

# Final Report

Standardization of the CRAM Update Process, Manuals and Training Materials through the L2 Committee of the California Wetlands Monitoring Workgroup

Funded by USEPA Region 9

October 2013



California Rapid Assessment Method  
for Wetlands

User's Manual

Version 6.1

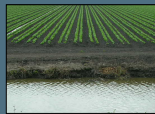


April 2013



California Rapid Assessment Method  
for Wetlands (CRAM)

Photo Dictionary



May 2013

Central Coast Wetlands Group  
at Moss Landing Marine Labs



DATA QUALITY ASSURANCE PLAN

California Rapid Assessment Method  
for Wetlands

CALIFORNIA WETLANDS MONITORING WORKGROUP

*Draft Version 4 - June 2013*



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**Final Report**

**USEPA Region 9, Award No. CD-00T54301-0**

***Submitted by:***

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**October, 2013**

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## Table of Contents

List of Figures.....	iv
List of Tables.....	iv
List of Appendices .....	iv
Document Intent .....	1
Overall Project Summary:.....	1
Task Descriptions and Accomplishments: .....	2
Task 1: Project Coordination and Reporting.....	2
Task 1.1: Report to EPA on the status of each work plan task and deliverable on a biannual basis.....	2
Task 1.2: update quality assurance project plan (QAPP) .....	2
Task 1.3: Produce Final Report .....	2
Task 2: Standardization of expanded CRAM materials.....	3
Task 2.1: major update and produce formal CRAM manual .....	3
Task 2.2: expanded CRAM descriptions and definitions.....	4
Task 2.3: major update of eCRAM for the vernal pool module .....	5
Task 2.4: annually updated CRAM manual and field books .....	6
Task 2.5: annually updated eCRAM .....	6
Task 2.6: annually updated CRAM plant list .....	6
Task 2.7: continuously updated CRAM website .....	6
Task 3: Coordination of CRAM Training and Reference materials.....	7
Task 3.1: standardized set of CRAM training presentations.....	7
Task 3.2: annual update of CRAM training presentations .....	8
Task 3.3: regional photo inventories of common plants and indicators .....	8
Task 3.4: field verification/audits sites for each region of the State .....	8
Task 4: Establish a QA Process for state agencies and CRAM development team .....	10
Task 4.1: agenda and minutes from biannual meetings.....	11
Task 4.2: record of potential changes to CRAM modules.....	12

## List of Figures

Figure 1. The new CRAM logo.....	4
Figure 2. New figure added to the Riverine Field book illustrating the lateral extent of the assessment area. ....	4
Figure 3. Revised figure in the Estuarine Field book illustrating buffer and non-buffer land cover types.....	5

## List of Tables

Table 1. Location of 36 CRAM “self-training sites” across California. ....	9
Table 2. Revised DQOs for the California Rapid Assessment Method.....	10
Table 3. List of Level 2 (Rapid Assessment) Committee Members, 2013.....	12

## List of Appendices

Appendix 1: Final Project Summary for tasks completed by the San Francisco Estuary Institute	
Appendix 2: Final Project Summary for tasks completed by the Southern California Coastal Water Research Project	
Appendix 3: Final Project Summary for tasks completed by Roberts Environmental and Conservation Planning	
Appendix 4: CRAM QA Plan	
Appendix 5: SWAMP Memo on the Endorsement of CRAM and CWMW Responses to SWAMP Review Questions	
Appendix 6: Version History and Changes for CRAM User’s Manual (v. 5.0.2-6.1)	
Appendix 7: Summary of Changes to the CRAM Riverine and Estuarine Field Books (v. 5.0.2-6.1)	
Appendix 8: Summary of Changes to the CRAM Vernal Pool Field Books (v. 5.0.2-6.1)	
Appendix 9: List of additional issues and potential changes for the vernal pool module developed during the spring training season, 2013	
Appendix 10: 2013 CRAM Plant List	
Appendix 11: CRAM Photo Dictionary	
Appendix 12: Example CRAM Self-Training Site Packet-Crissy Field, San Francisco	
Appendix 13: Assessment scores from CRAM Calibration events in 2011 and 2012 (a.k.a. Cram-aganza)	

## Document Intent

This document is intended to chronicle the efforts of the Central Coast Wetlands Group (CCWG) to meet the EPA grant objectives for the grant titled “Standardization of the CRAM Update Process, Manuals and Training Materials through the L2 Committee of the California Wetlands Monitoring Workgroup”.

This report will outline the success of CCWG in standardizing the CRAM methodology across the State, in the way it is taught, interpreted, and implemented. This document will describe the CRAM User’s Manual and Wetland Field Book update process, the development and refinement of CRAM QA documents, the calibration efforts of CRAM trainers, and the regular meetings of the Level 2 Committee of the CWMW. Finally it will report on the progress CCWG and it’s collaborators have made in developing an on-going, self-sustaining (or state-funded) Level 2 assessment program for California wetlands.

In addition to this document, several other documents have been completed and are provided as appendices and made available online for easy access and use at [www.cramwetlands.org](http://www.cramwetlands.org).

## Overall Project Summary:

The main goal of this multi-year project was to further the development of a common set of tools and state resources to implement a California Level 1,2,3 monitoring strategy through partnerships with regional teams and resource managers, and provide leadership for the development of a statewide wetlands monitoring program. The coordinated effort of the regional teams involved in this project over the past 3 years allowed for a much higher degree of input, evaluation, and support for the development of the state’s wetland monitoring program than could have been achieved by a single entity.

*Please see Appendices 1, 2, and 3 for a summary of activities completed by regional teams over the course of this grant.*

Major products include: an updated CRAM manual independent of the field books, annual revisions to the CRAM manual, field books, and eCRAM, revised descriptions and definitions of CRAM metrics to reflect input from CRAM reviews, a standardized set of CRAM training materials with annual updates to reflect changes in the manual and field books, 36 CRAM self-training sites located around the state for training and wetland tracking purposes, new training materials to assist in the standardization of CRAM assessment data collection, annual meetings of the CRAM PI team and other CRAM trainers to address updates and revisions to existing CRAM modules, and support for the L2 Committee of the California Wetland Monitoring Workgroup.

## **Task Descriptions and Accomplishments:**

### **Task 1: Project Coordination and Reporting**

#### *Task Description:*

The purpose of this task is to regularly monitor progress and success on each project task, manage grant funds and deliverables, coordinate among regional partners, provide quarterly written updates to the EPA Project Manager, and submit a final report upon project completion. This task also includes updating a quality assurance project plan (QAPP) to govern the collection of new data.

#### **Task 1.1: Report to EPA on the status of each work plan task and deliverable on a biannual basis.**

Biannual reports that described the progress made on each task and associated deliverables were provided to the EPA Project Manager on the following dates over the course of this grant:

- 7/26/2011
- 1/27/2012
- 7/23/2012
- 10/23/2012
- 4/29/2013

#### **Task 1.2: update quality assurance project plan (QAPP)**

Extensive progress was made on revising the CRAM QA plan initially put together by SCCWRP during the early portions of the grant period. Subsequent to that, the Plan went through several rounds of review by the L2 Committee members during 2012 and 2013.

Following extensive discussion, it was decided that the precision and accuracy descriptions for CRAM were outdated and needed clarification and revision. Datasets from calibration events around the state held by the regional data centers were assembled and analyzed. The resulting precision and accuracy estimates were inserted into the final version of the CRAM QA Plan.

Concomitantly, Chris Solek at SCCWRP along with Ross Clark at CCWG lead efforts to get CRAM adopted as a “SWAMP compatible” assessment methodology. A presentation was made to the SWAMP Round Table in 2012 and the CRAM manual along with several CRAM field books and a draft version of the CRAM QA Plan were submitted as support materials. On March 18<sup>th</sup>, 2013, the SWAMP Roundtable officially endorsed CRAM. A list of questions was included on the adoption letter, all of which were addressed in a letter back to SWAMP by members of the L2 Committee.

*Please see Appendix 4: CRAM QA Plan*

*Please see Appendix 5: SWAMP Endorsement Letter and Response to SWAMP Questions from CWMW.*

#### **Task 1.3: Produce Final Report**

This report fulfills the deliverable requirement for this subtask of the grant.



## Task 2: Standardization of expanded CRAM materials

### *Task Description:*

As the use and number of CRAM modules has increased, so too has the need for annual updates to the CRAM manual and its associated field books. Like all assessment methods, CRAM has continued to evolve and be refined with application. Additionally, as the number of people in the State trained to conduct CRAM assessments increased, it became clear that descriptions and definitions in the CRAM manual and field books were in some cases insufficient, leading to discrepancies in application of the tool and potentially poor precision and accuracy of the method.

Comments or suggestions regarding improvement, modification, or adaptation of CRAM for specific applications can be submitted on the CRAM website, are often received by trainers during CRAM Training classes and have come from agency personnel. No single member of the L2 Committee had taken the lead reviewing, addressing, and in some cases incorporating the submitted comments. This grant supported modifications to CRAM, its manual and field books, and minor updates to eCRAM with its associated plant list annually in winter, when field work is complete, and modifications were completed prior to revised manuals being released the following field season. Technical changes to CRAM were completed by the CRAM Principal Investigators in consultation with the regional teams and the L2 Committee. All individuals who registered on the CRAM website received email alerts regarding updates to CRAM.

### **Task 2.1: major update and produce formal CRAM manual**

The CRAM User's Manual was revised twice over the course of this grant, once in early 2012 and a second time a year later. In both occurrences there was a list of changes assembled over the course of a training season. The list of changes was reviewed by and commented on by the L2 Committee followed by CCWG initiating the changes. Input on the CRAM User's Manual was obtained each year from the L2 Committee members and CRAM trainers prior to the beginning of the field season. Comments and suggestions were assembled and implemented by CCWG. A final revised version of the manual was released on the CRAM website prior to the beginning of the field season.

Major changes included the following:

- Removal of all figures and tables that are present in the wetland-specific field books
- Revision of Chapters 4 and 5 to make them more up-to-date with CRAM development and implementation in California
- Removal of all non-essential appendices to the Manual.
- Creation of a CRAM logo



Figure 1. The new CRAM logo.

Please see Appendix 6 for a complete list of changes made in March 2012 and April 2013 to the CRAM User's Manual.

### Task 2.2: expanded CRAM descriptions and definitions

Multiple figures, descriptions and definitions were added, expanded and revised both in the CRAM field books and in the CRAM User's Manual. See below for several examples.

For a complete list of changes made to the Riverine and Estuarine field books from version 5.0.2 to 6.1, please see Appendix 7.

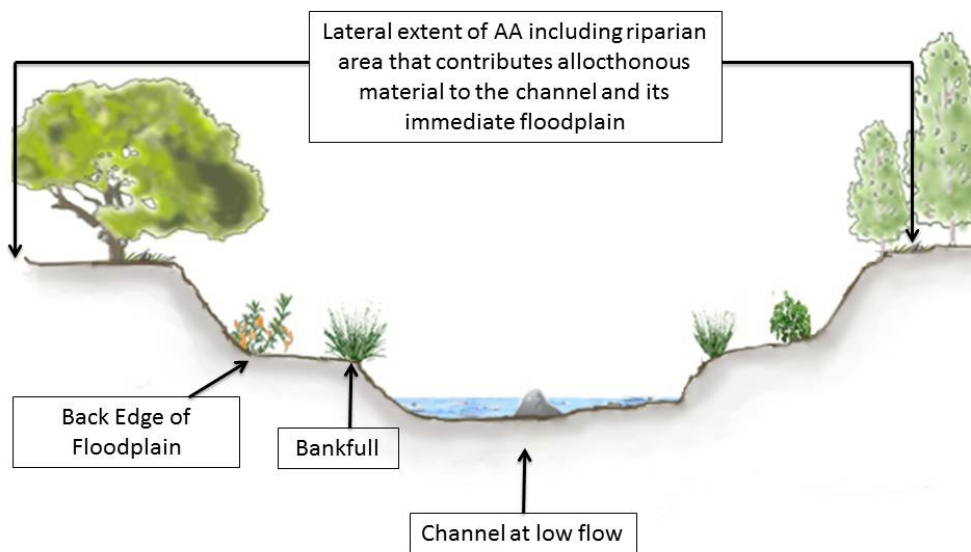


Figure 2. New figure added to the Riverine Field book illustrating the lateral extent of the assessment area.

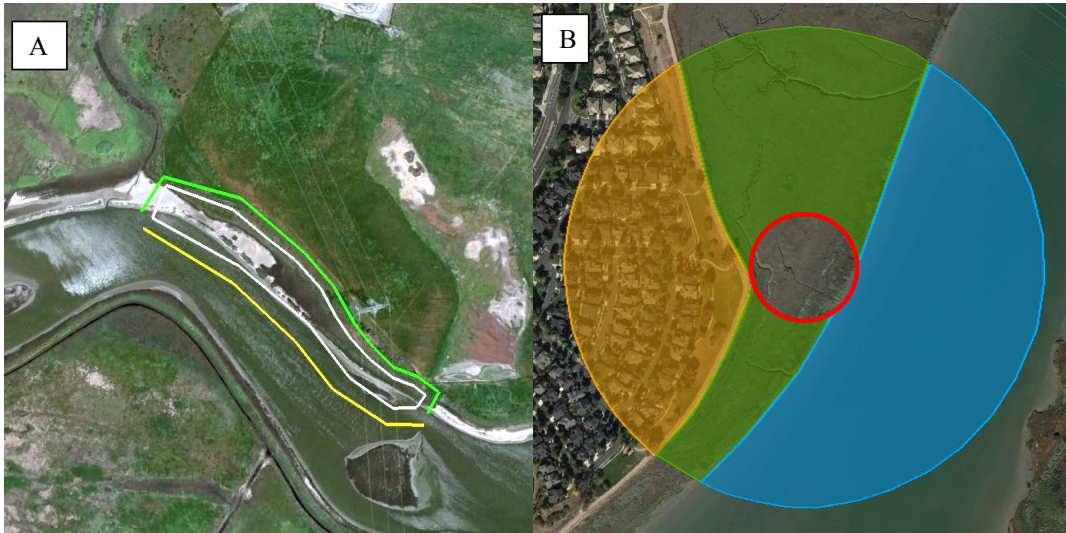


Figure 3. Revised figure in the Estuarine Field book illustrating buffer and non-buffer land cover types.

The glossary of terms in the CRAM user's manual was greatly expanded and revised to ensure all terms mentioned in the CRAM User's Manual were clearly defined. Please see page 57 of the CRAM User's Manual (v. 6.1) for the revised glossary of terms.

### **Task 2.3: major update of eCRAM for the vernal pool module**

A major revision of the Vernal Pool CRAM modules was needed. Initial development of the module had been completed by a small, but committed group of scientists and as a result, additional input was needed from a larger group of interested parties to ensure the method would reflect the condition of the wetland being assessed, met the CRAM method objectives, and would be adopted by the user community. As a result, a meeting was held in June 2011 with a group of vernal pool experts to review the current method in its entirety and look for potential issues with the metrics, their associated scoring bins and the method overall, and then revise it to address the issues. A long list of potential changes was made followed by a second meeting one month later to complete the revisions to the vernal pool systems module. Final changes were then made to the field book by CCWG and Carol Witham. The revised field book was presented to the L2 Committee in October 2012 where the revisions were accepted and an official "OK" was given for the revised field book to be used for trainings in spring 2012. Another round of final updates and revisions to the field book, and the individual VP field book took place in December 2012 in preparation for the CRAM v. 6.1 release in spring 2013. After extensive review and trouble shooting by SFEI, the revised Vernal Pool eCRAM module went live in Spring 2013.

*Please see Appendix 8 for a complete list of changes made to the Vernal Pool Systems and Individual Vernal Pool Field books between version 5.0.2 and 6.1.*

*Please see Appendix 9 for a list of additional issues and potential changes for the vernal pool module that were developed after the spring training season in 2013.*

#### **Task 2.4: annually updated CRAM manual and field books**

Please see tasks 2.1, 2.2 and 2.3 for the list of work completed on this subtask and the deliverables.

#### **Task 2.5: annually updated eCRAM**

Under the supervision of Cristina Grosso, SFEI staff participated in and implemented online updates to several CRAM Field books modified since October 2010. The most up to date CRAM Manual and Field books for five different wetland types are available online (in version 6.1, February 2013) along with copies of all the previous versions.

#### **Task 2.6: annually updated CRAM plant list**

The CRAM plant list was updated to be consistent with the new version of the Jepson Manual. This list was compared to the California IPC list to inform eCRAM which species are considered invasive. Additionally, several vernal pool experts (Carol Witham, Debra Sykes, Daria Snider) revised the original vernal pool endemic plant list which pulled directly from a report written by Todd Keeler-Wolf and associates in 1998. This was done for several reasons:

1. There were dozens of duplicate names in the list
2. There were lots of species that occur in vernal pool grasslands that would not be dominant in the vernal pools themselves
3. There were some species that cross multiple wetland types that should not be in the list (i.e. *Juncus bufonius*)
4. There was confusion with this list because it had multiple designations for the association of plants with vernal pools (vernal pool indicators, vernal pool associates, generalists, etc.)

The new 2013 CRAM Plant list used by eCRAM now has the most up-to-date plant species names for California, their invasive status, native status, and vernal pool endemic status.

*Please see Appendix 10: 2013 CRAM Plant list*

#### **Task 2.7: continuously updated CRAM website**

Working with the CWMW, L2 Committee, and CCWG, SFEI developed and manages the online California Rapid Assessment Method (CRAM) website (<http://www.cramwetlands.org/>) that houses CRAM documentation including:

- 1) CRAM Training announcements, materials and rosters,
- 2) CRAM Manual and Field books for all modules,
- 3) CRAM Plant List and other identification resources
- 4) Other CRAM reference materials

The website was continuously updated over the course of the grant to reflect updates to documentation, the CRAM training schedule, and training materials. A major revision of the website was completed in Spring 2013. The new website is easier to navigate, has a page dedicated to the L2

Committee and its role in CRAM development and implementation, as well as a table on the status of development of all CRAM modules.

### **Task 3: Coordination of CRAM Training and Reference materials**

*Task description:* CCWG recognizes that wetlands and riparian areas vary significantly in natural form and function among the regions of the state, and that each region has a community of experts best suited to account for this variability through data interpretation. As a result, CRAM trainings are being held in multiple locations across the state by the CRAM PI team and trained trainers. With multiple training centers running simultaneously, the need to standardize training materials and keep them updated to changes in the manual and field books was apparent.

The focus of this task was to coordinate and update the existing training materials for three CRAM modules, and to develop new materials based on the unique wetland characteristics found in different regions of the state. These new materials include a photo dictionary of common indicators of hydrologic features, images of physical patch types and topographic complexity for three CRAM wetland types. Additionally, 3 “self training” sites for three wetland classes for each of the four main training regions of the state (Northern, SF Bay, Central, and Southern) were established. These sites represent a range of condition for each validated module of CRAM, and can be used as post-training sites where practitioners can test their assessment capabilities. The sites can also be used in cases where a regional audit team finds that a CRAM practitioners scores seem questionable.

The intent of this task was to develop the capacity to provide consistent and appropriate application of CRAM for regulatory, mitigation, and restoration projects across a variety of private, state and federal organizations. The combination of these new materials with the standardization of the existing materials will allow for more uniform and consistent training of CRAM practitioners. These updated materials, in addition to the “self training” site documentation and score justifications are available on the CRAM website.

#### **Task 3.1: standardized set of CRAM training presentations**

A large effort was made Spring 2011 to ensure all the presentations used for the agency and practitioner trainings for all wetland types used a core set of slides across the state to provide a unified message from the L2 on CRAM development, use and adoption that was consistent with CRAM v. 5.0.2. The resulting presentations were transferred to each of the CRAM Training Centers in California.

Multiple “CRAM Trainer” conference calls were held over the course of this grant. Trainers from each region discussed upcoming trainings, issues with trainings, and needed changes to the training presentations.

*Dates of CRAM trainer conference calls:*

- *March 2<sup>nd</sup>, 2012*
- *January 8<sup>th</sup>, 2013*
- *April 8<sup>th</sup>, 2013*

### Task 3.2: annual update of CRAM training presentations

CCWG updated all of the module-specific presentations (riverine, estuarine, depressional, vernal pool) following the role-out of new CRAM versions in Spring 2012 (v.6.0) and Spring 2013 (v. 6.1). All figures and metric changes were updated in each presentation and transferred to each of the CRAM Training Centers to ensure uniform training materials.

### Task 3.3: regional photo inventories of common plants and indicators

All pictures taken by CCWG and SFEI at all CRAM assessment sites since 2007 were reviewed for good images of indicators pertinent to a CRAM assessment that depict various indicators of conditions for the metrics and submetrics of CRAM. In particular, photos representative of each patch type for all modules were assembled. The first draft of the CRAM photo dictionary was presented to the L2 Committee at their October 24<sup>th</sup> 2012 meeting. Comments were received and changes made by CCWG. The final version of the CRAM photo dictionary was sent to SFEI for posting on the new CRAM website in Spring 2013.

*Please See Appendix 11: CRAM Photo Dictionary*

### Task 3.4: field verification/audits sites for each region of the State

CCWG worked with SCCWRP to ensure there was a standard set of information associated with each of the 36 CRAM self-training sites (Table 1). The packet information is similar to the information in the packets developed for the CRAM reference network by SCCWRP in 2011. A list of potential sites was assembled for each region of the state in fall 2012 based on previous experience of each of the regional teams. For sites that had been assessed within the previous two years, existing data were used to develop the self-training site packets. For sites that lacked recent CRAM data, new assessments were conducted in summer 2013. It should be noted that the assessments represent a snapshot in time of the condition of the wetlands and as a result the scores are expected to change over time and may need to be re-assessed. Explanations of how each metric score was derived will help practitioners discern team misuse of the method from real changes occurring to the habitat on the ground.

For each site, the following information is provided:

- Site Coordinates
- Detailed directions to the site
- A local map of the location
- Information on access permission
- Contact info of the landowner
- Site history
- Characterization of land use in the catchment or around the site
- Information on site ownership and current management
- Anticipated future changes in land uses or other stressors



- An assessment area map (multiple scales)
- CRAM score and rationale for each metric
- Photos of the site and score rationale

Please see Appendix 12 for an example site packet.

Table 1. Location of 36 CRAM “self-training sites” across California.

Site Name	Wetland Type	Location	Coordinates
Whitely Marsh	Depressional	North Coast	40.79476, -124.18013
Foothill Regional Park	Depressional	North Coast	38.56189, -122.79662
Bodega Dunes Pond	Depressional	North Coast	38.34397, -123.05742
Scott Lindsey Park	Depressional	SF Bay	37.73022, -122.20954
Maricich North Pond	Depressional	SF Bay	37.94601, -122.13411
Sindicich North Pond	Depressional	SF Bay	37.94558, -122.14152
4 mile Beach Pond	Depressional	Central Coast	36.96706, -122.12486
Marina Dunes Pond	Depressional	Central Coast	36.68990, -121.80582
Quail Hollow Pond	Depressional	Central Coast	37.08282, -122.06256
Zuniga Pond	Depressional	South Coast	34.11213, -118.64253
Michelson Pond	Depressional	South Coast	33.66984, -117.83964
San Dieguito Pond	Depressional	South Coast	33.04039, -117.15610
Janes Creek	Riverine	North Coast	40.88858, -124.08370
Jolly Giant Creek	Riverine	North Coast	40.87622, -124.09093
Cambell Creek	Riverine	North Coast	40.87077, -124.07404
Devils Gulch	Riverine	SF Bay	38.02979, -122.73492
Penitencia Creek	Riverine	SF Bay	37.40088, -121.79540
Coyote Creek	Riverine	SF Bay	37.33659, -121.86731
Corralitos Creek	Riverine	Central Coast	36.99028, -121.80367
Fall Creek	Riverine	Central Coast	37.05185, -122.08661
Branciforte Creek	Riverine	Central Coast	36.98353, -122.01628
Solstice Creek	Riverine	South Coast	34.04027, -118.75379
Serrano Creek	Riverine	South Coast	33.64835, -117.69308
Lytle Creek	Riverine	South Coast	34.24878, -117.51851
Pudding Creek Estuary	Bar-Built Estuarine	North Coast	39.45562, -123.80676
Redwood Creek Estuary	Bar-Built Estuarine	North Coast	41.28780, -124.08887
Salmon Creek Estuary	Bar-Built Estuarine	North Coast	38.35175, -123.06386
Redwood Shores Marsh	Perennial Estuarine	SF Bay	37.53680, -122.23202
Crissy Field Marsh	Perennial Estuarine	SF Bay	37.80467, -122.45380
Mill Valley Marsh	Perennial Estuarine	SF Bay	37.89422, -122.52643
Lombardi Creek Estuary	Bar-Built Estuarine	Central Coast	36.96217, -122.11294
Coon Creek Estuary	Bar-Built Estuarine	Central Coast	35.25938, -120.89387
Corcoran Lagoon	Bar-Built Estuarine	Central Coast	36.96113, -121.98421
Arroyo Burro Creek Estuary	Bar-Built Estuarine	South Coast	34.40235, -119.74273
San Juan Creek Estuary	Bar-Built Estuarine	South Coast	33.46306, -117.68233
Ventura River Estuary	Bar-Built Estuarine	South Coast	34.27609, -119.30882

**Task 4: Establish a QA Process for state agencies and CRAM development team**

*Description:* As with any assessment method, discussion and debate on some elements of CRAM and its application is ongoing. As a result, CRAM will continue to evolve in response to new data and changing needs of the user community. This task has allowed for ongoing dialogue among the major regions of the state on differing viewpoints and perspectives with the goal of continuing to improve the utility of CRAM for both ambient and project assessments. To facilitate dialogue on technical aspects of CRAM and the policy implications of its use, four regional teams and the associated CRAM trainers met once annually for 3 years in coordination with the L2 Committee of the CWMW. All three meetings were a great success and laid the groundwork for annual CRAM trainer meetings in to the future.

These “CRAM-aganza” events took place over the course of this grant in Moss Landing (Spring 2011, Fall 2012) and in Costa Mesa (Fall 2011). At these meetings trainers from around the state met to conduct calibration exercises, discuss method use to ensure they are assessing wetlands in a consistent way, teaching the methodology consistently, and reviewed any questions that arose over the past training season. Additionally, these meetings allowed for extensive discussion of ongoing deliberations amongst the L2 Committee members on several metrics in CRAM. As a result of these meetings and several other calibration events in 2012 and 2013 between the CRAM PI Team, CRAM Trainers and qualified practitioners, revised data quality objectives were developed for CRAM (Table 2).



*Please see Appendix 13 for the results of the calibration assessments during the Fall 2011 and Fall 2012 CRAM-aganza events.*

**Table 2. Revised DQOs for the California Rapid Assessment Method.**

	<b>Error</b>
CRAM Index Score	+/- 2.5 points
CRAM Final Attribute Score	+/- 4 points



#### Task 4.1: agenda and minutes from biannual meetings

Funds were used to assist in the development of the L2 Committee (Table 3) through the recording of minutes from each meeting, and the sending out of agendas for meetings as well as other important notifications. Agendas and meeting notes were produced for the following L2 Committee meetings over the course of this grant:

- 10 March 2011, Moss Landing\*
- 18 May 2011, Costa Mesa
- 17 August 2011, Oakland
- 20 October 2011, Costa Mesa\*
- 07 February 2012, Oakland
- 24 May 2012, Richmond
- 07 August 2012, Richmond
- 24 September 2012, Moss Landing\*
- 28 January 2013, Costa Mesa
- 8 May 2013, Richmond
- 31 July 2013, Richmond
- 23 October 2013, Richmond

\* L2 Committee meeting occurred during a CRAM-aganza event\*

**Table 3. List of Level 2 (Rapid Assessment) Committee Members, 2013.**

<b>Last Name</b>	<b>First Name</b>	<b>Organization</b>	<b>Email</b>
Clark	Ross	Central Coast Wetlands Group at Moss Landing Marine Labs	rclark@mlml.calstate.edu
Clark	Cara	Central Coast Wetlands Group at Moss Landing Marine Labs	cclark@mlml.calstate.edu
Collins	Josh	San Francisco Estuary Institute	josh@sfei.org
Denn	Marie	National Park Service	Marie_Denn@nps.gov
Grosso	Cristina	San Francisco Estuary Institute	cristina@sfei.org
Harvey	Cliff	State Water Resources Control Board	CHarvey@waterboards.ca.gov
Jones	Paul	USEPA Region 9	Jones.Paul@EPA.GOV
Kunz	Nicholas	State Water Resources Control Board	Nicholas.Kunz@waterboards.ca.gov
Loffler	Rebecca	Caltrans	rebecca_loeffler@dot.ca.gov
Lowe	Sarah	San Francisco Estuary Institute	sarah@sfei.org
Lunde	Kevin	Bay Area Regional Water Quality Control Board	klunde@waterboards.ca.gov
Mattson	Michelle	USACE	michelle.l.mattson@usace.army.mil
O'Connor	Kevin	Central Coast Wetlands Group at Moss Landing Marine Labs	koconnor@mlml.calstate.edu
Payne	Rebecca	Caltrans	rebecca.payne@dot.ca.gov
Pearce	Sarah	San Francisco Estuary Institute	sarahp@sfei.org
Roberts	Chad	Roberts Environmental and Conservation Planning LLC	rcr@robertsecp.com
Robinson	April	San Francisco Estuary Institute	april@sfei.org
Scianni	Melissa	USEPA Region 9	Scianni.Melissa@epamail.epa.gov
Sibbald	Glen	CDFG-Aquatic Bioassessment Laboratory	gsibbald@ospr.dfg.ca.gov
Solek	Chris	Southern California Coastal Water Research Project	chriss@sccwrp.org
Solomesheh	Ayzik	UC Davis	aizsolom@plantsciences.ucdavis.edu
Stein	Eric	Southern California Coastal Water Research Project	erics@sccwrp.org
Stevens	Michelle	California State University Sacramento	stevensm@saclink.csus.edu
Teunis	Lindsay	AECOM	Lindsay.Teunis@aecom.com
Weixelman	David	U.S. Forest Service	dweixelman@fs.fed.us
Witham	Carol	Witham Consulting	cwitham@ncal.net

**Task 4.2: record of potential changes to CRAM modules**

A list of all changes made to the CRAM manual and field books each year was generated and distributed with the revised books.

*Please see Appendices 7, 8 and 9 for lists of all changes made to the CRAM User’s Manual and field books.*