California Results from the 2011 National Wetland Condition Assessment

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Central Coast Wetlands Group at

Moss Landing Marine Laboratories

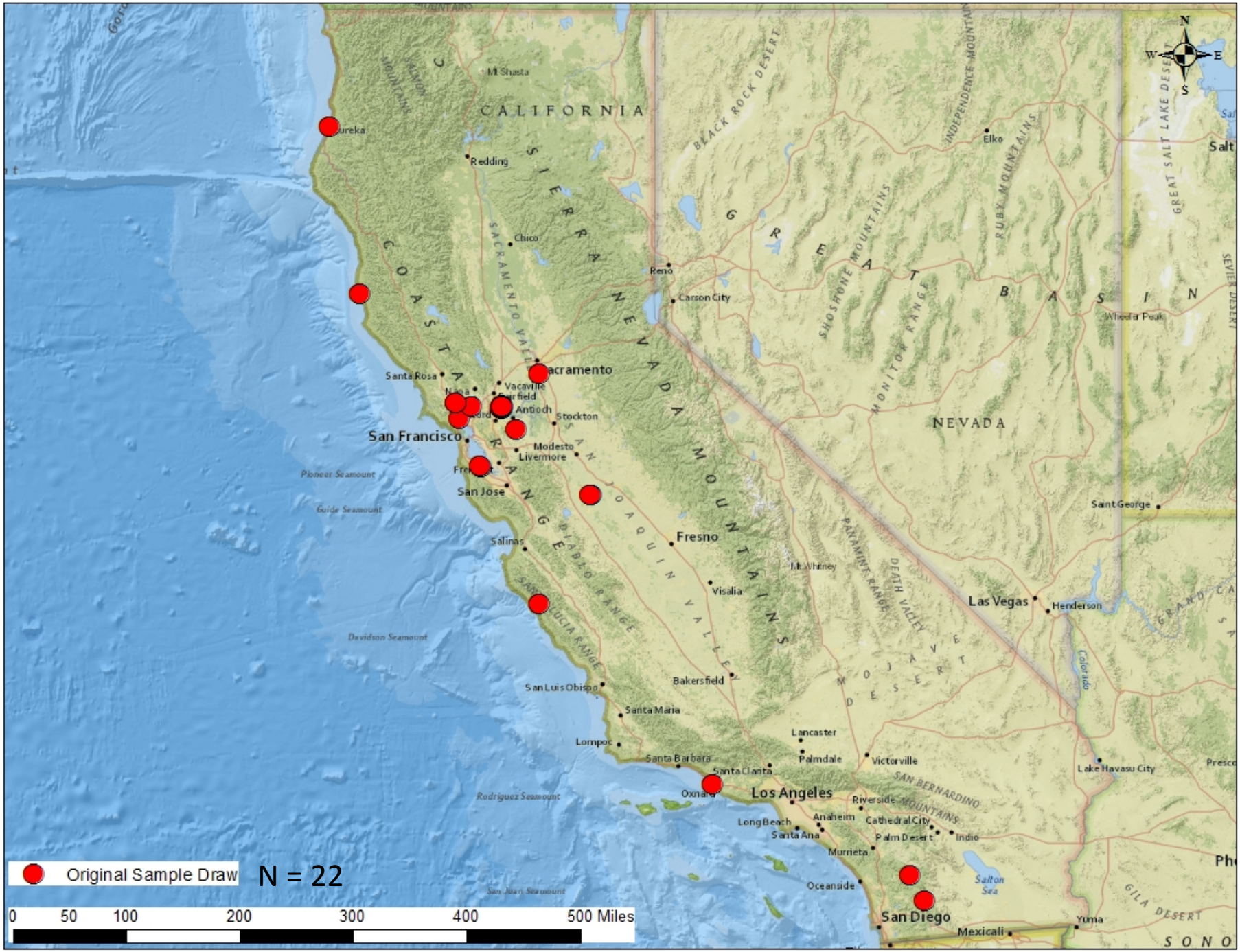
November 19, 2014

California Aquatic Bioassessment Workgroup

Davis, CA

Outline

- California's NWCA sites
- USA-RAM and CRAM Structure
- Preliminary Results
- Next Steps


Original Sample Draw
N = 22
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CALIFORNIA
NEVADA
Mt Shasta
Redding
Chico
Reno
Carson City
Elko
Sacramento
Santa Rosa
Vacaville
Fairfield
Antioch
Stockton
San Francisco
Modesto
Livermore
San Jose
Salinas
Fresno
Visalia
Bakersfield
San Luis Obispo
Santa Maria
Lompoc
Santa Barbara
Santa Clarita
Oxnard
Los Angeles
Lancaster
Palmdale
Victorville
Riverside
Anaheim
Long Beach
Santa Ana
Cathedral City
Palm Desert
Indio
Murrieta
Oceanside
San Diego
Mexicali
Yuma
Las Vegas
Henderson
Saint George
Lake Havasu City
Salton Sea
Mt Whitney
Pioneer Seamount
Guide Seamount
Davidson Seamount
Rodriguez Seamount
San Juan Seamount
SIERRA NEVADA MOUNTAINS
SAN JOAQUIN VALLEY
SAN DIEGO RANGE
SAN LUCIA RANGE
COAST RANGES
SACRAMENTO VALLEY
GREAT BASIN
MOJAVE DESERT
DEATH VALLEY
PANAMINT RANGE
SHOSHONE MOUNTAINS
MONITOR RANGE
RUBY MOUNTAINS
BLACK ROCK DESERT
GILA DESERT
SAN BERNARDINO MOUNTAINS
Colorado
N
S
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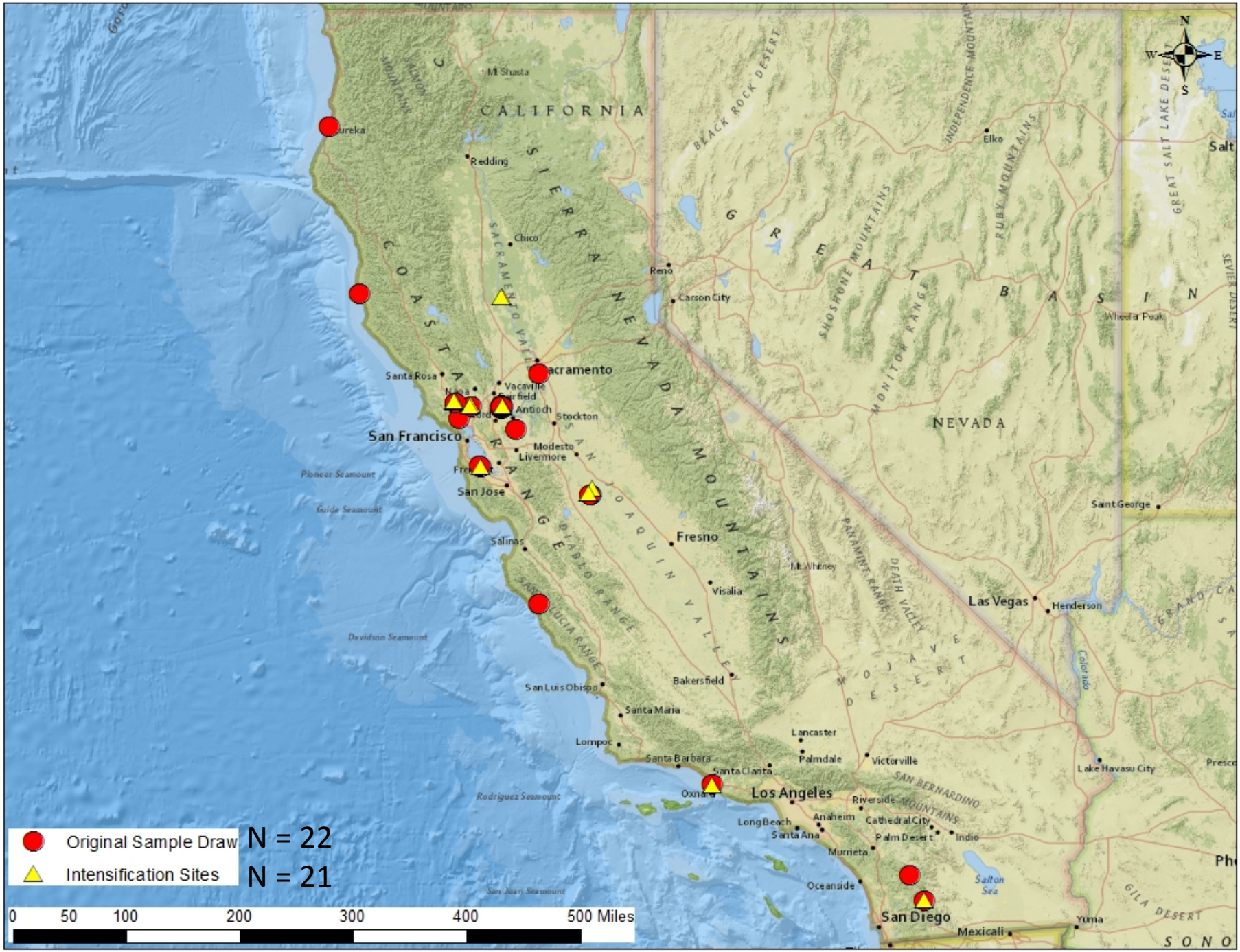
W


Original Sample Draw
N = 22
Intensification Sites
N = 21
0 50 100 200 300 400 500 Miles
CALIFORNIA
NEVADA
Eureka
Redding
Mt Shasta
Chico
Reno
Carson City
Elko
Salt
Sacramento
Santa Rosa
Napa
Vacaville
Fairfield
Antioch
Stockton
San Francisco
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San Jose
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Bakersfield
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Lake Havasu City
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Guide Seamount
Davidson Seamount
Rodriguez Seamount
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SIERRA NEVADA MOUNTAINS
COAST RANGES
SAN JOAQUIN VALLEY
SACRAMENTO VALLEY
GREAT BASIN
MOJAVE DESERT
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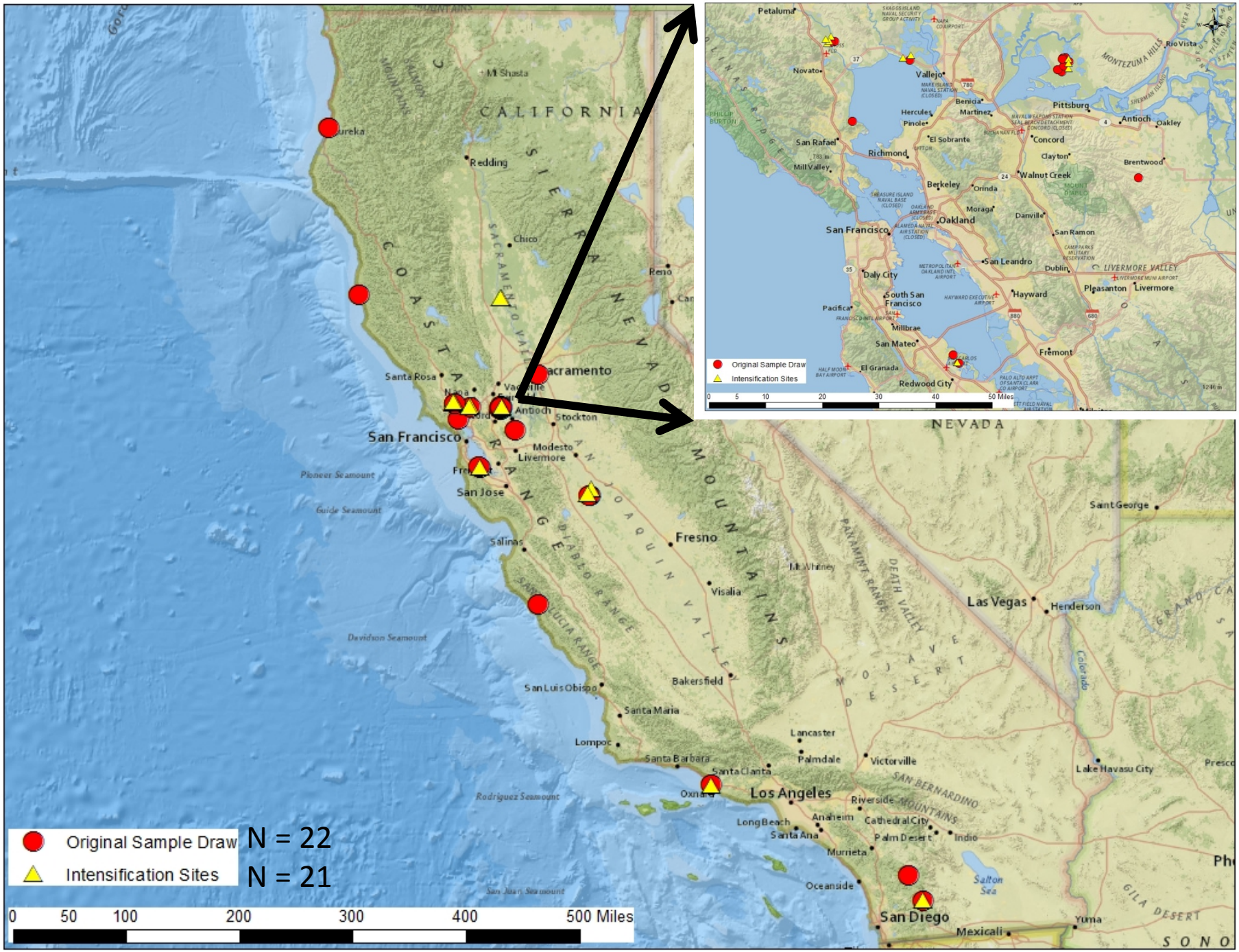
DEATH VALLEY
PANAMINT RANGE
SHOSHONE MOUNTAINS
MONITOR RANGE
RUBY MOUNTAINS
BLACK ROCK DESERT
GREAT SALT LAKE DESERT
SAN BERNARDINO MOUNTAINS
GILA DESERT
Salton Sea
Colorado
N
S
E
W


Original Sample Draw
Intensification Sites
N = 22
N = 21
0 50 100 200 300 400 500 Miles
Original Sample Draw
Intensification Sites
0 5 10 20 30 40 50 Miles
CALIFORNIA
NEVADA
San Francisco
Sacramento
Fresno
Los Angeles
San Diego
Las Vegas
Redding
Eureka
Mt Shasta
Chico
Reno
Santa Rosa
Napa
Antioch
Stockton
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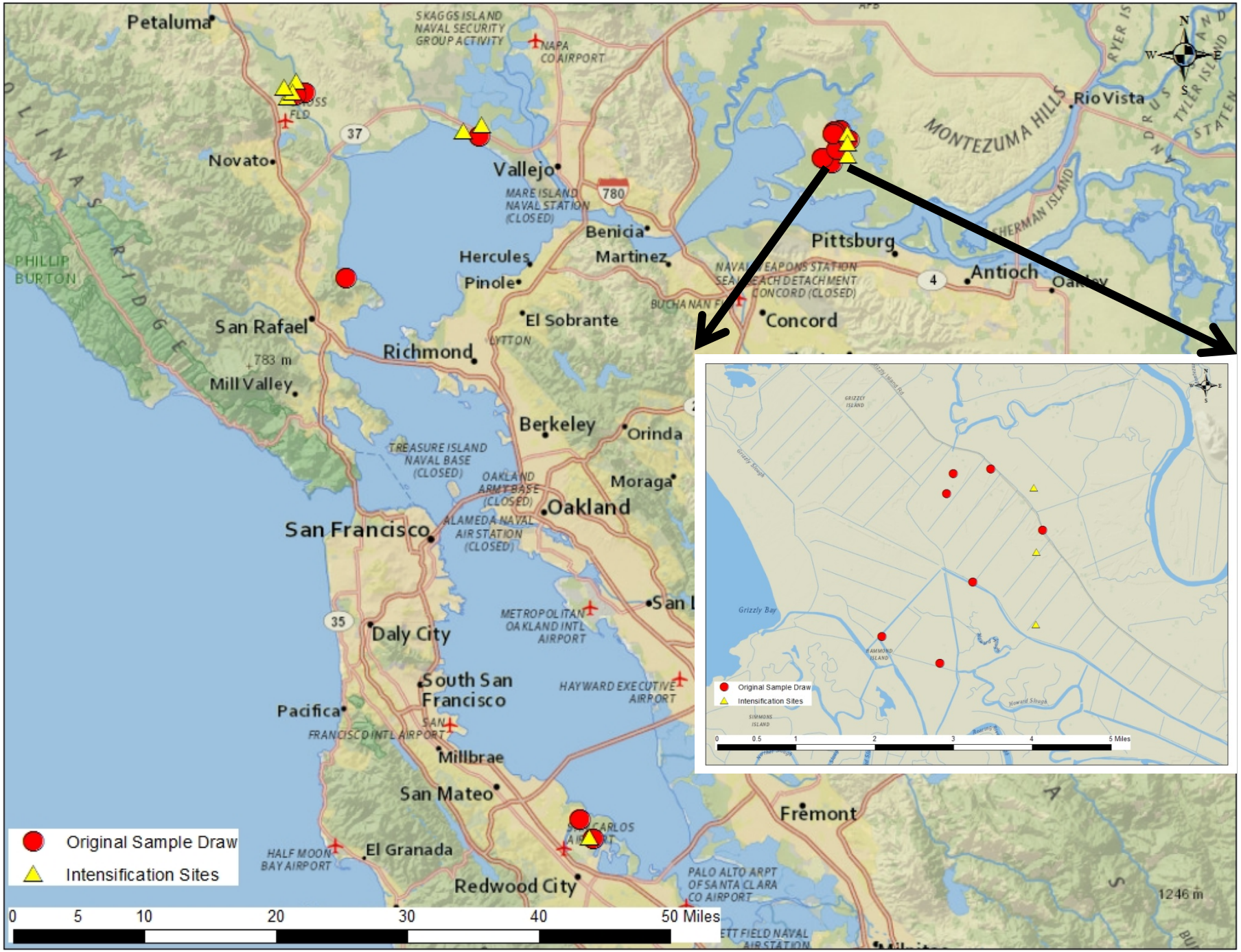
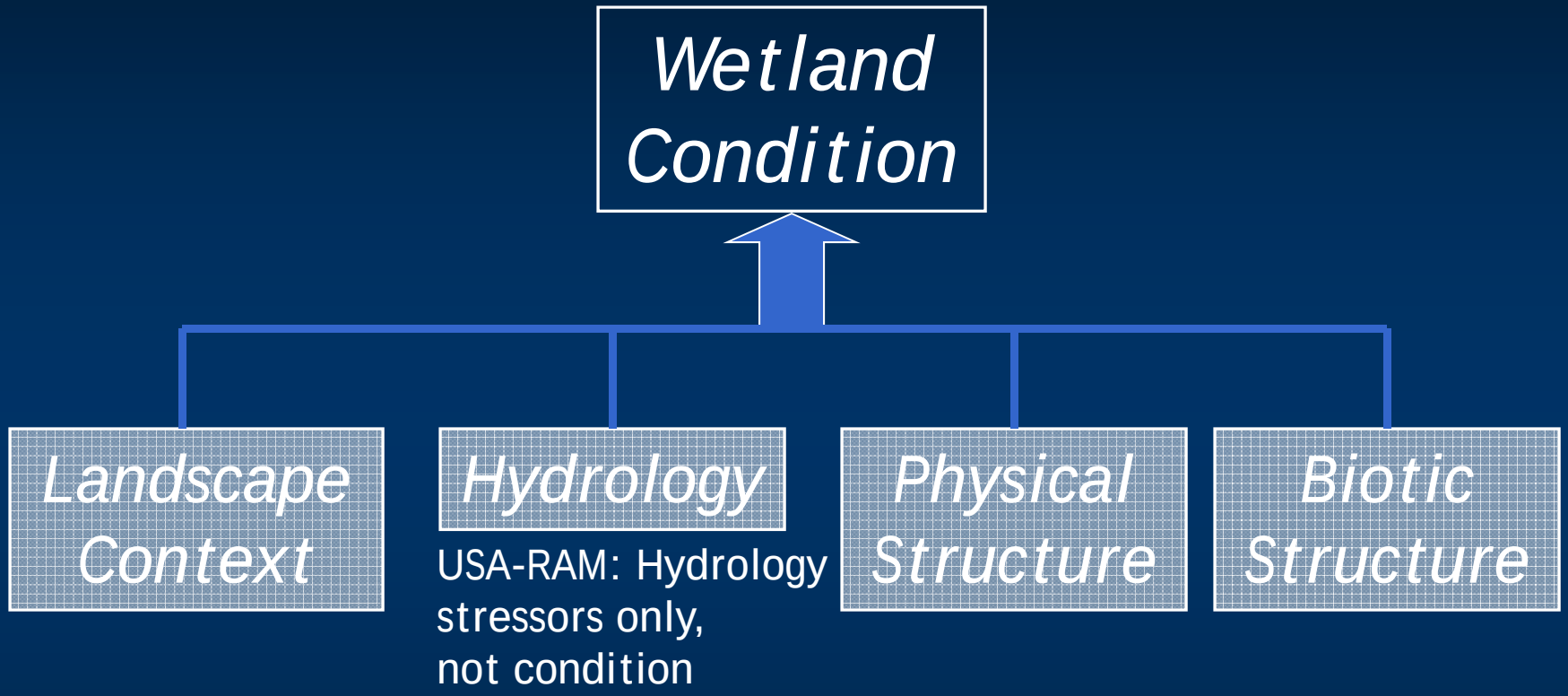
Lake Havasu City
Saint George
Henderson
Petaluma
Novato
Vallejo
Benicia
Martinez
Pittsburg
Antioch
Oakley
Hercules
Pinole
San Rafael
El Sobrante
Richmond
Concord
Clayton
Brentwood
Mill Valley
Walnut Creek
Berkeley
Orinda
Moraga
Danville
Oakland
San Ramon
San Leandro
Dublin
Livermore
Daly City
South San Francisco
Hayward
Pleasanton
Pacifica
Millbrae
San Mateo
Fremont
El Granada
Redwood City
Rio Vista
Pioneer Seamount
Guide Seamount
Davidson Seamount
Rodriguez Seamount
San Juan Seamount


Petaluma
Novato
Vallejo
Benicia
Hercules
Martinez
Pinole
Pittsburg
Antioch
Concord
El Sobrante
San Rafael
Richmond
Mill Valley
Berkeley
Orinda
Moraga
Oakland
San Francisco
Daly City
South San Francisco
Pacifica
Millbrae
San Mateo
El Granada
Redwood City
Fremont
Rio Vista
MONTEZUMA HILLS
SKAGGS ISLAND NAVAL SECURITY GROUP ACTIVITY
NAPA CO AIRPORT
MARE ISLAND NAVAL STATION (CLOSED)
TREASURE ISLAND NAVAL BASE (CLOSED)
OAKLAND ARMY BASE (CLOSED)
ALAMEDA NAVAL AIR STATION (CLOSED)
METROPOLITAN OAKLAND INTL AIRPORT
HAYWARD EXECUTIVE AIRPORT
SAN FRANCISCO INTL AIRPORT
HALF MOON BAY AIRPORT
PALO ALTO ARPT OF SANTA CLARA CO AIRPORT
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD (CLOSED)
PHILLIP BURTON
783 m
1246 m
Original Sample Draw
Intensification Sites
0 5 10 20 30 40 50 Miles
0 0.5 1 2 3 4 5 Miles

USA-RAM and CRAM

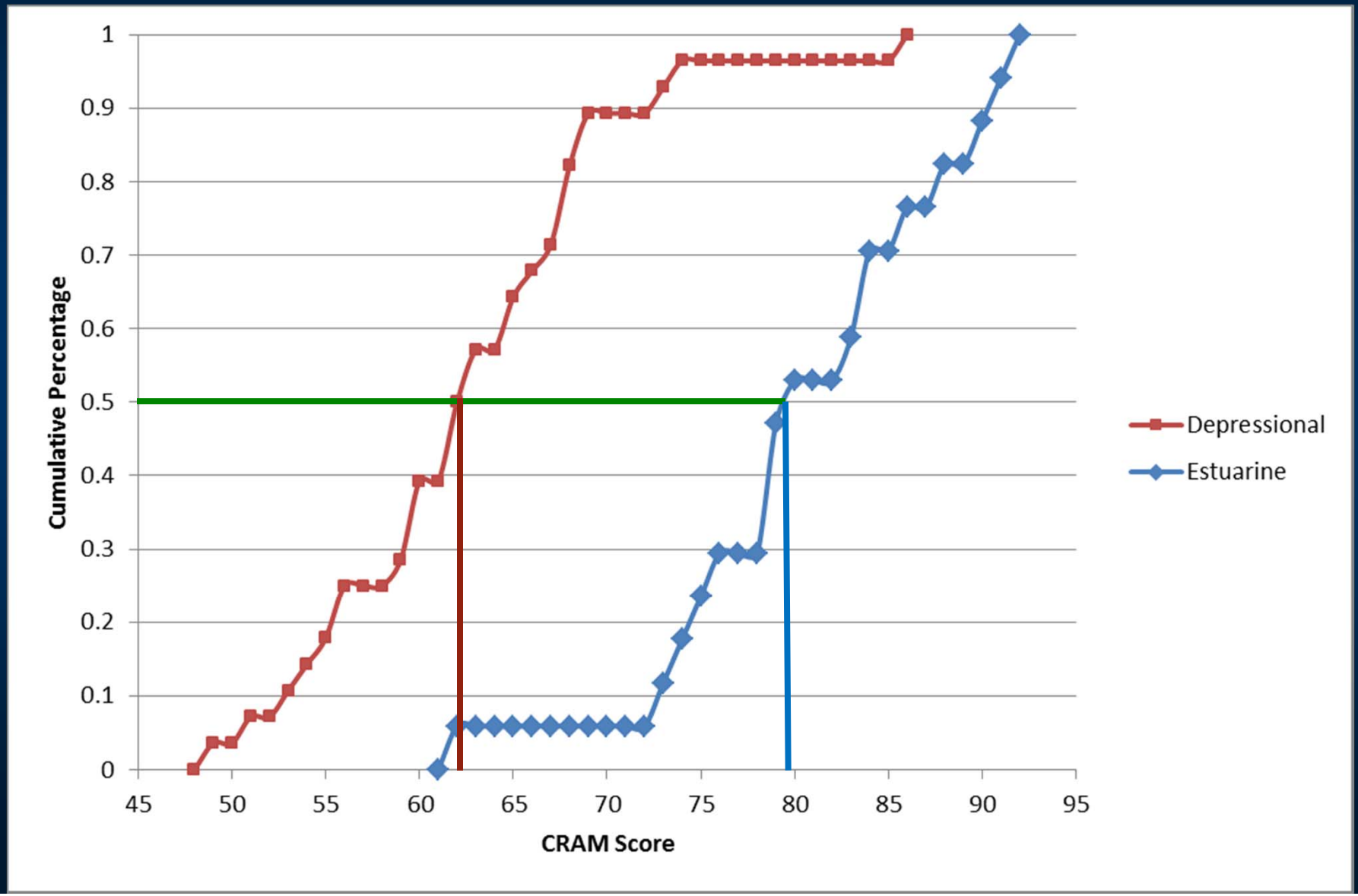
- Rapid Assessment Methods (RAMs)
- California's NWCA intensification used both methods (in addition to all standard NWCA methods)
- USA-RAM assesses all wetland types with one method, CRAM has modules for different types
- USA-RAM quantifies stressor severity, CRAM has a qualitative stressor checklist
- Both look at 4 Attributes

RAM Design: Attributes

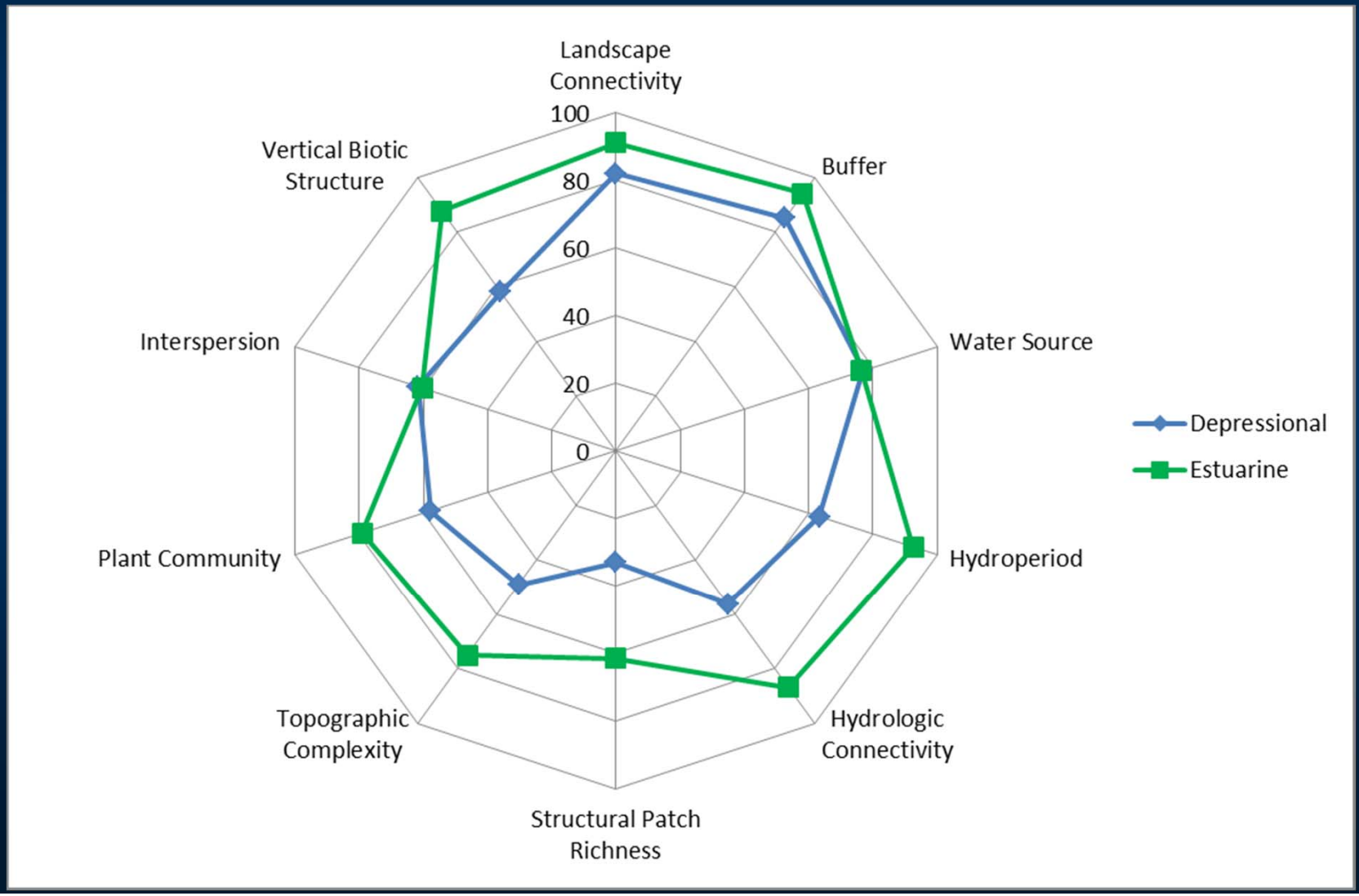


- Each attribute is represented by 1 or more metrics in both USA-RAM and CRAM

Depressional and Estuarine CRAM Score CFDs

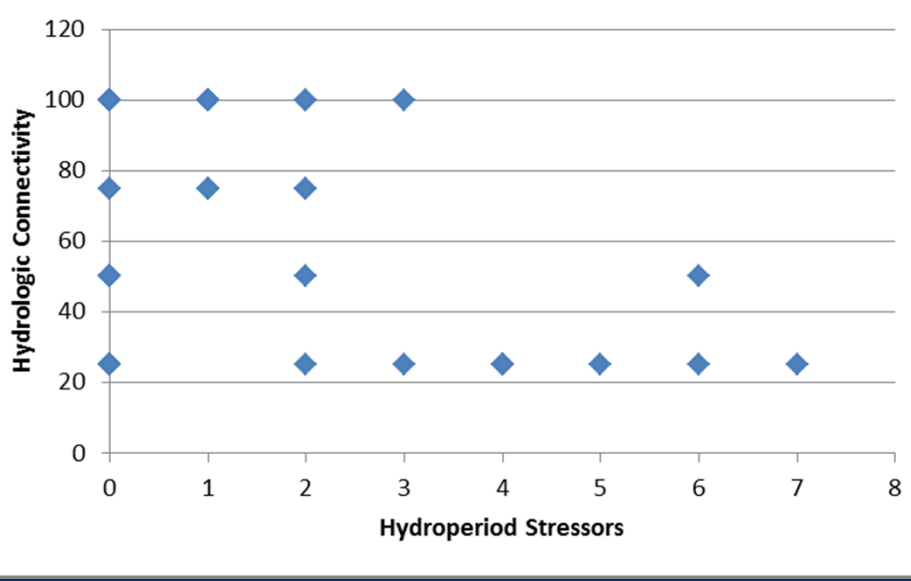


Metric Scores for Depressional and Estuarine Wetlands

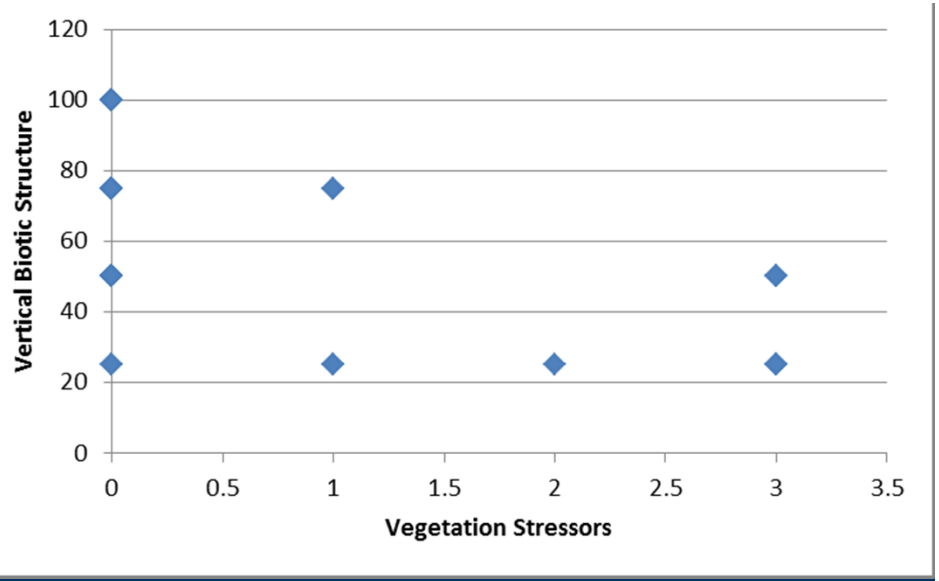


Correlation between stressors and condition metrics

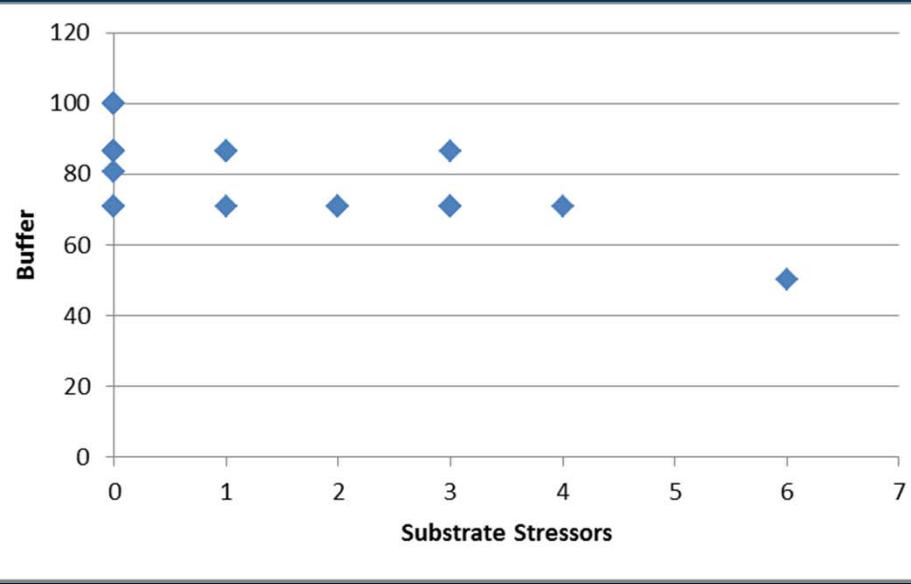
- Stressor indices from USA-RAM
- Condition metrics from CRAM
- Relationship may indicate causes and effects



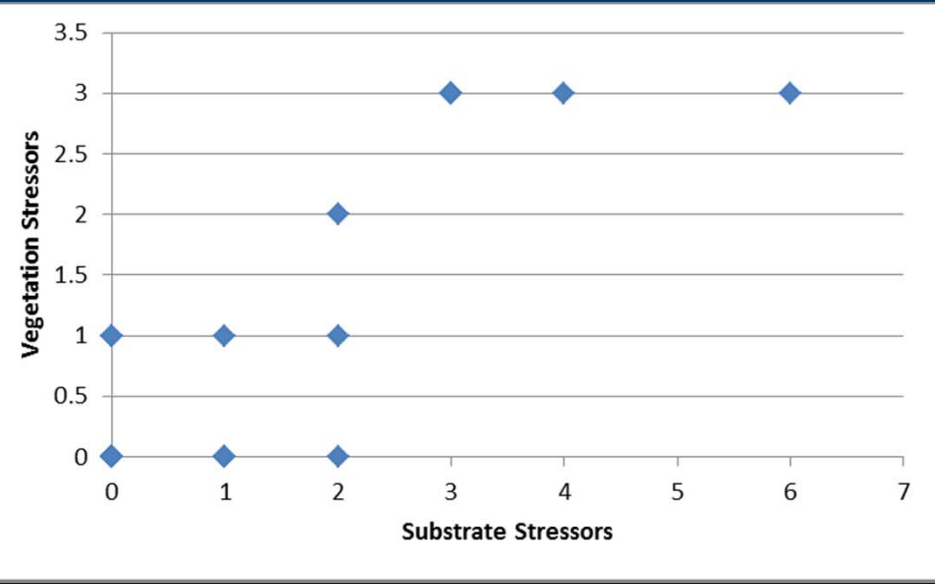
Pearson's *r* = -.427, p = .003, N = 45



r = -.544, p = .0001, N = 45



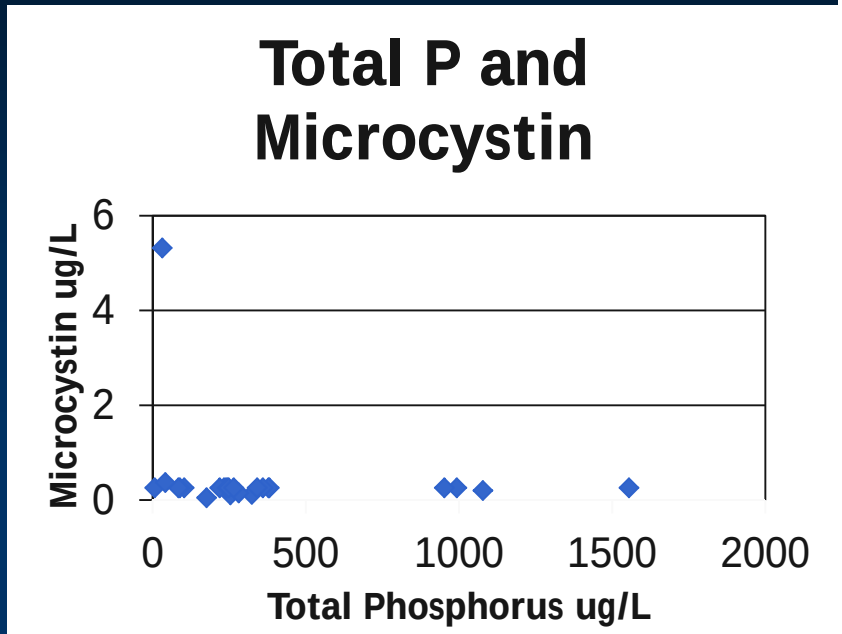
r = -.701, p = .0000, N = 45

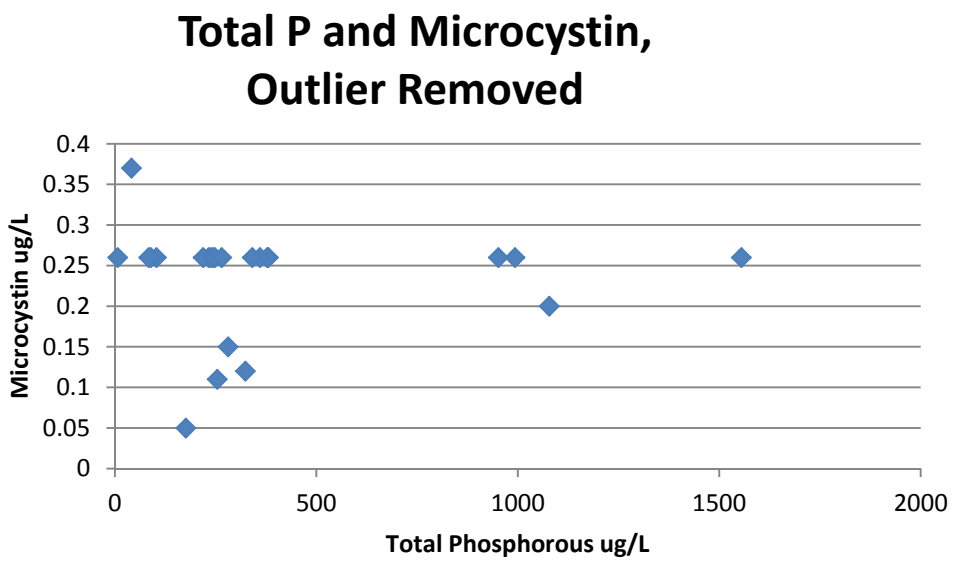


r = .885, p = .0000, N = 45

Nutrients and Toxins

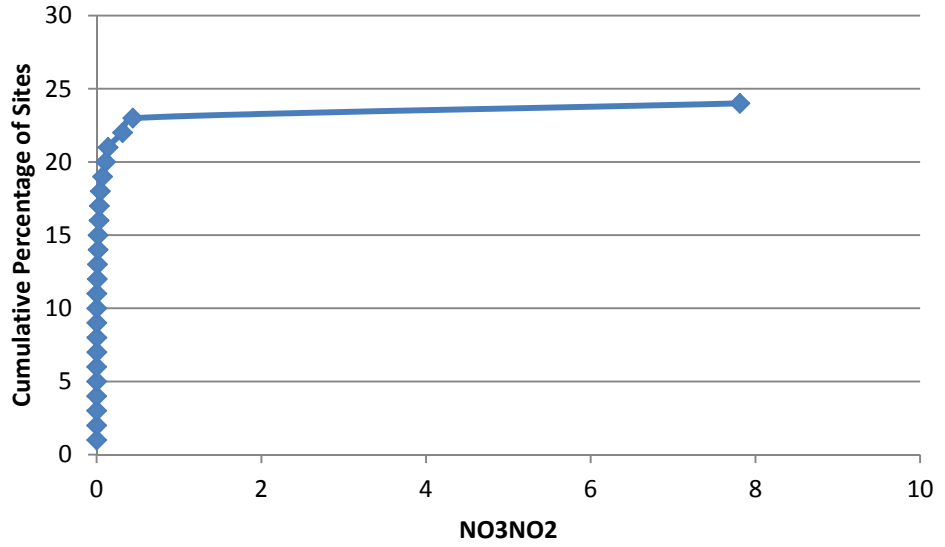
- Phosphorus adheres to sediment
- Re-suspension through mixing brings nutrients to water column
- No relationship between Total P and Microcystin concentrations (R^2 = 0.04, P = 0.38)

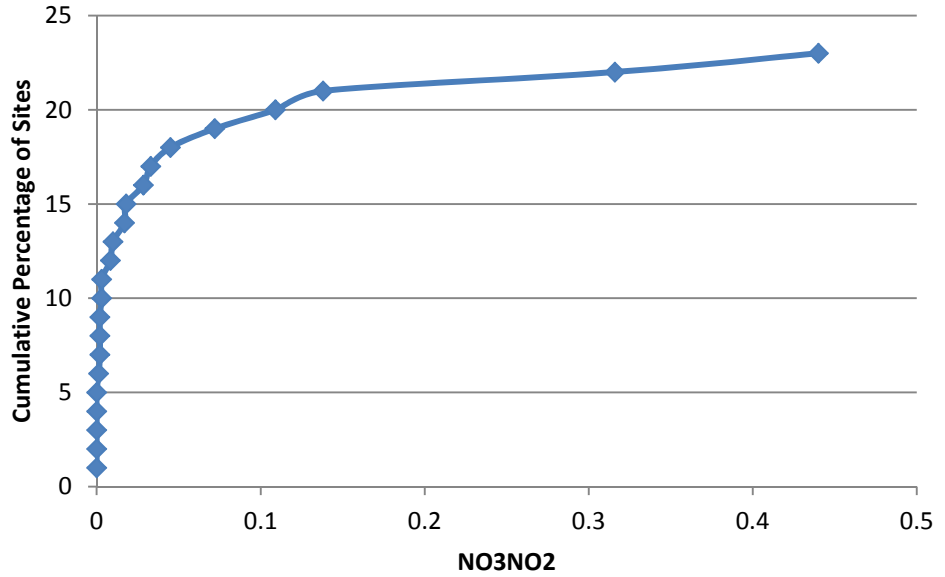




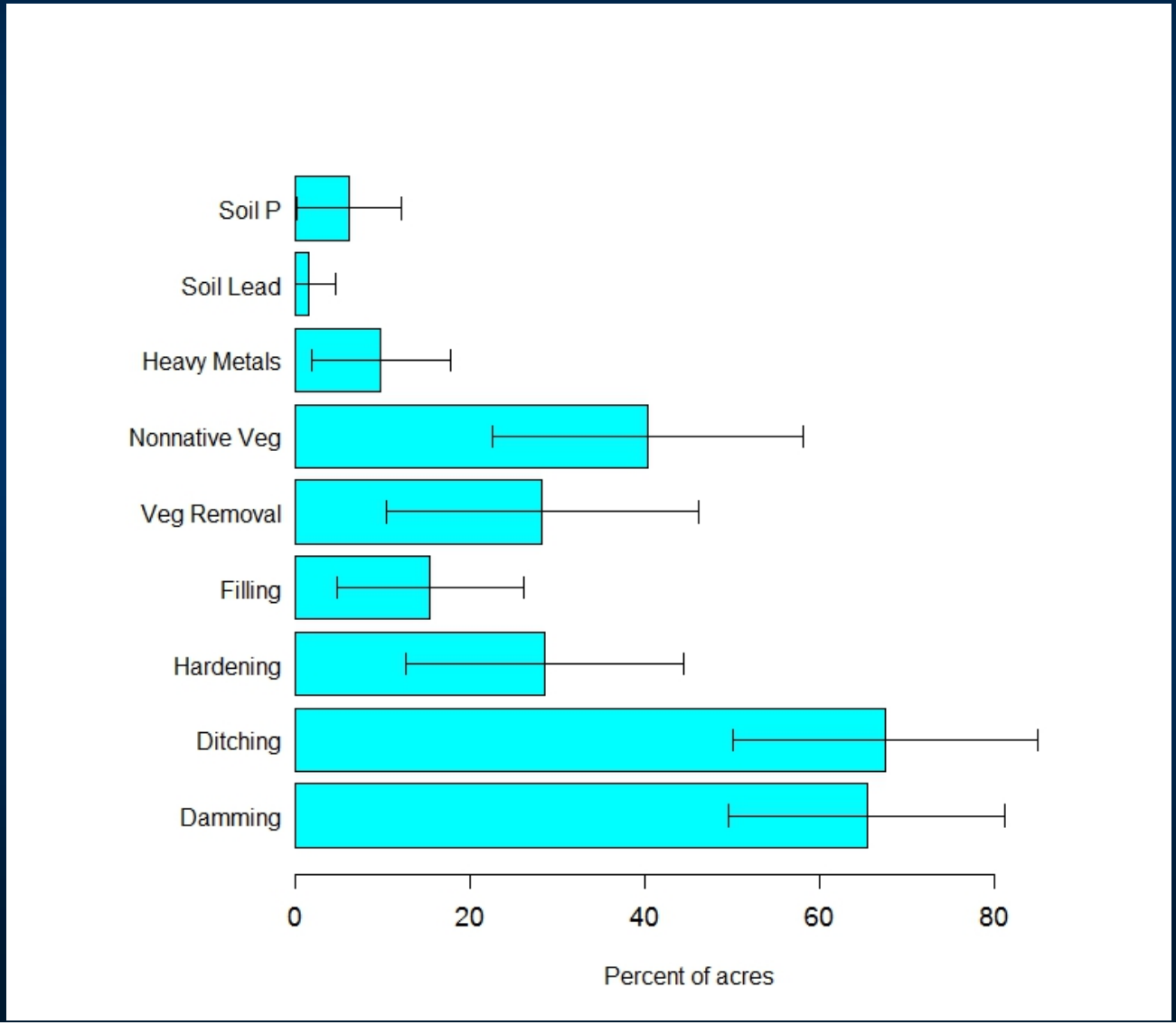
Nutrients Below Threshold

- Cumulative Frequency Distribution
- All sites below 0.5 ug/L except one outlier

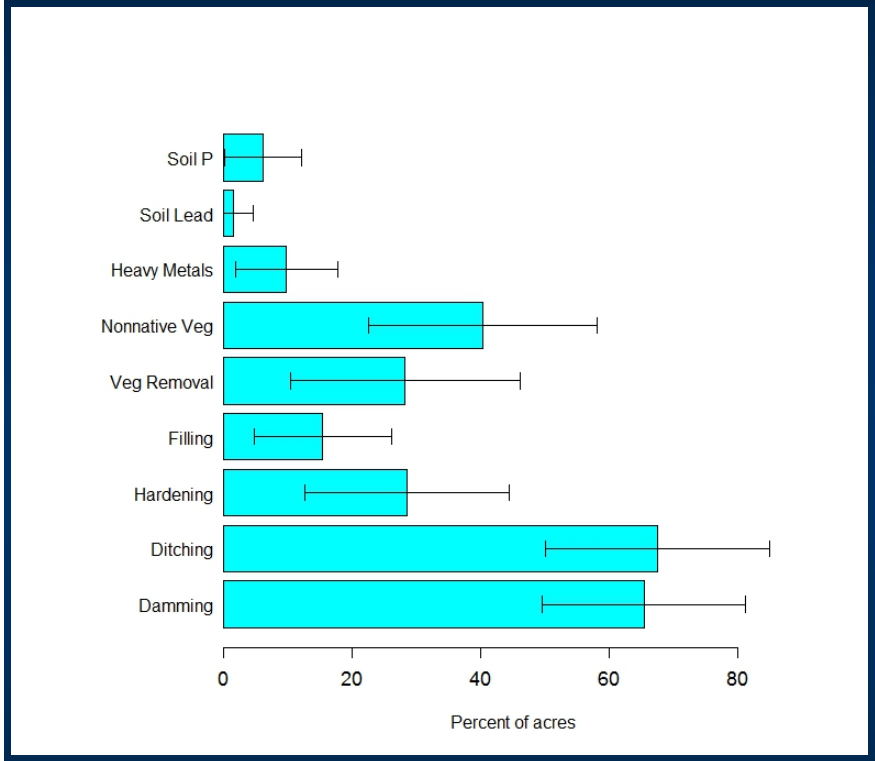


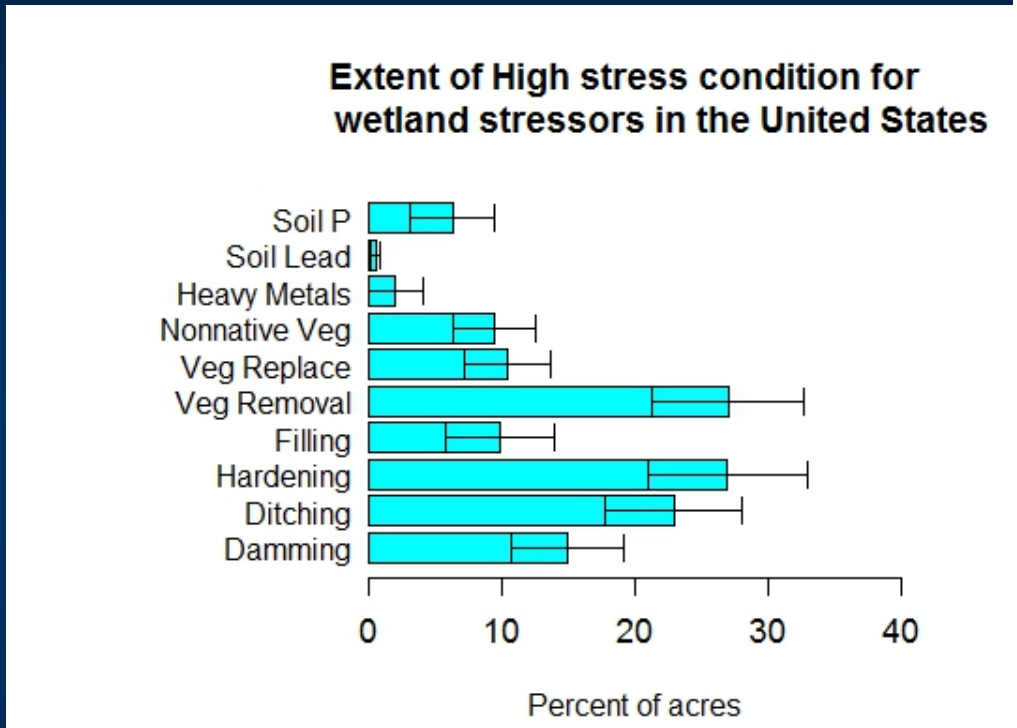


Extent of High Level Stressors

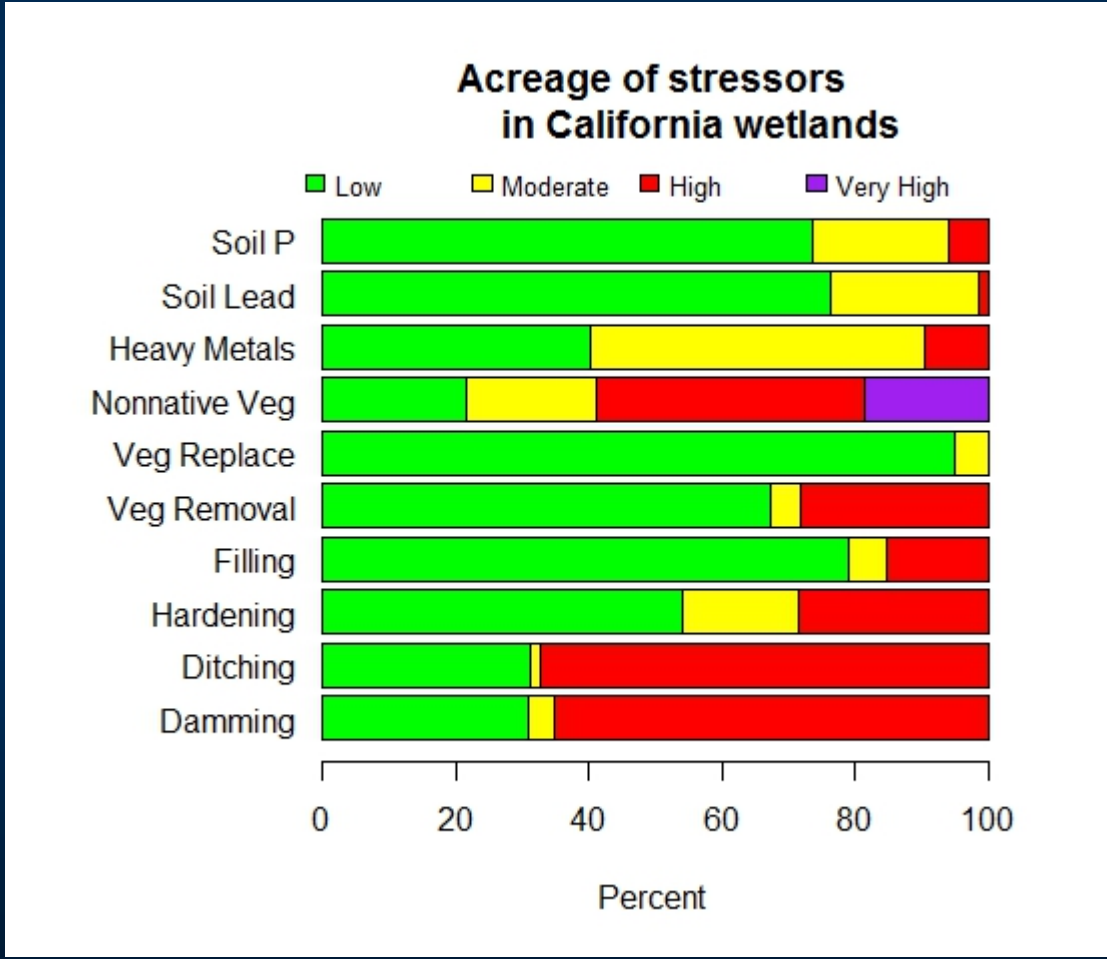


California vs. USA

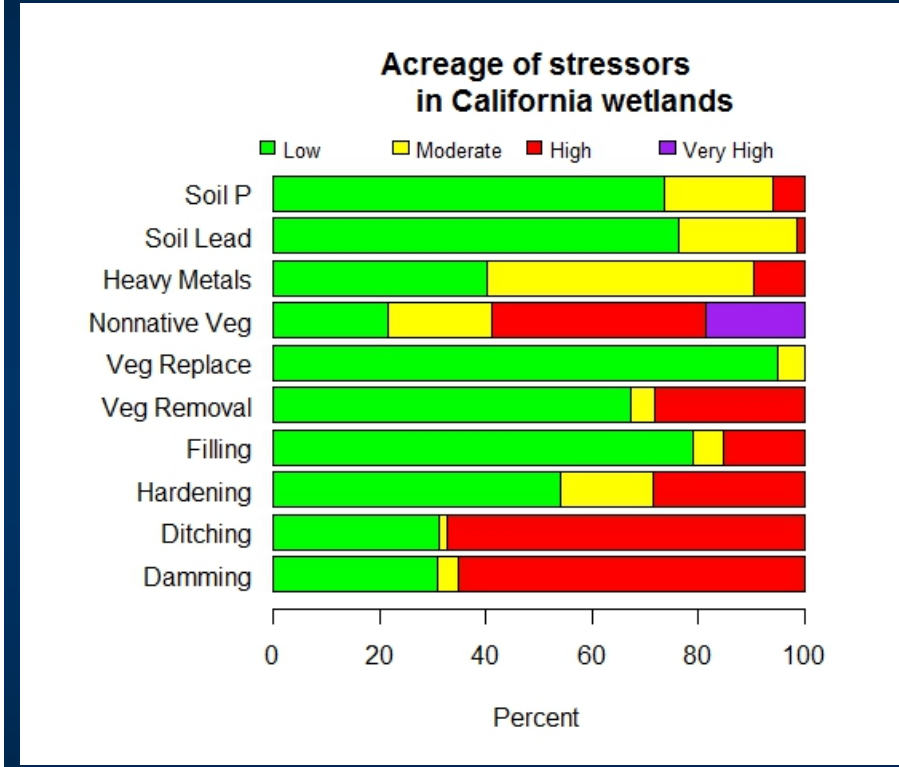


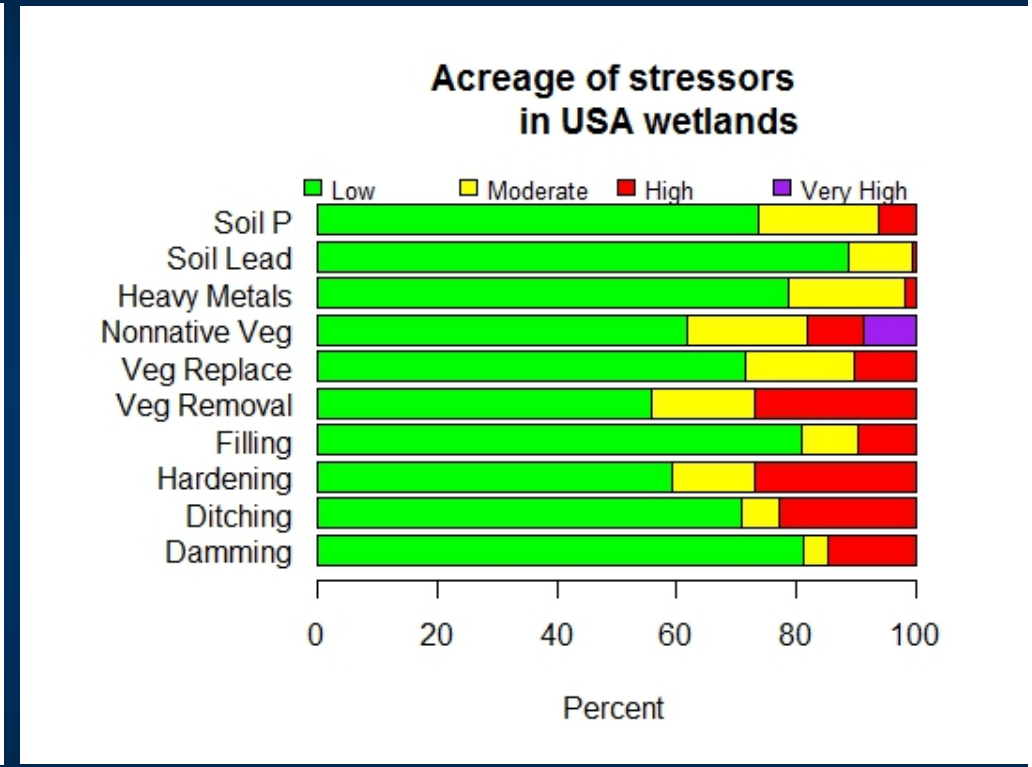


Stressor Classes by Acreage



California vs. USA



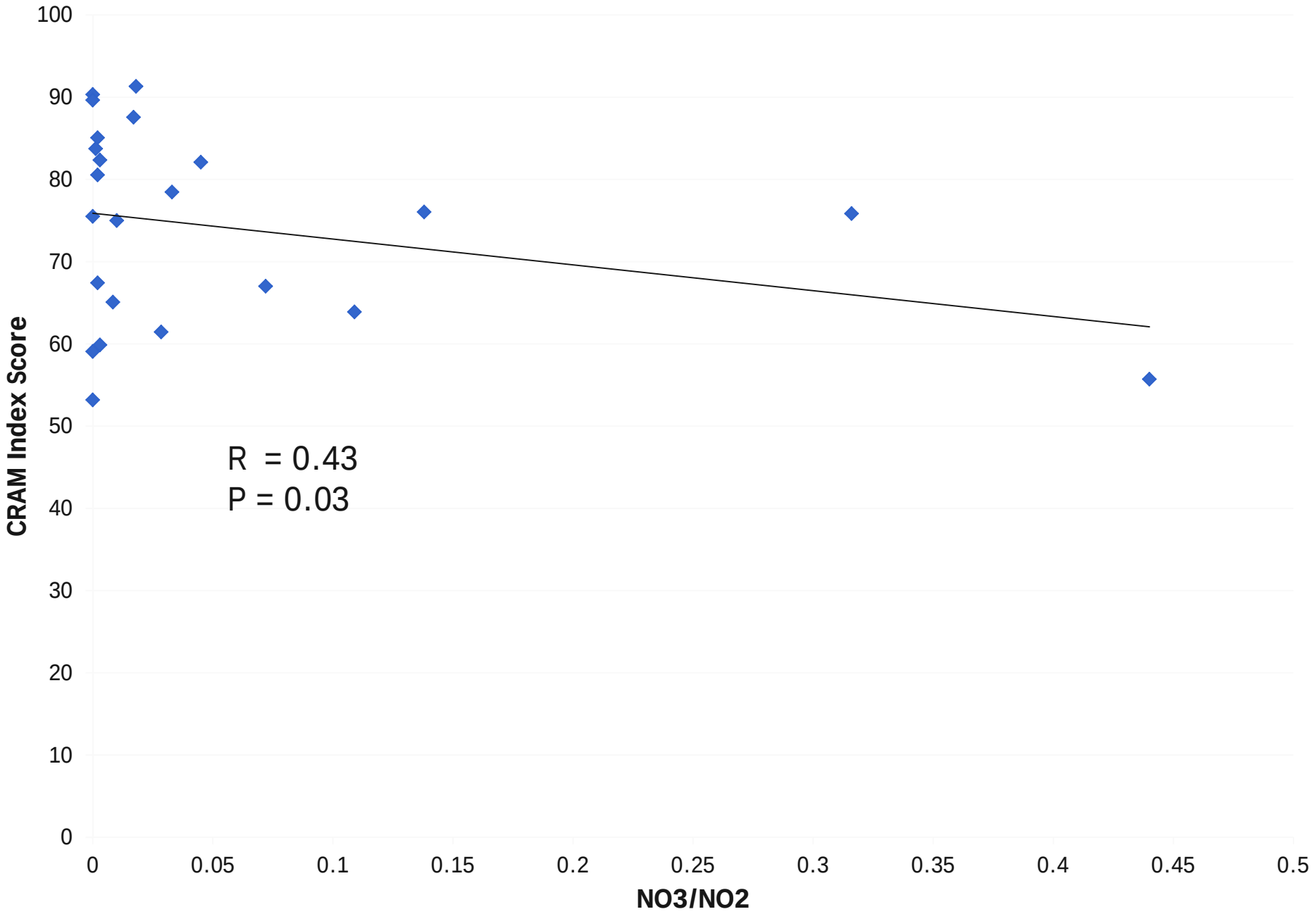


NWCA future analysis

- NWCA could be used to validate RAM models
- Past analysis of CRAM data found significant correlation to Level 3 data (Stein et al. 2009)
- Use NWCA Level 3 to validate USA-RAM and CRAM

Candidate NWCA Level 3 datasets for validation of Level 2 (USA-RAM and CRAM)

- Plant Indices (species richness, invasive cover, etc.)
- Water Quality measurements
- Algal toxicity
- Soil? Any indices?
- Other condition data?


Nitrate/Nitrite vs. CRAM Index Score
CRAM Index Score
NO3/NO2
R = 0.43
P = 0.03
100
90
80
70
60
50
40
30
20
10
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5

Next Steps

- Compare CA data to the nation
- Final binning for USA-RAM
- Designation of "good, fair, poor" for various metrics and analytes

- Communicate results to policy makers and the public (CWQMC, media, etc.)

Planning for 2016

- Discuss site selection for the west
- Sample frame issues
- Best available maps (CARI)
- Indicator and method selection


Thank you
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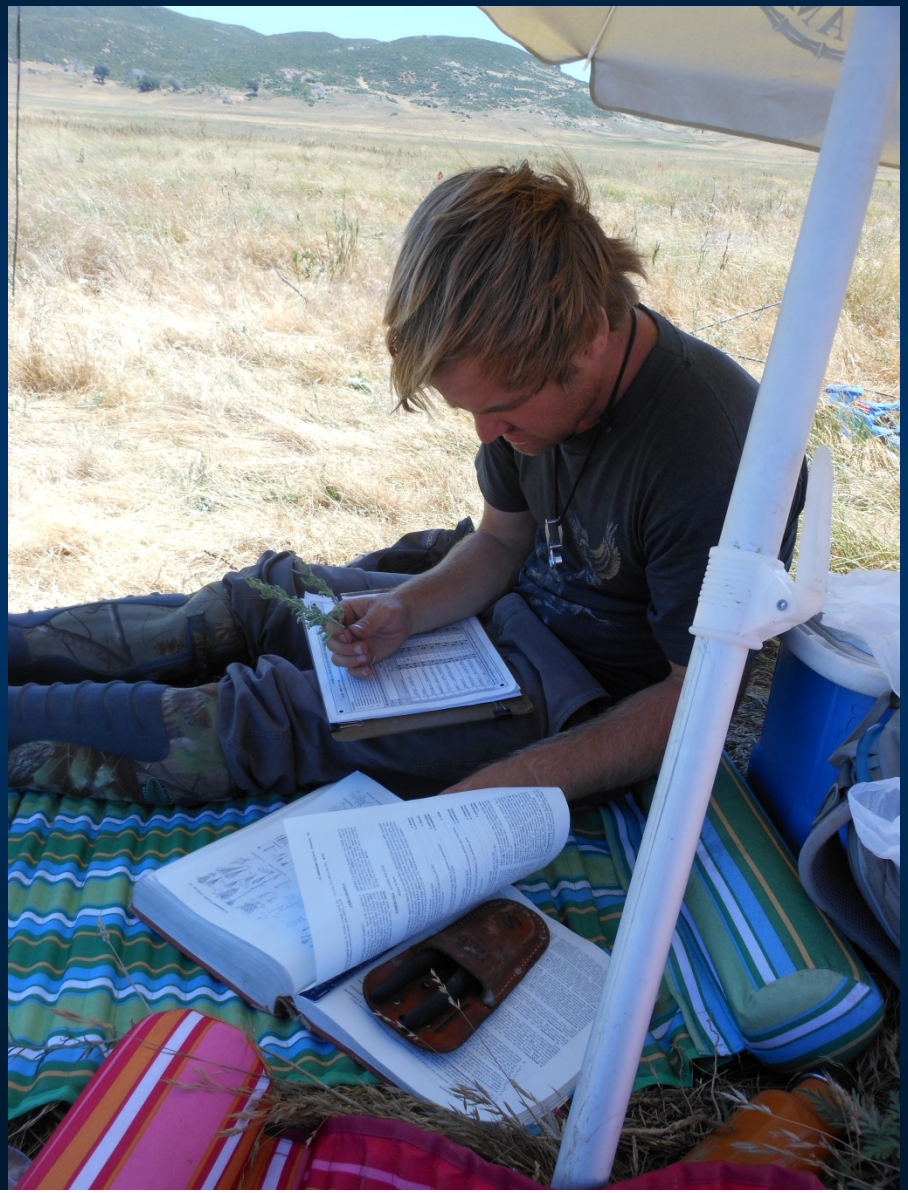
Field Highlights

Extreme Heat




Thunder and Lightning
06/01/2011

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Thursday, March 14, 2013

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Stone Lakes refuge among wetlands being assessed nationwide

By Anne Gonzales
Bee Correspondent

Published: Friday, Jun. 3, 2011 - 12:00 am | Page 1B
Last Modified: Friday, Jun. 3, 2011 - 8:03 am

A national wildlife refuge near Elk Grove is part of a far-reaching effort to assess water and soil conditions in some of the nation's most vulnerable ecosystems.

Stone Lakes National Wildlife Refuge is among the more than 1,000 areas being studied that could help shape protection efforts of wetlands and aquatic resources.

Up to 95 percent of the nation's wetlands – also known as streamside riparian habitats – have been wiped out or modified, said Jonathan Bishop, chief deputy director of the State Water Resources Control Board, one of the partners of the survey.

Nutrient-rich and easy-to-till wetlands were historically seen as good farmland, but many of

PHOTOS

RANDALL BENTON / rbenton@sacbee.com

Assessment team members, from left, Kevin O'Connor, Cara Clark and Sangeet Khalsa hike Thursday through part of the Stone Lakes National Wildlife Refuge near Elk Grove. The National Wetlands Condition Assessment is expected to produce a report on water and soil conditions in the nation's wetlands in 2013.

Slideshow: National Wetland Condition Assessment

MORE INFORMATION

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Wetlands could bog down development
1 month, 1 week ago

Viewpoints: Decision by Ken


Puzzles

Successes

Fun Times

Not so Fun Times


Challenging Condition
05/17/2011 11:48

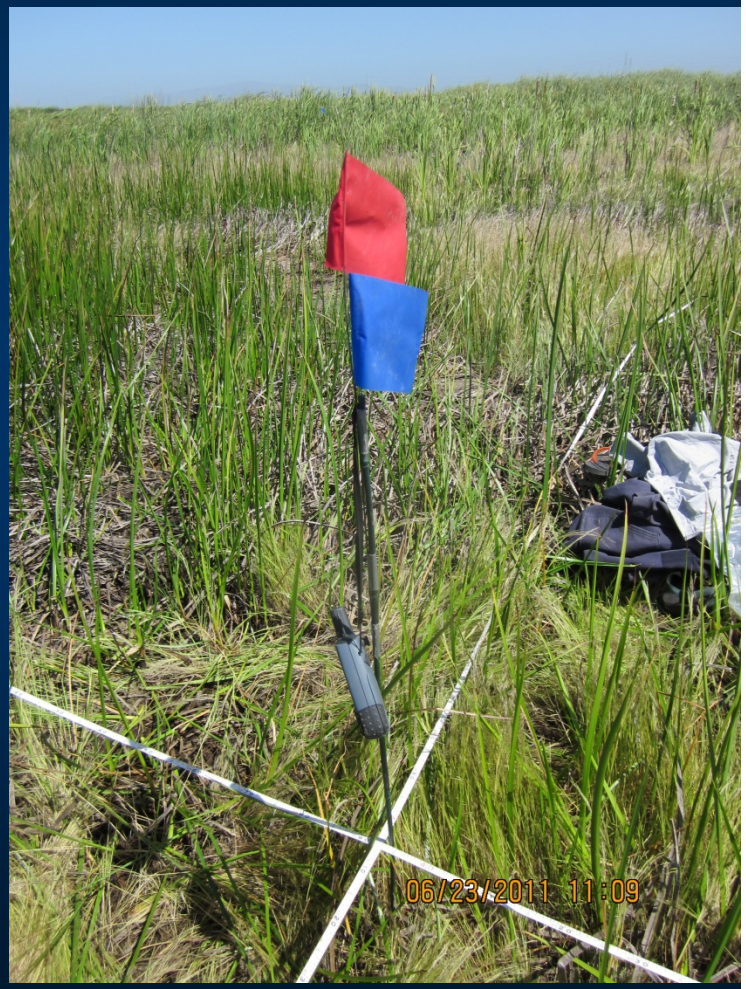

Beautiful Wetlands


Questions?
05/19/2011 08:52


Thank you
sacbee.c

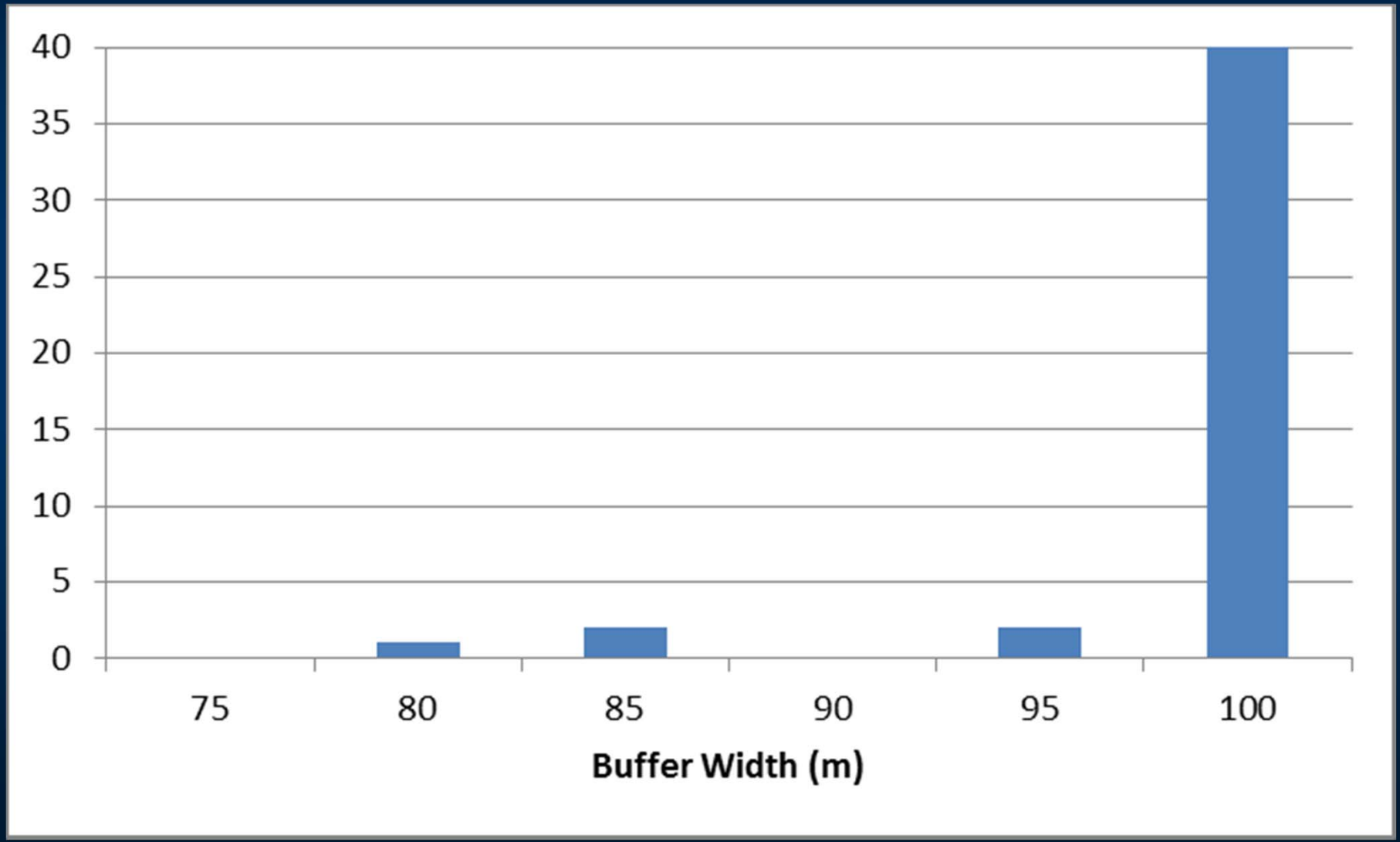
USA RAM: Percent with Buffer

- Every single site had 100% buffer
- Most sites in large wetland complexes
- Very little variability for analysis




Grizzly Island
Hammond Island
Simmons Island
© 2012 Google
Wheeler Island
Dutton Island
Google

USA RAM: Buffer Width



USA-RAM stressors vs. CRAM metrics

- Water Quality Stress was significantly correlated with: Biotic Structure (CRAM Attribute) and Water Source (CRAM metric)
- Hydroperiod Stress was significantly correlated with: Hydrologic Connectivity (CRAM metric)

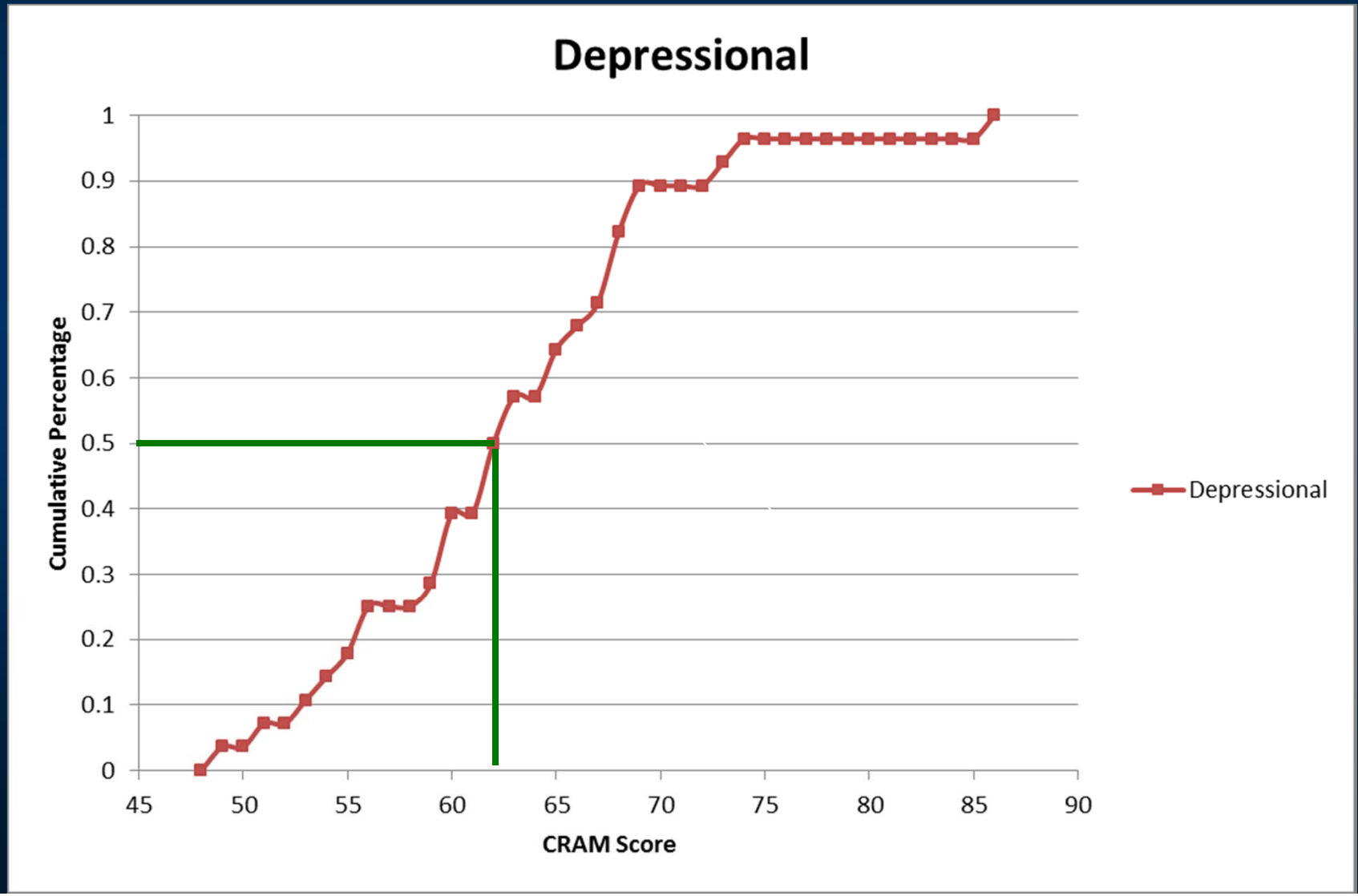
USA-RAM stressors vs. CRAM metrics

- Substrate Stress was significantly correlated with: Vegetation Stressors (USA-RAM stressor metric), CRAM Index score, CRAM Attributes Buffer and Landscape and Biotic Structure, CRAM metrics Buffer, Plant Community and Vertical Structure
- Invasive Cover Stress was significantly correlated with: the Percent Invasive CRAM metric

USA-RAM stressors vs. CRAM metrics

- Vegetation Stress was significantly correlated with: Buffer Stress, Substrate Stress, CRAM Index Score, CRAM Attributes Buffer and Landscape Context and Biotic Structure, CRAM metrics Buffer, Plant Community, and Vertical Structure

Depressional CRAM Score Cumulative Frequency Distribution (CFD)



Estuarine CRAM Score CFD