



Floristic Assessment Quotients for Wetlands

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Wetland conservation actions

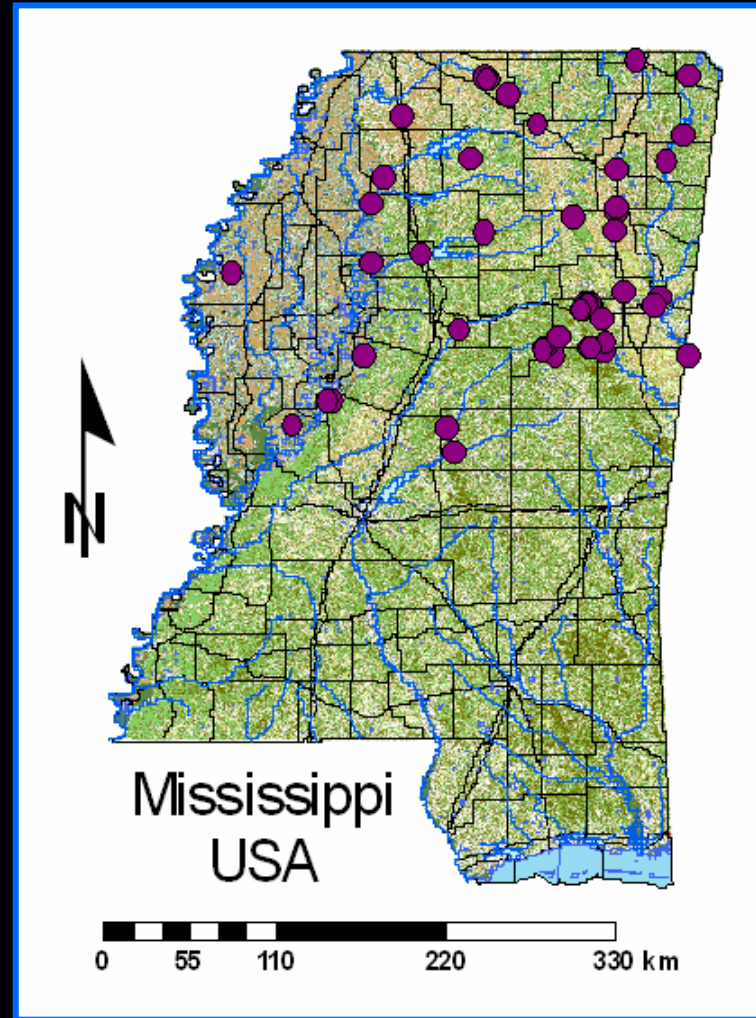
- **Evaluate restoration and mitigation**
- **Compare sites of special interest**
- **Identify natural areas of high quality**
- **Cost-effective long-term monitoring**

Motivation for Floristic Assessment

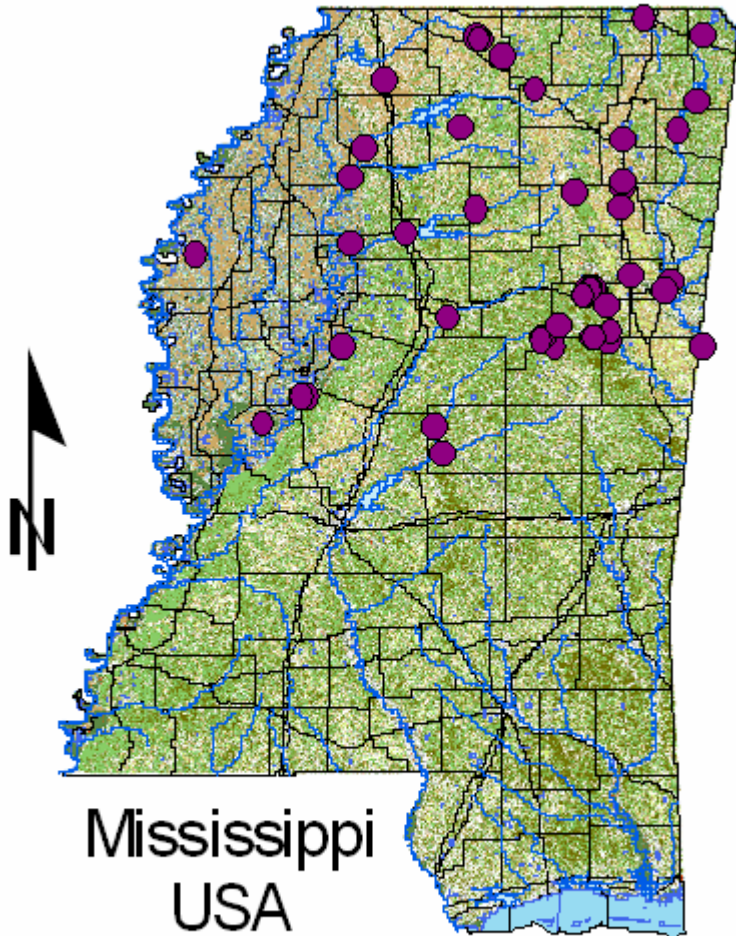
Human activity causes notable shifts in the pattern of vegetation composition

Assessment indices that incorporate exotic species data and wetland adaptedness should reflect ecosystem properties

Developing assessment tools: Wetlands Floristic Indices



Testing Wetlands Floristic Indices



53 wetlands

35 depressional

15 riverine

3 lake fringe

Moist-soil units

Farm pond



Beaver impoundments

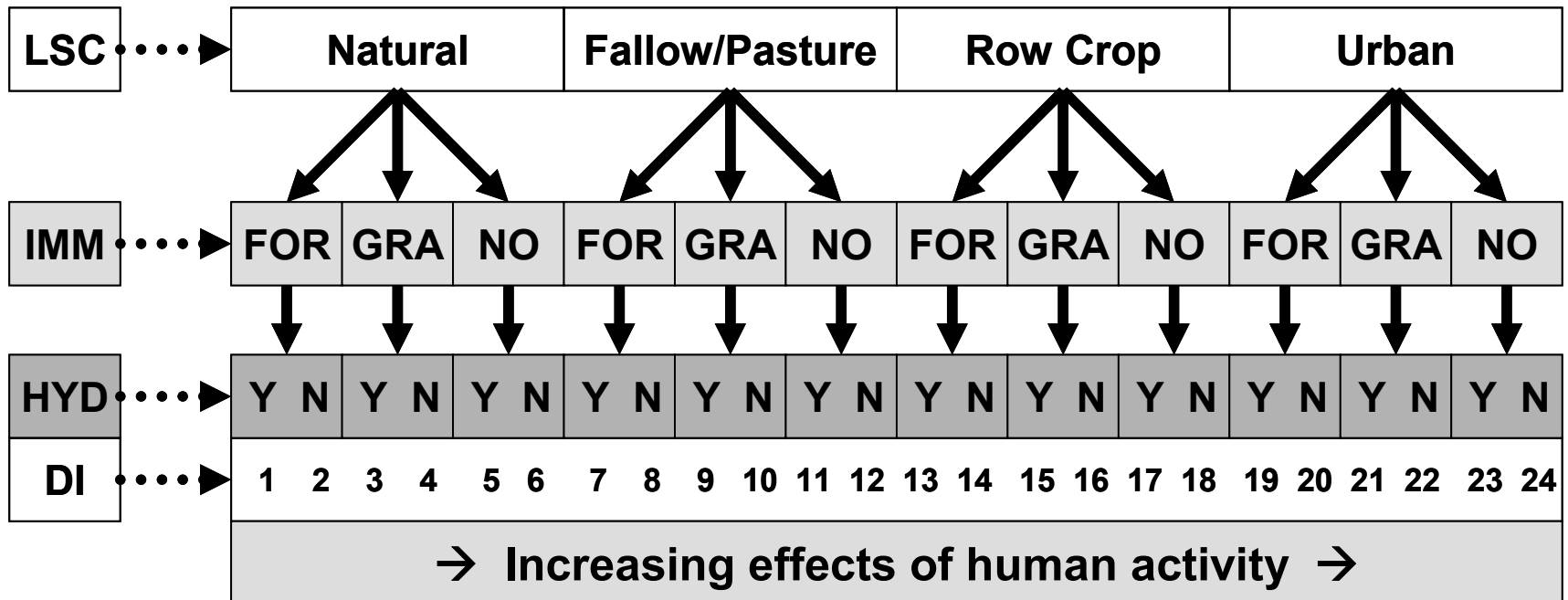


Urban site



Disturbance Index/Rank

Lopez & Fennessy (2002), *Ecological Applications*, 12:487



LSC – surrounding land cover

IMM – immediate buffer as forest (FOR), grass (GRA), or none (NO)

HYD – altered hydrology? (yes/no)

Anthropogenic Activity Index

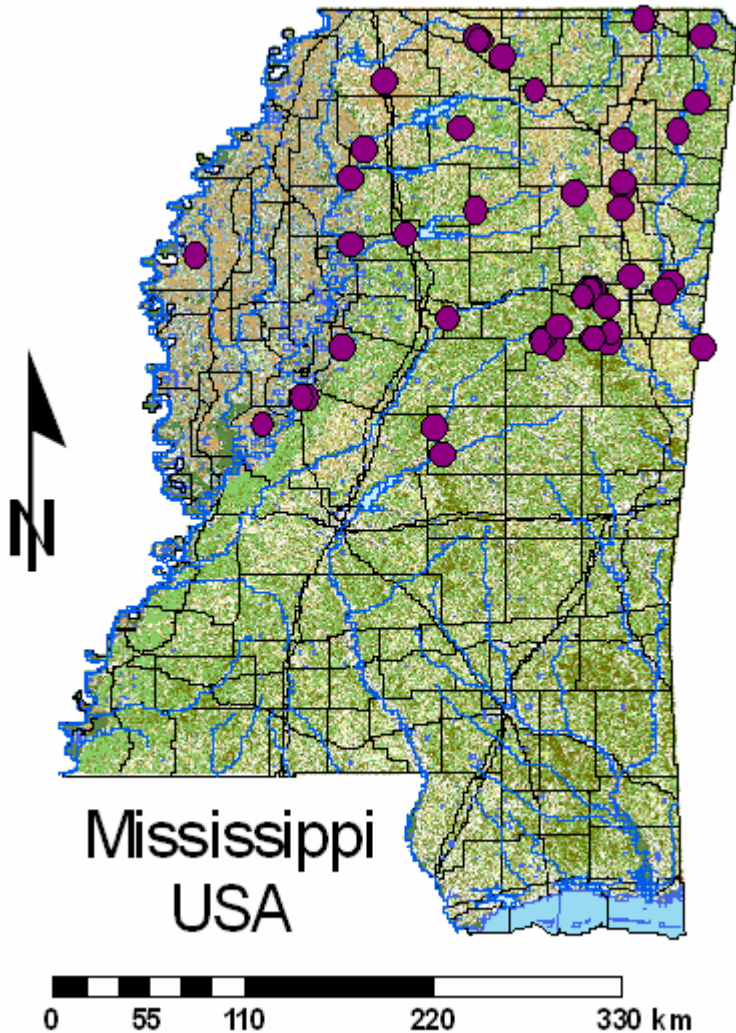
AAI is the sum of scores (0 to 3) for:

- **Land use intensity (500m radius)**
- **Intactness of immediate buffer (50m)**
- **Hydrologic alteration**
- **Within-wetland habitat alteration**
- **Within-wetland habitat heterogeneity**

Land use intensity (500m radius)

Very Low- as expected at reference site	No evidence of disturbance, mature forest, grassland	0
Low- mostly undisturbed, some human influence	Old fields, secondary forest, shrubby woodlots	1
Moderate- a significant amount of human influence	Active pasture, high road density, newly fallowed fields, wildlife habitat management, other intermittent agricultural practices	2
High- intensive use of land up to buffer or wetland margin	Urban, residential, industrial operations, row cropping, other intensive agricultural operations	3

Testing Wetlands Floristic Indices



Data:

50 plots per site

plant species

nativity status and
wetland indicator status

index calculation

Floristic Quality Assessment Index

$$\text{FQAI} = \bar{C} \times \sqrt{N} = \frac{\sum C}{N} \times \sqrt{N} = \frac{\sum C}{\sqrt{N}}$$

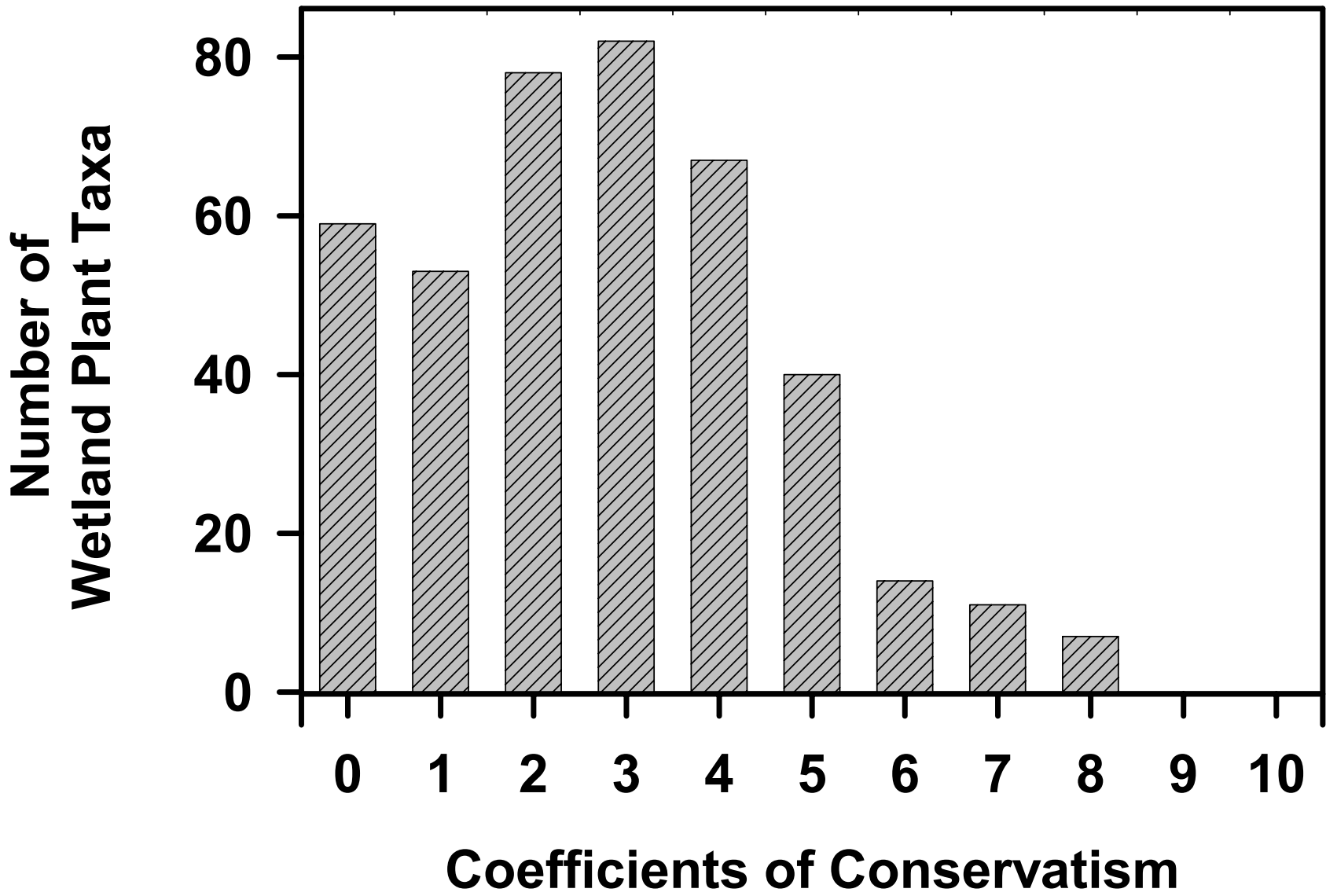
C = coefficients of conservatism

N = native species richness

For more info:

Lopez & Fennessy (2002), *Ecological Applications*, 12:487

Cohen et al. (2004), *Ecological Applications*, 14:784



Floristic Assessment Quotients for Wetlands (FAQWet)

$$1 = \frac{\sum WC_N}{\sqrt{N}}$$

$$2 = \frac{\sum WC}{\sqrt{S}}$$

$$3 = \frac{\sum WC}{\sqrt{S}} \times \frac{N}{S}$$

$$4 = \frac{\sum WC}{\sqrt{S}} \times \frac{\sum f}{\sum F}$$

WC = wetness coefficients

N = native species richness

S = total species richness

f (F) = native (total) species frequencies

Ervin et al. (2006)
Wetlands, 26:1114

Wetness Coefficients

Indicator status	Wetness coefficient (Reed 1988)
Obligate wetland (OBL)	+5
FACW+	+4
Facultative wetland (FACW)	+3
FACW-	+2
FAC+	+1
Facultative (FAC)	0
FAC-	-1
FACU+	-2
Facultative upland (FACU)	-3
FACU-	-4
Upland (UPL)	-5

Penn State's adjusted FQAI

$$I' = \left(\frac{\bar{C}}{10} \times \frac{\sqrt{N}}{\sqrt{S}} \right) \times 100$$

Miller & Wardrop (2006)

Ecological Indicators

6:313

Mississippi Results

Total spp definitively identified	over 400 ~60 non-natives
Mean spp ID per site (non-ID included)	38.4 ± 8.0 (41.1 ± 8.7)
Mean exotic spp per site (most exotic spp at a site)	4.5 ± 2.9 (12)



Lonicera japonica, FAC-

Alternanthera philoxeroides, OBL

Sorghum halepense, FACU

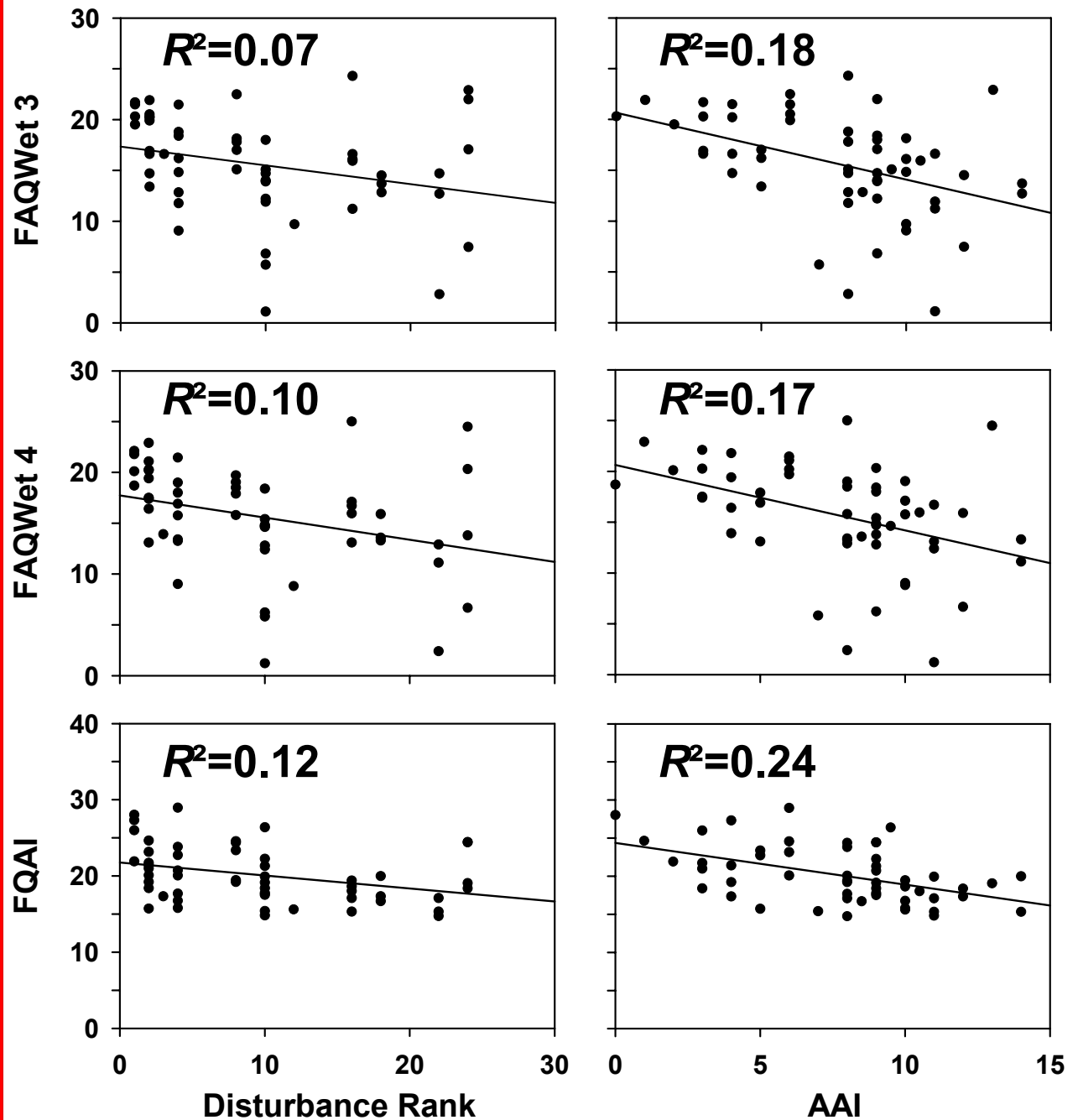
Microstegium vimineum, UPL



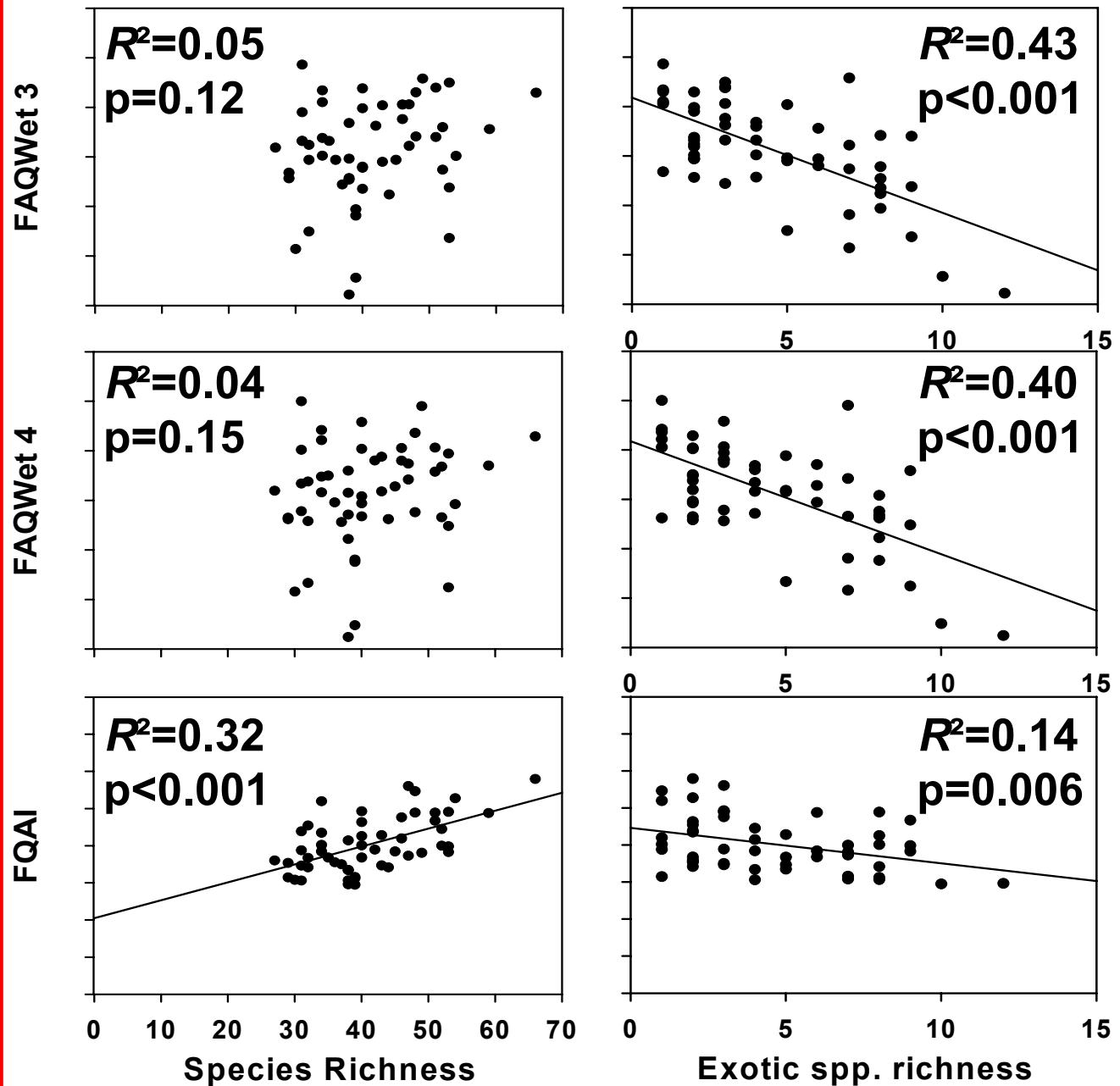
Indices and Human activity

all $p \leq 0.05$

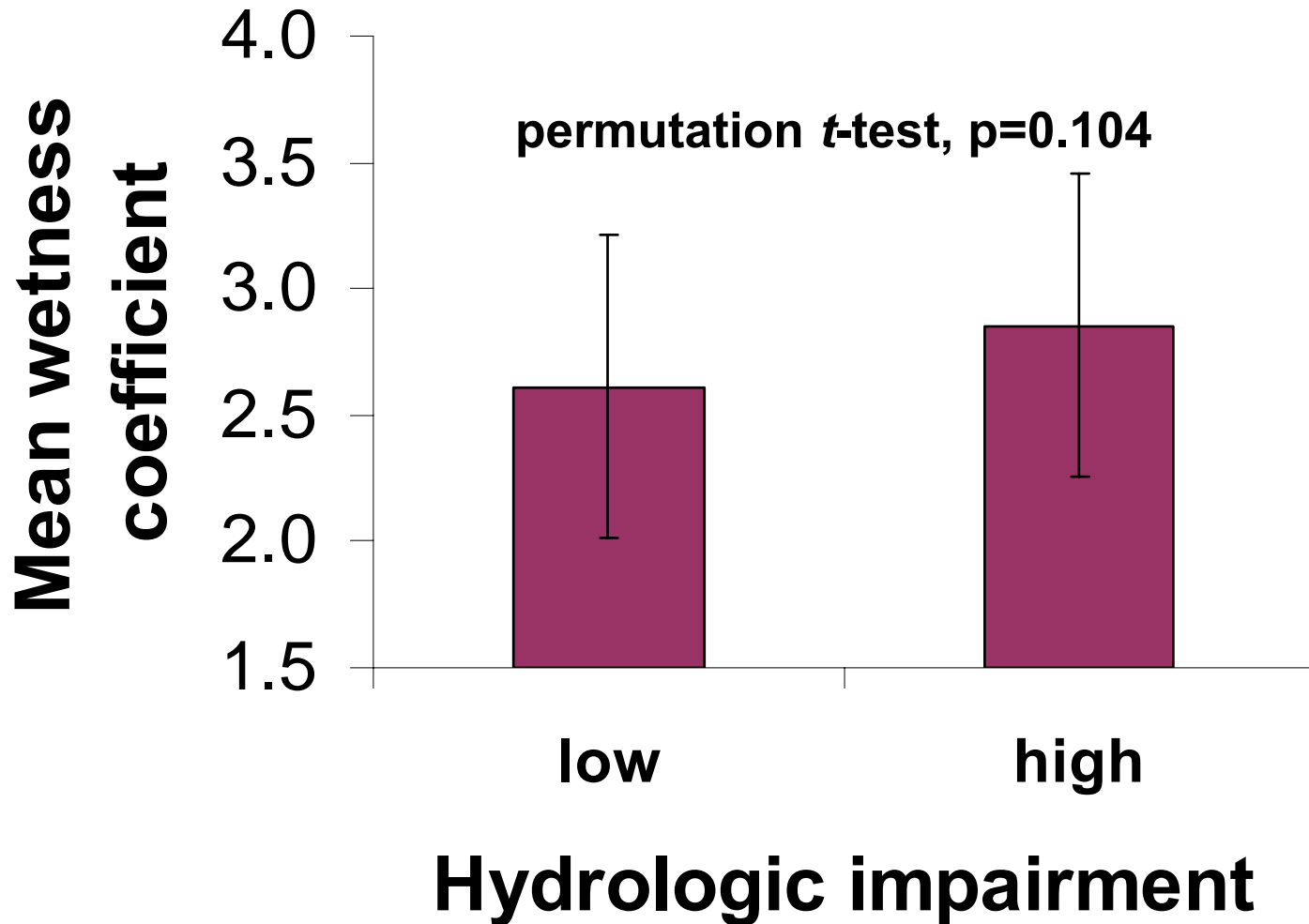
Ervin et al. (2006)
Wetlands, 26:1114



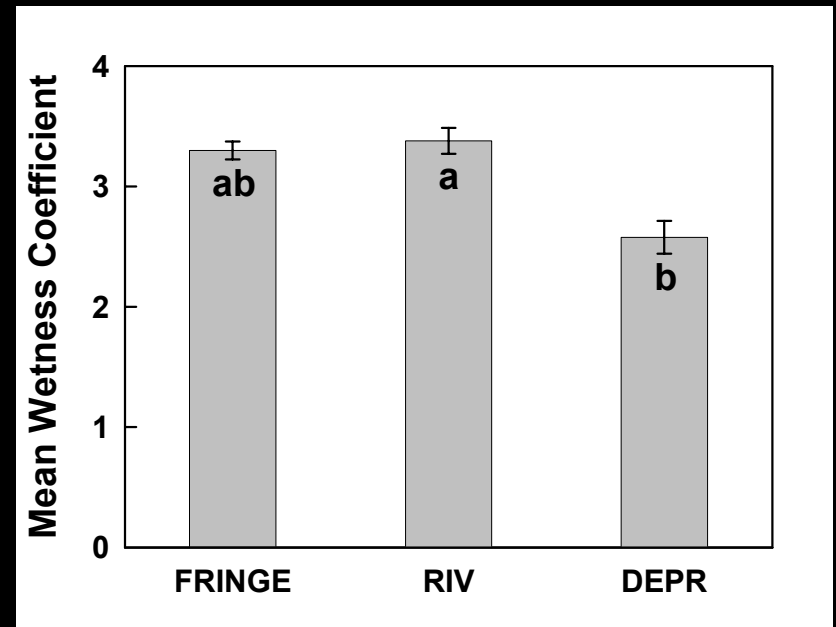
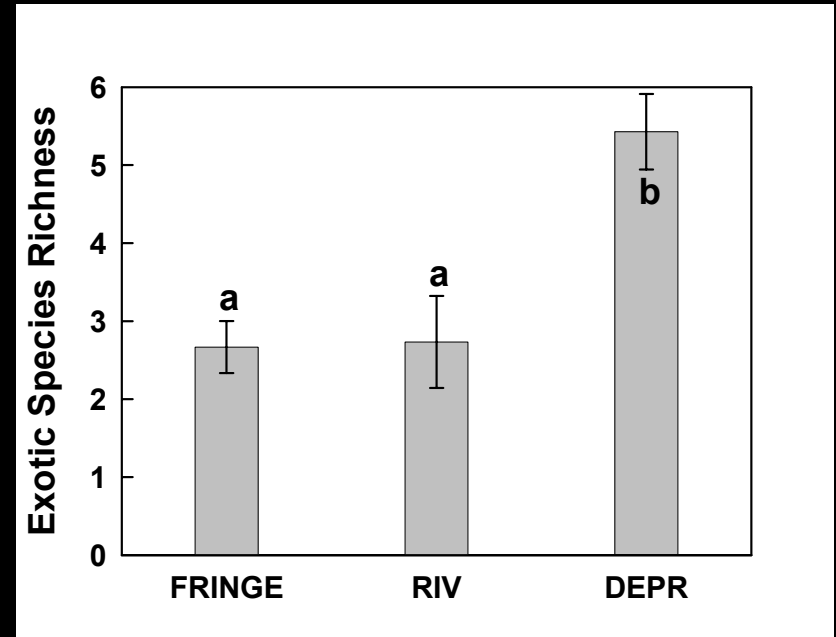
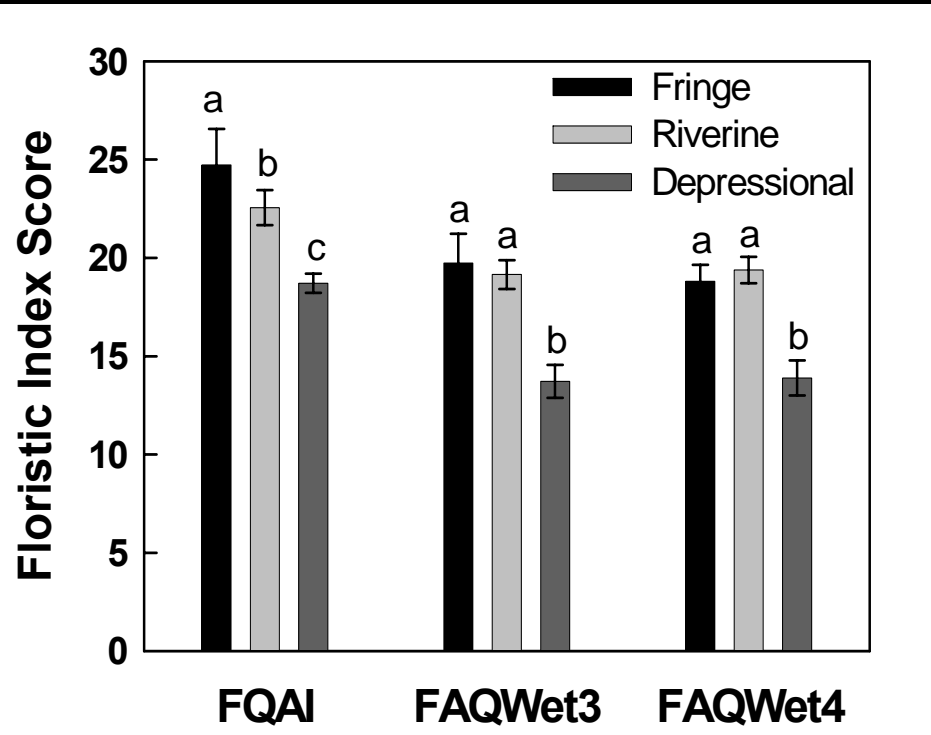
Indices and Plant species



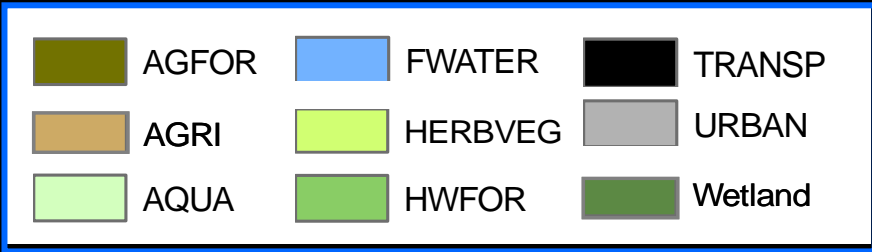
Hydrologic impairment



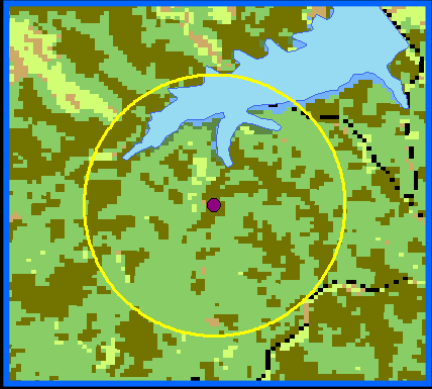
HGM analyses



“Good” sites

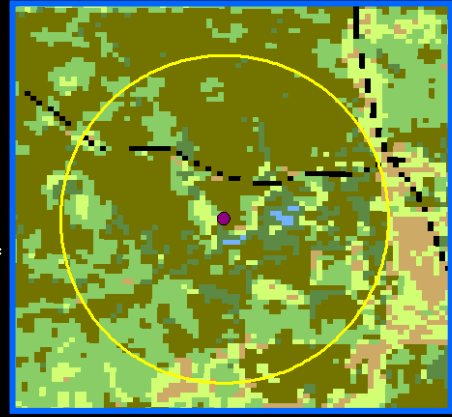


lake fringe



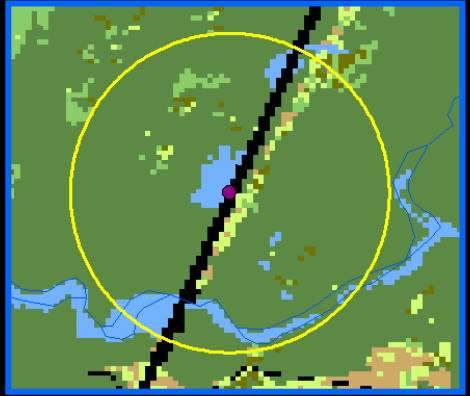
AAI = 0
DR = 1
3 Exotic Spp

riverine

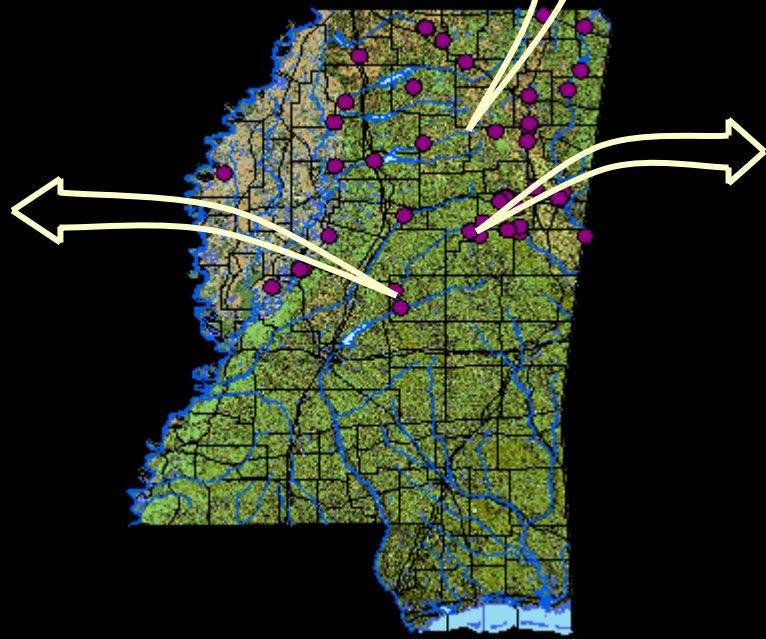


AAI = 2
DR = 1
2 Exotic Spp

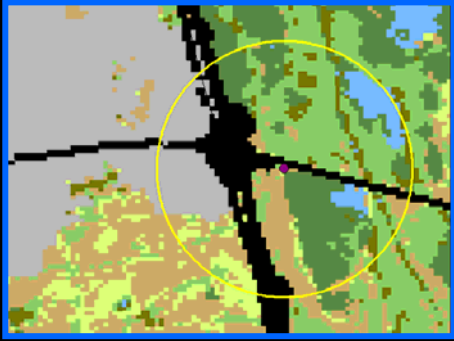
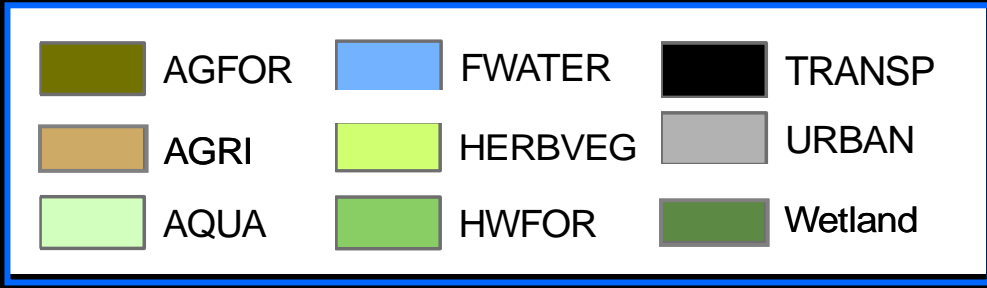
riverine



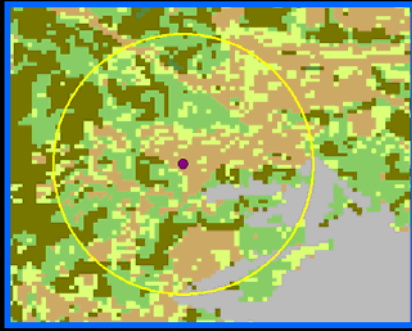
AAI = 6
DR = 2
2 Exotic Spp



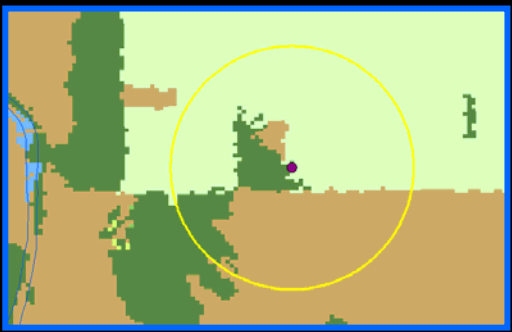
“Poor” sites



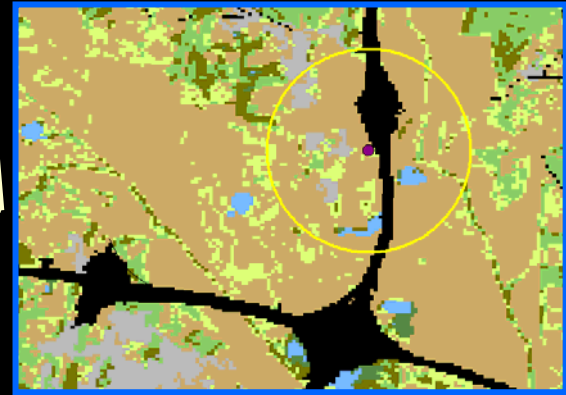
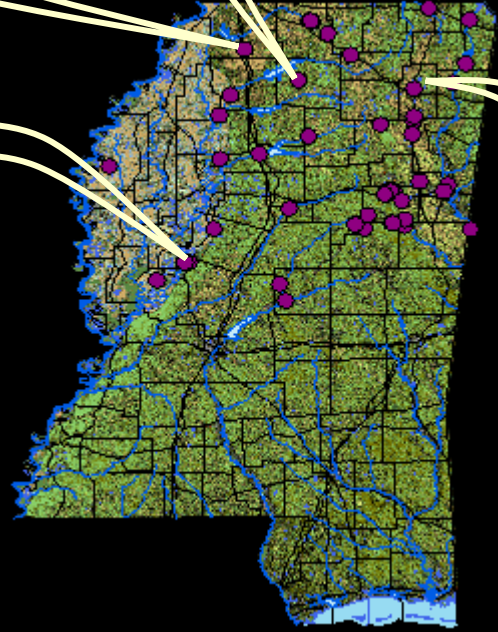
AAI = 9
DR = 24
8 Exotic Spp



AAI = 14
DR = 22
8 Exotic Spp



AAI = 14
DR = 18
7 Exotic Spp



AAI = 13
DR = 24
7 Exotic Spp

Conclusions

1. Further evaluation needed

- low R^2
- high Cs and WCs at some highly impacted sites

2. Riverine wetlands were wetter, less disturbed, & higher quality

3. Don't ignore exotic species!!

4. Use FAQWet 3 or 4

$$\frac{\sum WC}{\sqrt{S}} \times \frac{N}{S}$$

$$\frac{\sum WC}{\sqrt{S}} \times \frac{\sum f}{\sum F}$$

Advantages of FAQWet

- 1. Not overwhelmed by total species richness**
- 2. Accounts for non-native species**
- 3. Wetness coefficients are far easier to attain than coefficients of conservatism**

Disadvantages of FAQWet

Does it have a narrow focus on hydrologic modification? **Maybe**

Is greater plant community wetness always a good thing? **Probably not**

But...

No evidence that FAQWet indexed only hydrologic alteration

Wetland indicator status used in other assessment methods (e.g., prevalence index)

Future

- **More consideration of wetness as a health indicator**
- **Combine FAQWet and Penn State's index**
- **Account for non-native species identity**
- **Test it in New England!!**



Acknowledgements

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