

Development of a Wetland Status and Trends Program for California



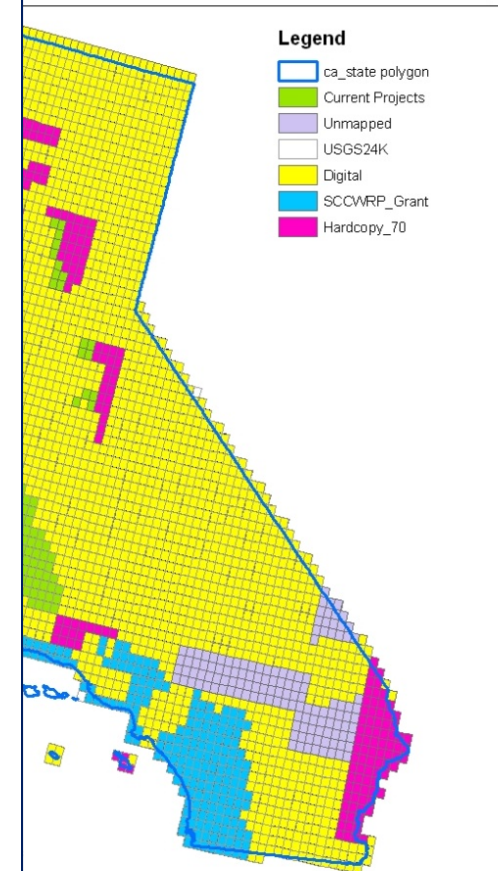
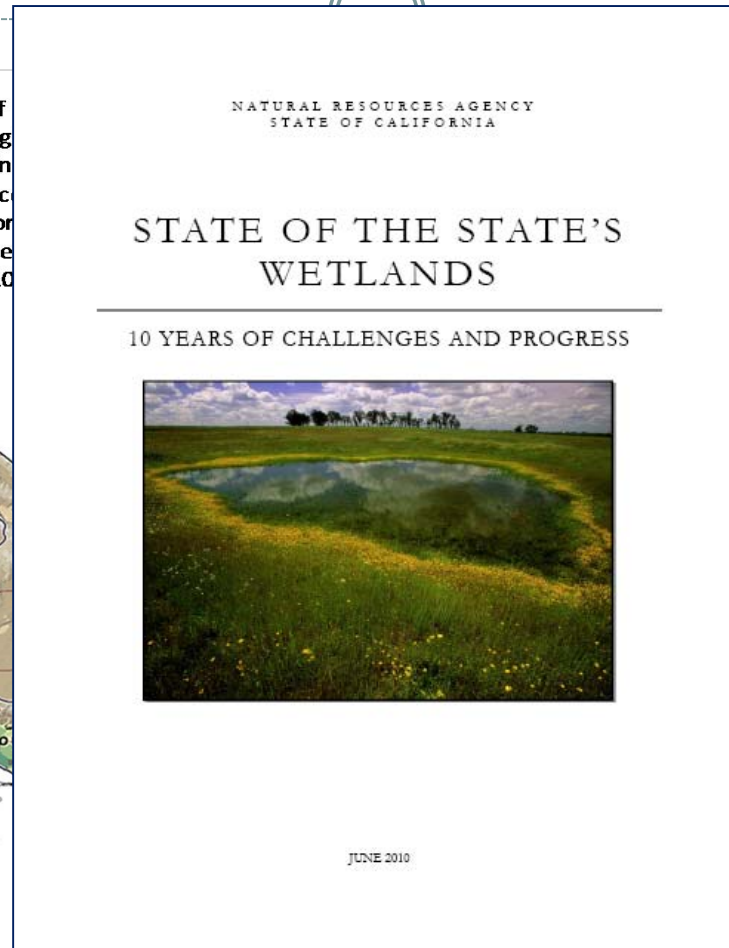
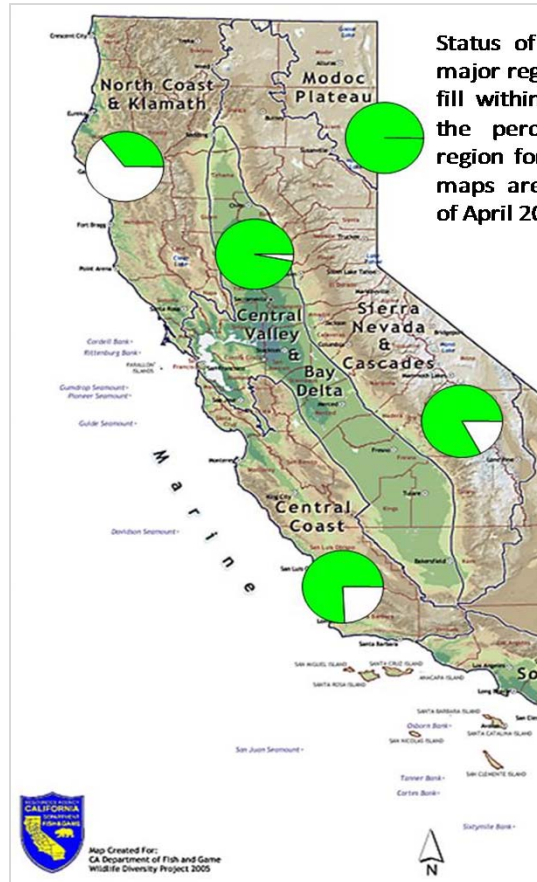
ERIC STEIN
BIOLOGY DEPARTMENT



Project Partners

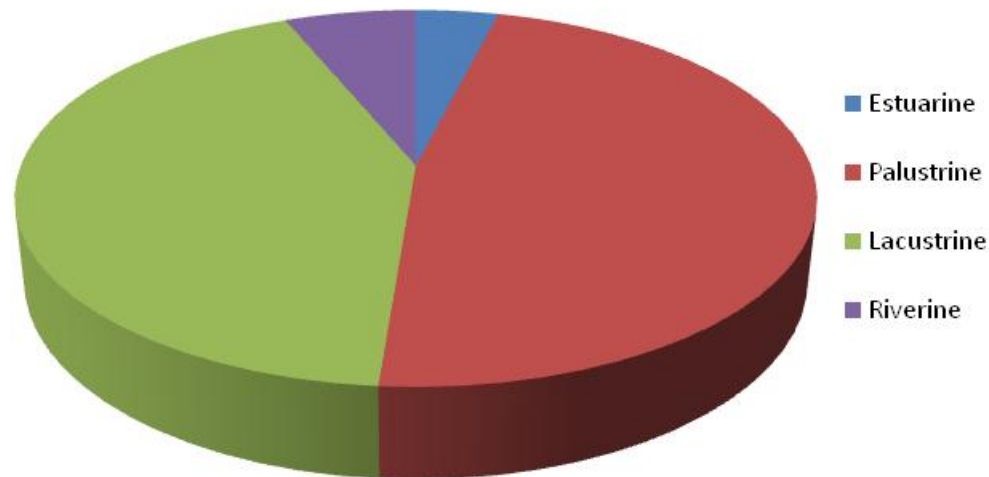


How Much wetlands are in CA?



Wetland inventory covers approximately 80% of the State
Inventory is patchwork of base imagery dates (1980s or better) and resolution
Status and Trends assessment is difficult to accomplish statewide

The gold standard for assessing status and trends is comprehensive mapping



California has \approx 3.5 million acres of wetlands,
with 80% of State mapped

...but time and budget constraints limit this type of approach

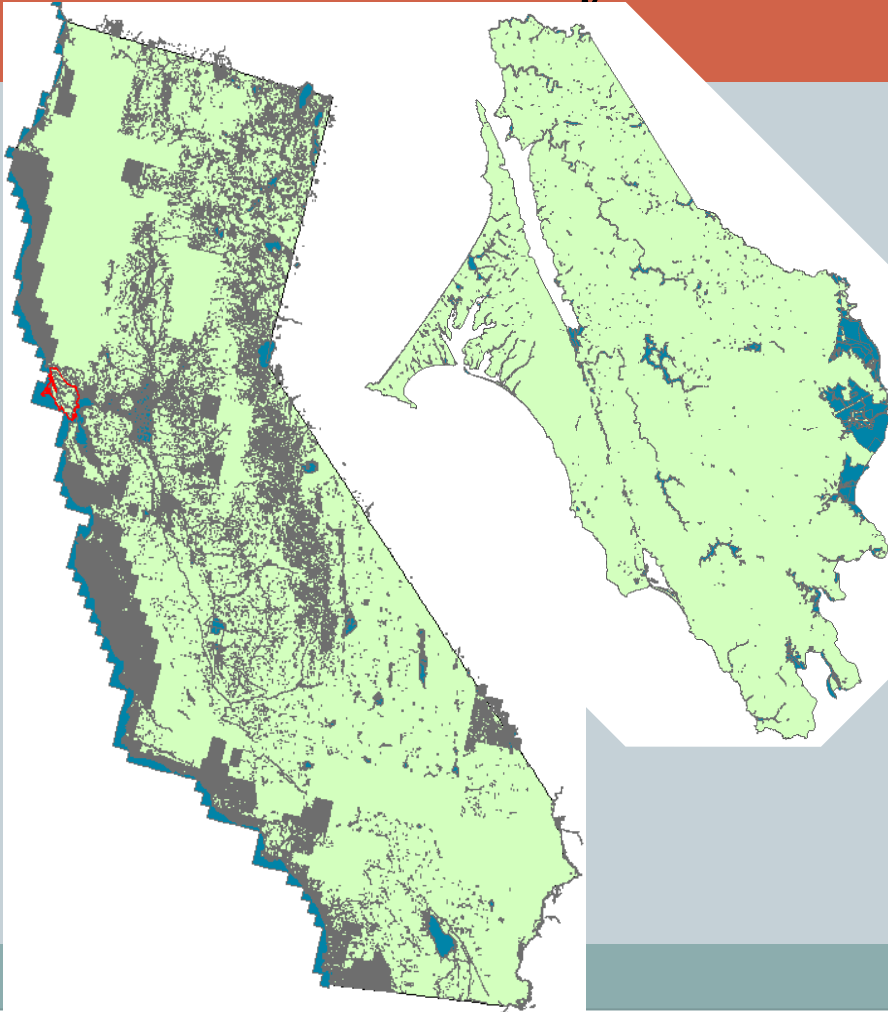
What are the alternatives?



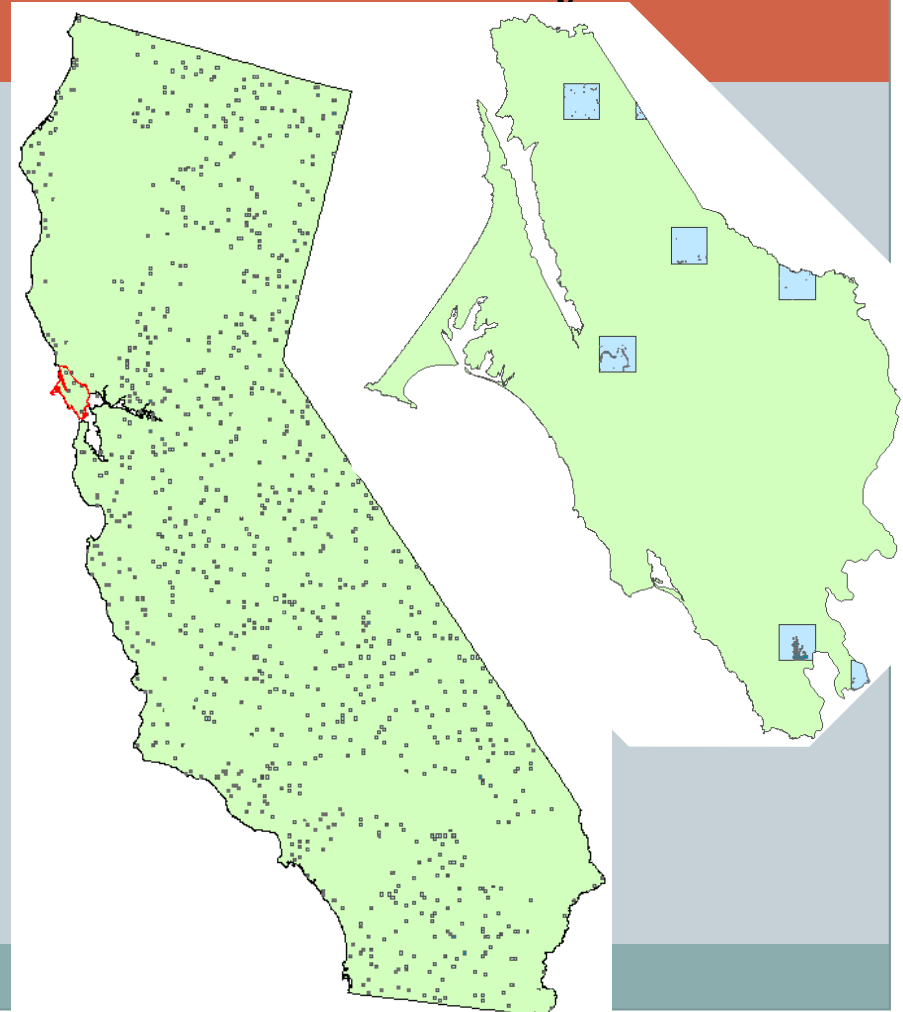
- Accounting of permits and restoration
 - Does not include natural changes, illegal or exempt activities, etc.
 - Requires remote or field validation
- Probability-based sampling
 - Capable of capturing all sources of change
 - Does not result in a comprehensive map
- Both options (and more) should be part of an overall strategy that includes state, regional, and local data

What does a probability-based approach look like?

NWI Map for California and Marin County Detail

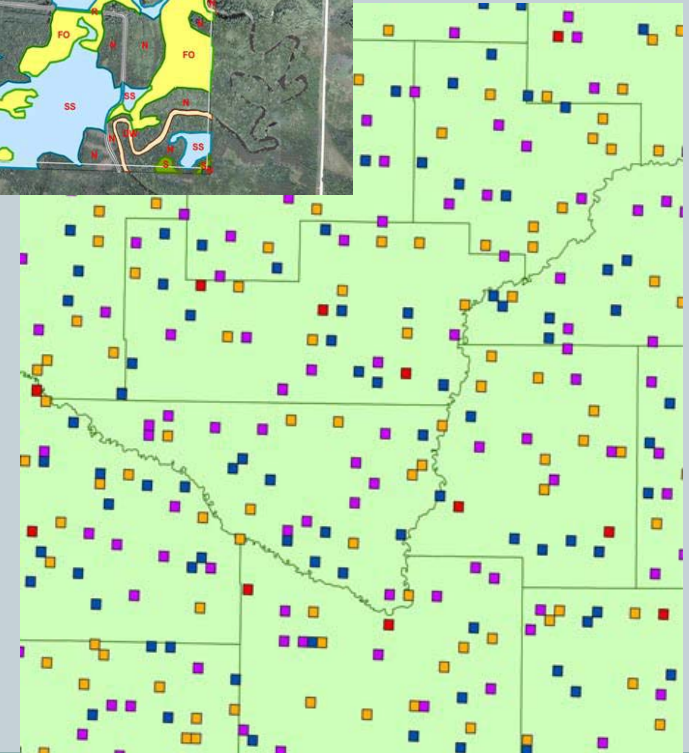
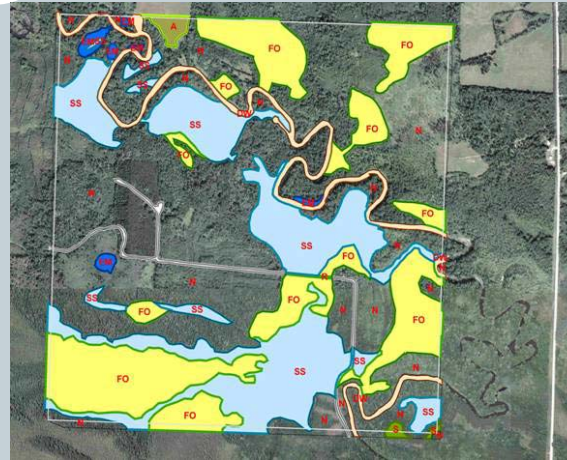


Random Sample for California and Marin County Detail



Study Approach & Expected Outcome

1. Review existing programs
2. Test various design options
3. Evaluate rigor vs. costs
4. Provide recommendation to CA Wetland Monitoring Workgroup
5. Test proposed design
6. Compare to traditional mapping
7. *Project does not include:*
 - *Implementation of S&T program*
 - *Developing change assessment methodology*



Technical Advisory Committee

Federal & MN Agencies

- MN-S&T: Steve Kloiber
- NRCS: Jennifer Cavanaugh, Dean Kwasny
- USEPA: Paul Jones
- USFS: Dave Weixelman
- USFWS: Elaine Blok, Tom Dahl

Independent

- CNPS: Julie Evens
- MLML: Ross Clark, Kevin O'Conner
- SCCWRP: Leila Lackey, Kerry Ritter, Chris Solek, Eric Stein, Martha Sutula
- SFEI: Kristen Cayce, Josh Collins

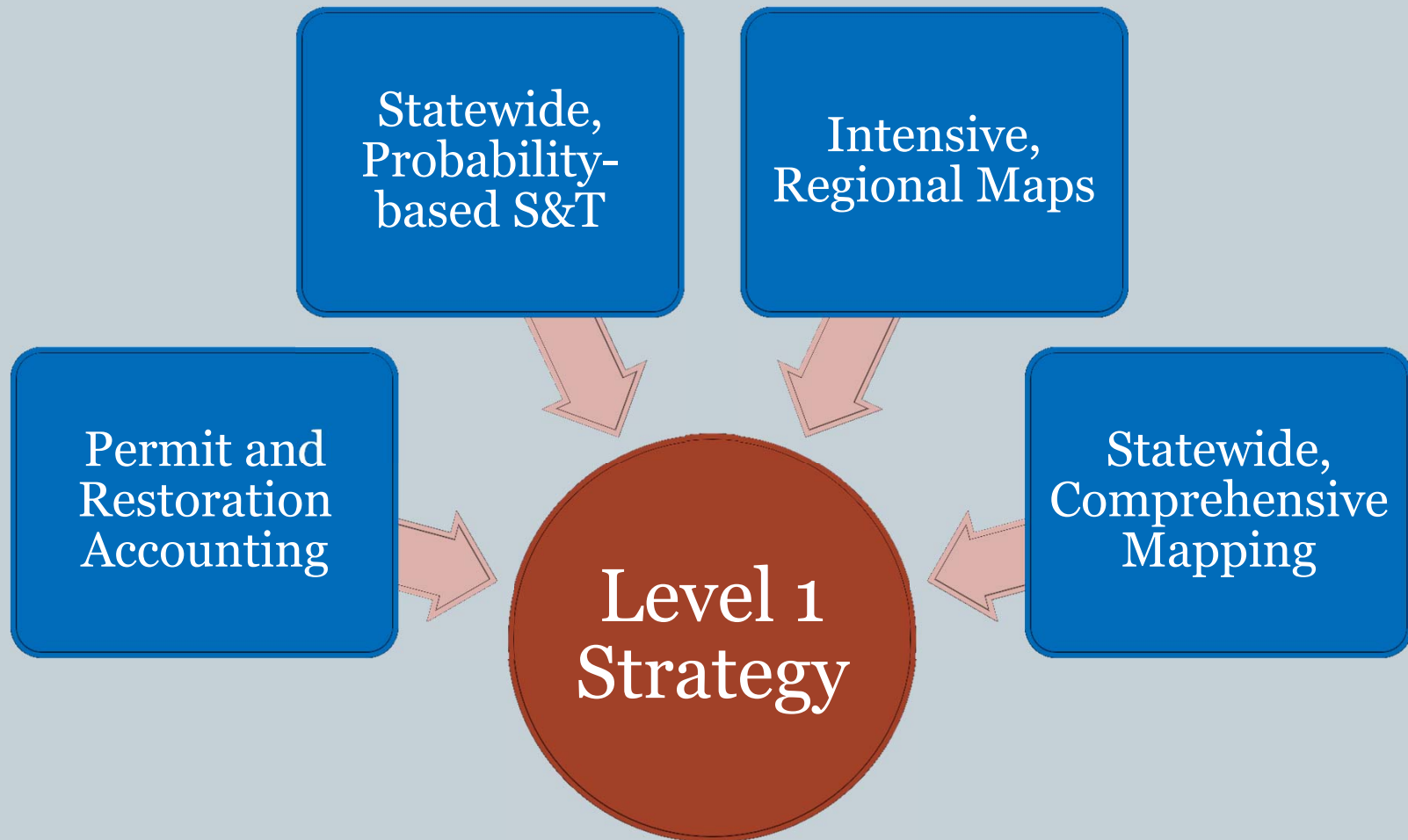
California State Agencies

- CDFG: Jim Harrington, Todd Keeler-Wolfe
- CDWR: Gail Kuenster
- CNRA: Chris Potter
- COPC: Pam Rittlemeyer
- CWMW: Chad Roberts
- Regional WB: Ben Livsey
- SCC: Karen Bane, Tim Duff
- State WB: Cliff Harvey

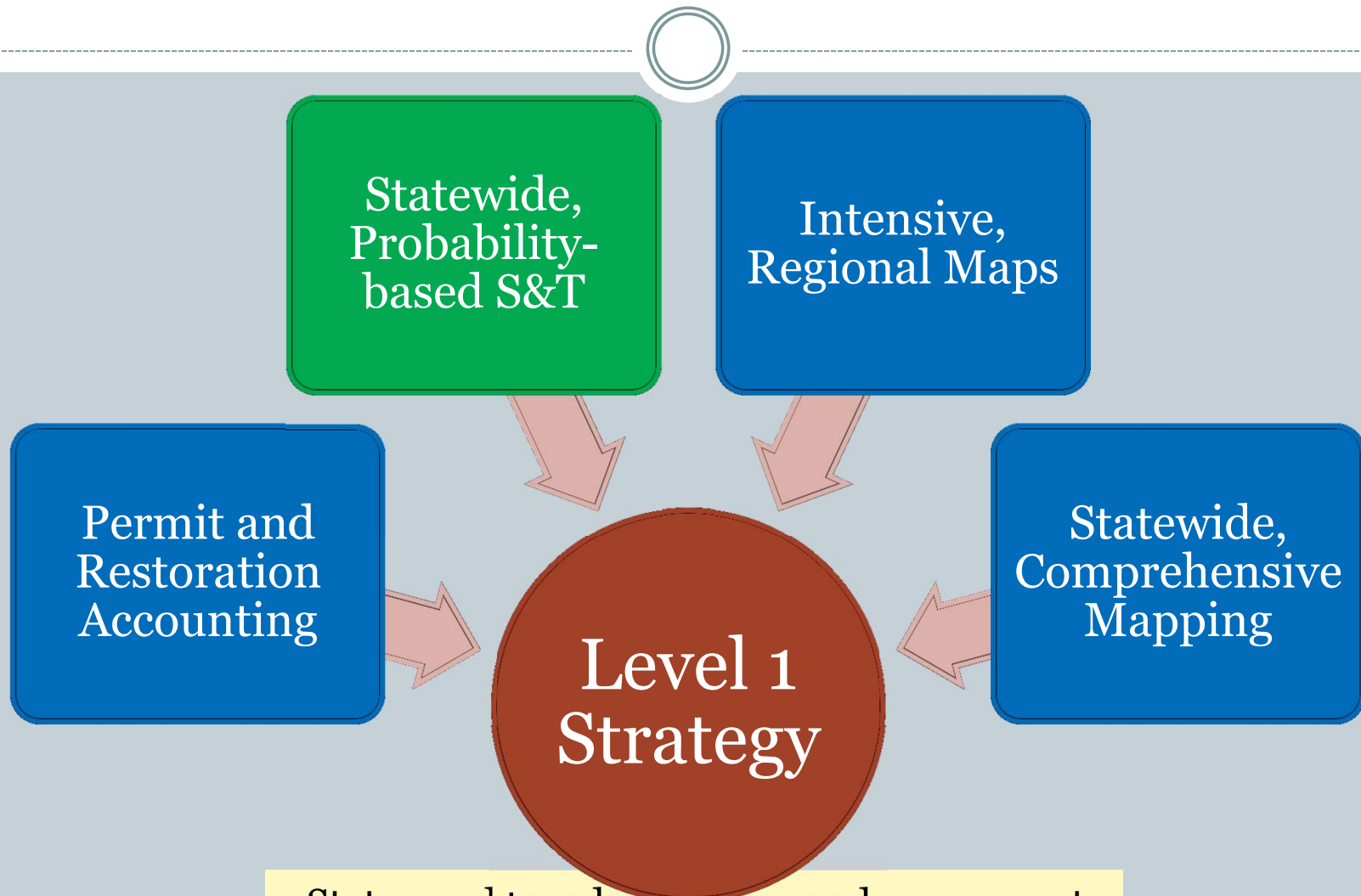
Academic Institutions

- CSUN: Shawna Dark
- Penn State: Denice Wardrop
- UC Davis: John Eadie
- UCLA: Rich Ambrose

California's Complete Level 1 Strategy

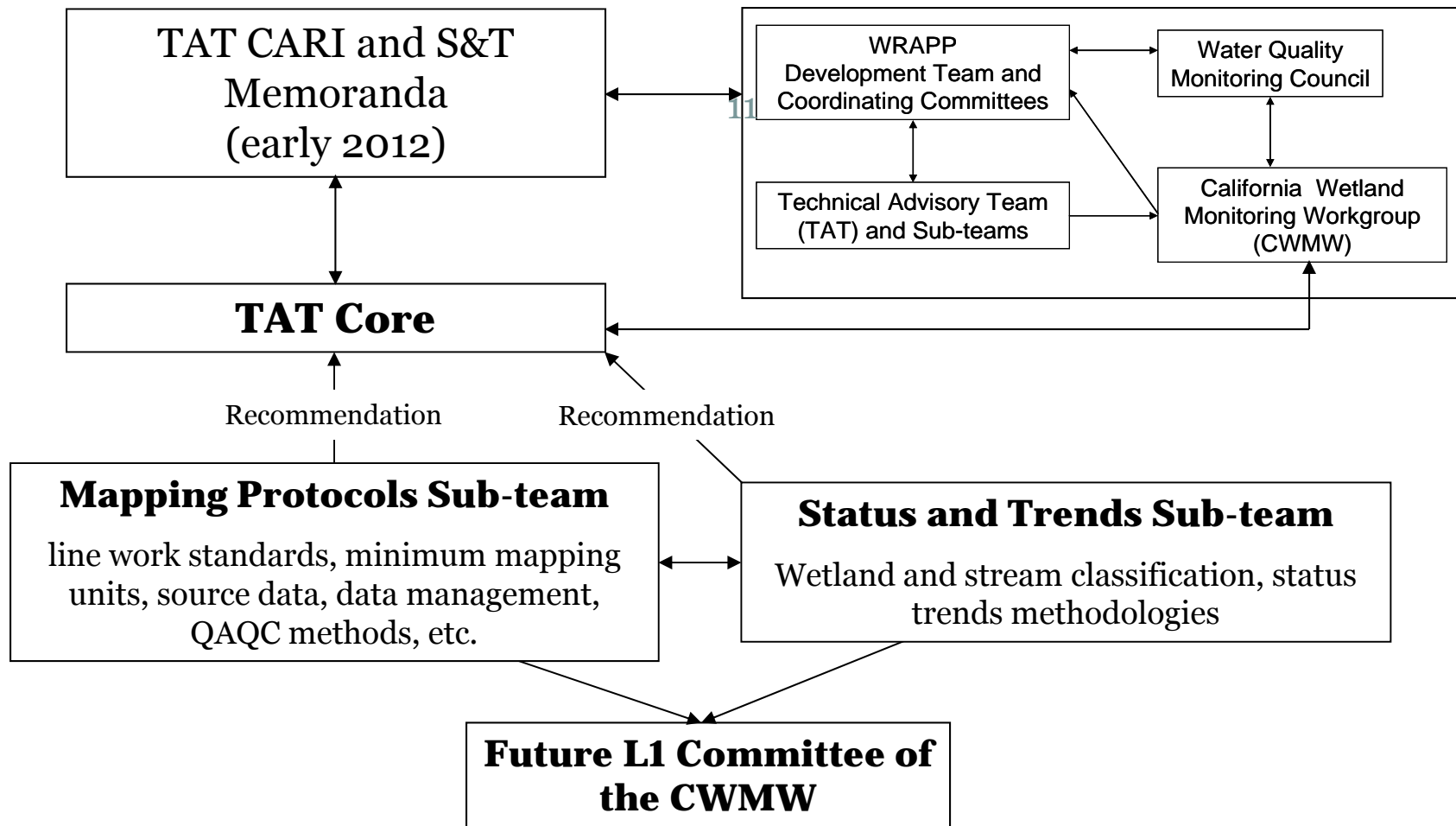


California's Complete Level 1 Strategy



- Status and trends mapping and assessment
- Support state wetland policy
- Sample frame for Level 2 assessments

Relationship Between TAT, S&T and Level 1



Progress to Date



- Reviewed existing State and Federal Programs
- Agreed upon key technical issues
- Agreed to comprehensive mapping
 - Open water, wetlands, streams, aquatic support areas, uplands
- Balance status and trends assessment
- Support other mapping and assessment programs
- Completed draft classification system
- Started initial investigation of technical issues

Existing Programs



- National Wetland Inventory, Status and Trends Program (NWI-S&T)

US Fish and Wildlife Service

<http://www.fws.gov/wetlands/StatusAndTrends/index.html>

- Natural Resource Inventory (NRI)

US Department of Agriculture

<http://www.nrcs.usda.gov/technical/NRI/>

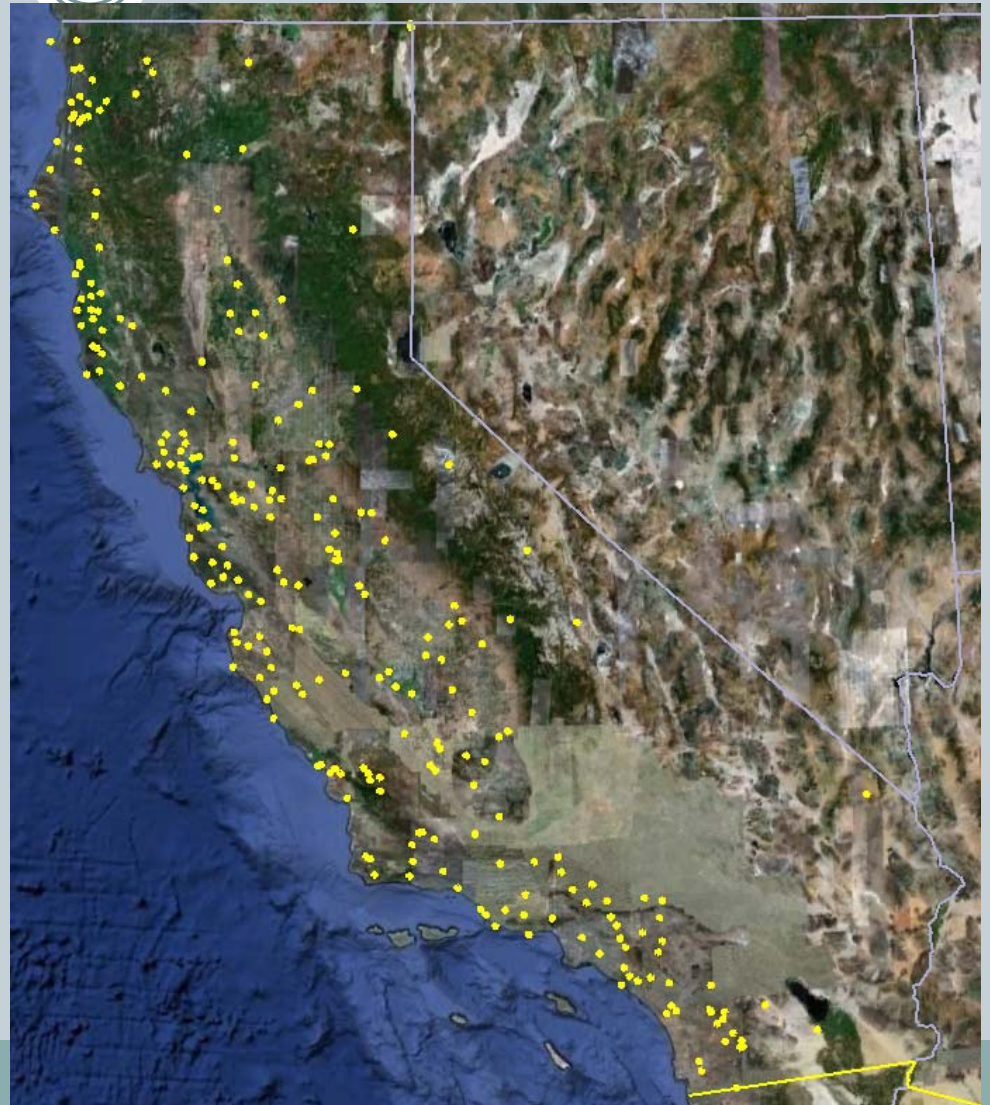
- Minnesota Wetland Status and Trends Program (MN-S&T)

Minnesota Department of Natural Resources

http://www.dnr.state.mn.us/eco/wetlands/wstm_prog.html

NWI-S&T Design: Challenges in California

- Plot allocation based on a 1956 study of wetlands used by migratory birds
- Sample biased to coastal region
- Need additional plots
- More comprehensive and representative distribution

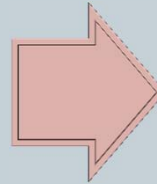


What Does this Mean for the California S&T program?

- One of the very first states to attempt S&T
- Elements from existing programs are useful
 - Delineation of entire plot
 - Supplemented panel design
- California also has unique challenges
 - Relative scarcity and rarity of wetlands
 - Heterogeneous geography and ecology
 - Little pilot trends data

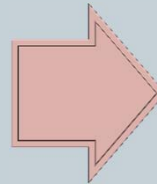
Challenges for California

Size and ecological heterogeneity



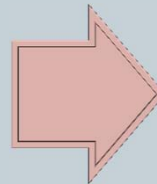
Static locations may not capture spatial variability

Relative scarcity of wetlands (~3% of land area)



More focused sample frame may be required

Unique and arid-region wetland types



Cowardin-derived classification may not support all types

Technical Issues Currently Being Investigated



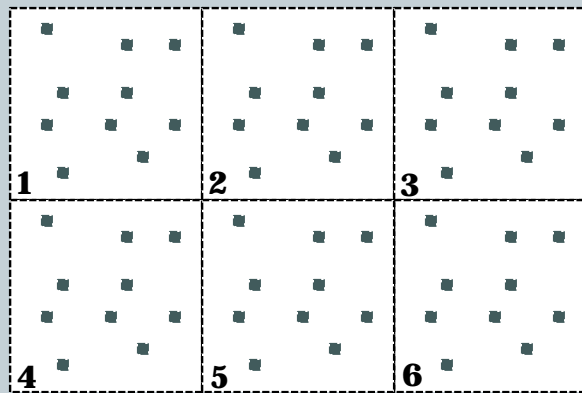
- Space-time sampling design
 - Fixed vs. rotating panels
- Stratification
- Plot size
- Plot placement method
 - SRS vs. GRTS

44 10	42	34 9	32
43 7	41 2	33 6	31 1
12	13 4	21	24 8
11	14	22 3	23 5

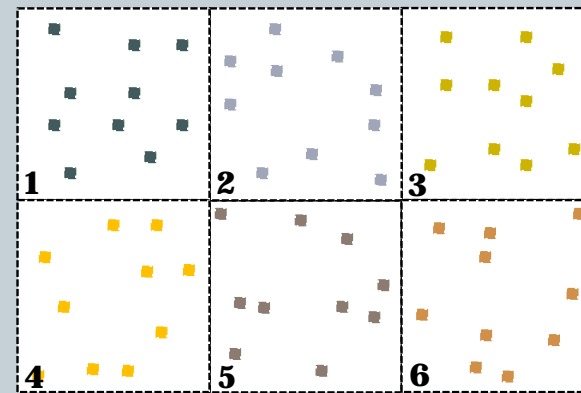
Temporal Observation Strategy

18

- Paired and unpaired designs

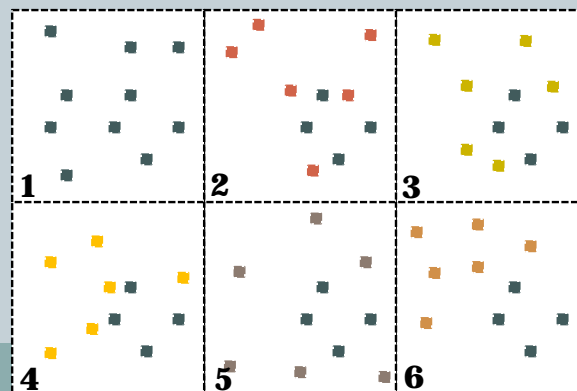


temporal trends



spatial trends

- Hybrid designs



Supplemented Panel Design



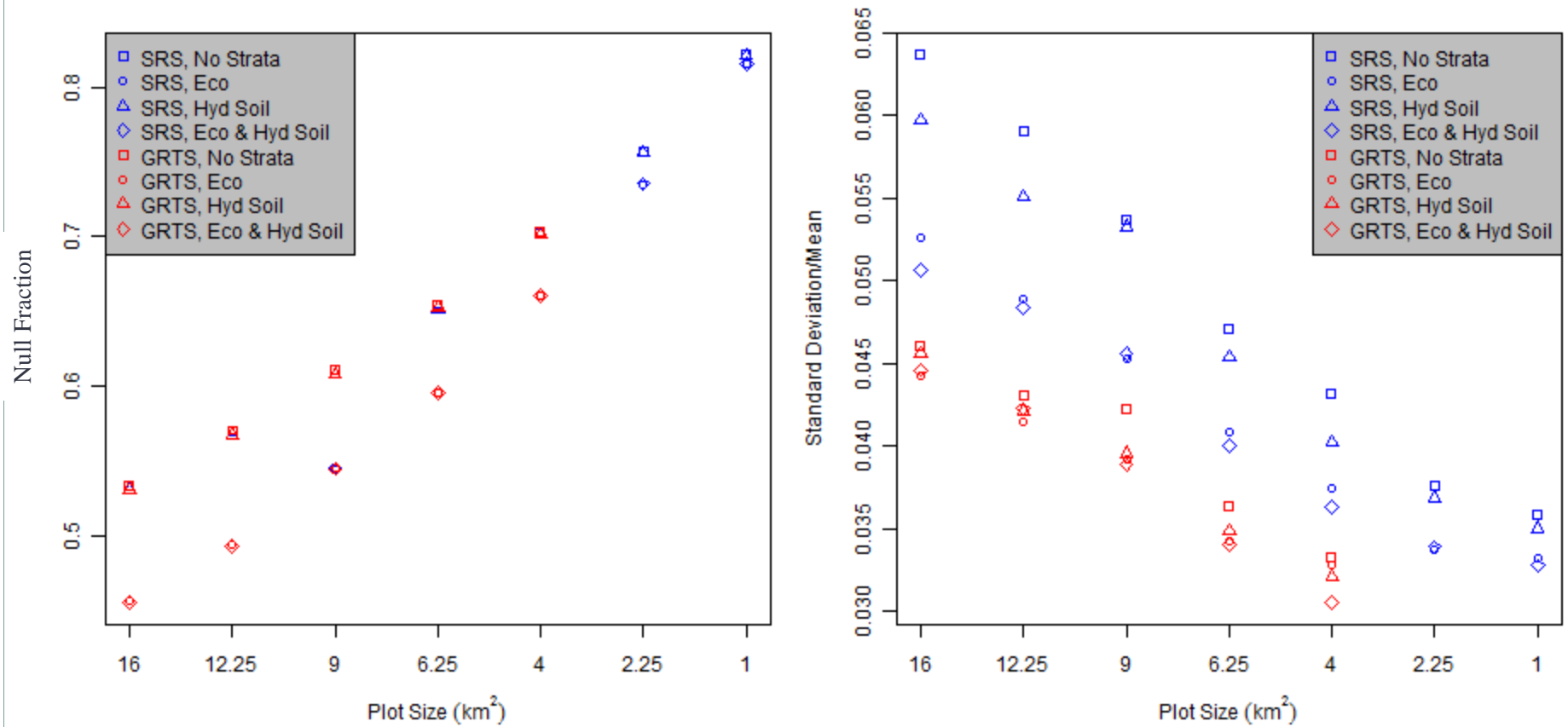
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P_1	•					•					
P_2		•					•				
P_3			•					•			...
P_4				•					•		
P_5					•					•	

Optimizing Plot Size



- Model different 120 different implementation scenarios
 - 15 permutations of base NWI & NHD data evaluated
 - 2 sampling designs (SRS, GRTS)
 - 4 stratification scenarios
- 5,000 model runs per permutation
 - Estimate variance and inclusion probability
- *Example:* Effect of plot size
 - Plots size x number of plots = constant cost factor
 - ✦ (larger plot size = less number of plots)
 - Evaluate variance and null fraction (percent omission)

Effect of Plot Size



Schedule



- Summer 2011: Prioritize technical investigations and general approach
- December 2011: Submit proposed design to TAC
- March 2012: Apply draft sampling design and validate probability-based estimation approach
- Summer 2012: Produce draft and final report

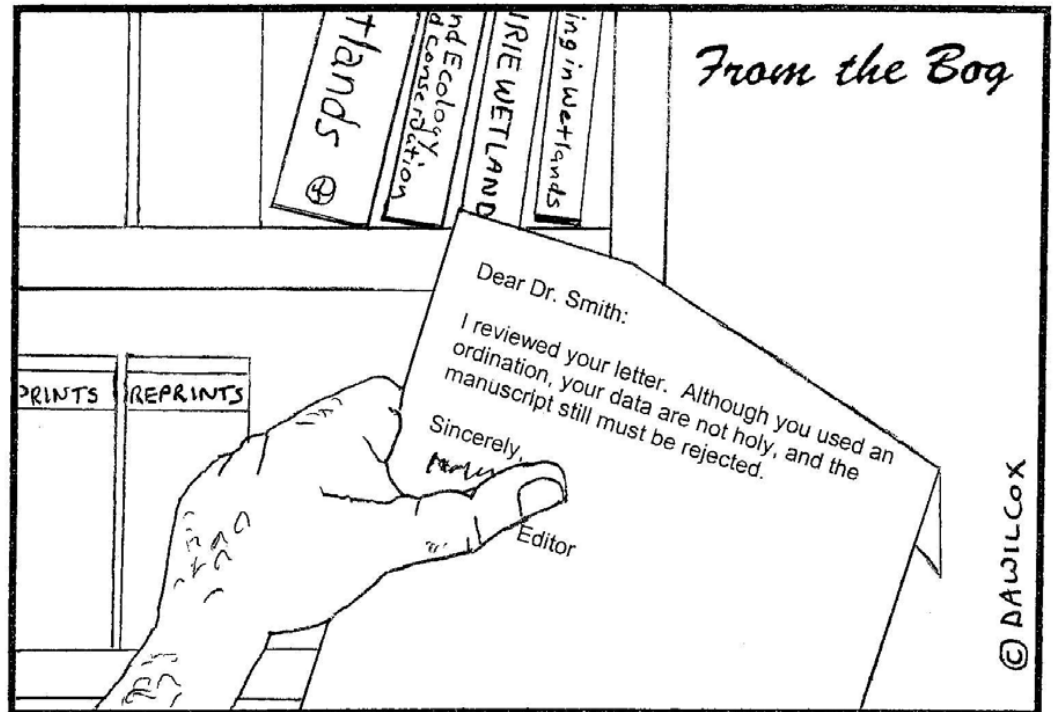
Get Involved !!! Help form Level 1 Committee



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QUESTIONS



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Nice try.