Testing Floristic Quality Assessment as an indicator of freshwater wetland condition in Rhode Island

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FQA Workshop
Albany Pine Bush Preserve, Albany NY
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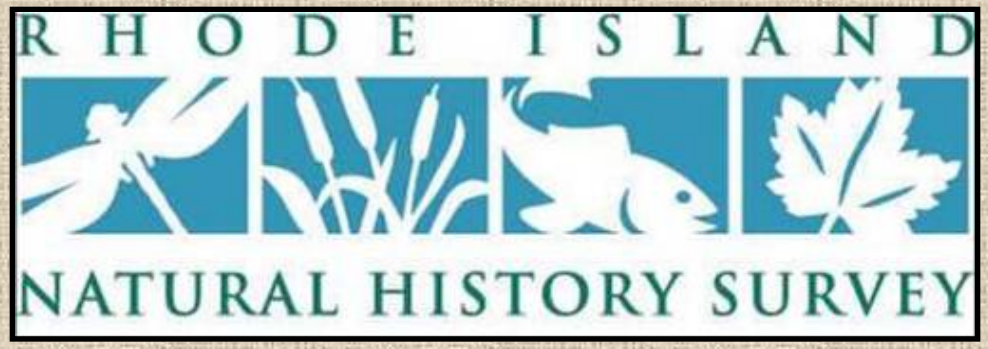
Acknowledgments



THE UNIVERSITY OF RHODE ISLAND

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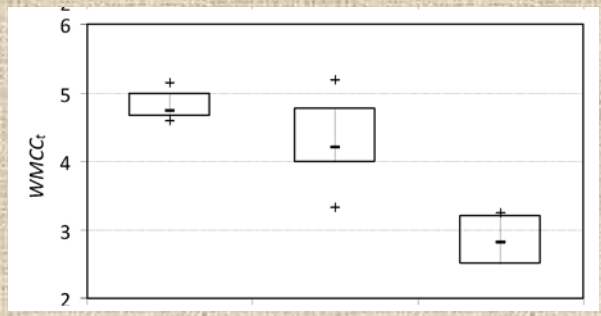
We set out to answer these questions

1. What FQA variant should we use and why?

$$\left(\frac{\sum CC}{N \times 10} \times \frac{\sqrt{N}}{\sqrt{S}}\right) \times 100$$

2. How effective are the best variants (and CCs)?



3. Can we make the methods any easier?

How do the FQA variants function?

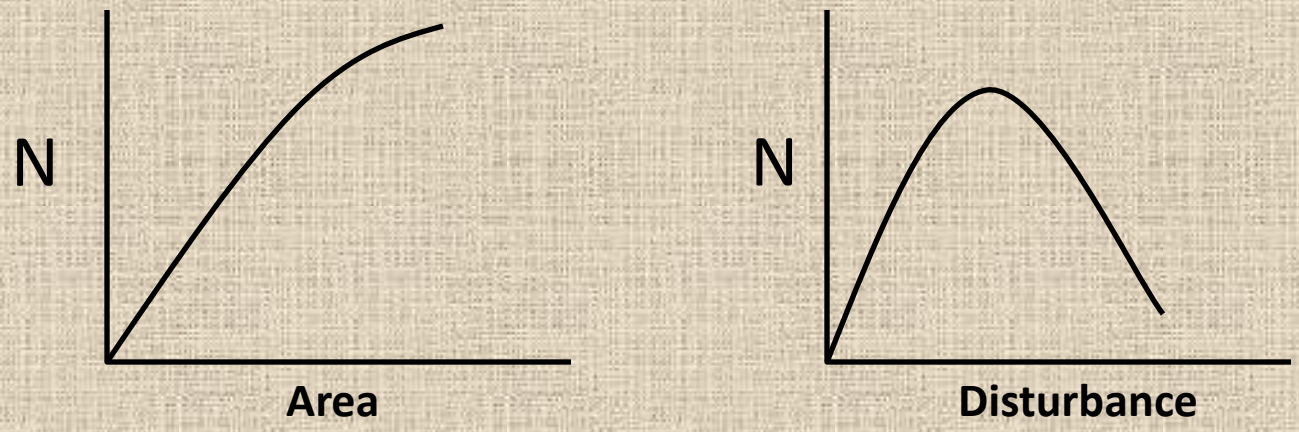
Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	
Mean CC_n	$\frac{\sum CC}{N}$	Rooney and Rogers 2002; Cohen et al. 2004; Miller and Wardrop 2006	
Mean CC_t	$\frac{\sum CC}{S}$	Cohen et al. 2004; Matthews et al. 2009	*Mean* $CC_n \times \frac{N}{S}$
Weighted mean CC_n [b]	$\frac{\sum (CC \times P_n)}{N \times \sum P_n}$	Cohen et al. 2004	
Weighted mean CC_t	$\frac{\sum (CC \times P_s)}{S \times \sum P_s}$	Developed in this study	
FQAI'	$\left(\frac{\sum CC}{N \times 10} \times \frac{\sqrt{N}}{\sqrt{S}}\right) \times 100$	Miller and Wardrop 2006; Vaselka et al. 2010	*Mean* $CC_n \times \sqrt{\frac{N}{S}} \times 10$
$FQAI_t$	$\frac{\sum CC}{S} \times \sqrt{S}$	Matthews et al. 2009	
% Native	$\frac{N}{S}$	Ervin et al. 2006	

The original old FQAI

Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	

1. Mean CC_n (Conservatism) **2. Richness**

Richness is confounding



Exotics are ignored

Mean CC of native species

Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	
Mean CC_n	$\frac{\sum CC}{N}$	Rooney and Rogers 2002; Cohen et al. 2004; Miller and Wardrop 2006	

1. Mean CC_n (Conservatism)

Richness is gone; better!

But exotics are still ignored

Mean CC of all species, including exotics

Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	
Mean CC_n	$\frac{\sum CC}{N}$	Rooney and Rogers 2002; Cohen et al. 2004; Miller and Wardrop 2006	
Mean CC_t	$\frac{\sum CC}{S}$	Cohen et al. 2004; Matthews et al. 2009	*Mean* $CC_n \times \frac{N}{S}$

Richness is gone, and
Exotics now lower the score
(as they should!)

So why does FQAI' work so well?

Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	
Mean CC_n	$\frac{\sum CC}{N}$	Rooney and Rogers 2002; Cohen et al. 2004; Miller and Wardrop 2006	
Mean CC_t	$\frac{\sum CC}{S}$	Cohen et al. 2004; Matthews et al. 2009	*Mean* $CC_n \times \frac{N}{S}$
FQAI'	$\left(\frac{\sum CC}{N \times 10} \times \frac{\sqrt{N}}{\sqrt{S}}\right) \times 100$	Miller and Wardrop 2006; Vaselka et al. 2010	*Mean* $CC_n \times \sqrt{\frac{N}{S}} \times 10$

Functionally nearly equivalent to *Mean* CC_t

Why not stop here?

Metric Variant	Formula[a]	Applications	Equivalent Formula
FQAI	$\frac{\sum CC}{N} \times \sqrt{N}$	Swink and Wilhelm 1979; Lopez and Fennessy 2002	
Mean CC_n	$\frac{\sum CC}{N}$	Rooney and Rogers 2002; Cohen et al. 2004; Miller and Wardrop 2006	
Mean CC_t	$\frac{\sum CC}{S}$	Cohen et al. 2004; Matthews et al. 2009	*Mean* $CC_n \times \frac{N}{S}$

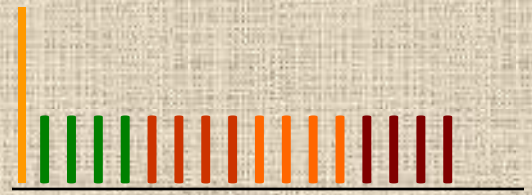
it lacks proportional cover

Add proportional cover, why?

Mean CC_t	$\frac{\sum CC}{S}$	Cohen et al. 2004; Matthews et al. 2009	*Mean* $CC_n \times \frac{N}{S}$
Weighted mean CC_t	$\frac{\sum (CC \times P_s)}{S \times \sum P_s}$	Developed in this study	

Mean CC_t

A



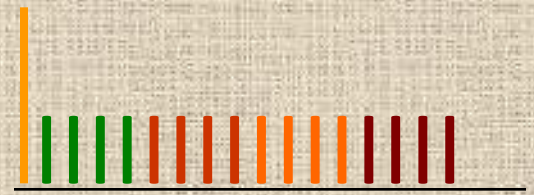
$MCC_t = 4$

B

$MCC_t = 4$

Weighted mean CC_t

A



$WMCC_t = 4.9$

B

$WMCC_t = 1.3$

Empirical results, how the variants work

n = 20 wetlands, *P* < 0.01 except * NS

Index	*OIWI*	*RIRAM*	*ISA*
FQAI	0.24 *	-0.08 *	-0.09 *
Mean CC $_n$	0.75	0.70	-0.70
★ *Mean CC* $_t$	0.82	0.81	-0.84
★ *Weighted Mean CC* $_t$	0.82	0.85	-0.86
FQAI'	0.82	0.78	-0.80
FQAI $_t$	0.39 *	0.11 *	-0.27 *
★ *% Native*	0.81	0.89	-0.89
Native Species Identified	-0.13 *	-0.40 *	0.27 *
Total Species Identified	-0.29 *	-0.54 **	0.44 *

* not a significant correlation (*P* > 0.05) ** *P* = 0.01

Data Collection

Three belt transects

Cover Classes:

1 = less than 10%	*scarce*
2 = 10 to 60%	*common*
3 = more than 60%	*dominant*

Investigators: Site Code: Date:

Species	Transect 1	Transect 2	Transect 3	Total

Effects of reduced sampling effort

	OIWI	*RIRAM*	*ISA*
Mean CC $_t$			
Full Sampling	0.82	0.81	-0.84
Single Transect	0.82	0.79	-0.82
≥10% Cover	0.74	0.81	-0.79
Single Transect ≥10% Cover	0.77	0.74	-0.78
Weighted Mean CC $_t$			
Full Sampling	0.82	0.85	-0.86
Single Transect	0.82	0.83	-0.84
≥10% Cover	0.79	0.85	-0.82
Single Transect ≥10% Cover	0.80	0.77	-0.80
% Native			
Full Sampling	0.81	0.89	-0.89
Single Transect	0.82	0.86	-0.86
≥10% Cover	0.73	0.70	-0.71
Single Transect ≥10% Cover	0.73	0.67	-0.70

	Sampling Effort		
	Single Transect	≥10% Cover	Single Trans ≥10%
Mean CC $_t$	0.98	0.83 (~69%)	0.84
Weighted Mean CC $_t$	0.95	0.96 (~92%)	0.90
% Native	0.98	0.74 (~55%)	0.74

Conclusions

1. Use *Weighted Mean* CC_t when possible
2. Use *Mean* CC_t when proportionality not feasible
3. Use *% Native* if you don't have CCs
4. *Weighted Mean* CC_t with reduced cover class will greatly reduce identification constraints
5. FQA works great
6. RI CCs work well

THANKS!