California Rapid Assessment Method for Wetlands (CRAM)

Buffer and Landscape Context Attribute

Buffer and Landscape Context Attribute

- *Presence and/or continuity of wetlands and riparian areas adjacent to the AA*
- *Size and quality of buffer surrounding AA*

Background

- *Buffer zone is the transition between the margins of the wetland and the surrounding environment*
  - *Filter pollutants*
  - *Refuge for wildlife during high water*
  - *Barriers to disruptive incursions (people/pets)*
  - *Reduce risk of invasion by non-native plants and animals*

Background

- *Regulation/Protection historically did not include adjacent uplands*
  - *Converted to recreation, agricultural, urban landuses*
  - *No longer provide critical buffer functions*

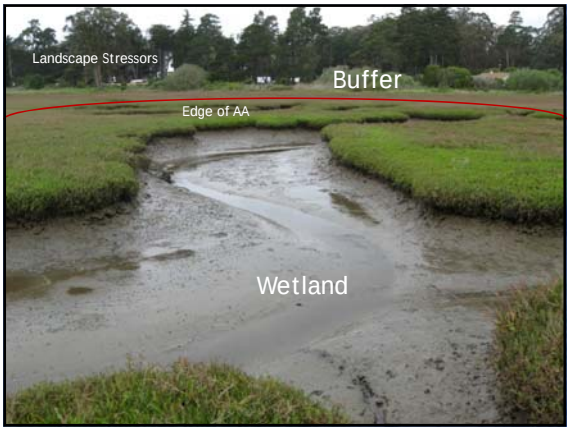
Wetlands in the Physical Landscape

State of *landscape stressors* is assessed outside the buffer

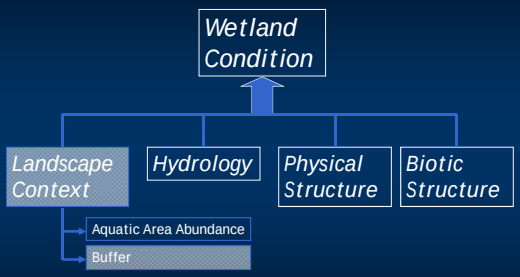
Condition is assessed at all three scales

Wetland condition results from internal and external influences

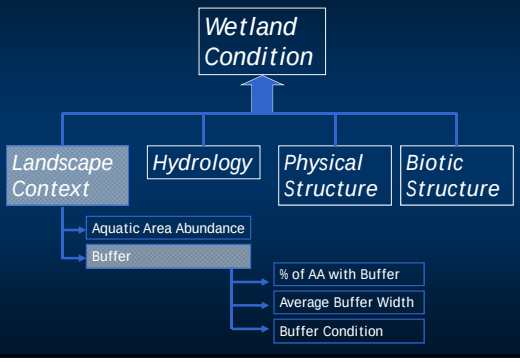
Buffer exists between landscape stressors and the wetland



CRAM Design: Metrics

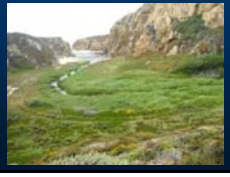


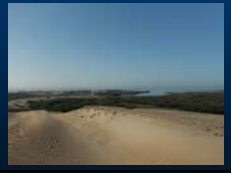
CRAM Design: Submetrics



Aquatic Area Abundance Metric

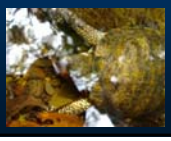
- Assess AA in terms of its spatial association with other "aquatic resources"
- Wetlands close to each other have greater potential to interact ecologically:
  - Provide refuge, support migratory populations, function as sources of colonists for newly created wetlands





Aquatic Area Abundance Metric

- Landscape variables are good predictors of wetland integrity (Roth et al. 1996, Scott et al. 2002)
- Wetlands are components of habitat mosaics
- Mosaic components have additive influences on processes: flooding, contaminant filtration, wildlife support
- Processes influence form and function
- Functional capacity partly determined by landscape relationships

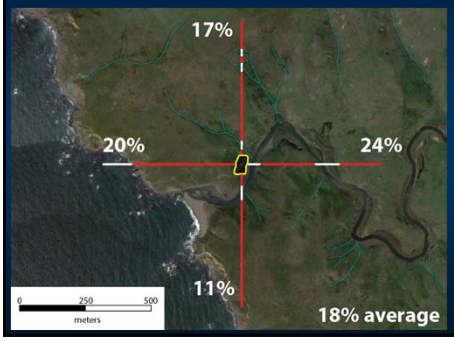

Aquatic Area Abundance Metric

- The Aquatic Area Abundance metric is called Stream Corridor Continuity for Riverine wetlands.
- This metric is assessed one of four ways, depending on the wetland type:
  - Aquatic Area Abundance: Estuarine, Depressional, Slope
  - Aquatic Area Abundance: Bar Built Estuarine
  - Aquatic Area Abundance: Vernal Pool Systems, Individual Vernal Pools
  - Stream Corridor Continuity: Riverine

Aquatic Area Abundance Metric:
Estuarine, Depressional, and Slope wetlands

- From the edge of the AA, draw four lines in cardinal compass directions 500m long on the aerial photo and determine the average percent of each line crossing aquatic habitat
- Include open water

Aquatic Area Abundance Metric:
Estuarine, Depressional, and Slope wetlands



How abundant are wetlands near the AA?

Aquatic Area Abundance Metric:
Bar Built Estuarine (BBE)

An average of the scores of these three submetrics make up the Aquatic Area Abundance metric score for this wetland type

Aquatic Area Abundance Metric:
Vernal Pool Systems and Individual Vernal Pools

Vernal Pool System example

Individual Vernal Pool example

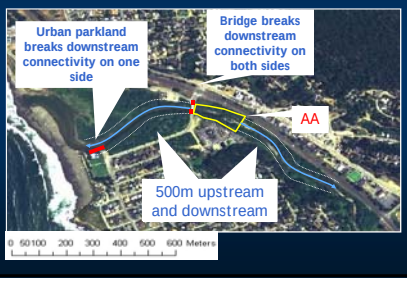
What percentage of each line crosses aquatic habitat, including individual vernal pools or vernal pool systems (using the AA boundary, as defined in the fieldbook)

Stream Corridor Continuity Metric:
Riverine

- Assesses riparian continuity
- Assume riparian area average width is the same upstream and downstream of the AA as it is within the AA
- Slide this "moving window" of riparian area width 500m upstream and 500m downstream from the AA boundary looking for areas of "non-buffer" land cover
- To break continuity, a segment of "non-buffer" cover must:
  - extend across at least one side of the riparian area
  - extend at least 10m along the channel
- A break that occurs on both sides (e.g. a bridge) is counted twice, once for each side

Stream Corridor Continuity Metric:
Riverine

Assess the total length of non-buffer segments 500m upstream and 500m downstream of the AA



Buffer Metric

- Buffer: a zone of transition between the wetland and its surrounding environment
- Buffers entrap contaminants, discourage visitation into the AA, and protect the AA from stress and disturbance
- Buffers reduce flood and drought risk and improve water quality
- Buffers maintain integrity and therefore resilience of wetland communities

Buffer Functions

- **Reduces watershed imperviousness by 5%.** An average buffer width of 100 feet protects up to 5% of watershed area from future development.
- **Areas of impervious cover are distanced from the stream.**
- **Reduces small drainage problems and complaints.**
- **Stream "right of way" allows for lateral movement.**
- **Provides effective flood control.** Other, expensive flood controls are not necessary if buffer includes the 100-yr floodplain.

In: The Practice of Watershed Protection, 2000. Watershed Protection Techniques 1(4): 155-163.

Buffer Functions: Nutrient Removal

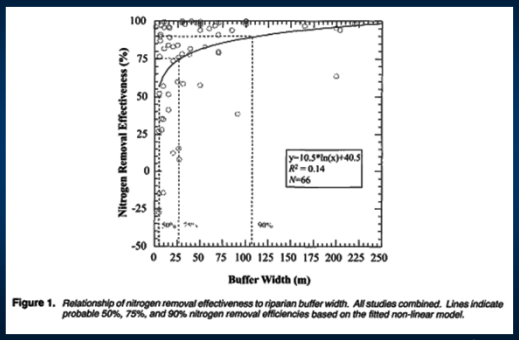


Figure 1. *Relationship of nitrogen removal effectiveness to riparian buffer width. All studies combined. Lines indicate probable 50%, 75%, and 90% nitrogen removal efficiencies based on the fitted non-linear model.*

Mayer et al., 2005

Buffer Metric

- Three submetrics:
  - Percent of AA with Buffer
  - Average Buffer Width
  - Buffer Condition
- The score is calculated so that the area and the condition of the buffer are weighted equally
- The combination of area and condition determine the overall capacity to perform critical functions

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 trailswith 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) • active railroads (more than 2 trains per day) • lawns • 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)

Included as buffer


roads not hazardous to wildlife


at grade bike and foot trails


vegetated levees


open rangeland

*See the CRAM Photo Dictionary for more examples

Excluded from buffer


parking lots


intensive agriculture (row crops, orchards and vineyards)


sounds walls or other concrete walls


golf course

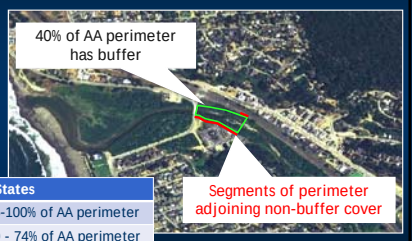
*See the CRAM Photo Dictionary for more examples

Submetric: Percent of AA with Buffer

- The ability to protect a wetland increases with buffer coverage along the wetland perimeter
- For some stressors (e.g. feral pet predation) even small breaks in buffer allow the stressor into the wetland
- For most stressors, small breaks in buffer (e.g. from trails) do not significantly disrupt buffer functions

Submetric: Percent of AA with Buffer

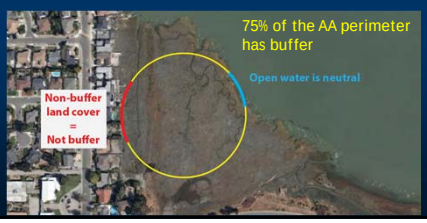
Estimate percent of the AA perimeter adjoining buffer land cover that is at least 5m wide and 5m long.



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

Submetric: Percent of AA with Buffer

- Open water (wider than 30m) directly adjoining the AA is neutral because:
  - Inflates score
  - Requires lab analysis for water quality
  - Can be a direct or indirect source of stress, or benefit to wetland



Submetric: Average Buffer Width

- Wider buffers have greater capacity to:
  - Serve as habitat
  - Reduce non-point source contaminants
  - Control erosion
  - Protect the wetland from human activities

Submetric: Average Buffer Width

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	100
B	170
C	250
D	250
E	250
F	40
G	20
H	30
Average Buffer Width	139

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.

Submetric: Average Buffer Width

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	140
B	180
C	55
D	32
E	46
F	110
G	250
H	50
Average Buffer Width	108

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.

Submetric: Average Buffer Width

Line A = 39m	Line D = 25m	Line G = 8m
Line B = 34m	Line E = 20m	Line H = 6m
Line C = 30m	Line F = 14m	**Avg. 176/8 = 22m**

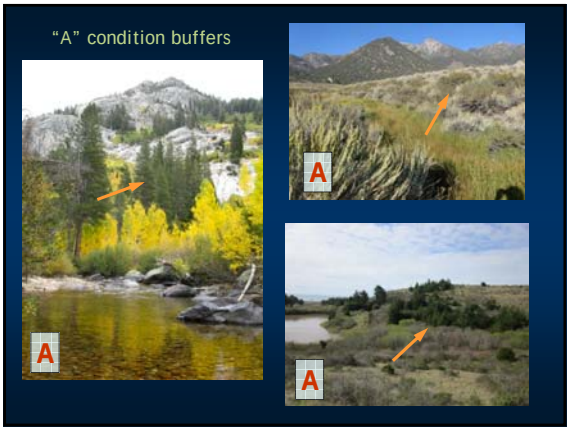
Submetric: Buffer Condition

- Condition of the buffer combined with width and extent determine overall capacity to perform critical functions
- Method is the same across all wetland types
- Assessed based on field indicators only

- Buffer characteristics examined:
  - Native vs non-native vegetation
  - Soil disturbance or compaction
  - Intensity of human visitation

Submetric: Buffer Condition

	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	1) Buffer for AA is characterized by an intermediate mix of native and non-native vegetation (25-75%), but mostly undisturbed soils and is apparently subject to little or low impact human visitation.
	OR
	2) 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 (>75%) amounts 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, or there is no buffer present.


"A" condition buffers
A
A
A


B
B
B
B


C
C
C
C


D
D
D
D


Thank You