A Conceptual Approach to Vernal Pool Monitoring under CWA Section 404 Permits

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New CWA Rule

***Compensatory Mitigation Rule* calls for:**

- Using a watershed approach
- Maintaining quality and quantity of aquatic resources within a watershed
- Ecological performance standards based on best available science
- Use of reference aquatic resources reflecting range of variability exhibited by regional classes of aquatic resources
- Greater attention to proper siting of projects

Emphasis on site selection & physical factors

- "If you build the field, the players will come."
- Review planning blueprints and as-built drawings to ensure on-the-ground accuracy and compliance with permit conditions.
- All project data will be entered in the Wetland Tracker: www.wetlandtracker.org

What to monitor?

- CA Rapid Assessment Method (CRAM)
- Hydrology
- Vegetation
  - Endemic vernal pool plants
    - Emphasis on co-dominants
  - Invasive plant species
- Fauna as required by project management objectives or FWS, DFG, others

What to monitor, continued

- All constructed or restored vernal pools
- Reference pools (n = 30 minimum)
  - Should there be as subset of "nearest-neighbor" pools to track effects of stressors on existing resources?
- If reference pool data are not available, then target specifications may be substituted for hydrology and vegetation data. However, this precludes statistical measures of progress or performance.

Timelines

- All years: CRAM
- Years 1 & 2: hydrology
  - If success criteria not met, then hydrology monitoring continues and "clock is reset"
- Years 3, 5, 7, 9 & 10: vegetation (and hydrology)
  - If vegetation criteria met by year 5, then pass till year 10 on a pool-by-pool basis
  - If success criteria for vegetation are not met by year 5, then vegetation monitoring continues until standards are met (or deemed a failure)

Sampling Frequency

- CRAM: once annually, 30-45 days after deepest part of pools are no longer inundated
- Hydrology: weekly
- Vegetation: how often??
  - 0-15 and 30-45 days after deepest part of pools are no longer inundated in Corps' guidance
  - peak of flowering?

Hydrology metrics

- Hydrology
  - Area of inundation
  - Maximum depth
  - Duration of inundation

Vegetation metrics

- Vegetation
  - Absolute cover of co-dominant vernal pool endemic* and invasive plant species**
  - Number of endemic plant species
  - Number of invasive plant species

** Species list maintained by US ACE Sacramento District*

*** CAL IPC "high" and "moderate" categories*

Hydrology methods

- Staff gauges in all constructed or restored pools and a representative sample of reference pools
- Continuous water-level monitors with data loggers, checked weekly, in selected pools
- Staff gauges read weekly

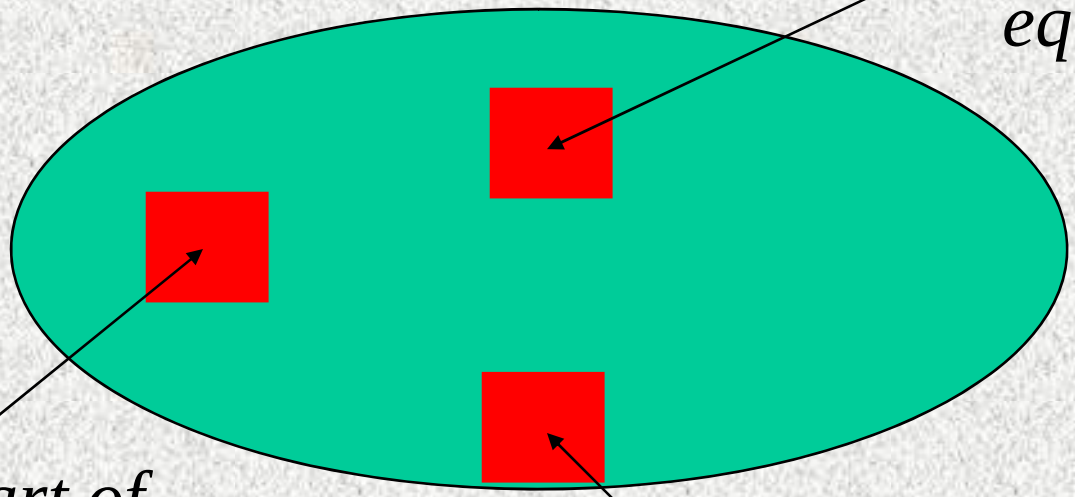
Vegetation method

- Vegetation monitoring in all constructed or restored pools and a representative sample of reference pools (if available)
- Modified relevé method*
  - "semi-quantitative" method
  - stratified plot locations
  - three 10 sq. m plots
- Record GPS position and photo-document the location of plots

**A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995)

Vegetation method, continued

Each plot is 10 sq. m



Mid-elevation, as close to equidistant as possible

Deepest part of pool and location of staff gauge

Wetland-upland ecotone

Performance Standards

- "Weight of evidence approach"
  - CRAM → hydrology → vegetation
  - No specific standard for CRAM scores
- Hydrology
  - Depth of water and duration of inundation in constructed or restored pools should fall within a specified portion of the distribution of reference pool data*
  - Extent of inundation should equal the area of the as-built drawings +/- 5% by pool and in total; credits adjusted as necessary

*vegetation trumps hydrology

Performance Standards

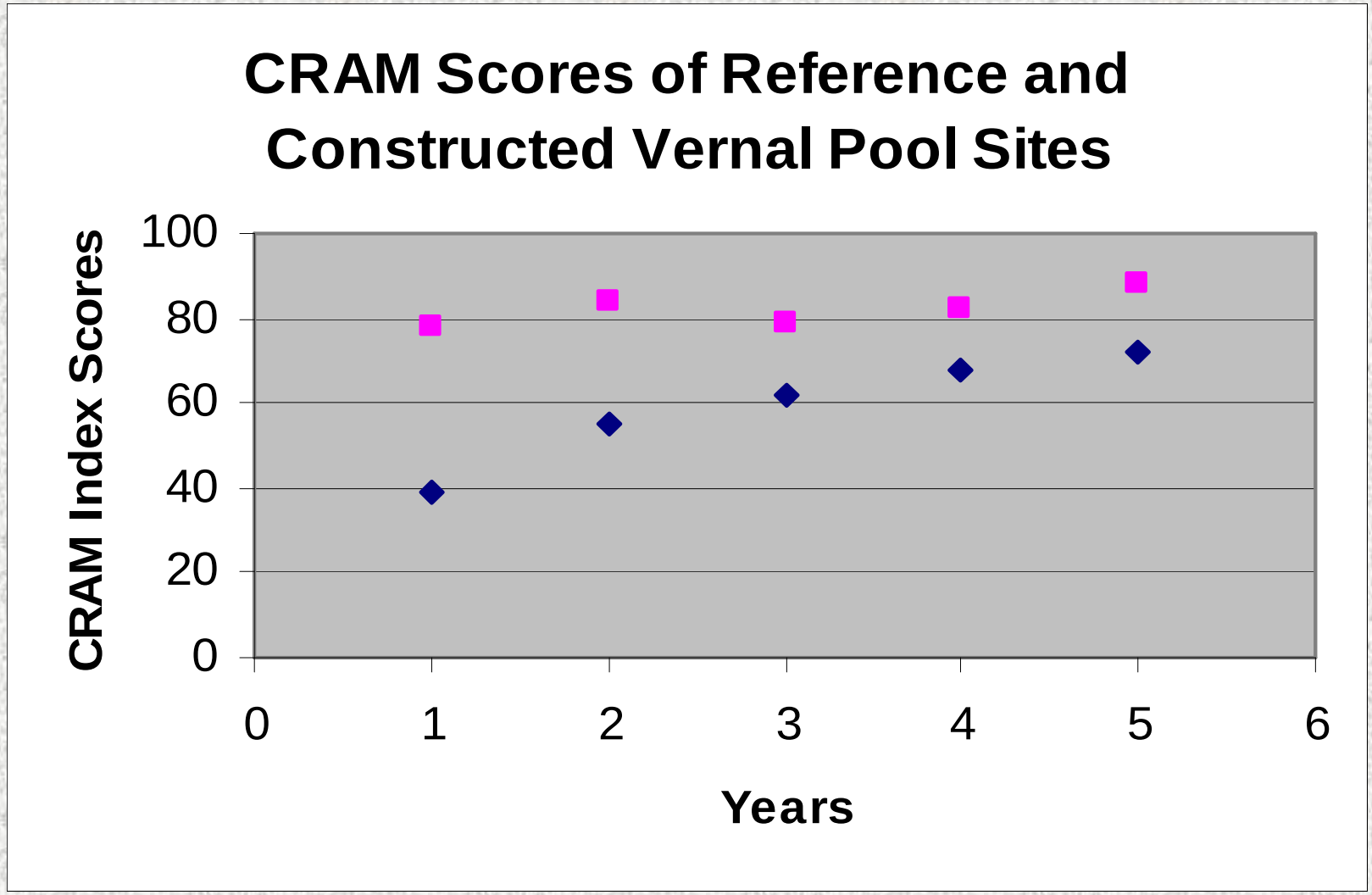
- Vegetation (endemic plants)
  - Absolute cover of co-dominant vernal pool endemic plants in constructed or restored pools should fall within a specified portion of the distribution of reference pool data
  - The number of vernal pool endemic plant species* in constructed or restored pools should fall within a specified portion of the distribution of reference pool data

Performance Standards

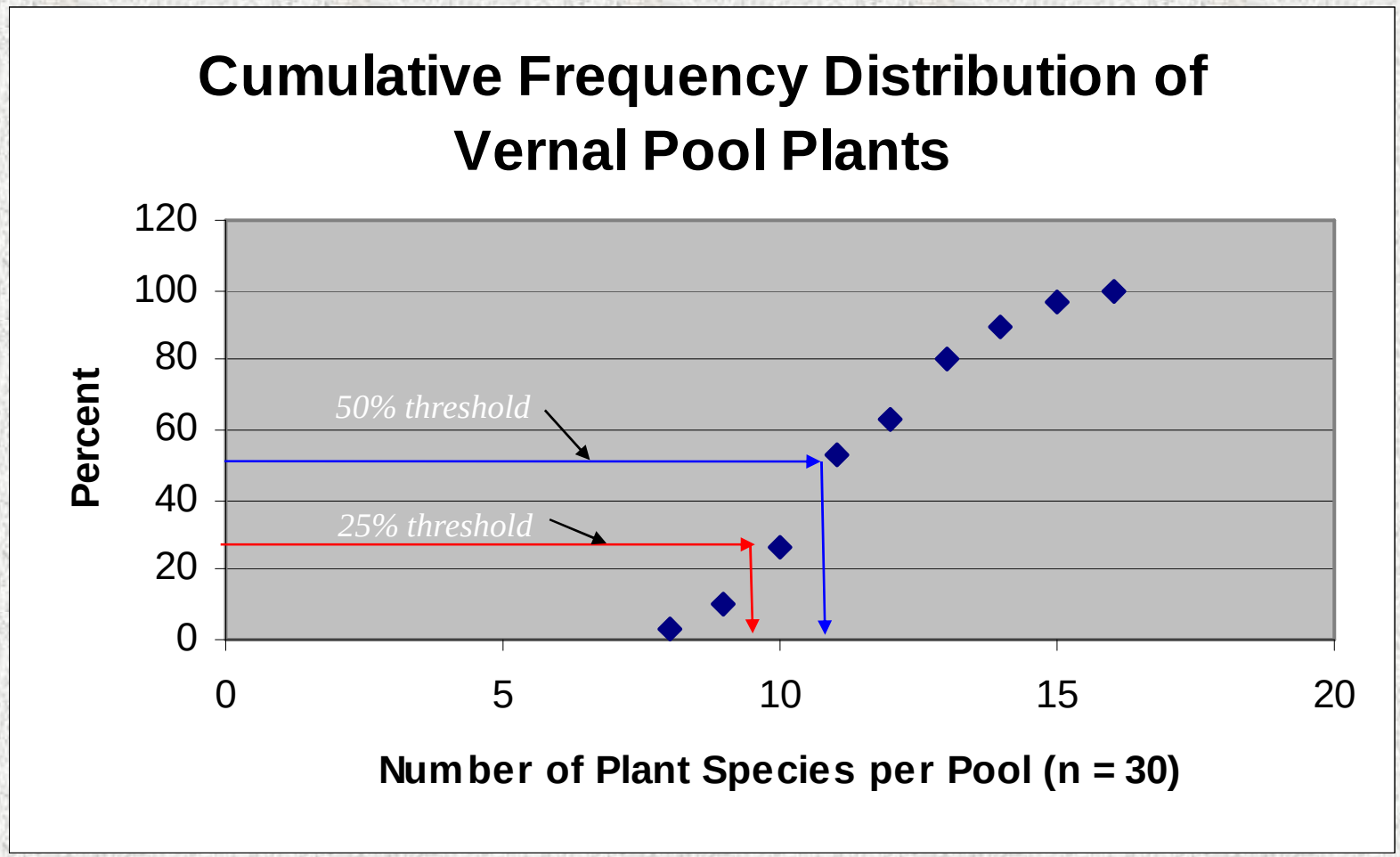
- Vegetation (invasive plants)
  - Absolute cover of invasive species* in constructed or restored pools should fall within a specified portion of the distribution of reference pool data
  - The number of invasive species* in constructed or restored pools should fall within a specified portion of the distribution of reference pool data

* *CAL IPC "high" and "moderate" categories*

Reporting

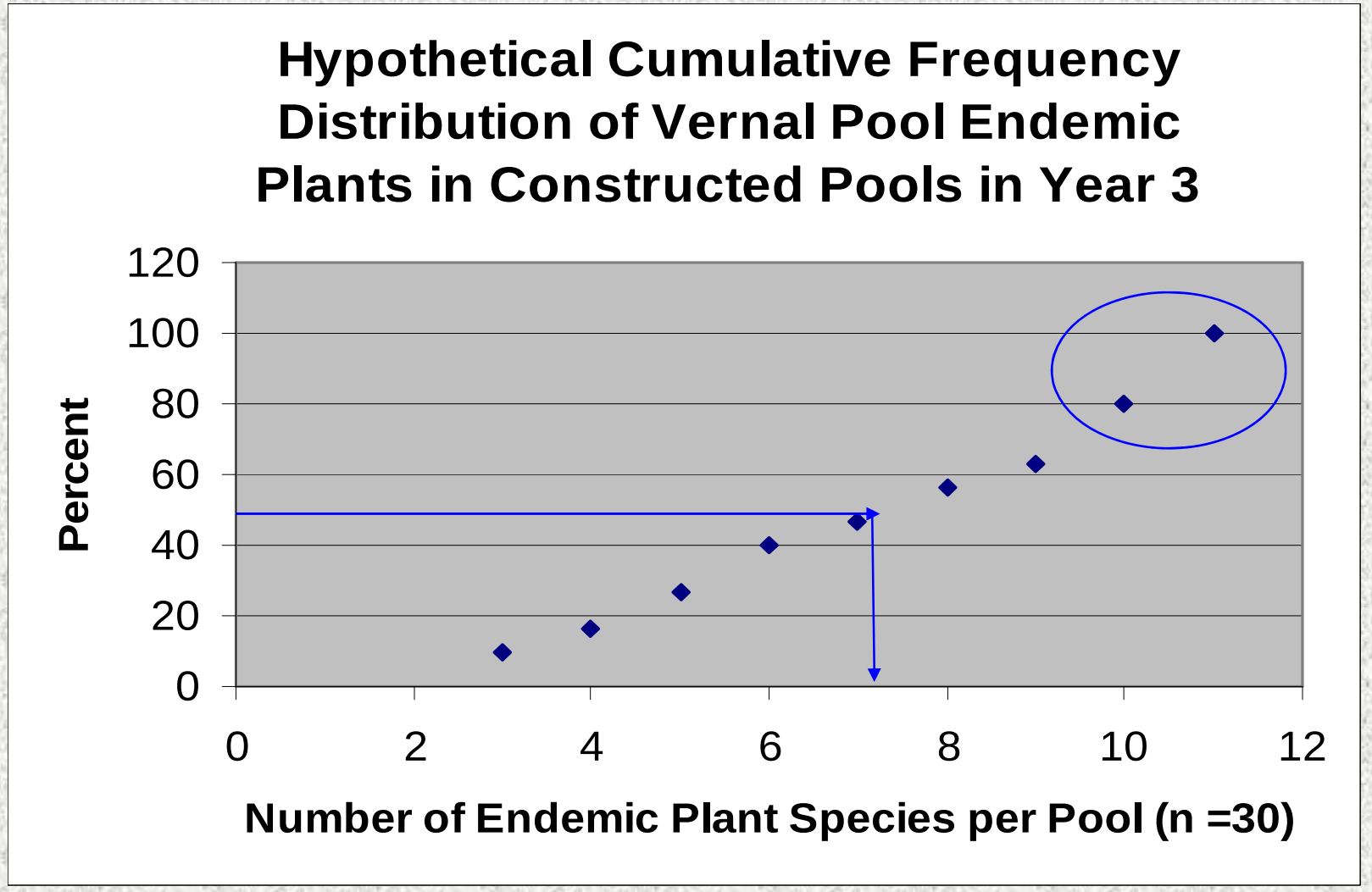

CRAM Scores of Reference and Constructed Vernal Pool Sites
CRAM Index Scores
100
80
60
40
20
0
0
1
2
3
4
5
6
Years

Reporting



Mean = 11.7 +/- 1.9 species per pool SD

Reporting



Simulated Mean = 7.6 +/- 2.7 SD species per pool

Next Steps

- Agency review of conceptual method and performance standards
- Set upper and lower limits of “reference distribution” for performance standards
- Determine how frequently to monitor vegetation
- Decide on statistical tests, if any, to be performed on individual pool data compared to reference data set

THANK YOU !