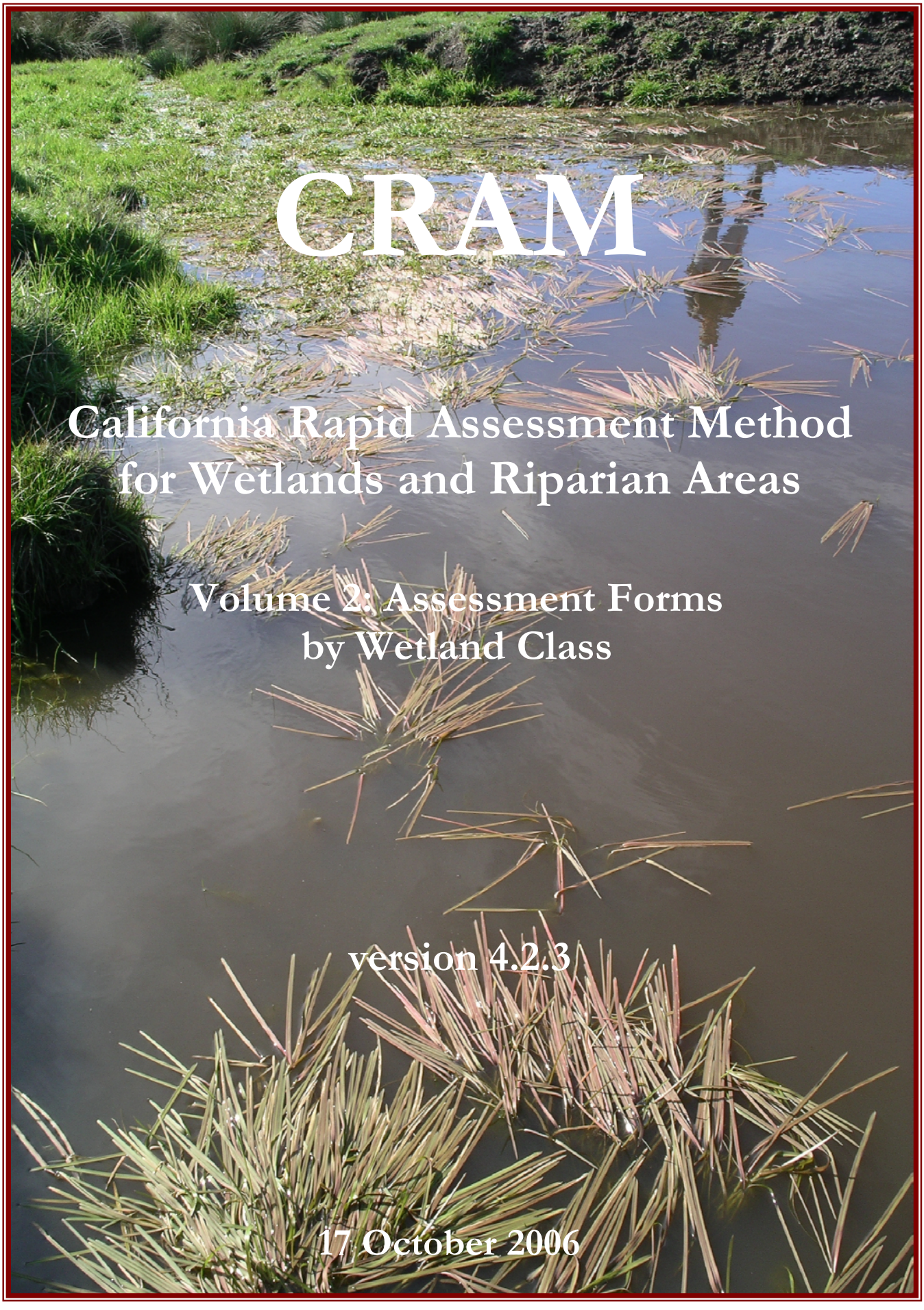

CRAM

California Rapid Assessment Method for Wetlands and Riparian Areas

Volume 2: Assessment Forms by Wetland Class

version 4.2.3

17 October 2006

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California Rapid Assessment Method (CRAM) for Wetlands and Riparian Areas

Volume 2: Assessment Forms by Wetland Class

version 4.2.3

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CRAM Software 1.0.0, an electronic version of CRAM 4.2.3, is available at www.cramwetlands.org

17 October 2006

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Assessment Form: Coastal Lagoon

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Is the mouth of the lagoon open at the time of the assessment? □ yes □ no

What best describes the tidal stage over the course of the time spent in the field?
Note: When feasible, it is recommended that the assessment be conducted when the lagoon mouth is open, and furthermore suggested that the assessment occurs during low tide.

□ high tide □ low tide

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Coastal Lagoon**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Pannes or pools on floodplain	
Pools in channels	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Shellfish beds	
Concentric or parallel high water marks	
Soil cracks	
Total Possible	**14**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for Saline Estuarine and Lagoon Wetlands

NOTE: All intertidal plants are either submergent or emergent. Emergent plants include those occupying tidal floodplains and areas above the plains but below the maximum height of the tide.

Saline Estuarine and Lagoon	Plant Layer			
	Submergent	Emergent		
		< 0.3 m	0.3 – 1 m	> 1 m
Mark if layer present (covers at least 5% of suitable habitat area)				
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)				
Total number of layers present				
Percent of layers dominated by non-native species				

Worksheet 4: Plant Community Metric - Co-dominant species richness for Saline Estuarine and Lagoon Wetlands

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent	Non-native?	Emergent (0.3 – 1 m)	Non-native?
Emergent (< 0.3 m)	**Non-native?**	**Emergent (< 1 m)**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Coastal Lagoon

WETLAND CLASS: Coastal Lagoon		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Coastal Lagoon (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	AA is subject to natural interannual tidal fluctuations (range may be severely muted or vary seasonally), and is episodically fully tidal by natural breaching due to either fluvial flooding or storm surge.
	B	AA is subject to full tidal range more often than would be expected under natural circumstances, because of artificial breaching of the tidal barrier.
	C	AA is subject to full tidal range less often than would be expected under natural circumstances due to management of the breach to prevent its opening.
	D	AA probably has no episodes of full tidal exchange.

WETLAND CLASS: Coastal Lagoon (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 11 of the possible patch types are evident in the AA.
	B	8 – 10 of the possible patch types are evident in the AA.
	C	5 – 7 of the possible patch types are evident in the AA.
	D	≤ 4 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Coastal Lagoon (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	≥4 layers are present.
	B	3 layers are present.
	C	2 layers are present.
	D	0 - 1 layer is present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥ 10 co-dominant species
	B	7 – 9 co-dominant species
	C	4 – 6 co-dominant species
	D	0 – 3 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 20%
	B	21 – 40%
	C	41 – 60%
	D	61 – 100%

WETLAND CLASS: Coastal Lagoon (cont'd)		
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	A	More than 50 % of the vegetated area of the AA supports abundant overlap of height classes (see Figure 4.6).
	B	More than 50 % of the area supports at least moderate overlap of height classes.
	C	25 – 50 % of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
	D	Less than 25% of the vegetated AA supports moderate overlap of height classes, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

Tables and Figures: Coastal Lagoon

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

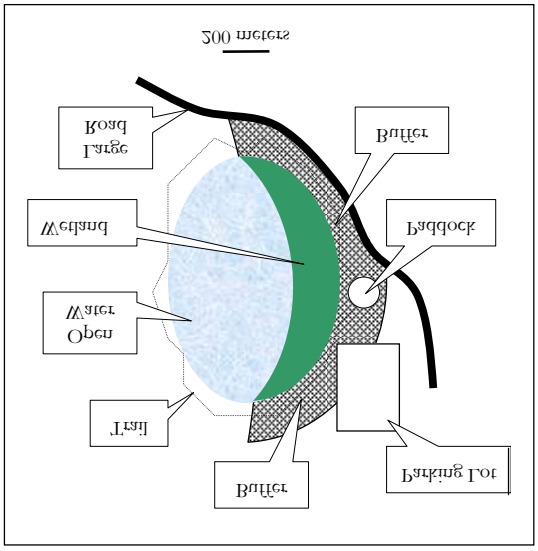


Figure 4.5a: Degrees of interspersion of plant zones for use in Table 4.20, except for Riverine, Estuarine, and Vernal Pool Wetland Classes (adapted from Mack, 2001). Each hatching pattern represents a distinct plant zone.

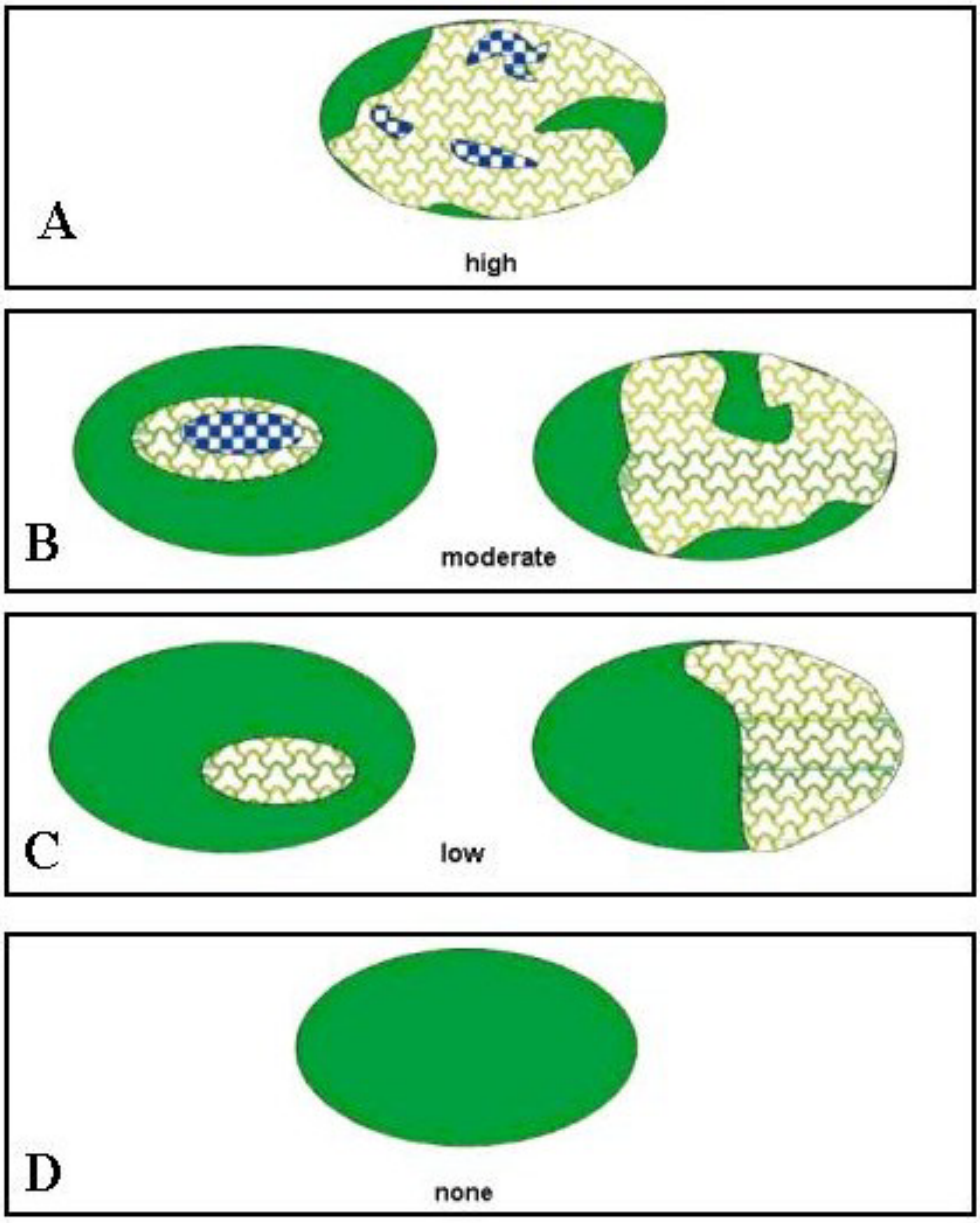


Figure 4.6: Schematic of abundant and moderate vertical interspersion of plant layers.

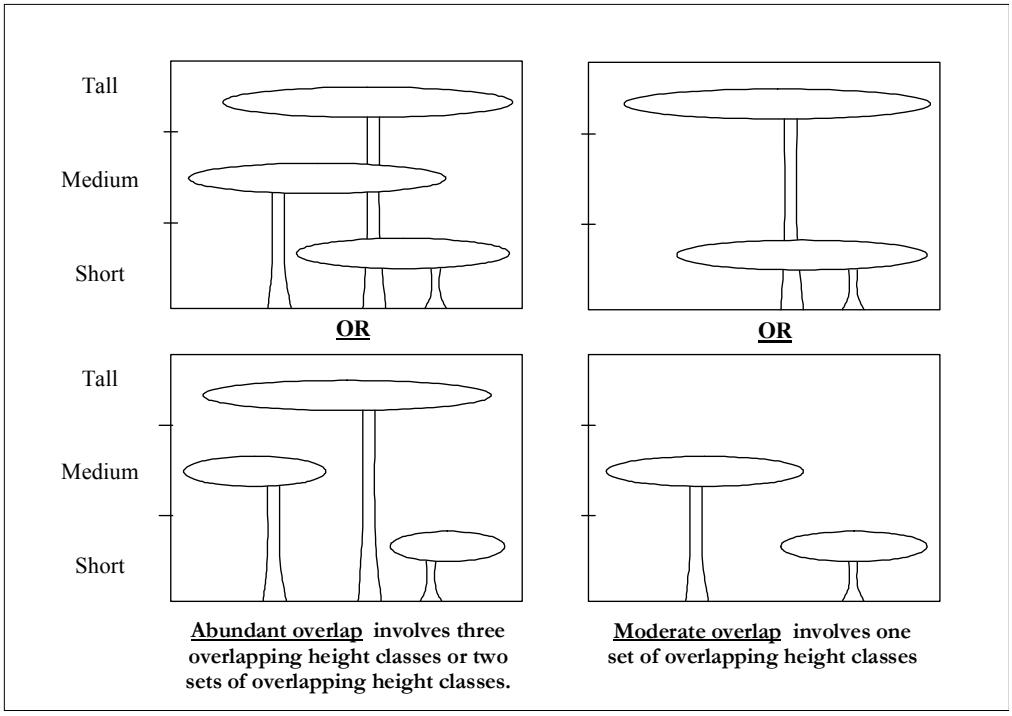
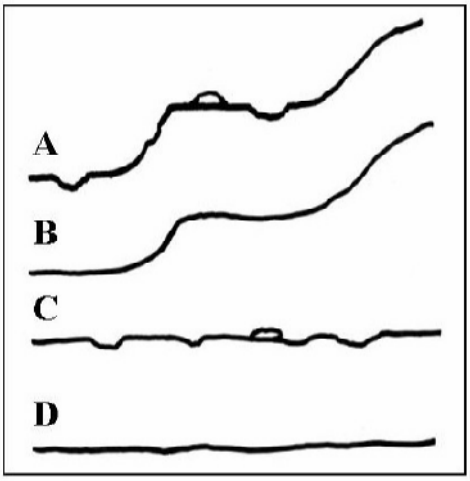


Table 4.7b: Appropriate landscape positions for each wetland class.

Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Depressional

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Which best describes the type of depressional wetland?

□ freshwater marsh □ alkaline marsh □ alkali flat □ other (specify):

Which best describes the hydrologic state of the wetland at the time of assessment?

□ ponded/inundated □ saturated soil, but no surface water □ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

□ long-duration □ medium-duration □ short-duration

Does your wetland connect with the floodplain of a nearby stream? □ yes □ no

Is the topographic basin of the wetland □ distinct **or** □ indistinct **?**

An *indistinct*, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas.*t* topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes.

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Depressional**
Minimum Patch Size	**3m²**
Swales on floodplain or along shoreline	
Islands (exposed at high-water stage)	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Abundant wrackline or organic debris in channel or on floodplain	
Hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Animal mounds and burrows	
Standing snags	
Macroalgae	
Concentric or parallel high water marks	
Soil cracks	
Total Possible	**12**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 4: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas.

(A dominant species represents ≥10% relative cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Depressional

WETLAND CLASS: Depressional		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Depressional (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	D	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Depressional (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 10 of the possible patch types are evident in the AA.
	B	7 – 9 of the possible patch types are evident in the AA.
	C	4 – 6 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Depressional (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	>3 layers are present.
	B	2 - 3 layers are present.
	C	1 layer is present.
	D	No layers are present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥ 7 co-dominant species
	B	5 – 6 co-dominant species
	C	3 – 4 co-dominant species
	D	0 – 2 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 14%
	B	15 – 30%
	C	31 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.

WETLAND CLASS: Depressional (cont'd)		
Vertical Biotic Structure	A	About 75 – 100 % of the vegetated area of the AA supports 4 plant layers.
	B	About 50 – 75 % of vegetated area of the AA supports 4 plant layers, or more than 75 % of the area supports 3 plant layers.
	C	About 25 – 50 % of the vegetated area supports 4 plant layers, or 50 – 75 % of the area supports 3 plant layers.
	D	Less than 25 % of the vegetated area of the AA supports 4 height classes, or less than 50 % of the area supports 3 plant layers.

Tables and Figures: Depressional

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

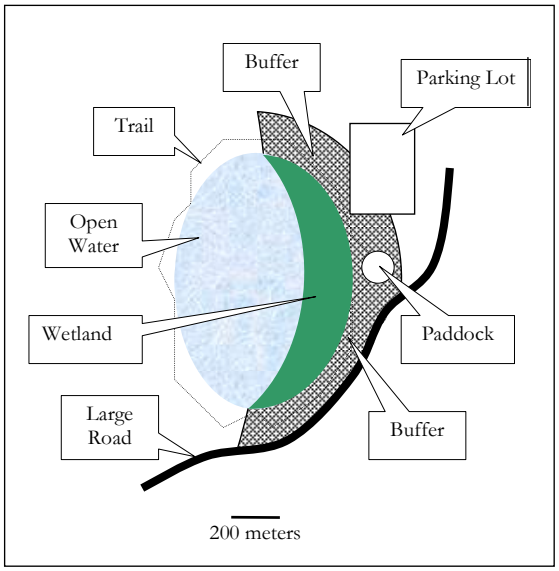


Figure 4.5a: Degrees of interspersion of plant zones for use in Table 4.20, except for Riverine, Estuarine, and Vernal Pool Wetland Classes (adapted from Mack, 2001). Each hatching pattern represents a distinct plant zone.

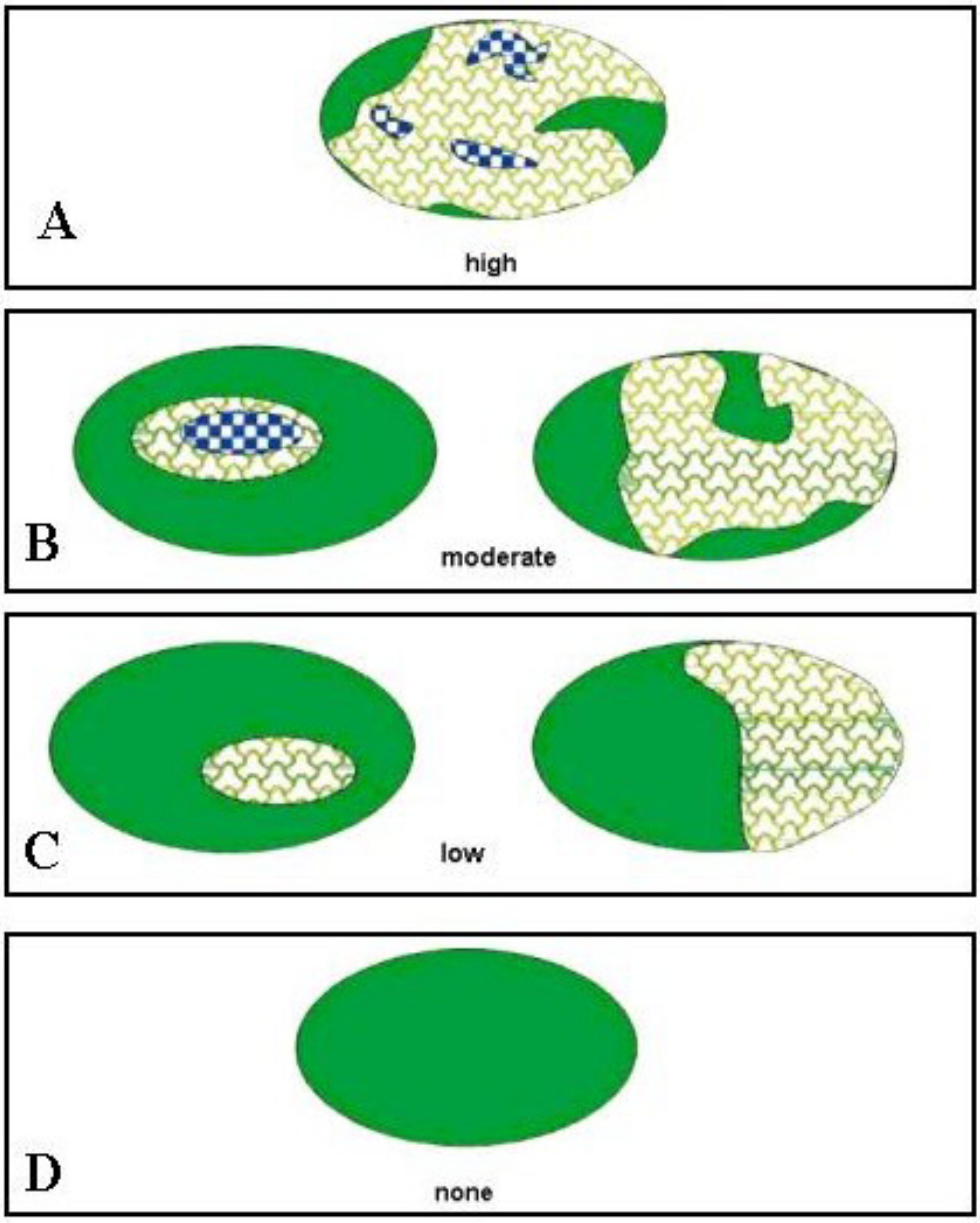


Table 4.7b: Appropriate landscape positions for each wetland class.

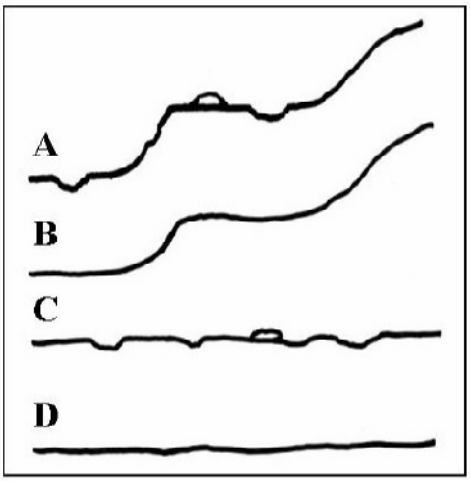
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Estuarine – Saline

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

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 (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Estuarine (Saline)**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Pools in channels	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Shellfish beds	
Soil cracks	
Total Possible	**14**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for Saline Estuarine and Lagoon Wetlands

NOTE: All intertidal plants are either submergent or emergent. Emergent plants include those occupying tidal floodplains and areas above the plains but below the maximum height of the tide.

Saline Estuarine and Lagoon	Plant Layer			
	Submergent	Emergent		
		< 0.3 m	0.3 – 1 m	> 1 m
Mark if layer present (covers at least 5% of suitable habitat area)				
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)				
Total number of layers present				
Percent of layers dominated by non-native species				

Worksheet 4: Plant Community Metric - Co-dominant species richness for Saline Estuarine and Lagoon Wetlands

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent	Non-native?	Emergent (0.3 – 1 m)	Non-native?
Emergent (< 0.3 m)	**Non-native?**	**Emergent (< 1 m)**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Estuarine – Saline

WETLAND CLASS: Estuarine – Saline		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Estuarine – Saline (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	AA is subject to the full tidal prism, with two daily tidal minima and maxima.
	B	AA is subject to reduced, or muted, tidal prism, although two daily minima and maxima are observed.
	C	AA is subject to muted tidal prism, with tidal fluctuations evident only in relation to extreme daily highs or spring tides.
	D	AA is subject to muted tidal prism, plus there is inadequate drainage, such that the marsh plain tends to remain flooded during low tide.

WETLAND CLASS: Estuarine – Saline (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 11 of the possible patch types are evident in the AA.
	B	8 – 10 of the possible patch types are evident in the AA.
	C	5 – 7 of the possible patch types are evident in the AA.
	D	≤ 4 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Estuarine – Saline (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	≥3 layers are present.
	B	2 layers are present.
	C	1 layer is present.
	D	No layers are present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥5 co-dominant species
	B	4 co-dominant species
	C	2 – 3 co-dominant species
	D	0 – 1 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 20%
	B	21 – 40%
	C	41 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.

WETLAND CLASS: Estuarine – Saline (cont'd)		
Vertical Biotic Structure	A	Most of the AA has entrained canopy (see Figure 4.7) and three plant layers.
	B	Most of the AA has an entrained canopy and supports two plant layers, or it has poor entrainment but mostly supports three plant layers.
	C	Most of the AA has an entrained canopy and supports one plant layer, or it has poor entrainment but mostly supports two plant layers.
	D	Most of the AA has poor entrainment and supports one plant layer.

Tables and Figures: Estuarine – Saline

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

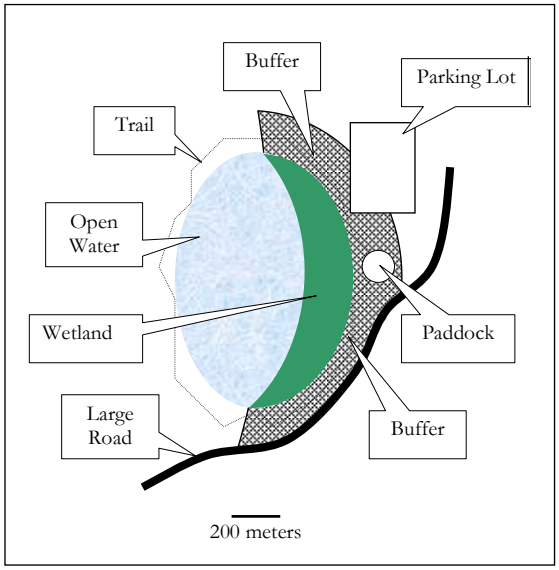


Figure 4.5e: Degrees of interspersion of plant zones showing decreasing complexity from A through D, for use in Table 4.20 for Saline Estuarine Wetlands. Each pattern represents a distinct plant zone or type.

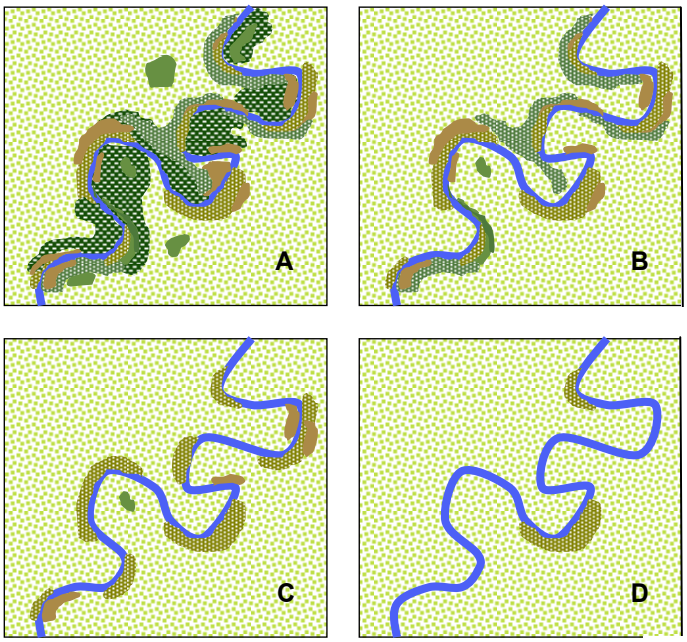


Table 4.7b: Appropriate landscape positions for each wetland class.

Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

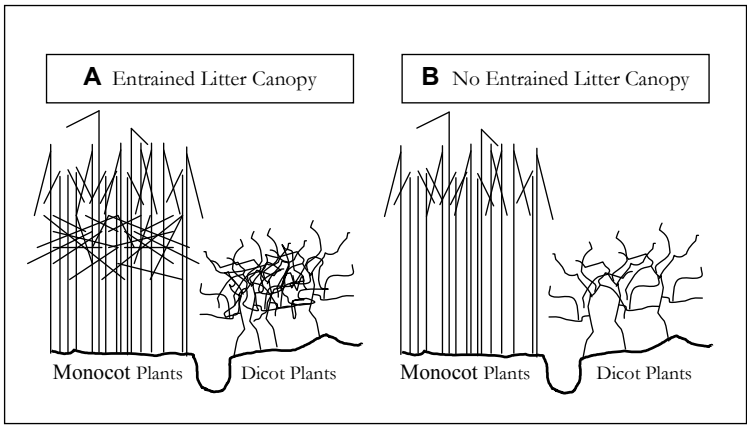
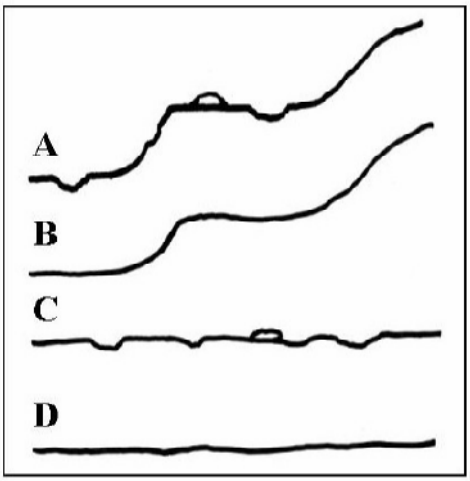


Figure 4.7: Schematic cross-section of estuarine marsh plain through small channel with and without entrained canopy.

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Estuarine – Non-Saline

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

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 (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Estuarine (Non-Saline)**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Pools in channels	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Shellfish beds	
Soil cracks	
Total Possible	**14**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 4: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Estuarine – Non-Saline

WETLAND CLASS: Estuarine – Non-Saline		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Estuarine – Non-Saline (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	AA is subject to the full tidal prism, with two daily tidal minima and maxima.
	B	AA is subject to reduced, or muted, tidal prism, although two daily minima and maxima are observed.
	C	AA is subject to muted tidal prism, with tidal fluctuations evident only in relation to extreme daily highs or spring tides.
	D	AA is subject to muted tidal prism, plus there is inadequate drainage, such that the marsh plain tends to remain flooded during low tide.

WETLAND CLASS: Estuarine – Non-Saline (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 11 of the possible patch types are evident in the AA.
	B	8 – 10 of the possible patch types are evident in the AA.
	C	5 – 7 of the possible patch types are evident in the AA.
	D	≤ 4 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Estuarine – Non-Saline (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	≥4 layers are present.
	B	3 layers are present.
	C	2 layers are present.
	D	0 – 1 layer is present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥10 co-dominant species
	B	7 – 9 co-dominant species
	C	4 – 6 co-dominant species
	D	0 – 3 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 20%
	B	21 – 40%
	C	41 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.

WETLAND CLASS: Estuarine – Non-Saline (cont'd)		
Vertical Biotic Structure	A	Most of the AA has entrained canopy (see Figure 4.7) and three plant layers.
	B	Most of the AA has an entrained canopy and supports two plant layers, or it has poor entrainment but mostly supports three plant layers.
	C	Most of the AA has an entrained canopy and supports one plant layer, or it has poor entrainment but mostly supports two plant layers.
	D	Most of the AA has poor entrainment and supports one plant layer.

Tables and Figures: Estuarine – Non-Saline

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers – Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

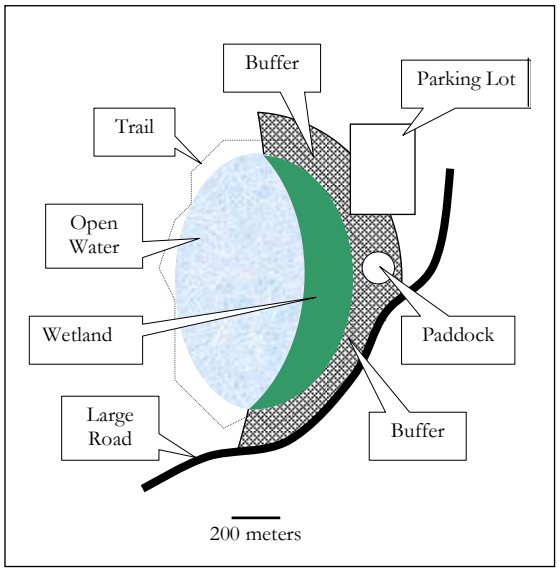


Figure 4.5f: Degrees of interspersion of plant zones showing decreasing complexity from A through D, for use in Table 4.20 for Non-saline Estuarine Wetlands. Each pattern represents a distinct plant zone or type.

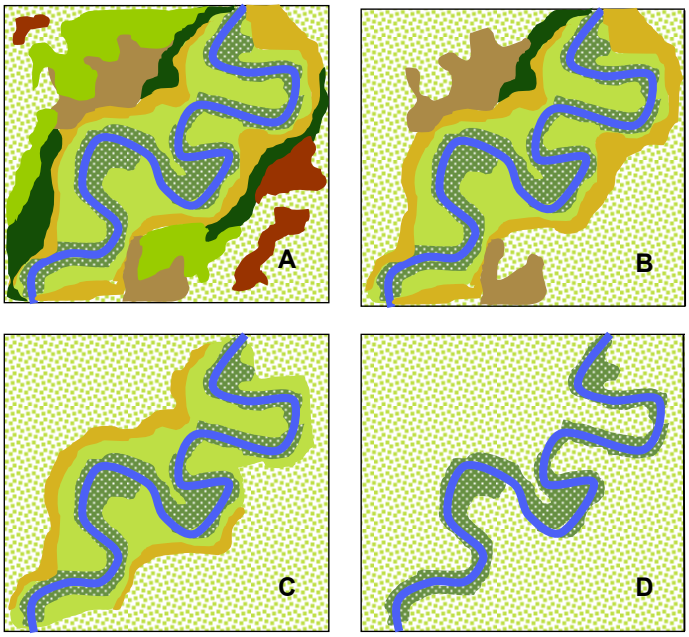


Table 4.7b: Appropriate landscape positions for each wetland class.

Wetland Type	Natural Landscape Position	Unnatural Landscape Position
iverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Figure 4.7: Schematic cross-section of estuarine marsh plain through small channel with and without entrained canopy.

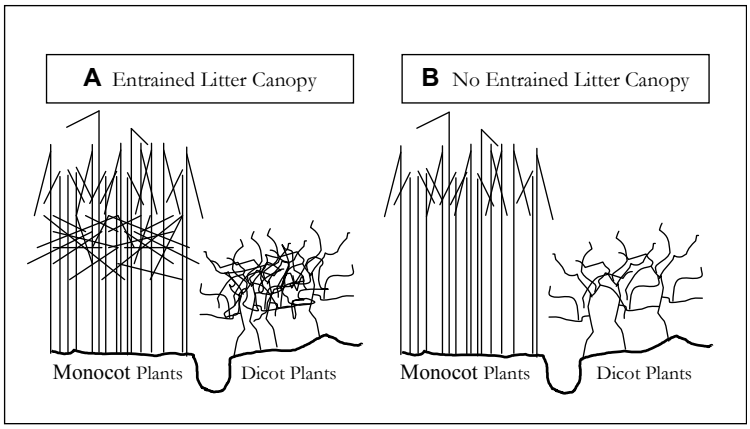
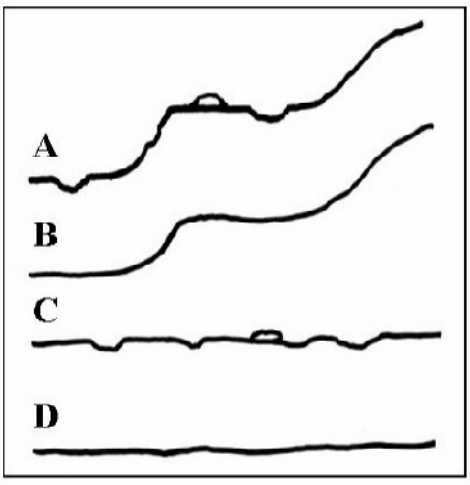


Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Lacustrine

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Is the lake □ natural **or** □ man-made**?**

Is the lake impounded by a dam? □ yes □ no

Which situation best describes the hydrologic connectivity of the lake? The lake is:
□ in-channel □ within a floodplain □ disconnected/isolated

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Lacustrine**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Shellfish beds	
Concentric or parallel high water marks	
Soil cracks	
Cobble and/or Boulders	
Total Possible	**15**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 4: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Lacustrine

WETLAND CLASS: Lacustrine		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Lacustrine (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	D	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Lacustrine (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 12 of the possible patch types are evident in the AA.
	B	9 – 11 of the possible patch types are evident in the AA.
	C	6 – 8 of the possible patch types are evident in the AA.
	D	≤ 5 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Lacustrine (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	4 – 5 layers are present.
	B	3 layers are present.
	C	2 layers are present.
	D	0 - 1 layer is present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥12 co-dominant species
	B	8 – 11 co-dominant species
	C	5 – 7 co-dominant species
	D	0 – 4 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 20%
	B	21 – 35%
	C	36 – 60%
	D	61 – 100%

WETLAND CLASS: Lacustrine (cont'd)		
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	A	About 75 – 100 % of the vegetated area of the AA supports 4 plant layers.
	B	About 50 – 75 % of vegetated area of the AA supports 4 plant layers, or more than 75 % of the area supports 3 plant layers.
	C	About 25 – 50 % of the vegetated area supports 4 plant layers, or 50 - 75 % of the area supports 3 plant layers.
	D	Less than 25 % of the vegetated area of the AA supports 4 height classes, or less than 50 % of the area supports 3 plant layers.

Tables and Figures: Lacustrine

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

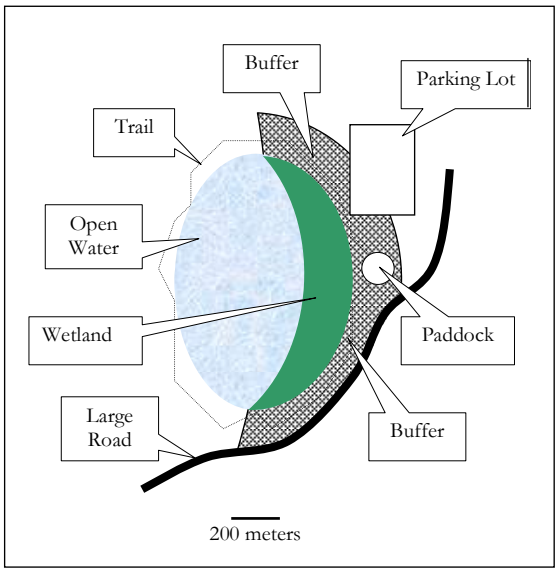


Figure 4.5a: Degrees of interspersion of plant zones for use in Table 4.20, except for Riverine, Estuarine, and Vernal Pool Wetland Classes (adapted from Mack, 2001). Each hatching pattern represents a distinct plant zone.

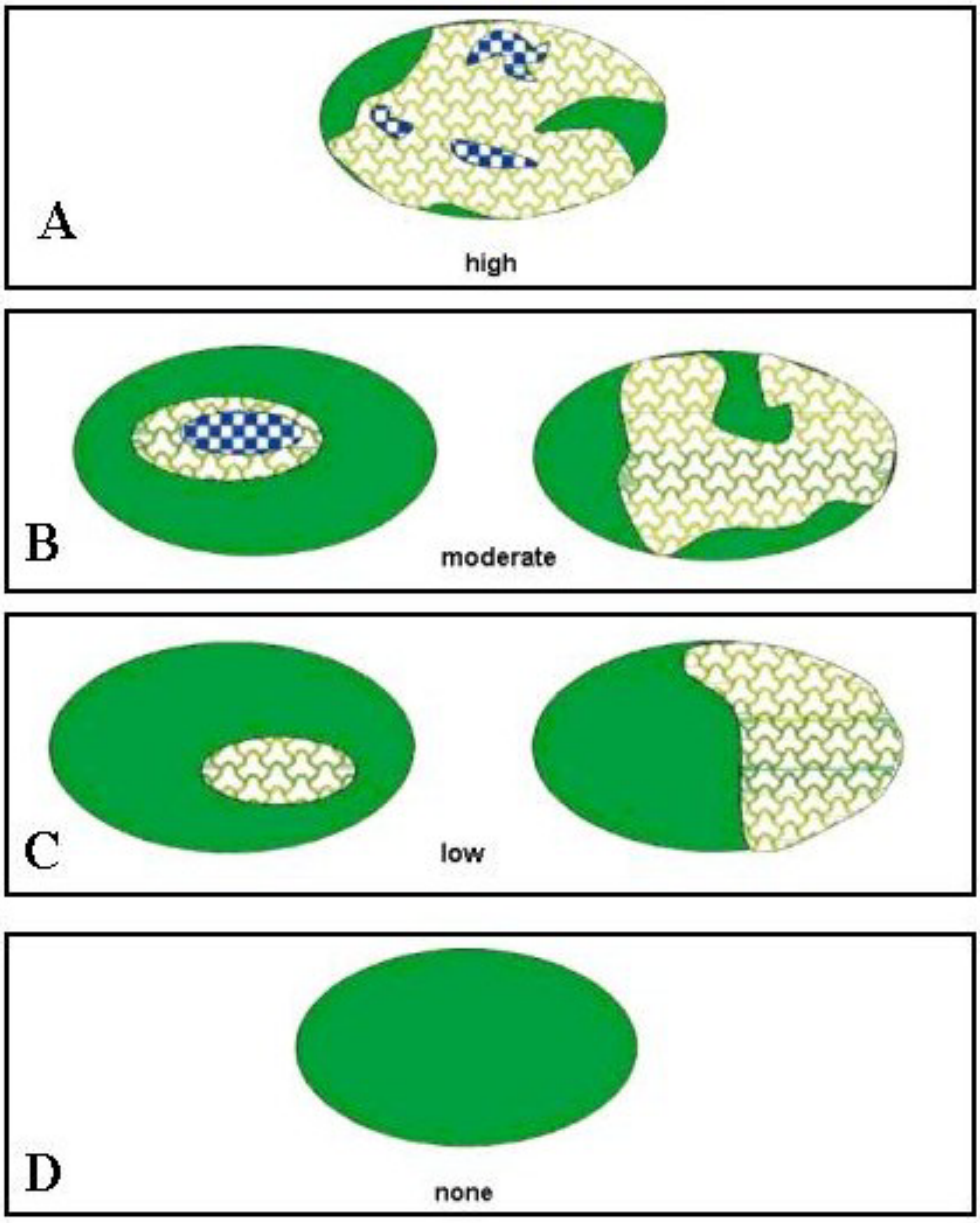


Table 4.7b: Appropriate landscape positions for each wetland class.

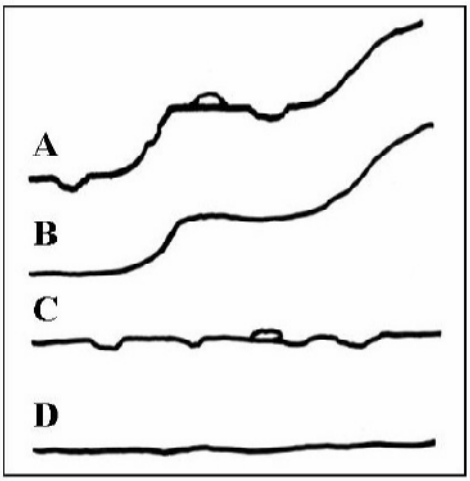
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Riverine – Confined

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Did the river/stream have flowing water at the time of the assessment? □ yes □ no

What is the apparent hydrologic flow regime of the reach you are assessing?
The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

□ perennial □ ephemeral □ intermittent

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 3: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Riverine (Confined)**
Minimum Patch Size	**3m²**
Pools in channels	
Riffles or rapids	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Cobble and/or Boulders	
Total Possible	**11**
No. Observed Patch Types	

Worksheet 2: Calculating entrenchment ratio

Step 1: Estimate bankfull width.	This is a critical step requiring experience. If the stream is entrenched, the depth of bankfull flow is identified as a scour line, narrow bench, or the top of active point bars well below the top of apparent channel banks. If the stream is not entrenched, bankfull stage can correspond to the elevation of a broader floodplain with indicative riparian vegetation. Once the bankfull contour is identified, estimate the bankfull channel width.	
Step 2: Estimate bankfull depth.	Once the bankfull contour is identified, estimate its maximum depth from the channel bottom.	
Step 3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2, and note the location of the new depth on the channel bank.	
Step 4: Estimate flood prone width.	Estimate the width of the channel at the flood prone depth.	
Step 5: Calculate entrenchment ratio.	Divide the flood prone width (result of Step 4) by the maximum bankfull width (result of Step 1)	
	Result	

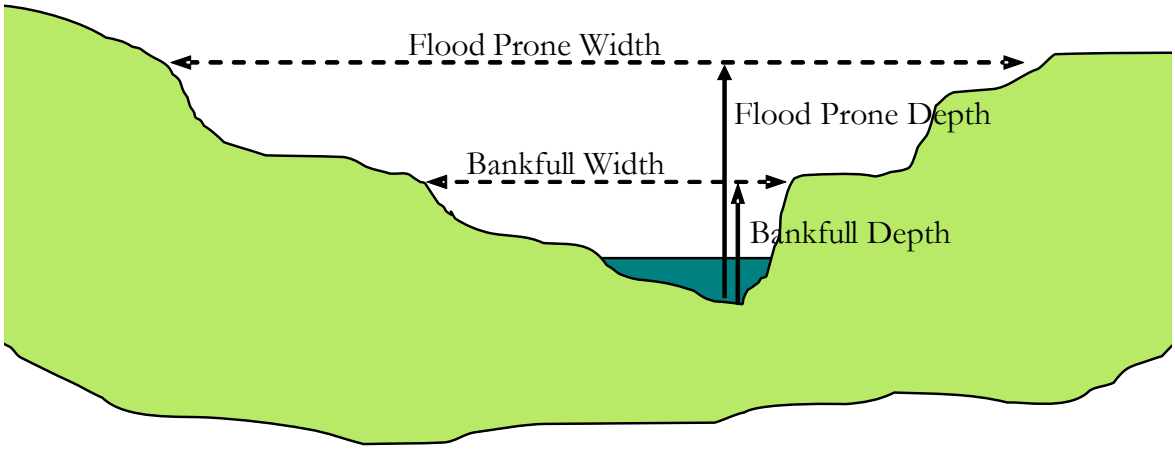


Figure 4.2: Channel cross-section diagram showing parameters for calculating entrenchment. Flood prone depth is twice bankfull depth. Entrenchment is measured as flood prone width divided by bankfull width.

Worksheet 4: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 5: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Riverine – Confined

WETLAND CLASS: Riverine – Confined		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	There is at least 500 m of riparian area extending upstream and downstream of the AA on both sides of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
	B	There is at least 500 m of riparian area extending upstream and downstream of the AA on one side of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
	C	There is less that 500 m of riparian area extending upstream and downstream of the AA on both sides of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Riverine – Confined (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Most of the channel through the AA is characterized by equilibrium conditions, with little evidence of aggradation or degradation (based on the field indicators listed in Table 4.8).
	B	Most of the channel through the AA is characterized by some aggradation or degradation, none of which is severe, and the channel seems to be approaching an equilibrium form (based on the field indicators listed in Table 4.8).
	C	There is evidence of severe aggradation or degradation of most of the channel through the AA (based on the field indicators listed in Table 4.8), or the channel is artificially hardened through less than half of the AA.
	D	The channel is concrete or is otherwise artificially hardened through most of the AA.
Hydrologic Connectivity (use Worksheet 2)	A	Entrenchment ratio is > 2.0.
	B	Entrenchment ratio is 1.5 – 2.0.
	C	Entrenchment ratio is < 1.5.

WETLAND CLASS: Riverine – Confined (cont'd)		
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 3)	A	≥ 8 of the possible patch types are evident in the AA.
	B	6 – 7 of the possible patch types are evident in the AA.
	C	4 – 5 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	B	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	C	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 4)	A	4 – 5 layers are present.
	B	3 layers are present.
	C	2 layers are present.
	D	0 – 1 layer is present.
Percent of Layers Dominated by Non-native Species (use Worksheet 4)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%

WETLAND CLASS: Riverine – Confined (cont'd)		
Number of Co-dominant Species (use Worksheet 5)	A	≥12 co-dominant species
	B	8 – 11 co-dominant species
	C	5 – 7 co-dominant species
	D	0 – 4 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 5)	A	0 – 20%
	B	21 – 35%
	C	36 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	A	More than 50 % of the vegetated area of the AA supports abundant overlap of height classes (see Figure 4.6).
	B	More than 50 % of the area supports at least moderate overlap of height classes.
	C	25 – 50 % of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
	D	Less than 25% of the vegetated AA supports moderate overlap of height classes, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

Tables and Figures: Riverine – Confined

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

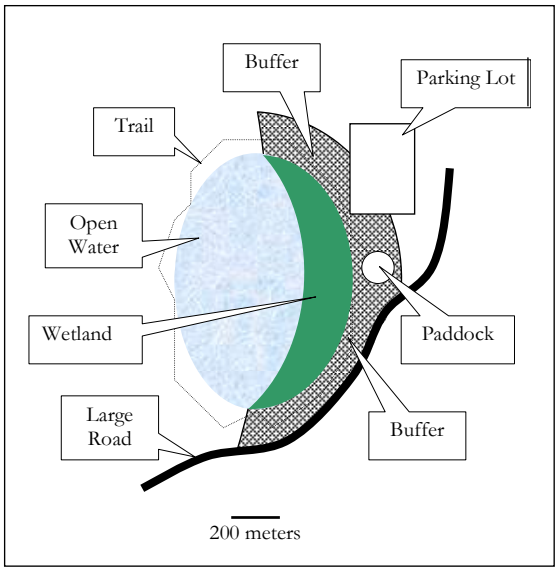


Figure 4.5d: Degrees of interspersion of plant zones showing decreasing complexity from A through D, for use in Table 4.20 for all Riverine Wetlands. Each hatching pattern represents a distinct plant zone.

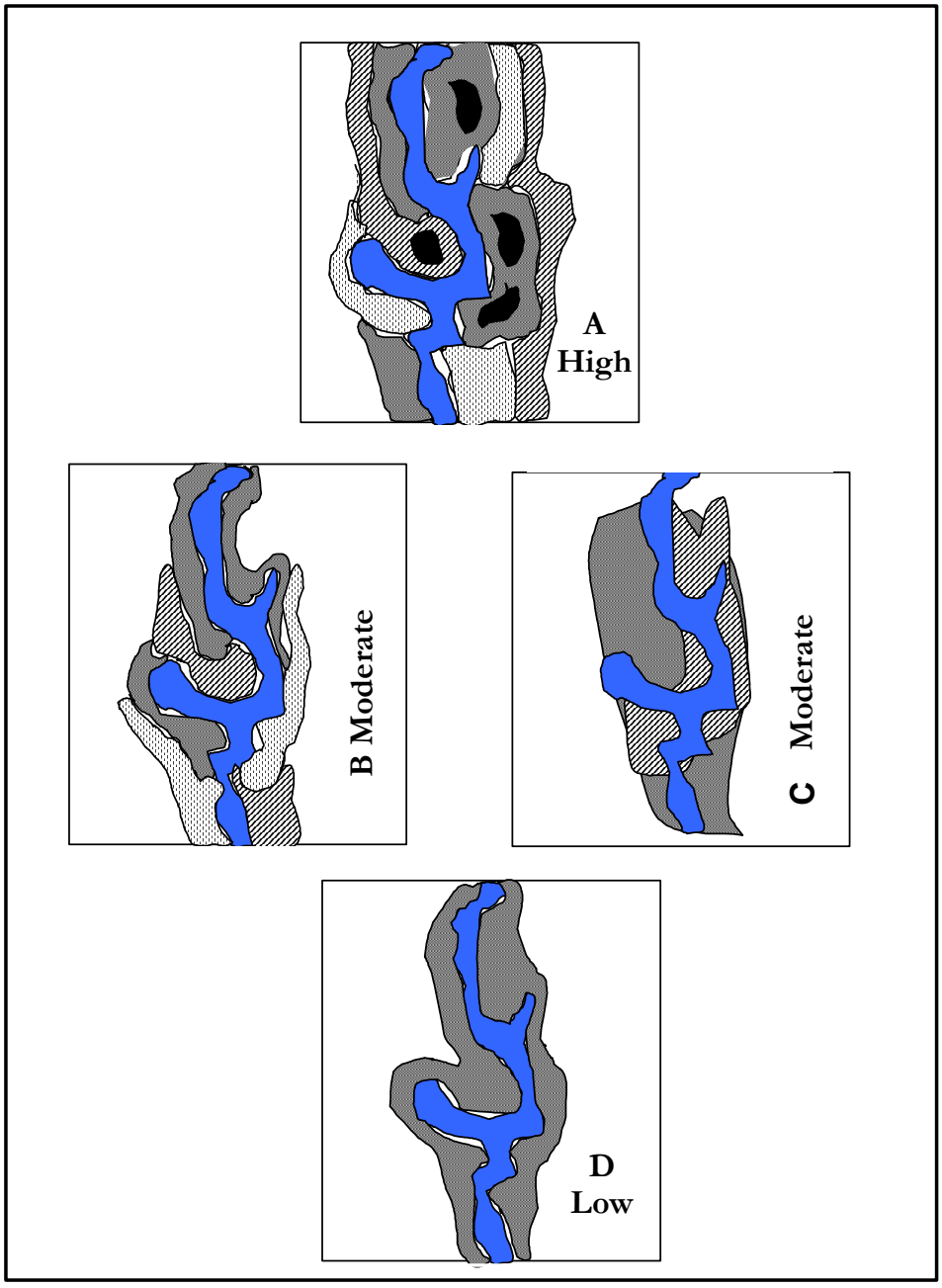


Figure 4.6: Schematic of abundant and moderate vertical interspersion of plant layers.

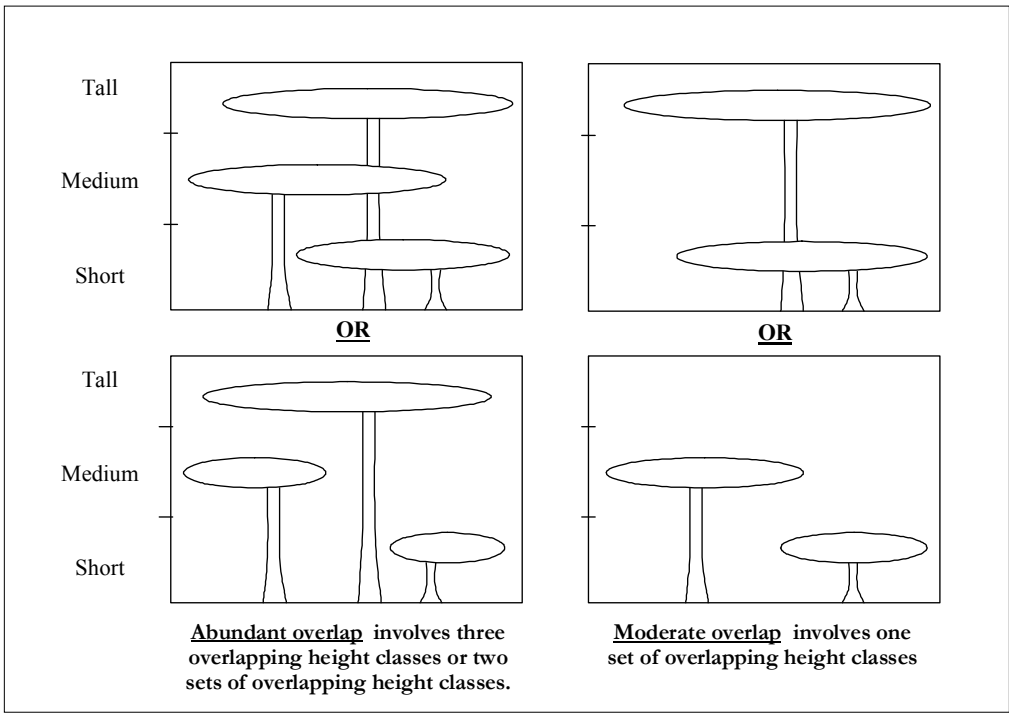


Table 4.7b: Appropriate landscape positions for each wetland class.

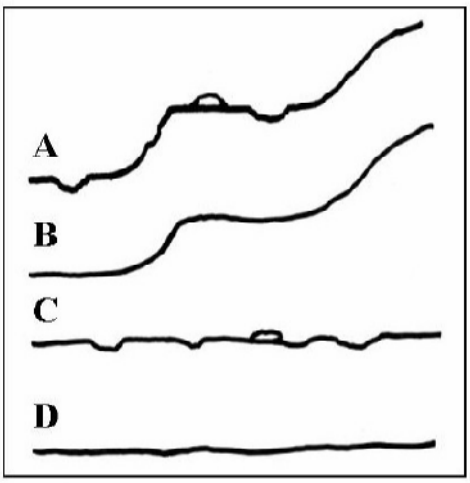
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.8: Suggested field indicators for evaluating Hydroperiod Metric for riverine wetlands.

Condition	Field Indicators
Indicators of Channel Equilibrium	• The channel (or multiple channels in braided systems) has a well-defined usual high water line, or bankfull stage that is clearly indicated by an obvious floodplain, topographic bench that represents an abrupt change in the cross-sectional profile of the channel throughout most of the AA. • The usual high water line or bank full stage corresponds to the lower limit of riparian vascular vegetation. • Leaf litter, thatch, wrack, and/or mosses exist in most pools. • The channel contains embedded woody debris of the size and amount consistent with what is available in the riparian area. • There is little or no active undercutting or burial of riparian vegetation. • There is little evidence of recent deposition of cobble or very coarse gravel on the floodplain, although recent sandy deposits may be evident. • There are no densely vegetated mid-channel bars and/or point bars. • The spacing between pools in the channel tends to be 5-7 channel widths. • The larger bed material supports abundant periphyton.
Indicators of Active Degradation	• The channel through the AA is characterized by deeply undercut banks with exposed living roots of trees or shrubs. There are abundant bank slides or slumps, or the banks are uniformly scoured and unvegetated. • Riparian vegetation may be declining in stature or vigor, and/or riparian trees and shrubs may be falling into the channel. • Abundant organic debris has accumulated on what seems to be the historical floodplain. • The channel bed appears scoured to bedrock or dense clay. • The channel bed lacks any fine-grained sediment. • Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). • There are one or more nick points along the channel, indicating headward erosion of the channel bed.
Indicators of Active Aggradation	• The channel through the AA lacks a well-defined usual high water line. • There is an active floodplain with fresh splays of sediment covering older soils or recent vegetation. • There are partially buried tree trunks or shrubs. • Cobbles and/or coarse gravels have recently been deposited on the floodplain. • There is a lack of in-channel pools, their spacing is greater than 5-7 channel widths, or many pools seem to be filling with sediment. • There are partially buried, or sediment-choked, culverts. • Transitional or upland vegetation is encroaching into the channel throughout most of the AA. • The bed material is loose and mostly devoid of periphyton.

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Riverine – Unconfined

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Did the river/stream have flowing water at the time of the assessment? □ yes □ no

What is the apparent hydrologic flow regime of the reach you are assessing?
The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

□ perennial □ ephemeral □ intermittent

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 3: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Riverine (Unconfined)**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Islands (exposed at high-water stage)	
Pools in channels	
Riffles or rapids	
Point bars and in-channel bars	
Debris jams	
Abundant wrackline or organic debris in channel or on floodplain	
Hummocks and/or sediment mounds	
Bank slumps or undercut banks in channels or along shoreline	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Standing snags	
Macroalgae	
Concentric or parallel high water marks	
Cobble and/or Boulders	
Total Possible	**16**
No. Observed Patch Types	

Worksheet 2: Calculating entrenchment ratio

Step 1:	Estimate bankfull width.	This is a critical step requiring experience. If the stream is entrenched, the depth of bankfull flow is identified as a scour line, narrow bench, or the top of active point bars well below the top of apparent channel banks. If the stream is not entrenched, bankfull stage can correspond to the elevation of a broader floodplain with indicative riparian vegetation. Once the bankfull contour is identified, estimate the bankfull channel width.	
Step 2:	Estimate bankfull depth.	Once the bankfull contour is identified, estimate its maximum depth from the channel bottom.	
Step 3:	Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2, and note the location of the new depth on the channel bank.	
Step 4:	Estimate flood prone width.	Estimate the width of the channel at the flood prone depth.	
Step 5:	Calculate entrenchment ratio.	Divide the flood prone width (result of Step 4) by the maximum bankfull width (result of Step 1)	
		Result	

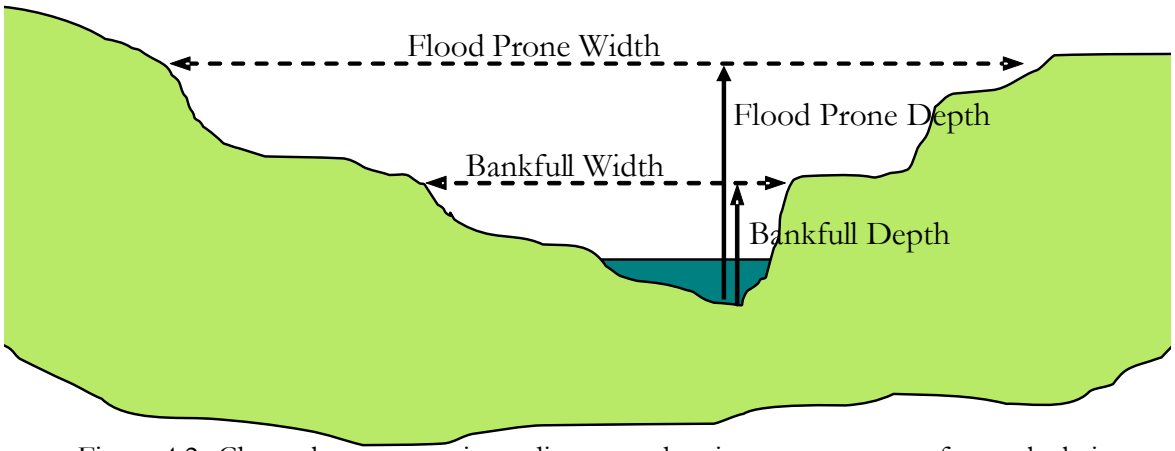


Figure 4.2: Channel cross-section diagram showing parameters for calculating entrenchment. Flood prone depth is twice bankfull depth. Entrenchment is measured as flood prone width divided by bankfull width.

Worksheet 4: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 5: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Riverine – Unconfined

WETLAND CLASS: Riverine – Unconfined		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	There is at least 500 m of riparian area extending upstream and downstream of the AA on both sides of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
	B	There is at least 500 m of riparian area extending upstream and downstream of the AA on one side of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
	C	There is less that 500 m of riparian area extending upstream and downstream of the AA on both sides of the AA that is not interrupted by any non-buffer land covers at least 10 m wide (see Table 4.3).
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Riverine – Unconfined (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Most of the channel through the AA is characterized by equilibrium conditions, with little evidence of aggradation or degradation (based on the field indicators listed in Table 4.8).
	B	Most of the channel through the AA is characterized by some aggradation or degradation, none of which is severe, and the channel seems to be approaching an equilibrium form (based on the field indicators listed in Table 4.8).
	C	There is evidence of severe aggradation or degradation of most of the channel through the AA (based on the field indicators listed in Table 4.8), or the channel is artificially hardened through less than half of the AA.
	D	The channel is concrete or is otherwise artificially hardened through most of the AA.
Hydrologic Connectivity (use Worksheet 2)	A	Entrenchment ratio is > 7.5.
	B	Entrenchment ratio is 3.0 – 7.5.
	C	Entrenchment ratio is < 3.0.

WETLAND CLASS: Riverine – Unconfined (cont'd)		
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 3)	A	≥ 12 of the possible patch types are evident in the AA.
	B	9 – 11 of the possible patch types are evident in the AA.
	C	6 – 8 of the possible patch types are evident in the AA.
	D	≤ 5 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.

WETLAND CLASS: Riverine – Unconfined (cont'd)		
Number of Plant Layers Present (use Worksheet 4)	A	4 – 5 layers are present.
	B	3 layers are present.
	C	2 layers are present.
	D	0 – 1 layer is present.
Percent of Layers Dominated by Non-native Species (use Worksheet 4)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 5)	A	≥12 co-dominant species
	B	7 – 11 co-dominant species
	C	4 – 6 co-dominant species
	D	0 – 3 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 5)	A	0 – 20%
	B	21 – 35%
	C	36 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	A	More than 50 % of the vegetated area of the AA supports abundant overlap of height classes (see Figure 4.6).
	B	More than 50 % of the area supports at least moderate overlap of height classes.
	C	25 – 50 % of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
	D	Less than 25% of the vegetated AA supports moderate overlap of height classes, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

Tables and Figures: Riverine – Unconfined

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

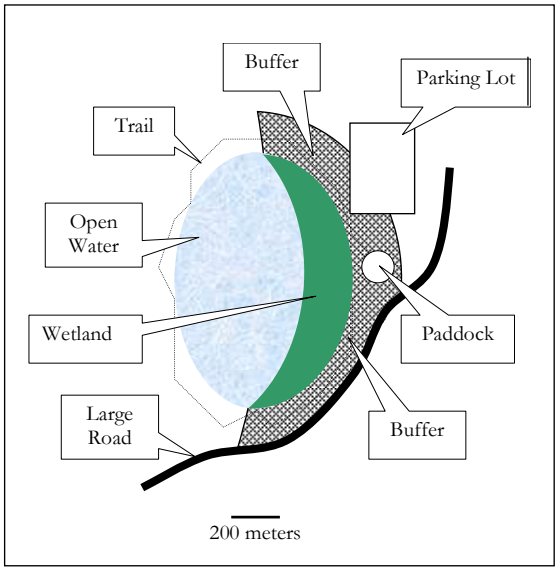


Figure 4.5d: Degrees of interspersion of plant zones showing decreasing complexity from A through D, for use in Table 4.20 for all Riverine Wetlands. Each hatching pattern represents a distinct plant zone.

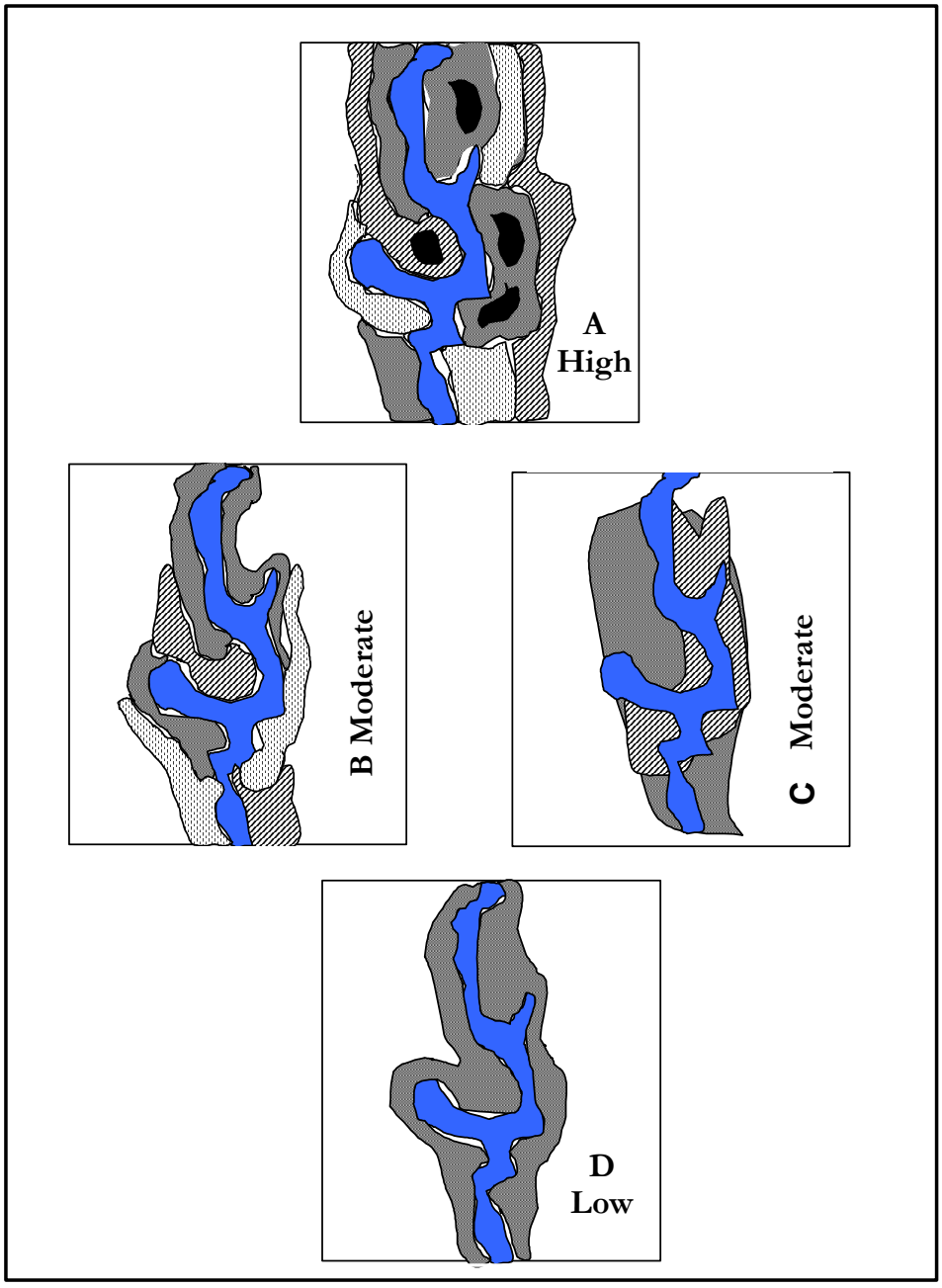


Figure 4.6: Schematic of abundant and moderate vertical interspersion of plant layers.

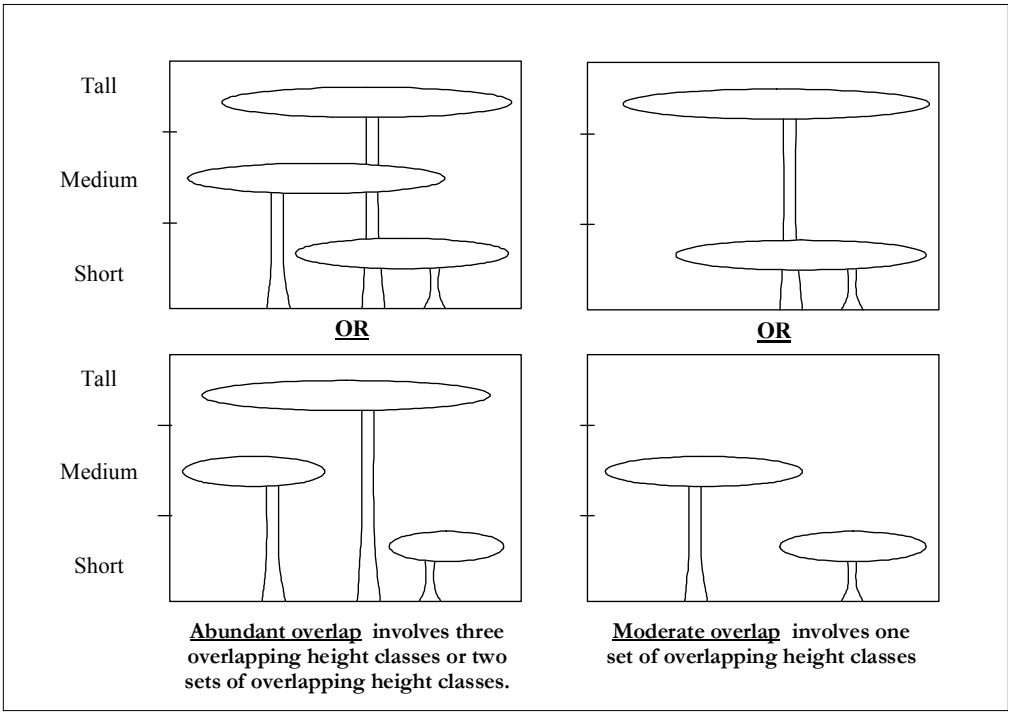


Table 4.7b: Appropriate landscape positions for each wetland class.

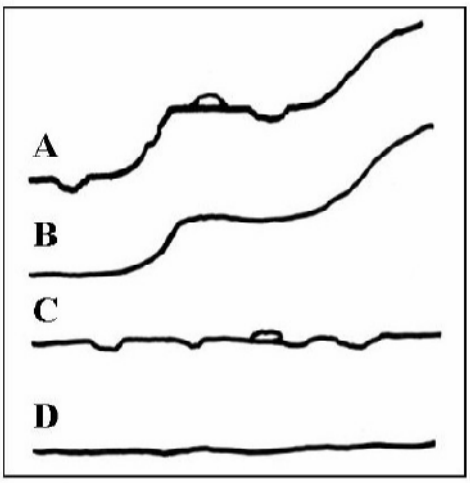
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.8: Suggested field indicators for evaluating Hydroperiod Metric for riverine wetlands.

Condition	Field Indicators
Indicators of Channel Equilibrium	• The channel (or multiple channels in braided systems) has a well-defined usual high water line, or bankfull stage that is clearly indicated by an obvious floodplain, topographic bench that represents an abrupt change in the cross-sectional profile of the channel throughout most of the AA. • The usual high water line or bank full stage corresponds to the lower limit of riparian vascular vegetation. • Leaf litter, thatch, wrack, and/or mosses exist in most pools. • The channel contains embedded woody debris of the size and amount consistent with what is available in the riparian area. • There is little or no active undercutting or burial of riparian vegetation. • There is little evidence of recent deposition of cobble or very coarse gravel on the floodplain, although recent sandy deposits may be evident. • There are no densely vegetated mid-channel bars and/or point bars. • The spacing between pools in the channel tends to be 5-7 channel widths. • The larger bed material supports abundant periphyton.
Indicators of Active Degradation	• The channel through the AA is characterized by deeply undercut banks with exposed living roots of trees or shrubs. There are abundant bank slides or slumps, or the banks are uniformly scoured and unvegetated. • Riparian vegetation may be declining in stature or vigor, and/or riparian trees and shrubs may be falling into the channel. • Abundant organic debris has accumulated on what seems to be the historical floodplain. • The channel bed appears scoured to bedrock or dense clay. • The channel bed lacks any fine-grained sediment. • Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). • There are one or more nick points along the channel, indicating headward erosion of the channel bed.
Indicators of Active Aggradation	• The channel through the AA lacks a well-defined usual high water line. • There is an active floodplain with fresh splays of sediment covering older soils or recent vegetation. • There are partially buried tree trunks or shrubs. • Cobbles and/or coarse gravels have recently been deposited on the floodplain. • There is a lack of in-channel pools, their spacing is greater than 5-7 channel widths, or many pools seem to be filling with sediment. • There are partially buried, or sediment-choked, culverts. • Transitional or upland vegetation is encroaching into the channel throughout most of the AA. • The bed material is loose and mostly devoid of periphyton.

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Slope Wetlands

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Does the wetland occur on a discernible slope?

□ yes □ no

Are there nay distinct channels associated with the wetland (e.g., a visible outflow)?

□ yes □ no

If yes, briefly describe the channel(s):

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 1-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Slope Wetlands**
Minimum Patch Size	**1m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Hummocks and/or sediment mounds	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Animal mounds and burrows	
Standing snags	
Concentric or parallel high water marks	
Cobble and/or Boulders	
Total Possible	**10**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Plant layers and their dominance by non-native species for all Non-saline Estuarine, Riverine, Slope, Lacustrine, and Depressional Wetlands

Non-saline Estuarine, Riverine, Depressional, Slope, and Lacustrine	Plant Layer				
	Aquatic/Semi-aquatic		Terrestrial/Riparian		
	Submergent	Emergent (all)	Short (< 1 m)	Medium (1-3 m)	Tall (> 3 m)
Mark if layer present (covers at least 5% of suitable habitat area)					
Mark if dominated by non-native species (at least 50% of the layer is represented by non-natives)					
Total number of layers present					
Percent of layers dominated by non-native species					

Worksheet 4: Plant Community Metric - Co-dominant species richness for all wetlands, except Saline Estuarine, Lagoon Wetlands, Vernal Pools and Playas

(A dominant species represents ≥10% *relative* cover–Mark all non-native species based on Appendix 2)

Submergent Aquatic/Semi-aquatic	Non-native?	Tall Terrestrial/Riparian	Non-native?
Emergent Aquatic/Semi-aquatic	**Non-native?**	**Medium Terrestrial/Riparian**	**Non-native?**
Short Terrestrial/Riparian	**Non-native?**	**Short Terrestrial/Riparian**	**Non-native?**
Total number of co-dominant species for all layers combined			
Percent of co-dominant species that are non-native			

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Slope Wetlands

WETLAND CLASS: Slope Wetlands		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Slope Wetlands (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	D	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Slope Wetlands (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 8 of the possible patch types are evident in the AA.
	B	6 – 7 of the possible patch types are evident in the AA.
	C	4 – 5 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Slope Wetlands (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present (use Worksheet 3)	A	>3 layers are present.
	B	2 - 3 layers are present.
	C	1 layer is present.
	D	No layers are present.
Percent of Layers Dominated by Non-native Species (use Worksheet 3)	A	0 – 24%
	B	25 – 49%
	C	50 – 74%
	D	75 – 100%
Number of Co-dominant Species (use Worksheet 4)	A	≥ 7 co-dominant species
	B	5 – 6 co-dominant species
	C	3 – 4 co-dominant species
	D	0 – 2 co-dominant species

WETLAND CLASS: Slope Wetlands (cont'd)		
Percent of Co-dominant Species that are Non-native (use Worksheet 4)	A	0 – 14%
	B	15 – 30%
	C	31 – 60%
	D	61 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	A	More than 50 % of the vegetated area of the AA supports abundant overlap of height classes (see Figure 4.6).
	B	More than 50 % of the area supports at least moderate overlap of height classes.
	C	25 – 50 % of the vegetated AA supports at least moderate overlap of plant layers, **or** three plant layers are well represented in the AA but there is little to no overlap.
	D	Less than 25% of the vegetated AA supports moderate overlap of height classes, **or** two layers are well represented with little overlap, **or** AA is sparsely vegetated overall.

Tables and Figures: Slope Wetlands

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

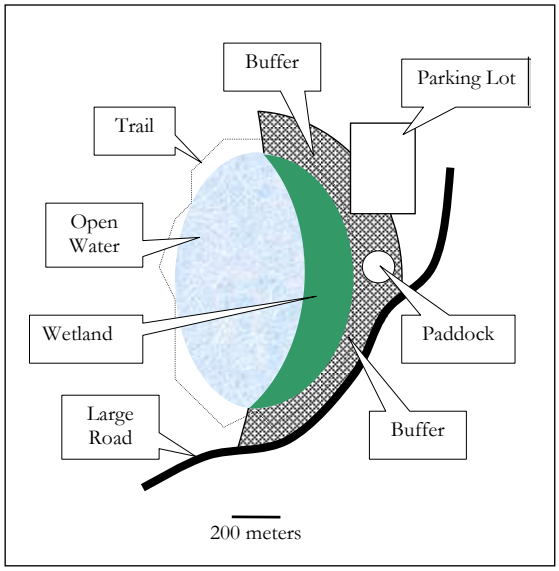


Figure 4.5a: Degrees of interspersion of plant zones for use in Table 4.20, except for Riverine, Estuarine, and Vernal Pool Wetland Classes (adapted from Mack, 2001). Each hatching pattern represents a distinct plant zone.

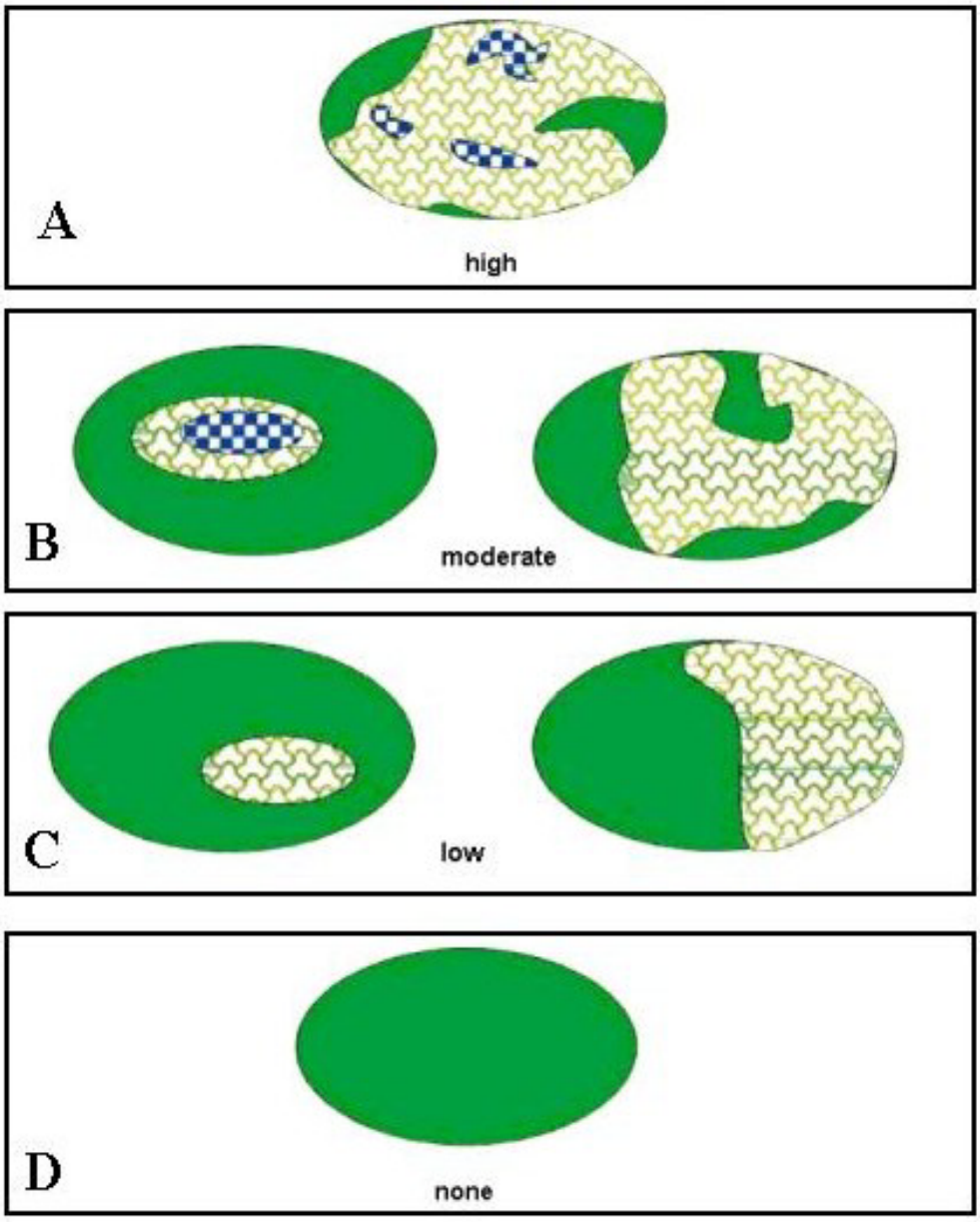


Figure 4.6: Schematic of abundant and moderate vertical interspersion of plant layers.

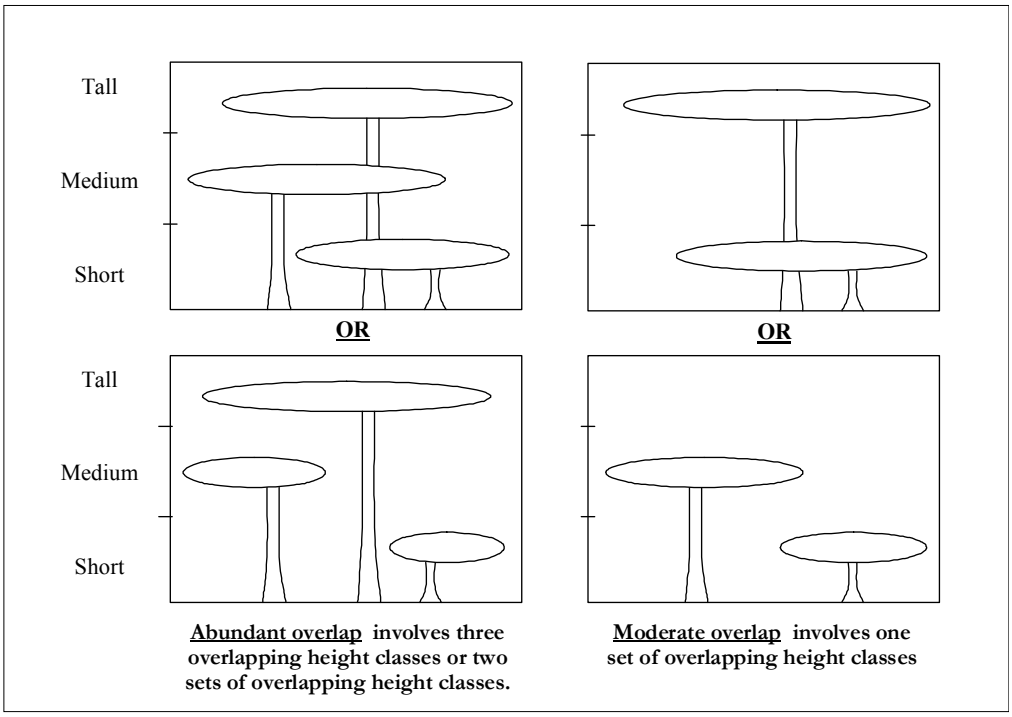


Table 4.7b: Appropriate landscape positions for each wetland class.

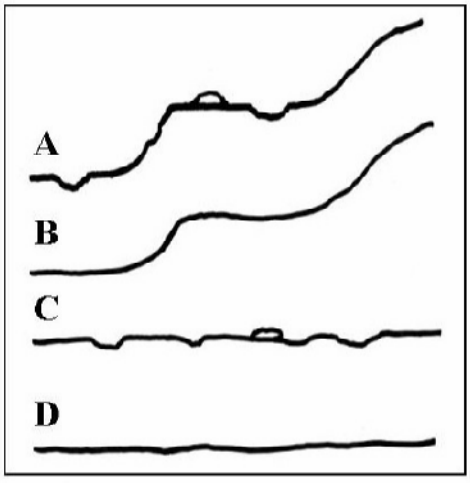
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Playas

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Which best describes the hydrologic state of the wetland at the time of assessment?

□ ponded/inundated □ saturated soil, but no surface water □ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

□ long-duration □ medium-duration □ short-duration

Does the vernal pool or playa connect with the floodplain of a nearby stream?

□ yes □ no

Is the topographic basin of the vernal pool or playa □ distinct **or** □ indistinct**?**

An *indistinct* topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas.

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 3-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Playas**
Minimum Patch Size	**3m²**
Secondary channels on floodplains or along shorelines	
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Islands (exposed at high-water stage)	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Hummocks and/or sediment mounds	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Animal mounds and burrows	
Concentric or parallel high water marks	
Soil cracks	
Total Possible	**10**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Co-dominant plant species in Individual Vernal Pools and Playas

List species that represent at least 10% of the absolute cover.					
Circle species that represent at least 50% of absolute cover:					
	Non-native?		**Non-native?**		**Non-native?**
Total number of co-dominant species across all pool strata					
Percent of total co-dominant species that are non-native					

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Playas

WETLAND CLASS: Playas		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Playas (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown.
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	C	Hydroperiod of the AA is characterized by natural patterns of filling or inundation, but thereafter, is subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR The filling or inundation patterns in the AA are of substantially lower magnitude or duration than would be expected under natural conditions, but thereafter, the AA is subject to natural drawdown or drying.
	D	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Playas (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 8 of the possible patch types are evident in the AA.
	B	6 – 7 of the possible patch types are evident in the AA.
	C	4 – 5 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Playas (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The AA is characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
	B	The AA is characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	C	The AA is characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	D	The AA contains essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
Number of Plant Layers Present	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Percent of Layers Dominated by Non-native Species	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Number of Co-dominant Species (use Worksheet 3)	A	≥ 9 co-dominant species
	B	5 – 8 co-dominant species
	C	3 – 4 co-dominant species
	D	0 – 2 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 3)	A	0 – 15%
	B	16 – 35%
	C	36 – 55%
	D	56 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	**This metric does not pertain to playas, vernal pools, or pool systems.**	

Tables and Figures: Playas

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

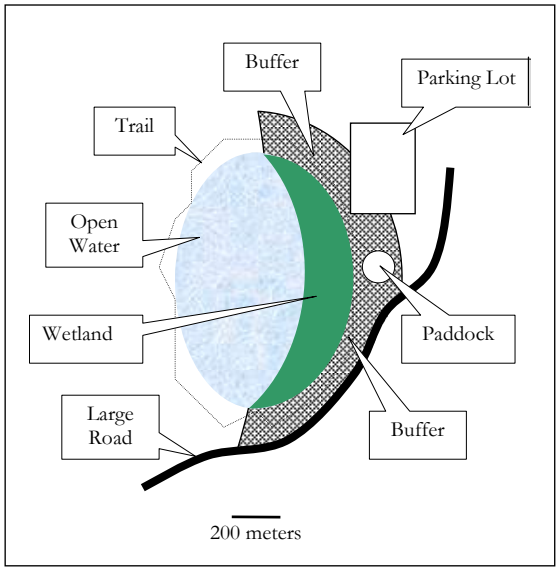


Figure 4.5a: Degrees of interspersion of plant zones for use in Table 4.20, except for Riverine, Estuarine, and Vernal Pool Wetland Classes (adapted from Mack, 2001). Each hatching pattern represents a distinct plant zone.

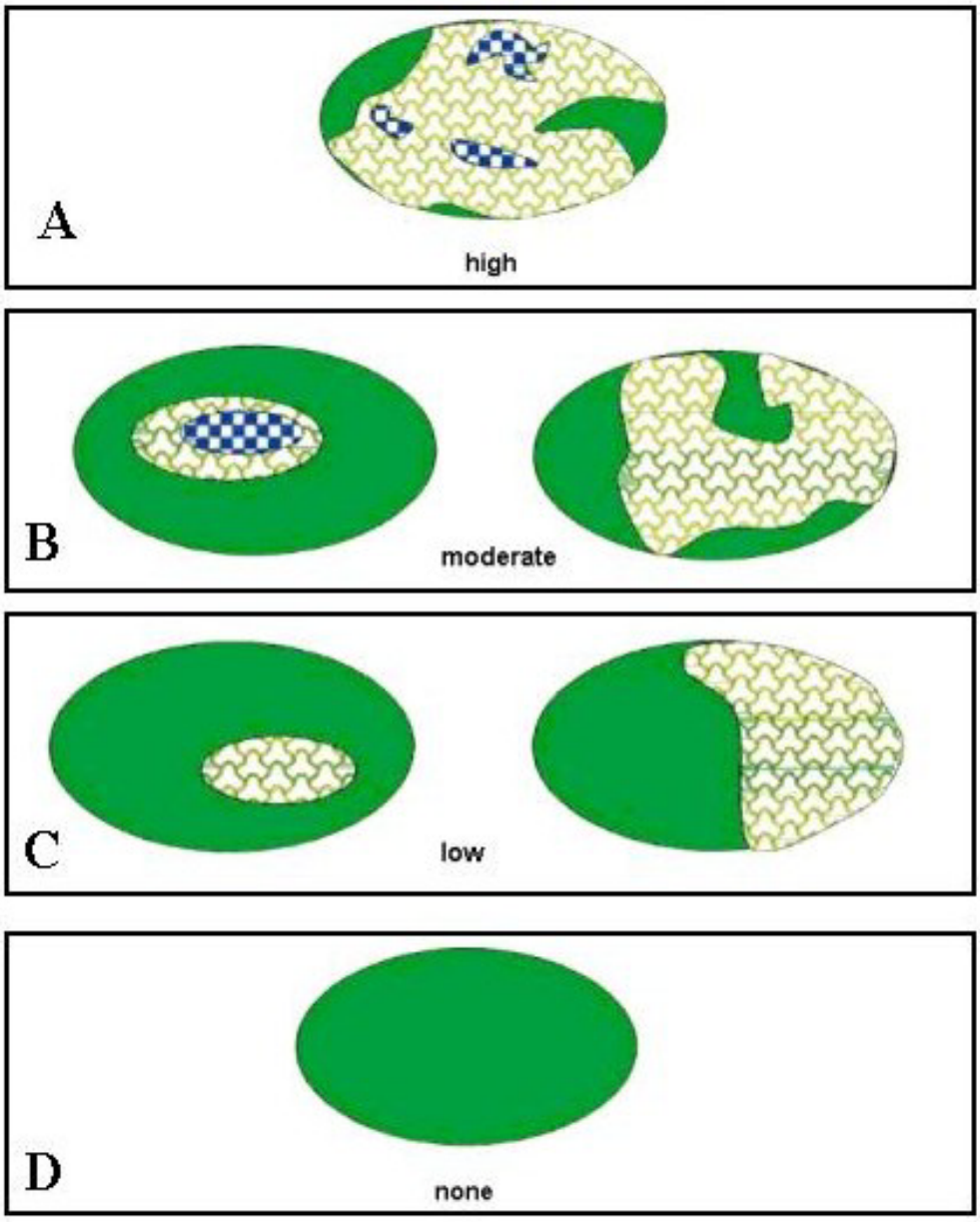


Table 4.7b: Appropriate landscape positions for each wetland class.

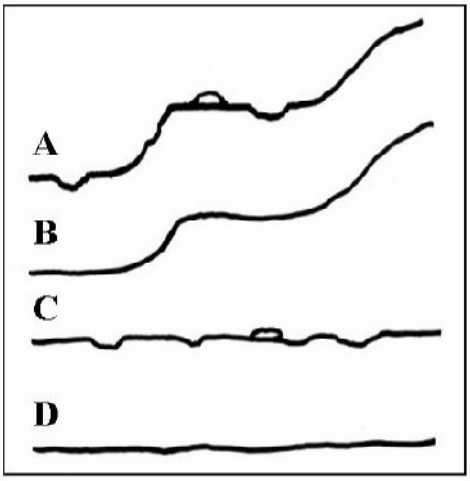
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Individual Vernal Pools

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Which best describes the hydrologic state of the wetland at the time of assessment?

□ ponded/inundated □ saturated soil, but no surface water □ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

□ long-duration □ medium-duration □ short-duration

Does the vernal pool or playa connect with the floodplain of a nearby stream? □ yes □ no

Is the topographic basin of the vernal pool or playa □ distinct **or** □ indistinct**?**

An *indistinct* topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas.

Scoring Sheet (see Table 3.8)

Assessment Name/No.:				**Date (m/d/y):**
	Office Score	**Raw Score**	**Final Score**	**Comments**
Buffer and Landscape Context				
Landscape Connectivity				
Percent of AA with Buffer				
Average Buffer Width				
Buffer Condition				
Buffer and Landscape Context Score				
Hydrology				
Water Source				
Hydroperiod or Channel Stability				
Hydrologic Connectivity				
Hydrology Score				
Physical Structure				
Structural Patch Richness				
Topographic Complexity				
Physical Structure Score				
Biotic Structure				
Organic Matter Accumulation				
Plant Community (*Average 3-4*)				
1. Number of Plant Layers Present				
2. Percent of Layers Dominated by Non-native Species				
3. Number of Co-dominant Species				
4. Percent of Co-dominant Species that are Non-native				
Interspersion and Zonation				
Vertical Biotic Structure				
Biotic Structure Score				
CRAM Score				
Photograph notes:				

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Individual Vernal Pools**
Minimum Patch Size	**1m²**
Swales on floodplain or along shoreline	
Pannes or pools on floodplain	
Islands (exposed at high-water stage)	
Unvegetated flats (sandflats, mudflats, gravel flats, etc.)	
Hummocks and/or sediment mounds	
Variegated foreshore overall (instead of broadly arcuate or essentially straight)	
Animal mounds and burrows	
Concentric or parallel high water marks	
Soil cracks	
Cobble and/or Boulders	
Total Possible	**10**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Co-dominant plant species in Individual Vernal Pools and Playas

List species that represent at least 10% of the absolute cover.					
Circle species that represent at least 50% of absolute cover:					
	Non-native?		**Non-native?**		**Non-native?**
Total number of co-dominant species across all pool strata					
Percent of total co-dominant species that are non-native					

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Individual Vernal Pools

WETLAND CLASS: Individual Vernal Pools		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Individual Vernal Pools (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown (e.g., without berms, dams, or ditches).
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural condition (or compared to comparable natural wetlands), but thereafter, the AA is subject to natural drawdown or drying.
	C	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Individual Vernal Pools (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 8 of the possible patch types are evident in the AA.
	B	6 – 7 of the possible patch types are evident in the AA.
	C	4 – 5 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Individual Vernal Pools (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The pools in the AA contain essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
	B	The pools or pool system in the AA are characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	C	The pools or pool system in the AA are characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	D	The pools or pool system in the AA are characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
Number of Plant Layers Present	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Percent of Layers Dominated by Non-native Species	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Number of Co-dominant Species (use Worksheet 3)	A	≥ 9 co-dominant species
	B	5 – 8 co-dominant species
	C	3 – 4 co-dominant species
	D	0 – 2 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 3)	A	0 – 15%
	B	16 – 35%
	C	36 – 55%
	D	56 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.

WETLAND CLASS: Individual Vernal Pools (cont'd)	
Vertical Biotic Structure	**This metric does not pertain to playas, vernal pools, or pool systems.**

Tables and Figures: Individual Vernal Pools

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).

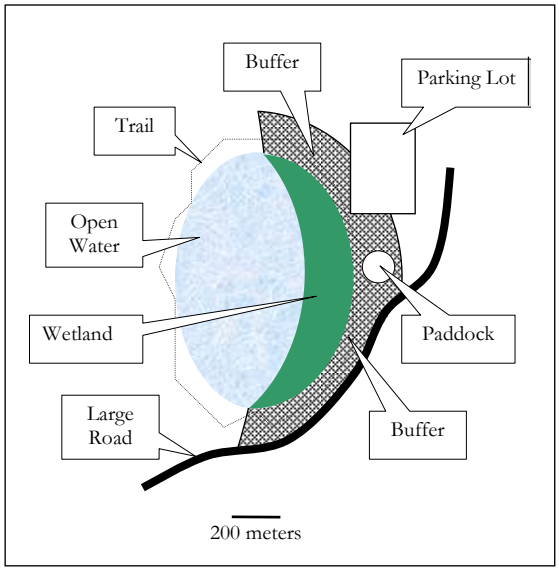


Figure 4.5b: Degrees of interspersion of plant zones for Individual Vernal Pools for use in Table 4.20 (adapted from Mack, 2001).

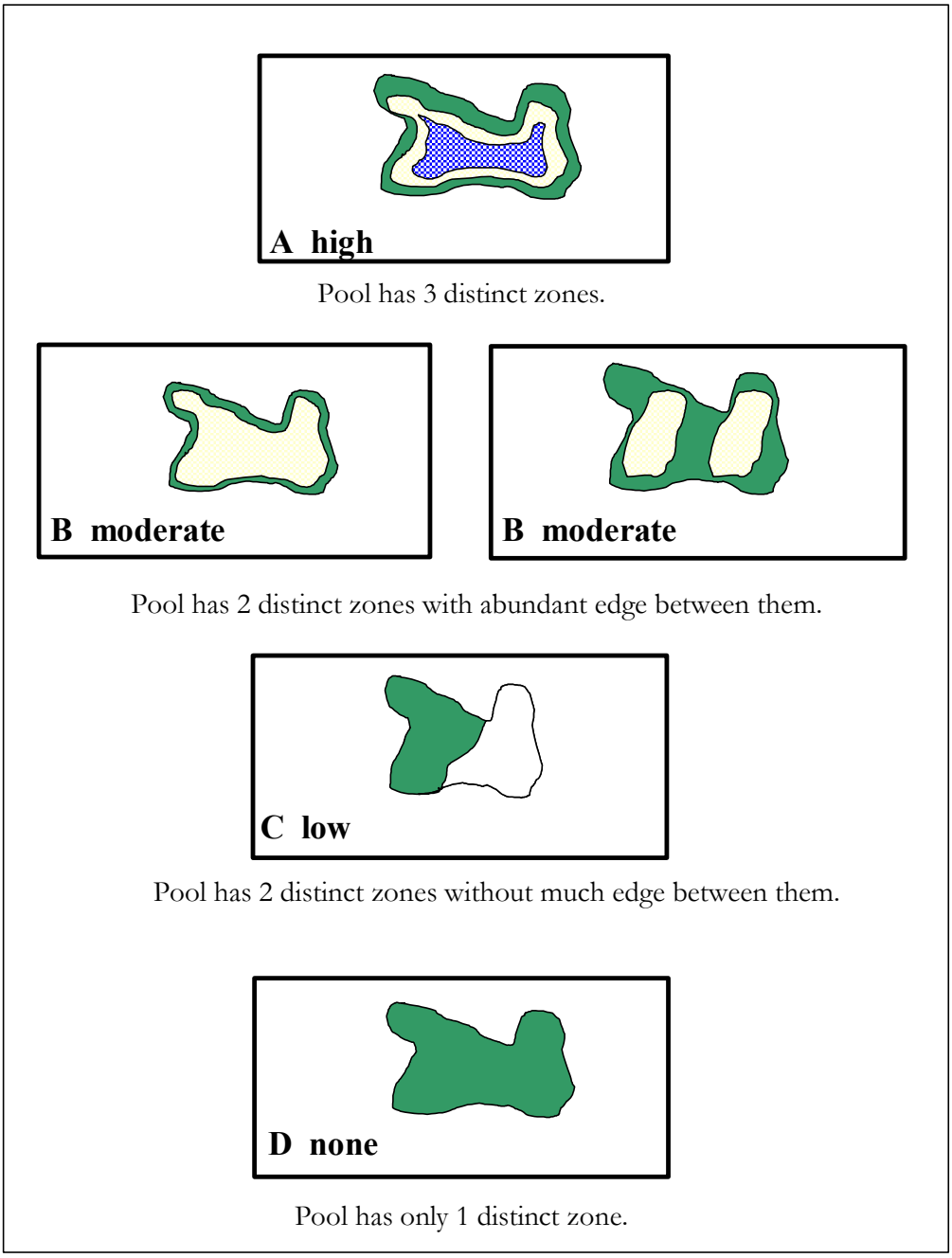


Table 4.7b: Appropriate landscape positions for each wetland class.

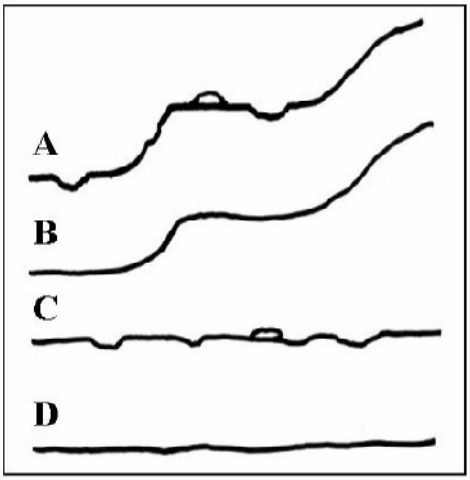
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.

Assessment Form: Vernal Pool Systems

Basic Information

Assessment Name				
Assessment No.	**Date (m/d/y)**			
Investigators				
County	**Assessment Area Size (ha)**			
GPS Coordinates of center of AA (as NAD 83 lat./lon.)				
□ **Restoration** □ **Mitigation** □ **Impacted** □ **Other**				

Note: Shaded fields will be populated when data are uploaded via CRAM-IT software.

Which best describes the hydrologic state of the wetland at the time of assessment?

□ ponded/inundated □ saturated soil, but no surface water □ dry

What is the apparent hydrologic regime of the wetland?

Long-duration depressional wetlands are defined as supporting surface water for > 9 months of the year (in > 5 out of 10 years.) *Medium-duration* depressional wetlands are defined as supporting surface water for between 4 and 9 months of the year. *Short-duration* wetlands possess surface water between 2 weeks and 4 months of the year.

□ long-duration □ medium-duration □ short-duration

Does the vernal pool or playa connect with the floodplain of a nearby stream?

□ yes □ no

Is the topographic basin of the vernal pool or playa □ distinct **or** □ indistinct**?**

An *indistinct* topographic basin is one that lacks obvious boundaries between wetland and upland. Examples of such features are seasonal, depressional wetlands in very low-gradient landscapes, such as vernal pool complexes and large wet meadows, which may be intricately interspersed with uplands or seemingly homogeneous over very large areas.

Scoring Sheet (see Table 3.8)

Assessment Name/No.										**Date (m/d/y)**					
	Office Score	**Field Score**													**Comments**
		Small Pools				**Large Pools**				**Pool Clusters**				**Average of strata**	
		1	**2**	**3**	**Avg.**	**1**	**2**	**3**	**Avg.**	**1**	**2**	**3**	**Avg.**		
Buffer and Landscape Context															
Landscape Connectivity															
Percent of AA with Buffer															
Average Buffer Width															
Buffer Condition															
Buffer and Landscape Context Score															
Hydrology															
Water Source															
Hydroperiod or Channel Stability															
Hydrologic Connectivity															
Hydrology Score															
Physical Structure															
Structural Patch Richness															
Topographic Complexity															
Physical Structure Score															
Biotic Structure															
Organic Matter Accumulation															
Plant Community (*Average 3-4*)															
1. Number of Plant Layers Present															
2. Percent of Layers Dominated by Non-native Species															
3. Number of Co-dominant Species															
4. Percent of Co-dominant Species that are Non-native															
Interspersion and Zonation															
Vertical Biotic Structure															
CRAM Score															
Photograph notes:															

Worksheet 1: Calculating average buffer width

Estimate average buffer width of AA in each of its quadrants and average for scoring.

Buffer Quadrant	Buffer Width in Meters
Quadrant 1	
Quadrant 2	
Quadrant 3	
Quadrant 4	
Average buffer width	

Worksheet 2: Structural Patch Types

STRUCTURAL PATCH TYPE (check for presence)	**Vernal Pool Systems**
Small individual pools	
Large individual pools	
Small swales	
Large swales	
Pool clusters (more than 1 pool cluster)	
Drainage branches (more than 1 drainage branch)	
Round or oval pools	
Convoluted-shaped pools	
Mounds	
Bare soil	
Total Possible	**10**
No. Observed Patch Types	

Worksheet 3: Plant Community Metric - Co-dominant plant species in Vernal Pool Systems

List species that represent at least 10% of the absolute cover.					
Circle species that represent at least 50% of absolute cover:					
Small Pools Stratum	**Non-native?**	**Large Pools Stratum**	**Non-native?**	**Pool Clusters Stratum**	**Non-native?**
Total number of co-dominant species across all pool strata					
Percent of total co-dominant species that are non-native					

Stressor Checklist Worksheets

HYDROLOGY	**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		

PHYSICAL STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)		
Heavy metal impaired (PS or Non-PS pollution)		
Pesticides or trace organics impaired (PS or Non-PS pollution)		
Bacteria and pathogens impaired (PS or Non-PS pollution)		
Trash or refuse		
Comments		

Stressor Checklist Worksheets (cont'd)

BIOTIC STRUCTURE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Evidence of fire		
Evidence of flood		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of appropriate treatment of invasive plant species adjacent to AA or buffer		
Comments		

ADJACENT LAND USE	**Present and likely to have negative effect on AA**	**Significant negative effect on AA**
Urban residential		
Industrial/commercial		
Military training/Air traffic		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)		
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)		
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

Narratives: Vernal Pool Systems

WETLAND CLASS: Vernal Pool Systems		
BUFFER and LANDSCAPE CONTEXT		
Landscape Connectivity	A	At least some portion of three or more other areas of water-dependent habitat (other wetlands of the same class, wetlands of different classes, lakes, streams, lagoons, etc.) exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement (see Table 4.3).
	B	At least some portion of two areas of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	C	At least some portion of one other area of water-dependent habitat exists within a 500 m zone surrounding the wetland being assessed, with no intervening barriers to wildlife movement.
	D	The 500 m zone surrounding the wetland does not contain any other areas of water-dependent habitat.
Percent of AA with Buffer	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.
Average Buffer Width (use Worksheet 1)	A	Average buffer width of AA is ≥ 200 m.
	B	Average buffer width of AA is 100 – 199 m.
	C	Average buffer width of AA is 50 – 99 m.
	D	Average buffer width of AA is 0 - 49 m.
Buffer Condition	A	Buffer for AA is characterized by abundant native vegetation and little to no cover of non-native plants, with intact soils, and little or no trash or refuse.
	B	Buffer for AA is characterized by moderate cover of native vegetation, moderate cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
	C	Buffer for AA is characterized by a prevalence of non-native plants, and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
	D	Buffer for AA is characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation; OR there is no buffer present.

WETLAND CLASS: Vernal Pool Systems (cont'd)		
HYDROLOGY		
Water Source	A	Dry-season freshwater source for AA is precipitation, groundwater, and/or natural runoff, or an adjacent freshwater body, or system naturally lacks water in the dry season. There is no indication of direct artificial water sources. Land use in the local drainage area of the AA is primarily open space or low density, passive uses. No large point sources discharge into or adjacent to the AA.
	B	Dry-season freshwater source is mostly natural, but AA directly receives occasional or small amounts of inflow from anthropogenic sources. Indications of anthropogenic input include developed land or irrigated agricultural land (< 20%) in the immediate drainage area of the AA, or the presence of small stormdrains or other local discharges emptying into the AA, or the presence of scattered homes along the wetland that probably have septic systems. No large point sources discharge into or adjacent to the AA.
	C	Dry-season freshwater source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology. Indications of substantial artificial hydrology include > 20% developed or irrigated agricultural land adjacent to the AA, and the presence of major point sources that discharge into or adjacent to the AA. OR Dry season freshwater flow exists but has been substantially diminished by known diversions of water or other withdrawals directly from the AA, its encompassing wetland, or from areas adjacent to the AA or its wetland.
	D	Natural, dry-season or end-of-wet-season sources of freshwater have been eliminated based on the following indicators: observable diversion of all dry-season flow, etc., and predominance of xeric vegetation (see Table 4.7b).
Hydroperiod or Channel Stability	A	Hydroperiod of the AA is characterized by natural patterns of filling or inundation and drying or drawdown (e.g., without berms, dams, or ditches).
	B	The filling or inundation patterns in the AA are of greater magnitude or duration than would be expected under natural condition (or compared to comparable natural wetlands), but thereafter, the AA is subject to natural drawdown or drying.
	C	Both the filling/inundation and drawdown/drying of the AA deviate from natural conditions (either increased or decreased in magnitude and/or duration).

WETLAND CLASS: Vernal Pool Systems (cont'd)		
Hydrologic Connectivity	A	Rising water in the AA has unrestricted access to adjacent upland, without levees, excessively high banks, artificial walls, or other obstructions to the lateral movement of flood flows.
	B	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, but less than 50% of the AA is restricted by barriers to drainage. Restrictions may be intermittent along the AA, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	C	Lateral excursion of rising waters in the AA is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the AA is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.
	D	All water stages in the AA are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
PHYSICAL STRUCTURE		
Structural Patch Richness (use Worksheet 2)	A	≥ 8 of the possible patch types are evident in the AA.
	B	6 – 7 of the possible patch types are evident in the AA.
	C	4 – 5 of the possible patch types are evident in the AA.
	D	≤ 3 of the possible patch types are evident in the AA.
Topographic Complexity	A	AA as viewed along cross-sections has a variety of slopes, or elevations, that are characterized by different moisture gradients. Each sub-slope contains physical patch types or features that contribute to irregularity in height, edges, or surface of the AA and to complex topography overall.
	B	AA has a variety of slopes, or elevations, that are characterized by different moisture gradients; however, each sub-slope lacks many physical patch types, such that the slopes or elevation zones tend to be regular and uniform.
	C	AA has a single, uniform slope or elevation. However that slope, or elevation, has a variety of physical patch types.
	D	AA has a single, uniform slope, or elevation, with few physical patch types.

WETLAND CLASS: Vernal Pool Systems (cont'd)		
BIOTIC STRUCTURE		
Organic Matter Accumulation	A	The pools in the AA contain essentially no significant amounts of coarse plant debris, and only scant amounts of fine debris.
	B	The pools or pool system in the AA are characterized by occasional small amounts of coarse organic debris, such as leaf litter or thatch, with only traces of fine debris, and with little evidence of organic matter recruitment.
	C	The pools or pool system in the AA are characterized by a moderate amount of fine organic matter in a patchy distribution. There is some matter of various sizes, but new materials seem much more prevalent than old materials. Litter layers, duff layers, and leaf piles in pools or topographic lows are thin.
	D	The pools or pool system in the AA are characterized by an abundance of fine organic matter in topographic lows, along high-water shorelines, and across vegetated plains. There is a range of kinds of organic matter representing all the visible stages of processing, from whole plant parts to fine detritus.
Number of Plant Layers Present	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Percent of Layers Dominated by Non-native Species	**This metric does not pertain to playas, vernal pools, or pool systems.**	
Number of Co-dominant Species (use Worksheet 3)	A	≥ 9 co-dominant species
	B	5 – 8 co-dominant species
	C	3 – 4 co-dominant species
	D	0 – 2 co-dominant species
Percent of Co-dominant Species that are Non-native (use Worksheet 3)	A	0 – 15%
	B	16 – 35%
	C	36 – 55%
	D	56 – 100%
Interspersion and Zonation	A	Wetland has a high degree of plan-view interspersion.
	B	Wetland has a moderate degree of plan-view interspersion.
	C	Wetland has a low degree of plan-view interspersion.
	D	Wetland has essentially no plan-view interspersion.
Vertical Biotic Structure	**This metric does not pertain to playas, vernal pools, or pool systems.**	

Tables and Figures: Vernal Pool Systems

(Note: Table and figure numbers are taken from the CRAM User's Manual 4.2.3.)

Table 3.8: Steps to calculate attribute and site scores.

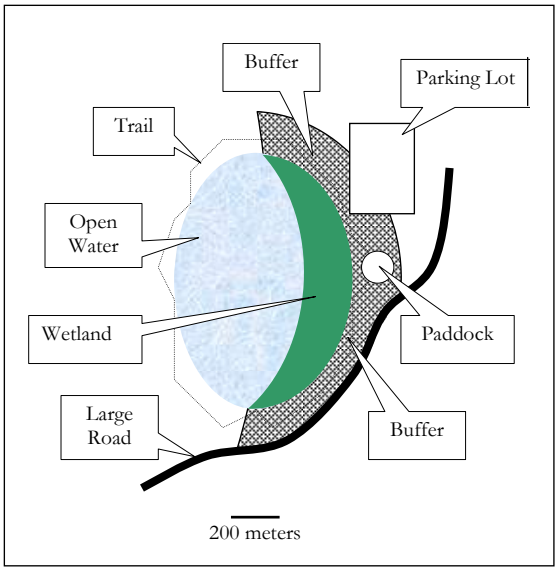
Steps to Calculate Attribute and Site Scores	
Step 1: Calculate Metric Score	For each metric, convert the letter score into the corresponding numeric score, depending on the number of possible alternative states. For metrics with 4 alternative states, use A=12, B=9, C=6, and D=3. For metrics with 3 alternative states, use A=12, B=8, and C=4.
Step 2: Calculate raw Attribute Score	For each attribute, calculate the raw attribute score as the sum of the numeric scores of the component metrics, except for Buffer and Landscape Context (see formula below).
Step 3: Calculate final Attribute Score	For each attribute, divide the raw score by the maximum possible score, which is 24 for Buffer and Landscape Context, 36 for Hydrology, 24 for Physical Structure, 36 for Biotic Structure for Playas and Vernal Pools, and 48 for Biotic Structure for all other wetland classes.
Step 4: Calculate the Overall Site Score	For each site, calculate the percentage of the maximum possible score by averaging the final attribute scores. Round the average to the nearest whole value.

Formula for calculating the Buffer and Landscape Context Attribute Score:

$$\left[\left[\text{Buffer Condition} \times \left(\text{\% AA with Buffer} \times \text{Average Buffer Width}\right)^{1/2}\right]^{1/2} + \text{Landscape Connectivity}\right]$$

Table 4.3: Guidelines for identifying wetland buffers and breaks in buffers.

Examples of Land Covers Included in Buffers	Examples of Land Covers That are Excluded from Buffers - Buffers Do Not Cross These Land Covers
natural upland habitats and plant communities, roads not hazardous to wildlife, railroads, vegetated levees, mowed grass or greenbelts, swales and ditches, foot trails, horse trails, bike trails, pastures subject to open range grazing pressure, dry-land farming areas	parking lots; commercial developments; residential areas; very active roadways and pedestrian/bike trails (i.e., nearly constant traffic); intensive agriculture/orchards or silviculture, pastures subject to heavy grazing pressure (e.g., horse paddock, feedlot, turkey ranch); large paved roads (two lanes plus a turning lane or larger); sound walls; fences that interfere with the movements of water, sediment, or wildlife species that are critical to the overall functions of the wetland; open water (see Section 4.1.2 part D).



Examples of vernal pool system patch types that appear at the landscape scale.

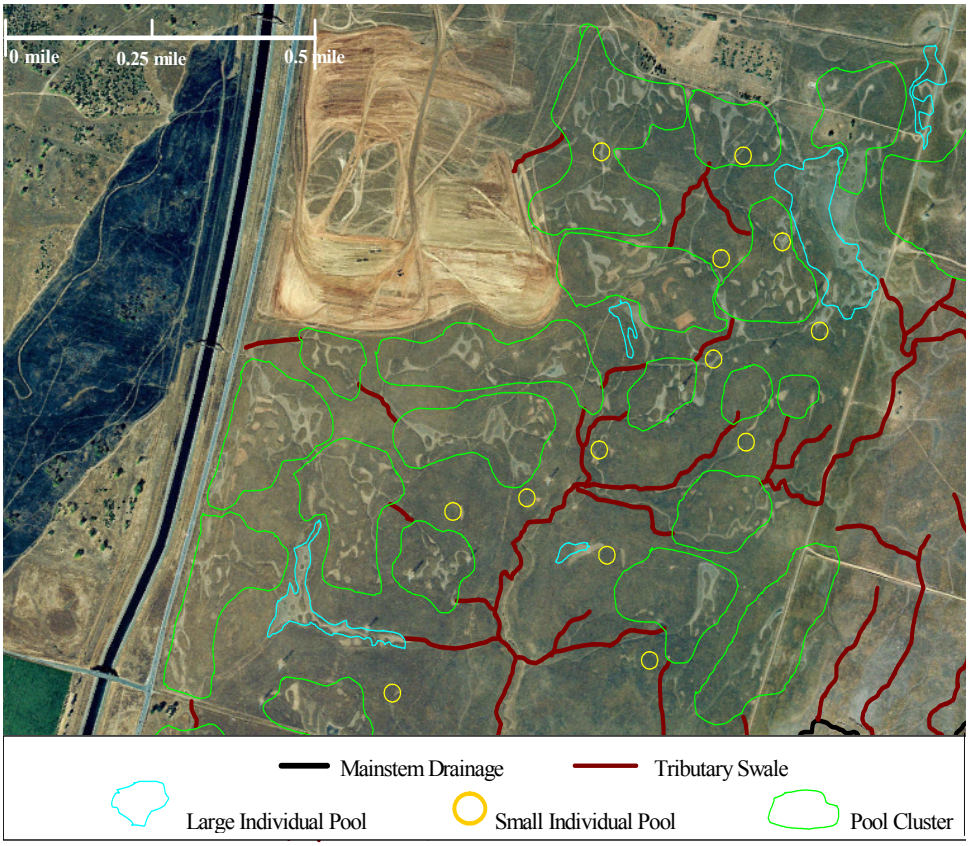
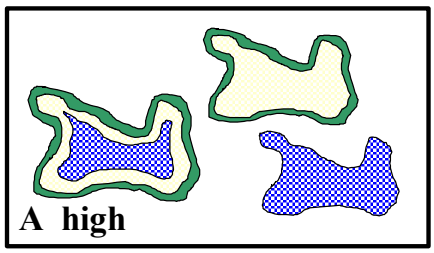
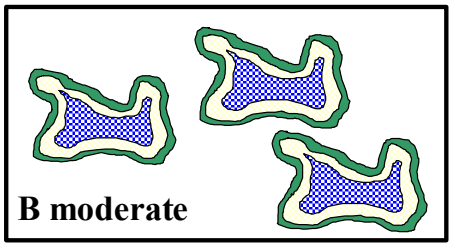


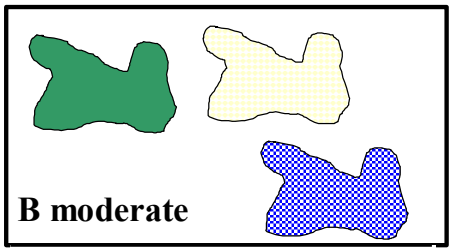
Figure 4.5c: Degrees of interspersion of plant zones for Vernal Pool Systems for use in Table 4.20.



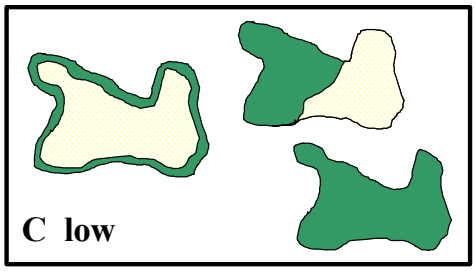
Most have 2 zones, a few have 3 zones, and a few have 1 zone.



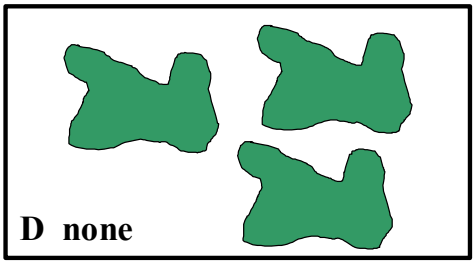
Most or all have 3 zones.



Most have 1 zone, but the zones in different pools represent different types of cover.



Most have 2 zones or some have 1 zone.



Most or all have 1 zone.

Table 4.7b: Appropriate landscape positions for each wetland class.

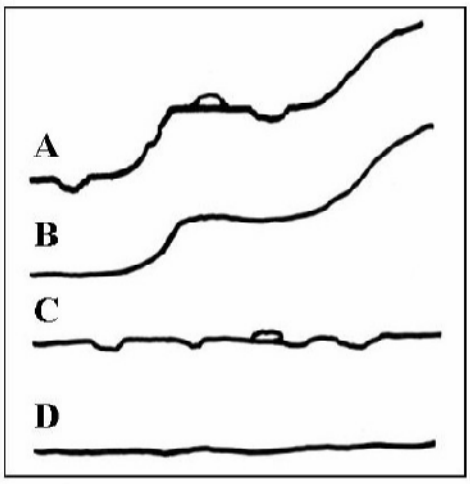
Wetland Type	Natural Landscape Position	Unnatural Landscape Position
Riverine/Riparian Wetlands	Along valley bottoms and canyon bottoms with at least seasonal channelized flow.	Along unnatural channels (e.g., abandoned paleo-channels, flumes, agricultural ditches and canals) across hillslopes benches, or terraces above the elevation of the flood-prone area.
Depressional and Lacustrine Wetlands, Vernal Pools, Playas	Topographic low points in basins, on natural topographic saddles, or on bedrock or other impermeable substrate. The basins may be distinct or diffuse and subtle.	At elevations above the topographic low point of a basin, on hillslopes or high ground lacking adequate catchment and runoff such that water in dry season must be pumped in order to reach the AA.
Slope Wetlands	Along the bases or middle reaches of hillslopes or dunes, typically at breaks in the slope, transitions between one slope and another, or at contacts between geological strata.	In flat, "mesa-like" areas or along tops of hills or ridges where water in the dry season must be pumped in order to reach the AA.
Estuarine Wetlands and Coastal Lagoon Wetlands	At the terminus of watersheds or coastal catchments, in the transition zone between tidal and freshwater areas, at or near sea level.	At elevations or positions in the watershed upstream, above, or below local intertidal elevations.

Table 4.10: Field Indicators of Altered Hydroperiod for Depressional, Lacustrine, Playas, Slope Wetlands, Individual Vernal Pools, and Vernal Pool Systems.

Direct Engineering Evidence	Indirect Ecological Evidence
Reduced Extent and Duration of Inundation or Saturation	
Upstream spring boxes, diversions, impoundments, pumps, ditching or draining ***from*** the wetland	Evidence of aquatic wildlife mortality Encroachment of terrestrial vegetation Stress or mortality of hydrophytes Compressed or reduced plant zonation
Increased Extent and Duration of Inundation or Saturation	
Berms, dikes, or other water-control features that increase duration of ponding: pumps, diversions, ditching or draining ***into*** the wetland	Late-season vitality of annual vegetation Recently drowned riparian or terrestrial vegetation Extensive fine-grain deposits on the wetland margins

Table 4.16: Typical Indicators of Topographic Complexity For Each Wetland Class.

Class	Examples of Topographic Features
Riverine	pools, runs, glides, pits, ponds, hummocks, bars, debris jams
Depressional and Playas	pools, islands, bars, mounds or hummocks, variegated shorelines
Estuarine	islands, bars, pannes, natural levees, shellfish beds, hummocks, slump blocks
Lacustrine	islands, bars, boulders, cliffs, benches, variegated shorelines
Slope Wetlands	pools, hummocks, burrows, changes in slope of the wetland surface
Lagoons	channels large and small, natural levees, pannes, potholes, dunes
Vernal Pools and Pool Systems	soil cracks, mounds, rivulets between pools or along swales, cobble



Scale-independent schematic profiles of wetlands in cross-section showing decreasing degrees of Topographic Complexity from A through D.