Rapid Assessment of Freshwater Wetlands in Rhode Island

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Rhode Island Freshwater Monitoring and Assessment Plan
RIDEM and NEIWPCC 2006

Short-term objectives

- Landscape impacts
- Invasive species impacts and causes
- Water withdrawal impacts
- Prioritize for preservation / acquisition

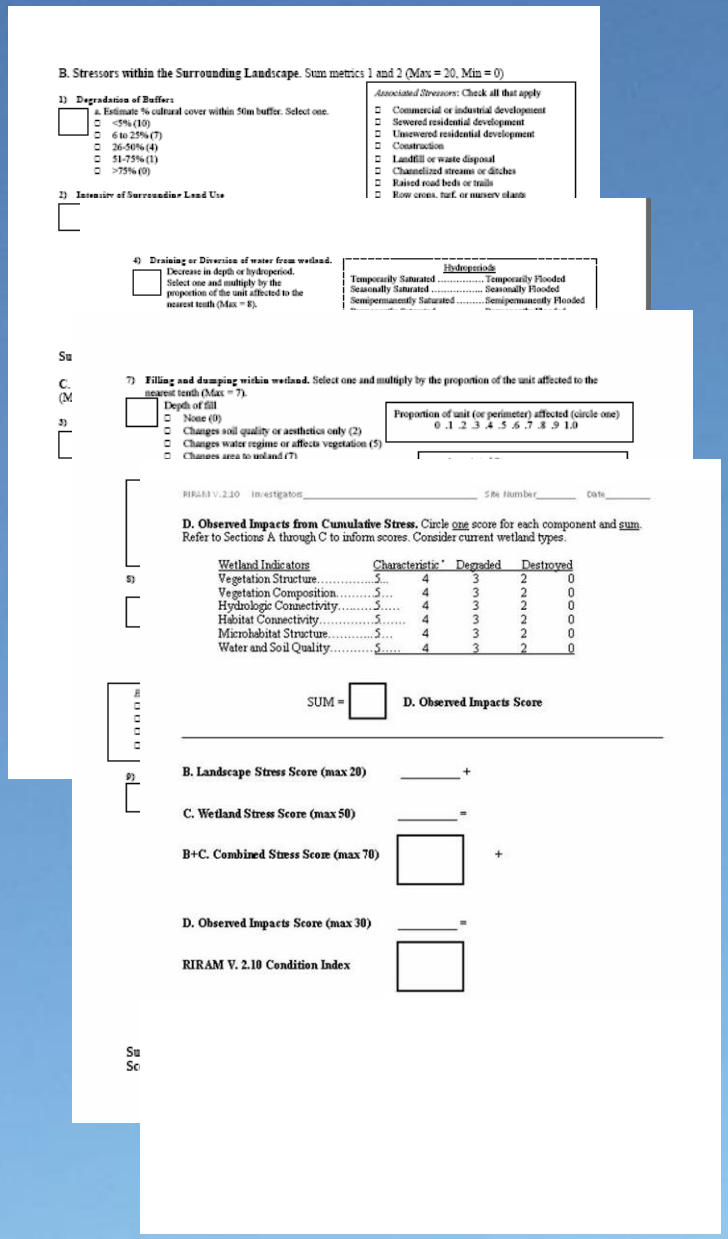
Long-term objectives

- Evaluate trends in wetland condition
- Identify causes and sources of degradation
- Evaluate the effectiveness of management

EPA-recommended Three-level Approach

- Level 1: Landscape Assessment
- Level 2: Rapid Assessment
- Level 3: Intensive Assessment

RIRAM V2: Overview of Approach


B. Stressors within the Surrounding Landscape. Sum metrics 1 and 2 (Max = 20, Min = 0)

1) Degradation of Buffers

a. Estimate % cultural cover within 50m buffer. Select one.
- <5% (10)
- 6 to 25% (7)
- 26-50% (4)
- 51-75% (1)
- >75% (0)

Associated Stressors: Check all that apply
- Commercial or industrial development
- Sewered residential development
- Unsewered residential development
- Construction
- Landfill or waste disposal
- Channelized streams or ditches
- Raised road beds or trails
- Row crops, turf, or nursery plants

2) Intensity of Surrounding Land Use

4) Draining or Diversion of water from wetland. Decrease in depth or hydroperiod. Select one and multiply by the proportion of the unit affected to the nearest tenth (Max = 8).

Hydroperiods
- Temporarily Saturated ..... Temporarily Flooded
- Seasonally Saturated ..... Seasonally Flooded
- Semipermanently Saturated ..... Semipermanently Flooded

7) Filling and dumping within wetland. Select one and multiply by the proportion of the unit affected to the nearest tenth (Max = 7).

Depth of fill
- None (0)
- Changes soil quality or aesthetics only (2)
- Changes water regime or affects vegetation (5)
- Changes area to upland (7)

Proportion of unit (or perimeter) affected (circle one)
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

RIRAM V. 2.10 Investigators_____ Site Number_____ Date_____

D. Observed Impacts from Cumulative Stress. Circle one score for each component and sum. Refer to Sections A through C to inform scores. Consider current wetland types.

Wetland Indicators	Characteristic	Degraded		Destroyed
Vegetation Structure	5	4	3	2	0
Vegetation Composition	5	4	3	2	0
Hydrologic Connectivity	5	4	3	2	0
Habitat Connectivity	5	4	3	2	0
Microhabitat Structure	5	4	3	2	0
Water and Soil Quality	5	4	3	2	0

SUM = ☐ D. Observed Impacts Score

B. Landscape Stress Score (max 20) _____ +

C. Wetland Stress Score (max 50) _____ =

B+C. Combined Stress Score (max 70) ☐ +

D. Observed Impacts Score (max 30) _____ =

RIRAM V. 2.10 Condition Index ☐

Assesses Relative Condition (only)

Collects baseline data
- Characterization
- Classification

Stress-response
- Intensity and proportion of stresses
- Intensity of Impacts

Evidence-based

Minimize subjectivity

Characterizes *current* condition

RIRAM V2 Format and Elements

Not Scored

A. Wetland Characteristics and Classification

- Assessment Unit Area
- Hydrologic Characteristics
- Habitat Characteristics
- Classification
- Wetland Values

B. Landscape Stresses

1. Degradation of Buffers
2. Intensity of Surrounding Land Use

C. Stresses Affecting Unit

3. Impoundment
4. Draining / Diversion
5. Fluvial Inputs
6. Vegetation Removal
7. Filling / Dumping
8. Excavation / Substrate Disturbance
9. Invasive Species

B = 20%
C = 50%
Evidence-Based
Intensity and Proportion

D. Observed Impacts from Cumulative Stresses

- Vegetation Structure
- Vegetation Composition
- Hydrologic Connectivity
- Habitat Connectivity
- Microhabitat Structure
- Water and Soil Quality

30%
Interpretive
Control F and V

B + C + D = RIRAM Index

B. Landscape Stresses. Sum metrics 1 and 2

1) Degradation of Buffers

Estimate % cultural cover within 100-foot buffer. Select one.

- ☐ <5% (10)
- ☐ 6 to 25% (7)
- ☐ 26-50% (4)
- ☐ 51-75% (1)
- ☐ >75% (0)

2) Intensity of Surrounding Land Use

Land Use Intensity weighted average within 500-foot buffer.
Estimate proportion of each class to the nearest tenth and multiply.

	Proportion	Score	Weighted Value
Very Low	_____	× 10 =	_____
Low	_____	× 7 =	_____
Moderately High	_____	× 4 =	_____
High	_____	× 1 =	_____
Sum weighted values for score		=	_____

Associated Stressors: Check all that apply

- ☐ Commercial or industrial development
- ☐ Unsewered Residential development
- ☐ Sewered Residential development
- ☐ New construction
- ☐ Landfill or waste disposal
- ☐ Channelized streams or ditches
- ☐ Raised road beds
- ☐ Foot paths / trails
- ☐ Row crops, turf, or nursery plants
- ☐ Poultry or livestock operations
- ☐ Orchards, hay fields, or pasture
- ☐ Piers, docks, or boat ramps
- ☐ Golf courses / recreational development
- ☐ Sand and gravel operations
- ☐ Other _____

Very Low.....Natural areas
Low.....Recovering natural lands, passive recreation, low trails/dirt roads
Mod High.....Residential, pasture/hay, mowed areas, raised roads to 2-lane
High.....Urban, impervious cover, new construction, row crops, turf crops, paved roads > 2-lane

6) **Filling and dumping within wetland.** Select one and multiply by the proportion of the unit affected to the nearest tenth (Max = 7).

Intensity of filling
- ☐ None (0)
- ☐ Affects aesthetics only (2)
- ☐ Affects water regime, vegetation, or soil quality (5)
- ☐ Changes area to upland (7)
- ☐ Fill is above surrounding upland grade (10)

Proportion of unit (or perimeter) affected (circle one)
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

Evidence: check all that apply
- ☐ Unnaturally abrupt change in ground level
- ☐ Abrupt change in soil texture or content
- ☐ Unnaturally straight or abrupt wetland edge
- ☐ Unnatural items on or within the sediments

Associated Stressors; Check all evident:
- ☐ Road
- ☐ Raised Trail
- ☐ Railway
- ☐ Trash
- ☐ Fill
- ☐ Organic / yard waste
- ☐ Dam
- ☐ Dike
- ☐ Other

Source of Stress; indicate all that apply as current (C) or historic (H):
- __ Private / Residential
- __ Commercial
- __ Agricultural
- __ Public transportation
- __ Public utilities
- __ Public recreation
- __ Undetermined

C. In-Wetland Stresses

- ➢ Evidence Checklist
- ➢ Intensity Rank
- ➢ Proportion of Unit Affected
- ➢ Associated Stressors
- ➢ Sources of Stress

D. Observed Impacts from Cumulative Stresses

RIRAM V.2.10 Investigators_____ Site Number_____ Date_____

D. Observed Impacts from Cumulative Stress. Circle one score for each component and sum. Refer to Sections A through C to inform scores. Consider current wetland types.

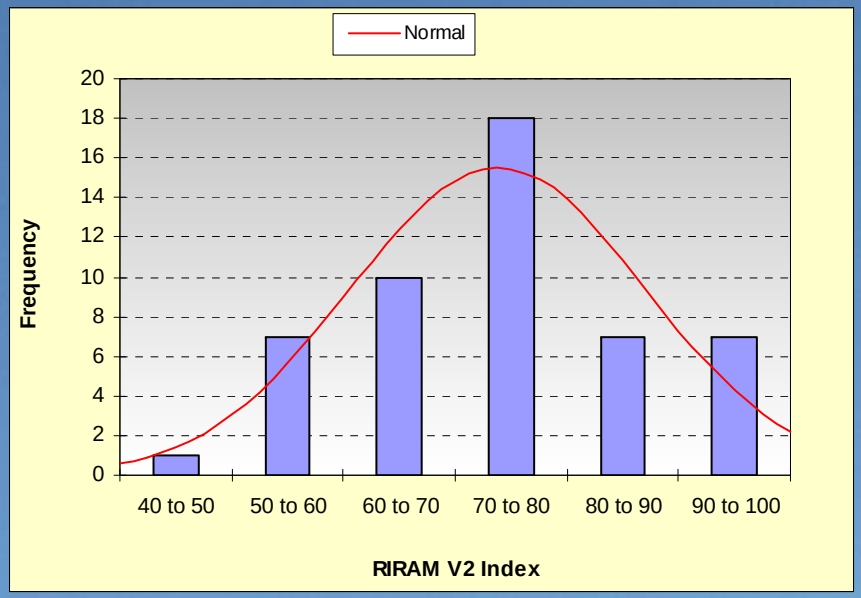
Wetland Indicators	Characteristic		Degraded		Destroyed
Vegetation Structure.....	5	4	3	2	0
Vegetation Composition.....	5	4	3	2	0
Hydrologic Connectivity.....	5	4	3	2	0
Habitat Connectivity.....	5	4	3	2	0
Microhabitat Structure.....	5	4	3	2	0
Water and Soil Quality.....	5	4	3	2	0

SUM = ☐ **D. Observed Impacts Score**

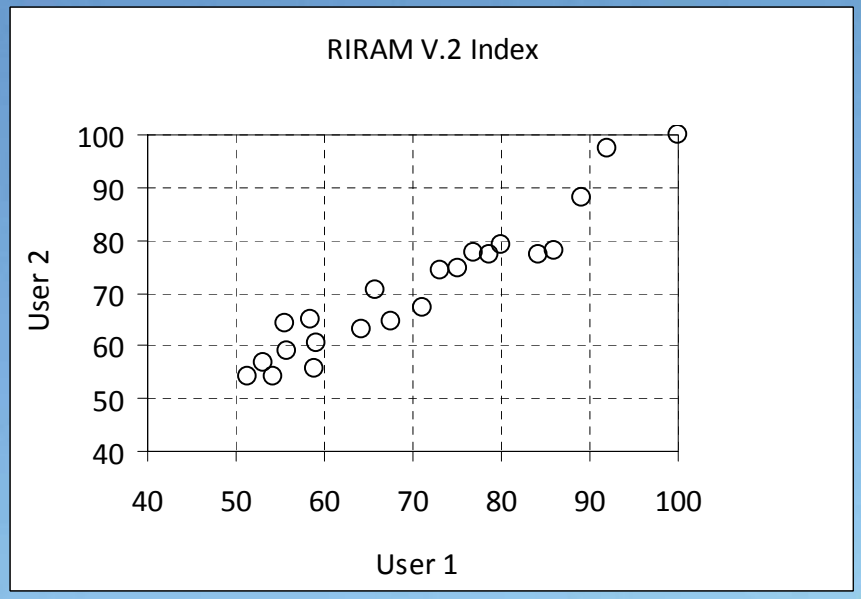
Testing and Demonstrations

- 197 units tested over three field seasons
- Two basin characterizations
- Two resource characterizations
- Validations
- Demonstration analyses
- Inter-user analysis
- Peer review

Data Analysis and Applications

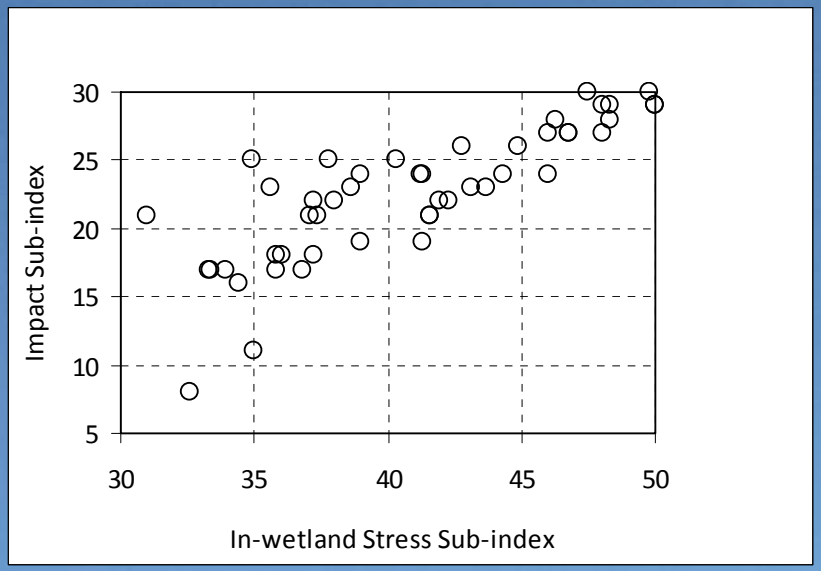


Sample distribution
Based on 100 points

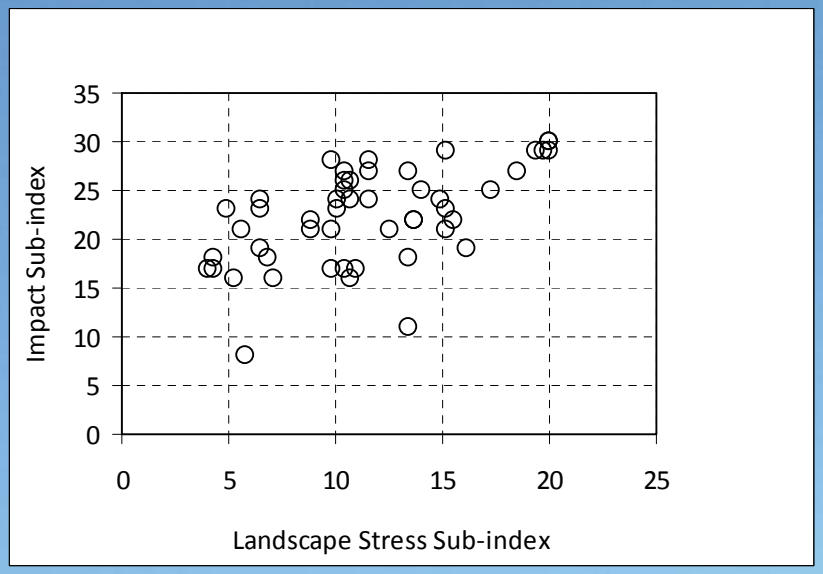


Inter-user analysis
r_s= 0.95, P<0.01

Inter-index Analysis

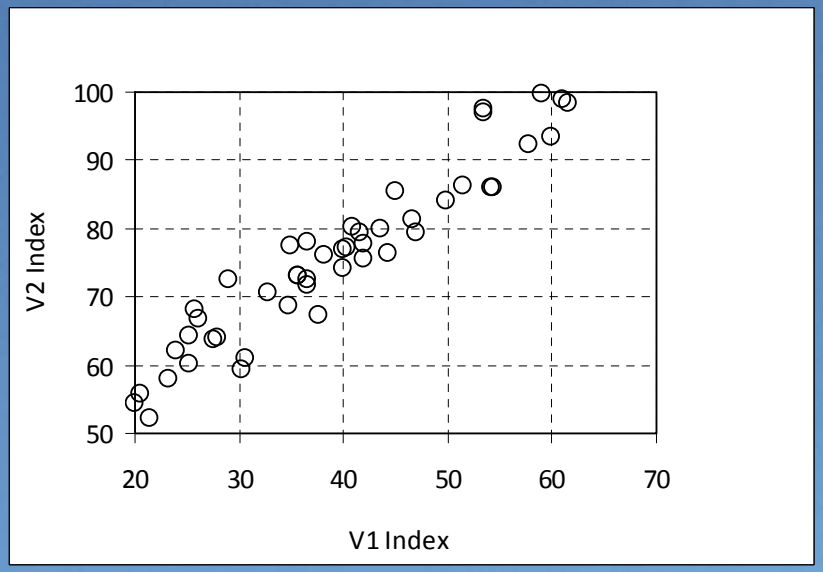


Stress Index
versus
Impact Index
r_s= 0.86, P<0.01

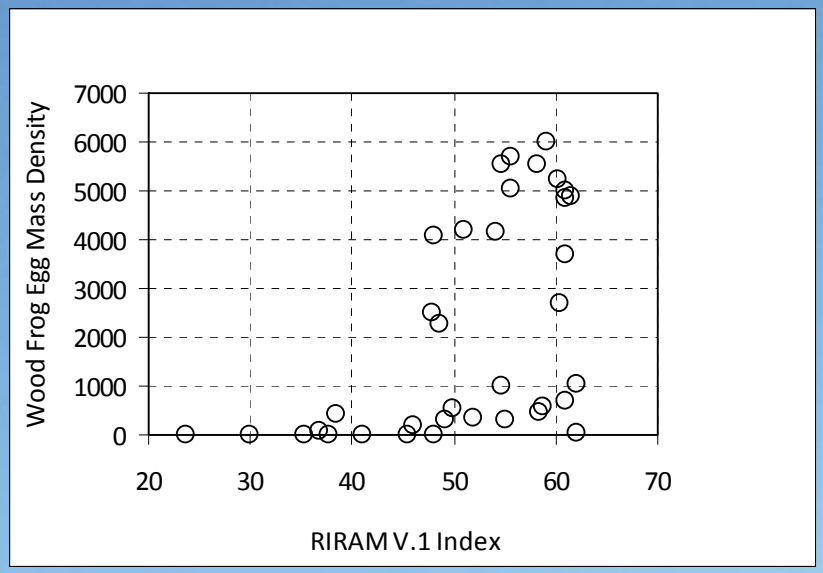


Landscape Index
versus
Impact Index
r_s= 0.55, P<0.01

Validations 2008 RIRAM V.1
Courtesy of A. Curtis and P. Paton



RIRAM V1 versus V2
r_s= 0.96, P<0.01



WFEMD: r_s= 0.62, P<0.01
AmphSR: r_s= 0.40, P=0.01
TotVeg: r_s= 0.46, P<0.01
%ForBuff: r_s= 0.54, P<0.01
SpeCon: r_s=-0.61, P<0.01

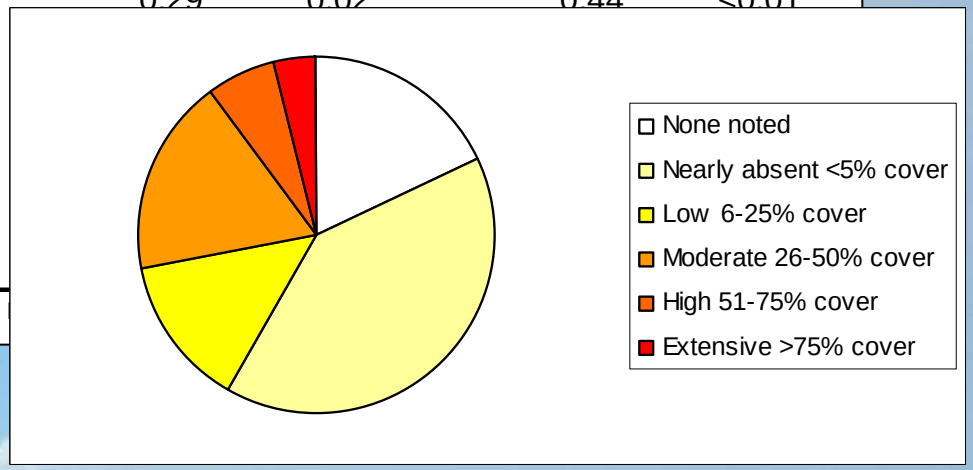
V2 %Cultural: r_s into the .70s

Demonstration Analyses - Invasive Plants

Scientific name	Common name	Percent of sites
Rhamnus frangula	European buckthorn	40
Celastrus orbiculatus	Oriental bittersweet	38
Berberis thunbergii	Japanese barberry	28
Rosa multiflora	Multiflora rose	28
Phragmites australis	Common reed	24
Lonicera morrowii		
Phalaris arundinacea		
Polygonum cuspidatum		
Cabomba caroliniana		
Solanum dulcamara		
Euonymus alatus		
Lythrum salicaria		
Myriophyllum sp.		
Elaeagnus umbellata		
Ligustrum vulgare		
Najas minor		
Polygonum perfoliatum		
Polygonum sachalinense		
Rorippa naturtium-aquat		

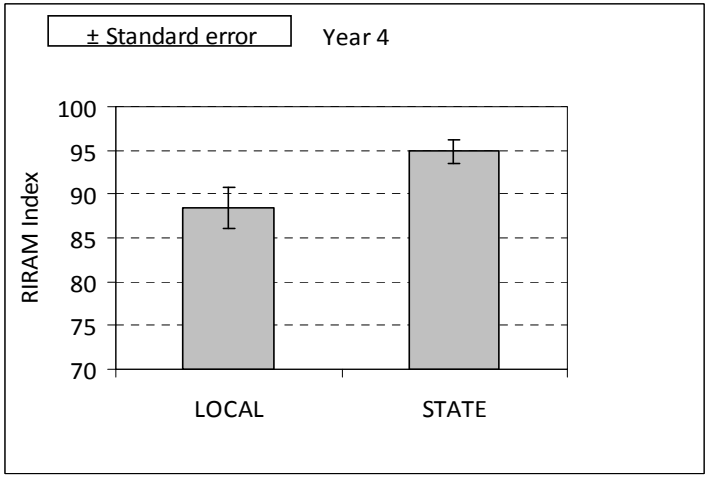
Metric / Index	INSP Cover Score		INSP Richness	
	Rs	P	Rs	P
Landscape Stresses Metrics				
2. 100-m Weighted Buffer	0.38	<0.01	-0.52	<0.01
1. % Cultural Cover 50m	0.40	<0.01	-0.41	<0.01
Wetland Stresses Metrics				
5. Fluvial Inputs	0.64	<0.01	0.55	<0.01
7. Filling	0.48	<0.01	0.54	<0.01
3. Impoundment	0.28	0.02	0.30	0.02
4. Draining	0.27	0.03	0.30	0.02
Wetland Stresses Submetrics				
5a. Nutrient Inputs	0.65	<0.01	0.43	<0.01
5b. Sediments	0.55	<0.01	0.46	<0.01
5d. Increased Flashiness	0.29	0.02	0.44	<0.01
3a. Increased Water Regime				
3b. Artificial Hydrologic Barrier				
RIRAM v.2 Indices				
B. Landscape Index				
C. Stress Index*				
D. Response Index				
RIRAM Index*				

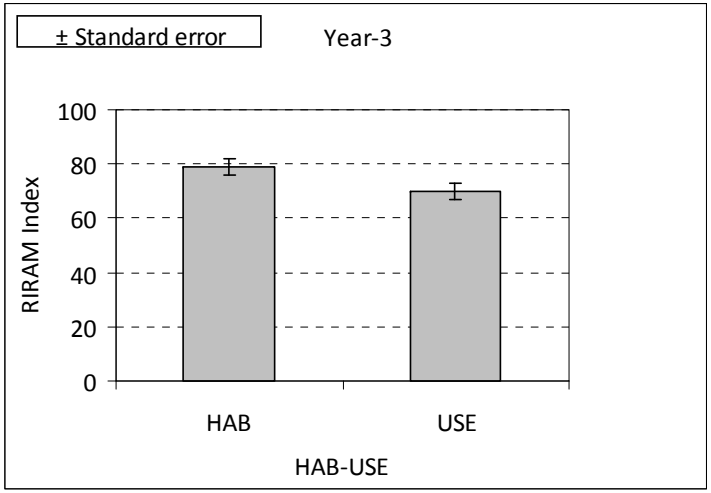
*minus invasive species metric;



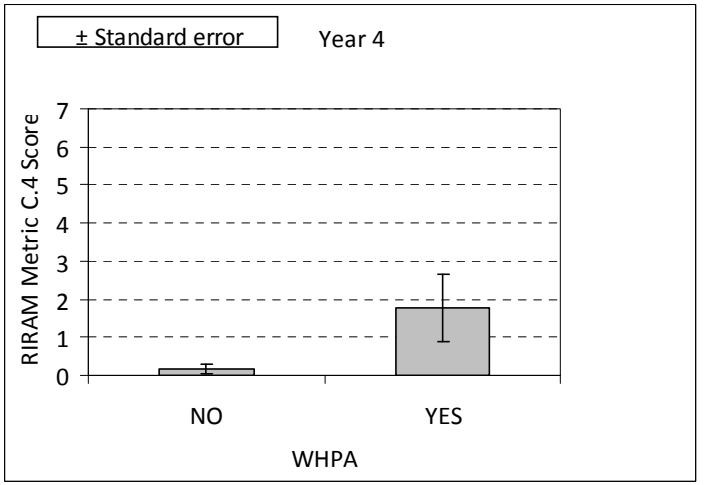
Demonstration Analyses- Others

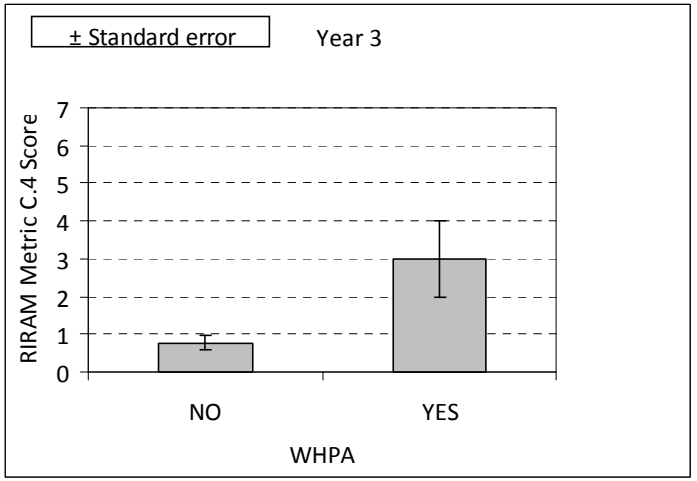
Management





Water Withdrawals

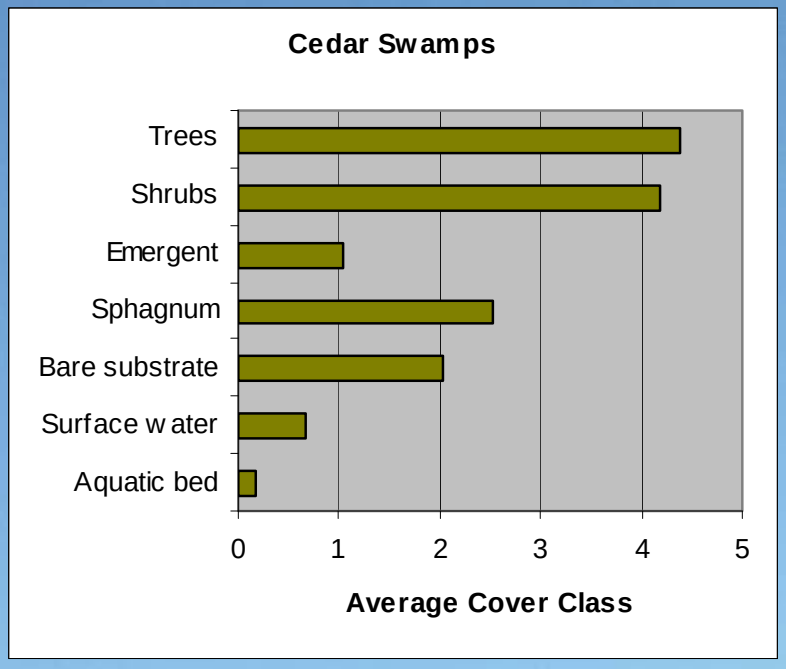


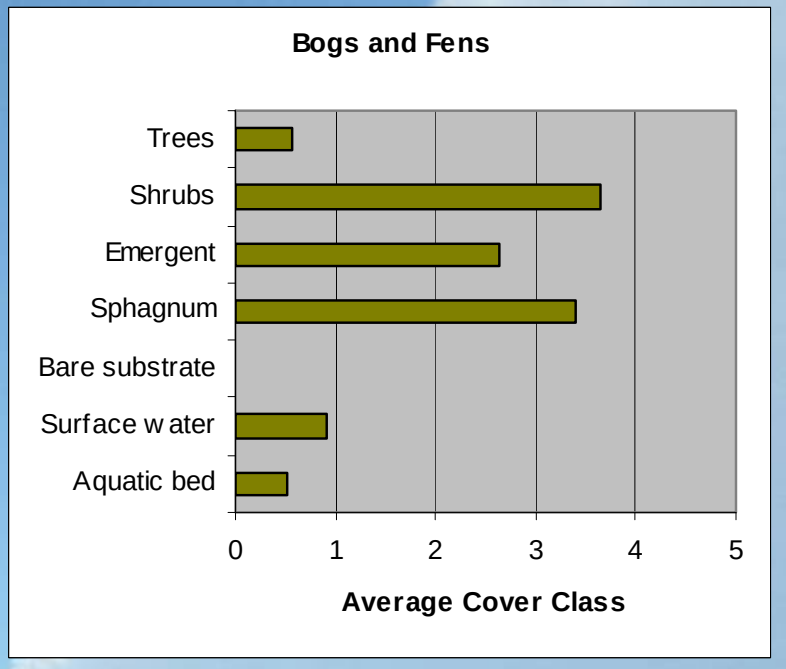


Wetland Classification and Characterization

National Wetlands Inventory (NWI) classes present at wetland sites, 2008

NWI class	Number of Sites	Percent of Sites
Palustrine forested	46	92
Palustrine Scrub shrub	22	44
Palustrine Emergent	21	42
Palustrine aquatic bed	7	14
Riverine aquatic bed	2	4
Palustine open water	7	14
Riverine open water	1	2
Intermittent riverine	7	14
Lower perennial riverine	3	6
Upper perennial riverine	2	4





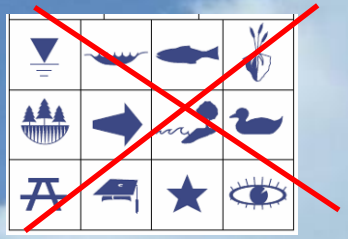
Reference Condition Identification Criteria

According to Faber-Langendoen et al. 2009

- Contains Landscape-based and field-based metrics
- Gradient-based
- Can identify minimally-disturbed sites
- Includes classification information
- Expressly characterizes relative condition
- Contains georeferencing information
- Contains sufficient metadata

Limitations, Considerations, Next Steps

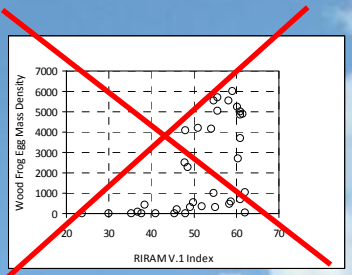
- Does not reflect wetland functions or values



US ACOE

- No direct measurements
  - Estimation and interpretation
  - Requires expertise

- Direct validation
  - Validation study
  - Application / IBI development



- RIRAM data are un-calibrated and ordinal

80/40 = 2/1

- User's guidance

- Standardized implementation protocols

END