California Coastal Wetlands Monitoring Venture

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3-Level Approach

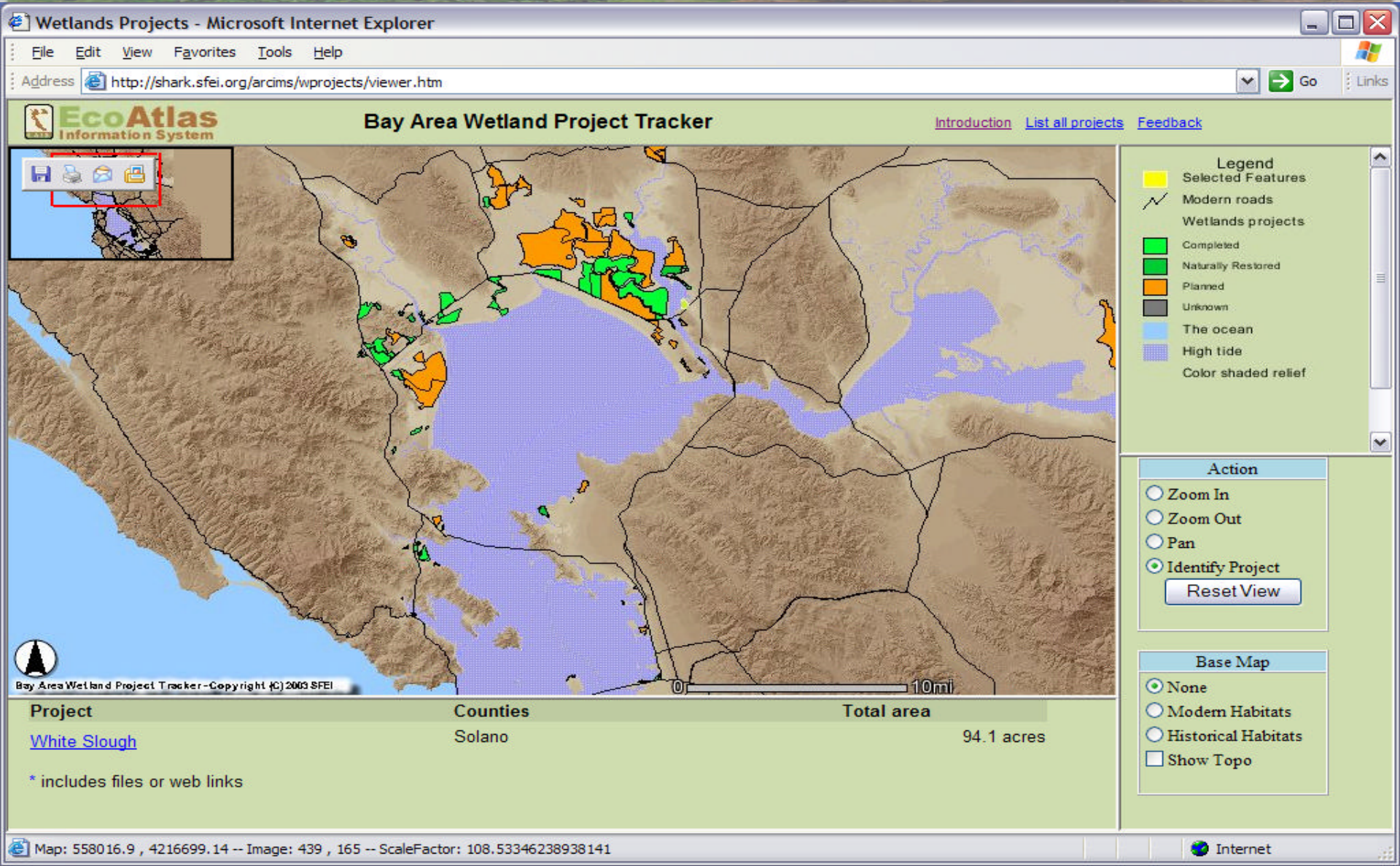
Level 1: Inventory Wetland Habitats and Projects; Develop Wetland Landscape Profiles

- Assess status and trends in wetland distribution and abundance, including projects.
- Develop sample frame for regional *probabilistic* ambient monitoring of condition by wetland type.

Level 1 Inventory

- California State Wetlands and Riparain Habitat Inventories follow NWI protocols with annotation for water source (HGM) and Landscape Position
- Input from local and regional agencies
- Data managed in Wetland Trackers of EcoAtlas www.wetlandtracker.org

Level 1 Inventory: Wetland Tracker



Level 1 Inventory: Wetland Tracker

Add Fileset, Web link, or Comment - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://dev.sfei.org/GISInfoCatalog/servlet/org.sfei.GISInfoCatalog.UserInterface?directive=newfileset&project_name=White+Slough

Go Links

EcoAtlas Information System

Bay Area Wetland Project Tracker

Close Window

White Slough

Add Files, Web Link, or Comments

Add one or more files to this project to make the information available to others in the wetland restoration community. The files can be of any type -- reports, photos, spreadsheets, or others.

Alternatively, submit a web link (URL) to information available elsewhere on the web, and the link will appear on the project information page.

Or, simply add a comment. Like web links, comments appear on the project information page.

To make a submission, you must have cookies enabled on your browser.

1. Give your submission a short, descriptive **title**; indicate the **type** of information you are submitting or providing a link to; and if desired, provide a detailed **description or comment**. This information will appear on the project information page.

Title

examples: "Aerial photo of Pond 16"; "Final project report"; "Link to mercury data"

Type ○ Report ○ Data ○ Photo ○ Map ○ Comment ○ Other

Description/ Comment

If you are submitting a link to a web page, enter the URL (address) here:

URL

example: http://www.sfei.org/wetlands/mydata (always start with "http://")

Done

Internet

3-Level Approach

Level 3: Intensive Monitoring and Special Studies

- Develop predictive models of relations among states, functions, and stressors.
- Calibrate and validate Level 1 and Level 2.
- Develop standard protocols for intensive monitoring www.wrmp.org/cram.html

3-Level Approach

Focus on Level 2:

California Rapid Assessment Method

CRAM

Goals of the CRAM Program

Develop a method for assessing wetland condition that can be routinely used for evaluation and monitoring purposes

- relatively rapid
- scientifically defensible
- understandable to a broad range of expertise
- usable and consistent across wetland types
- applicable throughout California
- has a regional perspective

CRAM Scope

All wetlands of all types within coastal watersheds of California

Seven Major Wetland Types

lacustrine, estuarine, coastal lagoon, riverine, depresssions, vernal pools, seeps and springs

At this time, “all” means every wetland that can be mapped using $1m^2$ pixel resolution geo-rectified image plus ground-truthing.

Basic CRAM Assumptions

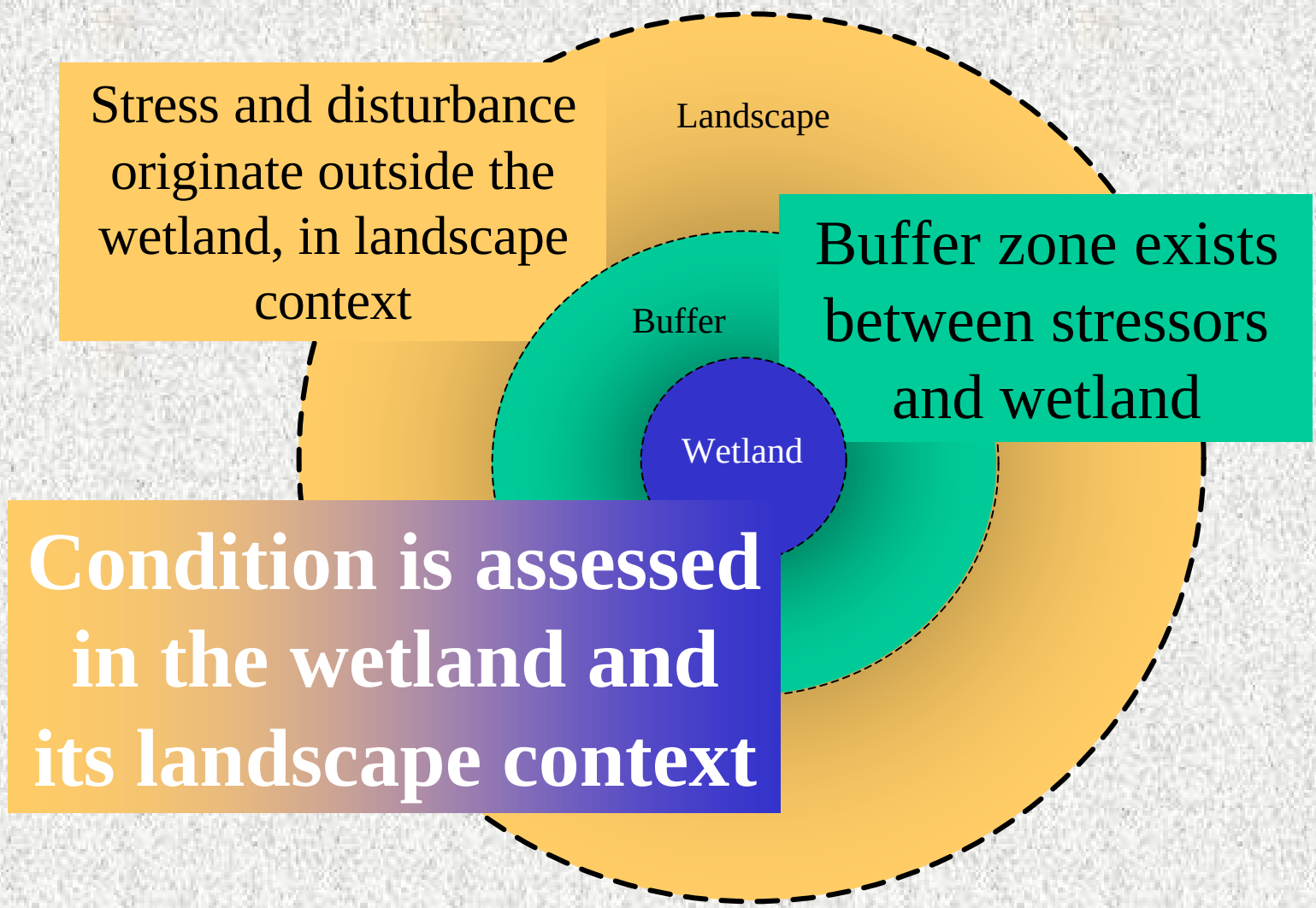
- Wetland condition can be assessed based on field indicators.
- Anthropogenic stressors contribute to wetland condition.
- Stressors can be managed to achieve conservation goals.

CRAM Potential Uses

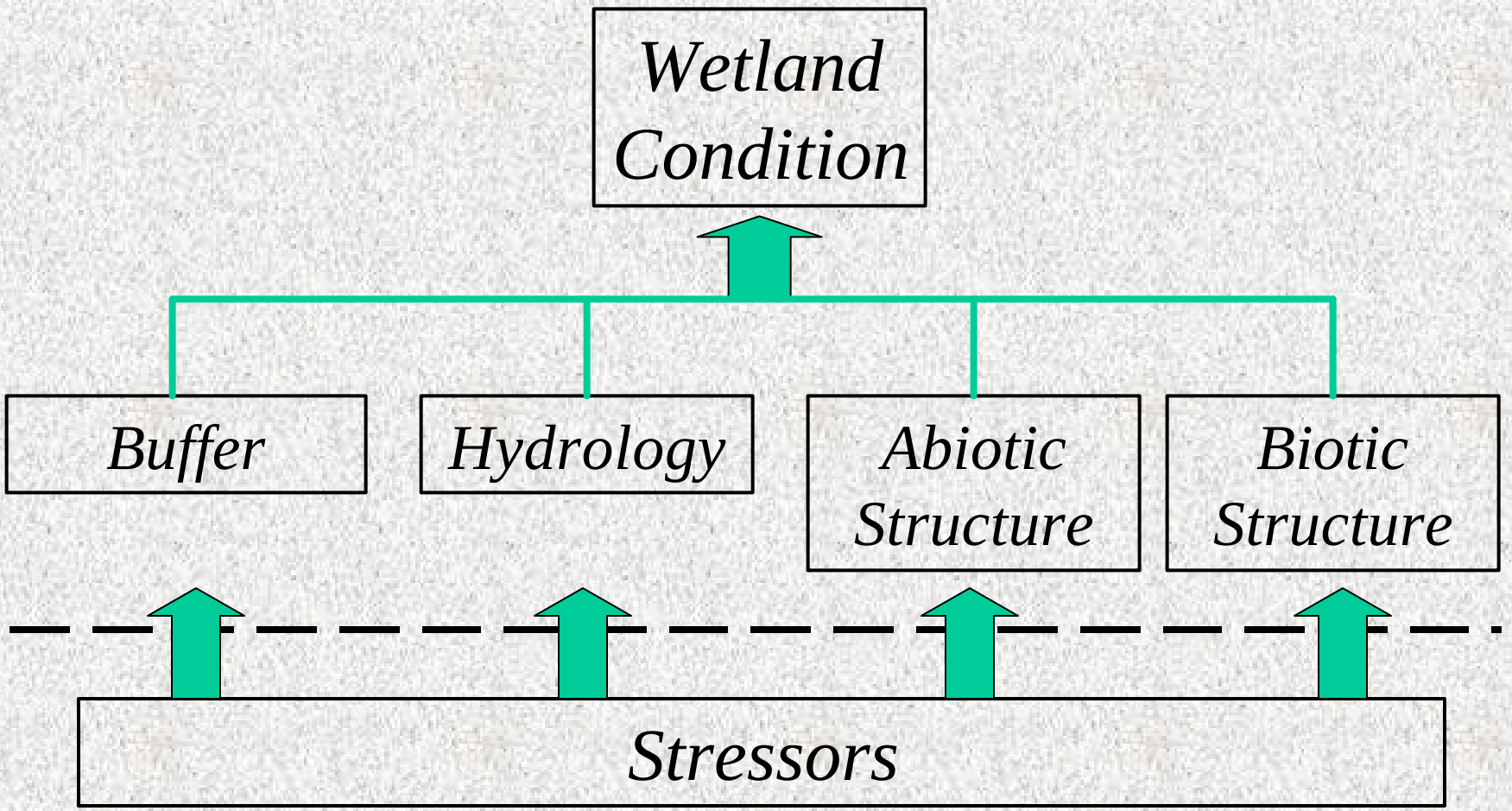
- Ambient monitoring
- Compliance monitoring
- Restoration performance assessment
- local and cumulative impact assessment
- Stressor analysis

Conceptual Model

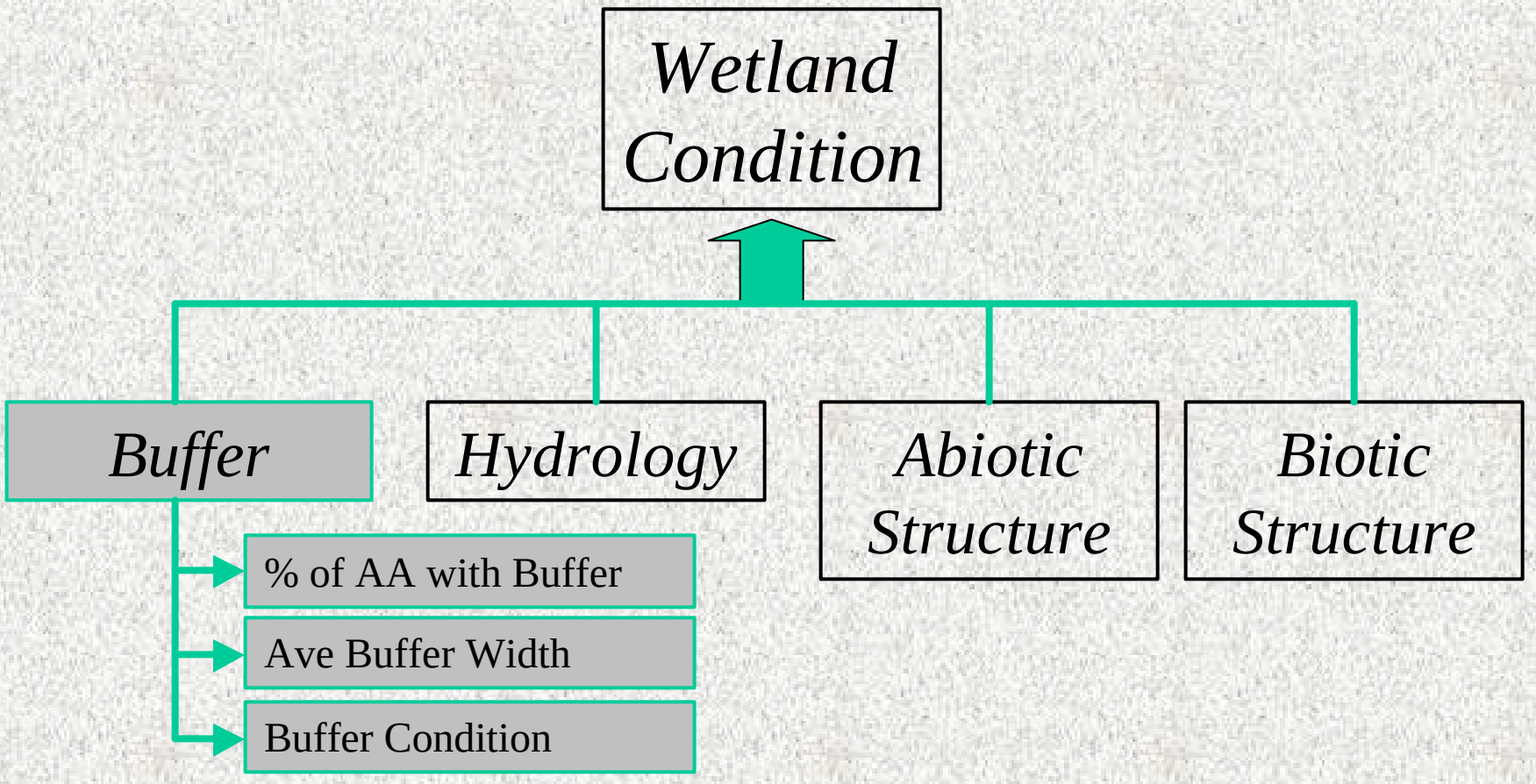
Spatial Template of Driving Forces



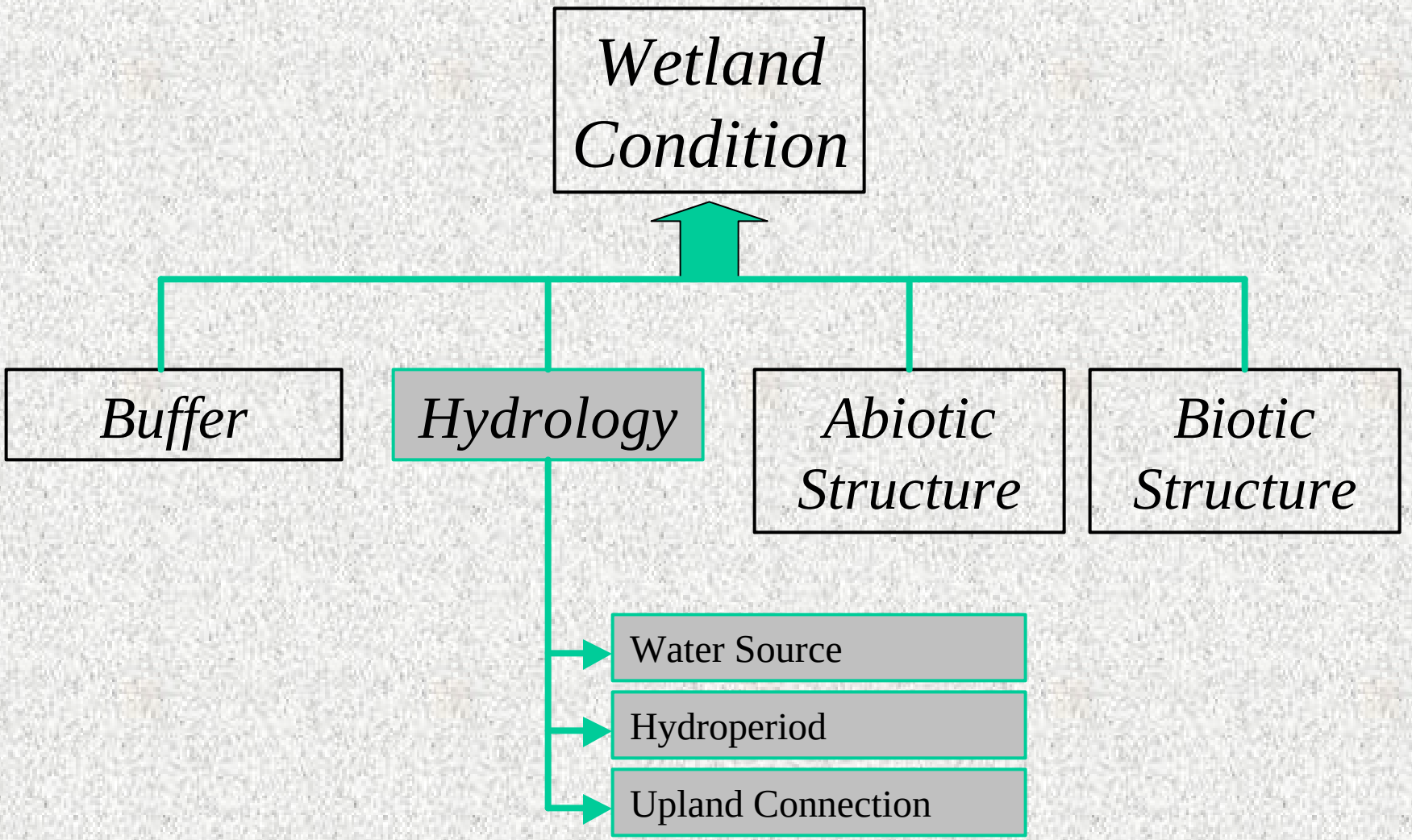
CRAM Conceptual Framework: Condition and Stressors



CRAM Conceptual Framework: Condition Attributes and Metrics



CRAM Conceptual Framework: Condition Attributes and Metrics



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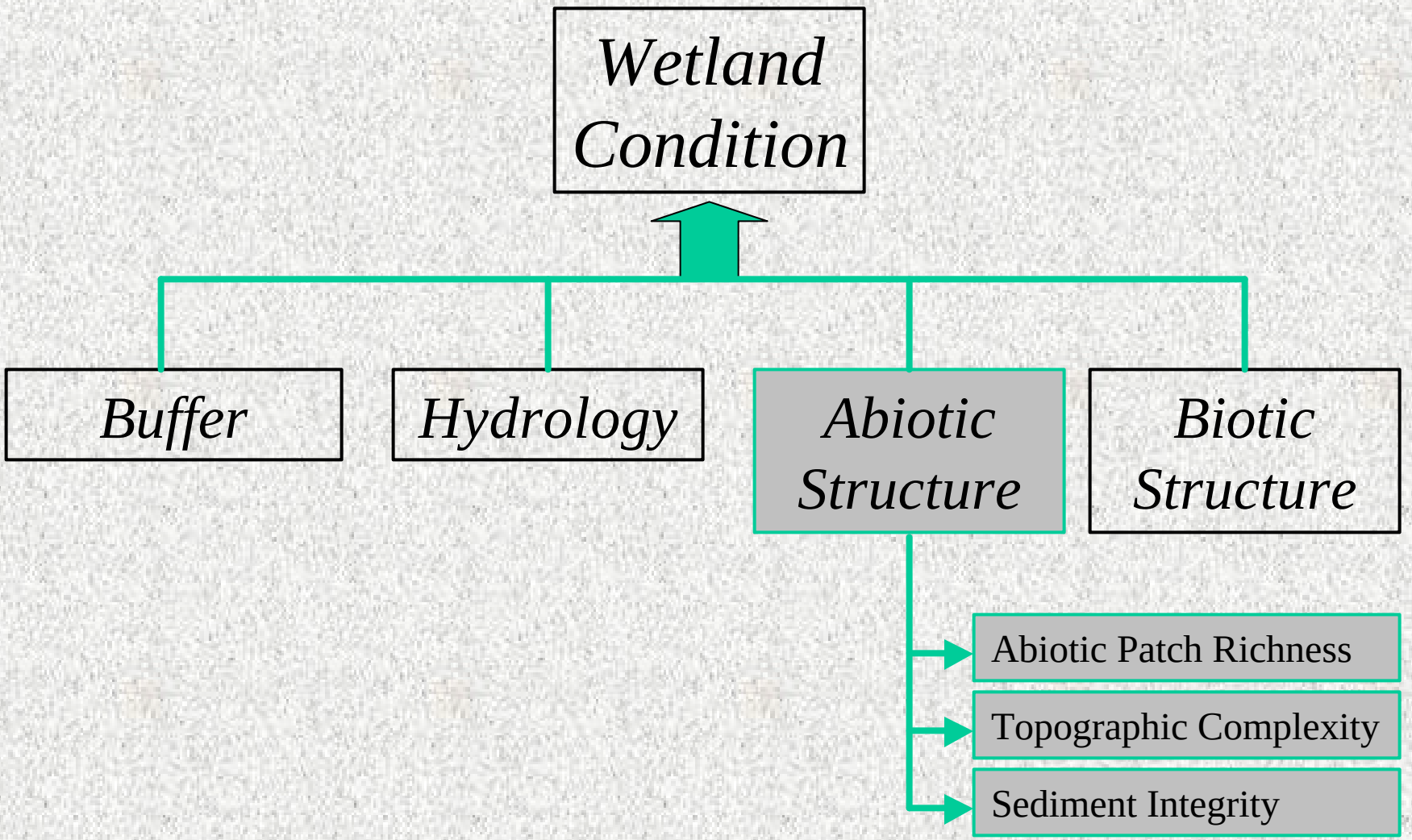

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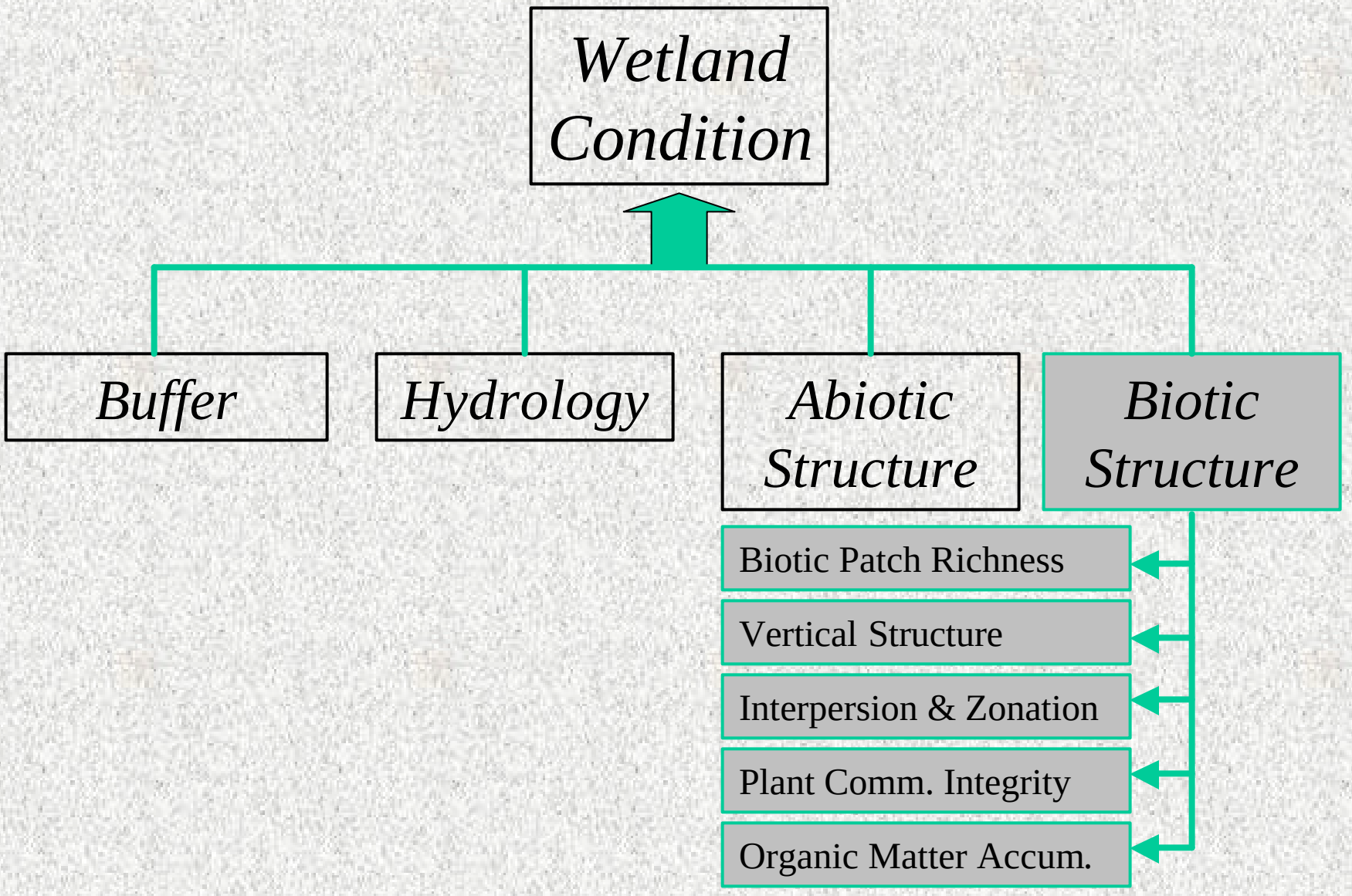


CRAM Development Teams

State Wide Core Team

- Coordinate process of CRAM development and implementation.
- Provide technical review.
- Integrate science and policy.

Regional Teams

- Provide regional perspective.
- Provide technical review.
- Help with verification, calibration, and validation.
- Help implement.

1 State-Wide Core Team

3 Regional Review Teams (South Ca, North Ca, Central Coast)

CRAM Development Teams

State Wide Core Team

- Project PIs
- State and Federal Regulatory and Resource Management Agencies
- State Colleges and Universities

Regional Teams

- Core Team
- Regional staff of State Agencies
- Regional Science NGOs
- Special Districts
- Private Consultants

CRAM Development

Development Steps

- **Initial development**
- **Field verification**
  - Assess the general ability of metrics to discern high vs. low condition wetland
- **Field calibration**
  - Develop scaling & scoring of metrics
- **Field validation**
  - Test the efficacy of the method to predict condition, fine-tune metrics
- **Education, outreach, & training**

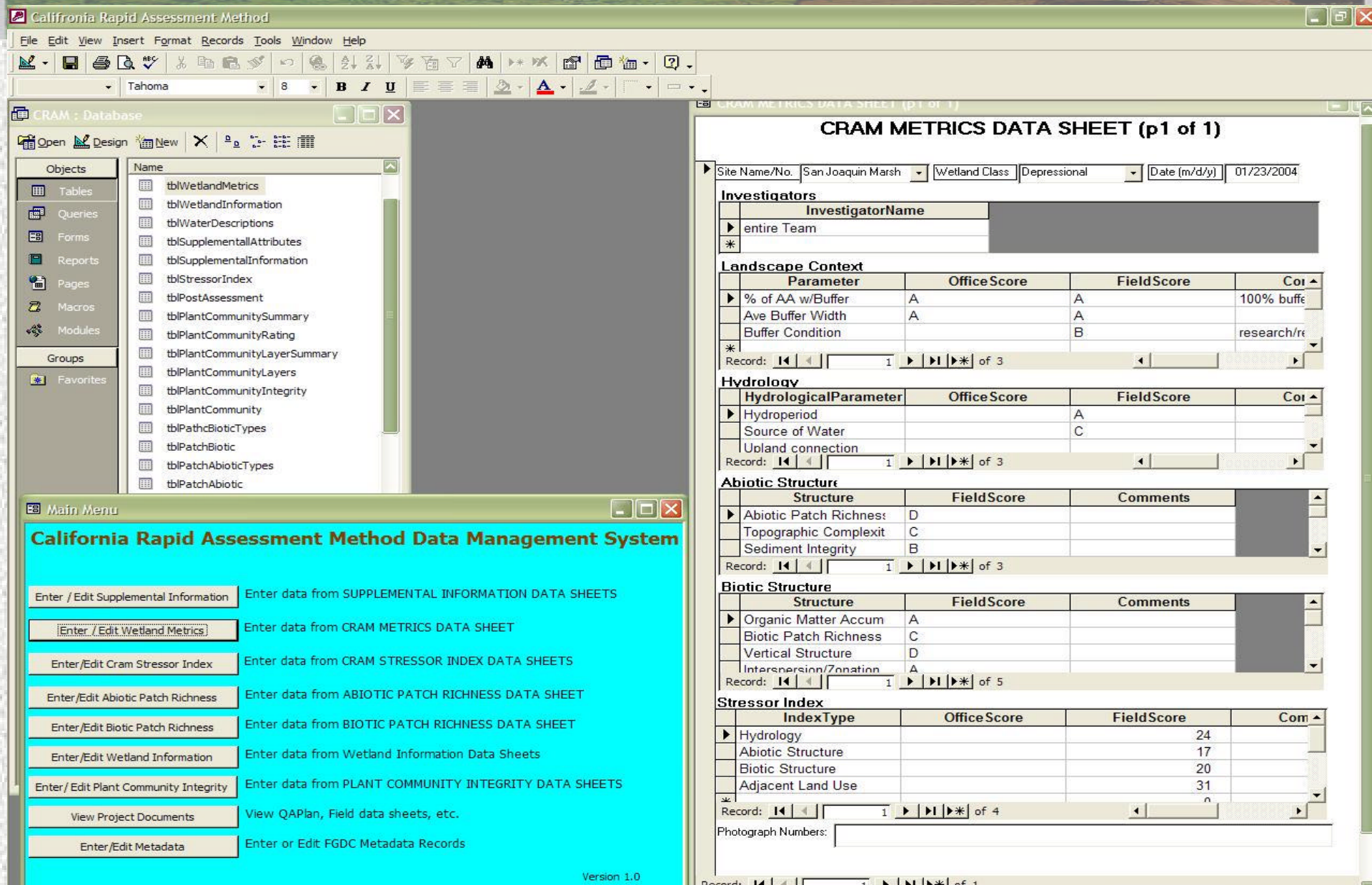
Verification Questions

- Is CRAM rapid (2-3 hours)?
- Does CRAM produce a full range of scores?
- Do the metrics discern high vs. low stress wetlands?
- Are the metrics appropriate and comprehensive?
- Are all wetland classes adequately assessed?
- Should wetland types or metrics be regionally modified?
- Is CRAM repeatable?

Number of Sites Visited

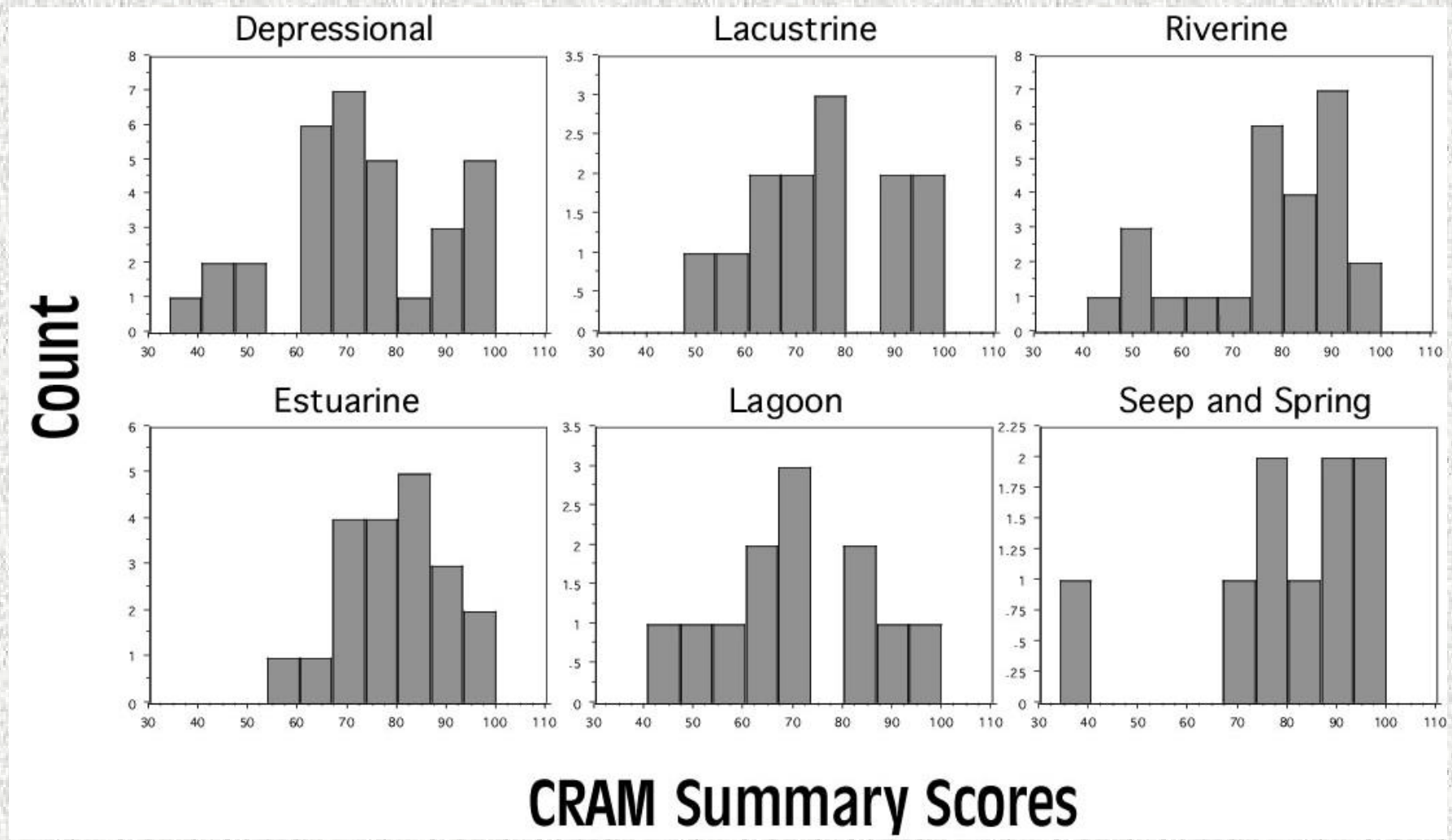
Wetland Class	A Priori Classification of Wetland Sites			
	High Quality	Med. Quality	Low Quality	Total
Riverine	10	9	7	26
Depressional	8	12	13	33
Vernal Pools	(5)	(5)	(2)	(12)
Lacustrine	4	5	7	16
Lagoons	2	3	8	13
Estuarine	8	8	5	21
Seeps and Springs	5	3	1	9
Total	**37**	**40**	**41**	**118**

CRAM Data in Regional Wetland Trackers

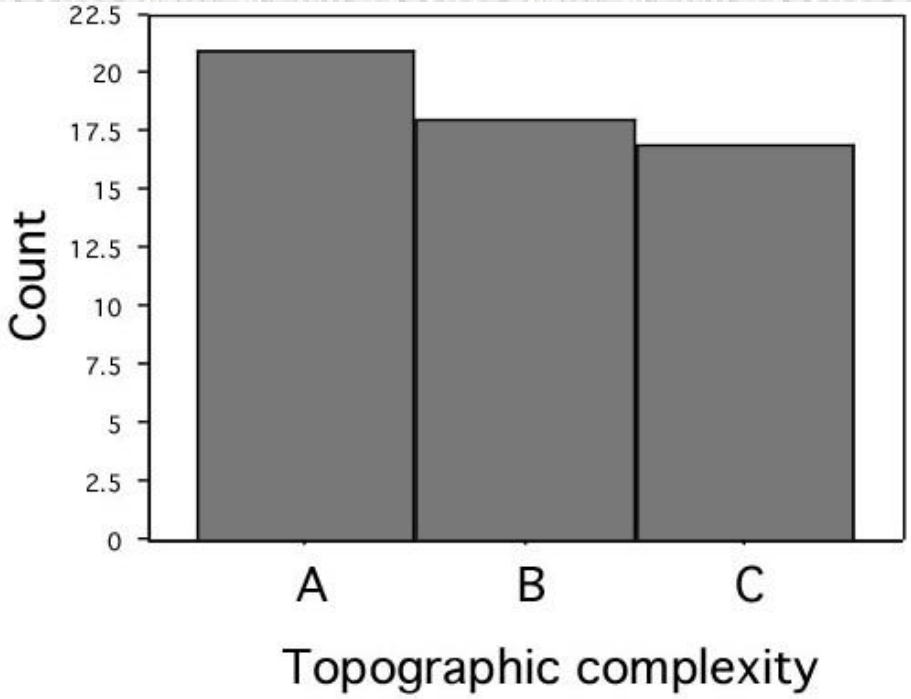


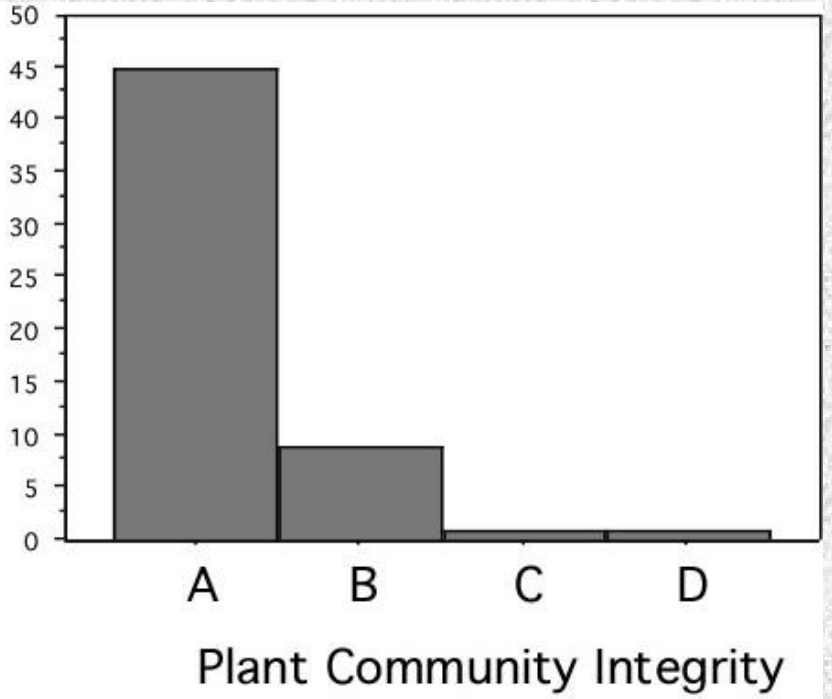
Is CRAM Rapid?

A Full Range of Scores?

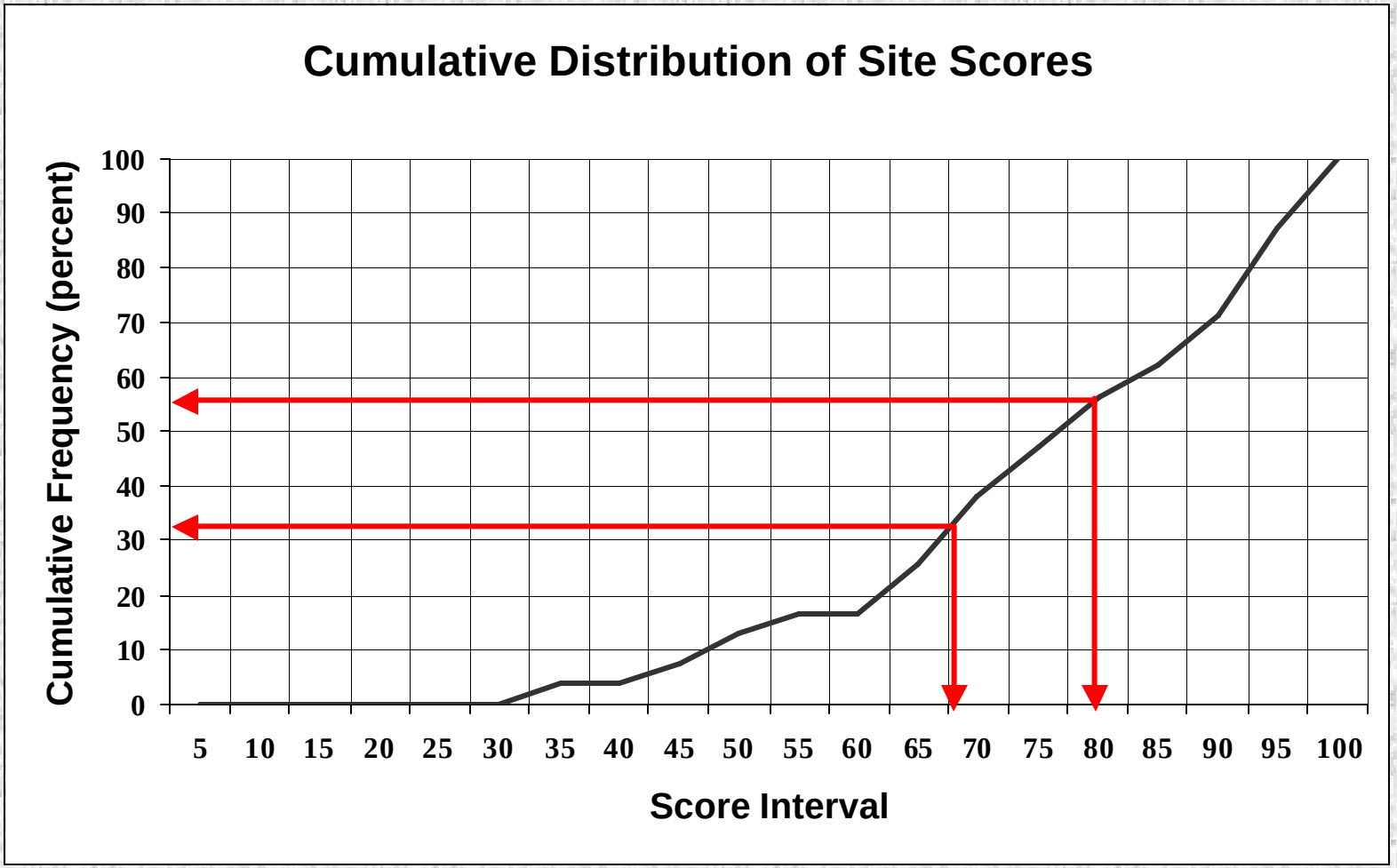


A Full Range of Variability?

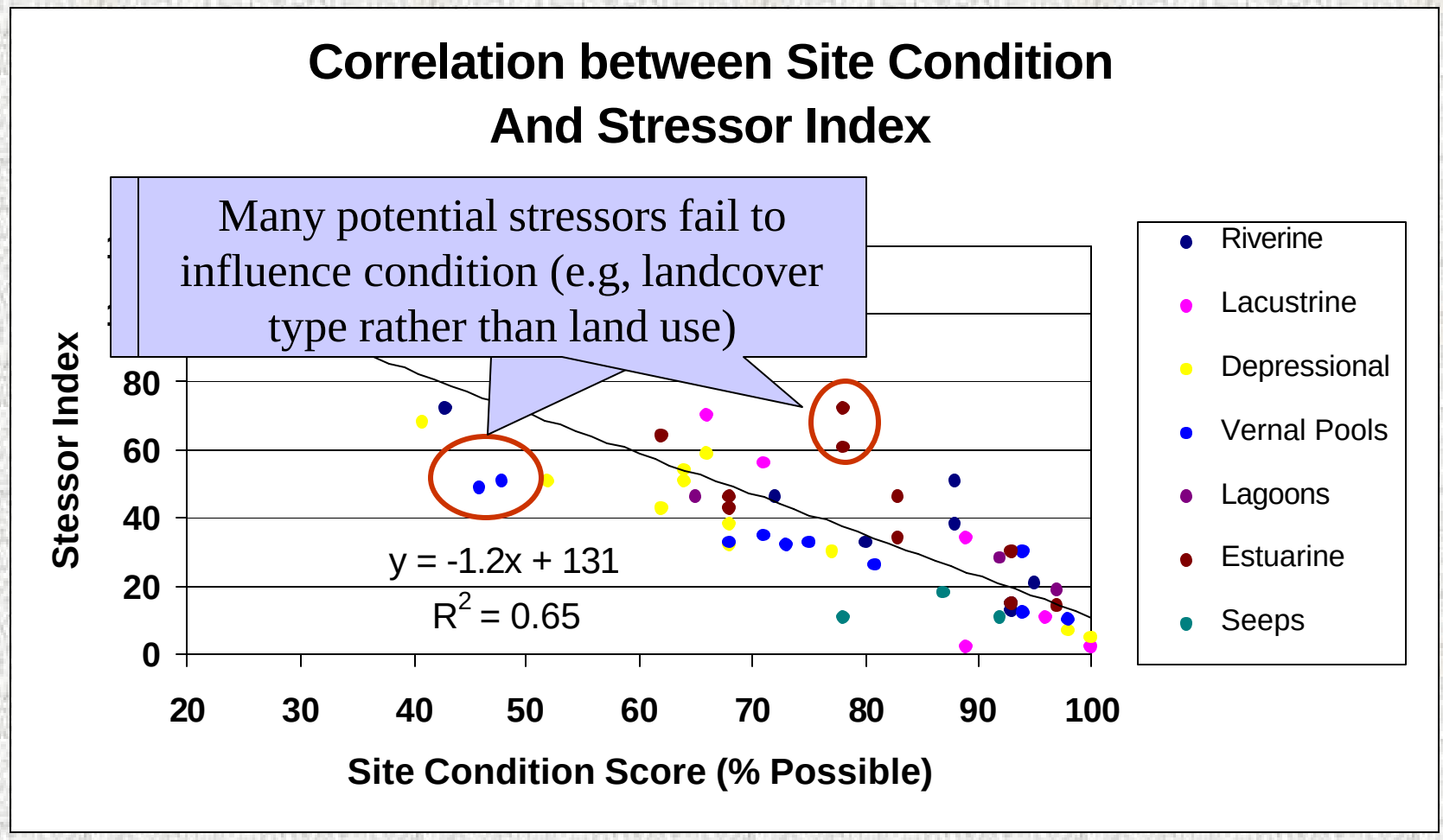




Discern High vs. Low Conditions?



Does Condition Relate to Stress?



All Wetlands Adequately Assessed?

Need additional work for:

- **Seeps and springs**
  - Differentiation from other wetland classes
  - Site-specific variability makes generalization difficult
- **Riverine wetlands**
  - High gradient versus low gradient

Performance of CRAM Metrics

Landscape Context

	% of AA w/ Buffer	Ave Buffer Width	Buffer Condition
Riverine			high gradient
Estuarine			
Lagoon			
Depressional			
Slope			
Lacustrine			

Hydrology

	Source of Water	Hydroperiod	Upland connection
Riverine			high gradient
Estuarine			
Lagoon			
Depressional			
Slope			
Lacustrine			

Biotic Structure

	Organic Matter Accum.	Biotic Patch Richness	Vertical Structure	Interspersion / Zonation	Plant Comm Integrity
Riverine	high gradient				
Estuarine					
Lagoon					
Depressional					
Slope					
Lacustrine					

Abiotic Structure

	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity
Riverine			
Estuarine			
Lagoon			
Depressional			
Slope			
Lacustrine			

Additional Metrics Suggested

Possible additional metrics

- Wetland size
- Wetland form
- Connectedness
- Site as percent of total wetland area
- Linear contiguity (riverine wetlands)
- Adjacent land use as stressor

CRAM Verification Conclusions

- CRAM ***is*** rapid.
- CRAM ***does produce*** a full range of scores.
- CRAM ***can discern*** high vs. low condition wetlands.
- CRAM scores ***do correlate*** with stressor index.
- Wetland classes are adequately assessed for most metrics (refinement needed for depressions, seeps and springs, and riverine wetlands).
- Is the method repeatable (may depend on expertise)?

Facing the Future

- Defining Reference Condition
- Conducting Calibration and Scaling
- Revising the Stressor Index
- Implementation

Reference Condition

Absolute Reference

- Consistent for each wetland class and region.
- Defined by optimal alternative states for all metrics combined (narrative definition).
- Requires more inter-regional coordination.
- May set the bar too high for some regions and sites.

Relative Reference

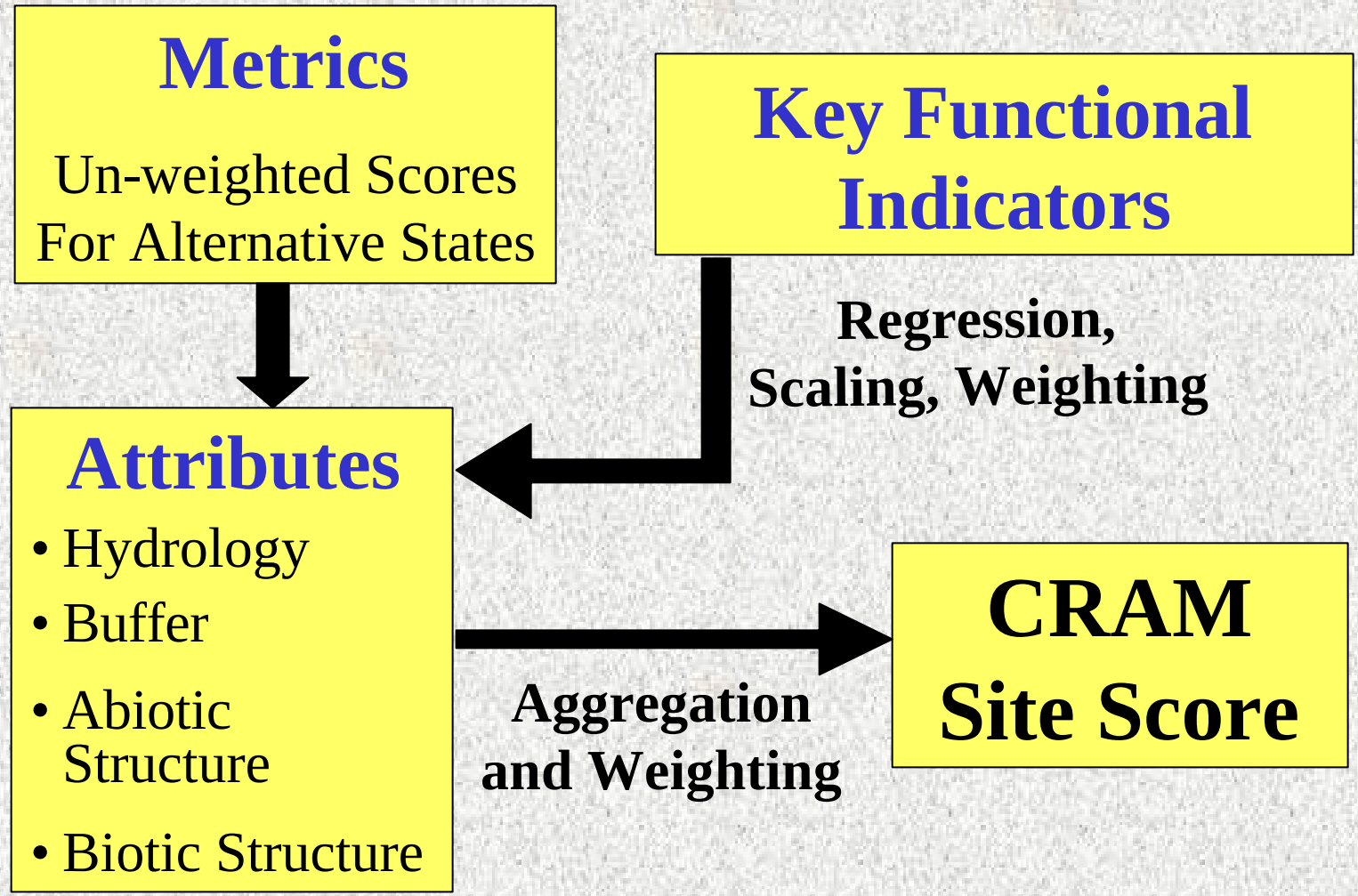
- Specific to each region (CRAM results would not be comparable between regions).
- Requires identifying and collecting data at reference sites (best achievable conditions may not be evident).
- May set the bar too low for some regions and sites.

Calibration

Calibration is needed to assure that CRAM scores correlate with key wetland functions

- Initial calibration will depend on existing data for plants, animals, and habitat structure along stressor gradients within each region.
- Common data exist for the structure of plant, avian, and macro-invertebrate communities, density of selected species of special status, and edaphic conditions.

Calibration Process



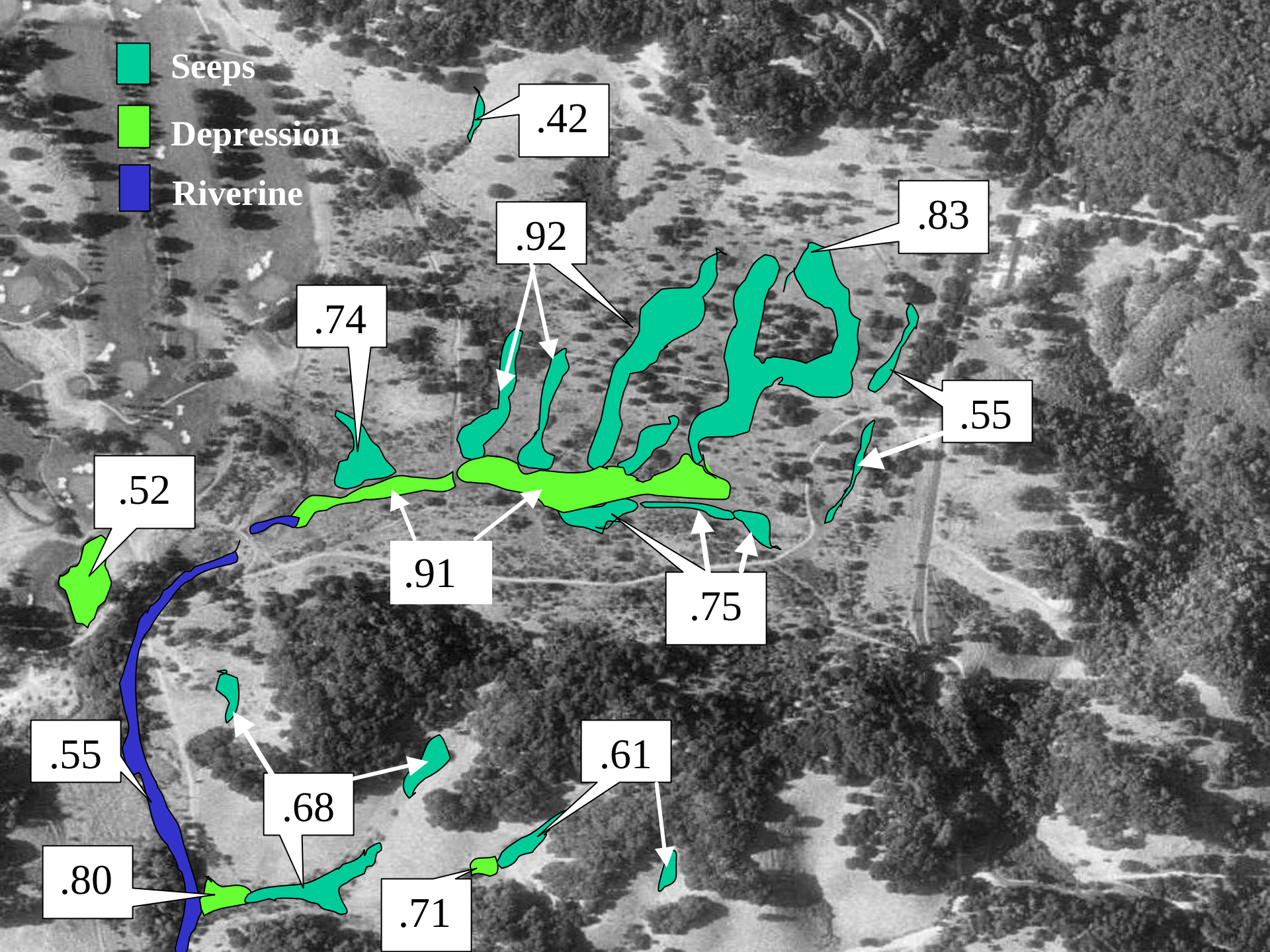
Stressor Index

- Very sensitive to site-specific knowledge.
- Stressors need to be weighted case-by-case.
- Can be over-used (should yield hypotheses and not conclusions).

CRAM Implementation

Implementation Committee of the Core Team

- **Who should use CRAM?**
  - Level of expertise and training
  - Data management, interpretation, and reporting
- **How to integrate into existing programs**
  - CWA Sections 404 and 401 and State codes
  - Surface Water Ambient Monitoring Program (SWAMP)
  - NPDES
  - Watershed Management


Seeps
Depression
Riverine
.42
.92
.83
.74
.55
.52
.91
.75
.55
.68
.61
.80
.71

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Thank You