California Rapid Assessment Method for Wetlands (CRAM) Physical Structure Attribute



Physical Structure Attribute

- Considers complexity of form and structure affecting biodiversity and other wetland functions
- Spatial organization of living and non-living surfaces that provide habitat (Maddock 1999, Frissell et al. 1986)
- Physical conditions indicate capacity of a wetland to support flora and fauna



Physical Structure Attribute

Richness of structural surfaces and features reflects the diversity of physical processes including:

- Energy dissipation
- Water storage
- Groundwater exchange
- Flood attenuation
- Filtering of pollutants



Physical Structure Attribute

Physical complexity promotes ecological complexity and increases:

- Ecological functions
- Beneficial uses
- Overall condition



Physical Structure Attribute

Composed of two metrics:

- Structural patch richness
- Number of patch types within AA
- Topographic complexity
 - Variety of elevations and extent of microtopography within AA

Structural Patch Richness

• For each wetland type:

- Visible patches of physical structure
- May occur along hydrologic/moisture gradients
- Not all patches are expected to occur in all wetlands
- Minimum patch size for many (3 m² for most)
- May be artificial

































Structural Patch Richness

Plant Hummocks











Each module has a unique set of expected patch typesSome patch type definitions vary as well					
Riverine STRUCTURAL PATCH TVPE (circle for presence)	Riserias Non-confined)	Rheerine (Continuel)	Depressional STRUCTURAL PATCH TVPE (citcle for presence)	Estuarine STRUCTURAL PATCH TYPE (siecle for presence)	
Minimum Patch Size	3 m	3 m	Minimum Patch Size	Marine Back Size	
Altraidust waschlase on organic debais in chonnel, on floodplain Bank shaript on undearnt banks in channels on	1	1	Abundant weark or organic debuis as thatesi, on floodylain, or across depensional wetland plain	Abundant wracklase or organic debuis in chausel, on Boodpline, or secon departmonal	
along shoetlair		-	Animal mersoids and brazews	wetland plan	
Cobbles and/or Borddess	1	1	Bank shange or rederet banks in channels or	Addition incodes and onurows	
Debra jama	1	1	ting thesian	Bank sources in unstanting banks in character of	
Funtientrone succouger or agai men	-	1	Contain and Downing	Debox issue	
Large woody details	1	100	Consector or parate right with mater	Elementors materiales at deal mate	
Paranet of boots on poodman	-	S/A	Passing and a supply of the state	1 MT 1 TO S	
Paul Insurances and or reduced include	14	1	Litanti (anote above auto-wave)	Large Woody Debus	
Pools or depensions in channels	1	1	Non-regetated fish as base ground	(vazdílats, szstélats, gyarel flats, etc.)	
Wolfer or words (met or det character)			Constanting and and and and and	Panars or pous on hoodpaan	
Secondary channels on floodplains or slong	÷	24	Plant Immunocks and/or vedament mounds	Point managements and/or relarger monaids Point bars and in-changel bars	
shortines	1.4	A/A	Soil careka	Pools or departments in channels	
Standing usage (at least 3 in tall)	1	1	Standing mag(s) (1 or more at least 3 m tall)	(wet or dry changely.)	
Solucinged regetation	1	N/A	Substanged regetation	Secondary chausels	
Swales on fleodylain or along shorelase	1	N/A	Swales on floodplain or along showlese	Shellish heds (impa)	
Vasiegated, convoluted, or canadated fourshoar (system) of honodly writing or movely straight)	1	1	Vaciegated, controluted, or resonanted foreshore (instead of hexaelly surrate or mostly straight)	Soil coicha	
Vegetated islands (mostly above high water)	1	N/A	Woody vegetations in water	Standing mage (at least 3 m tail)	
Total Presilde	17	12	Tutal Pussible	Submerged vegetation	
No. Observed Patch Types (enter here and use in Table 14 below)			No. Observed Patch Types (enser here and use in Table 15 helow)	No. Observed Patch Types	



Structural Patch Richness

- Transient in nature, appropriate timing of observations are critical
- Expected patch types vary between modules
- Read the definitions
- Photo dictionary (http://www.cramwetlands.org/documents)

Topographic Complexity

- Physical, abiotic features and elevation gradients
- Micro- and macro-topographic relief
- Reference standard varies among wetland types

Topographic Complexity

- Promotes variable hydroperiods and moisture gradients
- Promotes ecological complexity
- Increases spatial and temporal variability in:
 - Energy dissipation
 - Surface water storage
 - Groundwater recharge
 - Particulate matter detention
 - Cycling of elements and compounds
 - Habitat dynamics

	Module
Type	Examples of Topographic Features
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines, soil eracks, partially buried debris, plant hummocks, livestock tracks
Estuarine	channels large and small, islands, bars, pannes, potholes, natural levees, shellfish beds, hummocks, slump blocks, first-order tidal creeks, soil cracks, partially buried debris, plant hummocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines, cobble, boulders, partially buried debris, plant hummocks
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams, cobble, boulders, slump blocks, tree-fall holes, plant hummocks
Slope Wetlands	pools, runnels, plant hummocks, burrows, plant hummocks, cobbles, boulders, partially buried debris, cattle or sheep tracks
Vernal Pools and Pool Systems	soil cracks, "mima-mounds," rivulets between pools or along swales, cobble, plant hummocks, cattle or sheep tracks





Scale of Topographic Features Varies with Complexity

- Benches may be centimeters up to meters in scale
 May vary by module (i.e. depressional often smaller scale than riverine)
 May vary within module (i.e. small creek versus large river)











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Riverine Topographic Complexity





Macro-topographic Indicators



Presence and number of benches

Micro-topographic Indicators



Cobble, bank slumps, tree fall holes





Topographic Complexity



Topographic Complexity















