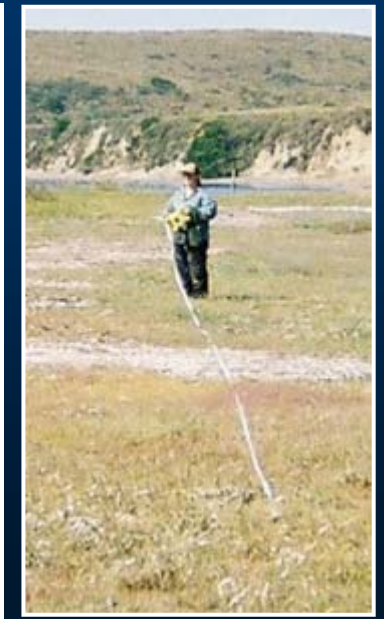
California Rapid Assessment Method for Wetlands

Estuarine Training Module


Steps of CRAM Assessment

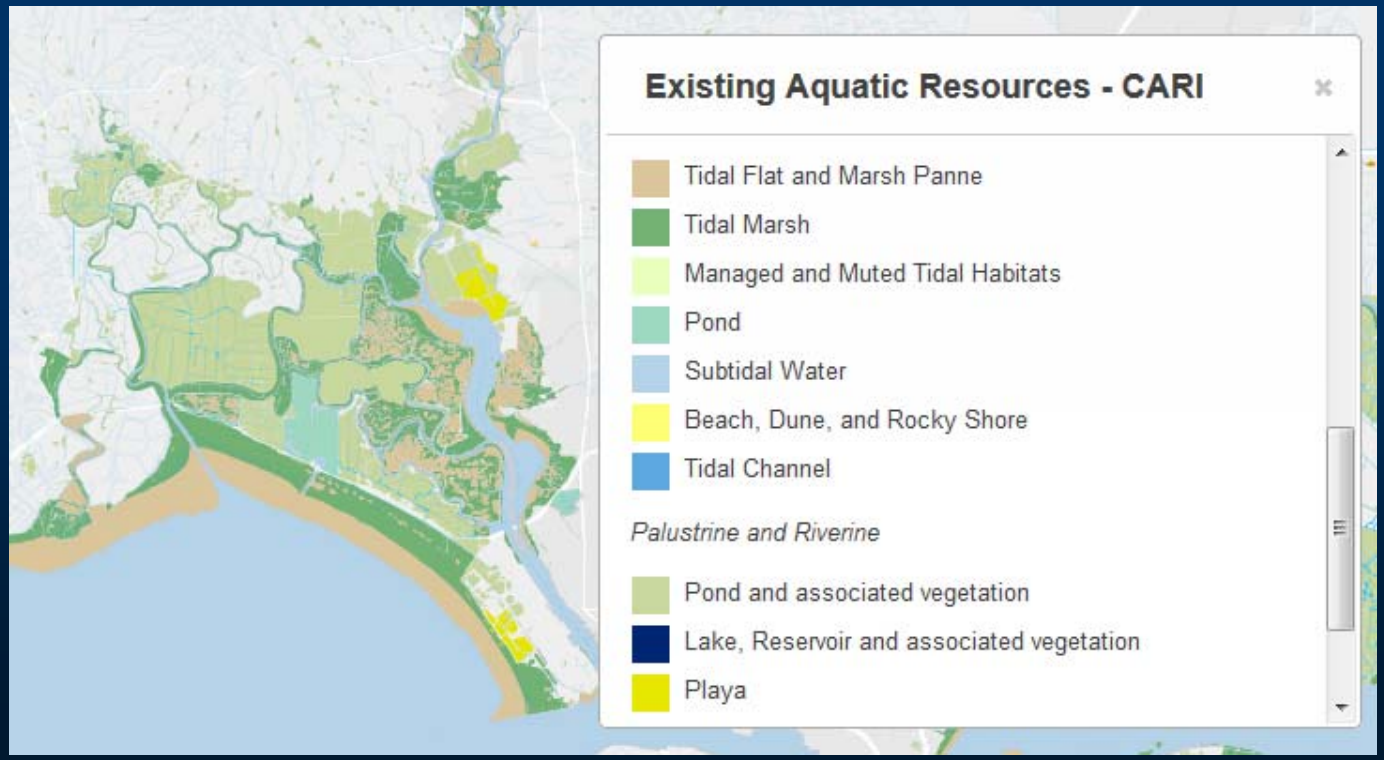
Step 1: Assemble background information
Step 2: Classify wetland
Step 3: Verify the appropriate season
Step 4: Sketch the CRAM Assessment Area (AA)
Step 5: Conduct the office assessment of AA
Step 6: Conduct the field assessment of AA
Step 7: Complete CRAM QA/QC
Step 8: Submit assessment results using *e*CRAM

Assemble Background Information

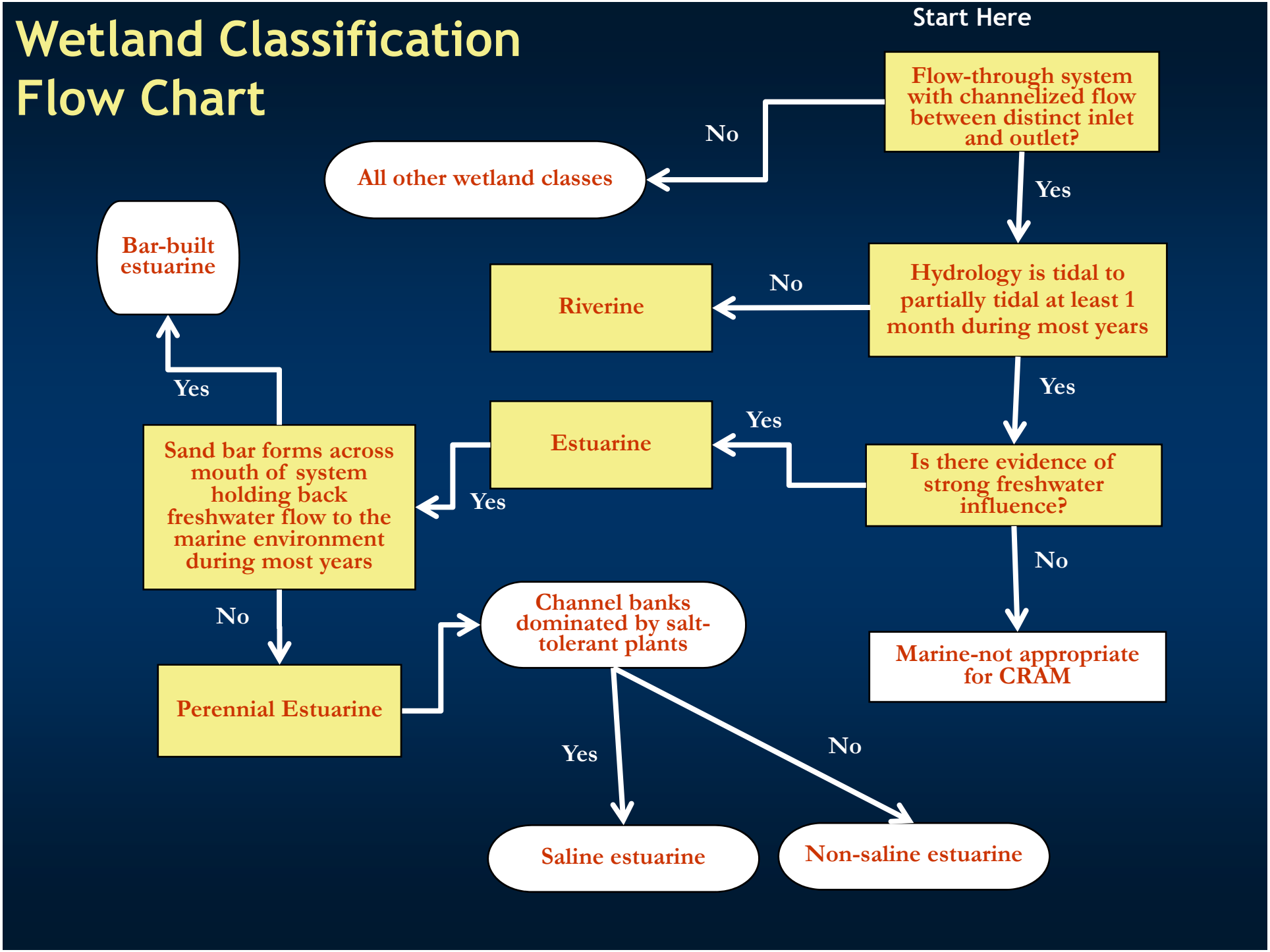
- 1-3m pixel resolution digital geo-rectified site imagery with a scale
- Preliminary map of assessment area (AA)
- Reports on hydrology, ecology, chemistry
- List of common plants
- Access permission (if needed)
- Map/directions to site

Sources of Background Information

- Wetland Maps (NWI, EcoAtlas)
- Other maps (topography, geology, soils, vegetation)
- Project reports (*e.g.*, monitoring reports)
- Phone interviews



Wetland Classification Flow Chart



Estuarine Wetland sub-types

- Perennial Non-saline (cattails, rushes, salt grass)

- Perennial Saline (cordgrass, pickleweed, salt grass)

- Bar-built (Seasonal)

CRAM Assessment Window

- Estuarine during low tide
  - Most small intertidal channels are de-watered
  - Benthic indicators visible
- Growing season of plants
  - Longer growing season for tidally influenced wetlands than others
  - Still new growth to senescence

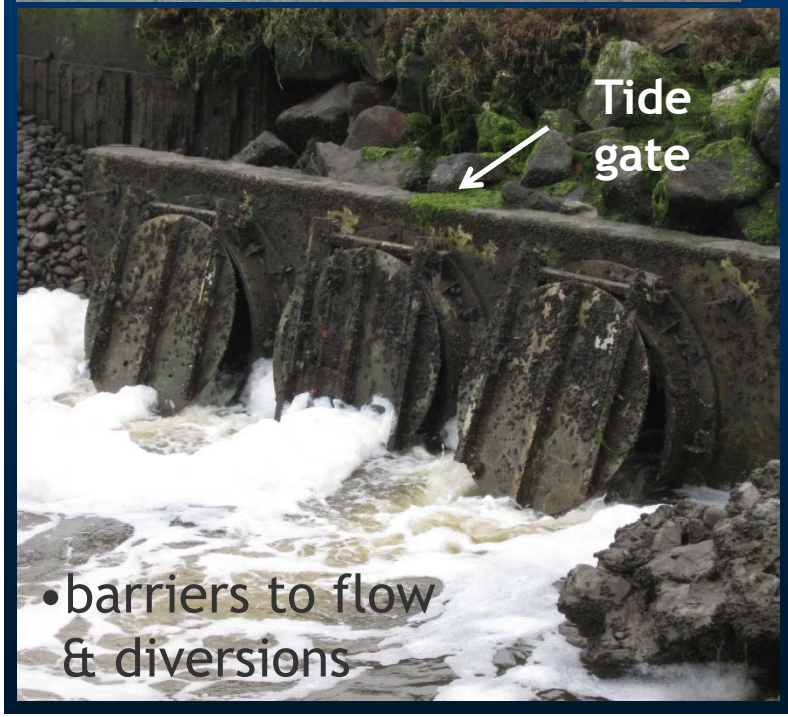
Considerations for delineating the AA

- Purpose of Assessment
  - Project (multiple AAs to cover site?)
  - Ambient (AA located at probabilistic draw point)
- Hydrogeomorphic Integrity
  - Standardize on flow and sediment regimes
  - Maximize detection of management effects
- Size Limits for AAs
  - Recommended size is a 1 ha circle (radius of 55 m)
  - Can be non-circular to fit wetland
  - Minimum size is 0.1 ha

Delineating the CRAM Assessment Area (AA)

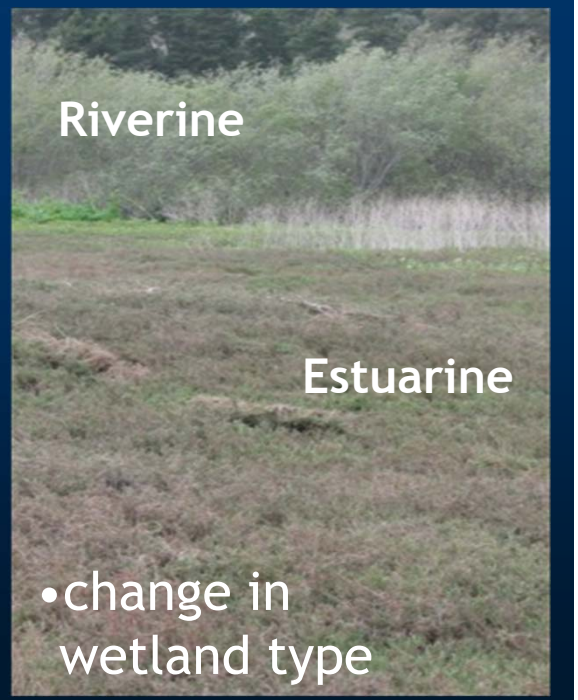
- Non-vegetated tidal flat

- Channel unable to be crossed



- barriers to flow & diversions

- backshore



- change in wetland type

Delineating the CRAM Assessment Area (AA)

Sketch the AA subject to field verification

- Determine boundary of AA at low tide
- Not to extend above the backshore
  - Wrack lines
  - Transition from tidal to upland
- Not to extend across:
  - more than 10m of non-vegetated tidal flat
  - a tidal channel more than 30m wide

Office Assessment

Some metrics that rely on background information and broad geographic overview are best assessed in the office, subject to field verification

- Buffer and Landscape Context Attribute
  - Aquatic Area Abundance (metric)
  - Percent of AA with Buffer (submetric)
  - Average Buffer Width (submetric)

- Hydrology Attribute
  - Water Source (metric)
  - Hydrologic Connectivity (metric)

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Field Assessment Procedure

1. Bring aerial with pre-drawn draft AA delineation
2. Modify AA, as needed
3. Walk through entire AA making mental notes & recording dominant plant species
4. Fill out datasheets
5. Walk again to clarify uncertainties
6. Finalize field scores

Basic Information Datasheet

Basic Information Sheet: Perennial Estuarine Wetlands

Assessment Area Name:	
Project Name:	
Assessment Area ID #:	
Project Site ID #:	**Date:**
Assessment Team Members for This AA	
Center of AA: **Latitude:** **Longitude:**	
Wetland Sub-type: ☐ Perennial Saline ☐ Perennial Non-saline	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☐ Other:	
What best describes the tidal stage over the course of the time spent in the field? Note: It is recommended that the assessment be conducted during low tide. ☐ high tide ☐ low tide	

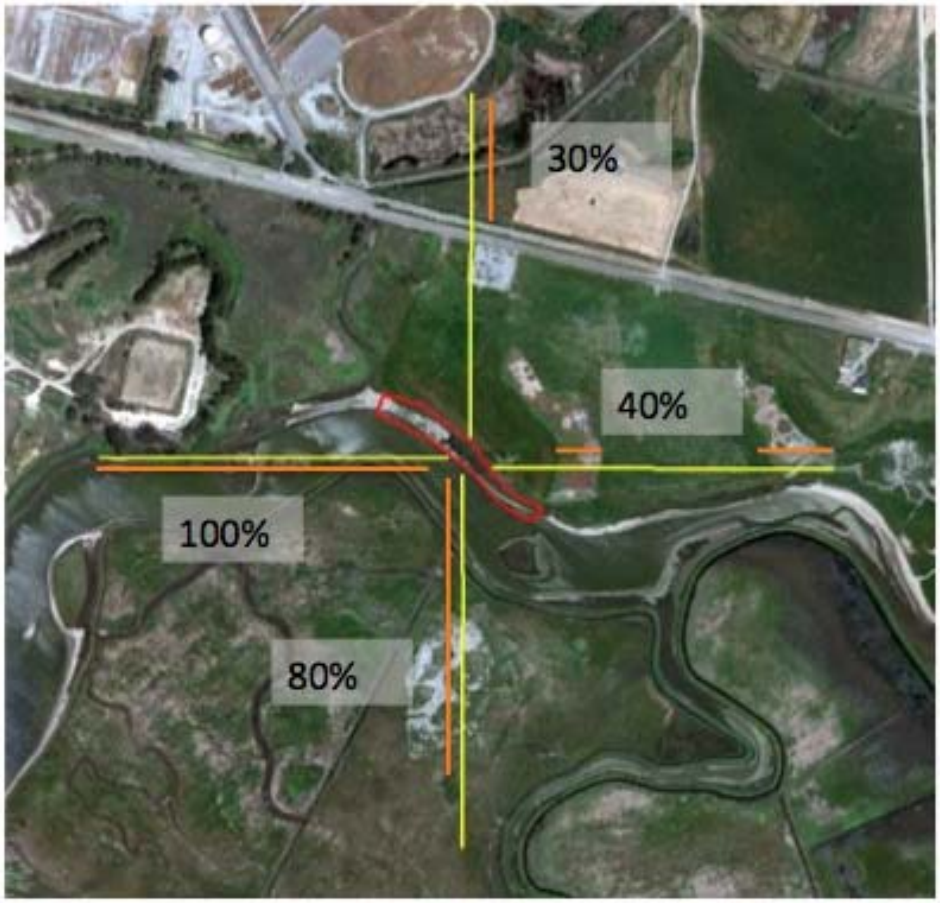
Buffer and Landscape Context Attribute

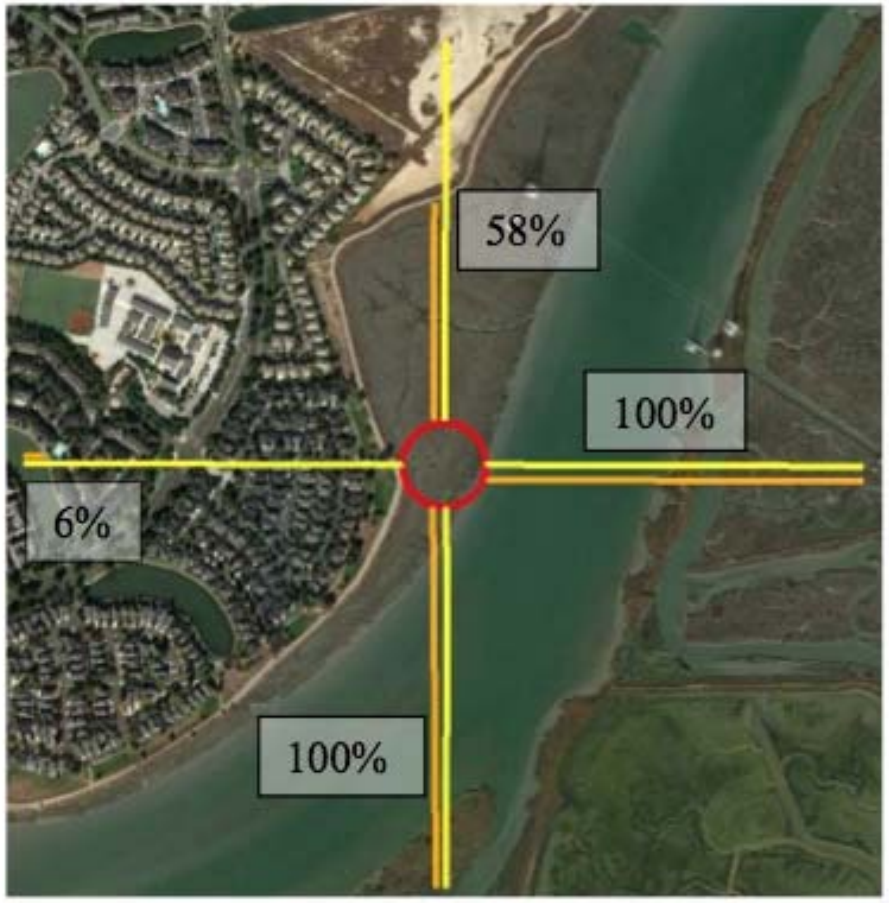
- *ecological connection to other wetlands*
- *extent and quality of buffer surrounding AA*

Aquatic Area Abundance Metric

- Assess AA in terms of its spatial association with other "aquatic resources"
- Wetlands close to each other have greater potential to interact ecologically
- Include open water
- Draw four lines in cardinal compass directions 500m long on the aerial and determine average % made up of an aquatic feature of any kind

Aquatic Area Abundance



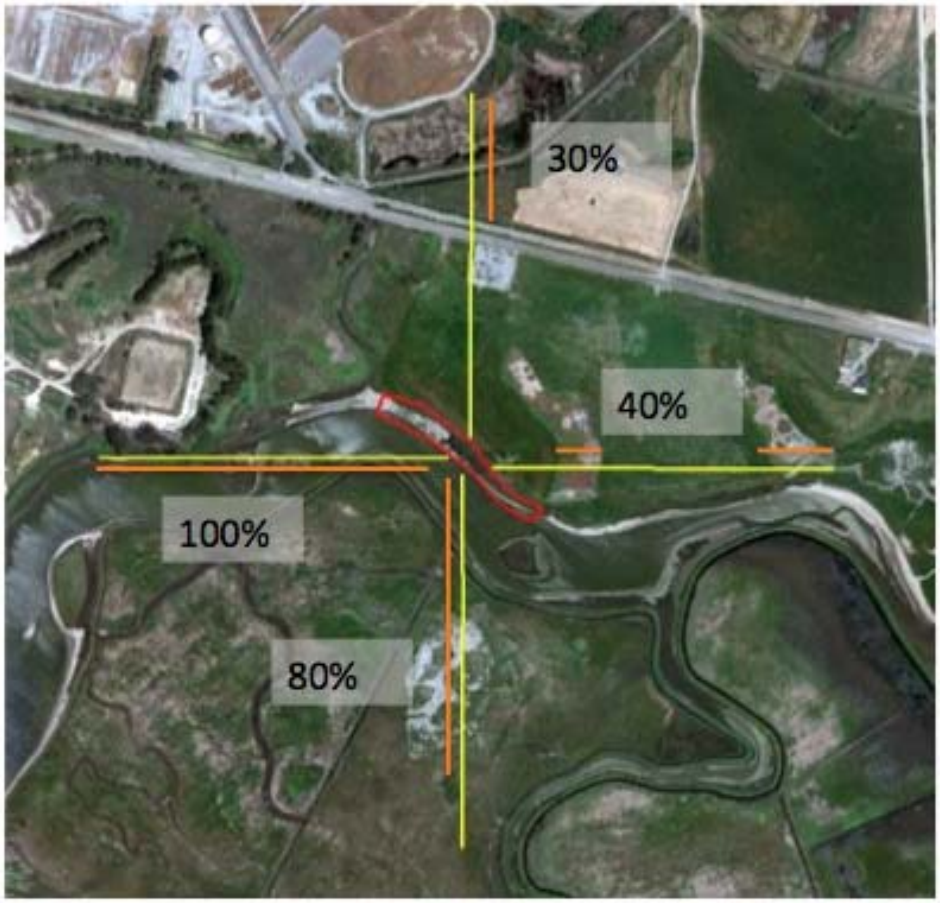


How abundant are wetlands near the AA?

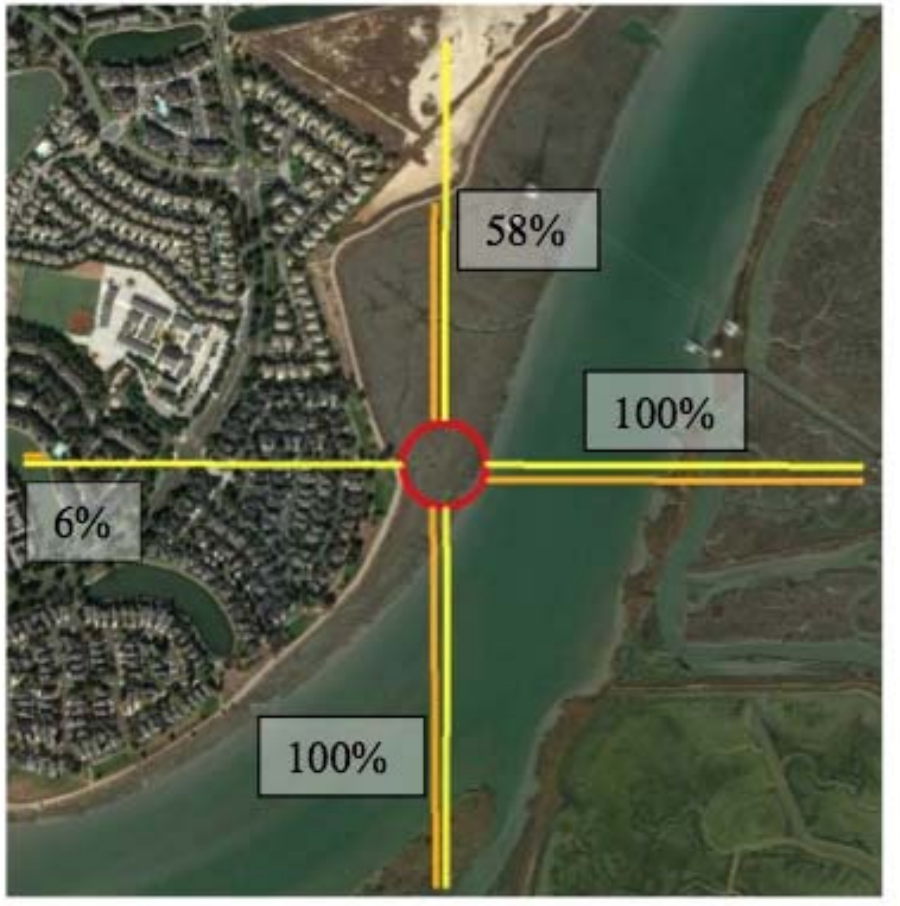
Aquatic Area Abundance

Rating	Alternative States
A	An average of 76-100% of the transects pass through an aquatic feature of any kind
B	An average of 51-75% of the transects pass through an aquatic feature of any kind
C	An average of 26-50% of the transects pass through an aquatic feature of any kind
D	An average of 0-25% of the transects pass through an aquatic feature of any kind

Aquatic Area Abundance



B



B

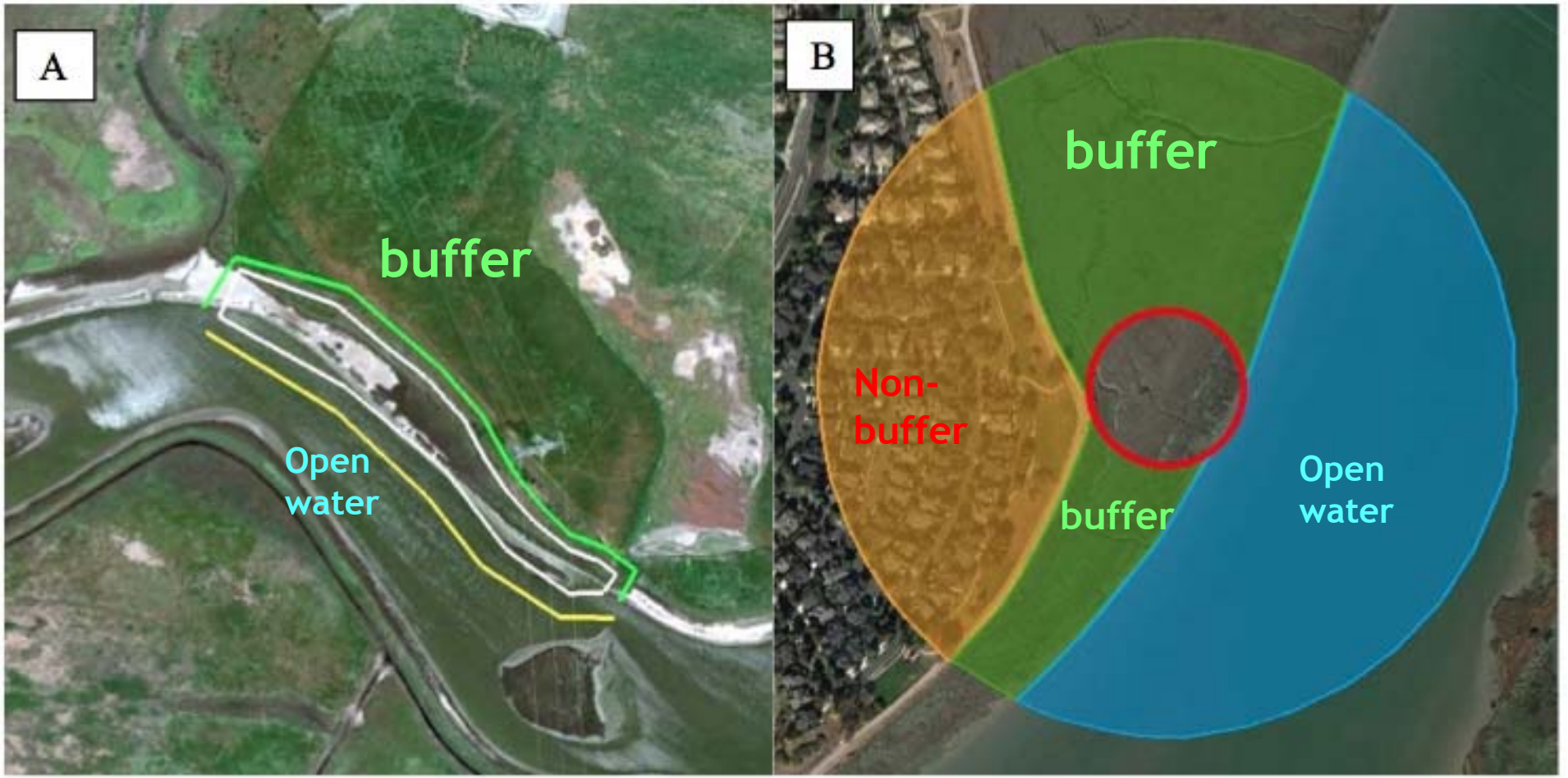
Percent of AA with Buffer

- Estimate percent of the AA perimeter adjoining buffer land cover that is at least 5m wide

- Open water over 30m adjoining the AA is neutral
    - Three Reasons:
        - Inflates score
        - Requires lab analysis for quality
        - Can be direct or indirect source of stress, or benefit to wetland

Percent of AA with Buffer

Estimate percent of the AA perimeter adjoining buffer land cover that is at least 5m wide



Percent of AA with Buffer

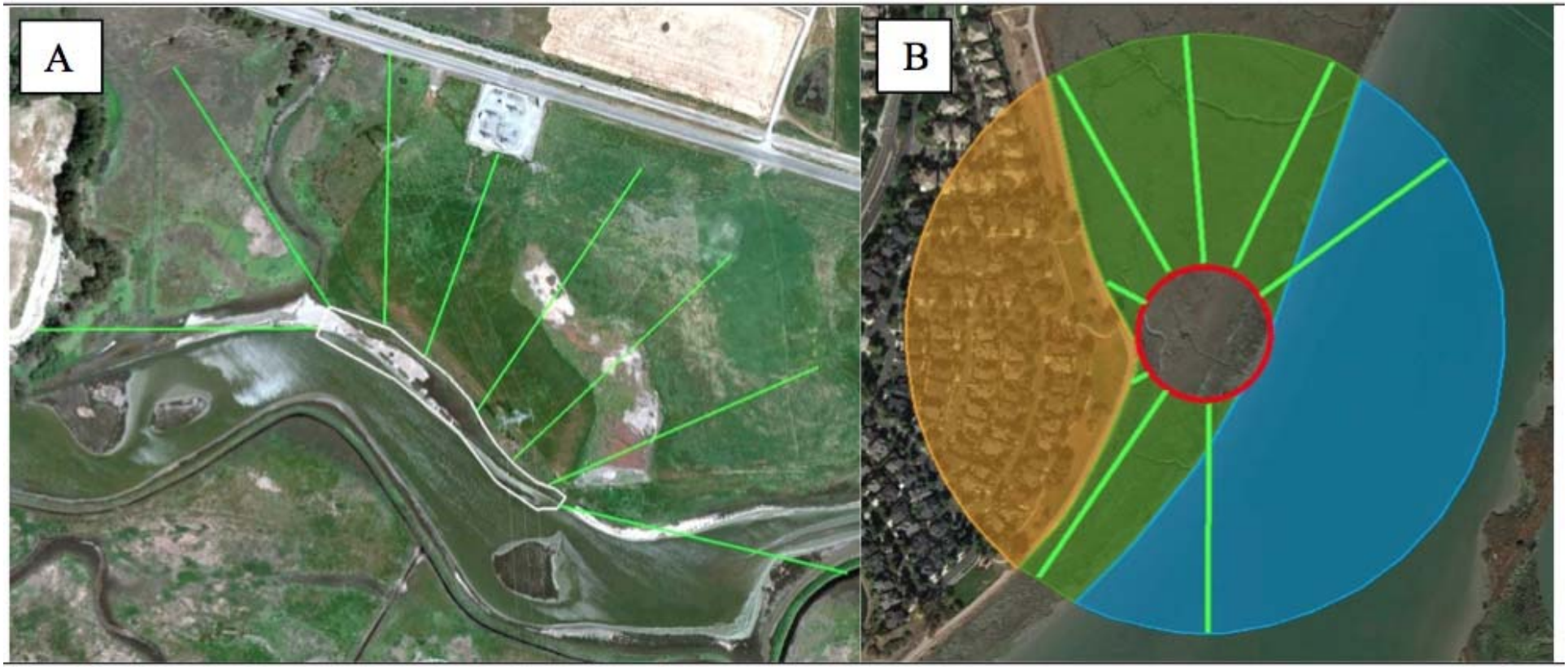
Rating	Alternative States
A	Buffer is > 75-100% of AA perimeter
B	Buffer is > 50 - 74% of AA perimeter
C	Buffer is 25 - 49% of AA perimeter
D	Buffer is < 25% of AA perimeter

Guidelines for identifying wetland buffers and breaks in buffers

Examples of Land Covers Included in Buffers	Examples of Land Covers Excluded from Buffers Notes: buffers do not cross these land covers; areas of open water adjacent to the AA are not included in the assessment of the AA or its buffer.
• at-grade bike and foot trails, or trails (with light traffic) • horse trails • natural upland habitats • nature or wildland parks • range land and pastures • railroads (with infrequent use: 2 trains per day or less) • roads not hazardous to wildlife, such as seldom used rural roads, forestry roads or private roads • swales and ditches • vegetated levees	• commercial developments • fences that interfere with the movements of wildlife (i.e. food safety fences that prevent the movement of deer, rabbits and frogs) • intensive agriculture (row crops, orchards and vineyards) • golf courses • paved roads (two lanes or larger) • lawns • active railroads (more than 2 trains per day) • parking lots • horse paddocks, feedlots, turkey ranches, etc. • residential areas • sound walls • sports fields • urbanized parks with active recreation • pedestrian/bike trails (with heavy traffic)

Average Buffer Width

Estimate width of buffer where it is present around the AA



Average Buffer Width

Rating	Alternative States
A	Average buffer width is 190 – 250 m.
B	Average buffer width 130 – 189 m.
C	Average buffer width is 65 – 129 m.
D	Average buffer width is 0 – 64 m

Buffer Condition

Assess the condition of the Buffer only where it is located

Rating for Buffer Condition

Rating	Alternative States
A	Buffer for AA is dominated by native vegetation, has undisturbed soils, and is apparently subject to little or no human visitation.
B	Buffer for AA is characterized by an intermediate mix of non-native and native vegetation (25% to 75% non-native), but mostly undisturbed soils, and is apparently subject to little or low impact human visitation.
B	Buffer for AA is dominated by native vegetation, but shows some soil disturbance, and is apparently subject to little or low impact human visitation.
C	Buffer for AA is characterized by substantial amounts (>75%) of non-native vegetation, AND there is at least a moderate degree of soil disturbance/compaction, and/or there is evidence of at least moderate intensity of human visitation.
D	Buffer for AA is characterized by barren ground and/or highly compacted or otherwise disturbed soils, and/or there is evidence of very intense human visitation.

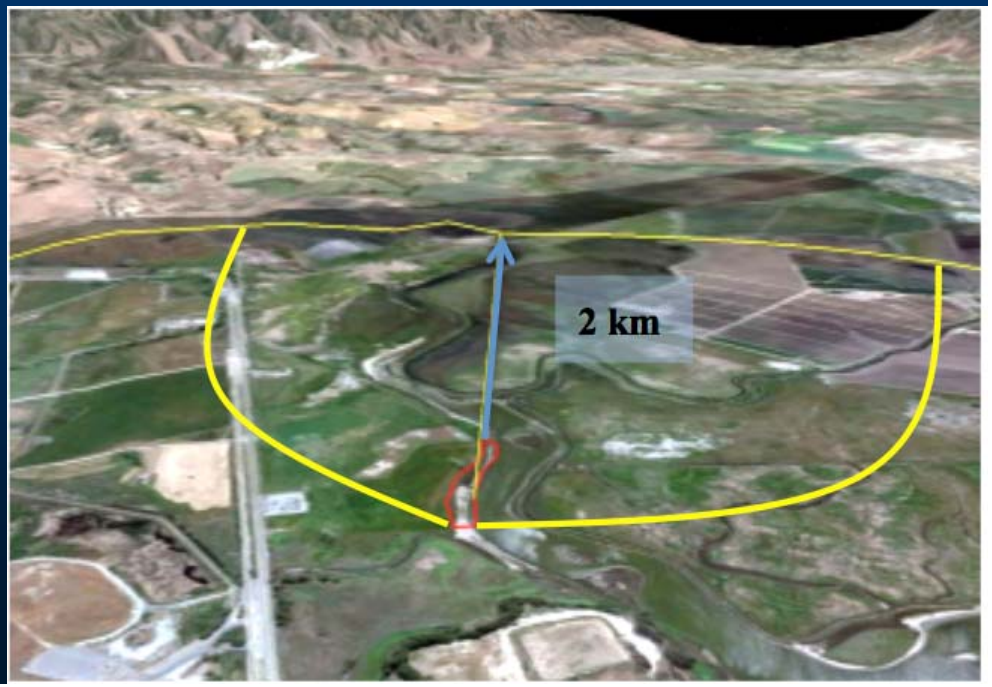
Buffer Condition

Hydrology Attribute

- *primary sources of water*
- *duration of inundation*
- *connection to surrounding area*

Water Source

- Consider freshwater sources affecting dry season conditions of AA
- Assess water sources within an area 2 kilometers (km) upstream of the AA
- Determine anthropogenic inputs
- Consider:
  - type and distribution of plant spp (level of salt tolerance)
  - inputs of fresh water from tidal action
- Consult information sources
  - watershed reports
  - local experts
  - maps or imagery



Rating for Water Source

Rating	Alternative States
A	Freshwater sources that affect the dry season condition of the AA, such as its flow characteristics, hydroperiod, or salinity regime, are precipitation, groundwater, and/or natural runoff, or natural flow from an adjacent freshwater body, or the AA naturally lacks water in the dry season. There is **no indication** that dry season conditions are substantially controlled by artificial water sources.
B	Freshwater sources that affect the dry season condition of the AA are mostly natural, but also obviously include occasional or small effects of modified hydrology. Indications of such anthropogenic inputs include developed land or irrigated agricultural land that comprises **less than** 20% of the immediate drainage basin within about 2 km upstream of the AA, or that is characterized by the presence of a few small stormdrains or scattered homes with septic systems. No large point sources or dams control the overall hydrology of the AA.
C	Freshwater sources that affect the dry season conditions of the AA are primarily urban runoff, direct irrigation or flooding, pumped water, artificially impounded water, water remaining after diversions, regulated releases of water through a dam, or other artificial hydrology. Indications of substantial artificial hydrology include developed or irrigated agricultural land that comprises **more than** 20% of the immediate drainage basin within about 2 km upstream of the AA, or the presence of major point source discharges that obviously control the hydrology of the AA. OR Freshwater sources that affect the dry season conditions of the AA are **substantially controlled** by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from its drainage basin.
D	Natural, freshwater sources that affect the dry season conditions of the AA have **been eliminated** based on the following indicators: impoundment of all possible wet season inflows, diversion of all dry-season inflow, predominance of xeric vegetation, etc.

Hydroperiod

- The characteristic frequency and duration of inundation or saturation of wetland surrounding AA during a typical year
- Consider tidal influence (non-freshwater)

Direct Engineering Evidence	Indirect Ecological Evidence
Changes in Extent and Duration of Inundation or Saturation	
•Tide gates •Culverts, hardened structures that constrict channels (bridges, rip rap) •Pumps, diversions, ditching that move water ***out of*** the wetland	•Reduced drainage network density •Encroachment of freshwater vegetation •Stress or mortality of halophytes •Increased relative abundance of high marsh plants

Hydroperiod

Rating	Alternative States
A	AA is subject to the full tidal prism, with two daily tidal minima and maxima, with minimal evidence of human-caused alterations to tidal hydrology.
B	AA is subject to reduced, or muted, tidal prism as a consequence of human action, although two daily minima and maxima are observed.
C	AA is subject to muted tidal prism as a consequence of human action, with tidal fluctuations evident only in relation to extreme daily highs or spring tides.
D	AA is subject to muted tidal prism as a consequence of human action, plus there is inadequate drainage, such that the marsh plain tends to remain flooded during low tide.

Hydrologic Connectivity

- Ability of water to flow into or out of the wetland that contains the AA
- Ability to accommodate rising flood waters without large changes in water level
- For larger estuarine wetlands, assess 500 meter radius surrounding AA; for smaller can assess entire wetland
- Restrictions include:
  - Roads
  - Levees
  - Sea walls

Hydrologic Connectivity

Rating	Alternative States
A	Rising water in the wetland that contains the AA has unrestricted access to adjacent areas, without levees, dikes or other obstructions to the lateral movement of flood waters.
B	There are unnatural features such as levees, dikes or road grades that limit the amount of adjacent transition zone or the lateral movement of flood waters, relative to what is expected for the setting. But, the limitations exist for **less than 50%** of the boundary of wetland that contains the AA. Restrictions may be intermittent along margins of the wetland, or they may occur only along one bank or shore of the wetland.
C	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees, dikes or road grades, for **50-90%** of the wetland that contains the AA.
D	The amount of adjacent transition zone or the lateral movement of flood waters is limited, relative to what is expected for the setting, by unnatural features, such as levees, dikes or road grades, for **more than 90%** of the wetland that contains the AA.

Hydrologic Connectivity

Physical Structure Attribute

- *Considers complexity of form and structure affecting bio-diversity*
- *Two metrics:*
  - *Structural patch richness*
  - *Topographic complexity*

Structural Patch Richness

STRUCTURAL PATCH TYPE (circle for presence)	Estuarine
Minimum Patch Size	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain, or across depressional wetland plain	1
Animal mounds and burrows	1
Bank slumps or undercut banks in channels or along shoreline	1
Debris jams	1
Filamentous macroalgae or algal mats	1
Large Woody Debris	1
Non-vegetated flats or bare ground (sandflats, mudflats, gravel flats, etc.)	1
Pannes or pools on floodplain	1
Plant hummocks and/or sediment mounds	1
Point bars and in-channel bars	1
Pools or depressions in channels (wet or dry channels)	1
Secondary channels	1
Shellfish beds (living)	1
Soil cracks	1
Standing snags (at least 3 m tall)	1
Submerged vegetation	1
Total Possible	**16**
No. Observed Patch Types	

Secondary Channels

Pannes or pools on floodplain

Structural Patch Richness

Soil Cracks

Abundant Wrackline

Structural Patch Richness

Abundant Wrackline

Algae

Structural Patch Richness

Plant Hummocks

Structural Patch Richness

Rating	# of patches present
A	≥ 9
B	6 - 8
C	3 - 5
D	≤ 2

Debris jam

Shellfish beds

Topographic Complexity

Refers to the micro- and macro-topographic relief and variety of elevations within a wetland due to physical features and elevation gradients.

Topographic Complexity

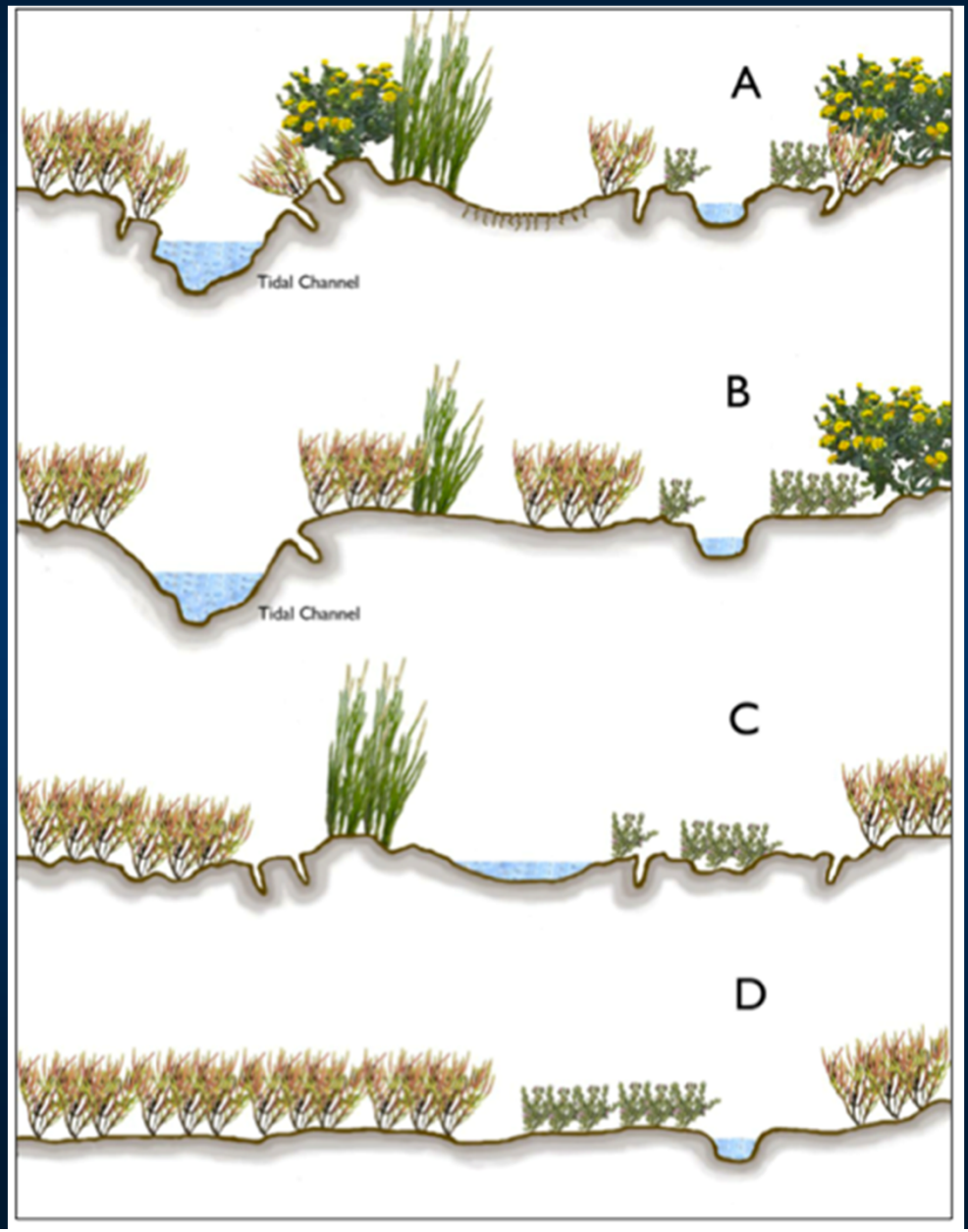
- *Step 1-observe your AA for indicators of topographic complexity*
- *Step 2- draw cross sections*
- *Step 3- compare your cross sections to the diagram and scoring rationale*

Topographic Complexity

Typical indicators of Macro- and Micro-topographic Complexity

Wetland Type	Examples of Topographic Features
Estuarine	channels large and small, ditches, islands, bars, pannes, potholes, natural and unnatural levees or dikes, shellfish beds, sediment mounds, bank slumps, first-order tidal channels, soil cracks, partially buried debris, plant hummocks, burrows, animal tracks

Topographic Complexity

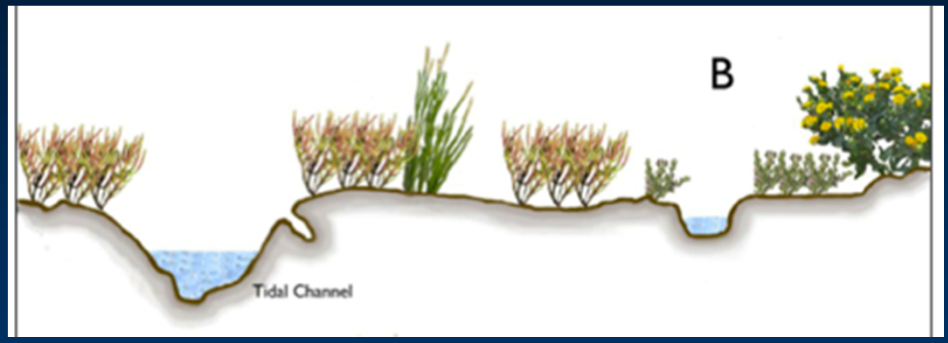


Topographic Complexity

Rating of Topographic Complexity

Rating	Alternative States (based on diagrams in Figure 8 above)
A	The vegetated plain of the AA in cross-section has well-formed tidal channels that are well-drained during ebb tide and a variety of micro-topographic features created by plants, animal tracks, cracks, partially buried debris, retrogressing channels (filling-in with sediment and plants), natural and unnatural levees along channels, potholes and pannes that together comprise a complex array of ups and downs resembling diagram A in Figure 8.
B	The vegetated plain of the AA has channels and a variety of micro-topographic features as described above for "A" but they are less abundant and/or they comprise less variability in elevation overall, as illustrated in diagram B of Figure 8.
C	The vegetated plain of the AA has a variety of micro-topographic features as described above for "A" but lacks well-formed tidal channels that are well-drained during ebb tide. If channels exist, they mostly do not drain well or are filling-in with sediment. The plain overall resembles diagram C of Figure 8.
D	The vegetated plain of the AA has little or no micro-topographic relief and few or no well-formed channels. The plain resembles diagram D of Figure 8.

Topographic Complexity



Topographic Complexity

Biotic Structure Attribute

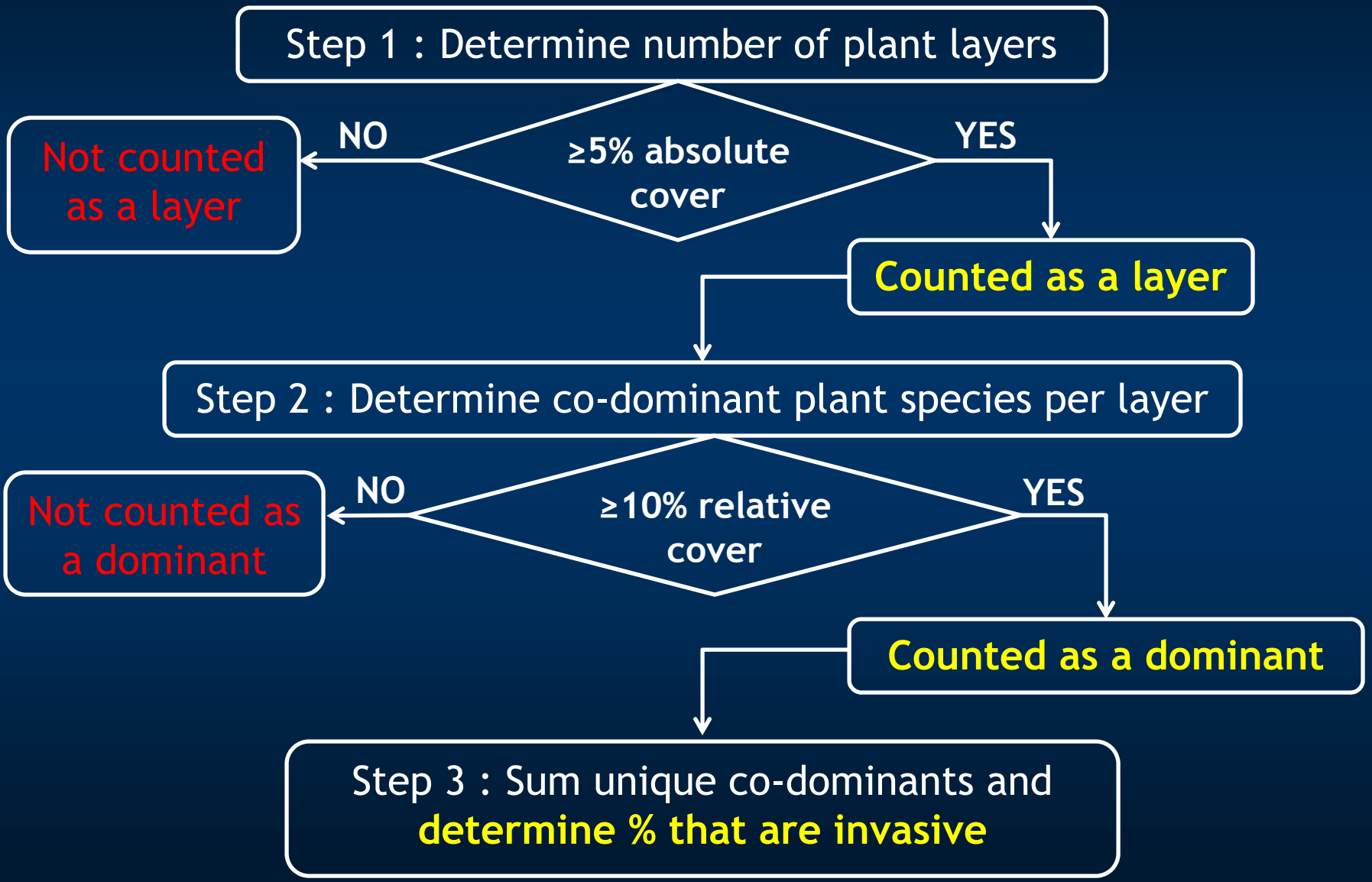
Considers…

- *Overall ecological complexity of plant community of the wetland*
- *Three metrics:*
  - *Plant Community*
  - *Horizontal interspersion and zonation*
  - *Vertical biotic structure*

Plant Community Sub-Metrics

- *Number of Plant Layers Present*
- *Number of Co-dominant Species*
- *Percent Invasion*

Determining Plant Community Submetrics



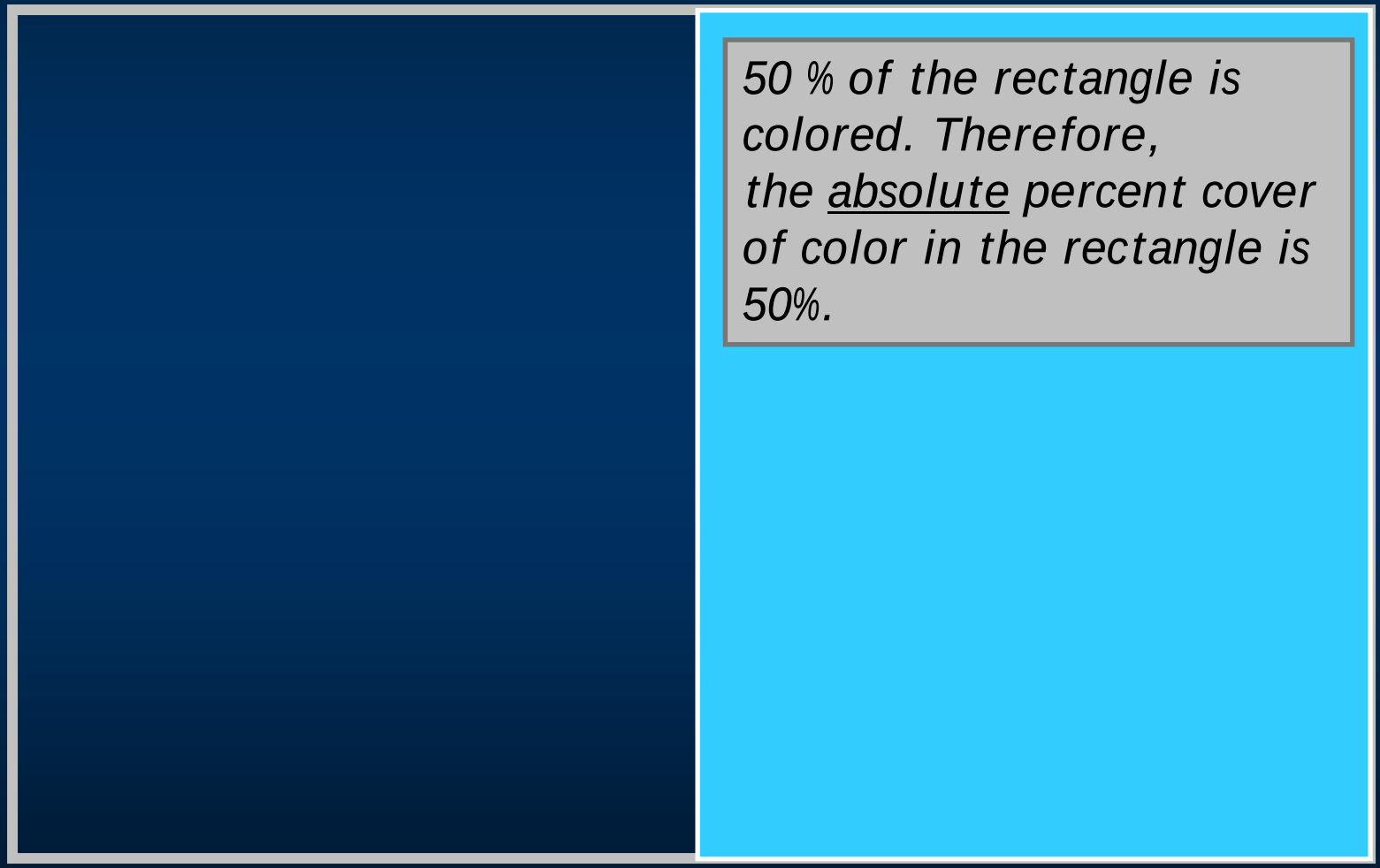
Getting Started: Defining Plant Layers

Wetland Type	Plant Layers				
	Aquatic	Semi-aquatic and Riparian			
	Floating	Short	Medium	Tall	Very Tall
Perennial Saline Estuarine	On Water Surface	<0.3 m	0.3 – 0.75 m	0.75 – 1.5 m	>1.5 m

Rules for Plant Community Metric

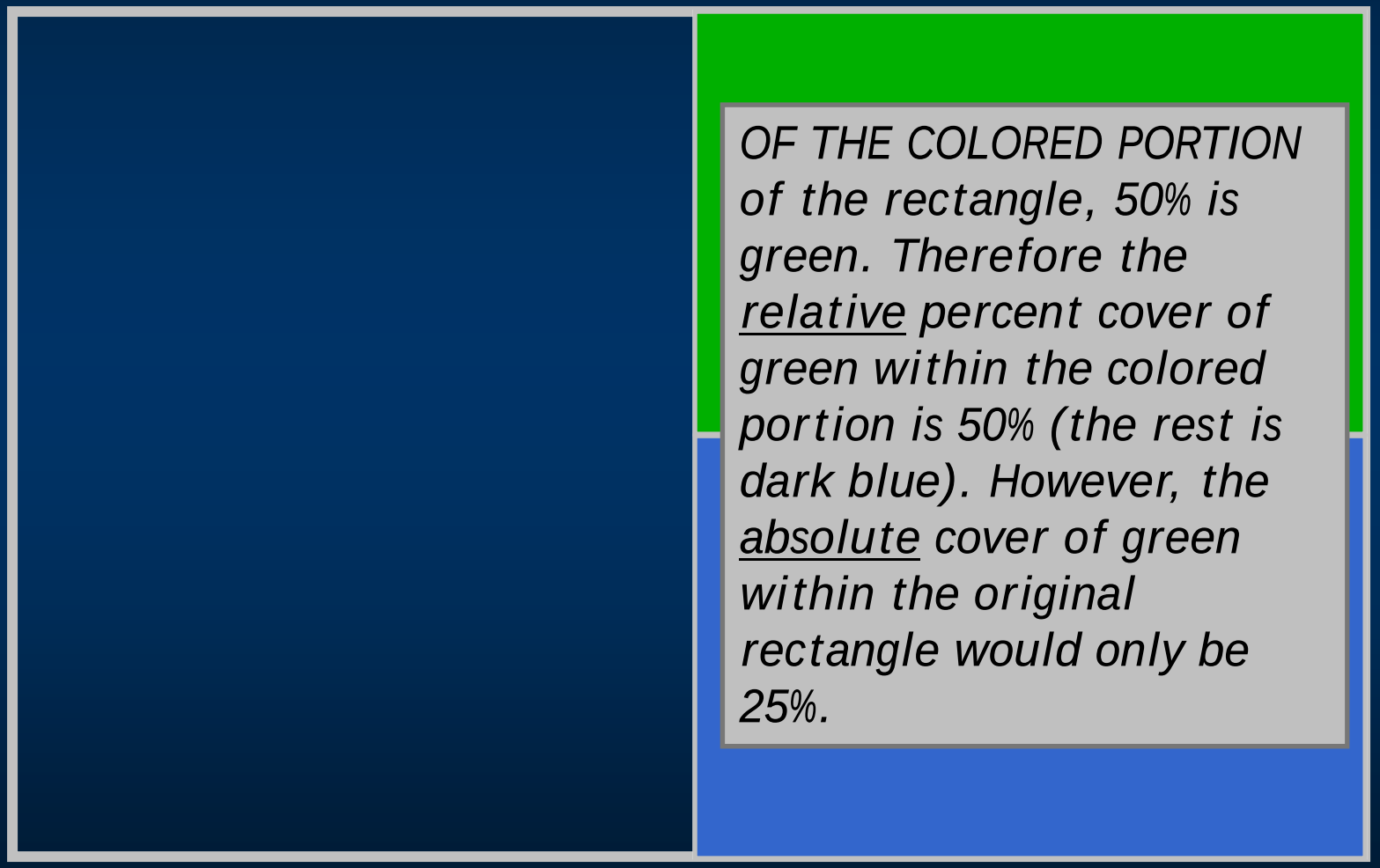
- Plant Layers:
  - identified by actual plant heights, regardless of the growth potential of the species
- Co-dominant Species:
  - can exist in multiple layers, a given plant species is counted only once when calculating total number of co-dominants and percent invasive spp.
- Dead vegetation can count as a layer, but is not included in the dominant species count
- Vines are counted in the layer of vegetation they are covering

Absolute vs. Relative % Cover



50 % of the rectangle is colored. Therefore, the absolute percent cover of color in the rectangle is 50%.

Absolute vs. Relative % Cover



Number of Plant Layers

≥ 5% <u>Absolute</u> Cover, in aggregate, Within AA

One box = 5 % of Area, or 1/20

- Very Tall Layer (> 1.5m)
  - (20%)
- Tall Layer (75-1.5m)
  - (5%)
- Medium Layer (0.-75m)
  - (25%)

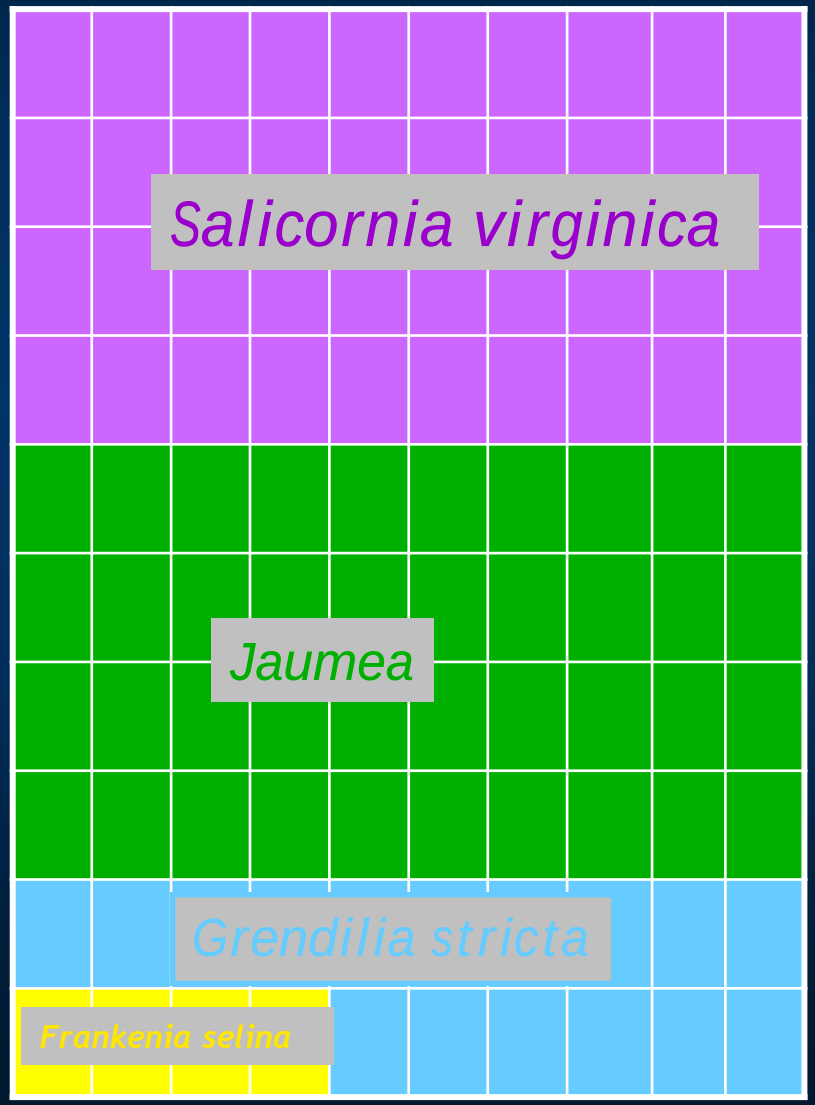
» *next slide ->*

- Short (< 0.3m)
  - (5%)

Number of Co-Dominant Plant Species

≥ 10% Relative Cover, in aggregate, per Layer (Within AA)

Medium Layer in aggregate

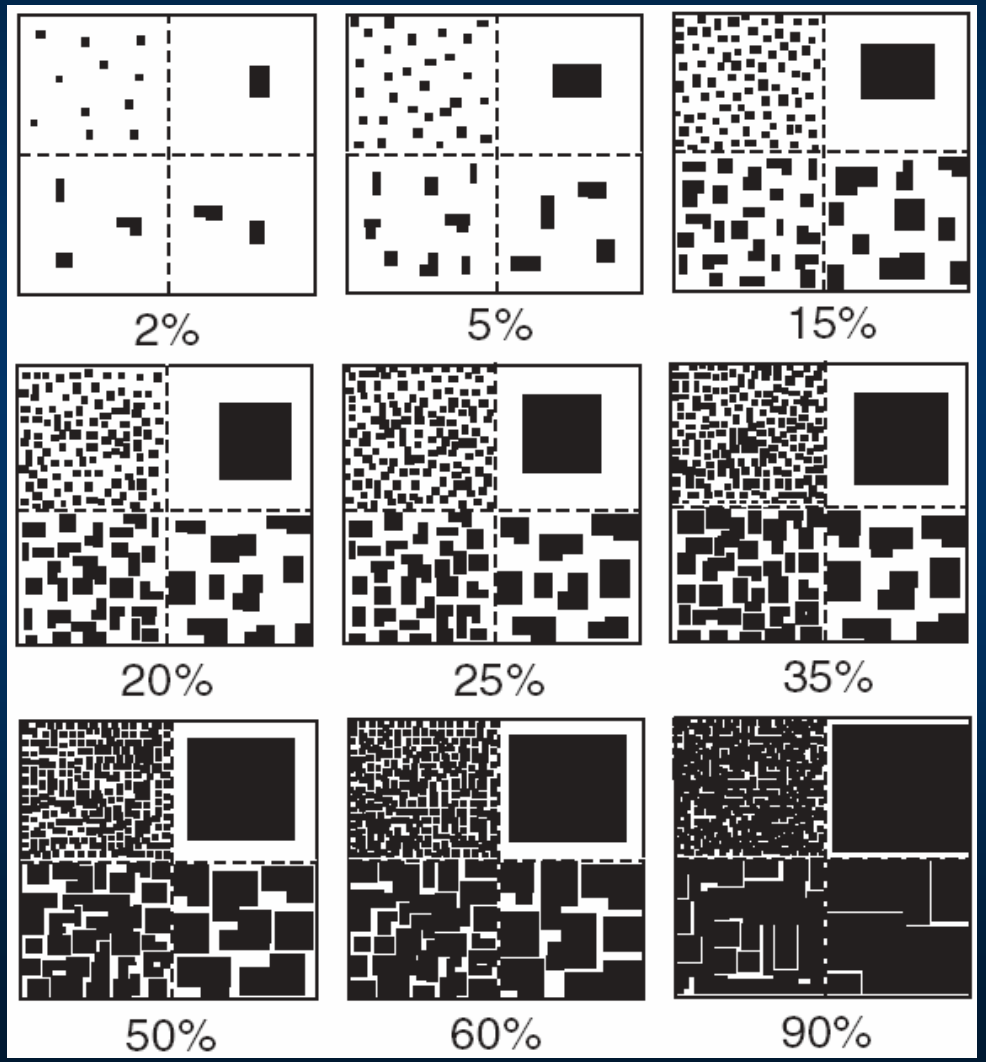


Relative Cover within layer ≥ 10%?

- *Salicornia virginica*
  40/100 = 40% Yes
- *Jaumea carnosa*
  40/100 = 40% Yes
- *Grindelia stricta*
  16/100 = 16% Yes
- *Frankenia salina*
  4/100 = 4% No

Estimating Percent Areal Cover

It's worthwhile to "calibrate your eyes" to different percent cover situations.



Calcagno Restoration Site AA

- Four Layers ≥ 5% Absolute Cover:
  Very Tall, Tall, Medium, Short

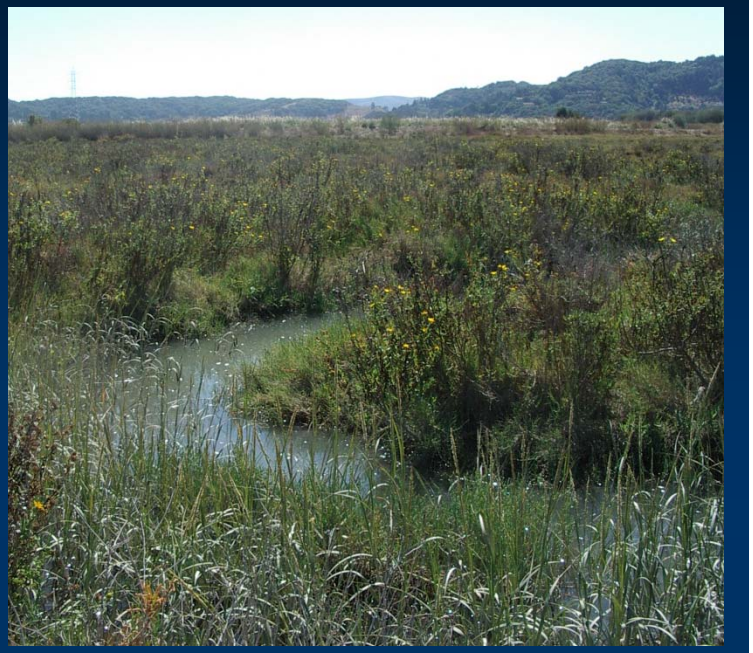
- Example:
  - 8,000 sq. m AA
  - 400 sq. m = 5% of AA
    (e.g., 20 m x 20 m box)

Plant Community Metric Worksheet

Floating or Canopy-forming	Invasive?	Short (<0.3 m)	Invasive?
Medium (0.3 – 0.75 m)	**Invasive?**	**Tall (0.75 – 1.5 m)**	**Invasive?**
Very Tall (>1.5 m)	**Invasive?**		
		Total number of co-dominant species for all layers combined (enter here and use in Table 18)	
		Percent Invasion *Round to the nearest whole number (integer)* (enter here and use in Table 18)	

Plant Community Sub-Metrics (Biotic attribute)

Co-dominant Species	Invasive?	
	Yes	No
Floating		
Short		
Medium		
Tall		
Very Tall		
# co-dominant species		
% non-native co-dominant		



Plant Community Sub-Metrics (Biotic attribute)

Co-dominant Species	Invasive?	
	Yes	No
Floating		
Short	0	3
Medium		
Tall		
Very Tall		
# co-dominant species		
% non-native co-dominant		

Salicornia virginica*

Jaumea carnosa

Distichlis spicata

Plant Community Sub-Metrics (Biotic attribute)

Co-dominant Species	Invasive?	
	Yes	No
Floating		
Short	0	3
Medium	0	1
Tall		
Very Tall		
# co-dominant species		
% non-native co-dominant		

Grindelia stricta

Plant Community Sub-Metrics (Biotic attribute)

Co-dominant Species	Invasive?	
	Yes	No
Floating		
Short	0	3
Medium	0	1
Tall	0	1
Very Tall		
# co-dominant species		5
% non-native co-dominant		0

Spartina foliosa
Grindelia stricta

Table 4.19: Ratings for submetrics of Plant Community Metric

Rating	Number of Plant Layers Present	Number of Co-dominant Species	Percent Invasion
Perennial Saline Wetlands			
A	4 – 5	≥ 5	0 – 15%
B	2 – 3	4	16 – 30%
C	1	2 – 3	31 – 45%
D	0	0 – 1	46 – 100%
Perennial Non-Saline			
A	4 – 5	≥ 7	0 – 20%
B	3	5 – 6	21 – 35%
C	1 – 2	3 – 4	36 – 60%
D	0	0 – 2	61 – 100%

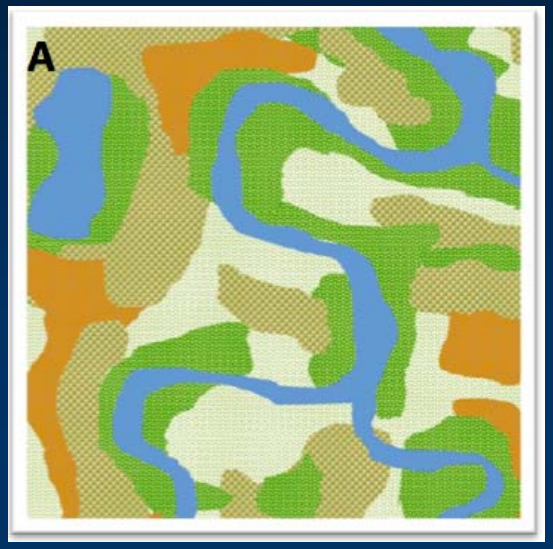
Horizontal Interspersion

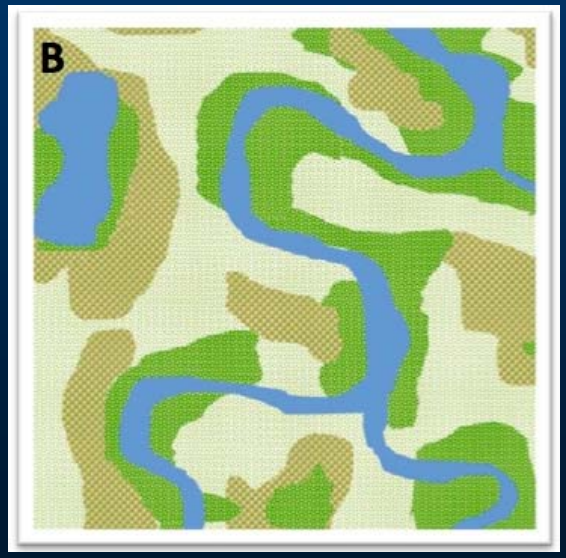
- Interspersion: the number of distinct plant zones and the amount of edge between them
  - Scoring is based upon field observation and aerial image interpretation
- Plant zones: plant monocultures or multi-species associations
  - Remain relatively constant in makeup throughout the AA
  - Arrayed along gradients of elevation, moisture, etc., that affect the plant community organization in 2-D plan view

Scoring Horizontal Interspersion

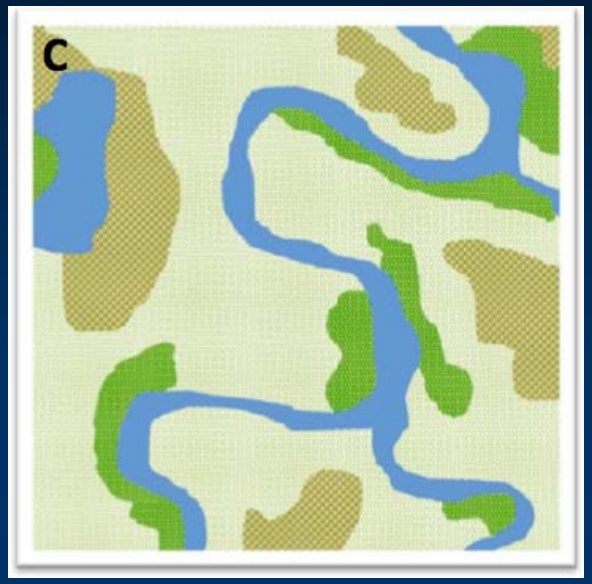
- An "A" condition means BOTH more zones AND a greater degree of interspersion, and the departure from the "A" condition is proportional to BOTH the reduction in both the numbers of zones AND their interspersion.

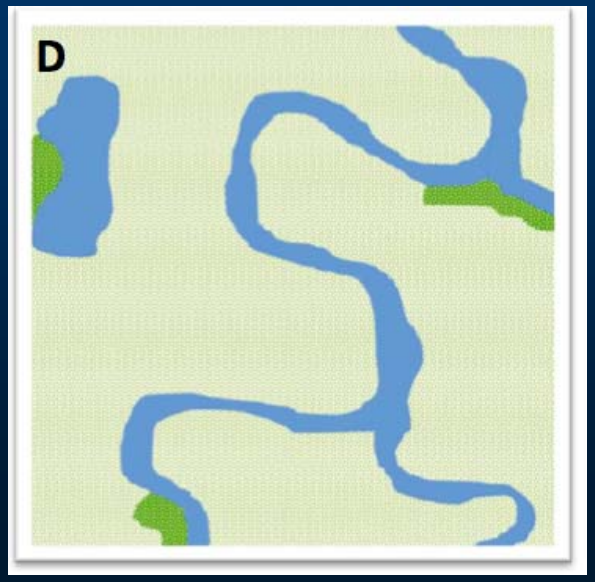
Horizontal Interspersion and Zonation





Horizontal Interspersion and Zonation

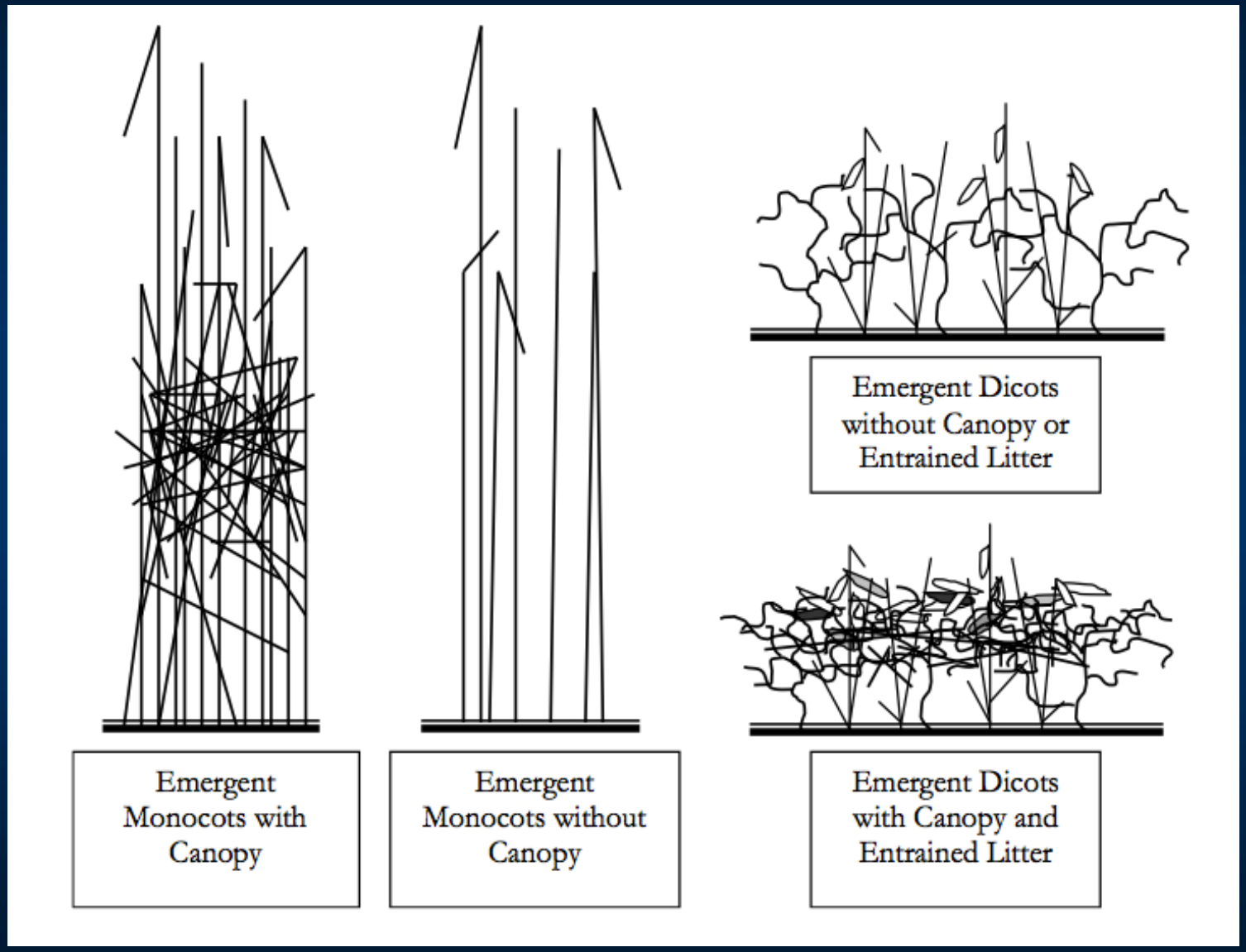




Vertical Biotic Structure

- Amount of entrained litter
  - The “stomp” technique
- Height of litter above the ground
- Provides habitat for faunal species

Vertical Biotic Structure



Vertical Biotic Structure

Rating	Alternative States
A	**Most** of the vegetated plain of the AA **has** a dense canopy of living vegetation, entrained litter or detritus forming a "ceiling" of cover 10-20 cm of above the wetland surface that shades the surface and can provide abundant cover for wildlife.
B	**Less than half** of the vegetated plain of the AA **has** a dense canopy of vegetation, entrained litter or detritus as described in "A" above; OR **More than half** of the vegetated plain **has** a dense canopy of living vegetation, entrained litter or detritus, but the ceiling it forms is **much less** than 10-20 cm above the ground surface.
C	**Less than half** of the vegetated plain of the AA **has** a dense canopy of living vegetation or entrained litter or detritus **AND** the ceiling it forms is **much less** than 10-20 cm above the ground surface.
D	**Most** of the AA **lacks** a dense canopy of living vegetation, entrained litter or detritus.

Vertical Biotic Structure

Entrained canopy forming a ceiling 10-20 cm above surface

Dense canopy with low ceiling <10-20 cm above surface

Lacking dense canopy

Vertical Biotic Structure

Now that's an A!

Dense, Tall canopy

Vertical Biotic Structure

Steps of CRAM Assessment

Step 1: Assemble background information
Step 2: Classify the wetland
Step 3: Verify the appropriate season
Step 4: Sketch the CRAM Assessment Area (AA)
Step 5: Conduct the office assessment of AA
Step 6: Conduct the field assessment of AA
Step 7: Complete CRAM QA/QC
Step 8: Submit assessment results using *e*CRAM

CRAM Initial QAQC

- Review map of AA
- Review CRAM results
  - Complete all CRAM data fields
- Add comments as needed
- Complete stressor checklist
- Ensure photographs, GPS points and any plant voucher specimens have been collected

Basic Information Sheet: Estuarine Wetlands

Basic Information Sheet: Perennial Estuarine Wetlands

Assessment Area Name:	
Project Name:	
Assessment Area ID #:	
Project Site ID #:	**Date:**
Assessment Team Members for This AA	
Center of AA: **Latitude:** **Longitude:**	
Wetland Sub-type: ☐ Perennial Saline ☐ Perennial Non-saline	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☐ Ambient ☐ Reference ☐ Training ☐ Other:	
What best describes the tidal stage over the course of the time spent in the field? Note: It is recommended that the assessment be conducted during low tide. ☐ high tide ☐ low tide	

Scoring Sheet: Estuarine Wetlands

Buffer and Landscape Context Attribute

Hydrology Attribute

Physical Structure Attribute

Biotic Structure Attribute

Overall AA Score

AA Name:			Date:
Attribute 1: Buffer and Landscape Context (pp. 8-14)			**Comments**
Aquatic Area Abundance (D)	Alpha.	Numeric	
Buffer (based on sub-metrics A-C)			
Buffer submetric A: Percent of AA with Buffer	Alpha.	Numeric	
Buffer submetric B: Average Buffer Width			
Buffer submetric C: Buffer Condition			
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$			**Final Attribute Score = (Raw Score/24) x 100**
Attribute 2: Hydrology Attribute (pp. 15-19)			
	Alpha.	Numeric	
Water Source			
Hydroperiod			
Hydrologic Connectivity			
Raw Attribute Score = sum of numeric scores			**Final Attribute Score = (Raw Score/36) x 100**
Attribute 3: Physical Structure Attribute (pp. 20-25)			
	Alpha.	Numeric	
Structural Patch Richness			
Topographic Complexity			
Raw Attribute Score = sum of numeric scores			**Final Attribute Score = (Raw Score/24) x 100**
Attribute 4: Biotic Structure Attribute (pp. 26-34)			
Plant Community Composition (based on sub-metrics A-C)			
Plant Community submetric A: Number of plant layers	Alpha.	Numeric	
Plant Community submetric B: Number of Co-dominant species			
Plant Community submetric C: Percent Invasion			
Plant Community Composition *(numeric average of submetrics A-C)*			
Horizontal Interspersion			
Vertical Biotic Structure			
Raw Attribute Score = sum of numeric scores			**Final Attribute Score = (Raw Score/36) x 100**
Overall AA Score (average of four final Attribute Scores)			

Stressor Checklist

- Anthropogenic perturbation within the wetland or in the surrounding landscape with negative impact on condition and function
- Can be “present” or “significant”
- Four assumptions:
  - Stressor(s) can lead to deviation from best attainable condition
  - More stressors can cause a decline in condition
    - Linear, multiplicative, other non-linear model
  - Increase in intensity/proximity increases decline in condition
  - Continuous/chronic stress increases decline in condition

Stressor Checklist

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present and likely to have negative effect on AA	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)		
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

Steps of CRAM Assessment

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Upload CRAM results

- Benefits of Statewide database
  - Increasingly required for regulatory applications
  - Contributes to statewide dataset
  - Enables comparisons to other assessments


Thank You