Project Performance Curves

Tidal Wetlands (SFEI)
Wadeable Streams (SCCWRP)

CWMW Briefing
May 5, 2015

Challenges to Determining Restoration Success

- Unknown time to optimal performance

- Performance measures vary between projects

- Development rates vary between projects

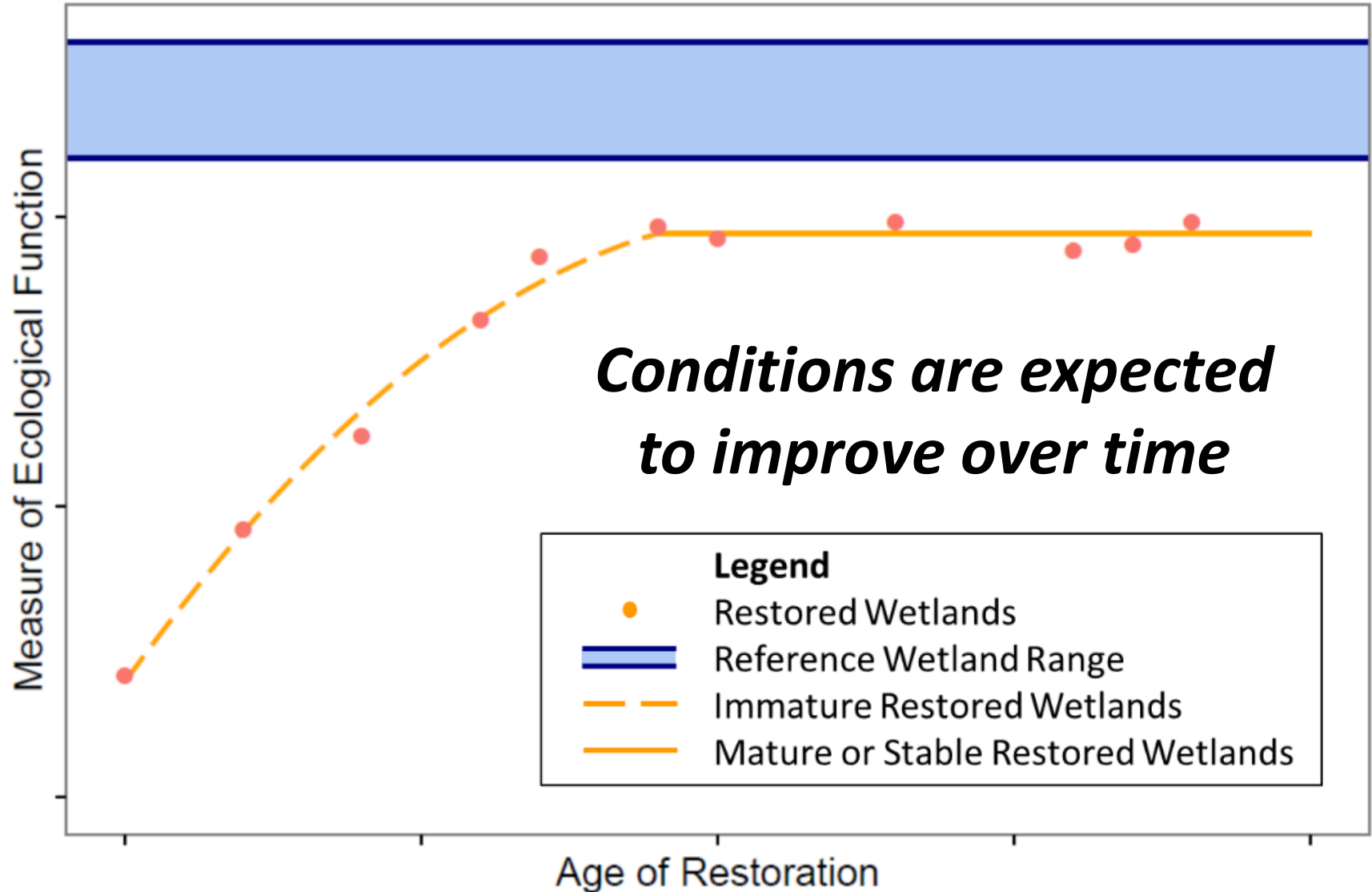- Ecological monitoring indicators vary

Performance Curves

- Describe future performance

- Predict project condition

- Can inform management measures

- Recommended by ACOE during CRAM review

Hypothetical Performance Curve

Conditions are expected to improve over time

Legend
- Restored Wetlands
- Reference Wetland Range
- Immature Restored Wetlands
- Mature or Stable Restored Wetlands

Measure of Ecological Function

Age of Restoration

Methods

- Collect CRAM data:

  – Restoration projects of various ages

  – Reference sites

  – Sites that have naturally evolved

- Develop performance curves

- Test restoration project performance with data not used for curve development
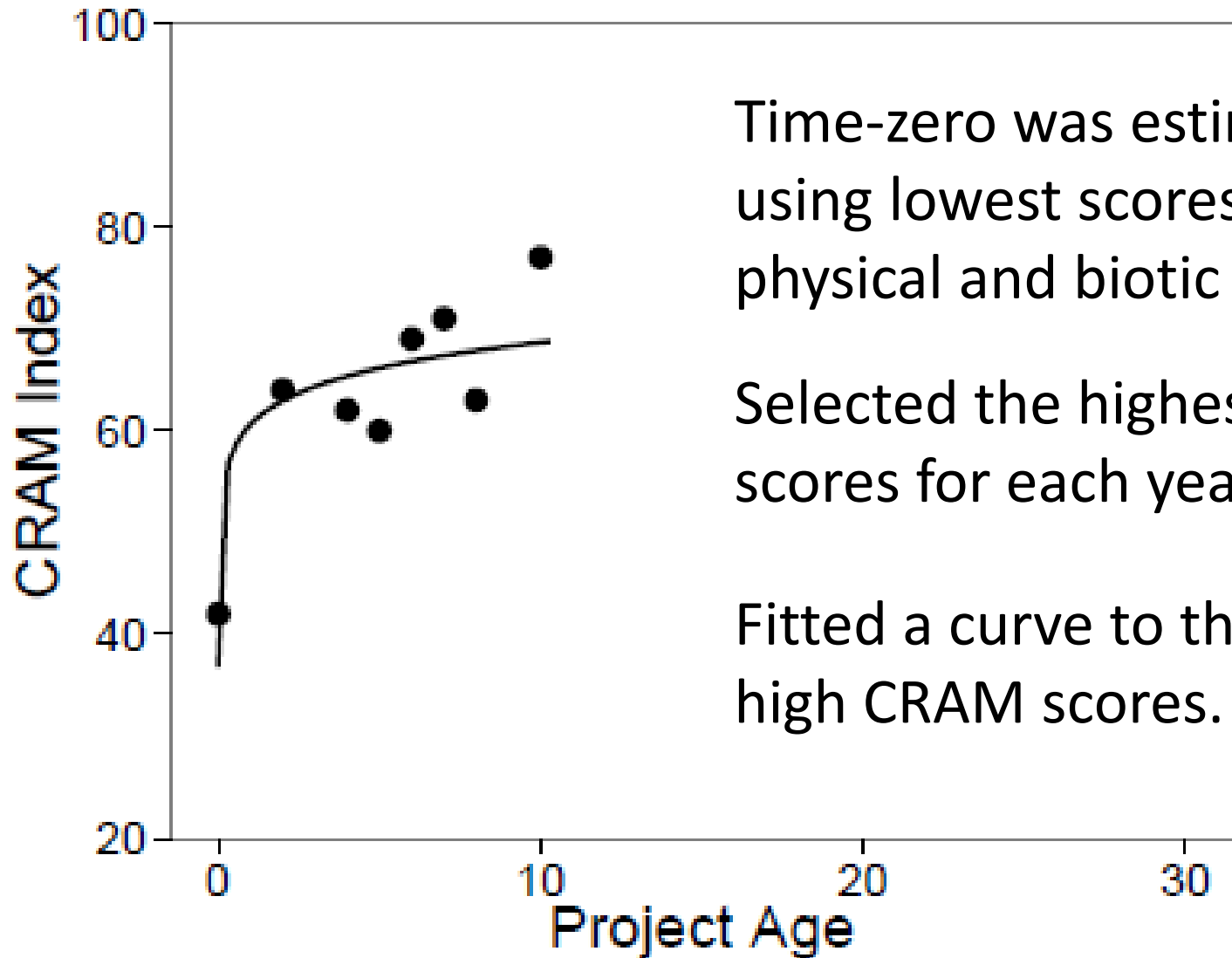
Wadeable Streams
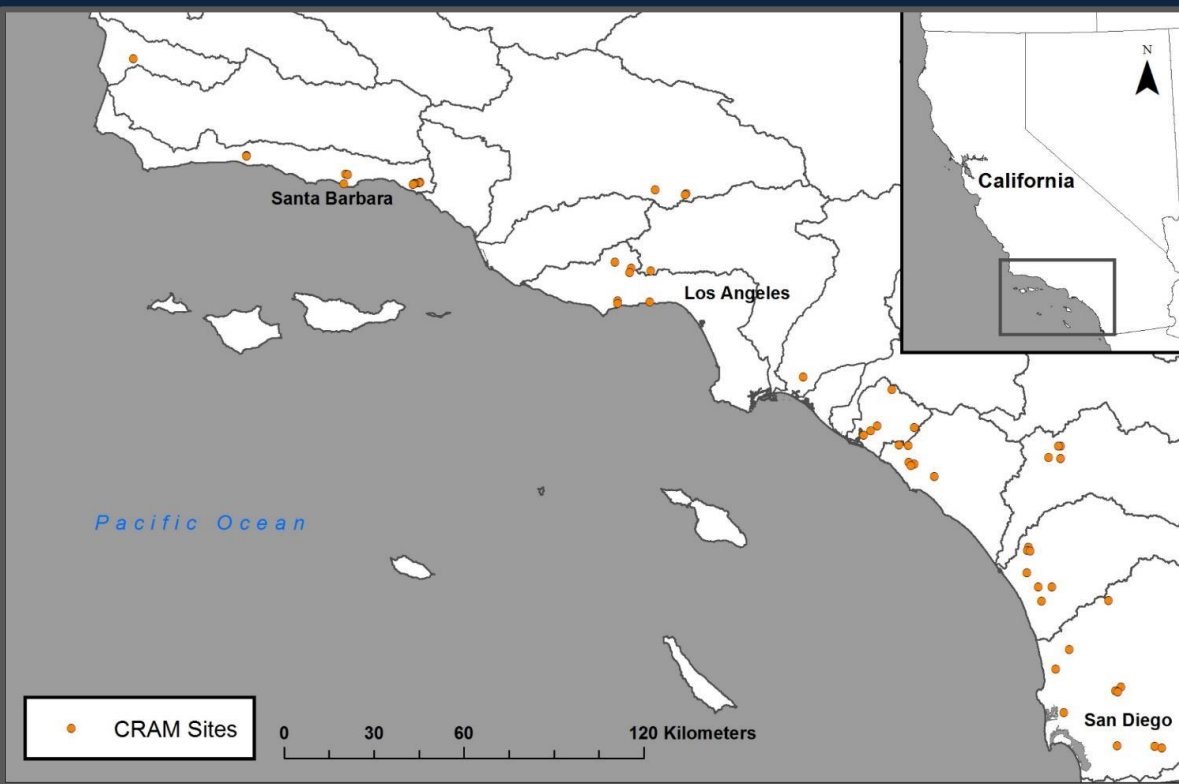
Based on CRAM Data for 27 Sites

- Santa Barbara to San Diego counties

- Restoration and mitigation

- Riparian re-vegetation and channel construction

- Perennial or intermittent flow

- Sites range in age from 2-10 yrs

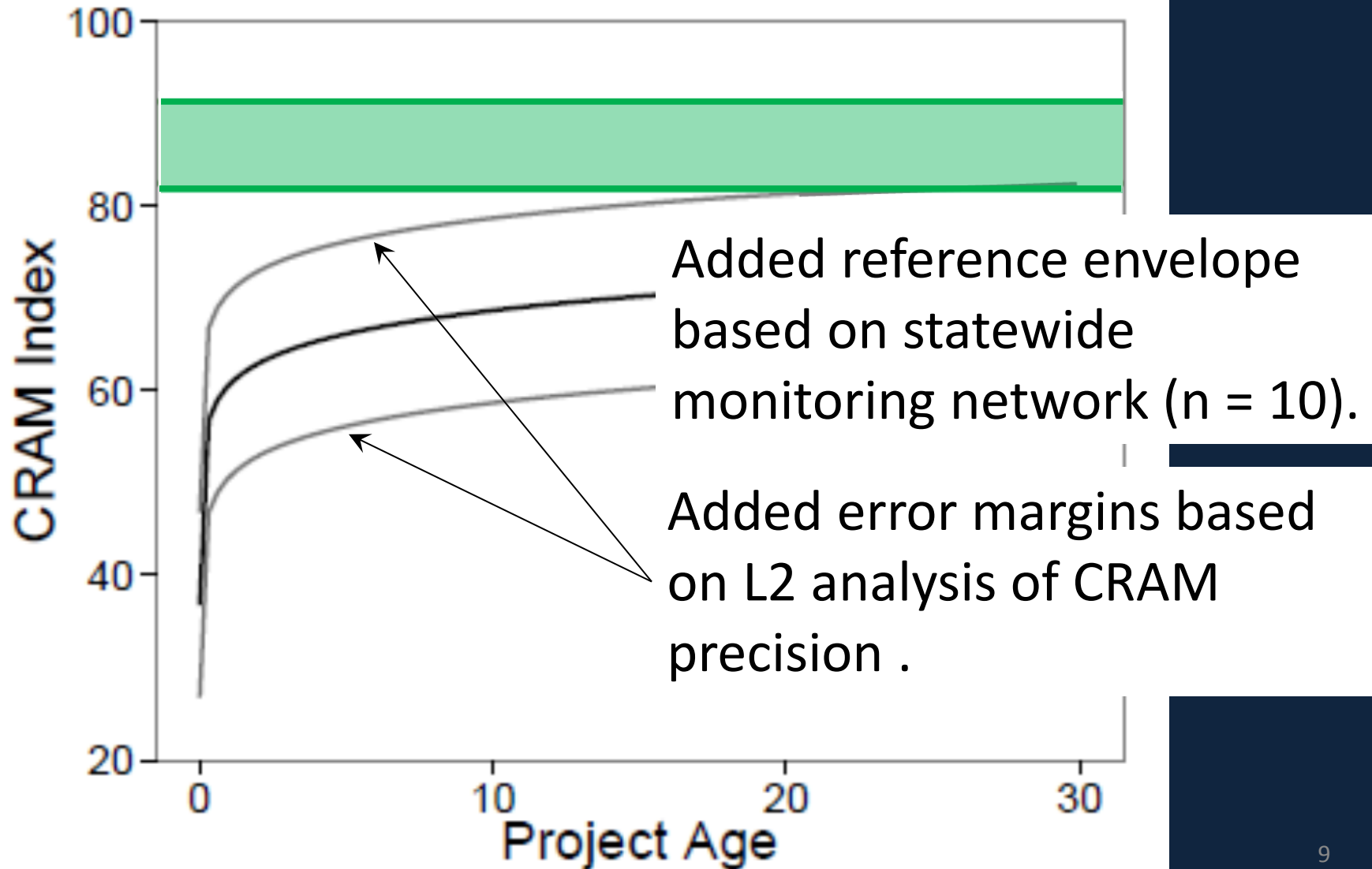# Performance Curve Development

Time-zero was estimated using lowest scores for physical and biotic structure.
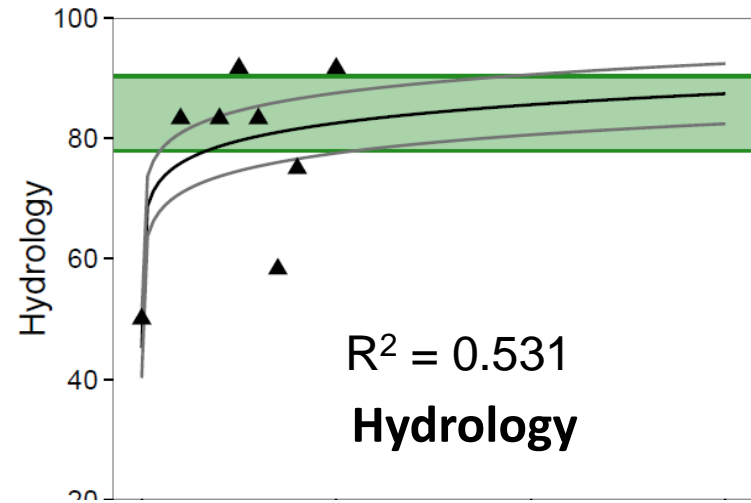
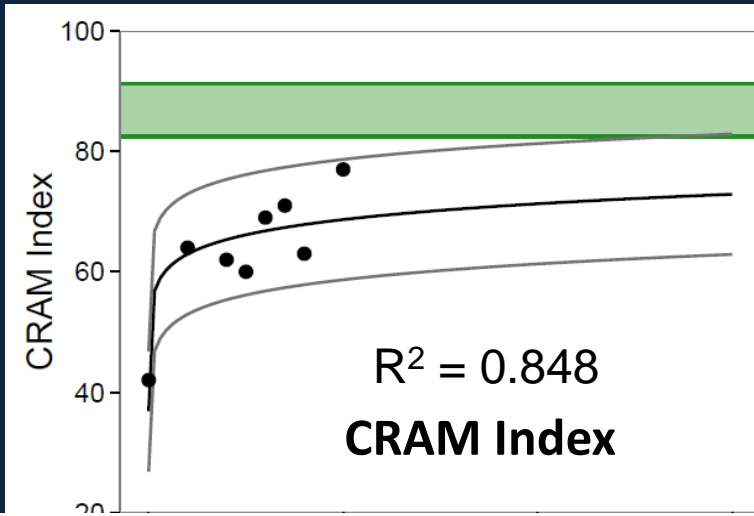Selected the highest CRAM scores for each year .

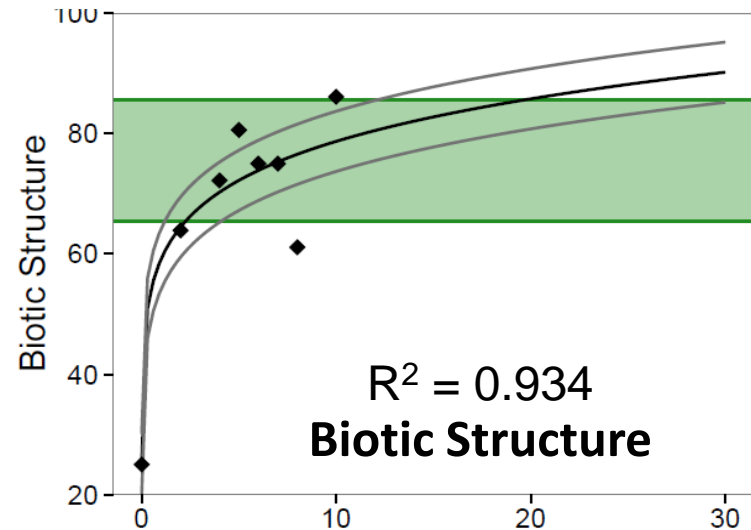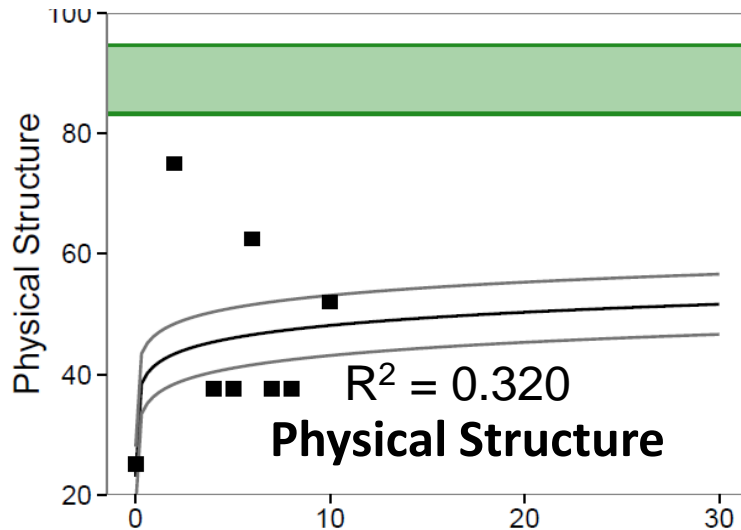Fitted a curve to the selected high CRAM scores.

Performance Curve Development

Added reference envelope based on statewide monitoring network (n = 10).

Added error margins based on L2 analysis of CRAM precision .

Attribute Curves

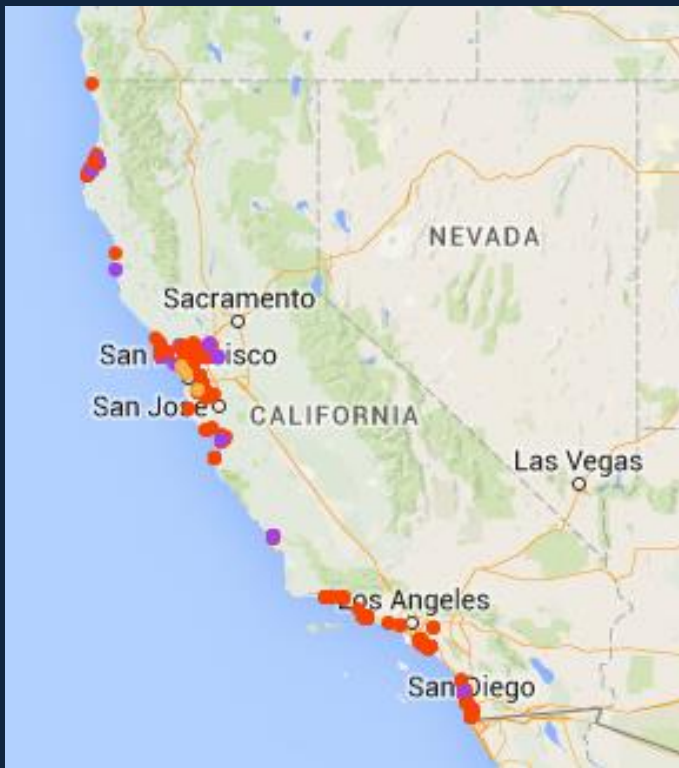*Referee Envelope calculated separately for each Attribute*

Summary for Wadeable Streams

- These curves suggest that projects will attain reference condition for Hydrology and Biotic Structure within 30 years, but not for Physical Structure or Overall Condition (i.e., CRAM Index).

- Low scores for Physical Structure are lowering scores for Overall Condition. Buffer and Landscape Setting less applicable

- More data are needed to generalize the curves, especially to add sites with known time zero scores, and to add sites older than 10 yrs.

Tidal Marsh

Based on CRAM Data for 171 Sites

- Statewide

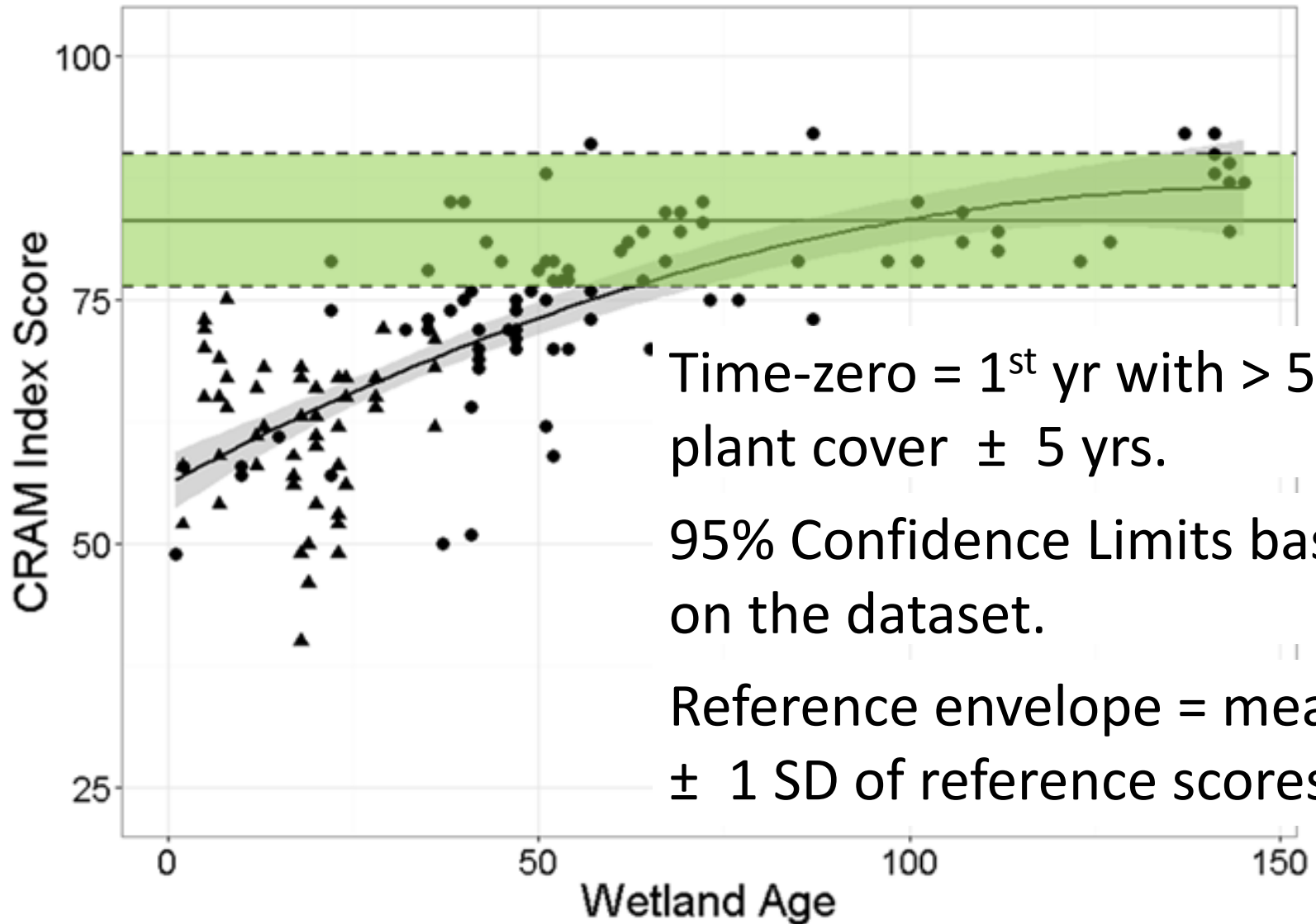|	No. Sites	Ages (yrs)
Projects	53	2-36
Non-Projects	93	1-46
Reference	25	250 – 3,000

- Reference = uninterrupted evolution for past 150 yrs (mature, high-elevation marshes).

- Zero AAs subject to frequent disturbance (e.g., none on active deltas, active dunes, or artificially maintained).

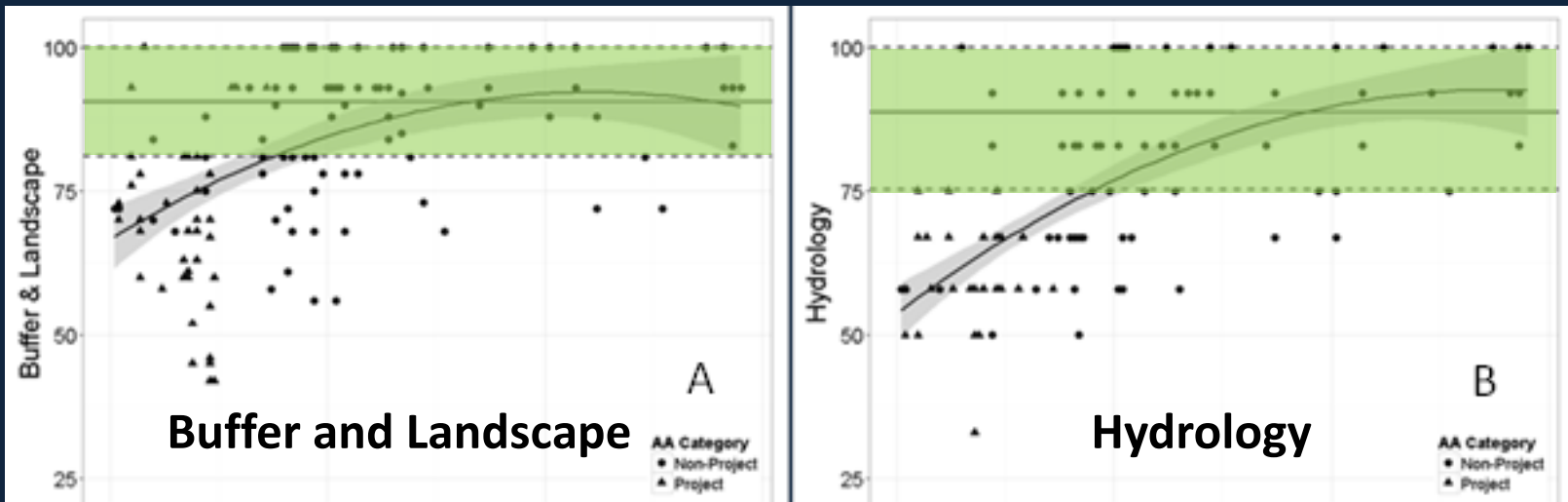- Lots of detective work required for each site.

Example Sites

Index Score = 79

Index Score = 61

Index Score = 40

Performance Curve Development

Time-zero = 1st yr with > 5% plant cover ± 5 yrs.

95% Confidence Limits based on the dataset.
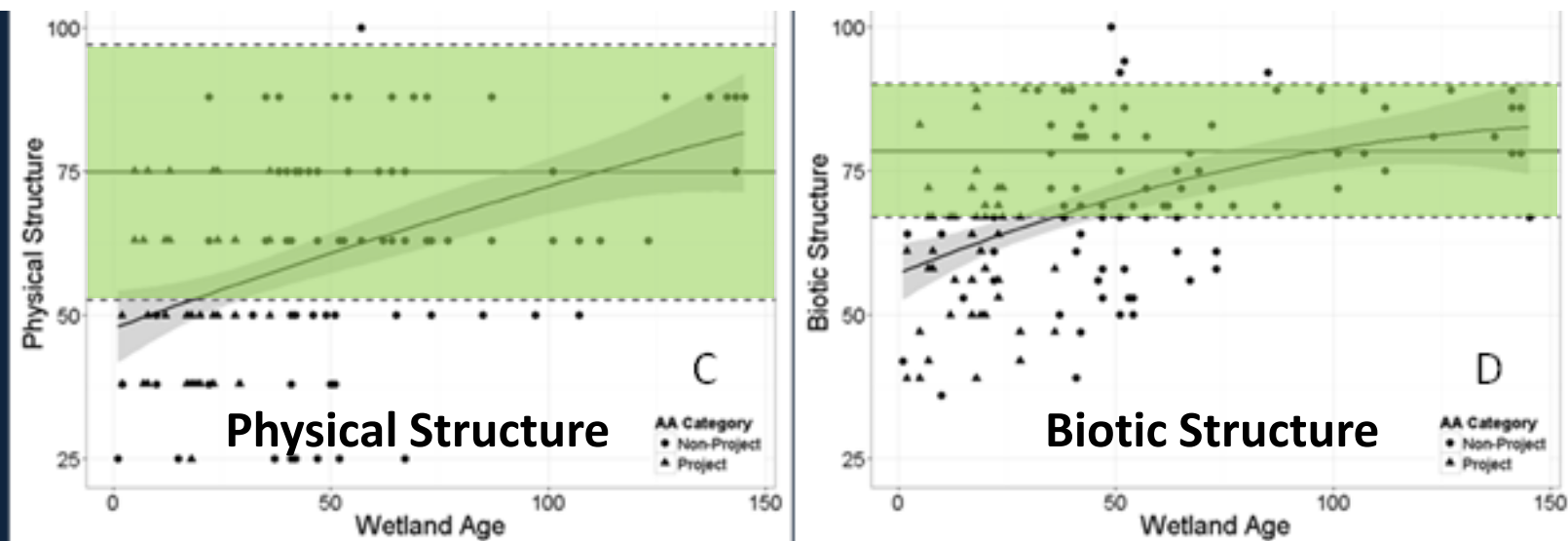
Reference envelope = mean ± 1 SD of reference scores.

Attribute Curves

Referee Envelope calculated separately for each Attribute

Summary for Tidal Marshes

- These curves suggest that projects will attain the lower limit of reference condition within 30-50 yrs, and the mean reference condition in < 100 yrs.

- These curves do not reflect accelerated Sea Level Rise.

- Low precision of the Physical Structure Metric causes low precision of the Physical Structure curve.

Overall Recommendations

- Performance Curves should be developed for each CRAM module that has been validated.

- Some current CRAM metrics may be more applicable for Performance Curve than others.

  - Physical structure
  - Buffer (riverine only)

- Encourage additional data collection from early in the restoration process (improve time zero information)

- "Being on the Curve" (within Confidence Limits) at set times could be a useful project performance standard.