An Introduction to California Rapid Assessment Method for Wetlands (CRAM)

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What is CRAM?

- Rapid method used to assess condition based on readily observable field indicators
- Less than 4 hrs field time, team of 2-3
- Required expertise comparable to jurisdictional delineation
- Validated with intensive measures of wetland condition
CRAM Assessment Framework

Wetland Condition

- Landscape Context
- Hydrology
- Physical Structure
- Biotic Structure

Stressor Checklist
CRAM Attributes & Metrics

- Wetland Condition
  - Landscape Context
    - Landscape Connectivity
    - Buffer
  - Hydrology
  - Physical Structure
  - Biotic Structure
    - % of Area with Buffer
    - Buffer Width
    - Buffer Condition
Mutually Exclusive Alternative States Representing the Full Range of Possible Condition for *Buffer Width*

<table>
<thead>
<tr>
<th>Alphabetic Score</th>
<th>Numeric Score</th>
<th>Alternative State</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12</td>
<td>Average buffer width &gt; 250m</td>
</tr>
<tr>
<td>B</td>
<td>9</td>
<td>Average buffer width is 151 - 250m</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>Average buffer width is 76 - 150m</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>Average buffer width is ≤ 75m</td>
</tr>
</tbody>
</table>
Overall Score Equals Average Attribute Scores

**Wetland Condition**

- **Buffer**: 57.25%
- **Hydrology**: 30.0%
- **Physical Structure**: 47.5%
- **Biotic Structure**: 68.75%

**Organic Matter Accumulation**
- A = 12 or 100%

**Interspersion & Zonation**
- C = 6 or 50%

**Plant Comm. Composition**
- C = 6 or 50%

**Vertical Biotic Structure**
- B = 9 or 75%

11/16 or 68.75% of Possible
CRAM Features a Standard Set of Attributes and Metrics for 8 Wetland Classes

- Lakes
- Estuaries
- Lagoons
- Rivers, Creeks, Riparian Areas
- Depressional Wetlands
- Vernal Pools
- Playas
- Slope, Seeps & Springs
Reference Concepts

Metrics are scored relative to the best achievable condition, which is standardized throughout the state for each wetland class.

We are building a network of reference sites for each possible alternative state of condition, including worst to best achievable, for each wetland class.
Status of CRAM Development

- Manual: Complete for all classes
- Verification: Complete for all classes
- Validation: Complete for
  - Riverine/Riparian
  - Estuarine
  In progress for other classes
- Peer Review: Ongoing
  - Rapid Assessment in California (Sutula et al. 2006)
  - Manuscript on CRAM validation in preparation
  - Formal peer review by State this fall
## Validation: Repeatability Among Teams At Metric Level

<table>
<thead>
<tr>
<th>Precision Test</th>
<th>Precision Targeted</th>
<th>Precision Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Teams</td>
<td>+/- 20%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12%</td>
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</table>
# Significant Correlations

Riverine CRAM and Level 3 Data

<table>
<thead>
<tr>
<th>CRAM Score</th>
<th>Level 3 Data</th>
<th>$r^2$</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape</td>
<td>Diversity of non-riparian bird species</td>
<td>+.39</td>
<td>.01</td>
</tr>
<tr>
<td>Hydrology</td>
<td>Total bird species diversity</td>
<td>+.32</td>
<td>.04</td>
</tr>
<tr>
<td>Physical</td>
<td>CDFG Benthic IBI</td>
<td>+.35</td>
<td>.01</td>
</tr>
<tr>
<td>Biotic</td>
<td>Benthic IBI</td>
<td>+.40</td>
<td>.003</td>
</tr>
<tr>
<td>Overall</td>
<td>Benthic IBI</td>
<td>+.62</td>
<td>.001</td>
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</tbody>
</table>
Overview of CRAM Uses

- Ambient monitoring (statewide, regional, watershed assessment)
- Compliance monitoring
- Wetland program evaluation
- Cumulative impacts
CRAM Resources

- CRAM Users Manual Version 4.5
- CRAM Information Technology (eCRAM)
  - Field CRAM with tablet or laptop
  - Aerial imagery, CRAM software
  - Statewide database
- Training Materials
  - CRAM dictionary on web site
  - Condensed field manuals
- URL: cramwetlands.org