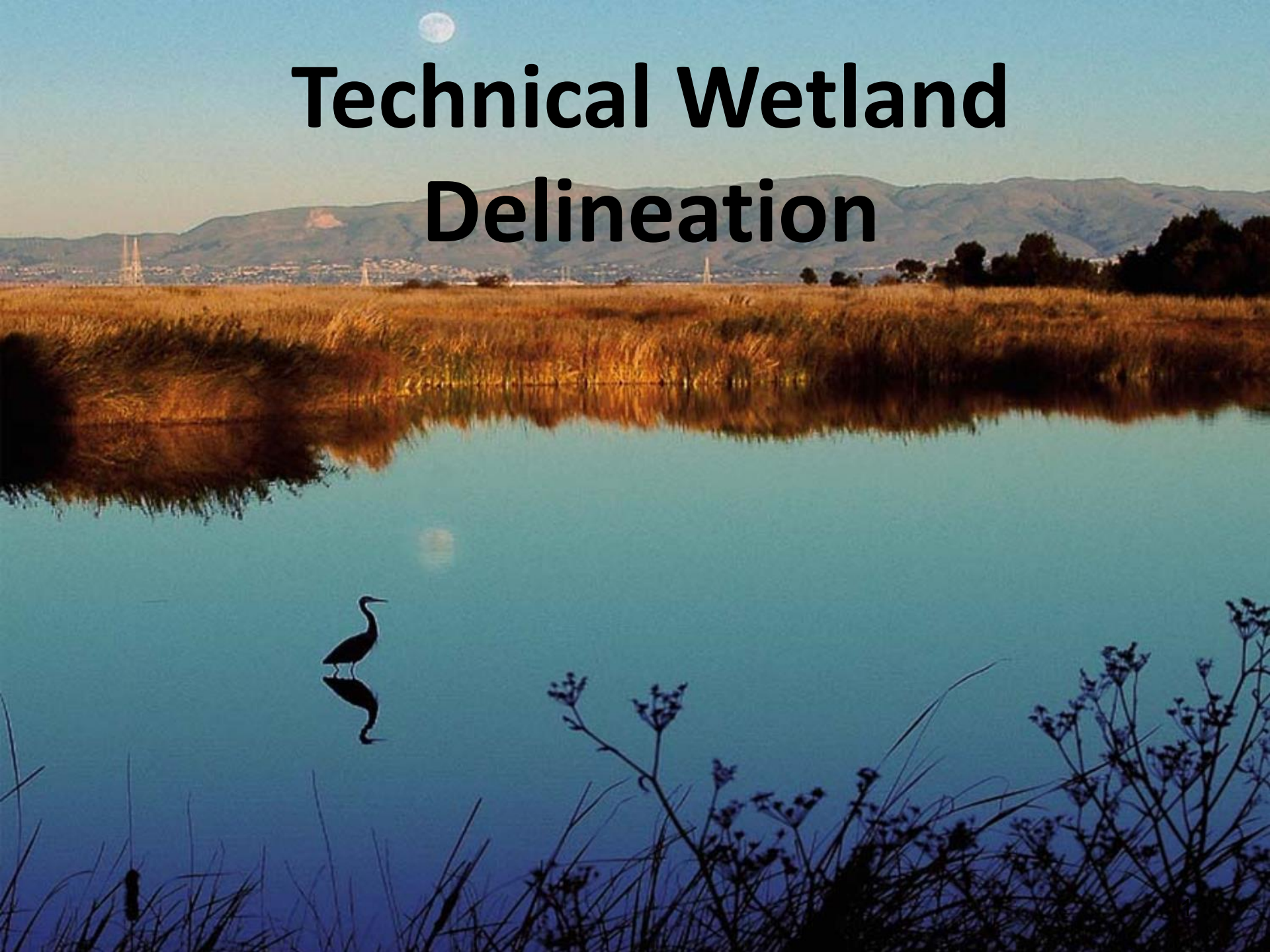


# Technical Wetland Delineation

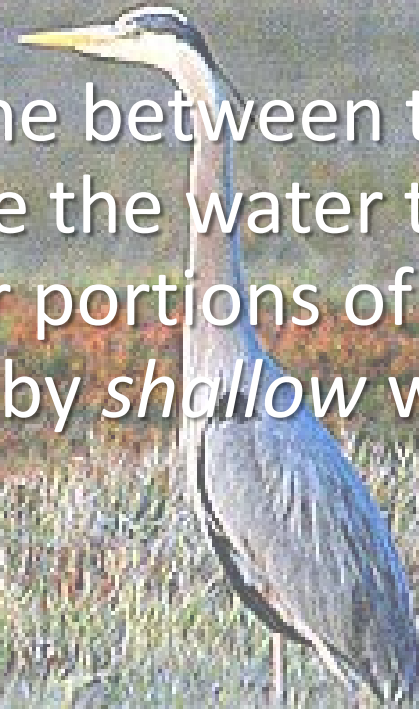


# Today's Talk

- Wetland Definitions and Importance of Wetlands
- Overview of the Wetland Delineation Approach
- Vegetation Parameter
- Soils Parameter
- Hydrology Parameter
- Some Wetland Permits of the Past

# What is a Wetland?

Lands that occur in the zone between terrestrial and aquatic systems where the water table is at or near the soil surface for portions of the year, or the land is covered by *shallow* water.



# What is a Wetland – USACE Definition

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

# Wetlands Differ from Uplands in their Physical, Chemical and Biological Characteristics

Wetland Soils



Wetland Plants



Wetland Animals



Wetland Soil Microbes



# Why Are Wetlands Important?

They provide habitat for many species and support high biodiversity.



# Why Are Wetlands Important?

Filter impurities from water  
– improve water quality



Store Carbon

# Why Are Wetlands Important?

Recreation opportunities for nature viewing.





# Why Are Wetlands Important?

- Promote groundwater recharge
- Reduce erosion



# Why Are Wetlands Important?

Buffer wave energy from storm surge



# Dramatic Historical Loss of Wetlands in CA



# Overview of the Wetland Delineation Approach



# Many Different Types of Wetlands



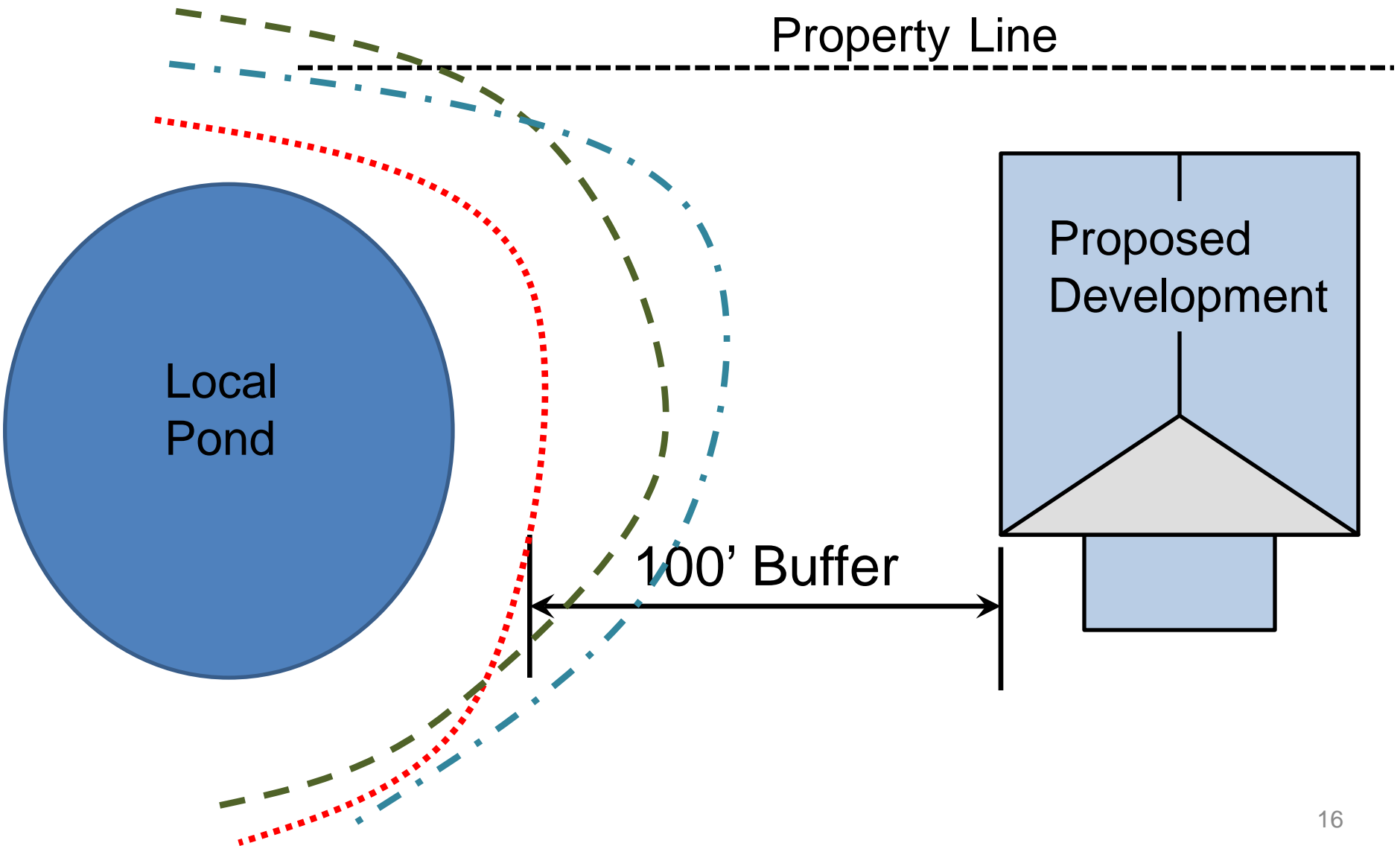
# Wetland Delineation



# Wetland Delineation



# Typical Delineation







US Army Corps  
of Engineers  
Waterways Experiment  
Station

Wetlands Research Program Technical Report Y-87-1 (on-line edition)

## Corps of Engineers Wetlands Delineation Manual

by Environmental Laboratory



January 1987 - Final Report  
Approved For Public Release; Distribution Is Unlimited



# 1987 USACE Manual

1. Presents the technical guidelines for identifying wetlands and distinguishing them from aquatic habitats and other non-wetlands.
2. Provides the methods for applying the technical guidelines.
3. Provide supporting information useful in applying the technical guidelines.

An aerial photograph of a wetland landscape. The scene is dominated by a network of blue water channels and green vegetation. In the foreground, there are dense, tall green reeds or grasses. The water channels wind through the landscape, some appearing as narrow streams and others as larger, more open areas. The background shows a vast expanse of water under a clear sky, with some distant landmasses or islands visible. The overall color palette is a mix of blues, greens, and browns, suggesting a natural, undisturbed environment.

# Wetland Parameters

1. Wetland Vegetation (Hydrophytes)
2. Wetland Soils (Hydric Soils)
3. Wetland Hydrology

# Different Wetland Definitions for Different Agencies

US Army Corps of Engineers

**Three** parameter approach

Vegetation, Soil and Hydrology Parameters must be satisfied

California Coastal Commission/ The USFWS/ CDFG Commission

**One** parameter approach:

Vegetation or Soils or Hydrology under certain conditions.

# Does the Hydrology Parameter Apply?



Salt pan **wetland**  
San Elijo Lagoon



Mud puddle  
**Not a wetland**

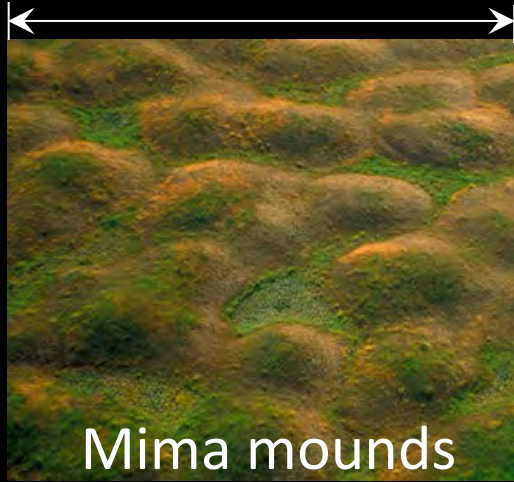


# Field Indicators

Field Indicators are physical, chemical, or biological features of an area that can be easily observed or assayed and that are usually correlated with the presence of a wetland parameter.

# Field Indicators

100 ft.



Aquatic Invertebrates



10 ft.



# The USACE Wetland Delineation Data Form

## Site Description and Sampling Date

Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

**SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes _____ No _____	Is the Sampled Area within a Wetland?	Yes _____ No _____
Hydric Soil Present?	Yes _____ No _____		
Wetland Hydrology Present?	Yes _____ No _____		

## Vegetation Parameter

Tree Stratum (Plot size: _____)	% Cover	Species?	Status	Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
4. _____	_____	_____	_____	
= Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____
= Total Cover				
= Total Cover				OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FAU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: (A) _____ (B) _____
= Total Cover				
Prevalence Index = B/A = _____				Hydrophytic Vegetation Indicators: ___ Dominance Test is >50% ___ Prevalence Index is $\leq 3.0^1$ ___ Morphological Adaptations <sup>2</sup> (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation <sup>3</sup> (Explain)
Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.				
Hydrophytic Vegetation Present? Yes _____ No _____				Hydrophytic Vegetation Present? Yes _____ No _____
Remarks:				

Indicators

## SOIL

## Soil Parameter

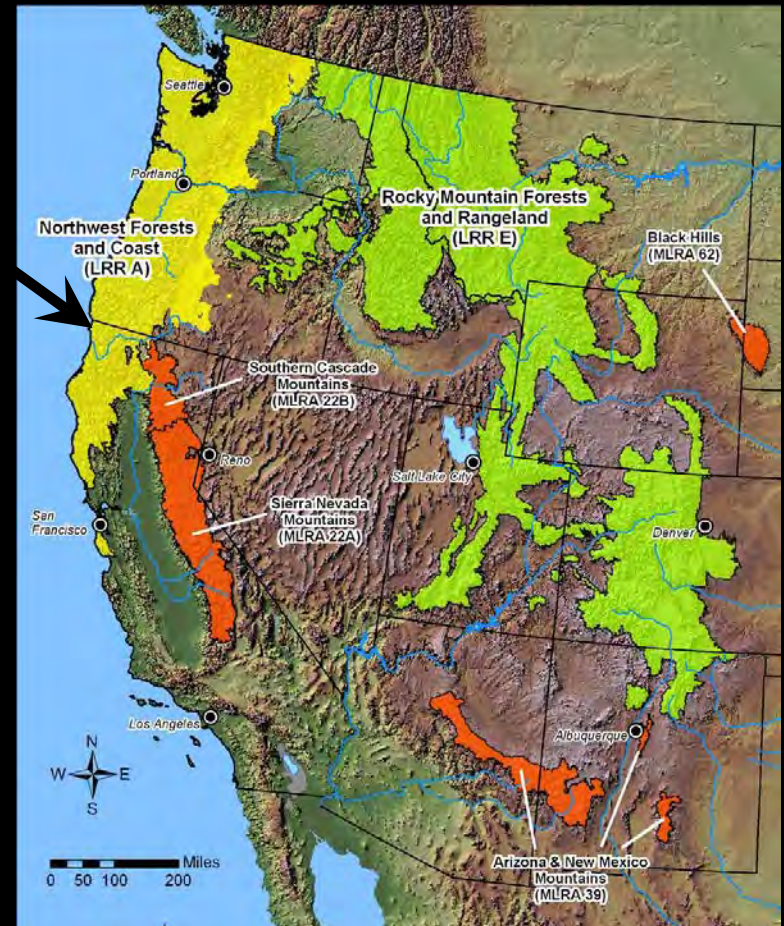
Type		Concentration	Depletion	Reduced Matrix	Covered or Coated Sand Grains	Location	Pore Lining	Matrix
___ Histosol (A1)	___ Sandy Redox (S5)	___	___	___	___	___	___	___
___ Histic Epipedon (A2)	___ Stripped Matrix (S6)	___	___	___	___	___	___	___
___ Black Histic (A3)	___ Loamy Mucky Mineral (F1)	___	___	___	___	___	___	___
___ Hydrogen Sulfide (A4)	___ Loamy Gleyed Matrix (F2)	___	___	___	___	___	___	___
___ Stratified Layers (A5) (LRR C)	___ Depleted Matrix (F3)	___	___	___	___	___	___	___
___ 1 cm Muck (A9) (LRR D)	___ Redox Dark Surface (F6)	___	___	___	___	___	___	___
___ Depleted Below Dark Surface (A11)	___ Depleted Dark Surface (F7)	___	___	___	___	___	___	___
___ Thick Dark Surface (A12)	___ Redox Depressions (F8)	___	___	___	___	___	___	___
___ Sandy Mucky Mineral (S1)	___ Vernal Pools (F9)	___	___	___	___	___	___	___
___ Sandy Gleyed Matrix (S4)								
Restrictive Layer (if present): Type: _____ Depth (inches): _____								
Remarks:								
Hydric Soil Present? Yes _____ No _____								
Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.								
Primary Indicators (minimum of one required to check all that apply)					Secondary Indicators (2 or more required)			
___ Surface Water (A1)	___ Salt Crust (B11)	___ Water Marks (B1) (Riverine)	___ Biotic Crust (B12)	___ Sediment Deposits (B2) (Riverine)	___ Drift Deposits (B3) (Riverine)	___ Drainage Patterns (B10)	___ Dry-Season Water Table (C2)	___ Crayfish Burrows (C8)
___ High Water Table (A2)	___ Aquatic Invertebrates (B13)	___ Oxidized Rhizospheres along Living Roots (C3)	___ Hydrogen Sulfide Odor (C1)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)	___ Thin Muck Surface (C7)	___ Shallow Aquifer (D3)	___ FAC-Neutral Test (D5)
___ Saturation (A3)	___ Water Marks (B1) (Nonriverine)	___ Sediment Deposits (B2) (Nonriverine)	___ Drift Deposits (B3) (Nonriverine)	___ Surface Soil Cracks (B6)	___ Recent Iron Reduction in Tilled Soils (C8)	___ Inundation Visible on Aerial Imagery (B7)	___ Water-Stained Leaves (E9)	___ Other (Explain in Remarks)
Field Observations: Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)								
Wetland Hydrology Present? Yes _____ No _____								
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:								
Remarks:								

## Hydrology Parameter

# California Regions: Regional Supplements

## Arid West

## Western Mountains, Valleys, and Coast Region





# Vegetation Parameter



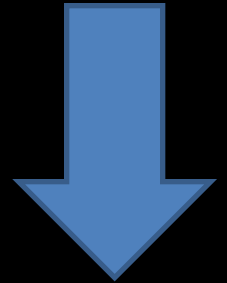
# Wetland Vegetation

- Tolerant to fluctuations in water level
- Tolerant to low soil oxygen and frequent saturation
- Marine influenced plants are tolerant to saline or brackish water

# Plant Classifications

Indicator Code	Indicator Status	Frequency of Occurrence in Wetlands
OBL	Obligate Wetland	>99%
FACW	Facultative Wetland	67% - 99%
FAC	Facultative	33% - 66%
FACU	Facultative Upland	1% - 33%
UPL	Obligate Upland	<1%

Hydrophyte



Upland Plant

# Obligate (OBL)

(found in wetlands >99% of the time)

Smooth Cordgrass

*Spartina alterniflora*

California Bulrush

*Schoenoplectus californicus*



# Facultative Wetland (FACW)

(found in wetlands 67 - 99% of the time)

Umbrella Sedge

*Cyperus eragrostis*



Spreading Rush

*Juncus patens*



# Facultative (FAC)

(found in wetlands 33 - 67% of the time)

Fragile Sheath Sedge

*Carex fracta*

Western Larkspur

*Delphinium hesperium*



# Upland Species (UPL)

(found in wetlands >1% of the time)

Coyote Brush

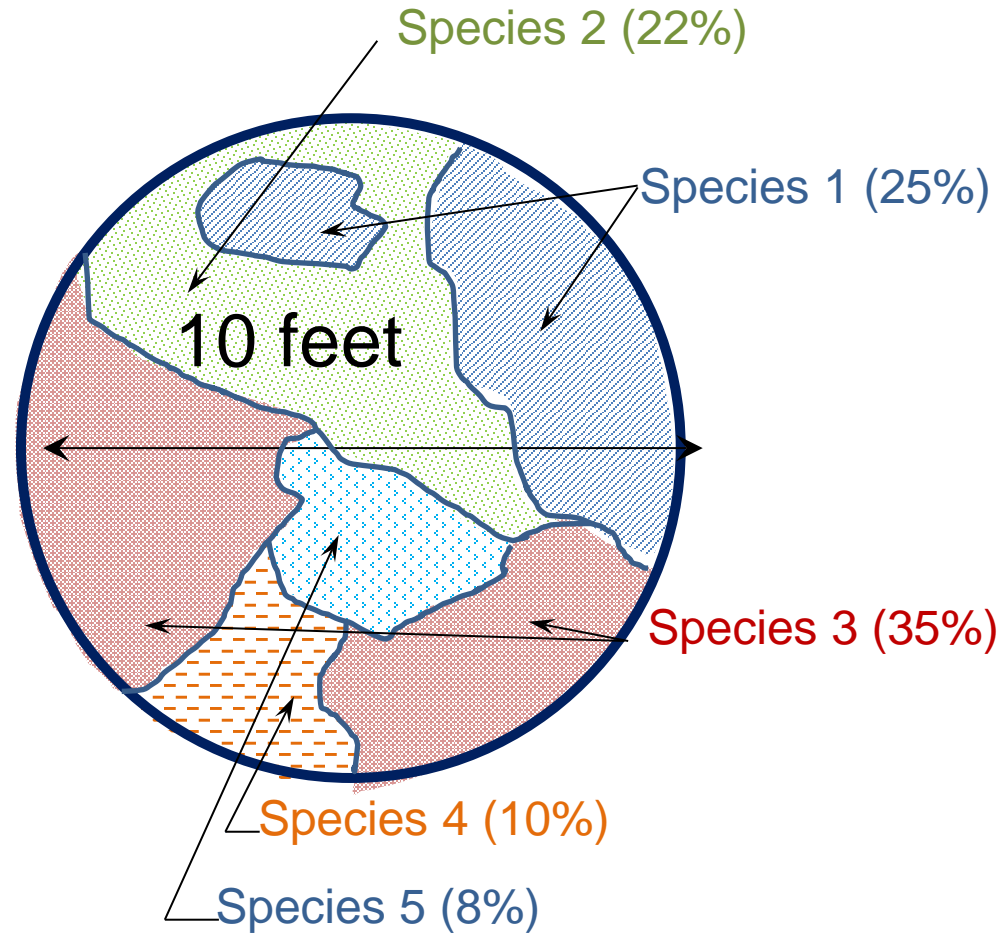
*Baccharis pilularis*

California Sage

*Artemisia californica*



# Plant Layer: Grass/Herb Layer





# Determining the Vegetation Parameter

VEGETATION – Use scientific names of plants.

		Absolute % Cover	Dominant Species?	Indicator Status
<b>Tree</b> (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
		_____ = Total Cover		
<b>Shrub</b> <u>stratum</u> (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
		_____ = Total Cover		
<b>Herb</b> (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
		_____ = Total Cover		
<b>Vine</b> <u>stratum</u> (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
		_____ = Total Cover		
% Bare Ground in Herb Stratum _____		% Cover of Biotic Crust _____		

## 50/20 Rule

- Species that make up 50% of each layer
- Any species with 20% or more cover.

## Vegetation Layers

## % Cover of Dominant Plants

Remarks:

# Assessing Predominance

## Dominance Test

There is a predominance of hydrophytes if more than 50 percent of the **dominant species** are classified as FAC, FACW, or OBL.

## 50 % of Species

- Species 3.....	35%	_____	FACW ✓
- Species 1.....	25%	_____	FACU
- Species 2.....	22%	_____	OBL ✓
- Species 4.....	21%	_____	UPL

**2/3** Dominant species are FAC, FACW or OBL = ~~50%~~  
Therefore, wetland vegetation parameter is ~~not~~ met.

# Soil Parameter

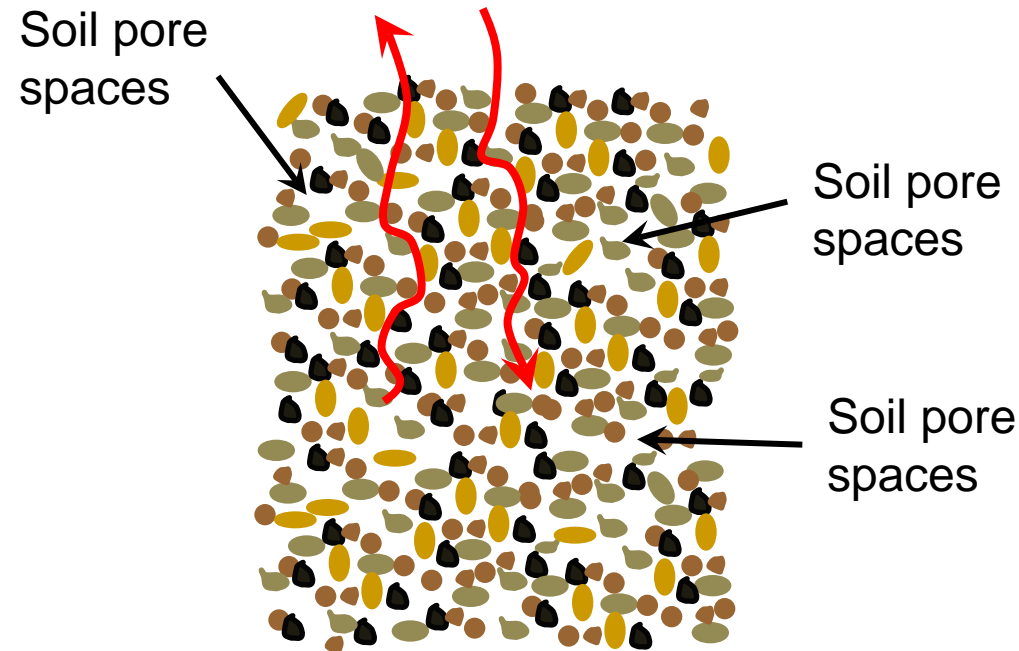
## Identifying Hydric Soils



# Upland and Wetland Soils

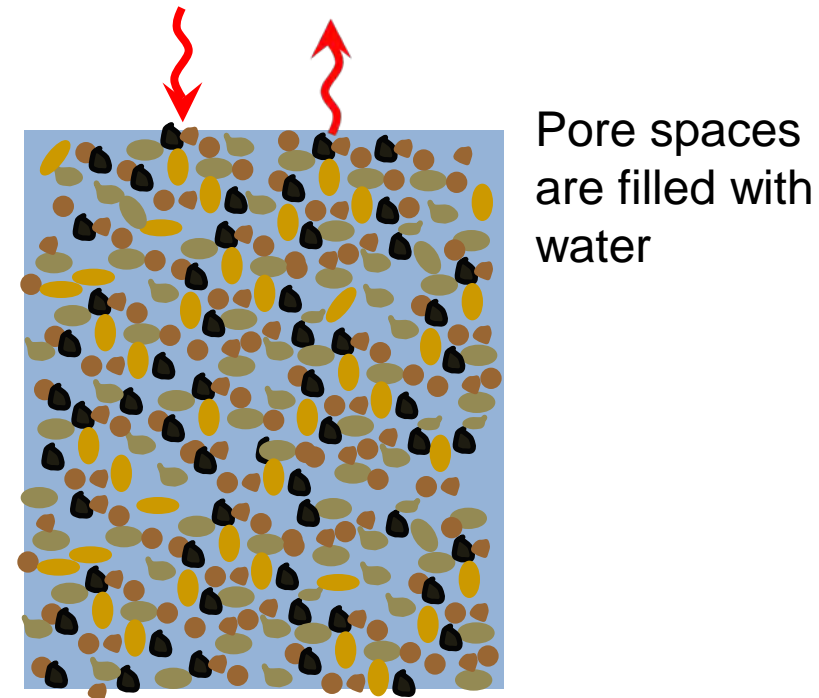
## Dry Upland Soil

Air exchange with the atmosphere



## Saturated Wetland Soil

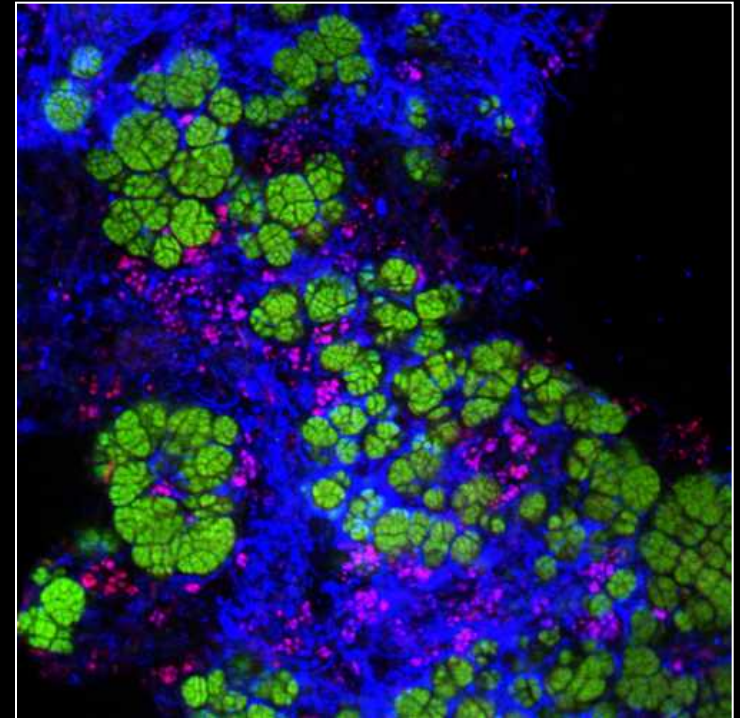
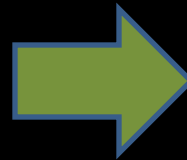
Air exchange with the atmosphere  
Happens only at the surface



# Switch in the Microbial Community After Soil Wetting



Aerobic Bacteria and Fungi

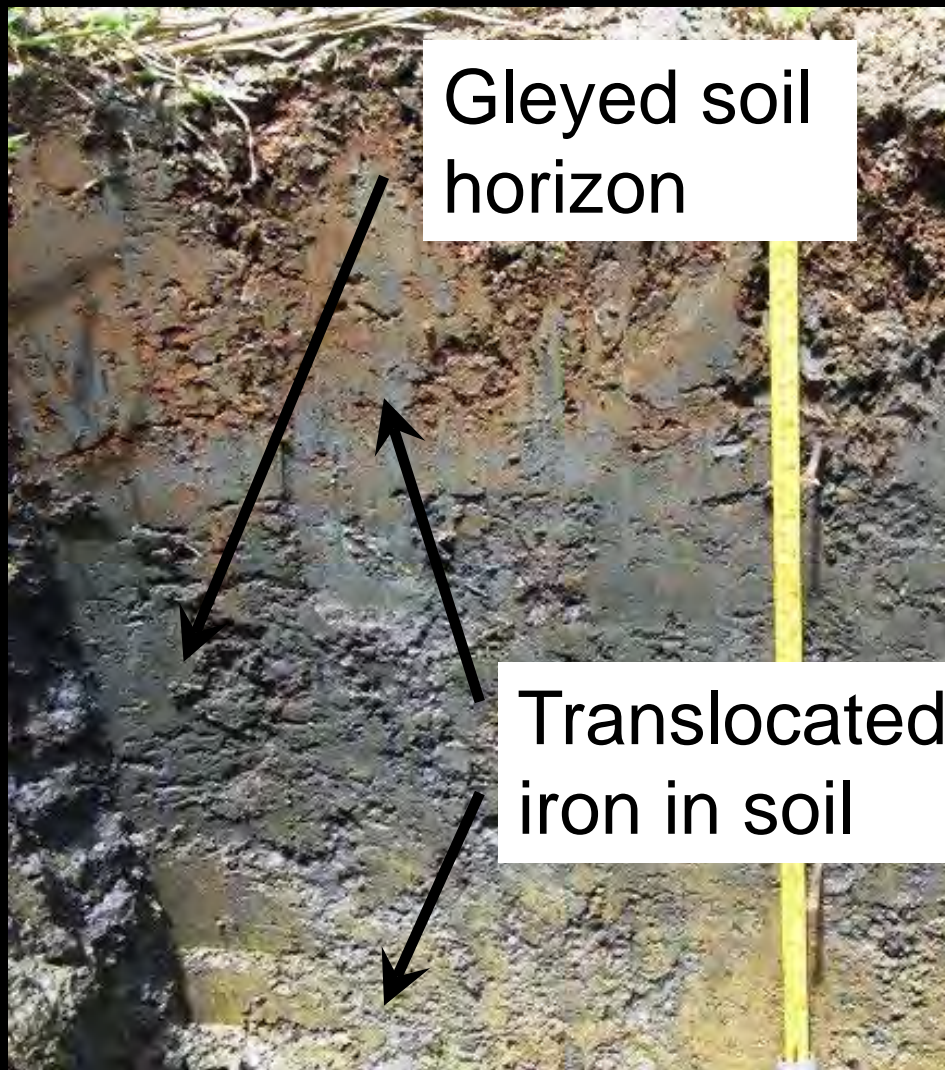


Anaerobic Bacteria and other  
Micro-organisms

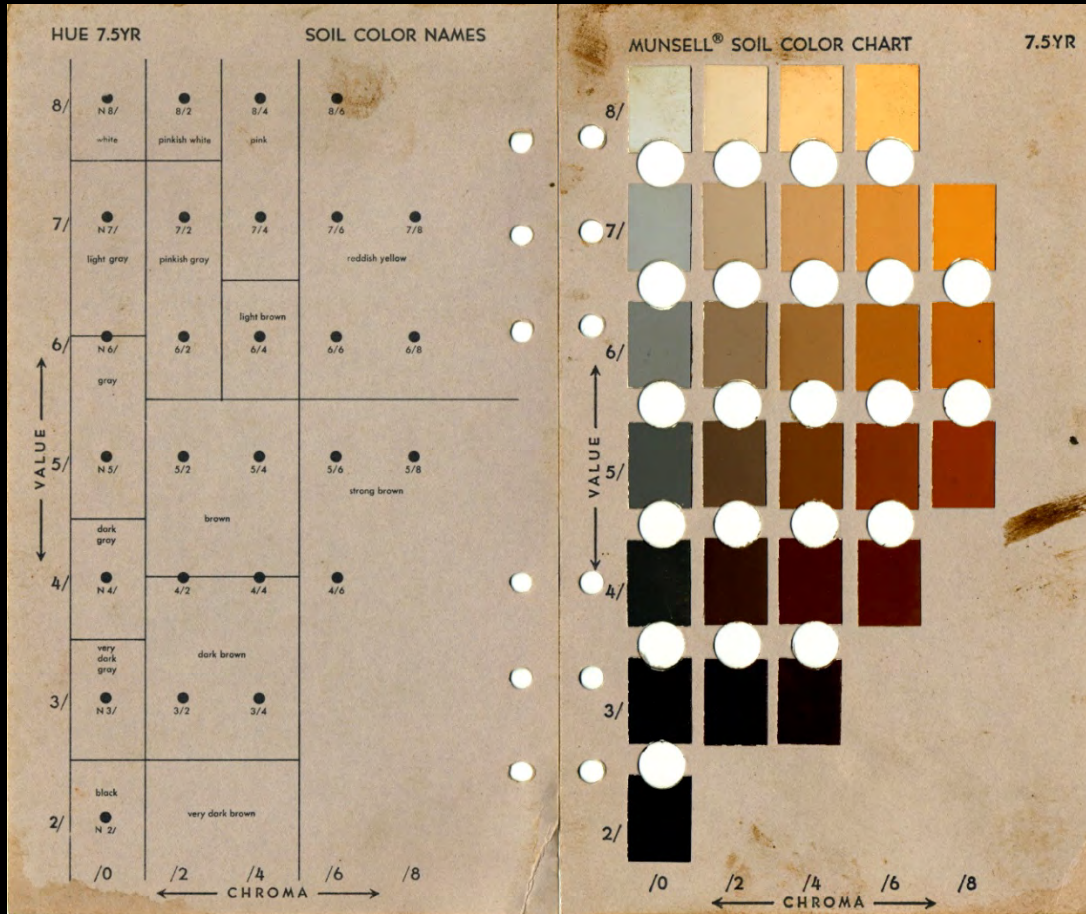
# Accumulation of Organic Materials in Frequently Saturated Soils – Organic Soils



# Observable Chemical Changes in Hydric Soils



# Munsell Soil Color Book





# Soil Parameter

Sampling Point: \_\_\_\_\_

ad to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type <sup>1</sup>	Loc <sup>2</sup>		
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

**Soil Matrix  
Attributes**

**Mottle Attributes**

<sup>1</sup>Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. <sup>2</sup>Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Indicators for Problematic Hydric Soils<sup>3</sup>:

- \_\_\_ Histosol (A1)
- \_\_\_ Histic Epipedon (A1)
- \_\_\_ Black Histic (A3)
- \_\_\_ Hydrogen Sulfide
- \_\_\_ Stratified Layers
- \_\_\_ 1 cm Muck (A9) (LRR C)
- \_\_\_ Depleted Below I
- \_\_\_ Thick Dark Surface
- \_\_\_ Sandy Mucky Matrix
- \_\_\_ Sandy Cleyed Matrix

Sandy Pedon (C5)

1 cm Muck (A9) (LRR C)

## Field Indicators for Hydric Soils

- Hydrogen Sulfide
- Sandy Mucky Matrix

and  
nt,

Restrictive Layer (if present):

Type: \_\_\_\_\_

Depth (inches): \_\_\_\_\_

Hydric Soil Present? Yes \_\_\_\_\_ No \_\_\_\_\_

Remarks:

# Hydrology Parameter

Looking for Evidence of  
Saturation or Ponding



# Evidence of Hydrology



# Evidence of Hydrology: Oxidized Rhizosphere and Shallow Water Table



Oxidized Rhizosphere



Water Table Near Surface

# Evidence of Hydrology: Wetland Species



Santa Rosa  
Fairy Shrimp



Vernal Pool  
Tadpole Shrimp

CA Tiger Salamander  
Metamorphic Stage  
(Early Stage of Development)



# Hydrology

## Hydrology Parameter

Primary Indicators (minimum of one required; check all that apply)

- Surface Water (A1)
- High Water Table Saturation (A3)
- Water Marks (B1)
- Sediment Deposits
- Drift Deposits (B2)
- Surface Soil Cracks
- Inundation Visible
- Water-Stained Leaves (D4)

- High water table
- Drift deposits
- Surface soil cracks

- Salt Crust (B11)
- Sulfide Odor (C1)
- Spherules along Living Roots (C2)
- Reduced Iron (C4)
- Reduction in Tilled Soils (C6)
- Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (Riverine)
- Crayfish burrows
- Shallow aquitard
- Water stained leaves
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

### Field Observations:

Surface Water Present? Yes  No  Depth (inches): \_\_\_\_\_

Water Table Present? Yes  No  Depth (inches): \_\_\_\_\_

Saturation Present? Yes  No  Depth (inches): \_\_\_\_\_  
(includes capillary fringe)

Wetland Hydrology Present? Yes  No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Primary Hydrology Indicators (Need 1)

Secondary Hydrology Indicators (Need 2)

# Factors that Influence the Reliability of Field Indicators of Hydrophytic Vegetation

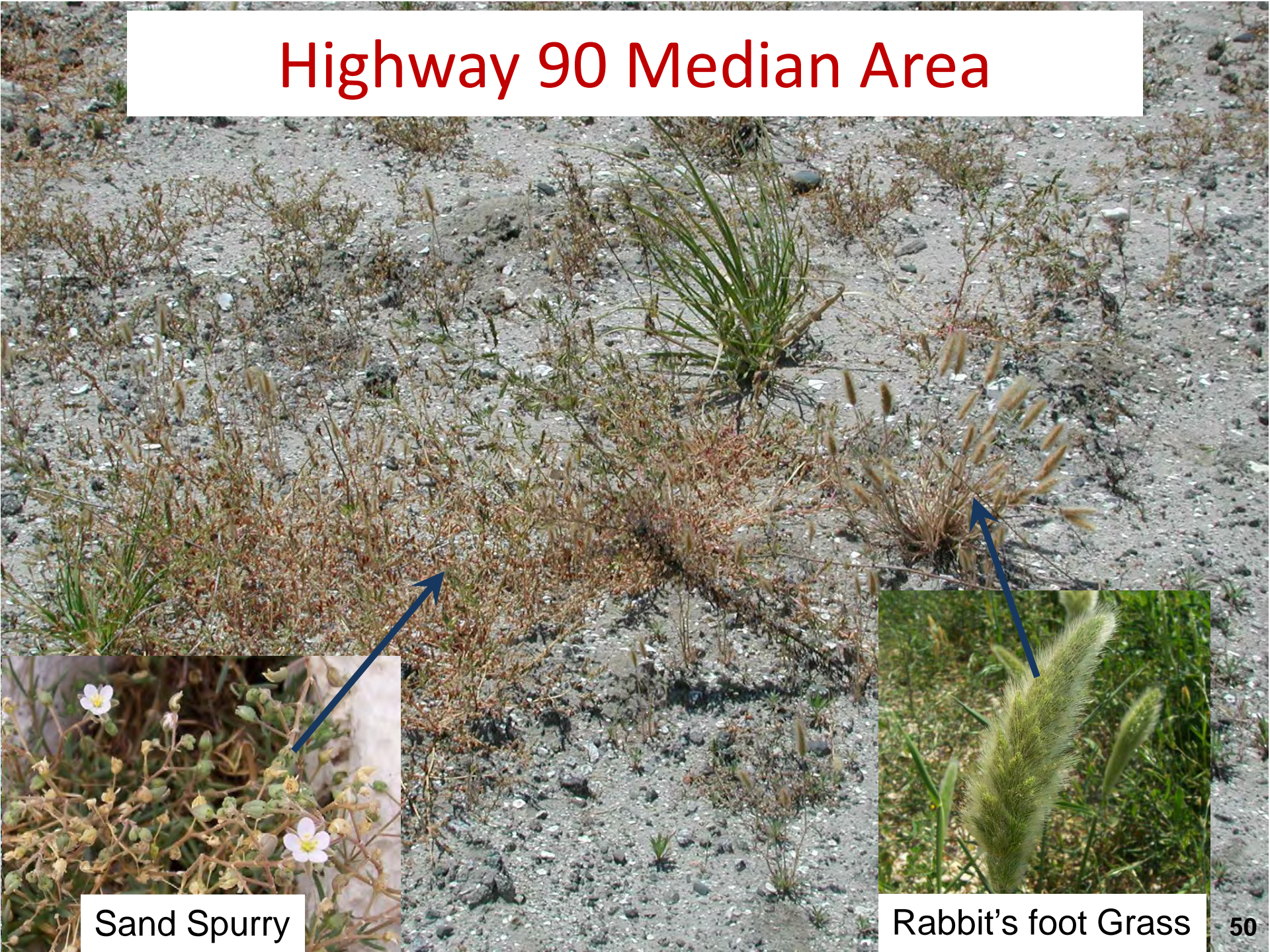
- Atypical situations where the vegetation has been removed or altered by human activities
- Facultative (FAC) species dominate the vegetation
- Community characterization based on only one or two species
- Delineation during the dry season when upland species may be abundant in seasonal wetlands
- Vegetation present following disturbance may not be characteristic of the long-term community

# Coastal Commission Approach to Problem Areas

- Species listed as OBL, FACW, or FAC are presumed to be growing as “hydrophytes”
- Where there is a predominance of OBL, FACW, or FAC species, the area is presumed to be a wetland
- In problem areas, the wetland presumption is rebuttable by compelling evidence of upland conditions.
- All pertinent evidence may be brought to bear on problem situations, but direct observations of hydrology during normal or unusually wet rainy seasons is most useful



# Highway 90 Median Area



Sand Spurry



Rabbit's foot Grass

# San Elijo Lagoon Watershed



# Kirkorowicz Permit Application

From CDP W8a – 10 - 1997

From Google Earth ~ May 1994

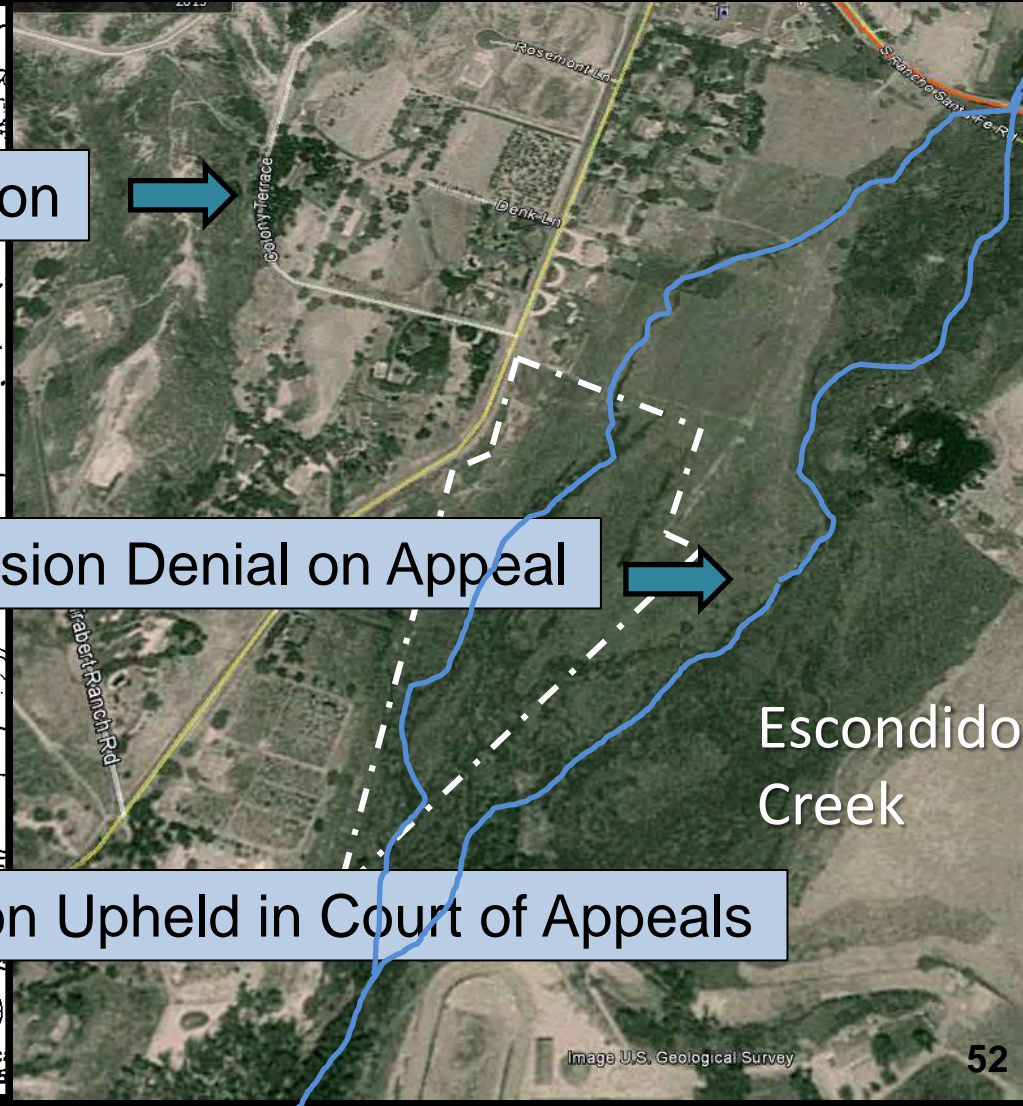
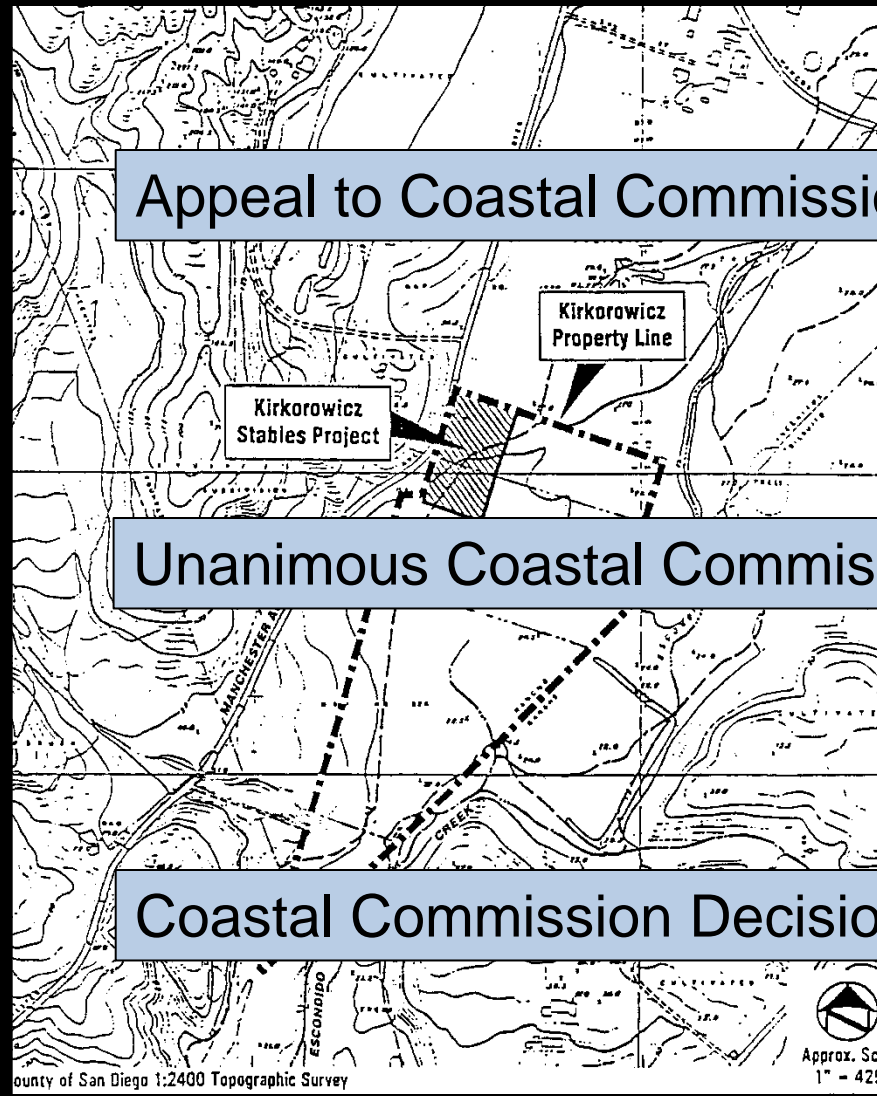
Appeal to Coastal Commission



Unanimous Coastal Commission Denial on Appeal



Coastal Commission Decision Upheld in Court of Appeals



Thank You

