Adapting SWAMP's Bioassessment Infrastructure to Support Bio-Objectives Implementation

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RESOURCES AGENCY CALIFORNIA DEPARTMENT FISH&GAME

Aquatic Bioassessment Laboratory

CALIFORNIA Water Boards

SWAMP Surface Water Ambient Monitoring Program

Overview

- Refresher from last October
- Infrastructure Elements:
  - Field and Lab Methods
  - Benthic Macoinvertebrate Taxonomy
  - Data Management
  - Scoring Tools (metrics, MMIs and O/Es)
  - Quality Assurance (incorporated into all elements)
- Adaptation to Support Bio-Objectives
- Additional Indicators
  - Algae
  - CRAM

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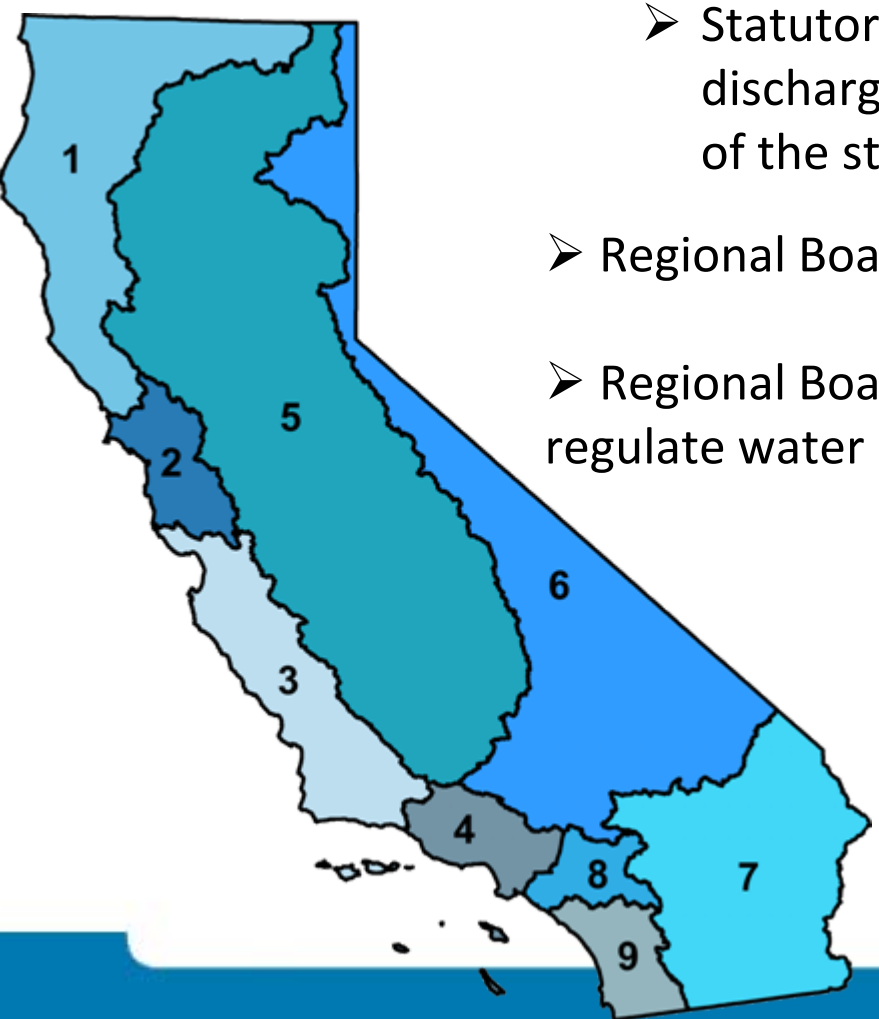
CA Water Quality Regulatory Setting

- CA Porter-Cologne Act (1969)
  - State Water Board and nine Regional Water Boards
  - Statutory framework to protect water quality from discharges of waste to both surface and groundwaters of the state.
- Regional Boards are **semi-autonomous**
- Regional Boards adopt water quality standards and regulate water quality according to those standards



Effective biological objectives require both **technical soundness** and **regulatory viability**

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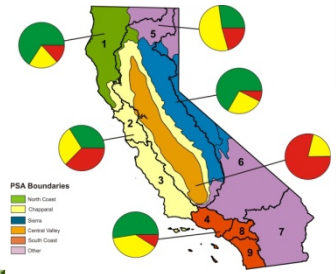
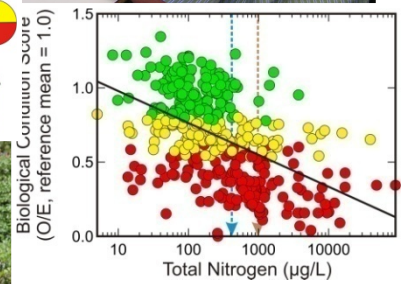
Phase I: The Early Years (1990s- 2005)

- Early efforts focused on demonstration projects, point-source monitoring, enforcement
- The California Aquatic Bioassessment Workgroup (CABW) was created (17th Annual Mtg in Nov 2010)
- Early infrastructure designed and developed without central support
- Established basic elements by 2005:
  - Standard field and lab methods
  - Taxonomic standards and QA-QC
  - Reference conditions
  - Scoring tools (MMIs and O/Es)
  - Data management
  - Research program
    - Probability surveys
    - Stressor associations
    - Ecological assessments





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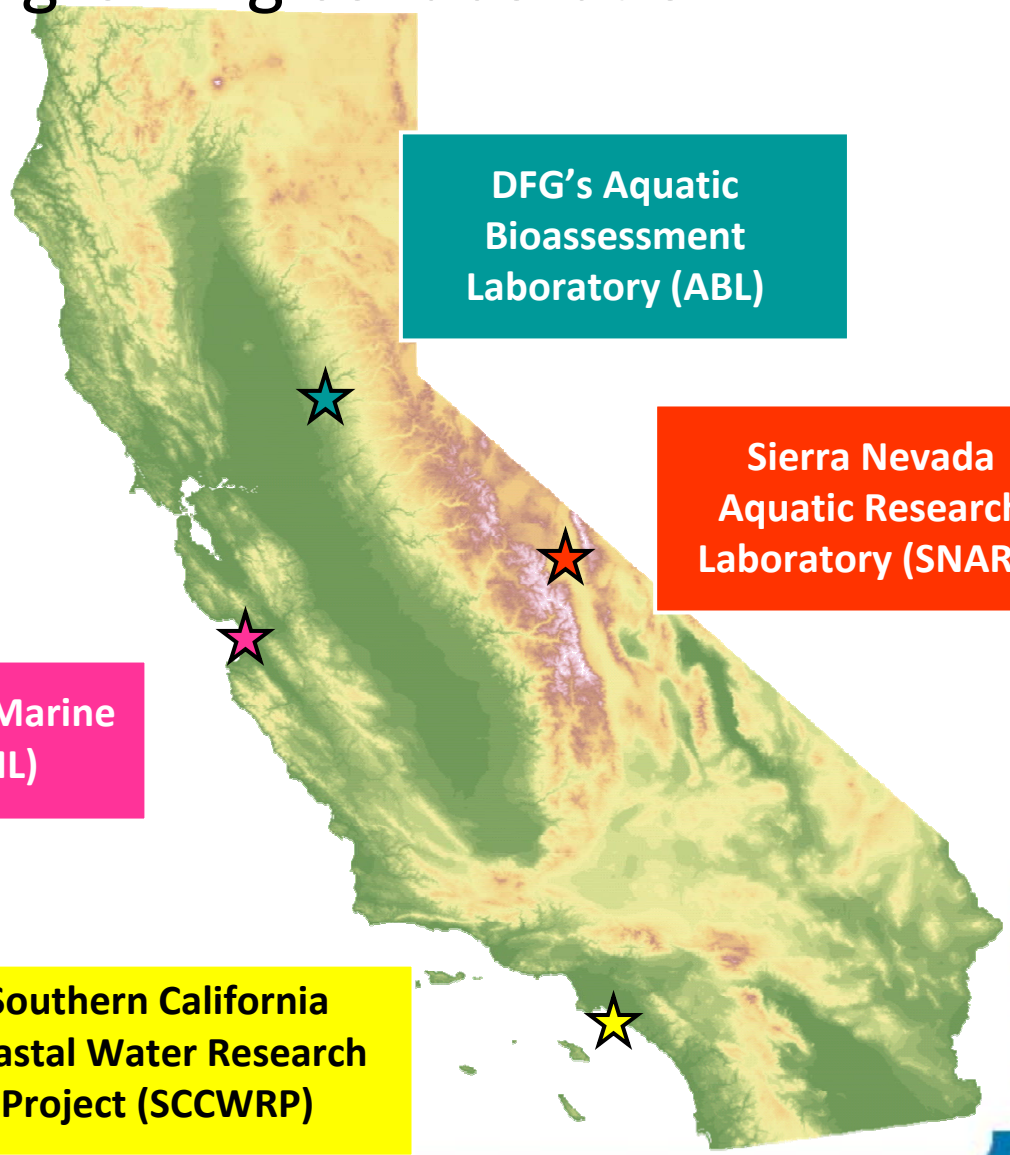
California Biological Assessment: a growing collaboration

Federal Programs

USGS-NAWQA

USFS-Utah State

EPA-REMAP, W-EMAP



DFG's Aquatic Bioassessment Laboratory (ABL)

Sierra Nevada Aquatic Research Laboratory (SNARL)

Moss Landing Marine Labs (MLML)

Southern California Coastal Water Research Project (SCCWRP)

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Phase II: SWAMP Standardizes Bioassessment

Building on Scientific Planning and Review Committee (SPARC) Final Recommendation 3: "The State Water Board should adjust water quality management approaches to take advantage of the more direct measures SWAMP is developing of aquatic life condition through bioassessment monitoring…."

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and **biological integrity** of the nation's waters - Section 101(a)

State Water Board Objective – Assimilate biological integrity into California's state and regional water quality regulatory programs

SWAMP's Initial Role – Develop and standardize the technical tools programs need to accomplish the goal

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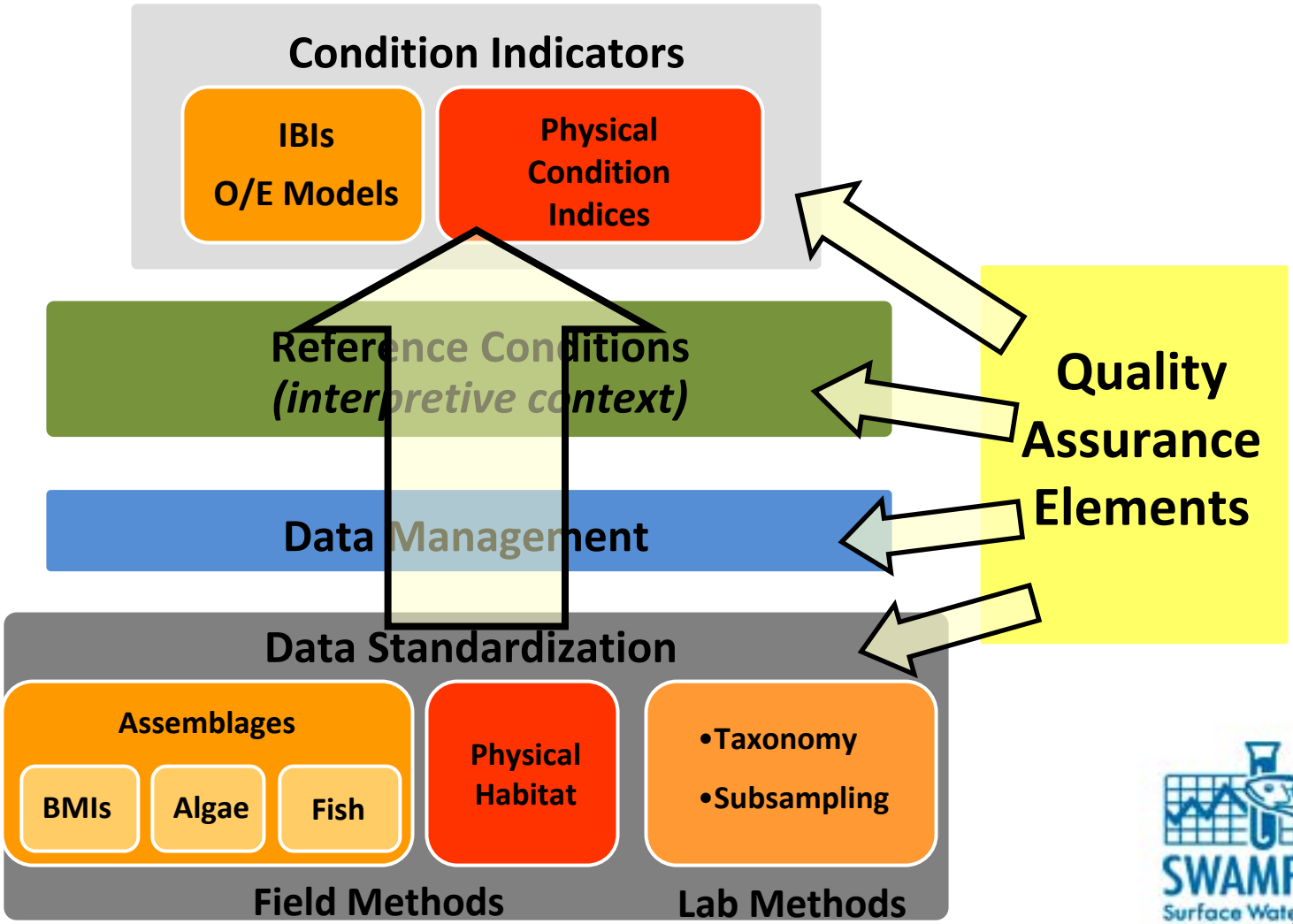
SWAMP's bioassessment infrastructure



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Methods Development and Standardization

Benthic Macroinvertebrates: California's primary biological indicator

- CA started with a diversity of field methods (CSBP, SNARL, EMAP, Utah State, NAWQA)

- SWAMP standardized to EMAP's multi-habitat method (**RWB**) in most settings: 11 composited 1 ft^2 samples from 11 equidistant transects

- Supplement with targeted riffle method (**TRC**) in some situations

See BMI methods standardization papers (Ode et al. 2005, Herbst and Silldorff 2006, Rehn et al. 2007): comparisons of targeted riffle/ reachwide and low gradient protocols throughout CA

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Methods Development and Standardization

Physical Habitat Methods (PHAB)

A close adaptation of the EMAP protocols …. removed several bed stability measures

Emphasis on:

- Physical setting (slope, channel dimensions, discharge)
- Instream habitat and riparian condition
- Anthropogenic stress

Experienced field crews of 3 can complete the protocol in 2-3 hours at a site of average complexity

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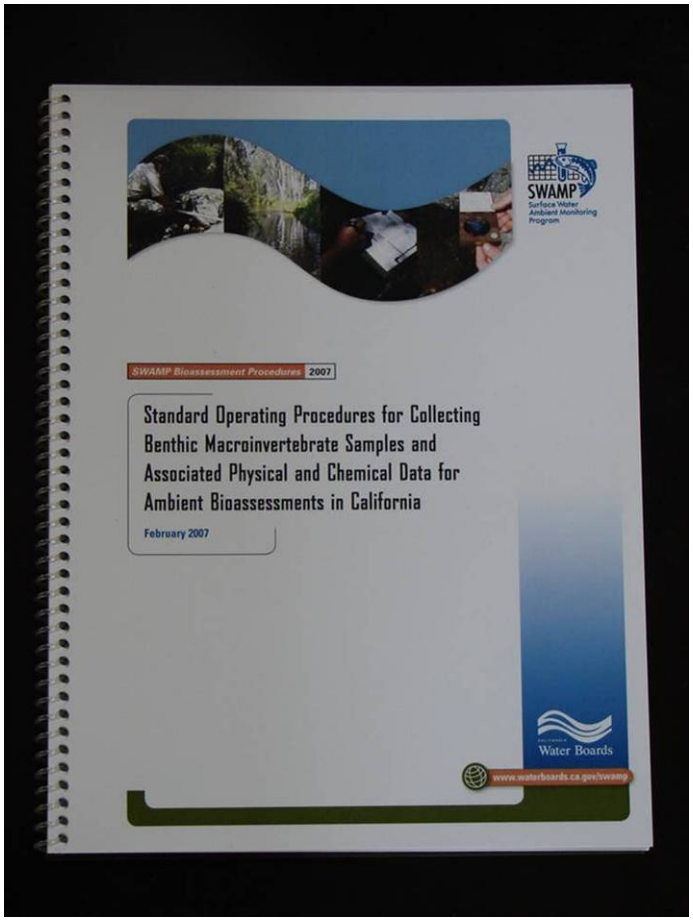
Standard Field Protocols and Forms



Field SOP and field forms for BMIs and habitat (Ode 2007)

Electronic field forms

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Adaptation for Bio-Objectives

Field Methods

Collection of BMI and Habitat Data – standardizing training and field audit program

Field Forms – improve usability (more user friendly)

PHAB Workplan

1. Develop reporting module to standardize habitat metrics
2. Evaluate PHAB elements for information content, signal to noise, efficiency ….. create new metrics as appropriate
3. Integrate results into training and auditing program
4. Ongoing data collection will be used to develop a more comprehensive QA program for habitat data
5. Revise full and basic versions of protocols to streamline PHAB requirements and provide guidance for which measurements to require in different settings

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Methods Development and Standardization

BMI Taxonomy

SAFIT: The Southwest Association of Freshwater Invertebrate Taxonomists -- provides essential standardization of the identification and reporting of freshwater invertebrates for SWAMP (www.safit.org)

Key Products:

- Standard Taxonomic Effort (STE) documents
  - defines appropriate taxonomic resolution for all taxa
- Maintains database master taxa list
- Taxonomic training workshops and documents

Aquatic Bioassessment Laboratory: Developed a process for systematic review and documentation of taxonomic data quality

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Adaptation for Bio-Objectives

BMI Taxonomy

- Continued support of SAFIT
- Training – taxonomic training and workshops
- Guidance for use of different standard taxonomic effort levels (SAFIT I vs. SAFIT II)
- SWAMP is creating a robust framework for documentation of bioassessment data quality
  - Work with SWAMP's Quality Assurance and Data Management Teams to develop and store QC data
  - Implement systematic review of taxonomic data quality
  - Corrective Actions

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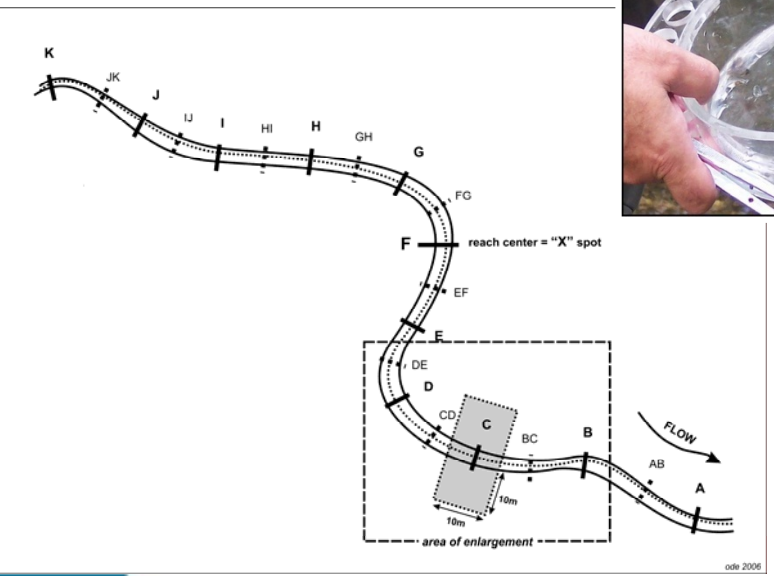
Data Collection and Processing

- SWAMP has established standard methods for collecting BMIs, algae and physical habitat data
- Standardized Reporting of Taxonomic Data (SWAMP-SAFIT)
- Standardized Data Management (SWAMP → CEDEN)
  - Data entry and reporting consistency



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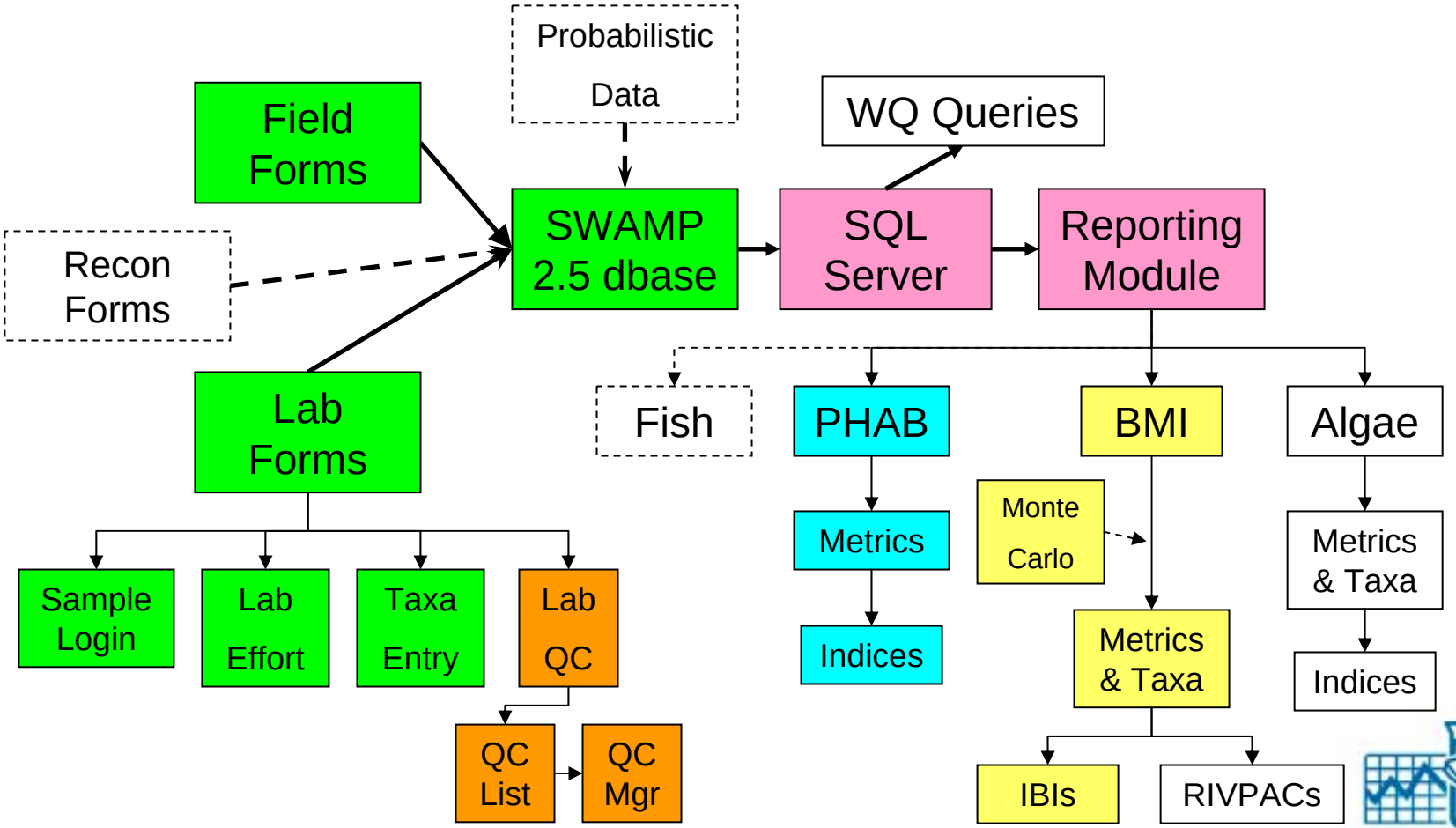
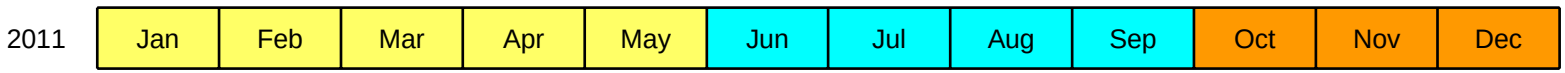
Data Management

SWAMP Bioassessment Data Flow





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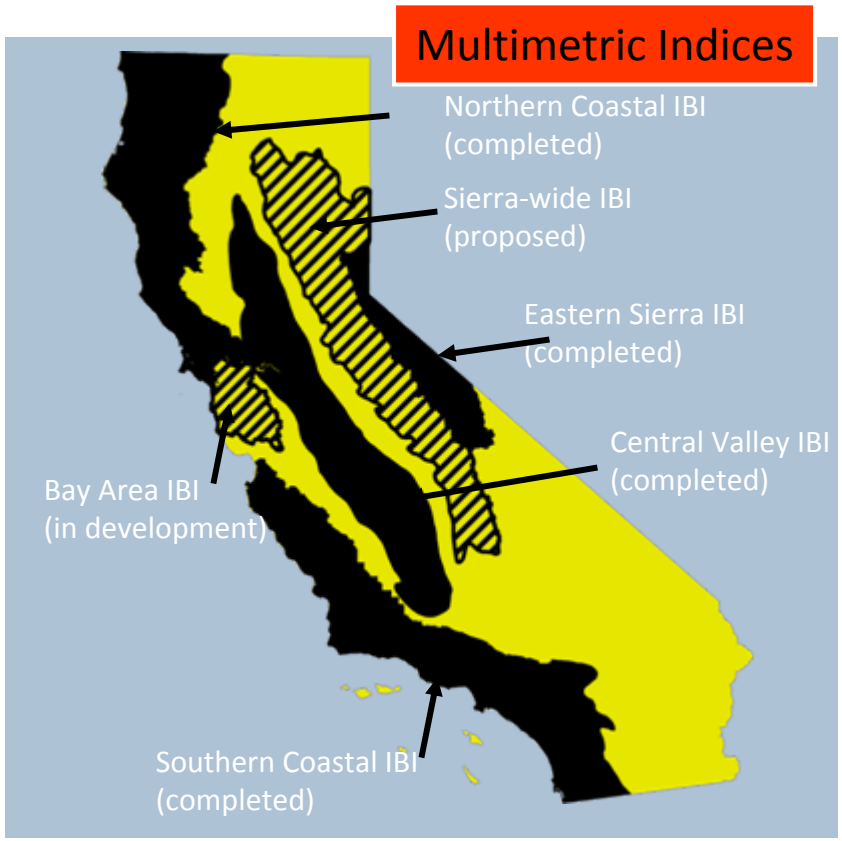
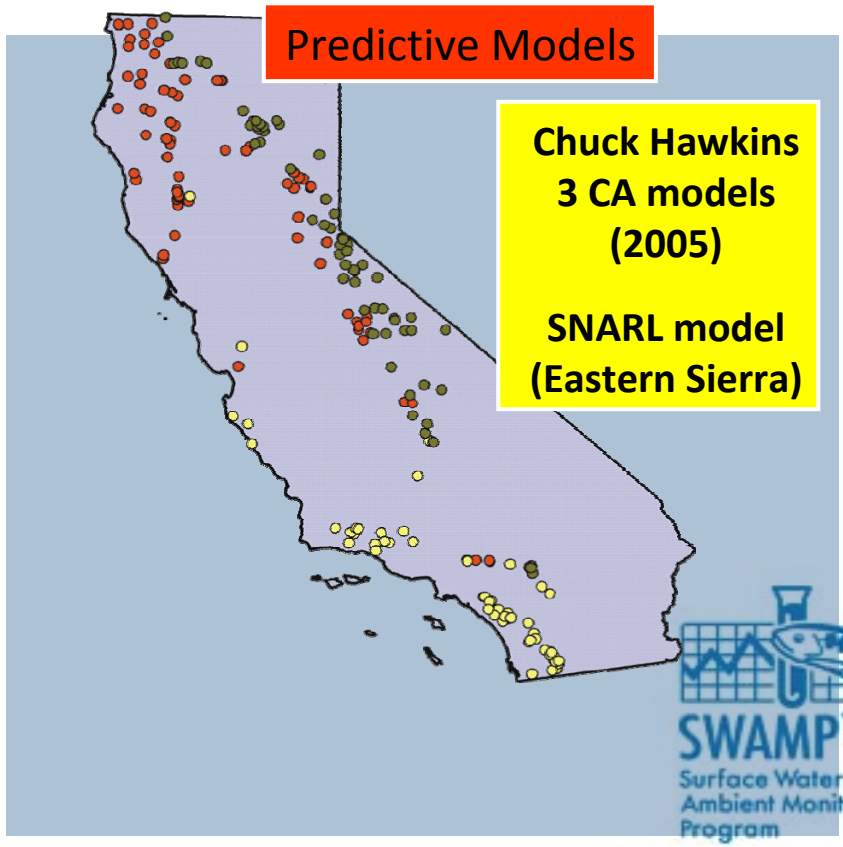
Scoring Tools: Current Status

- Indices of Biological Integrity (IBIs) are available for several regions of California
- 3 - Observed/Expected (O/E) models cover the entire state





Adaptation for Bio-Objectives

Data Management and Scoring Tools

- Complete reporting modules for BMI and PHAB
- Process for storing QC data
- Tools for calculating IBIs or O/Es
  - Watershed delineation tools
  - Predictors for O/E
  - Standard O/E output
  - Server for predictive models
- Need a solid system for other entities to upload data and score biology using our tools
  - Ensure CEDEN's bioassessment capabilities are user friendly
- Transfer tools developed through SWAMP to CEDEN

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QA/QC for Bioassessment

- Many bioassessment programs force their QA/QC into a chemistry model

- SWAMP is developing an approach to QA that better ties monitoring quality objectives to how the data are used

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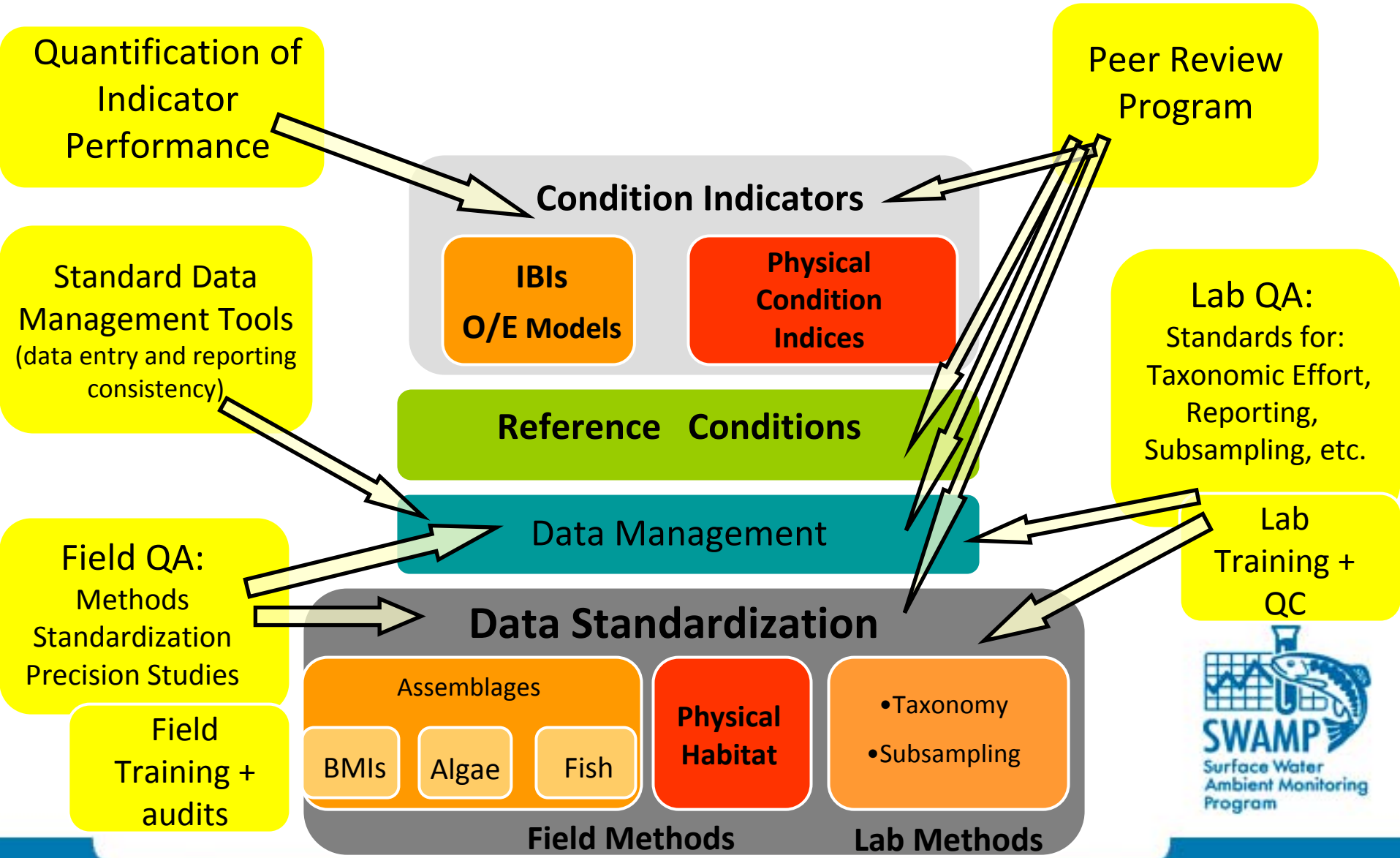
Quality Assurance Components

(Coordinating with SWAMP QA & DM Teams / SCCWRP)



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Adaptation for Bio-Objectives

Quality Assurance / Quality Control

- Standardized field and laboratory training and auditing programs
- Develop laboratory quality objectives and standard operating procedures
- Develop a more comprehensive QA program for habitat data
- Transfer standard data management tools developed in SWAMP to CEDEN
- Develop a robust framework for documentation of bioassessment data quality
  - Implement systematic review of taxonomic data quality
  - Establish process for storing QC data
  - Corrective Actions

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Additional Indicators

- The State should use multiple indicators for biological objectives
- Current focus is on **BMIs**, but long term strategy is to include multiple assemblages
- Ongoing efforts to develop **algal** indicators for streams
- Ongoing efforts related to the California Rapid Assessment Method (**CRAM**)
- Some exploratory work on **fish**

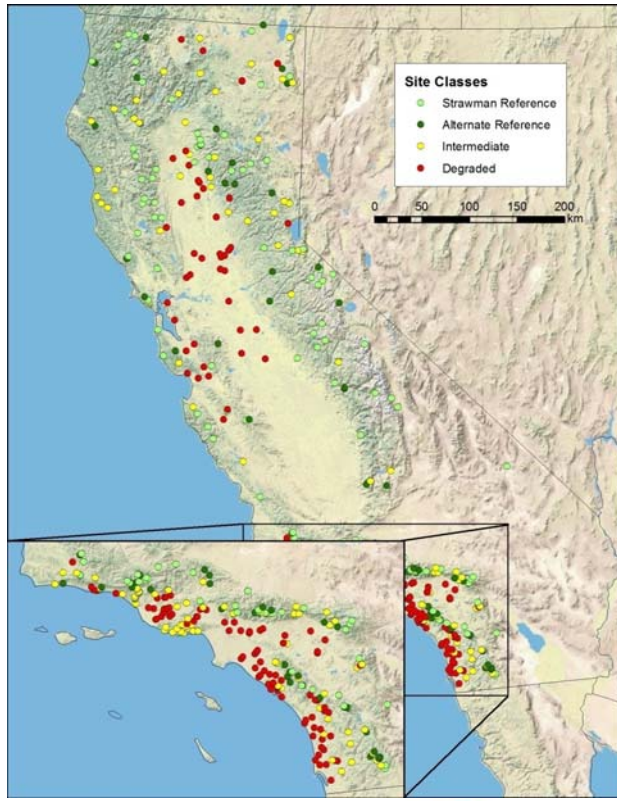
algae photos courtesy Robert Sheath

Methods Development and Standardization

Algae Methods

SWAMP Algae Plan (2008): "steps SWAMP should take to incorporate algae into its biomonitoring programs"

- SWAMP has standard field methods[1] for algae
- Algae data collected through PSA, RCMP, SMC, EMAP…
- Algae sampled at >800 sites using State's standard field methods; data are available for IBI development



[1]*Fetscher, A.E., L. Busse, and P. R. Ode. 2009. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002. (updated May 2010)*

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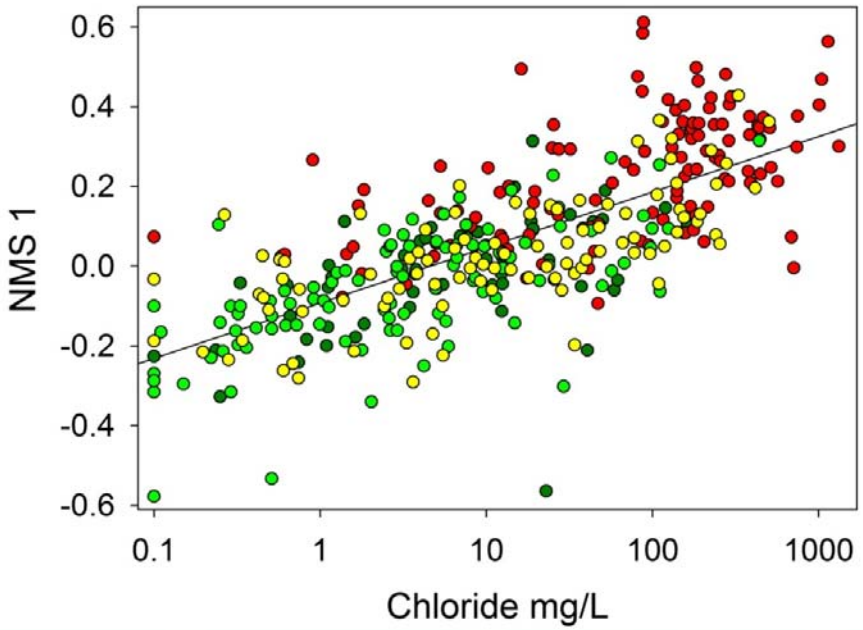
Methods Development and Standardization

Algae Methods - Continued

- Algae provide complementary signals to BMIs (esp. nutrients)
- Algal assemblages are showing expected relationships to stress
- Preliminary IBI prepared in Eastern Sierra Nevada
- IBIs for Southern California and Central Coast are currently being developed



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Methods Development and Standardization

Algae Methods - Continued

- Intercalibration study for field method and taxonomic identification comparison (SWAMP Algae SOP and Sierra Nevada Algae Projects)
- Taxonomic workgroup formed – developing master taxa list and standard taxonomic effort
- Development of algae reporting module
  - Following establishment of the master taxa list
- Quality Assurance Project Plan and Laboratory SOPs are under development
- Field sampling training is ongoing

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Methods Development and Standardization

California Rapid Assessment Method (CRAM)

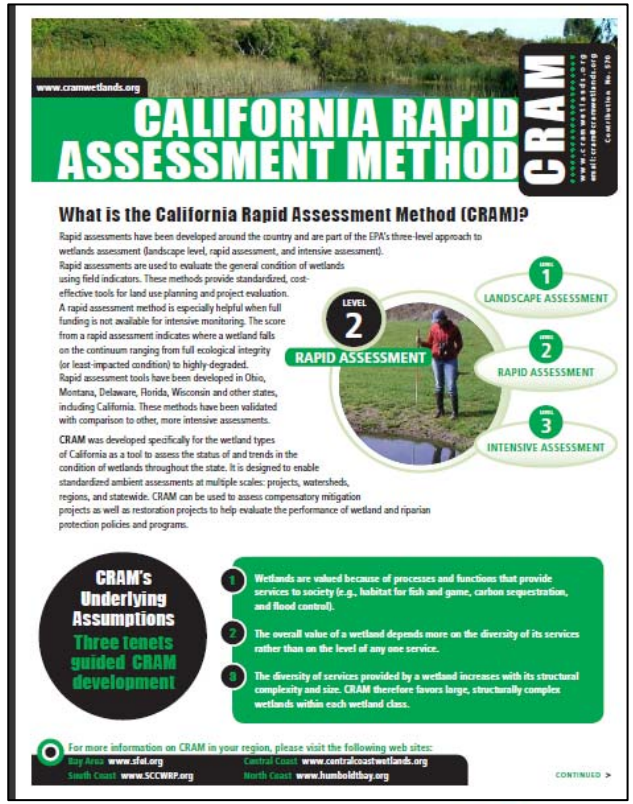
Standardized “walk and talk” diagnostic tool to assess condition (health) of wetlands and riparian habitats

Requires expertise comparable to a wetland jurisdictional delineation

Assesses condition based on four attributes

- Landscape context
- Hydrology
- Physical Structure
- Biotic Structure

The CRAM score indicates condition relative to the best achievable condition.



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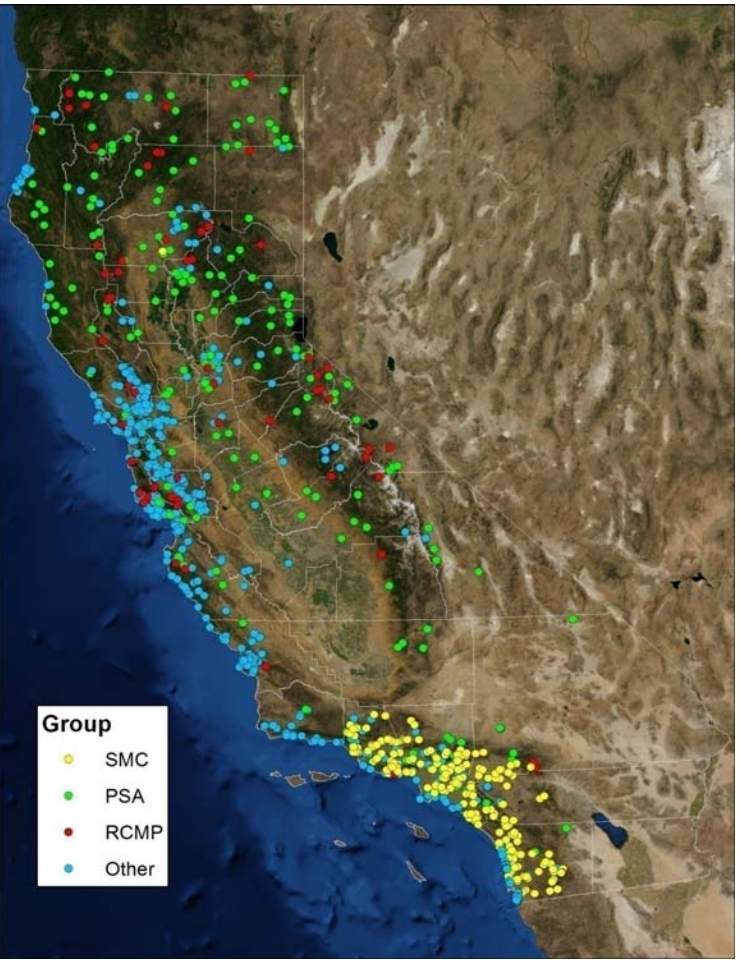
www.cramwetlands.org

Methods Development and Standardization

California Rapid Assessment Method (CRAM)



Stream monitoring programs using CRAM:

- SWAMP Perennial Stream Assessment (PSA)
- SWAMP Reference Condition Management Program (RCMP)
- Stormwater Monitoring Coalition (SMC)

1,550 total CRAM assessments entered into the State database

74% are stream assessments (ambient and project data)

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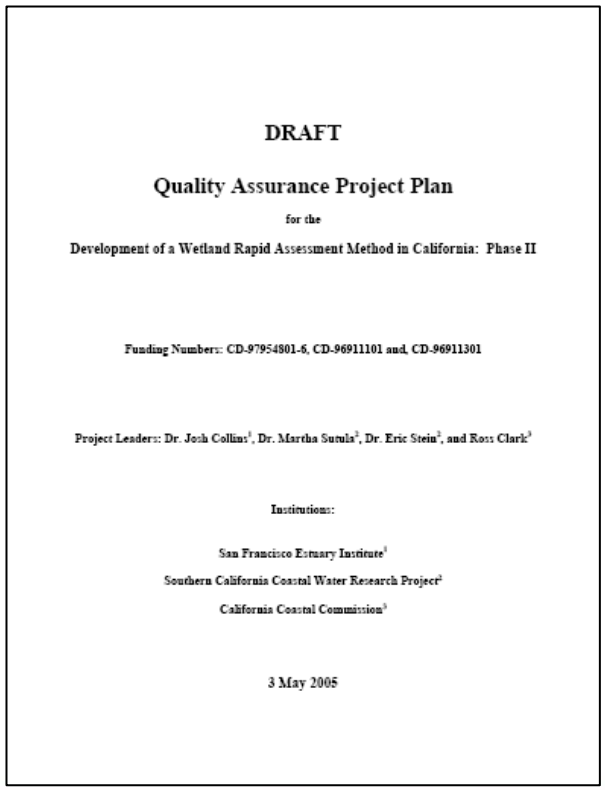
Methods Development and Standardization

CRAM Training and QA/QC

- Minimum reporting requirements
- Audit process
- Training
- Intercalibration



DRAFT

Quality Assurance Project Plan

for the

Development of a Wetland Rapid Assessment Method in California: Phase II

Funding Numbers: CD-97954801-6, CD-96911101 and, CD-96911301

Project Leaders: Dr. Josh Collins[1], Dr. Martha Sutula[2], Dr. Eric Stein[2], and Ross Clark[3]

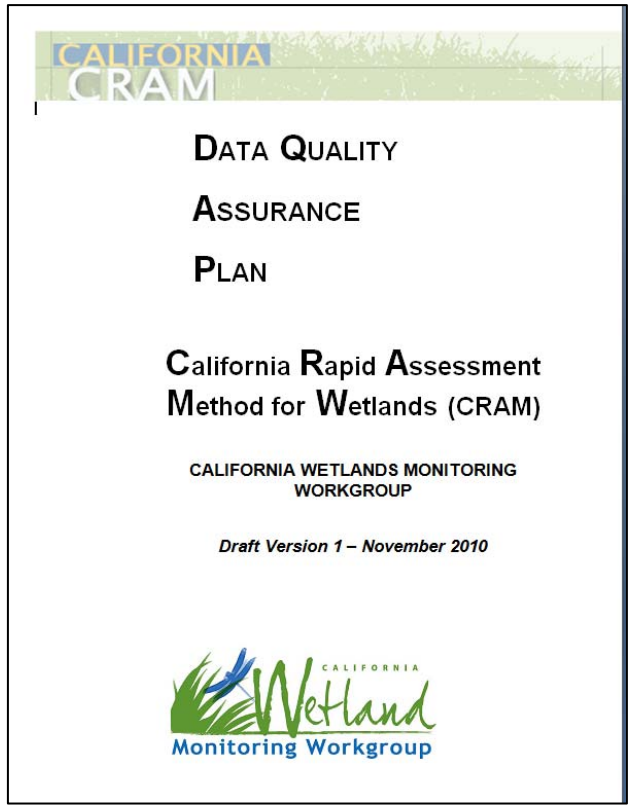
Institutions:

San Francisco Estuary Institute[1]

Southern California Coastal Water Research Project[2]

California Coastal Commission[3]

3 May 2005



CALIFORNIA CRAM

DATA QUALITY

ASSURANCE

PLAN

California Rapid Assessment Method for Wetlands (CRAM)

CALIFORNIA WETLANDS MONITORING WORKGROUP

Draft Version 1 – November 2010

California Wetland Monitoring Workgroup

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