

WATER QUALITY - BIOLOGICAL RESPONSE RELATIONSHIPS

Anett Trebitz, John Brazner, John Morrice,
Mike Sierszen, Jo Thompson

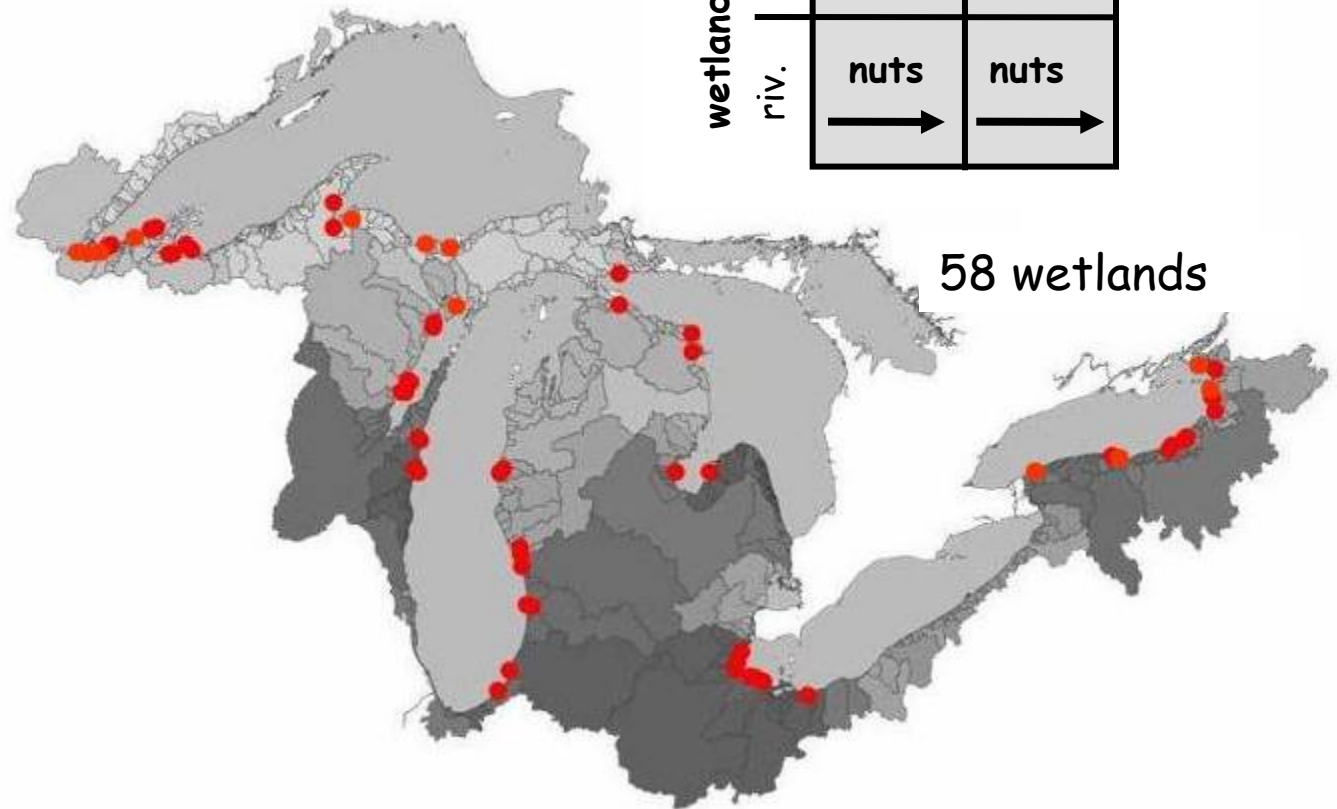
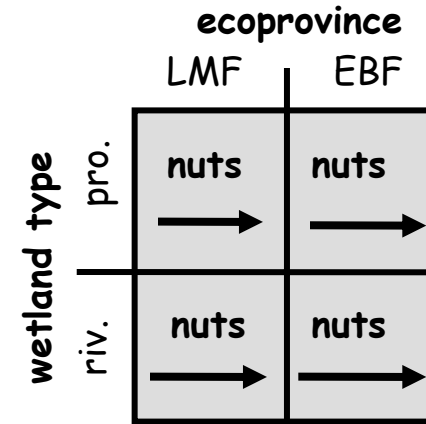
US-Environmental Protection Agency,
Mid Continent Ecology Division,
Duluth MN

Presentation for Great Lakes Coastal Wetlands Consortium Science Committee
Workshop,
22-23 Jan 2007, Duluth MN

EPA-Duluth project...

A collaboration with GLEI - separate sampling effort building on GLEI landscape characterization and experimental design.

Goal: developing stressor-response relationships for coastal wetlands.



Water Qual.

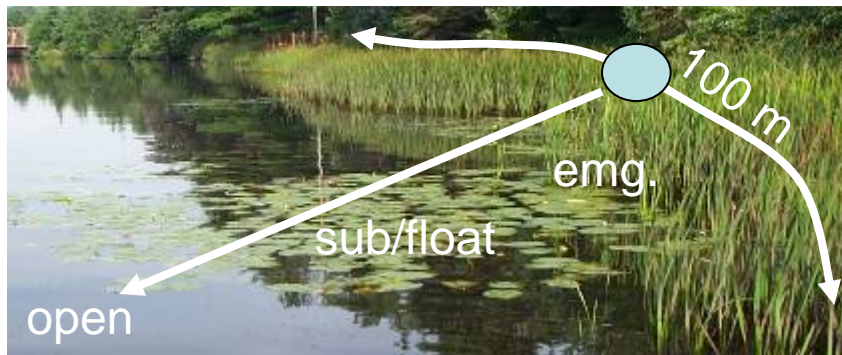
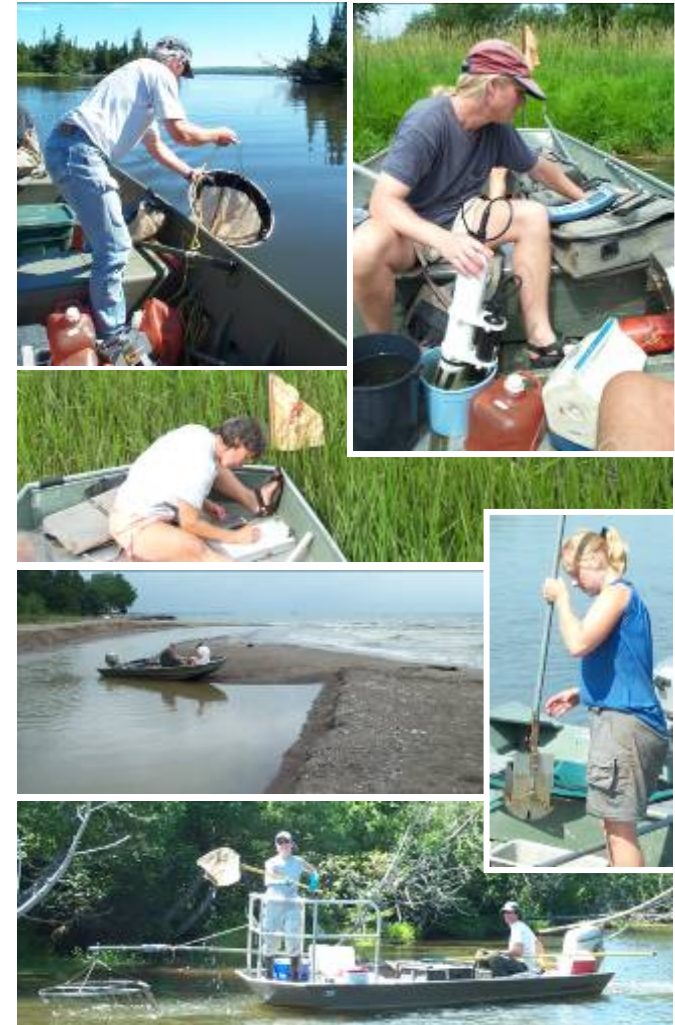
- clarity (chl-a, secchi, TSS, light profile)
- nutrients (DOC, TN, NH₄, NO₃, TP, SRP, Si)
- cations & anions (Ca⁺⁺, Cl⁻, K⁺, Mg⁺⁺, Na⁺, SO₄²⁻)
- hydrolab (temp., O₂, pH, turb., cond.)

Biota

- electro-fish survey (composition, size)
- aquatic plants (cover, composition by zone)
- attached algae (chl-a, composition)
- food web (via isotopes)
- sediment microbial enzymes

Physical

- stream & lake inputs (discharge, WQ, seiche)
- sediments (density, TVS, TP, TN)
- morphology (area, shape, water depth)
- visible impacts (roads, docks, etc.)



Goal: quantify this conceptual model, with a focus on nutrients, such that condition assessments and protection standards for Great Lakes coastal wetlands can be established.

Watershed Land Use:

- nutrient loading
- sedimentation
- hydrology alteration

In-Wetland Activities:

- shoreline hardening
- dredging/plant removal
- power boating

Water Quality

- increasing nutrients
- declining clarity
- declining DO
- algae proliferate

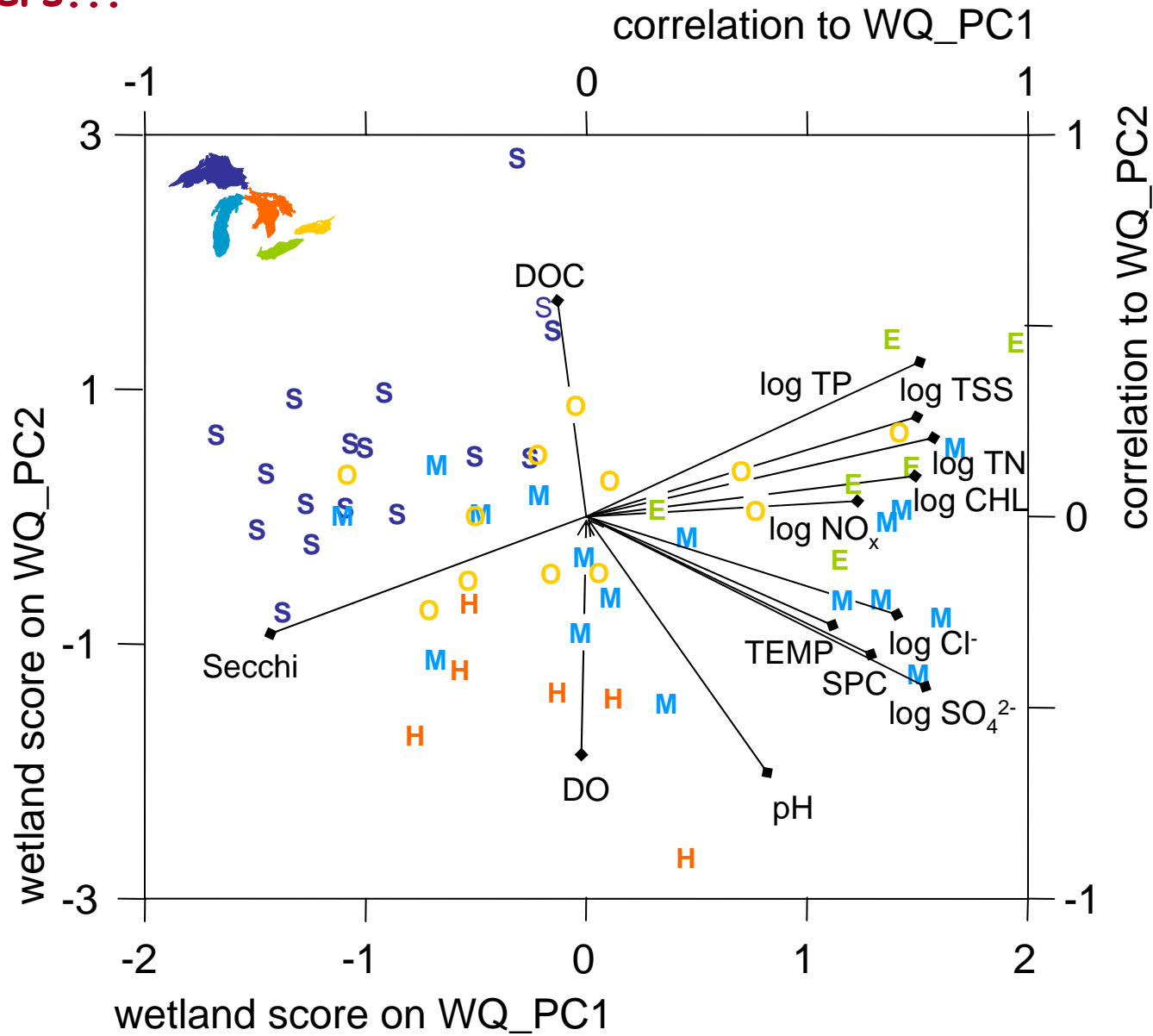
Aquatic Veg

- loss of submerged veg.
- increasing nuisance spp.
- degraded habitat

Fish

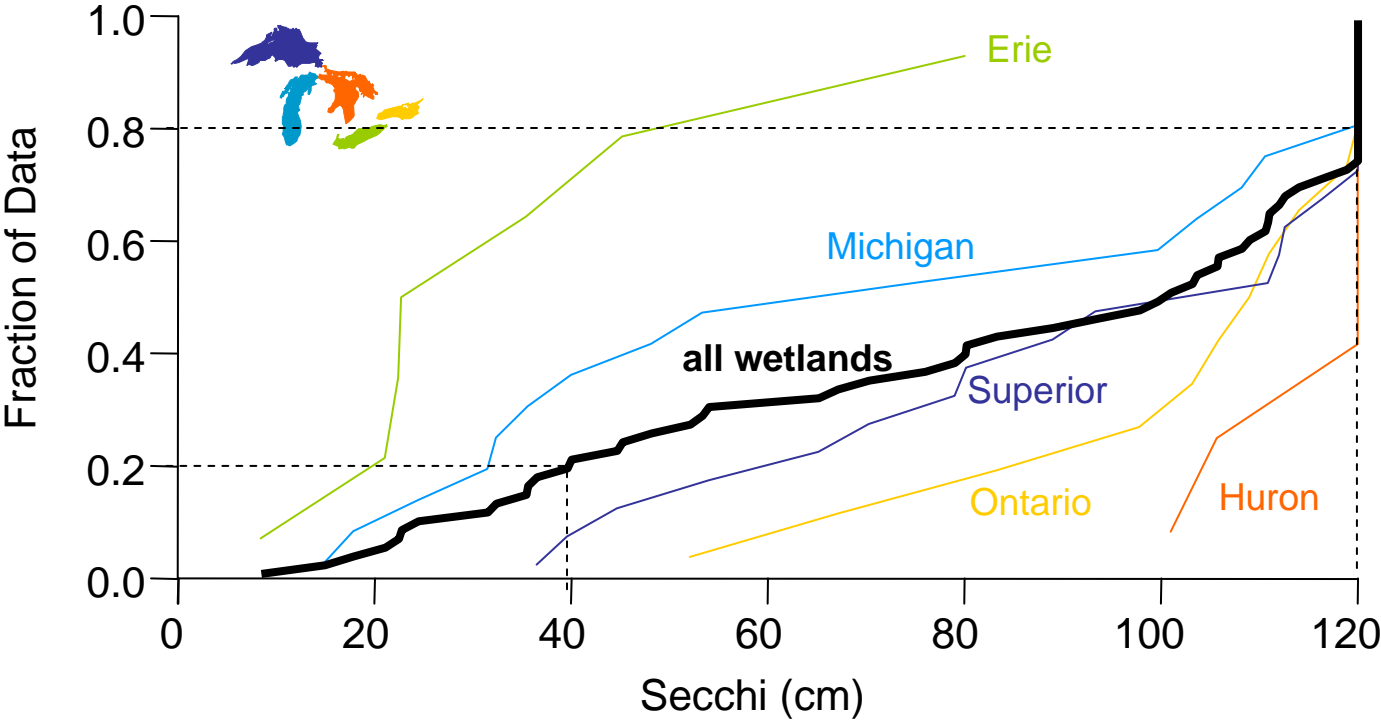
- exotic spp. thrive
- biodiversity declines
- fewer gamefish
- etc...

Relationship among water quality parameters...



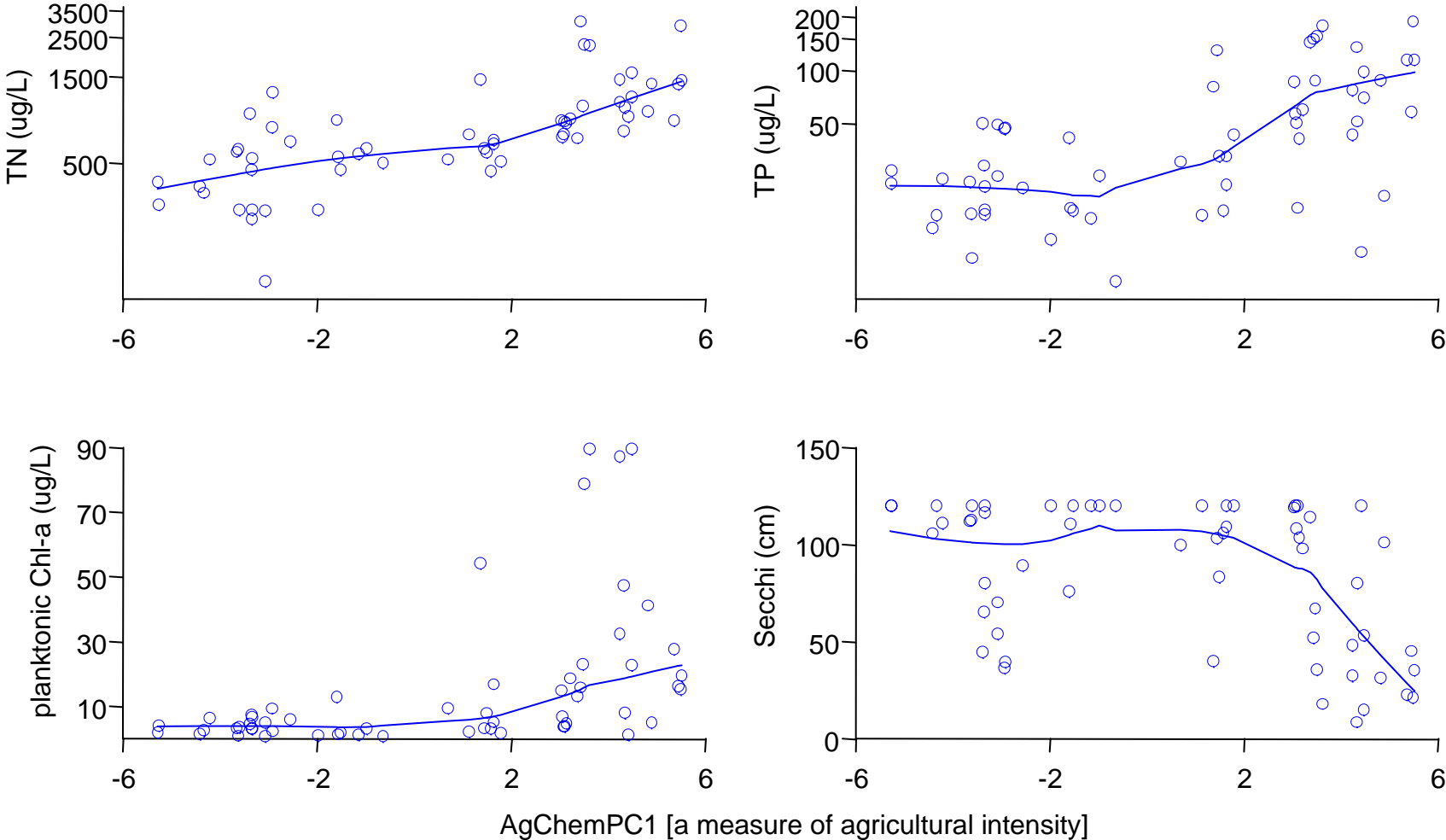
NMDS ordinations of wetlands in water quality space

A traditional means for establishing protective criteria...



Cumulative distributions using wetland avg. data., N=58

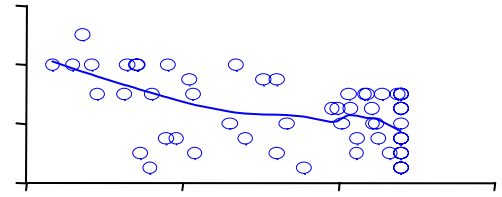
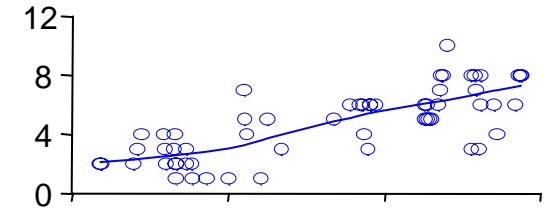
Water quality as an indicator of landscape condition...



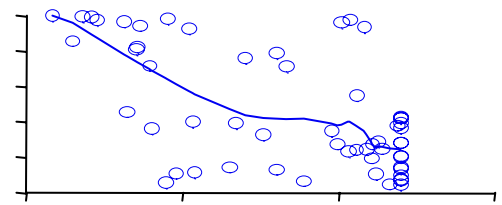
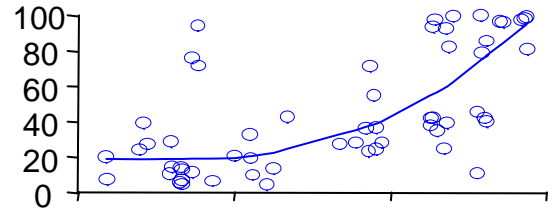
Lowess smoother of wetland avg., N=58

Water quality as a mediator of biological response...

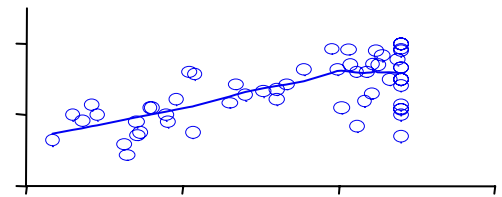
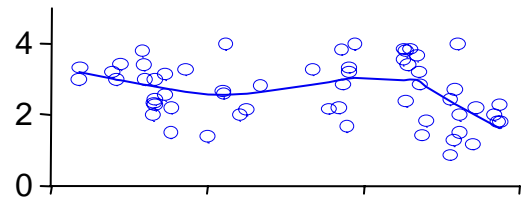
nuisance plant score
(*M. spicatum* + phragmites
+ typha + *S. pectinatus*)



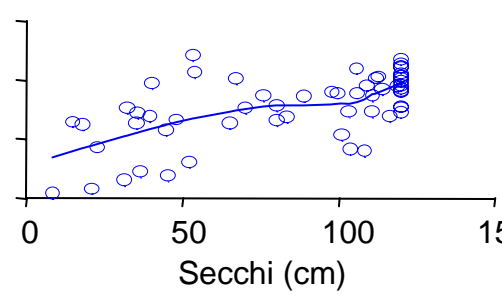
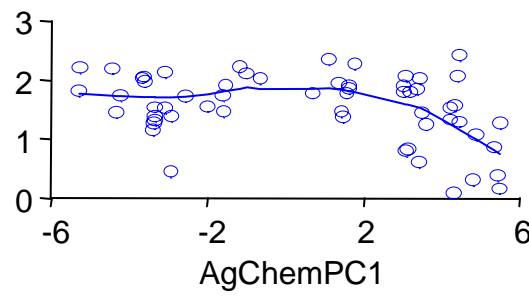
% turbidity
tolerant fish



submerged vegetation
cover score



fish Shannon-
Wiener diversity



Lowess smoother of wetland avg., N=58

