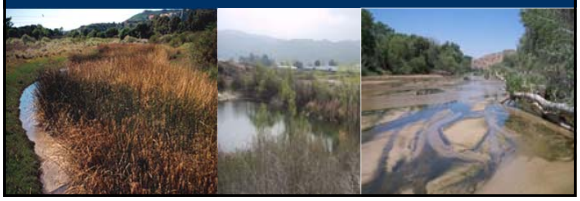
California Rapid Assessment Method

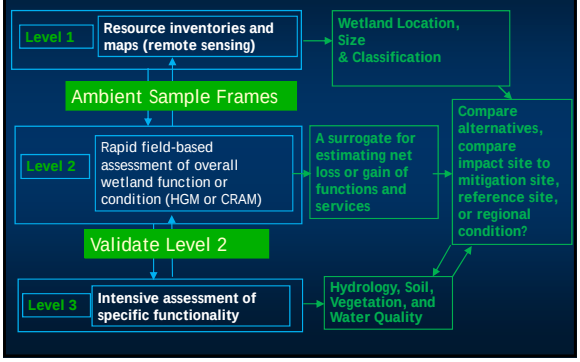
Applications and Regulatory Context

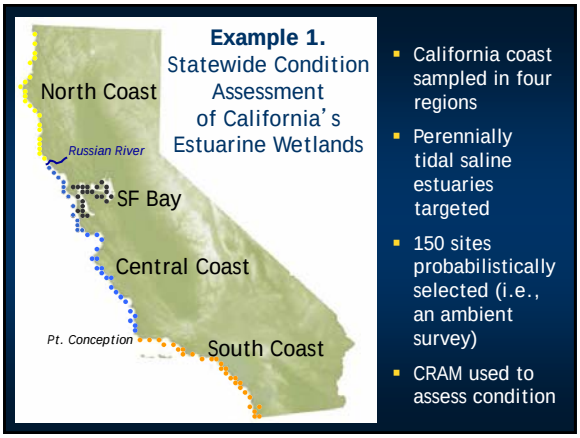


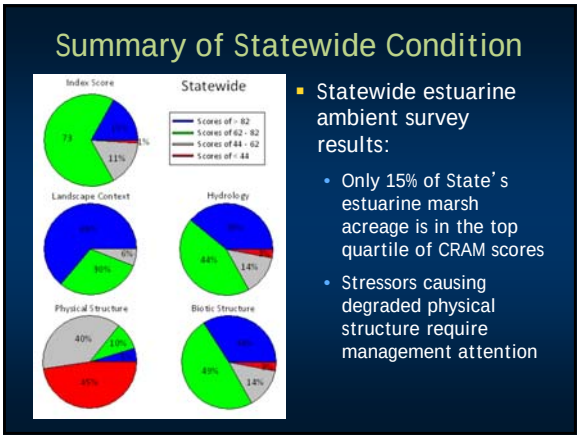
How is CRAM Being Used?

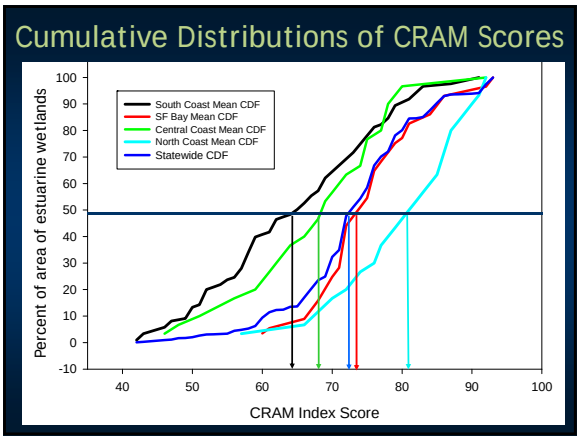
- Statewide Assessments
- Watershed Assessments
- Project Assessments
  - Baseline Conditions
  - Alternative Comparison
  - Impact Assessment and Avoidance
  - Restoration/Mitigation Planning and Permitting
  - Long-term Monitoring
- Regulatory Context

EPA 3-Level Approach Assessment Tools




Example 1.
Statewide Condition Assessment of California's Estuarine Wetlands
North Coast
Russian River
SF Bay
Central Coast
Pt. Conception
South Coast
California coast sampled in four regions
Perennially tidal saline estuaries targeted
150 sites probabilistically selected (i.e., an ambient survey)
CRAM used to assess condition


Summary of Statewide Condition
Statewide
Statewide estuarine ambient survey results:
Only 15% of State's estuarine marsh acreage is in the top quartile of CRAM scores
Stressors causing degraded physical structure require management attention

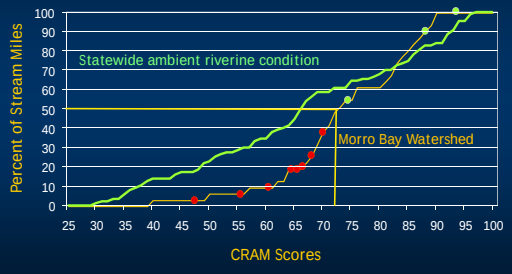

Cumulative Distributions of CRAM Scores
South Coast Mean CDF
SF Bay Mean CDF
Central Coast Mean CDF
North Coast Mean CDF
Statewide CDF
Percent of area of estuarine wetlands
CRAM Index Score

Example 2.
Ambient Riverine Surveys at Watershed Scale

Morro Bay Watershed
Ambient Assessment 2007

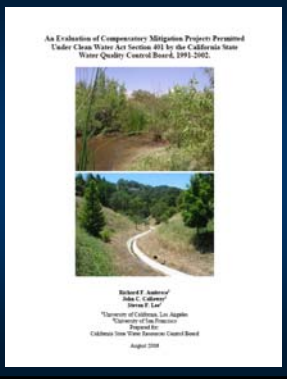
- Probabilistic sampling of 30 "ambient sites"
- Targeted sampling at restoration projects
- Major Issue: Access to private land
  - Los Osos Creek >90% private
  - Chorro Creek ~40% private

Morro Bay Riverine Projects of Statewide and Local Ambient Condition

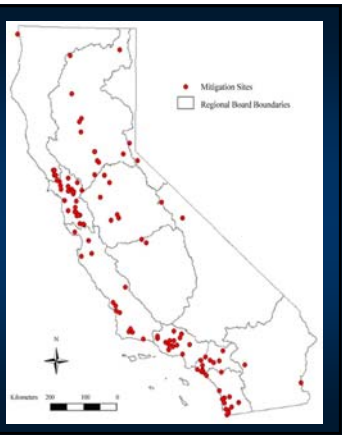


Example 3. Program Evaluation

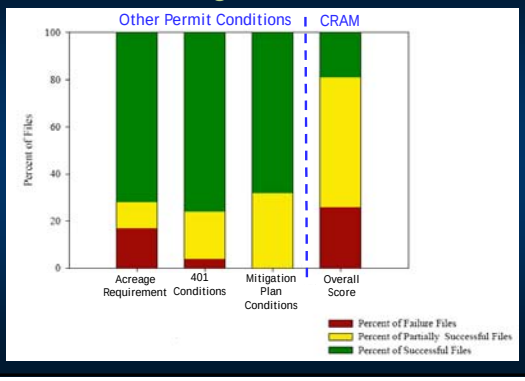
Evaluate the compliance and wetland condition of compensatory wetland mitigation projects associated with Section 401 Water Quality Certifications throughout California



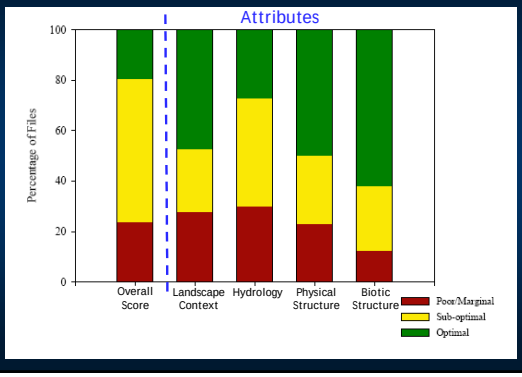
- 204 mitigation sites
- Review permit files for compliance
- Evaluate condition using CRAM (an earlier version)



Was the Mitigation Successful??



CRAM Condition Breakdown



Project Impact/ Mitigation Assessment Using CRAM

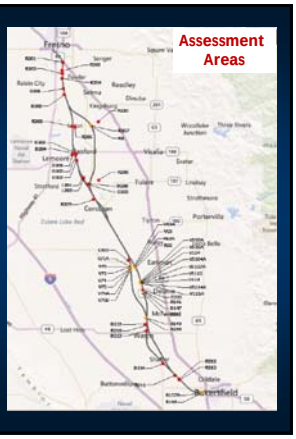
- Approach depends on objectives of assessment
- Impact Assessments:
  - Probabilistic survey (watershed or reach effects)
  - Targeted survey (project specific)
- Restoration/Mitigation Assessments:
  - Mitigation opportunities/alternatives
  - Performance standards
    - Short term (5-10 yrs)
    - Long term (every 5 yrs in perpetuity)

Example 4. CRAM for Linear Projects

Example Projects
- High Speed Train
- Sunrise Powerlink
- Orange County Freeways
- Caltrans I-5 Corridor

Many types of wetlands including:
- Riverine, Depressional, Vernal Pools, Estuarine

CRAM provides a common language to assess them.



Many Types of Wetlands

Example 5. Alternatives Evaluation
Imperial Valley Solar Project

881 acres of Waters of the U.S.

Proposed Project to fill 165 acres

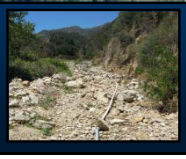
- 84 CRAM AAs
- Data Used in 404(b)(1)
- Evaluate Baseline Stream Condition
- Analyze Direct and Indirect Impacts of 6 Alternatives
- Redesign Alternatives to Avoid and Minimize
- Identify Mitigation Need

Permitted Project

- Avoidance of high quality primary streams
- Minimization of direct and indirect impacts through reduction of roads, redesign of crossings, and suncatcher layout
- Reduced fill, somewhat reduced energy generating capacity

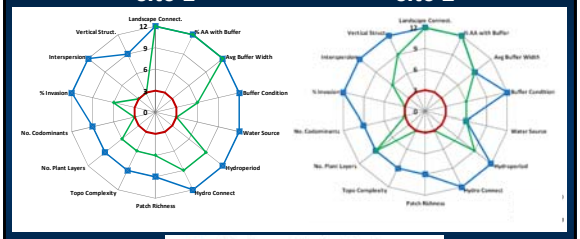
Example 6. Assessing Mitigation Site Potential

- Confidential project in San Diego
- Compare two potential sites
- Project maximum CRAM score following restoration
- Determine if site(s) meet the mitigation needs of project
- Allow for comparison of mitigation opportunities and potential "lift"
- Inform decision making prior to large financial output



Visual Comparison

Site 1 **Site 2**



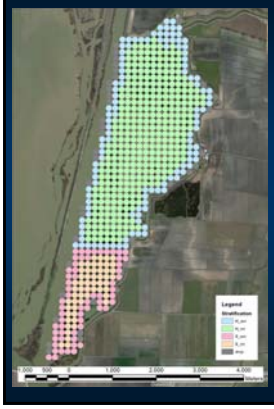
Maximum Obtainable Scores
July 2010
Minimum CRAM Score

CRAM Score Comparison

CRAM Attributes	CRAM Metric and Submetrics		Site 1 Baseline*	Site 1 Max Obtainable	Site 2 Baseline	Site 2 Max Obtainable
Buffer and Landscape Connectivity		**Attribute Score**	**20**	**24**	**20**	**23**
	Landscape Connectivity		12 (A)	12 (A)	12 (A)	12 (A)
	Buffer Submetrics	% of AA with Buffer	12 (A)	12 (A)	12 (A)	12 (A)
		Average Buffer Width	12 (A)	12 (A)	9 (B)	12 (A)
		Buffer Condition	12 (A)	12 (A)	6 (C)	6 (C)
		Buffer Submetric Score	8.49	12.00	7.90	11.17
Hydrology		**Attribute Score**	**21**	**36**	**18**	**30**
	Water Source		3 (D)	12 (A)	6 (C)	6 (C)
	Hydroperiod		9 (B)	12 (A)	9 (B)	12 (A)
	Hydrologic Connectivity		9 (B)	12 (A)	3 (D)	12 (A)
Physical Structure		**Attribute Score**	**12**	**18**	**6**	**18**
	Structural Patch Richness		6 (C)	9 (B)	3 (D)	9 (B)
	Topographic Complexity		6 (C)	9 (B)	3 (D)	9 (B)
Biotic Structure		**Attribute Score**	**11**	**31**	**20**	**34**
	Plant Community Submetrics	No. of plant layers	9 (B)	9 (B)	9 (B)	6 (C)
		No. of co-dominants	9 (B)	9 (B)	3 (D)	3 (D)
		Percent Invasion	12 (A)	12 (A)	3 (D)	6 (C)
	Plant Community Submetric Score		5	10	5	10
	Horizontal Interspersion		3 (D)	12 (A)	6 (C)	12 (A)
	Vertical Biotic Structure		3 (D)	9 (B)	9 (B)	12 (A)
	Overall AA Score		**54**	**91**	**53**	**88**

Example 7. Prospect Island Restoration

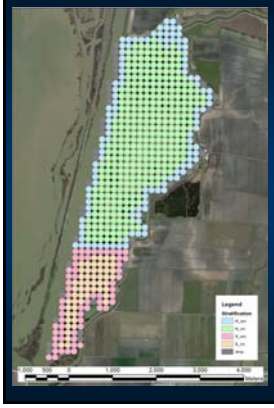
- DWR and CDFW restoration project
- The island is currently two large depressional wetlands
- Restoration will breach levees and return tidal action, transforming into a brackish estuarine wetland
- CRAM used to assess current and post-restoration condition



- Very large project
- Stratified into 4 classes:
  - North interior
  - North exterior
  - South interior
  - South exterior
- A grid of 1 ha circles representing potential AAs was overlain on the project area
- Random number generator used to select a sequence of AAs within each class

Why Stratify?

- Future restoration and management may be different
- The vegetation structure is visibly different

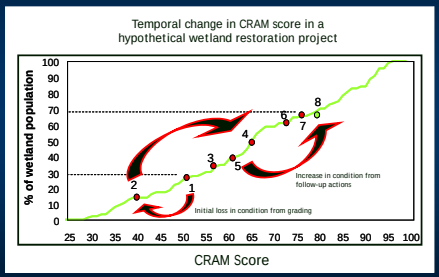


- Within each class, the first 3 AAs selected were assessed sequentially
- By attribute, the scores for AA1 and AA2 were averaged, and compared to AA3
- If the scores for AA3 were within 10 points of the average of AA1 and AA2, no other AAs were assessed
- If the score was >10 points, the fourth selected AA was assessed, then compared to the average of AA1, 2, 3

- Table shows example from the South Interior class, where 4 AAs were needed to achieve <10 point difference
- Ultimately 18 AAs in total were assessed on the island
- Captured the likely full variability of condition present within each class
- Gathered baseline condition in only 6 days of fieldwork

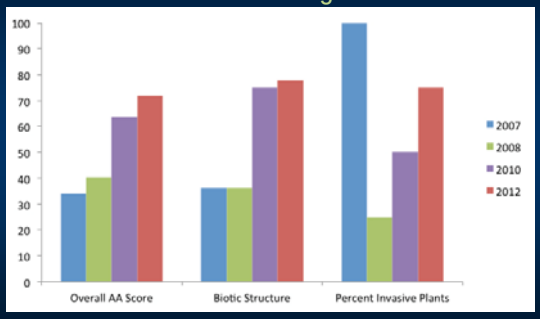
	South Interior		
	Average of first 3 AAs	Last AA	Difference
Buffer and Landscape Context	95.53	93.30	2.23
Hydrology	83.33	83.33	0.00
Physical Structure	50.00	50.00	0.00
Biotic Structure	61.11	55.56	5.56
Overall Score	73	71	2

Example 8. Monitoring Restoration Site Condition Through Time



Monitoring Change Over Time - Manabe Site

Manabe Restoration Site Condition Through Time

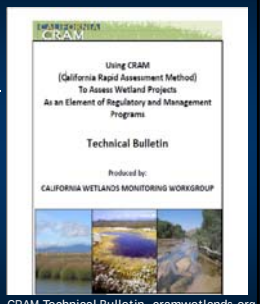


Restoration Project Monitoring

CRAM is one tool in the toolbox and is not intended to replace Level 1 or Level 3 data

Appropriate Uses of CRAM

- CRAM is designed to evaluate the ecological condition of a wetland in terms of its ability to support characteristic plants and animals. Evaluation of pre-project conditions at mitigation sites
- Baseline Information
- Assessment of mitigation compliance as condition-based performance criteria (along with Level 1 and 3 measures)
- Comparison of alternatives or different sites



CRAM Technical Bulletin, cramwetlands.org

Example of 5-Year Comprehensive Monitoring Plan

- Level 1: Vegetation Mapping and Delineation
- Level 2: CRAM and other Site Conditions
  - Plant survival and plant condition
  - Erosion issues, trash, trespass/vandalism
- Level 3: Quantitative Assessments
  - Vegetation transects (Cover, Richness, and Diversity)
  - Bird counts/focused surveys
  - IBI (Macroinvertebrates, Algae, etc.)
  - Soil development
  - Hydrology (depth of groundwater, flooding interval)
  - Hydrogeomorphic (HGM) Method

CRAM In Regulatory Process

The USACE Mitigation Rule (2008)

"In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods *should* be used *where practicable* to determine how much compensatory mitigation is required."

Local Guidance/Resources (USACE):

- 2011 Mitigation Ratio Checklist
- 2012 Uniform Performance Standards
- 2013 Updated Mitigation Ratio Checklist – ongoing updates in 2012 and 2013 (a living document)
- 2015 Final Mitigation and Monitoring Guidelines

2013 USACE Mitigation Ratio Procedure

Step 3: Before After Mitigation Impact (BAMI)

Functions/conditions	$Impact_{Before}$	$Impact_{After}$	$Impact_{Delta}$	$Mitigation_{Before}$	$Mitigation_{After}$	$Mitigation_{Delta}$
4.1 Buffer and Landscape Context						
4.1.1 Landscape Connectivity	9	3	-6	6	6	0
4.1.2 Percent of AA with Buffer	12	6	-6	3	9	6
4.1.3 Average Buffer Width	3	3	0	3	12	9
4.1.4 Buffer Condition	6	6	0	3	9	6
RAW SCORE	**15.0**	**8.0**	**-7**	**9.0**	**15.7**	**7**
FINAL SCORE	**76.0**	**33.6**	**-42**	**37.5**	**65.3**	**28**
4.2 Attribute 2: Hydrology						
4.2.1 Water Source	6	6	0	6	6	0
4.2.2 Hydroperiod or Channel Stability	9	12	3	3	9	6
4.2.3 Hydrologic Connectivity	12	9	-3	3	12	9
RAW SCORE	**27.0**	**27.0**	**0**	**12.0**	**27.0**	**15**
FINAL SCORE	**75.0**	**75.0**	**0**	**33.4**	**75.0**	**42**
4.3 Attribute 3: Physical Structure						
4.3.1 Structural Patch Richness	6	3	-3	3	9	6
4.3.2 Topographic Complexity	6	3	-3	3	6	3
RAW SCORE	**12.0**	**6.0**	**-6**	**6.0**	**15.0**	**9**
FINAL SCORE	**63.0**	**25.0**	**-38**	**25.0**	**62.5**	**38**
4.4 Attribute 4: Biotic Structure						
4.4.1 Number of Plant Layers	12	9	-3	6	9	3
4.4.2 Co-Dominant Species	6	6	0	6	12	6
4.4.3 Percent Invasion	6	9	3	3	12	9
4.4.4 Interspersion/Zonation	9	3	-6	3	9	6
4.4.5 Vertical Structure	6	3	-3	3	6	3
RAW SCORE	**23**	**14**	**-9**	**11**	**26**	**15**
FINAL SCORE	**38.0**	**38.9**	**1**	**30.6**	**72.3**	**42**
OVERALL SCORE	**63.0**	**44.0**	**-20**	**32.0**	**69.0**	**38**

1. Assess existing condition at project (impact) site and post impact
2. Assess existing condition at mitigation site and project future
3. Look at Delta Loss vs. Delta Gain. Add into SOP, Step 2.

Example: Functional Loss < Functional Gain Mitigation Ratio is Adjusted down

$Quotient=ABS(MI)_{Ai}$
1 9/10

Baseline ratio:
1 : 1.9

Thank You