CIAP Task 3 Summary Report

Prepared by Cara Clark and Kevin O'Connor, CCWG

Verification of the Depressional CRAM Wetland Module

Central Coast Wetlands Group

Roberts Environment and Conservation Planning, LLC

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Introduction

The purpose of this project was to verify the performance of the CRAM Depressional module across ranges of condition, location, and period of inundation. It was a collaborative effort between the Central Coast Wetlands Group @ Moss Landing Marine Labs (CCWG), San Francisco Estuary Institute Aquatic Science Center (SFEI-ASC), the Southern California Coastal Water Research Project (SCCWRP), and Roberts Environmental and Conservation Planning, LLC (RECP). It was funded by the Coastal Impact Assistance Program through the U.S. Fish and Wildlife Service. The project was not intended to fully validate the module by comparing it to Level 3 data, which will occur in a future project funded by USEPA Region 9. The "verification" of the module is an important step in the development process, which takes the module beyond theory and tests its capabilities on the ground.

As a subtask of this project, SCCWRP staff, in coordination with MLML, compiled and analyzed intensive (Level-3) indicators for application in depressional wetlands based on data collected from 53 sampling sites in southern California. This work included organization of ambient assessment data and initial comparisons of patterns observed using landscape stressor data, CRAM, and L3 measures of condition and stress. Specific tasks included developing criteria to select L3 data types to use in correlation analyses; predicting the expected correlations between L3 data, landscape stressor data and CRAM metrics; compiling the data; analyzing correlations relative to expected; and vetting and working with the Depressional Core Technical Team. This work began the process for full validation of the module, which will be completed for the entire state utilizing data collected by SCCWRP, SWAMP and CCWG in 2014 or 2015.

Roles and Responsibilities

- CCWG:
  - Kevin O'Connor: Project Manager, Core Team and analysis
  - Cara Clark: Core Team and analysis
  - Sarah Stoner-Duncan: Field data collection
  - Ross Clark: Field data collection
  - Sierra Ryan: Field data collection
- RECP:
  - Chad Roberts: Core Team
- SCCWRP:
  - Chris Solek: Core Team
  - Staff: Southern California data collection
- SFEI:
  - Sarah Pearce: Core Team
- SWRCB:
  - Cliff Harvey: Core Team

Initial Field book Revision

Based on comments from the L2 (Rapid Assessment) Committee of the California Wetland Monitoring Workgroup (CWMW), users of the depressional module, particularly SCCWRP, and CRAM trainees, the Depressional Wetland Field book was revised at the beginning of this project to improve its performance. The document titled "2012_0606_CRAM_Field_Book_Depressional" was used for data collection in the summer of 2012.

2012 Sampling

The 2012 sampling season was designed to sample depressional wetlands across a range of hydroperiods, distributed across geographic regions of the state, and encompassing a range of condition. Seven geographic regions were sampled: North Coast, Central Coast, South Coast, San Francisco Bay Area, Central Valley, Sierras, and Modoc. A total of 55 sites were sampled under this project in 2012, with an additional 9 sites added to the analysis from a SWAMP-funded project in the South Coast to represent depressions in that region (Figure 1).

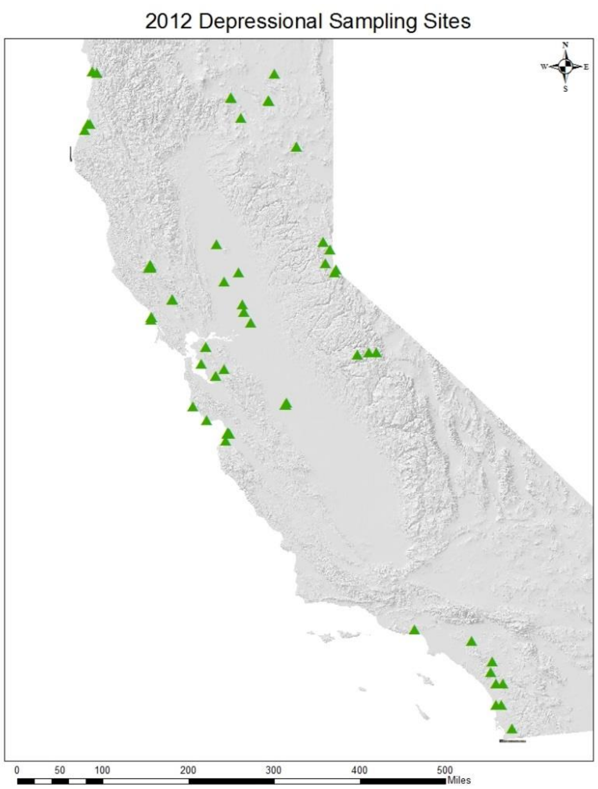

Figure 1. Depressional wetland sites sampled in 2012

In the spring of 2013 an additional 25 depressional wetlands were sampled. These wetlands were located in very dry areas of the state and had very short periods of inundation. We targeted sites that are only inundated for one to two months or less to see if any of the metrics in them module had bias or issues with assessing condition. The sites were clustered in locations where access was facilitated, including San Jose, eastern Contra Costa County, the San Luis National Wildlife Refuge, and the Kern and Pixley National Wildlife Refuges (Figure 2).

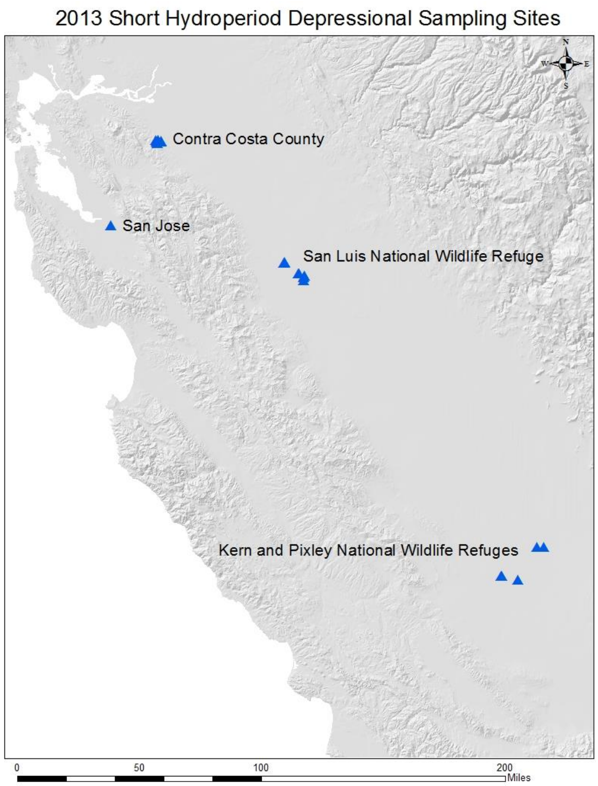

Figure 2. Temporary depressional wetlands sampled in 2013

Analyses of Depressional Module Performance

Each site assessed during the 2012 sampling season was categorized a priori as good, fair, or poor by the Core Team and local experts prior to sampling. Field-testing verified that the method was parsing these differences as expected (Figure 3). Sites that were designated as poor scored on the lower end of the spectrum, with a mean of 68, while the "good" sites had a much higher mean of 82. The CRAM module reflects the differences in condition that were detected a priori.

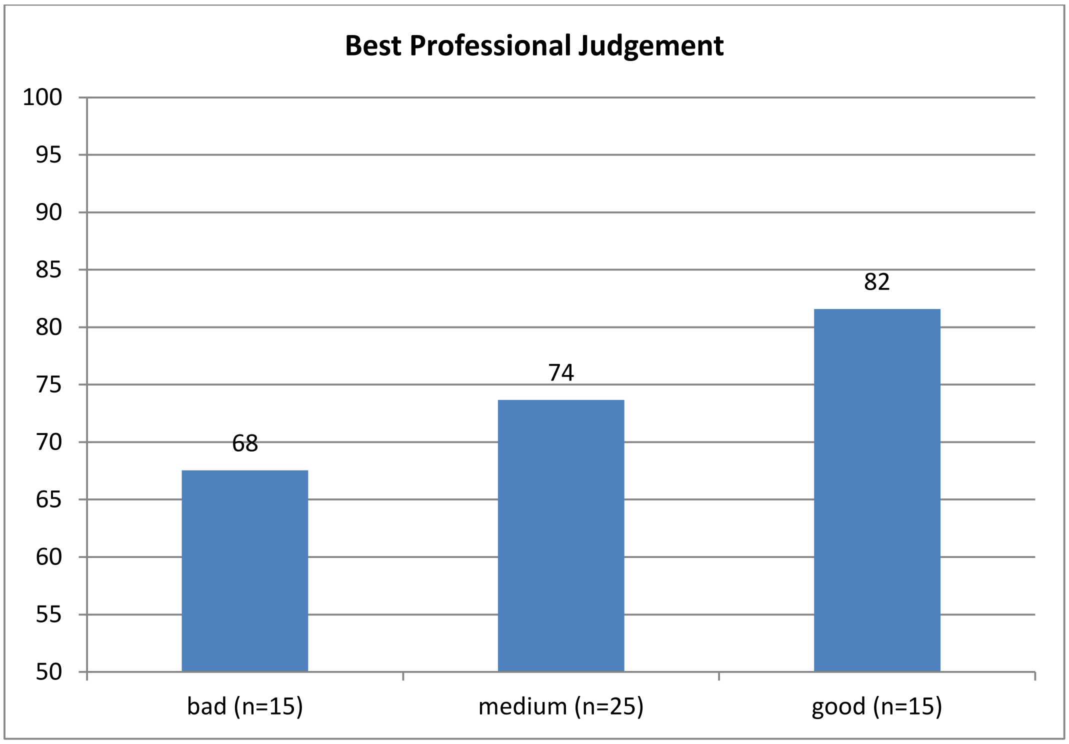

Figure 3. Average scores for sites categorized by BPJ condition (significant effect, P = 0.001)

The 2012 sampling effort looked at wetlands with hydroperiods ranging from seasonal (inundated 4-11 each year) to perennial (inundated >11 months each year). There was no significant effect of hydroperiod on the CRAM Index score (Figure 4). However, the Core Team and the Review Team were concerned that the seasonal wetlands sampled in 2012 didn't include wetlands on the extremely dry end of the hydroperiod spectrum, and that the method might not work as well in those wetlands. Therefore, the team assessed additional "temporary" wetlands in the spring of 2013.

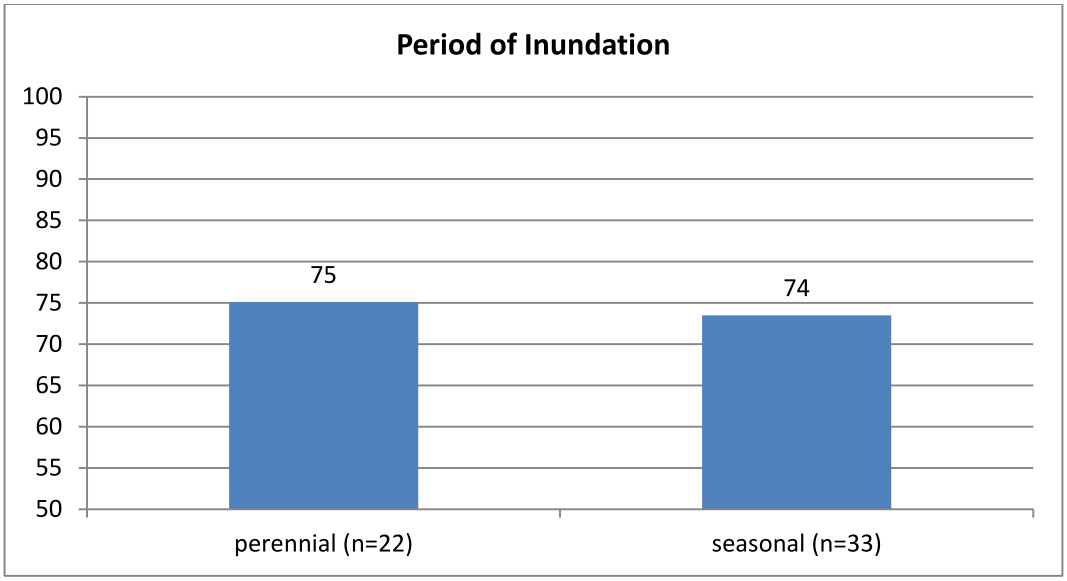

Figure 4. Average scores for sites categorized by period of inundation (no significant effect, P = 0.624)

There was a significant difference between artificial constructed and naturally established wetlands (Figure 5). Naturally occurring wetlands had a mean score 8 points higher than artificial wetlands. The difference was primarily due to the Hydrology and Physical Structure Attribute scores, with artificially constructed wetlands scoring lower in both. However, there did not appear to be as much of a discrepancy in the Landscape Context and Biotic Structure Attribute scores.

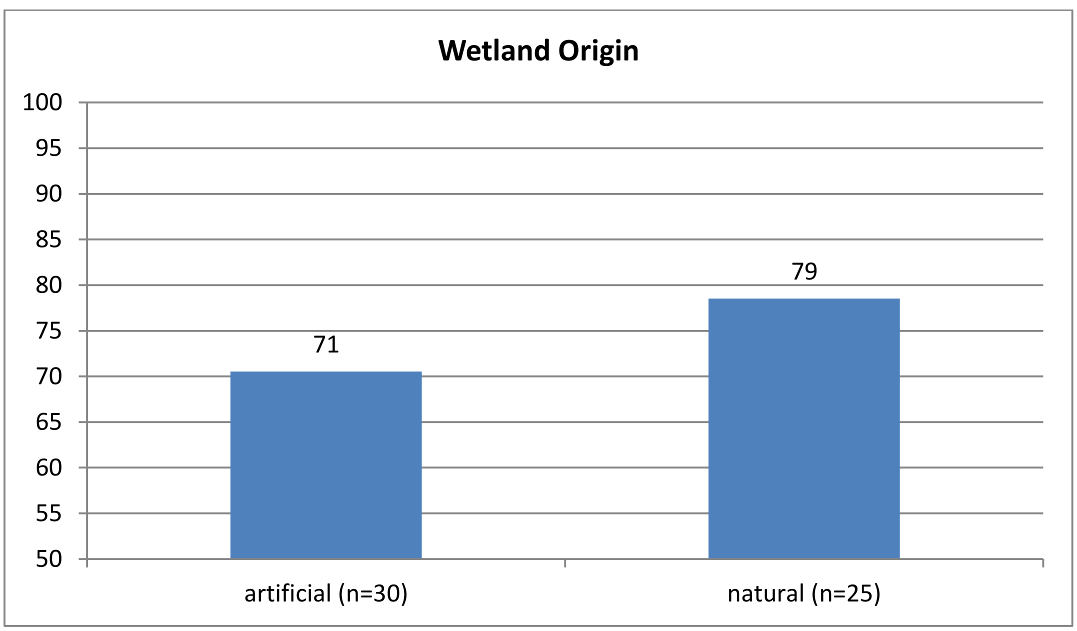

Figure 5. Average scores for sites categorized by wetland origin (significant effect, P = 0.005)

Part of the verification of the method requires that each metric exhibit a full range of possible scores. In general, this was verified at the depressional sites sampled for this project (Figure 6). All of the metrics had a range from A to D, except for the Percent with Buffer metric, where a C was the lowest score observed. A wetland that gets a D score for this metric would have less than 25% buffer around its perimeter. The Core Team and the Level 2 Committee are confident that it is possible to have less than 25% buffer, however a site representing this level of condition didn't happen to be encountered in this survey. There were several sites in the SWAMP-funded assessment with D scores for this metric in Southern California. This survey did not sample any sites that had a C score for Hydroperiod, but again there are reports of C scores being found at several sites in Southern California.

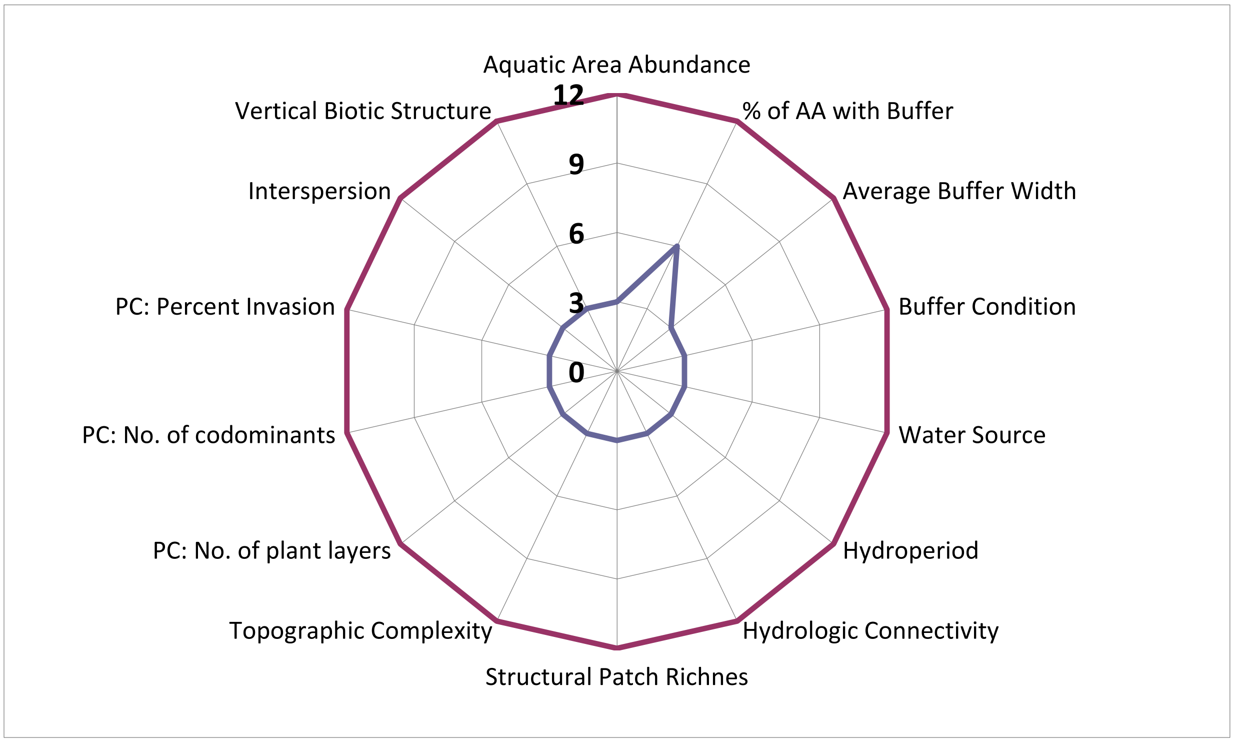

Figure 6. Minimum and maximum scores for each metric for all sites samples in 2012 and 2013.

2013 Sampling

In the spring of 2013 the module was used at 25 additional sites to test its performance in "temporary" depressions. The module defines temporary wetlands as those that are inundated for less than four months of the year. The sampling effort focused on wetlands at the dry end of this spectrum, primarily ones that are inundated for less than one or two months out of the year.

The temporary depressions generally had lower average scores and also a more narrow range of scores (Figures 7 and 8). However, some members of the Level 2 Committee argued that this was due to a true gradient in condition rather than a bias in the scoring method. In other words, the temporary wetlands have lower productivity and provide fewer functions because they have less water. The team also decided that more data was needed to support separating the temporary depressions into a sub-module. Future work could include looking at reference sites with varying hydroperiods, as well as collecting Level 3 data to get a better idea of the functions that these systems provide. Another reason not to separate these systems into a sub-module was that their CRAM scores would then not be comparable with scores from other depressional wetlands. This would make the implementation of CRAM in regulatory or state monitoring programs more difficult.

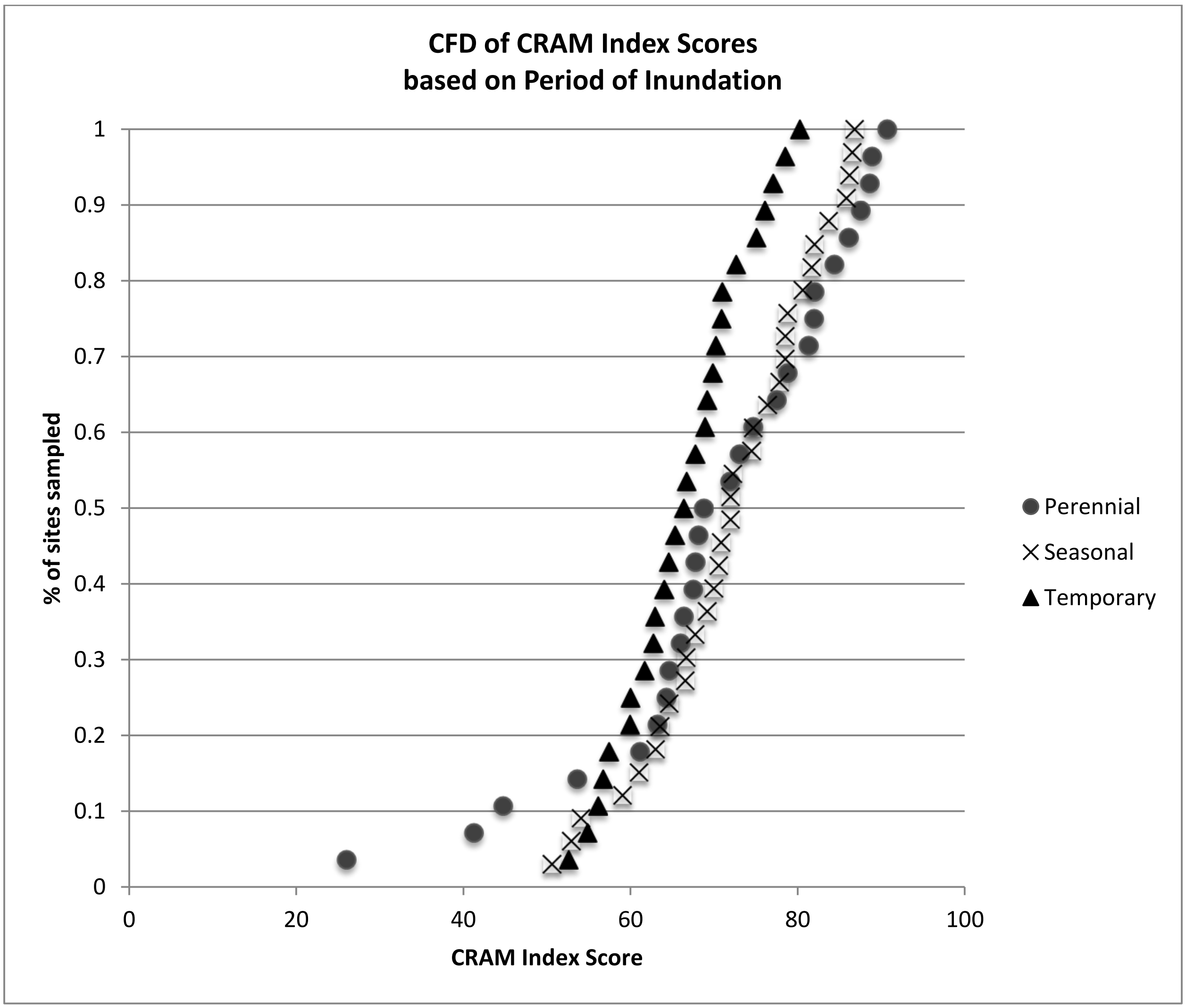

Figure 7. Cumulative Frequency Distribution of depressional wetlands categorized by length of inundation.

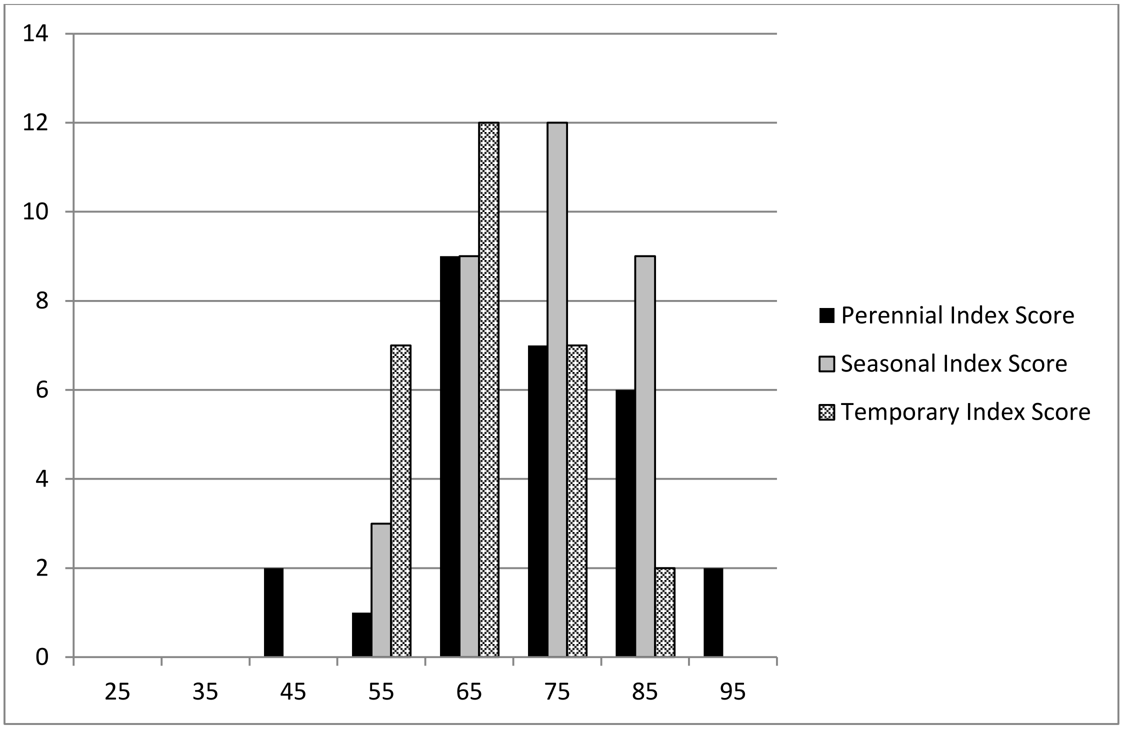

Figure 8. Range of Index Scores for depressional wetlands categorized by period of inundation.

Reviewers and Advisers

A team of experts was convened to advise on this project. The team included representatives from State and Federal agencies, non-profit organizations, academic institutions, and the private sector. The Level 2 Committee of the CWMW also provided input.

Table 1. Review Team Members

Name	Organization
Beatrix Treiterer	US Fish and Wildlife Service
Bill Patterson	Yurok Tribe
Brad Burkholder	CA Department of Fish and Wildlife
Cliff Harvey	State Water Resources Control Board
Dean Kwasny	Natural Resources Conservation Service
Heidi West	CA Department of Fish and Wildlife
Jake Messerli	CA Waterfowl Association
Jeffrey Stoddard	CA Department of Fish and Wildlife
Jennifer Cavanaugh	Natural Resources Conservation Service
Kate Guerena	US Fish and Wildlife Service
John Eadie	UC Davis/Central Valley Joint Venture
Karl Stromayer	US Fish and Wildlife Service

Lillian Busse	San Diego Regional Water Quality Control Board
Michelle Stevens	Sacramento State University
Mike Brown	UC Davis
Mike Finan	US Army Corps of Engineers
Mike Wolder	US Fish and Wildlife Service
Patrick Britton	Ducks Unlimited
Tracy Schohr	CA Rangeland Coalition

Recommendations and Module Updates

Several changes to the module were recommended by the Core Team, the L2 Committee, the Review Team, and general practitioners of CRAM. These changes were incorporated into a revised field book for depressional wetlands (see document "Changes to Depressional Field Book 5.0.2 to 6.1"). Major changes include: adjustment of bins for Aquatic Area Abundance to better reflect statewide data, reducing the minimum needed for an "A" from 75% to 45% wetland; clarification on what constitutes a break in connectivity for the Hydrologic Connectivity Metric, where a berm or levee with a gradual slope does not reduce the score; adjusted bins for Structural Patch Richness to better reflect statewide data; the Topographic Complexity diagram was revised; adjusted bins for Number of Co-dominant Species and Percent Invasion; and revised the Vertical Structure metric to include two methods, entrainment and overlap.

Result of Recommendations

A finalized field book was produced as part of this project (see document "2013.03.19_CRAM_Fieldbook_Depressional_final"). This field book for Depressional CRAM version 6.1 is now online as the official standard operating procedure for Depressional CRAM assessments and is posted on the *cramwetlands.org* website.

Photo Highlights

Figure 9. North Coast sites, clockwise from top left: Bodega Dunes, Klamath Floodplain, Bayshore Mall, Marshall Pond

Figure 10. Modoc sites, clockwise from top left: Pond near Pinky's Reservoir, Baum Lake/Crystal Lake, Upper Big Bear Flat, Ash Creek Wildlife Area

Figure 11. Central Valley sites clockwise from top left: Bobelaine Preserve, Roosevelt Ranch, Cosumnes River Preserve, San Luis National Wildlife Refuge

Figure 12. San Francisco Bay Area sites clockwise from top left: Vineyard Ave., Tyson's Lagoon, Turtle Pond, Sindicich Pond

Figure 13. Central Coast sites clockwise from top left: Franklin Point, Dolan Farm, Marina Dunes, Four Mile Beach

Figure 14. Sierra Nevada sites clockwise from top left: Tuolomne Meadows Oxbow, Disc Golf Pond, Tioga Pass Pond, Kahle Dr. Pond

Figure 15. The field crew