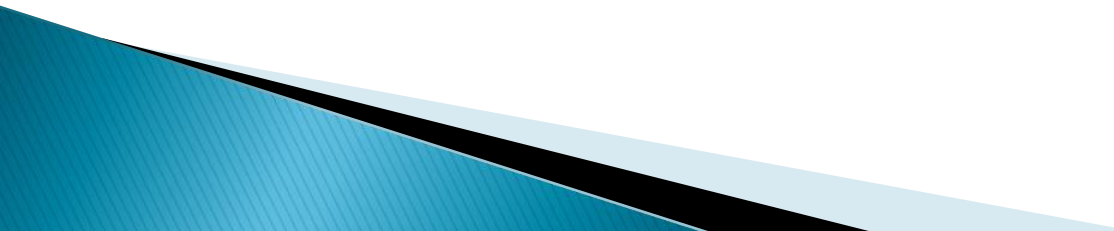
# Extraordinary Examples: Spring Garden Prairie, Windsor

Ecosystems	Native Plants	Non-native Plants	Total Plants	Native FQI	Native Mean C
Cultural	241	80	328	70.71	4.56
Forest	247	67	317	78.26	4.98
Marsh	136	47	188	51.51	4.42
Swamp	322	73	403	90.98	5.07
Tallgrasses	281	77	363	87.41	5.21



**What does that Look Like?**

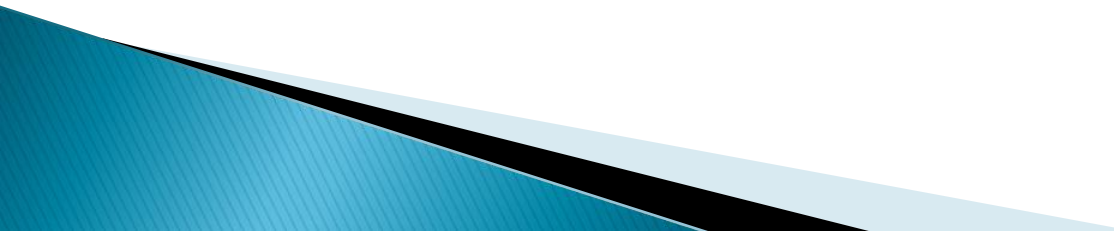
# Useful to Provide Information on a Wide Variety of Circumstances

- ▶ Differences between uplands and wetlands
  - ▶ Areas that are most susceptible to disturbance
  - ▶ Differences across time (e.g. evidence of degradation) – but new lists must be taken for each time period with similar effort and expertise
- 

# Interpret with Care

- ▶ Is a low FQI related to disturbance? Some highly naturally disturbed habitats have high FQIs, e.g. sand dunes

# Conclusion

- ▶ Depends what the measure is used for, and be very clear how you are using it
  - ▶ Useful for comparing communities, but be specific about what you are comparing
  - ▶ General Rule: stay within context of geography
  - ▶ In comparing areas over time, be careful that plant lists at different times are obtained with similar effort
- 

- ▶ If communities are different sizes, there may be value in highlighting the importance of the large size and configuration that contributes to its high quality
- ▶ Compare similar communities but there may be value in telling the story of how much forest you need to equal the quality of a small wetland

