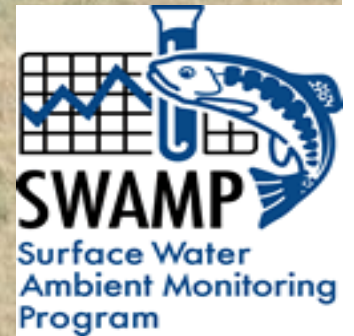# Developing an Ambient Assessment Program for California's Depressional Wetlands

ERIC STEIN

S. Ca. Coastal Water Research Project (SCCWRP)

CABW - 2013

The Big Question

How "Healthy" are Depressional Wetlands in CA?

- What is the extent and distribution of depressional wetlands?
- What is the condition of depressional wetlands?
- What are the major stressors affecting wetland condition?

Today's Presentation

- What are depressional wetlands?

- Why are we doing this (aka Why do we care)?

- What is our study approach and methods?

- Recap of 2011-2012 results

- Future plans

Depressional Wetlands

- Closed systems or basins (<20 acres, < 6 feet deep)

- Inflow by overland runoff or groundwater discharge

- Main losses by evapotranspiration or infiltration (i.e. vertical hydrodynamics)

- Occur along broad hydrologic and elevational gradients
  - Perennial →seasonal
  - High altitude → coastal

- Can be natural or manmade
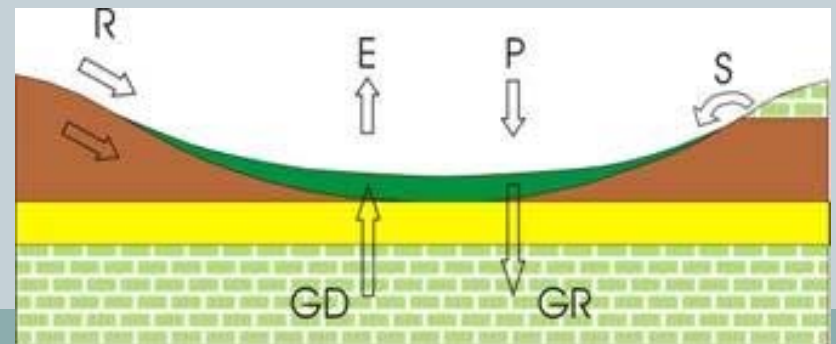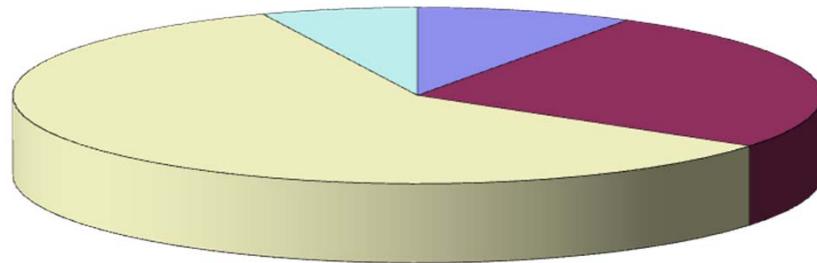
Depressional Wetland Diversity

- Freshwater marshes
- Seasonal ponds
- Stock ponds
- Stormwater ponds
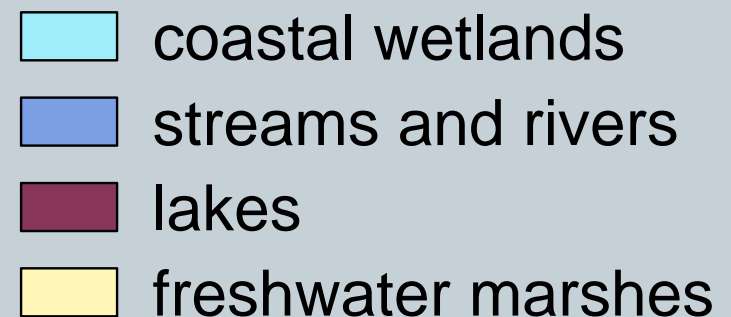- Golf course ponds
- Vernal pools
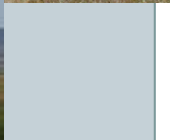
Why Depressional Wetlands?

- Largest wetland class in California

- Important for habitat & groundwater recharge

- Lots of pressure (development, pollutants, invasive species)
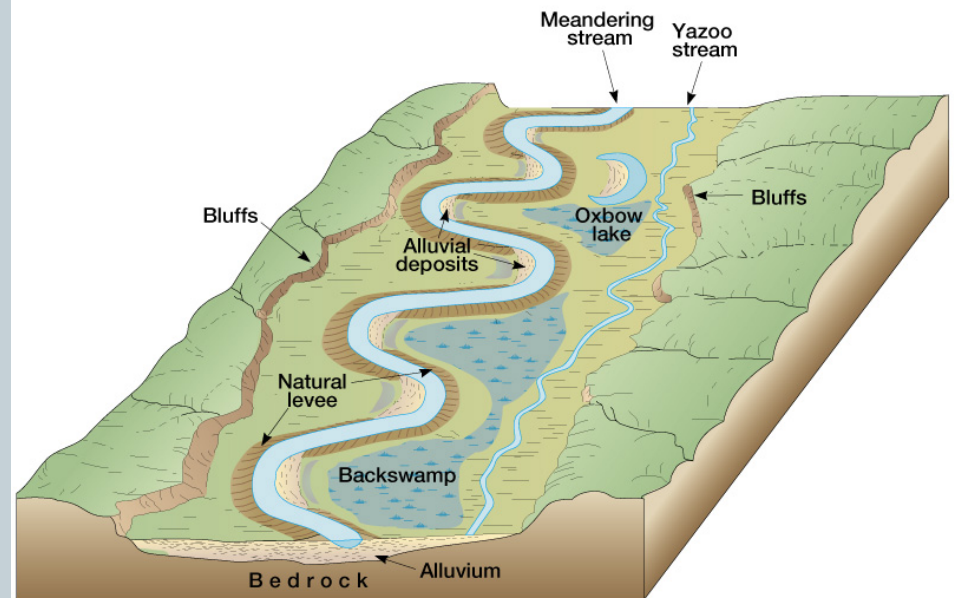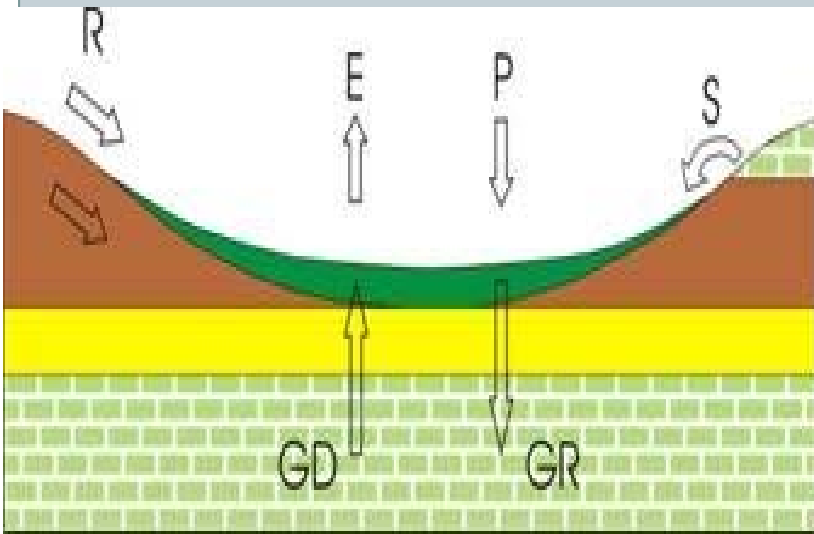
- Overall condition unknown

Proportion by wetland area

- coastal wetlands
- streams and rivers
- lakes
- freshwater marshes

Challeneges

Develop Capacity to Assess Depressional Wetlands Statewide
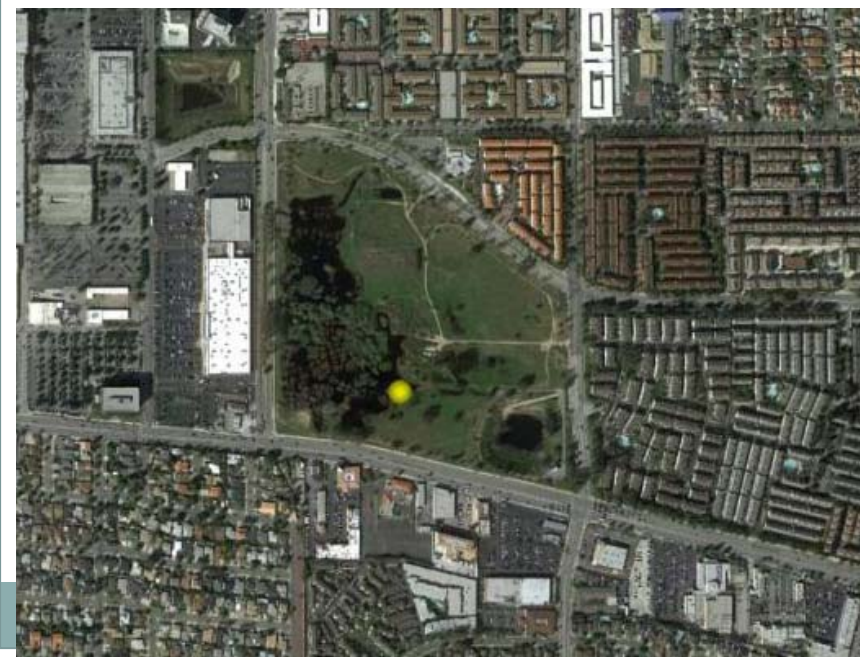

- Standardized field methods
- Assessment tools → modify stream tools
- Monitoring programs and infrastructure

Zuniga Marsh
May

Zuniga Marsh
November

Punch Line

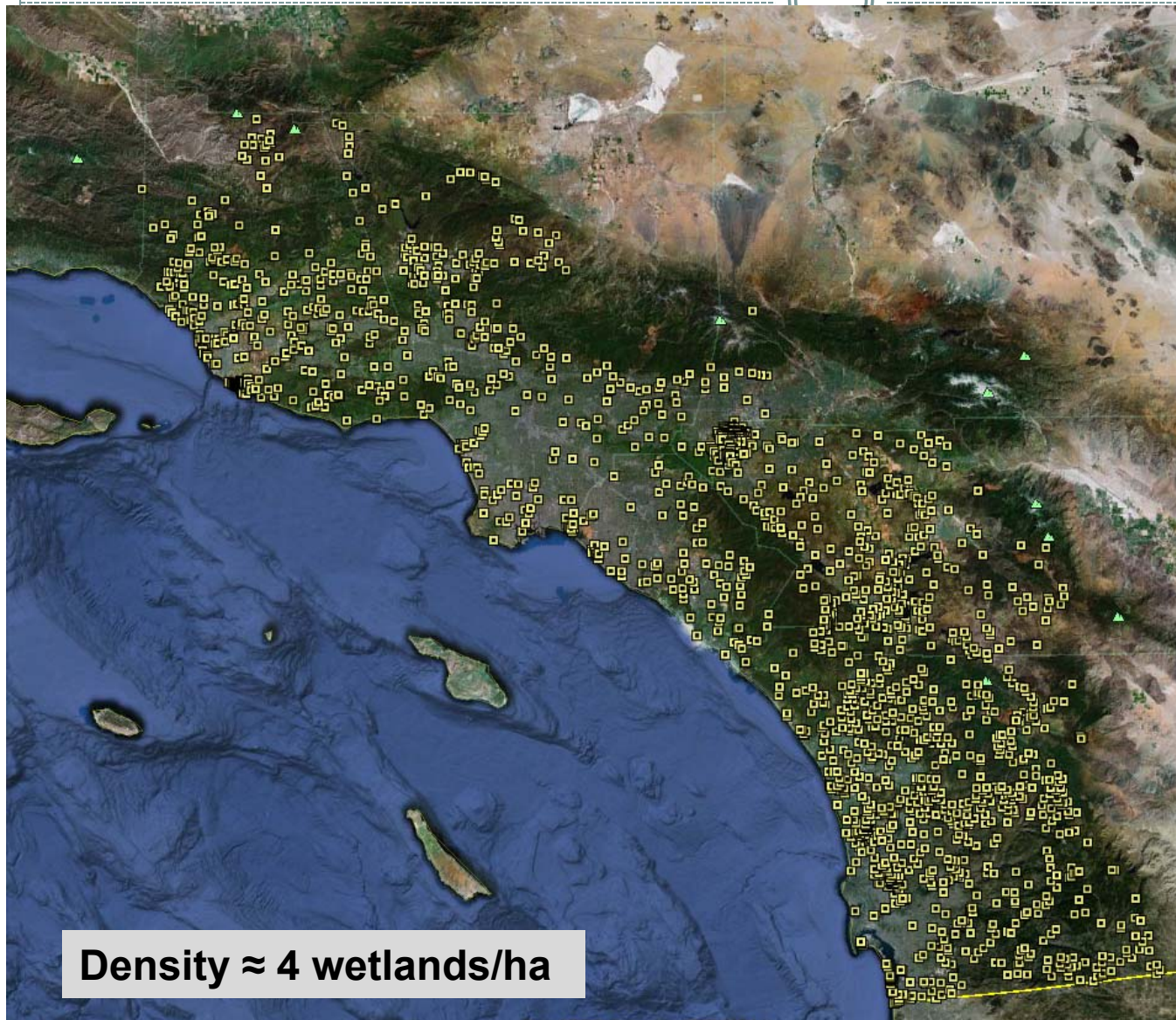- Assessment tools work → Can assess condition
  - Reconsider some scale issues

Streams

Depressional Wetlands

Mapping Depressional Wetlands

Density ≈ 4 wetlands/ha

CARI v.0 MAPPING COLOR KEY

| Color	Dataset
	National Wetland Inventory
	National Wetland Inventory - image date 2000 or later (NWI)
	National Hydrography Dataset (NHD)
	Six County Aquatic Resource Inventory
	Tahoe Aquatic Resource Inventory
	Mark West Creek Aquatic Resource Inventory
	Bay Area Aquatic Resource Inventory
	Delta Aquatic Resource Inventory
	Southern California Coastal Wetland Mapping Project

Wetland Inventory
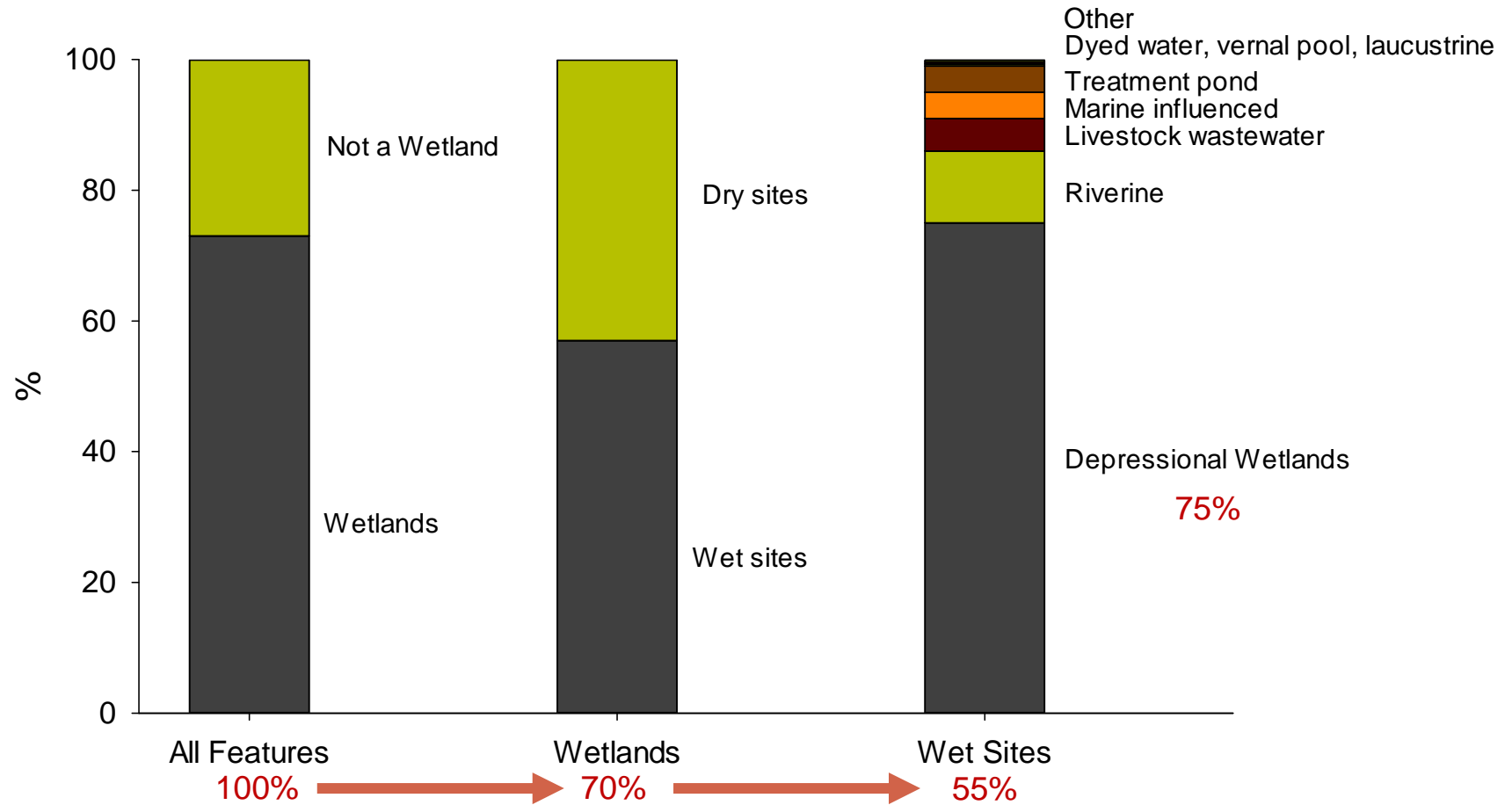
Recon Results

- 70% of sites fail office screens

- Of those that pass office screens, 80% fail field screens

- Overall 6% success through reconnaissance

- For every 1,000 sites drawn → 60 samplable sites

- Top reasons for failure
  - No access – 55%
  - Dry – 25%
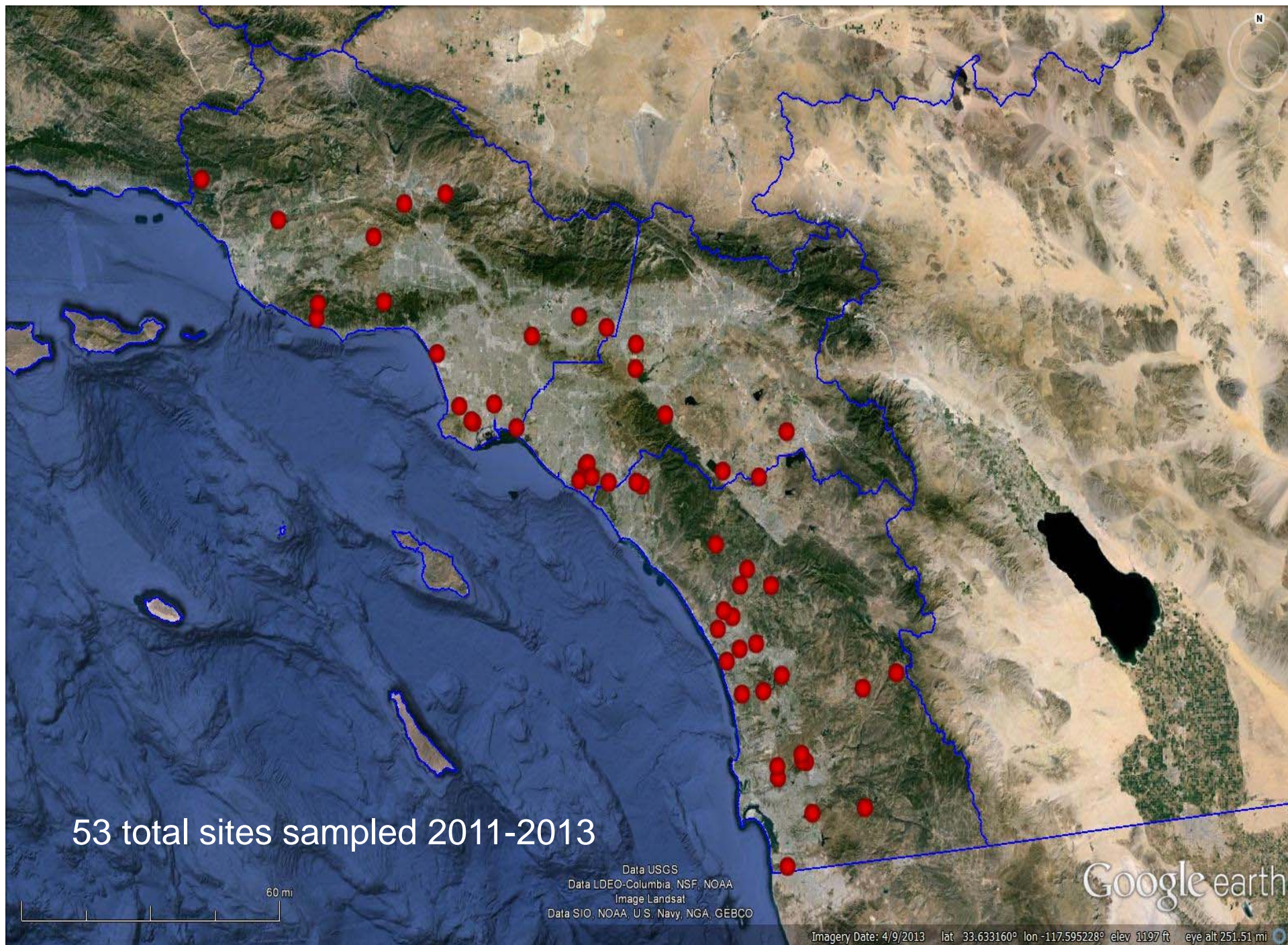
53 total sites sampled 2011-2013

Assessment Approach

- Develop/adapt tools and protocols for assessment of depressional wetlands
  - California Rapid Assessment Method (CRAM)
  - Benthic invertebrate index from **Northern CA**
  - Diatom index from **perennial S.CA streams**

- Develop field methods for assessment of depressional wetlands

- Develop standard operating procedures (SOPs)

- Develop data management infrastructure
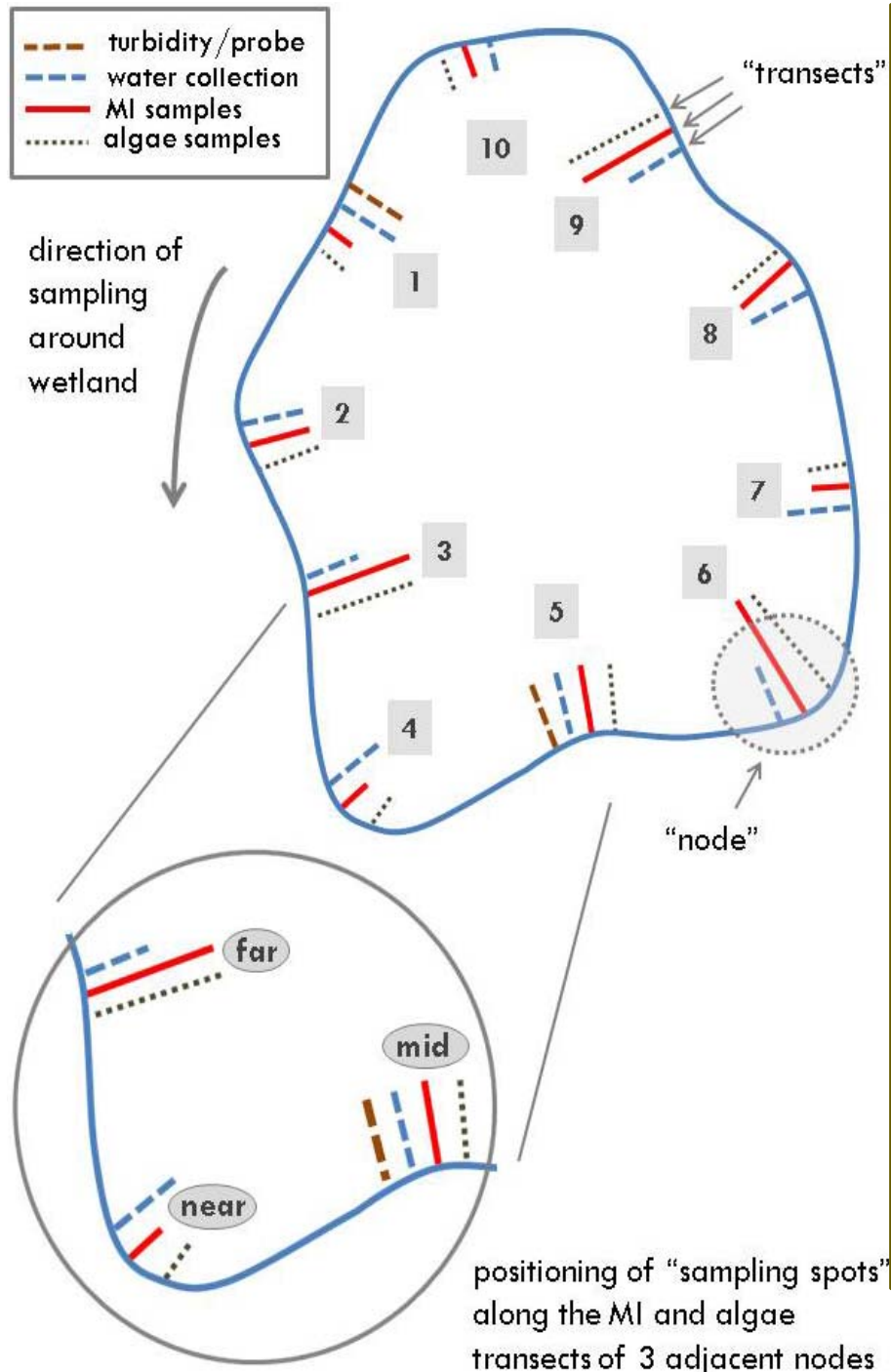 - Working with SWAMP/MLML team

Multiple Indicator Approach

turbidity/probe
water collection
MI samples
algae samples

"transects"

10
9
1
8
2
7
3
6
5
4

direction of sampling around wetland

"node"

far
mid
near

positioning of "sampling spots" along the MI and algae transects of 3 adjacent nodes

Standard Operating Procedures (SOP) for Collection of Macroinvertebrates, Algae, and Associated Physical Habitat Data in California Depressional Wetlands v1

10 May 2012

Prepared by:

A. Elizabeth Fetscher, Kevin Lunde, Eric Stein, and Jeff Brown

SWAMP field crews conducted Year 2012 & 2103 sampling

Project Goals
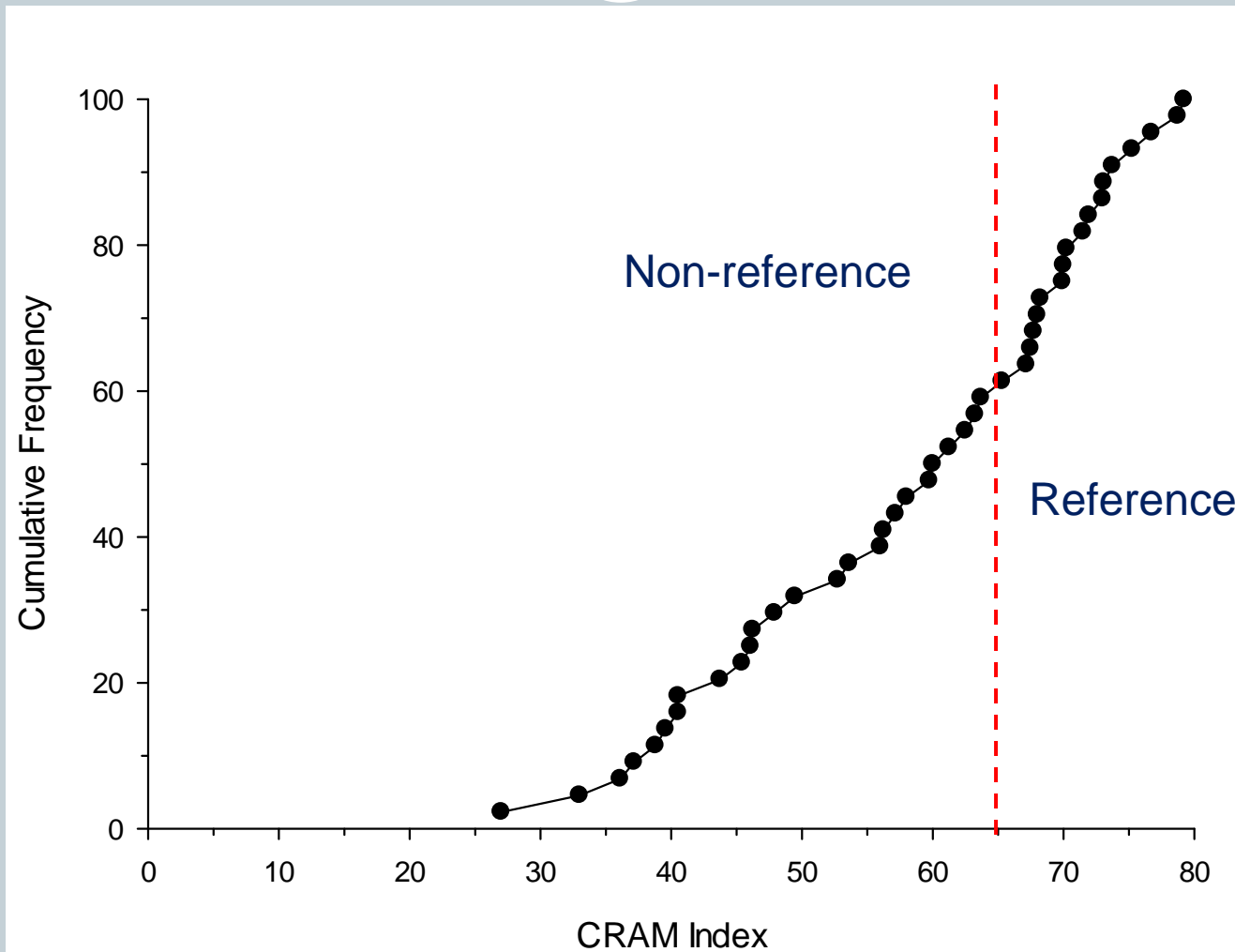
- Key questions:
  - What is the extent and distribution of depressional wetlands?
  - What is the condition of depressional wetlands?
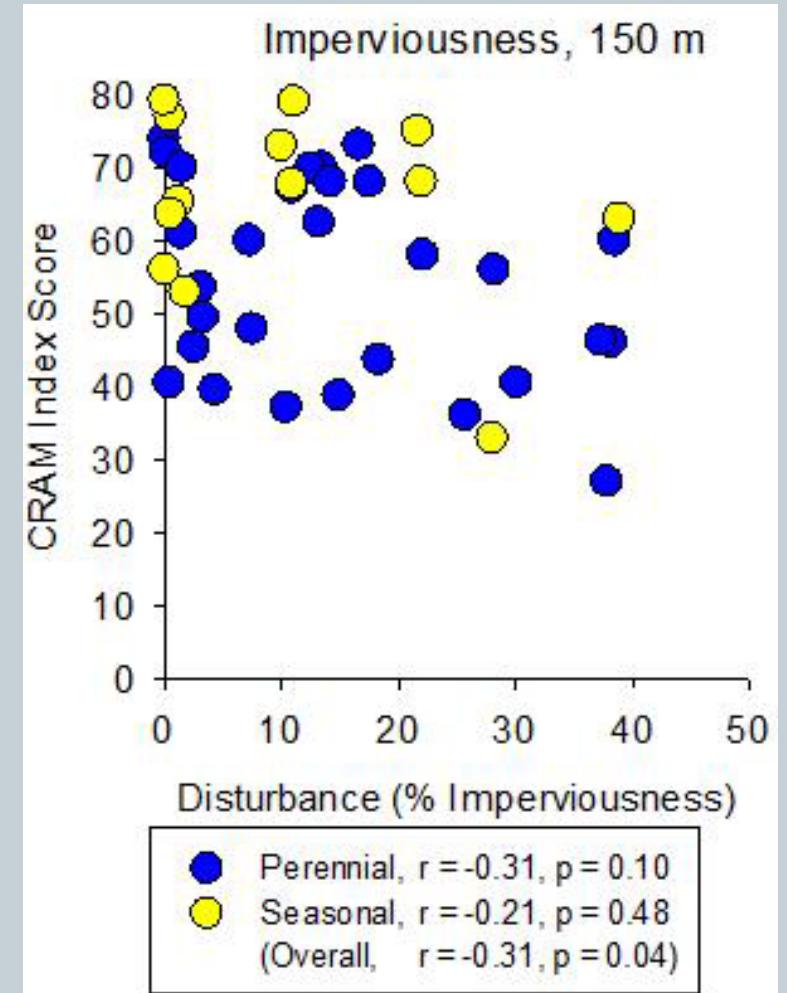 - What are the major stressors affecting wetland condition?

- Data from 38 sites (2011-12)

- CRAM, algae, chemistry

- Bug data not yet analyzed
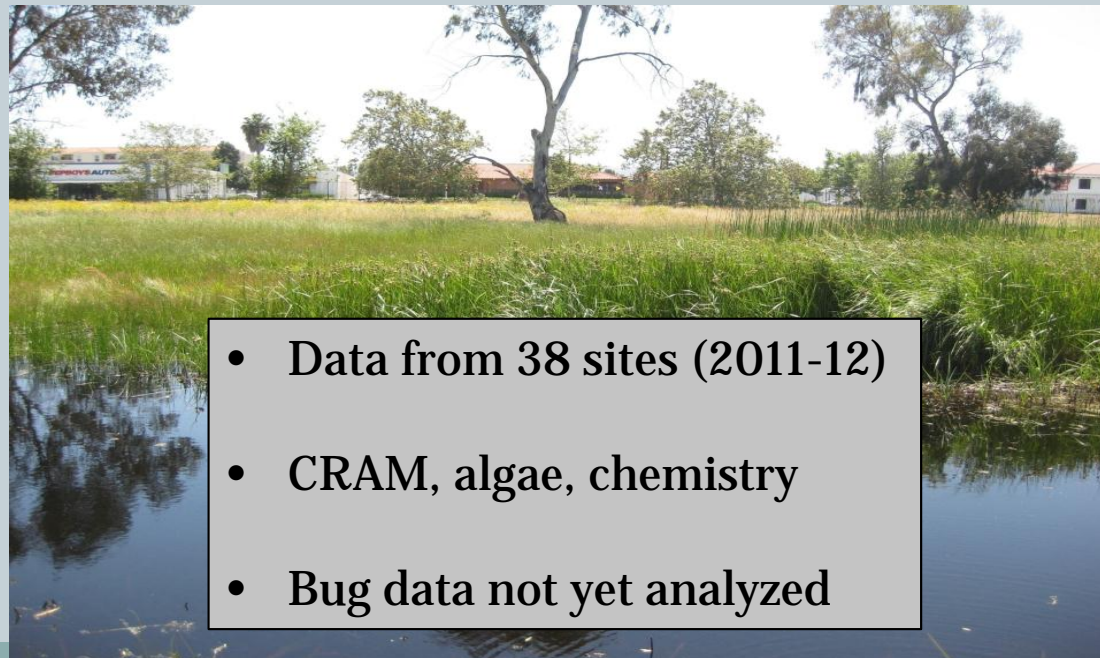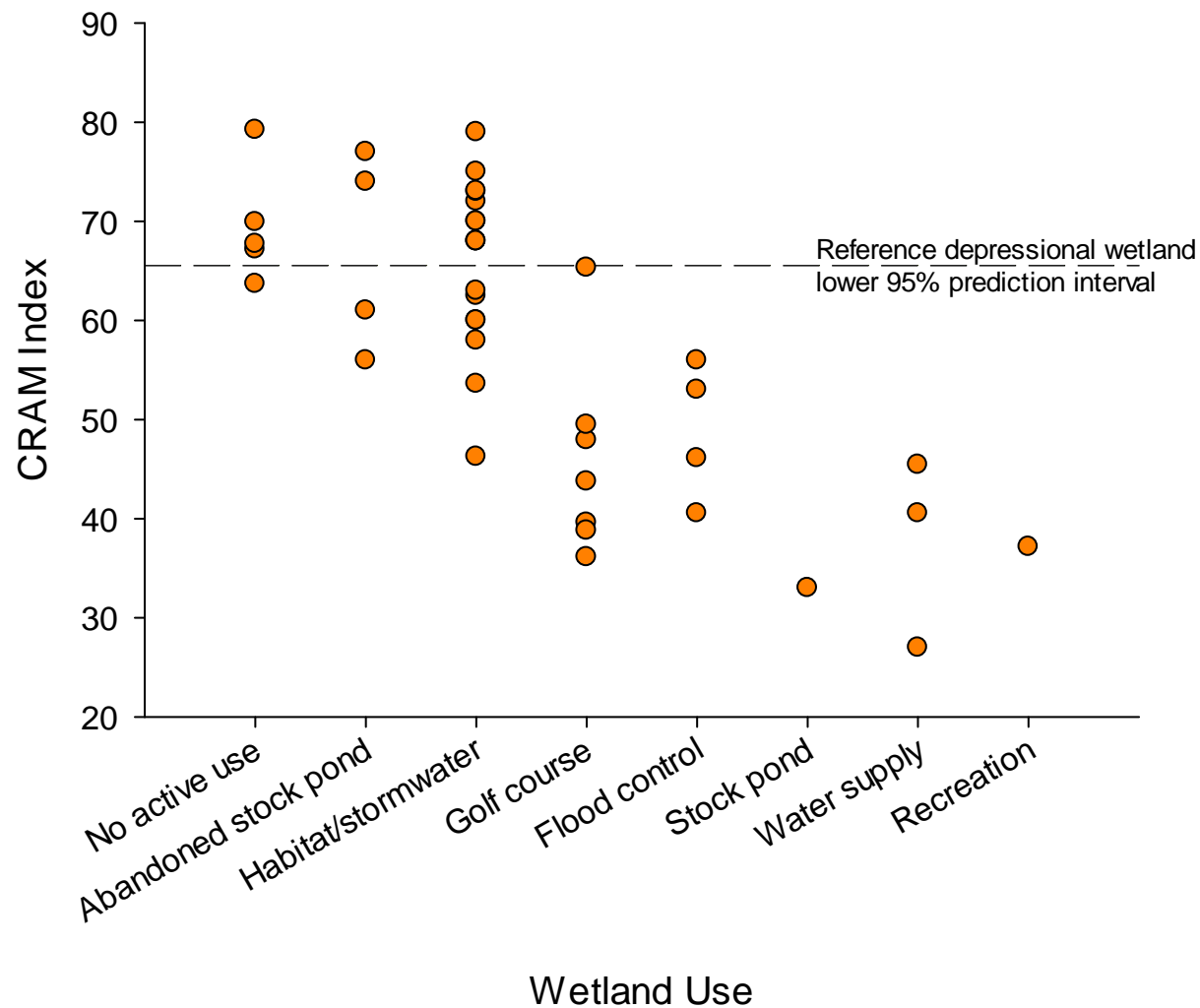
Range of Conditions - CRAM

No Relationship w/ Landscape Factors

- **By indicator**
  - Imperviousness
  - Land use
  - Road density

- **Different scales**
  - 150 m – 3000 m

- **Attribute level**
  - Buffer
  - Hydrology
  - Physical
  - Biological

Imperviousness, 150 m

CRAM Index Score vs Disturbance (% Imperviousness)

Perennial, $r = -0.31$, $p = 0.10$
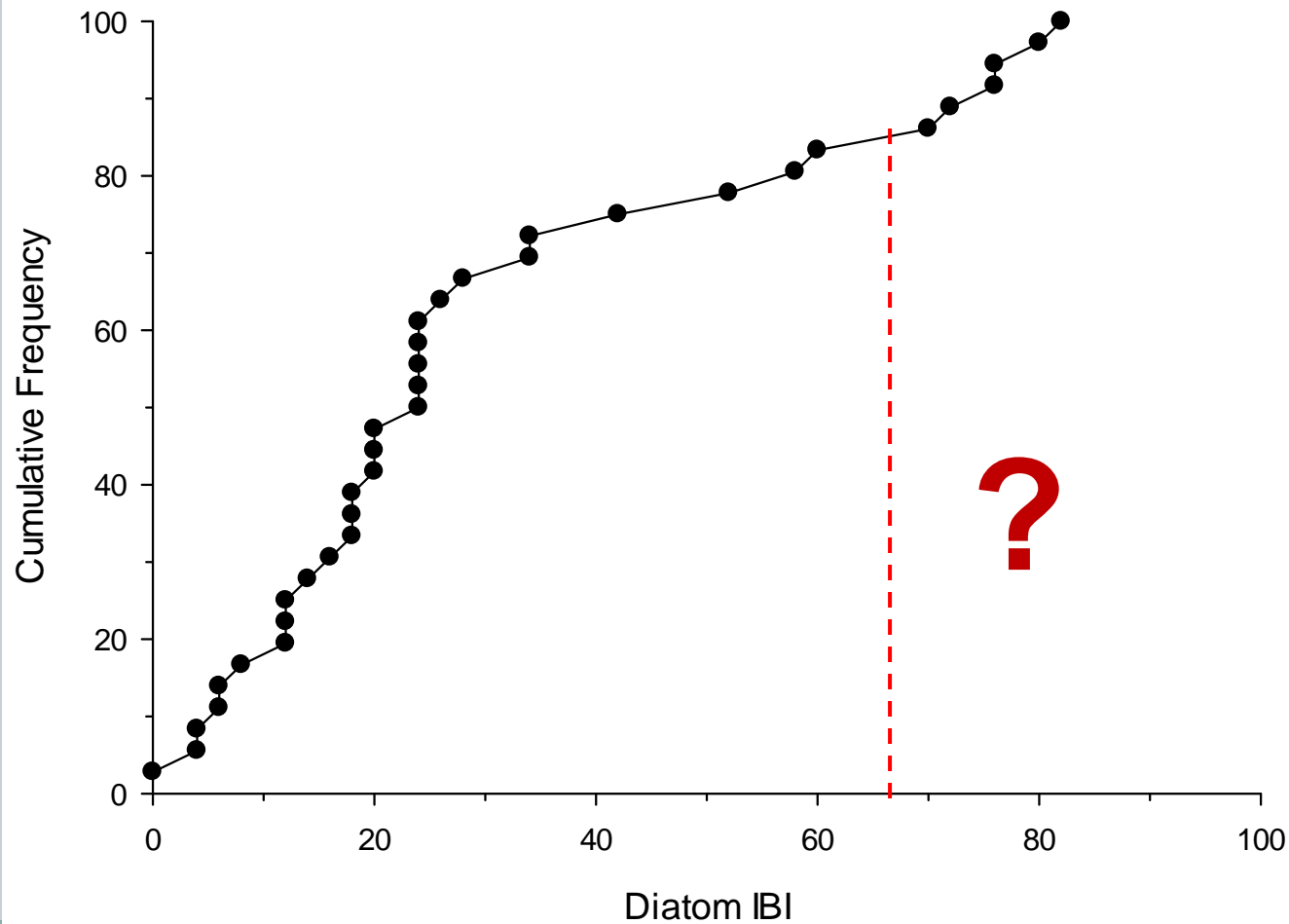Seasonal, $r = -0.21$, $p = 0.48$
(Overall, $r = -0.31$, $p = 0.04$)
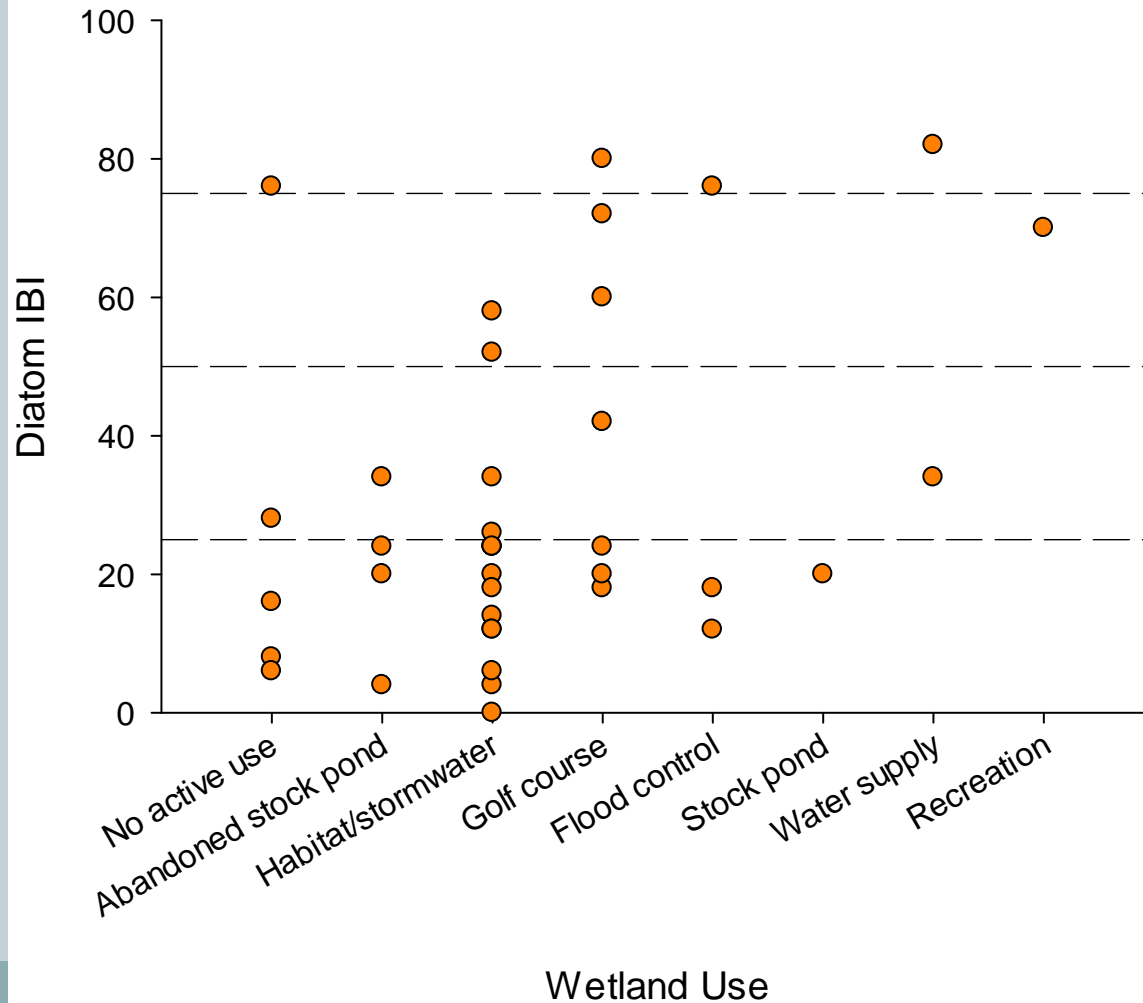
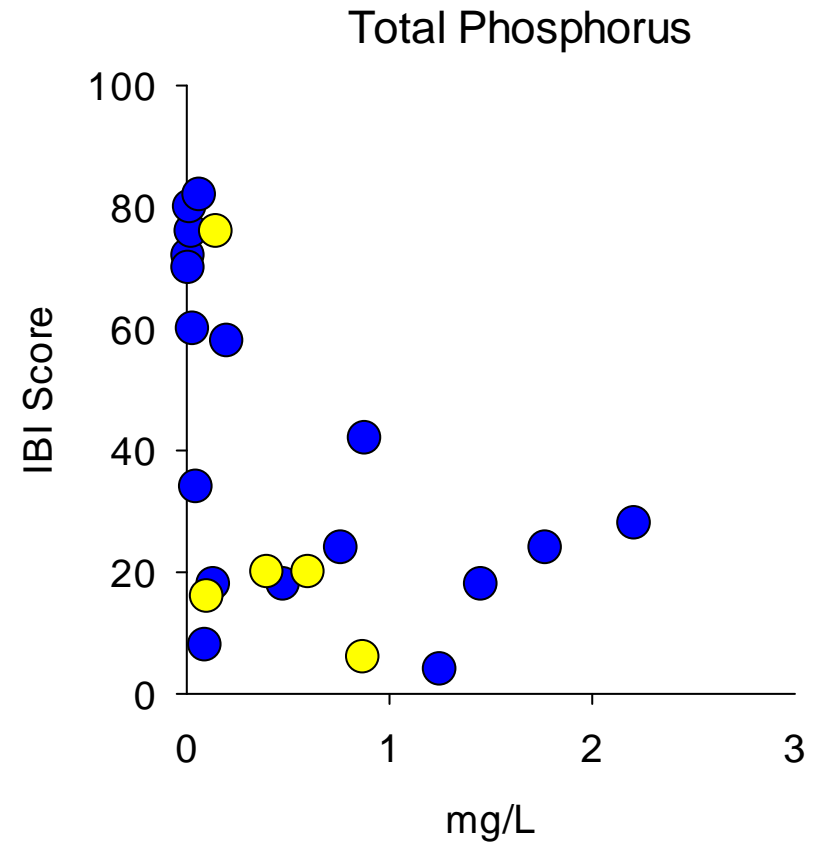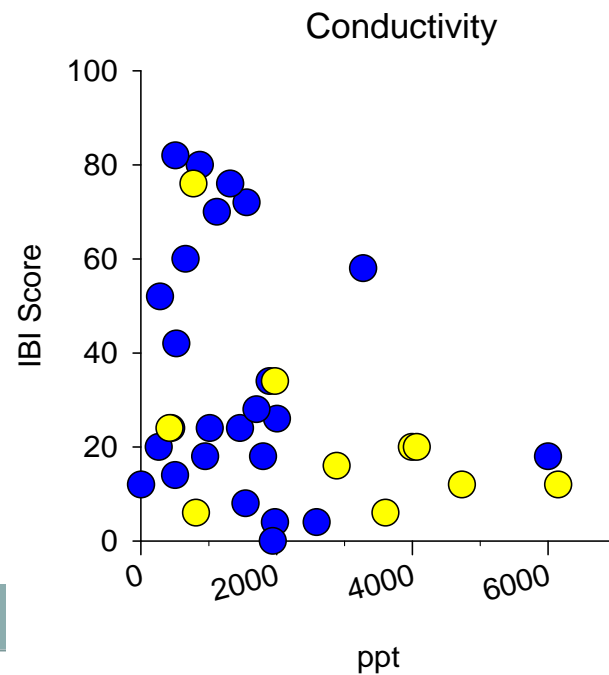# Intensity of Use is a Better Predictor

Range of Conditions – Diatom IBI

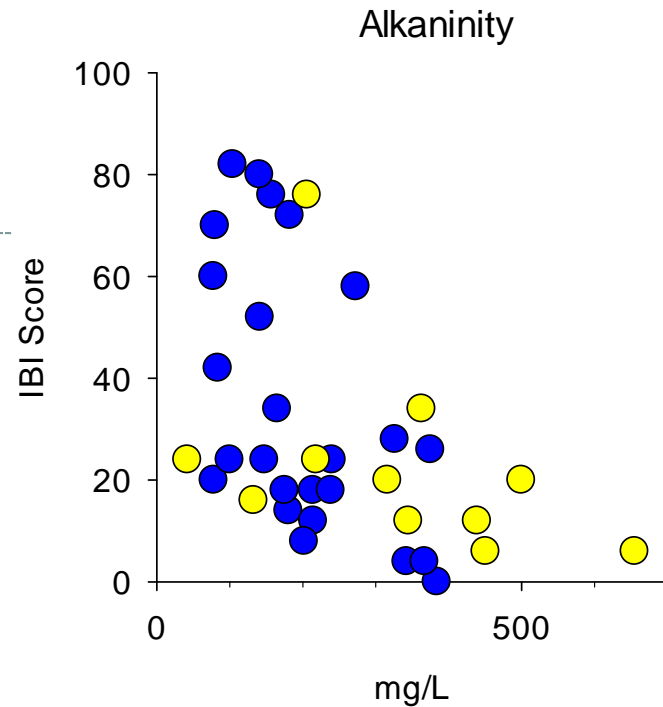# Intensity of Use Not Predictive

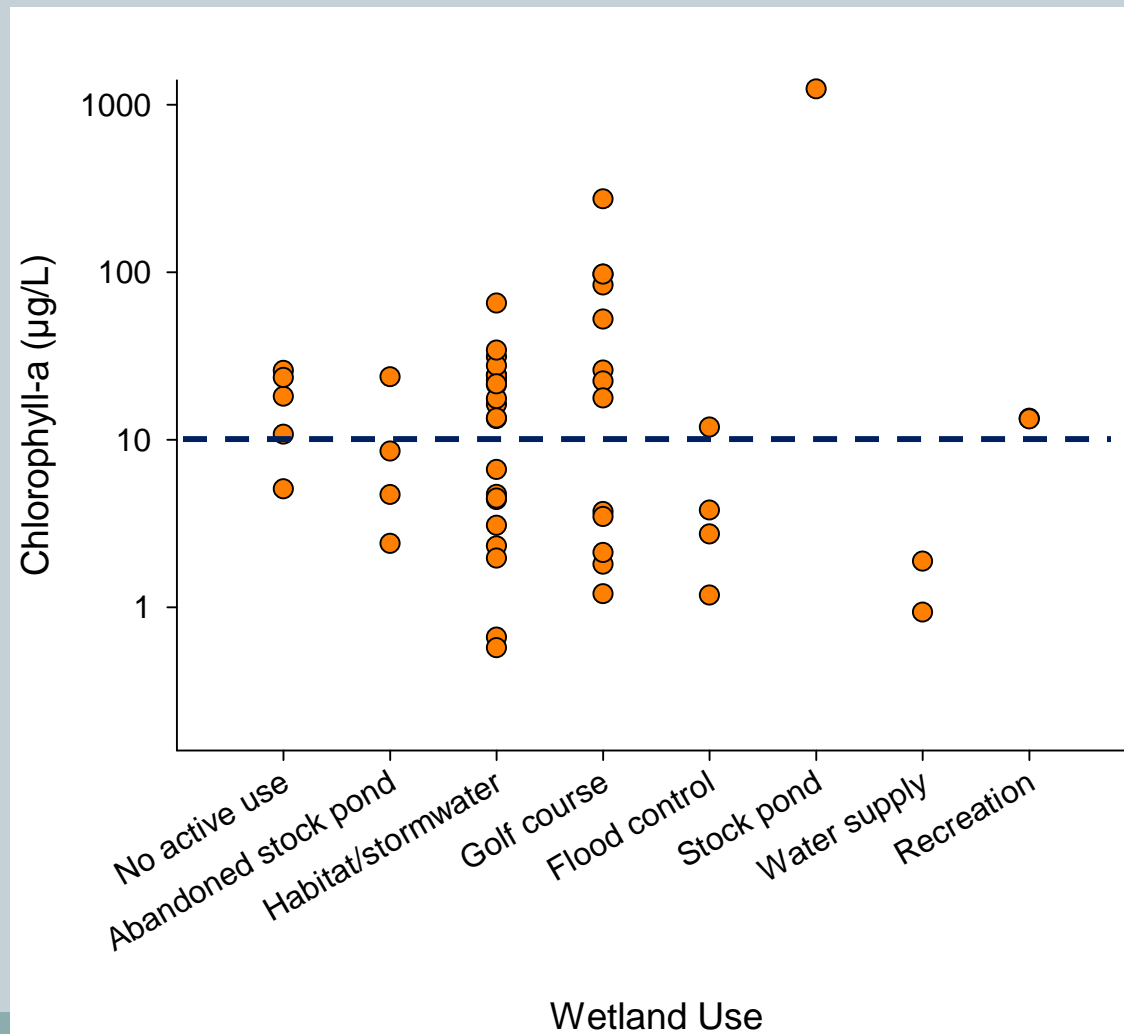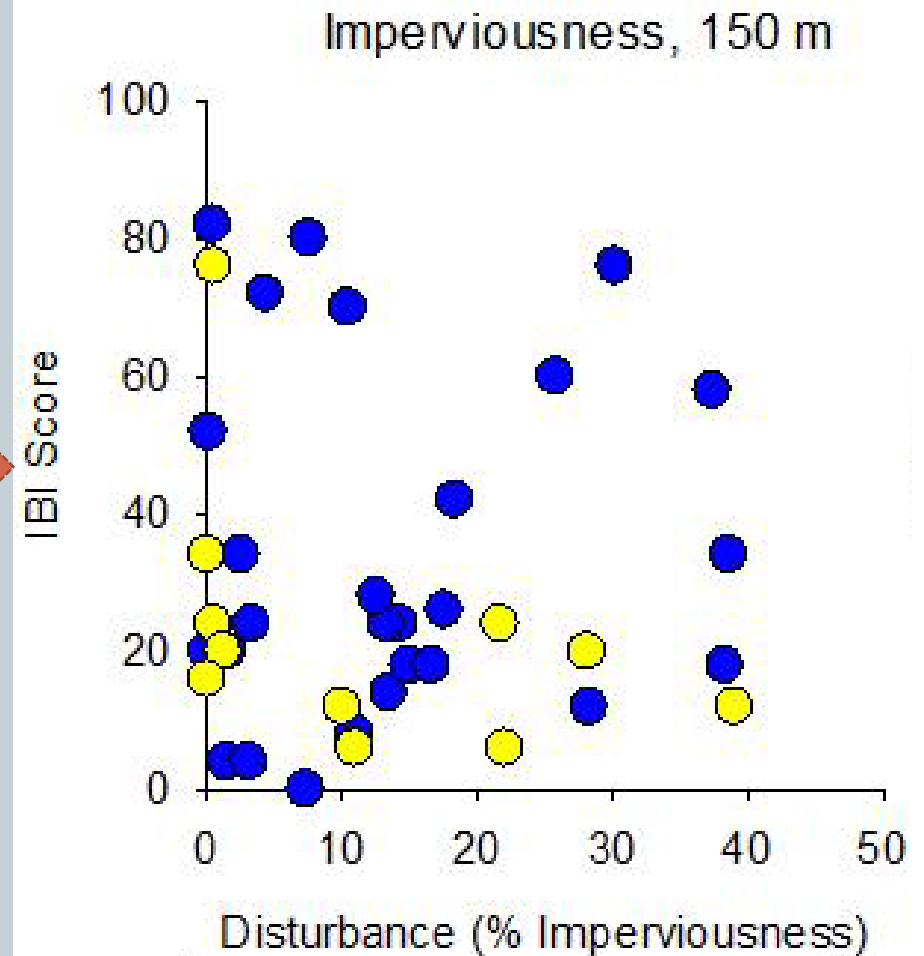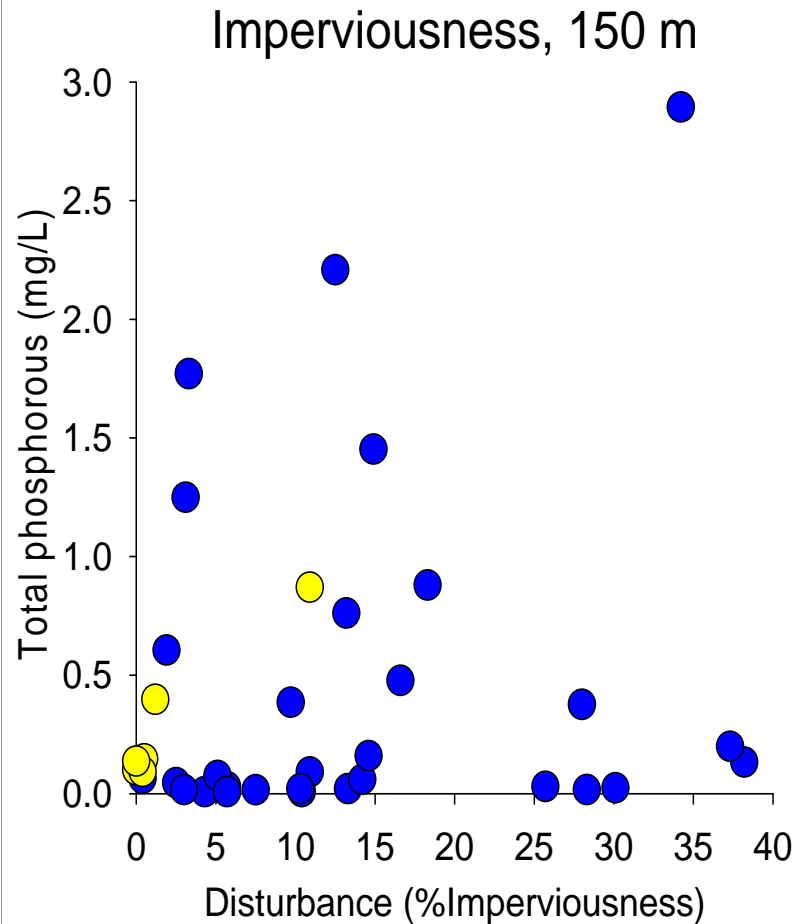# Water Chemistry is a Better Predictor

Alkaninity

Conductivity

Total Phosphorus

Perennial, r = -0.66, p = 0.004
Seasonal, r = -0.10, p = 0.87
(Overall, r = -0.55, p = 0.008)

Most Systems Mesotrophic or Eutrophic

Land Use and Water Chemistry Not Well Correlated

Expanding The Program

San Francisco Bay Region (Regional Board 2)

- Probabilistic sampling from Bay Area Aquatic Resource Inventory (BAARI) dataset housed at SFEI

- Sample approximately 25 freshwater depressional wetlands in May/June 2014 (e.g. ponds, playas, small reservoirs, stockponds)

- Exclude non-waters of the state

- Monitor using a standardized sampling protocol for invertebrates, algae, and nutrients

Central Coast (Moss Landing Marine Labs)

- Applying bioassessment protocols to validate depressional wetland CRAM

Conclusions

- Depressional wetlands are ubiquitous

- Reconnaissance is challenging

- Assessment tools appear to generally work

- Land use screens likely too coarse

- Diatoms responsive to water chemistry

- Indices may need to be rescaled/recalibrated

Recommendations

- Diatoms
  - Consider using planktonic algae
  - Consider using soft-bodied algae
  - May need to rescale index developed for streams

- Invertebrates
  - Analysis pending
  - May need to revisit index period for seasonal wetlands

- Need additional water chemistry at reference sites
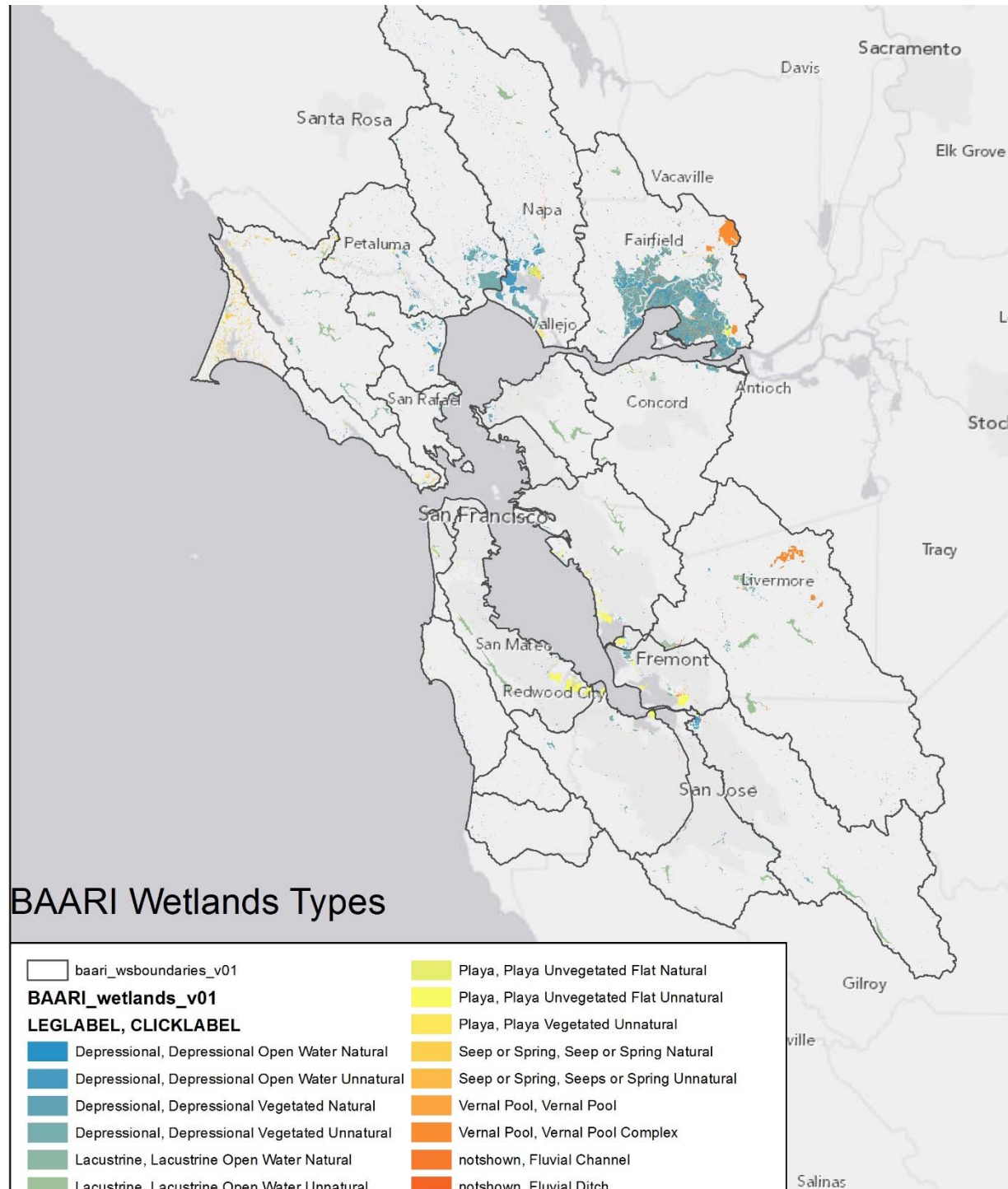 - Reconsider how we define reference

THANK YOU

Eric Stein
erics@sccwrp.org
714-755-3233

EXTRA SLIDES

BAARI Wetlands Types

☐ baari_wsboundaries_v01	🟩 Playa, Playa Unvegetated Flat Natural
BAARI_wetlands_v01	🟨 Playa, Playa Unvegetated Flat Unnatural
LEGLABEL, CLICKLABEL	🟨 Playa, Playa Vegetated Unnatural
🟦 Depressional, Depressional Open Water Natural	🟧 Seep or Spring, Seep or Spring Natural
🟦 Depressional, Depressional Open Water Unnatural	🟧 Seep or Spring, Seeps or Spring Unnatural
🟦 Depressional, Depressional Vegetated Natural	🟧 Vernal Pool, Vernal Pool
🟩 Depressional, Depressional Vegetated Unnatural	🟧 Vernal Pool, Vernal Pool Complex
🟩 Lacustrine, Lacustrine Open Water Natural	🟧 notshown, Fluvial Channel
🟩 Lacustrine, Lacustrine Open Water Unnatural	🟧 notshown, Fluvial Ditch

| Row Labels	Count	Average	Min	Max	Stdev	Median
Depressional Open Water Natural	213	1950.6	0.006	38755.5	4429.3	584.3
Depressional Open Water Unnatural	10059	9329.4	0.000	4617740.5	65844.2	1591.4
Depressional Vegetated Natural	270	8456.3	0.073	396324.3	29493.8	1893.0
Depressional Vegetated Unnatural	5298	33633.1	0.002	5102287.4	140468.9	2073.9
(blank)						
Grand Total	15840	17344.16	0.00	5102287.45	97472.89	
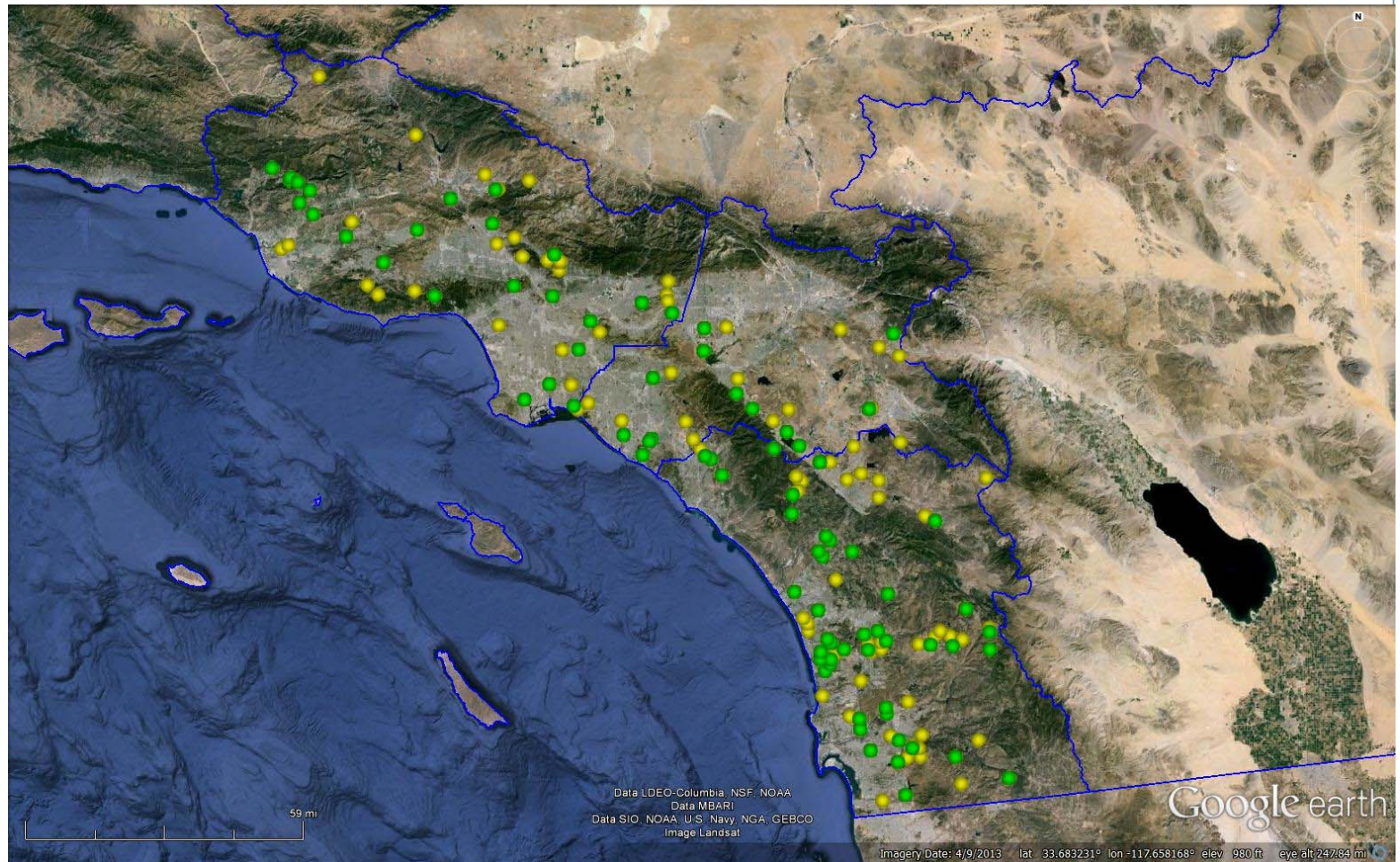
Total sites visited during field recon = 163
Sites accepted = 81 (green)
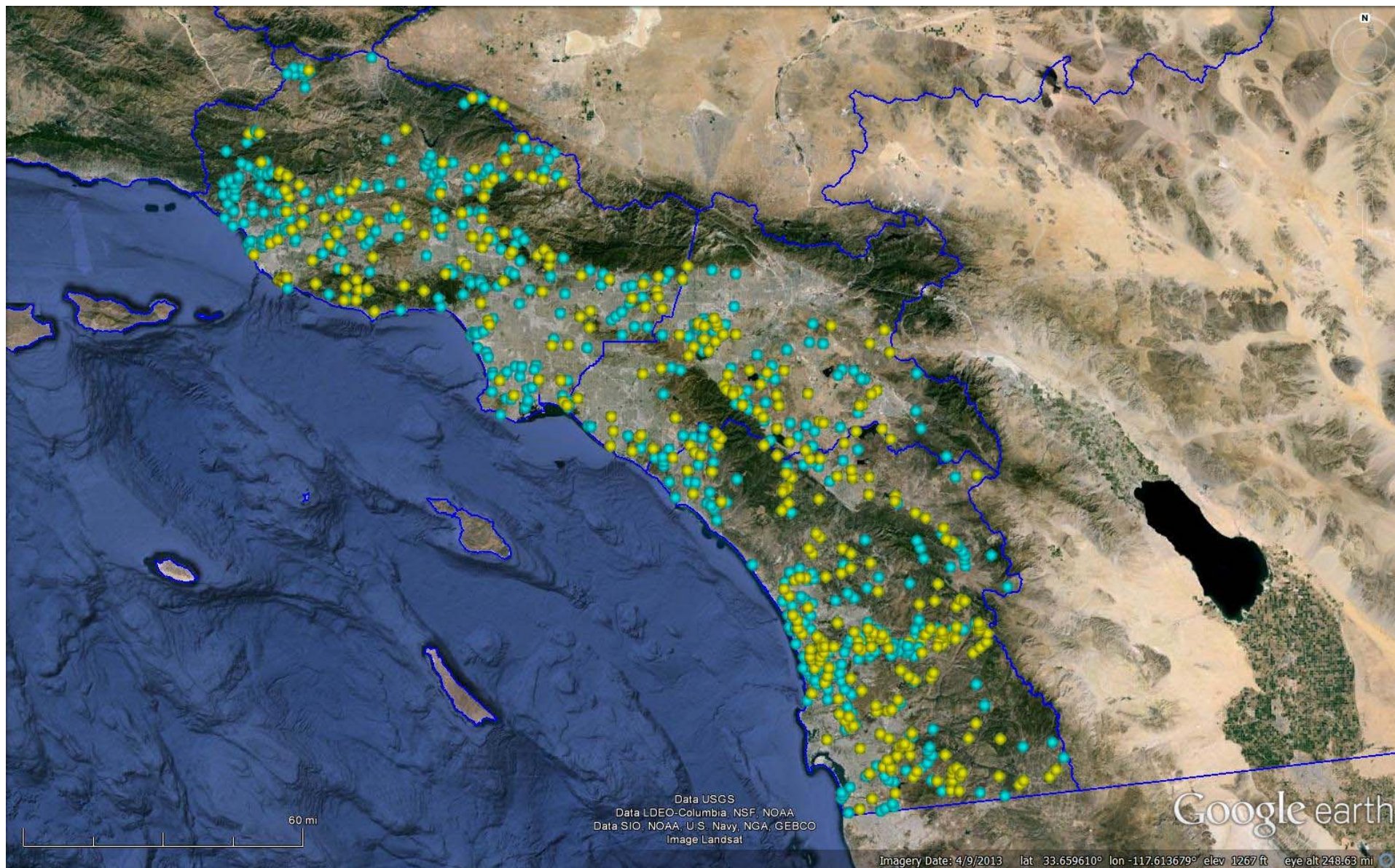
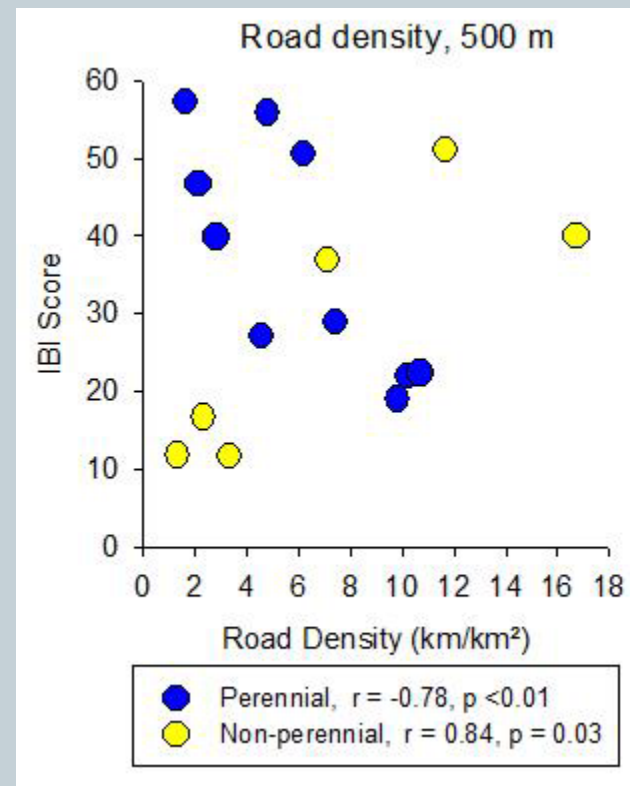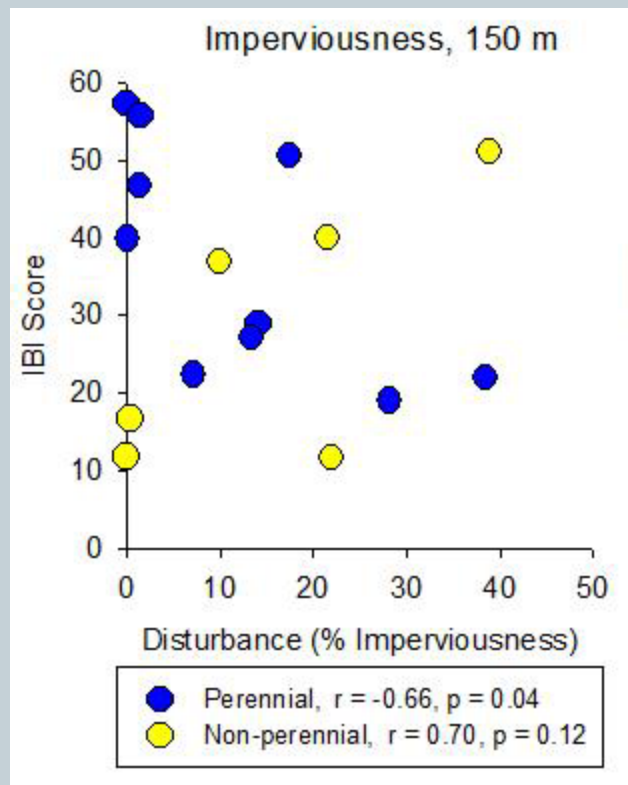Total draw sites evaluated = 928
Passed office screens = 373 (yellow)
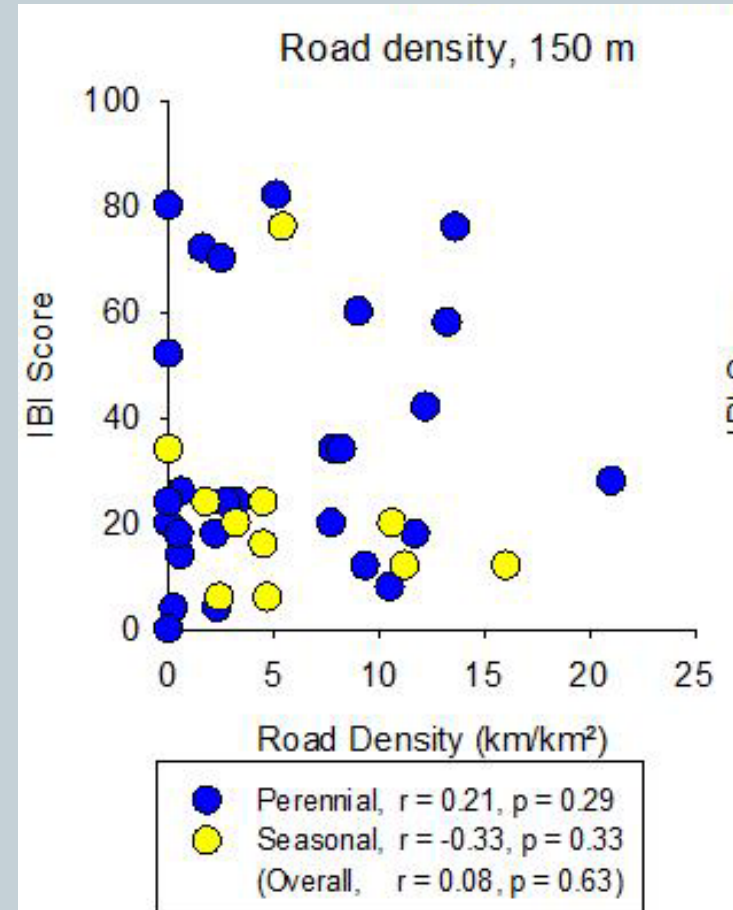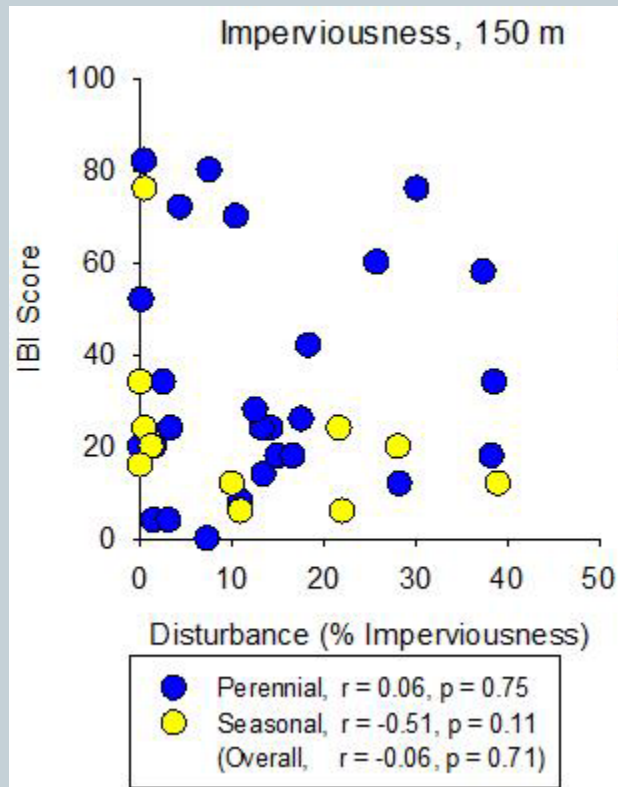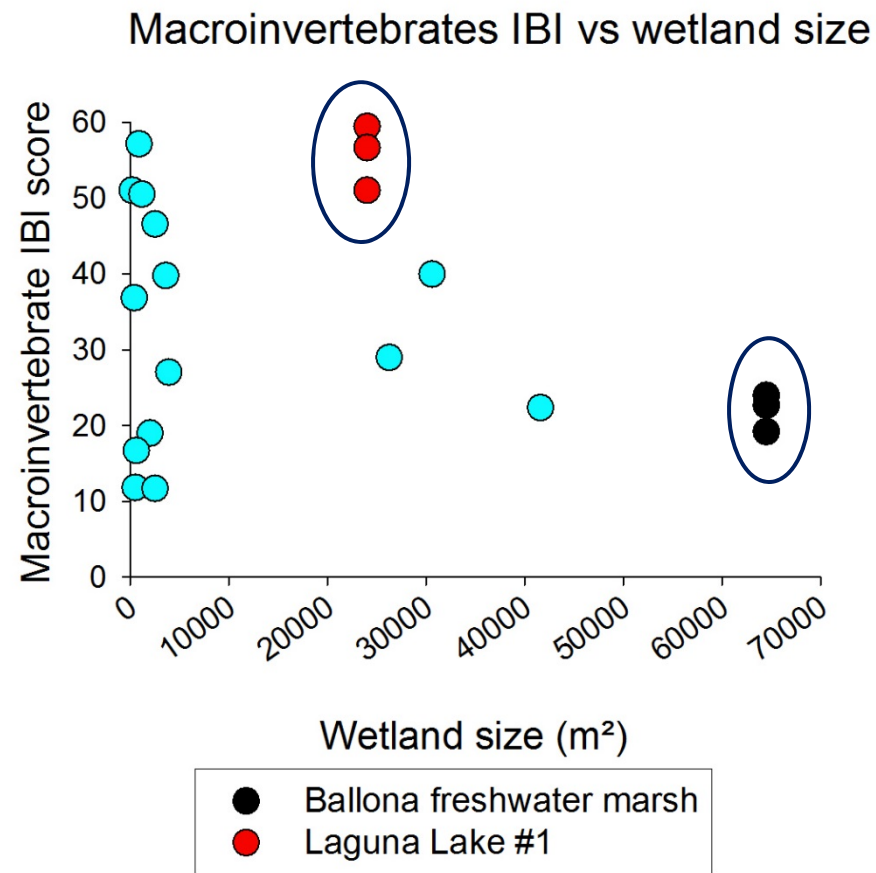
Diatom Submetrics Show Relationships
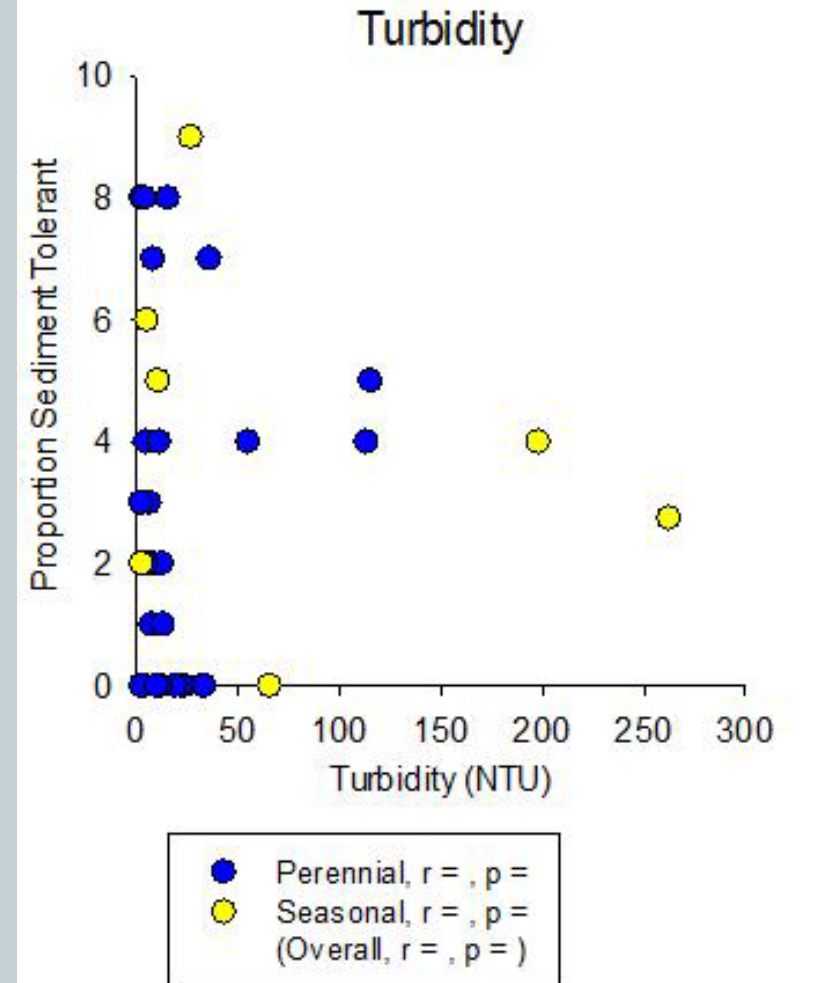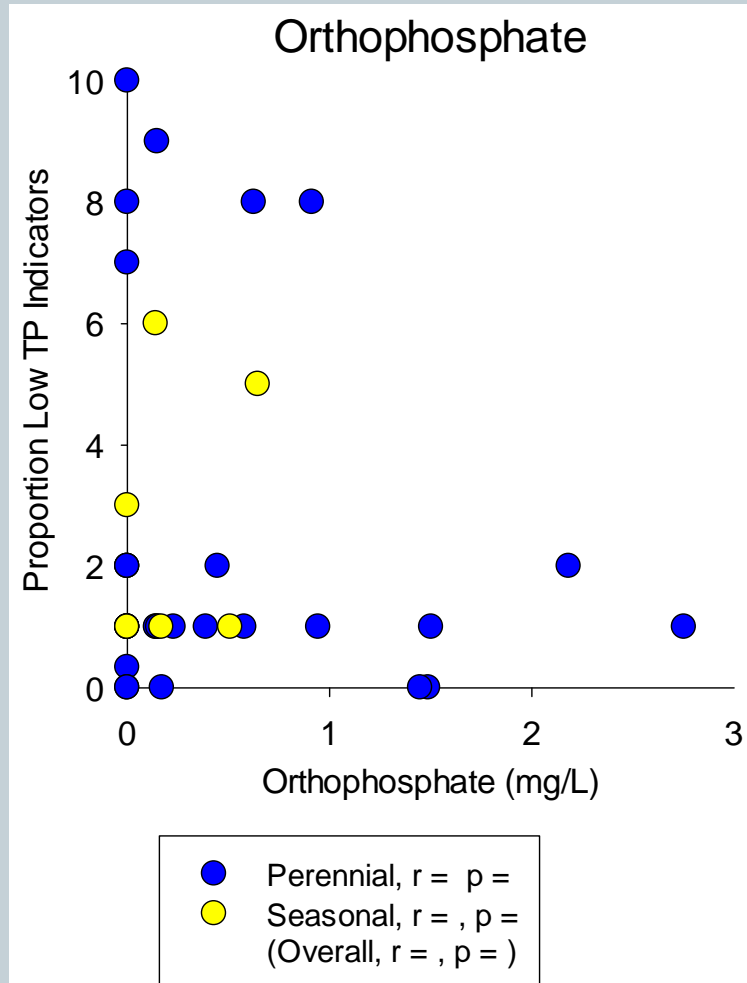
Invertebrates

Diatoms

Protocols Work Across Wetland Size

Macroinvertebrates IBI vs wetland size

Legend:
- Ballona freshwater marsh
- Laguna Lake #1

Protocols Work Across Wetland Size