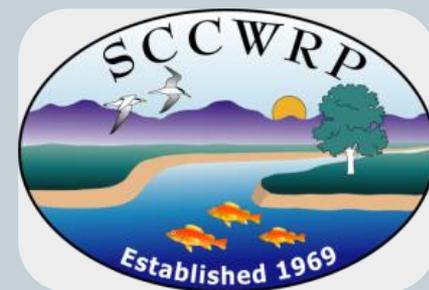


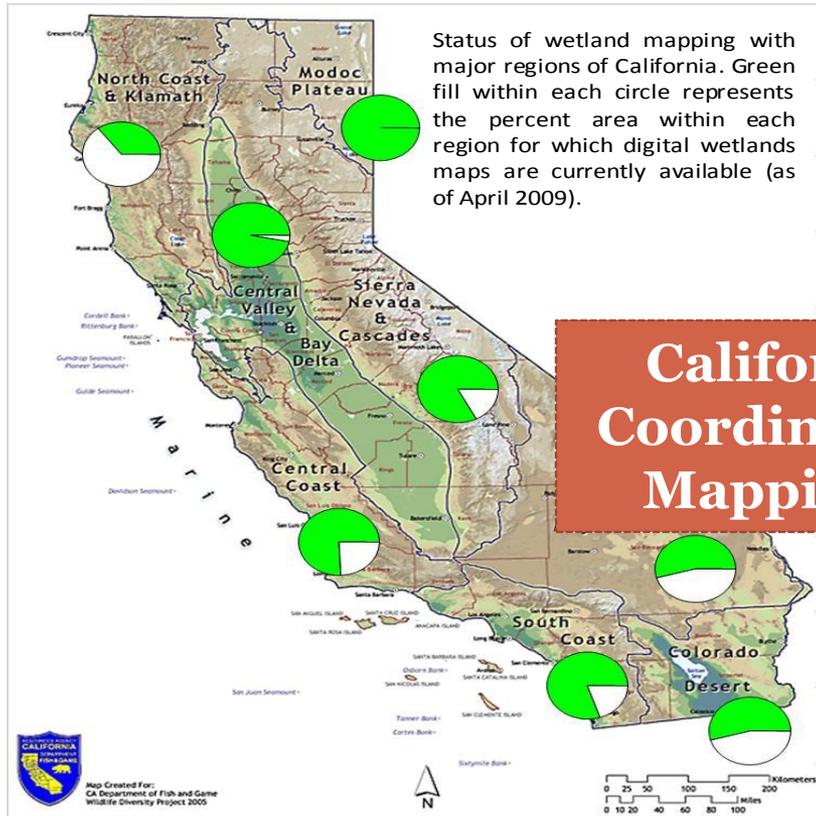
Are We Achieving No Net Loss? Tracking Wetland Status and Trends in California



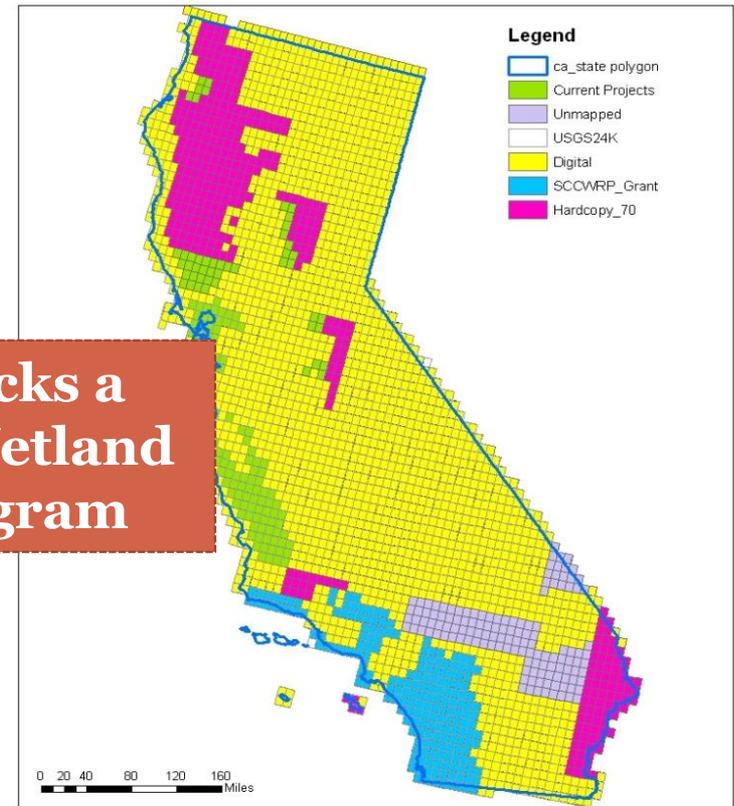
Funded by USEPA



How Much Wetlands are in CA?



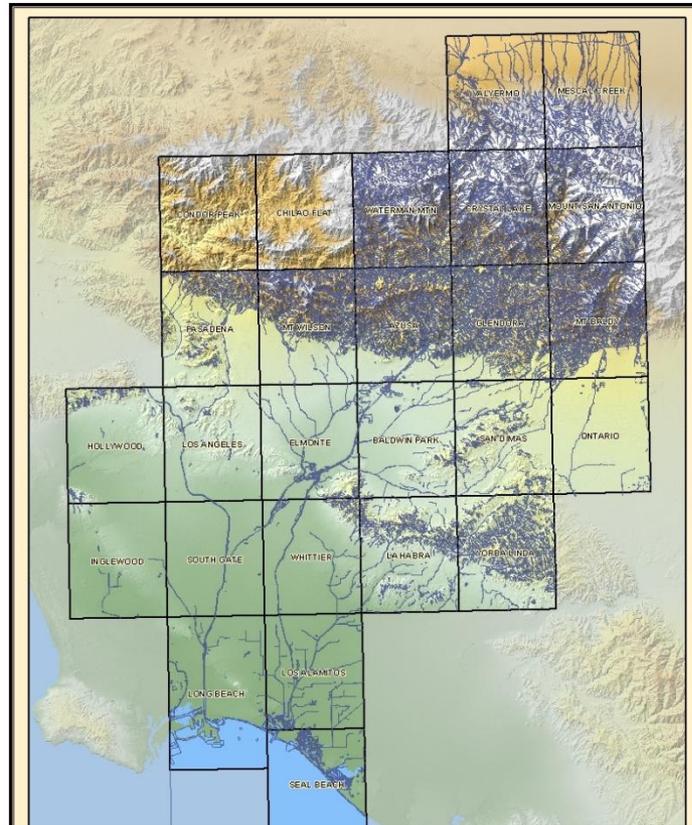
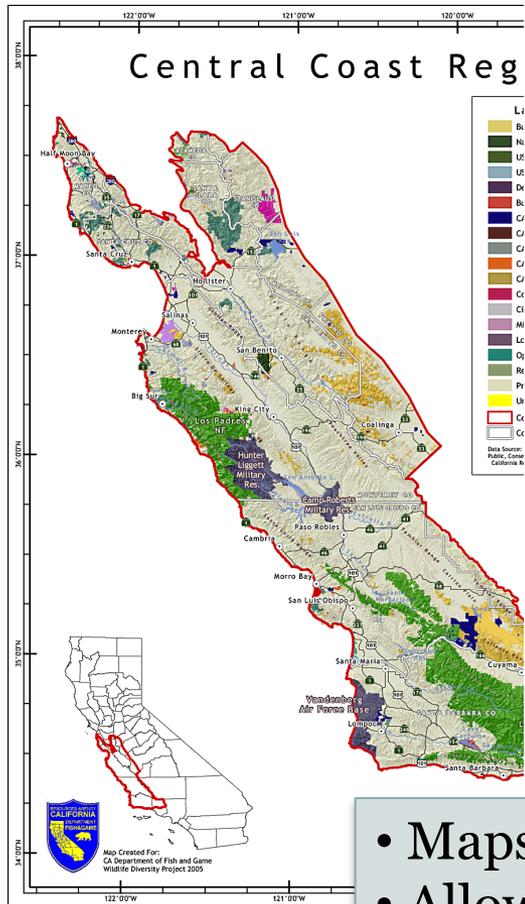
California Lacks a Coordinated Wetland Mapping Program



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

Why Do We Care??

Natural Lands in the Puente-Chino Hills Wildlife Corridor



- Maps are the foundation of all monitoring
- Allow us to answer basic questions
- Sample frame for evaluating condition

How Did We Get Here?



1993 California Wetlands Conservation Policy

- established a policy framework and strategy for **no overall net loss** of wetland acreage

1998 State of the State's Wetlands Report

- demonstrated that questions of wetland **extent and distribution** were hard to answer with **existing data**

2010 State of the State's Wetlands Report

- also encountered similar difficulties but made **recommendations to address the issues**
... ***Wetland Status and Trends Program***

NATURAL RESOURCES AGENCY
STATE OF CALIFORNIA

STATE OF THE STATE'S WETLANDS

10 YEARS OF CHALLENGES AND PROGRESS



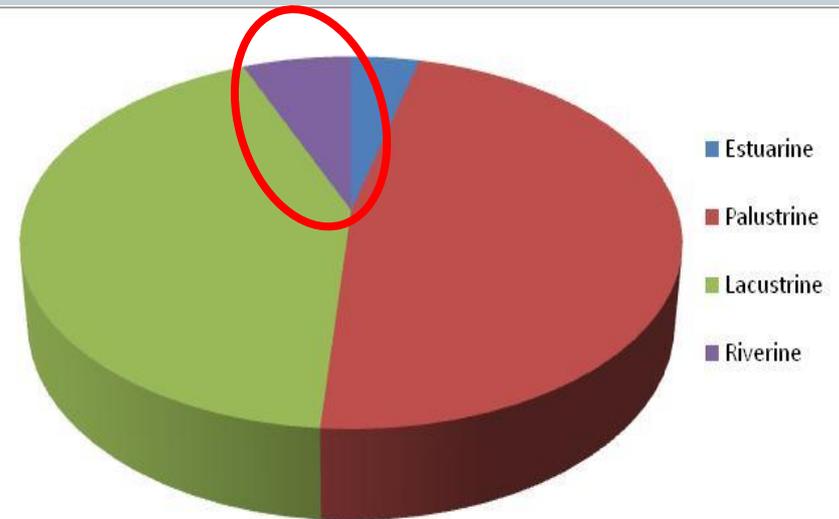
Long Term Goals



- Provide scientifically defensible **estimate of statewide extent and distribution of wetlands**
- **Track changes** in wetland extent and distribution over time
 - Relate changes to various management programs/efforts
- Provide sample frame for future condition assessment
- Make data/information readily available via web-based services for **many programs to use and build upon**

In a Perfect World . . . We Would Map Everything

- *We do OK for streams....*
- *Not so good for other waterbodies*
- **Just map it!!!!**
 - Not enough time
 - Not enough money
 - Not agile enough to inform management



California has \approx 3.5 million acres of wetlands, with 80% of State mapped of varying vintages and *high degree of uncertainty*

2010 State of State's Wetlands

What is the alternative?

What are the alternatives?



- Come up with additional funds for mapping
- 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
- All options (and more) should be part of an overall strategy that includes state, regional, and local data

California's Mapping Strategy

Statewide,
Probability-
based S&T

Intensive,
Regional Maps

Permit and
Restoration
Accounting

Statewide,
Comprehensive
Mapping

Overall
Strategy

Bayfront P Basic Info

Sta
Project Type
Project Area 0.3 acres

Project Identification ?

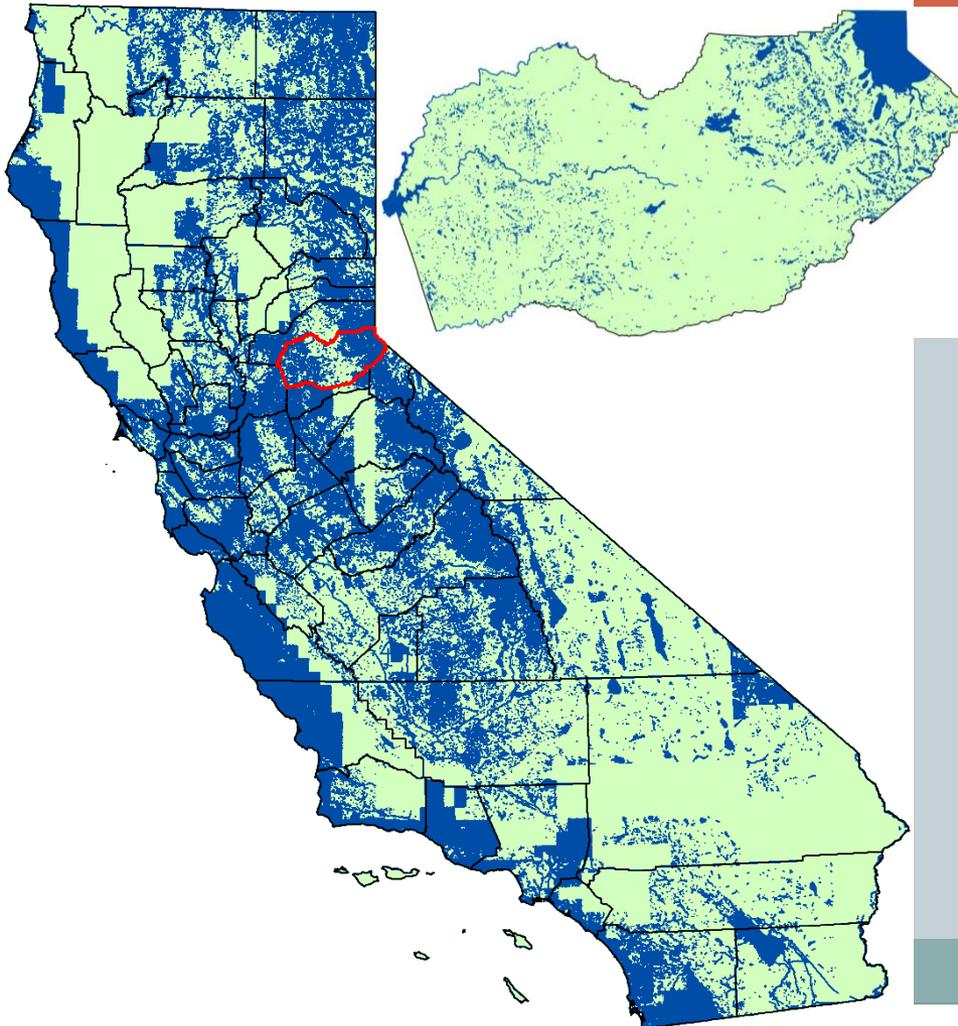
ID	Type
02-21-C0675	RWQCB - 401 Certification Letter Site Number
1600-2007-0260-3	CDFG - Fisheries Restoration Grant
2007-400538N	USACE - File Number
M98-60	BCDC - Record Number

Habitat Plan ?

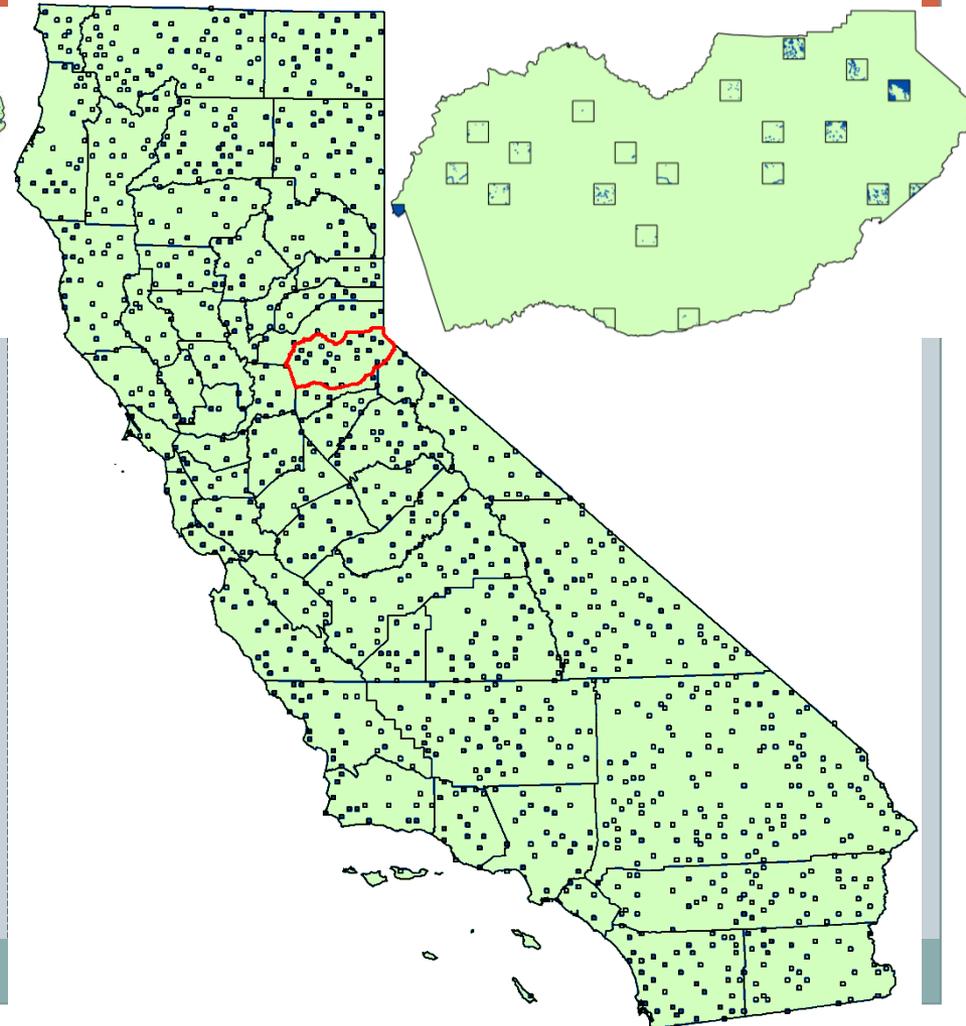
Habitat	Activity	Acres	Source
Estuarine wetlands	Created,Enhanced	0.3	Tracker Form

What does a probability-based approach look like?

Comprehensive Approach

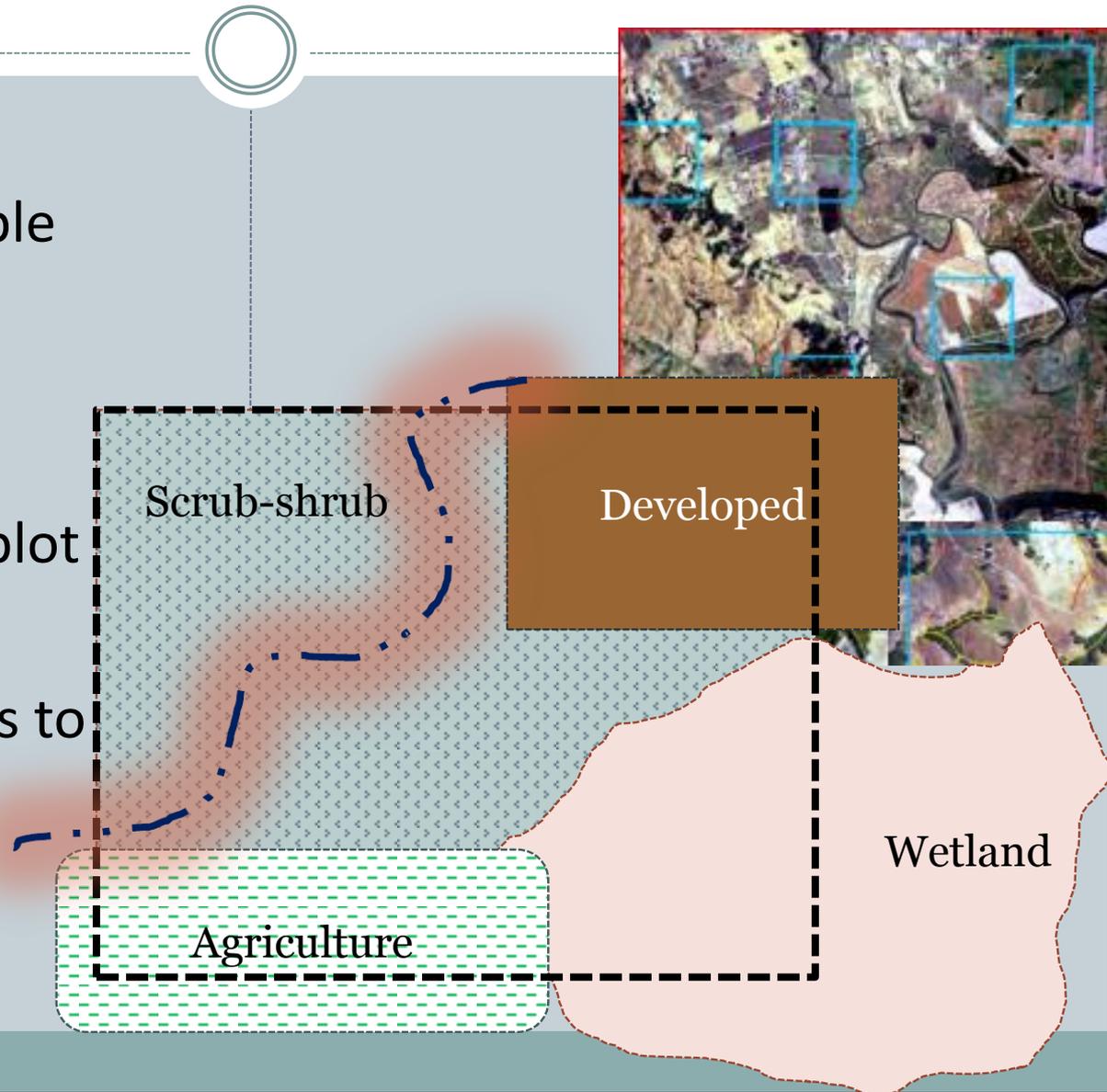


Probabilistic Approach



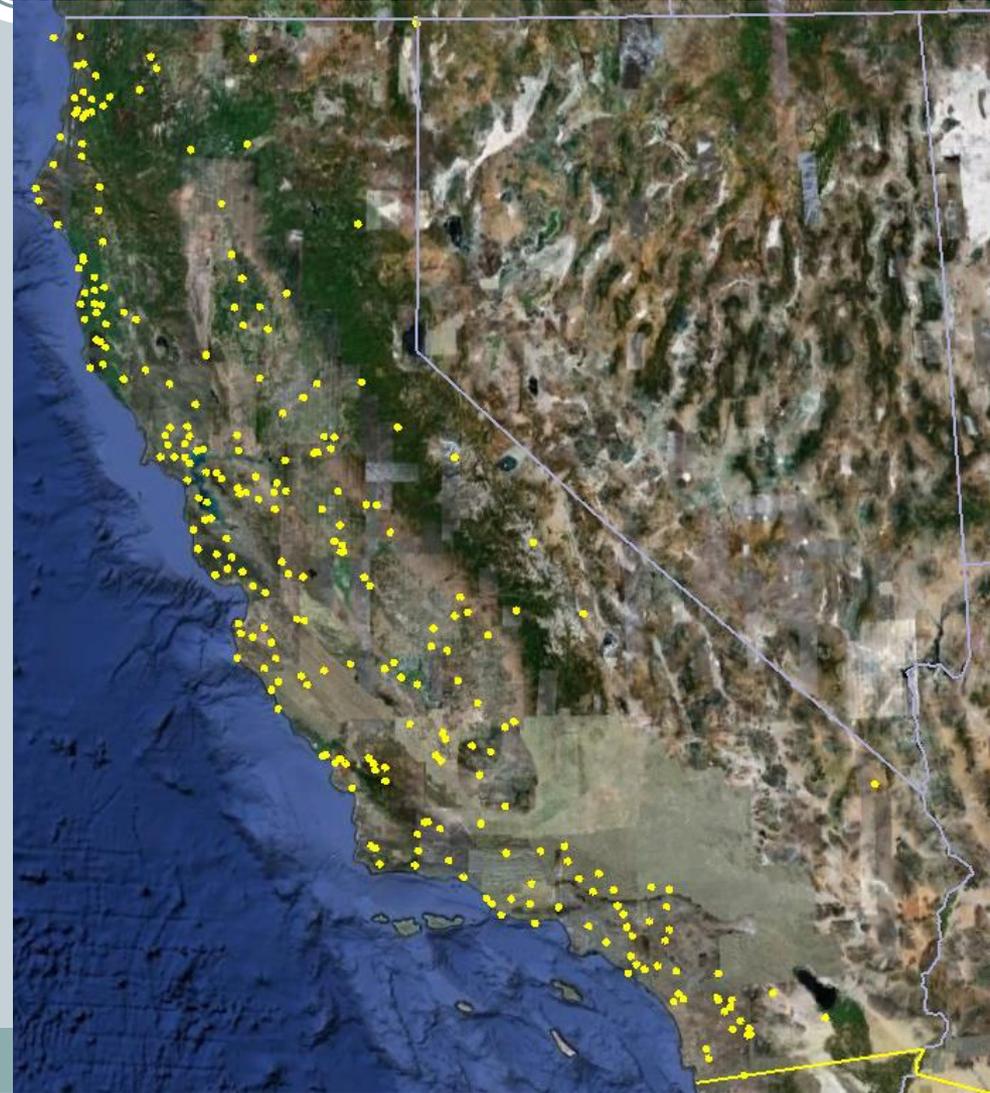
How does Probability-based Mapping work?

- Randomly place sample plots
- Map all wetlands and streams within each plot
- Use the sampled plots to statistically estimate statewide extent



NWI-S&T Design: Challenges in California

- National Wetland Inventory, Status and Trends Program
- Plot allocation based on a 1956 study of wetlands used by migratory birds
- Sample biased to coastal region
 - No streams
- Approximately 250 plots
- **NEED** more comprehensive and representative distribution

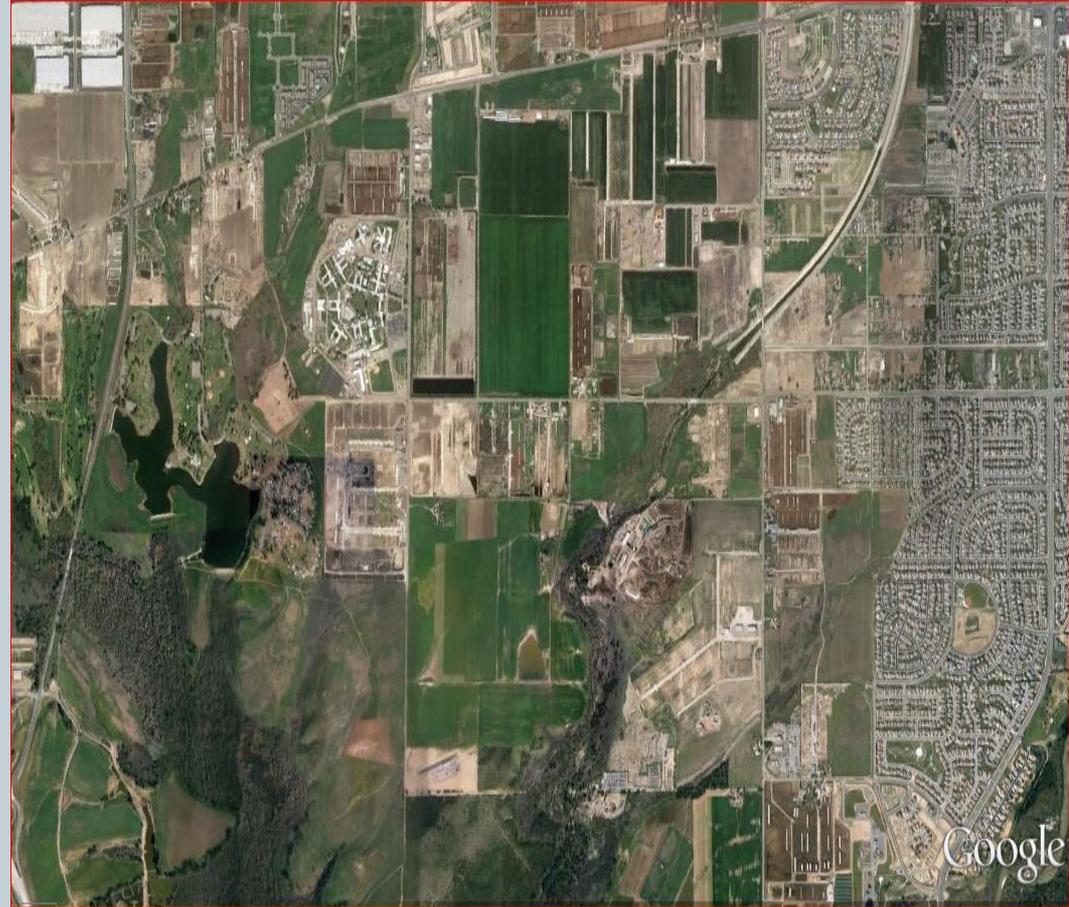


General Design Features

- Statewide coverage
 - 2,000 x 4 km² plots
- Static plots
 - Remapped on 5 –year interval
- Map everything in the plot
 - Wetlands
 - Streams
 - Riparian areas
 - Uplands
 - Developed
 - Agriculture
- Includes classification

} Main focus

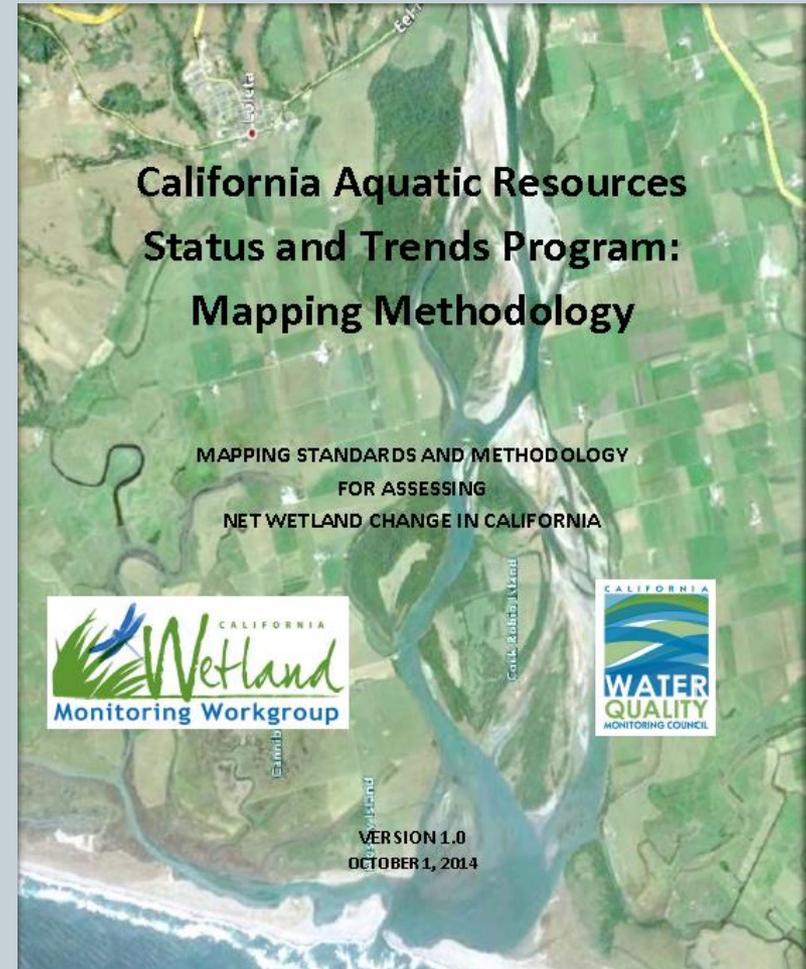
} Interpretation



Standard Operating Procedures



- Mapping protocols
- Classification rules
- Change assessment rules
- Data quality objectives



California Aquatic Resources Classification System - Structure

Primary
Factors

Hydro-
geomorphology

Landscape
Connection

Secondary
Modifiers

Anthropogenic
Influences

Hydrology

Vegetation

<i>Hydrogeomorphology (required)</i>	
<i>Major Class</i>	<i>Class</i>
Open Water (O)	Lacustrine (L)
	Riverine (R)
	Estuarine (E)
	Marine (M)
Wetland (W)	Depression (D)
	Lacustrine (L)
	Slope (S)
	Riverine (R)
	Estuarine (E)

<i>Hydrogeomorphology (required)</i>		<i>Landscape Connection</i>		
<i>Major Class</i>	<i>Class</i>	<i>Type (required)</i>	<i>Subtype (optional)</i>	
Open Water (O)	Lacustrine (L)			
	Riverine (R)	Confined (c) Unconfined (u)		
	Estuarine (E)	Lagoon/Dune strand (l)		
		Bar Built estuary (r) Open embayment (b)	Tidal Channels (a) Tidal Basin (c)	
	Marine (M)	Intertidal (i)	Embayment (e) Exposed Shoreline (s)	
		Subtidal (s)	Embayment (e) Exposed Shoreline (s)	
Wetland (W)	Depression (D)	Depression, Other (d)	Defined outlet (d) Undefined outlet (u)	
		Vernal Pool Complex (v)		
		Playa (p)		
	Lacustrine (L)			
	Slope (S)	Wet Meadow (w)	-	
		Forested Slope (f)	-	
		Slope, Other (s)	-	
	Riverine (R)	Confined (c) Unconfined (u)		
		Estuarine (E)	Lagoon/Dune strand (l)	
	Bar Built estuary (r) Open embayment (b)			

Wetland Vegetation & Uplands



Wetland Vegetation Modifier (required)

Class	Type
<i>Non-vegetated</i>	shallow open water (sow) mud/sand/salt flat (flt)
<i>Aquatic Vegetation</i>	Algae (AL) Floating (FL) Submerged (SU) Emergent (EM)
<i>Transitional Vegetation</i>	Forested (FO) Scrub-shrub (SS) Herbaceous/Grass (HE) Mixed (MI)
<i>Naturally disturbed</i>	Scour (nsc) Slides (nsl)

Upland Categories (required)

Class
Beach and dune (BD)
Developed (DEV)
Developed, Open Space/Recreation (DOS)
Cultivated Crops (CC)
Pasture, Rangeland, Ranchland (PRR)
Flooded agriculture (FLA)
Grassland/Herbaceous (GRS)
Forest (FST)
Rock Outcrop (RKO)
Ruderal/Barren (RUD)
Scrub/shrub (SSH)
Undeveloped Urban Open Space (UOS)

Proposed Data Quality Objectives



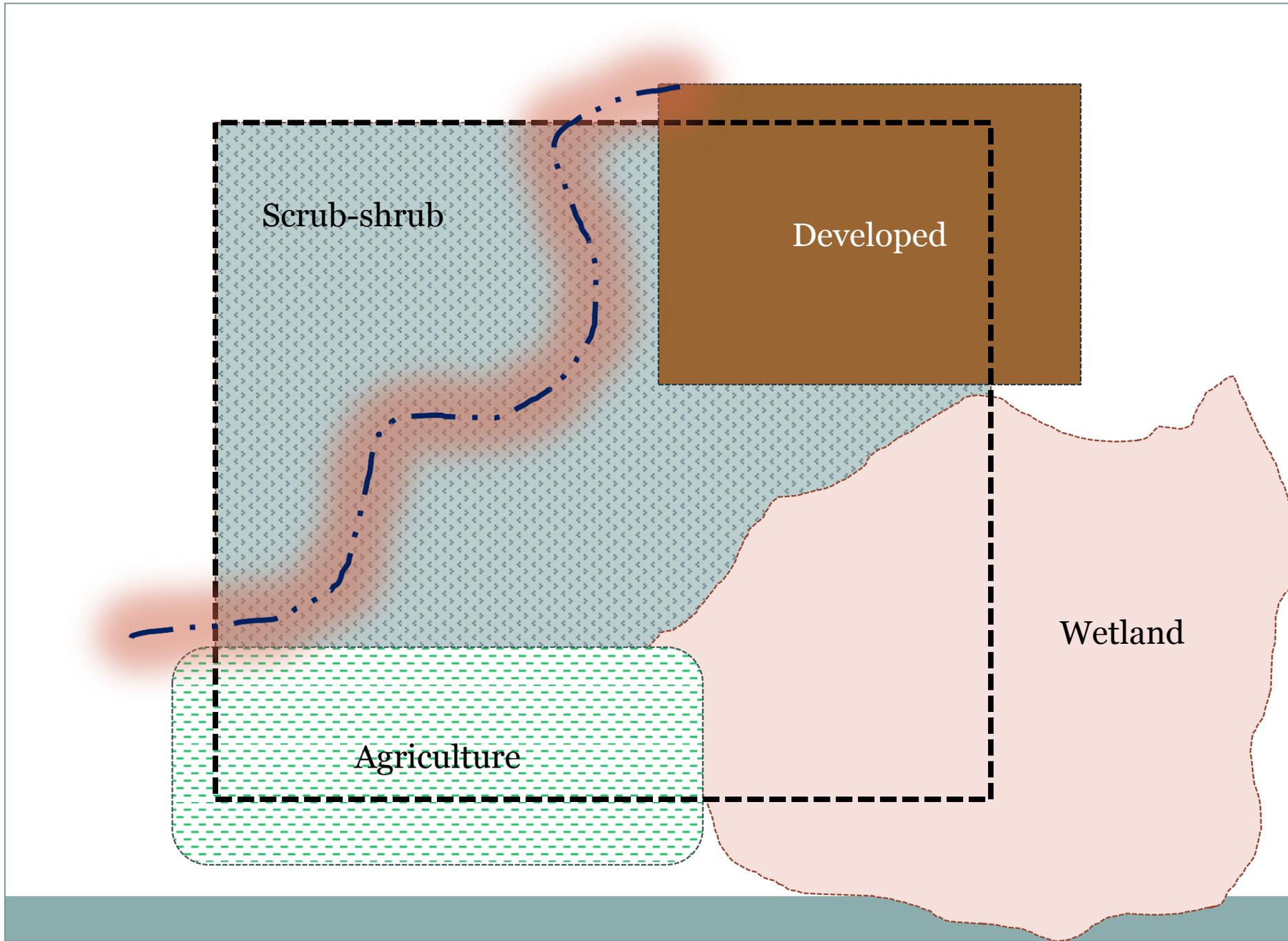
Criterion	Quality Control Requirement	Objective
Representativeness	use GRTS draw without substitutions	±10%
Comparability	use of standard imagery, data sources and protocols	100%
Completeness	all area within all plots selected should be mapped	100%
Precision/Bias		
area	10% of plots verified by an independent mapper	±6%
classification		80%
Accuracy		
area	groundtruthing 5% of mapped plots	±6%
classification		80%

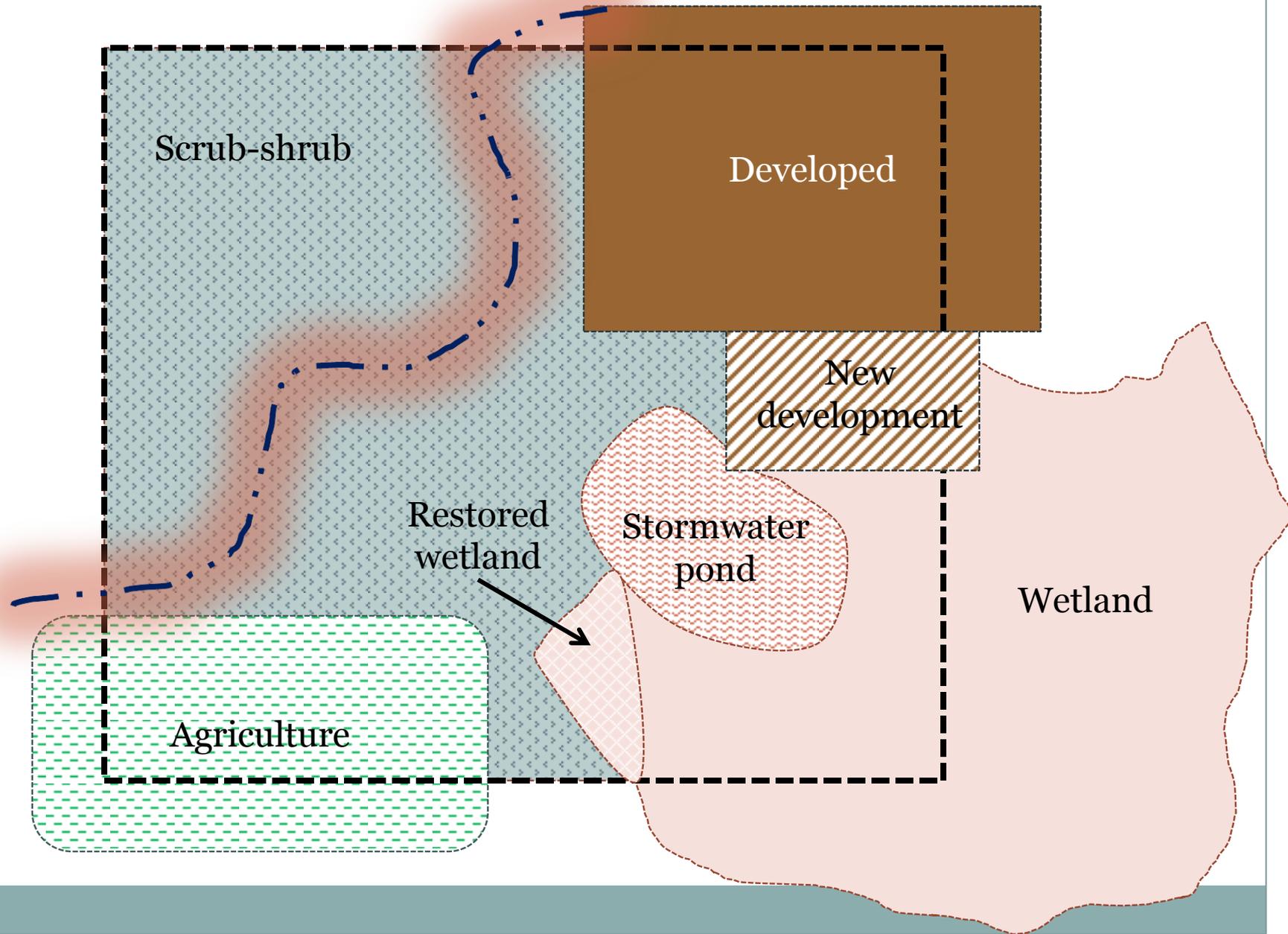
- **Overall wetland area: ±6%**
- **Overall stream length: ±15%**
- **Wetland class: ±20%**

Change Assessment Approach



- Select random plots
- Map contents of plots at time point #1 based on aerial imagery and ancillary data sources
- Overlay maps and data from time point #2
- Map differences between time points 2 vs. 1
- Change in plots extrapolated to produce statewide trend information





Scrub-shrub

Developed

New
development

Restored
wetland

Stormwater
pond

Agriculture

Wetland

Change Assessment Products



- Report on overall changes:
 - Change in area by wetland type
 - Change in stream length by stream type
 - Change in stream area
- Report on specific change categories:
 - Wetland type to a different wetland type
 - Wetland/stream <--> open water
 - Wetland/stream <--> natural upland
 - Wetland/stream <--> developed
 - Wetland/stream <--> agriculture
 - Wetland/stream <--> structure

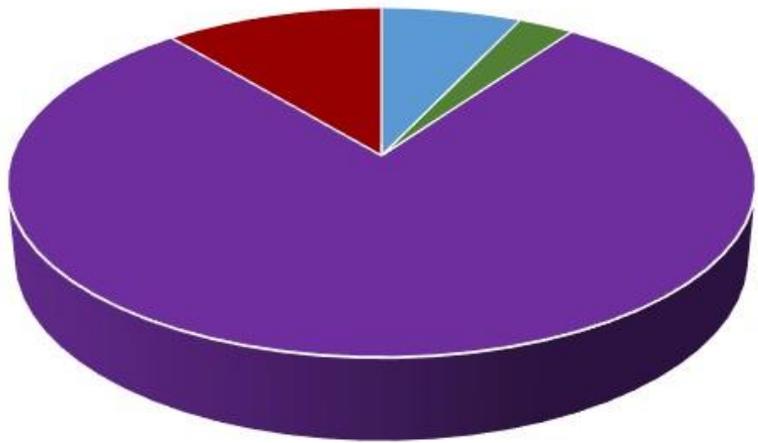
Demonstrating Change Assessment



2005 linework on 2010 imagery

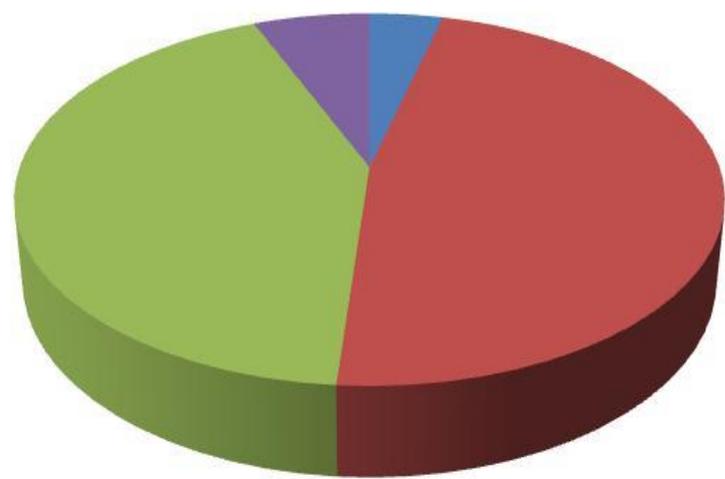


Estimates of Wetland Extent



- Estuarine
- Lacustrine
- Riverine
- Slope

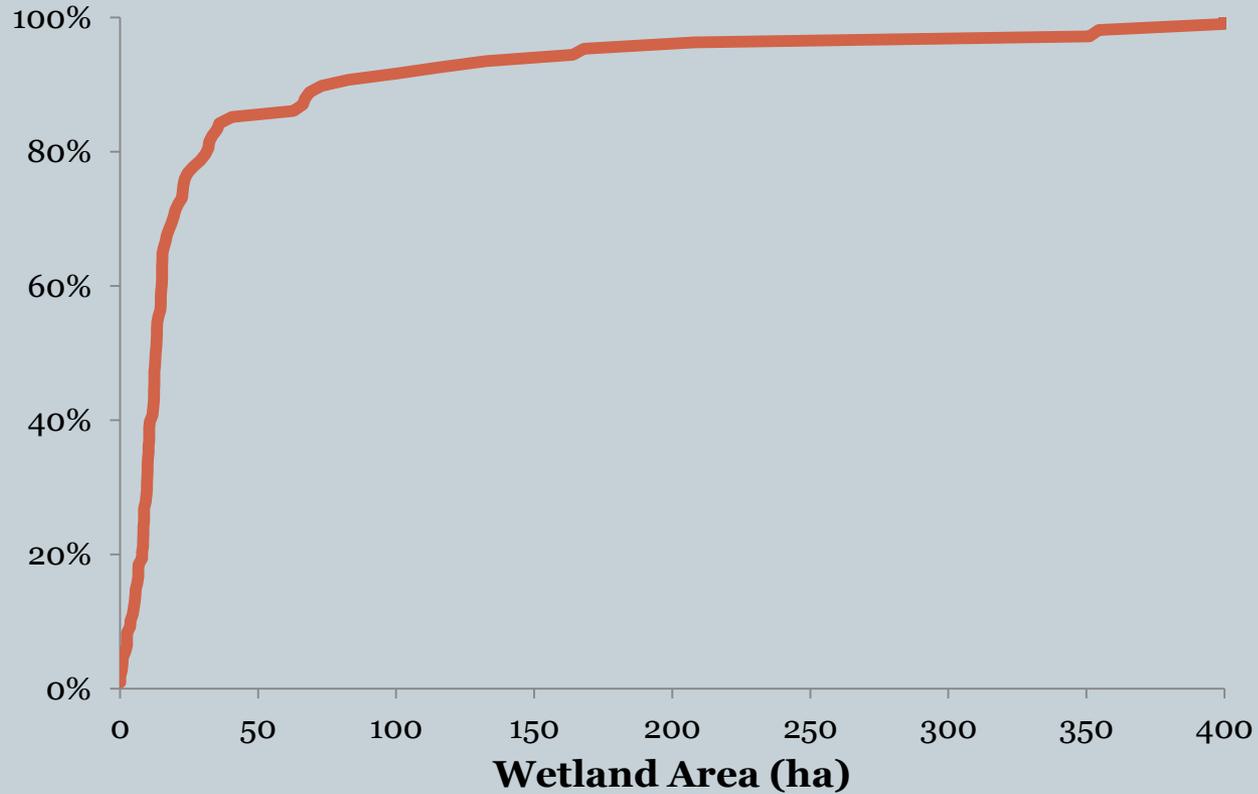
9% of mapped area



- Estuarine
- Palustrine
- Lacustrine
- Riverine

3.5 % of total area in CA

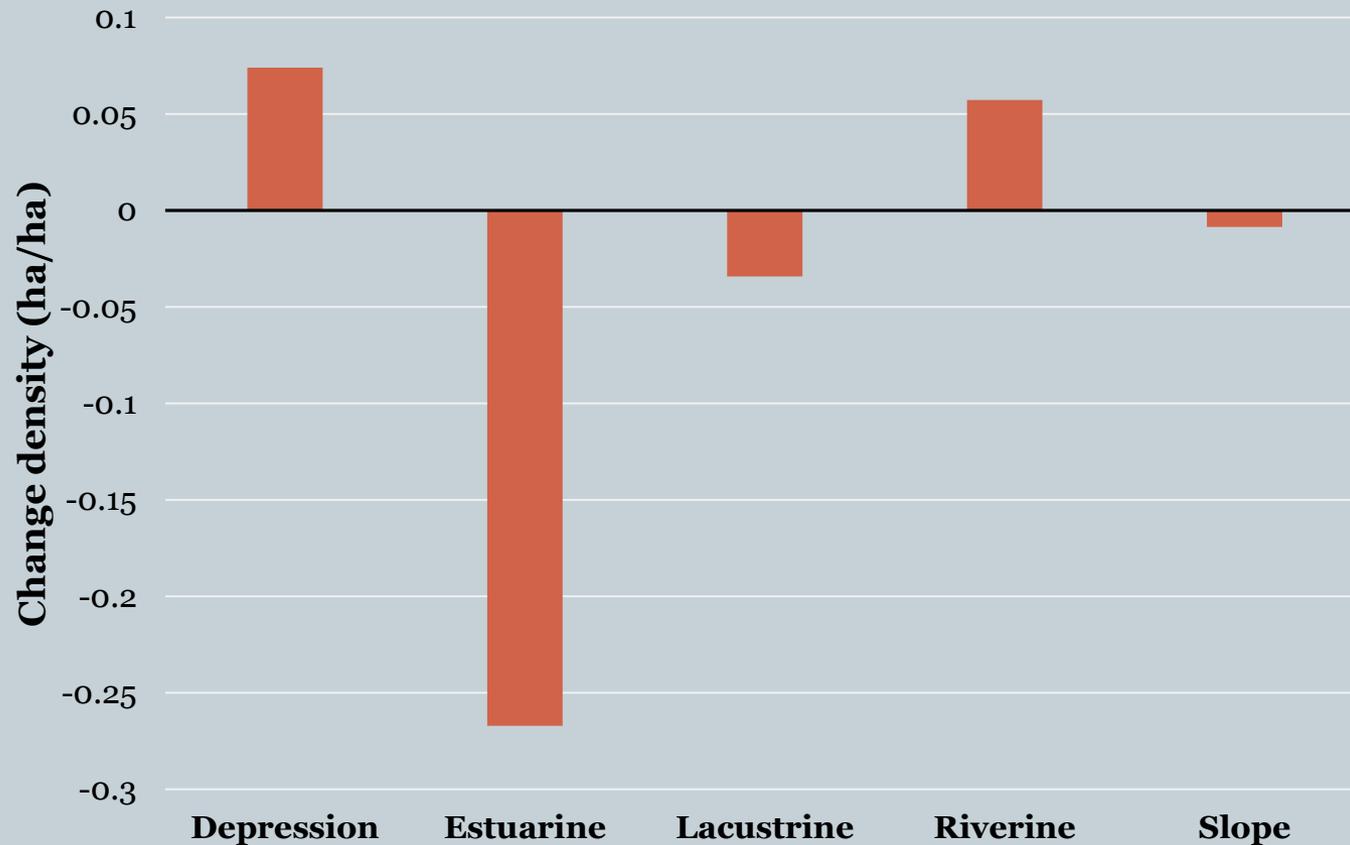
Most Wetlands are “Small”



Preliminary Change Estimates



Wetland Change by Class
2005-2010

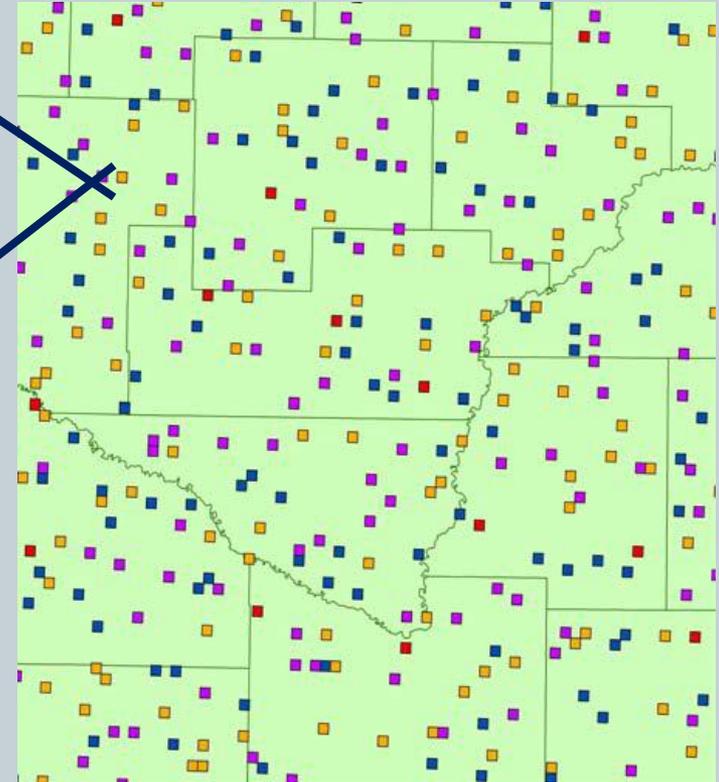
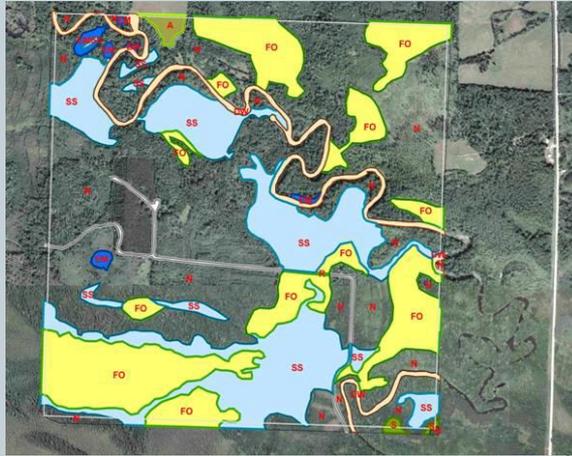


Analysis Upon Program Implementation



- Statewide extrapolation
- Regional patterns
- Type conversions
- Associations with specific land use types or stressors

Leveraging Opportunities



- Regional context for detailed studies
- Landscape change analysis
- General habitat mapping
- Suitable or critical habitat
- Species occurrences
- Invasive species
- Other applications?

- NCCP/HCP
- SWAP
- Joint Ventures

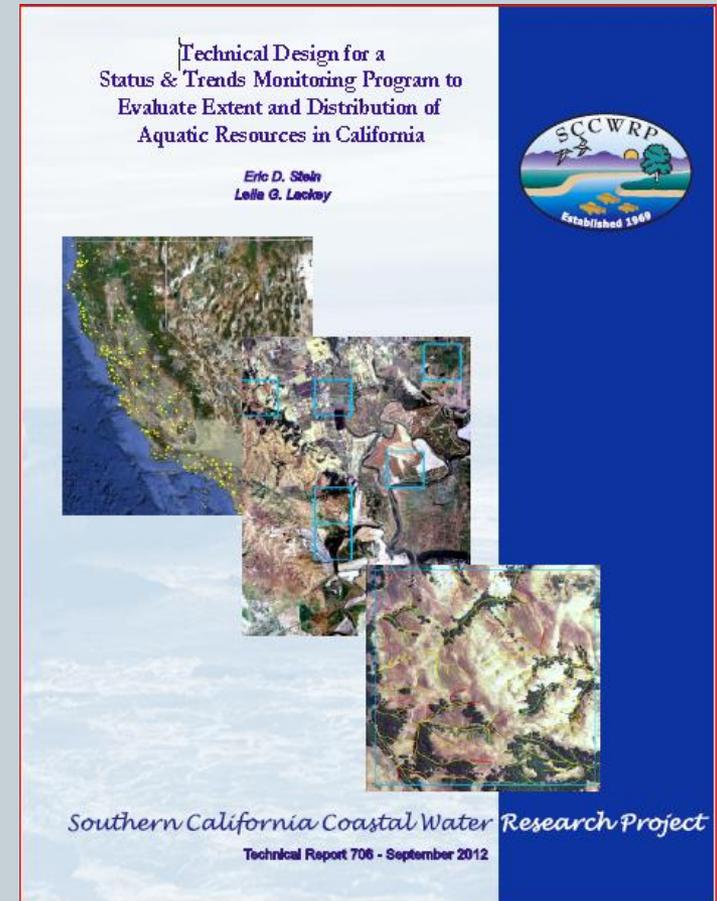
Advantages of S&T for California



- ***Direct response to recommendations of 2010 State of the State's Wetlands report regarding evaluating the no net loss policy***
 - Ability to report on wetland, stream, and other water body extent, distribution, and trends
- **Sample frame for probabilistic condition analysis**
 - Platform for identifying priority areas for intensified investigations of condition
- **Starting point for additional analysis to address specific management questions**
 - Effect of conservation practices on managed lands (e.g. NCCP, JV)

Program Implementation

- Program development is largely complete
- Natural Resources Agency to assume responsibility for program implementation
- Approximate implementation costs
 - \$250,000/year for years 1-5
 - \$200,000/year for years 6+
- Need to develop long-term data management strategy
- ***Continue to develop partnerships for implementation and use of products***



How You Can Help



- Endorse the value of the program for addressing basic questions of status and trends
 - Wetlands, lakes, streams, estuaries
- Provide a letter of support for inclusion in final funding request to State Department of Finance
- Encourage programs to incorporate S&T plots into their monitoring and assessment programs for both aquatic and terrestrial natural resources

Thank You



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Eric Stein – erics@sccwrp.org