New Mexico Rapid Assessment Method (NMRAM) for Riverine Wetlands Introduction

2013

New Mexico Environment Department
Surface Water Quality Bureau
Wetlands Program

Natural Heritage New Mexico
Museum of Southwest Biology
University of New Mexico

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NMRAM Introduction

Day 1

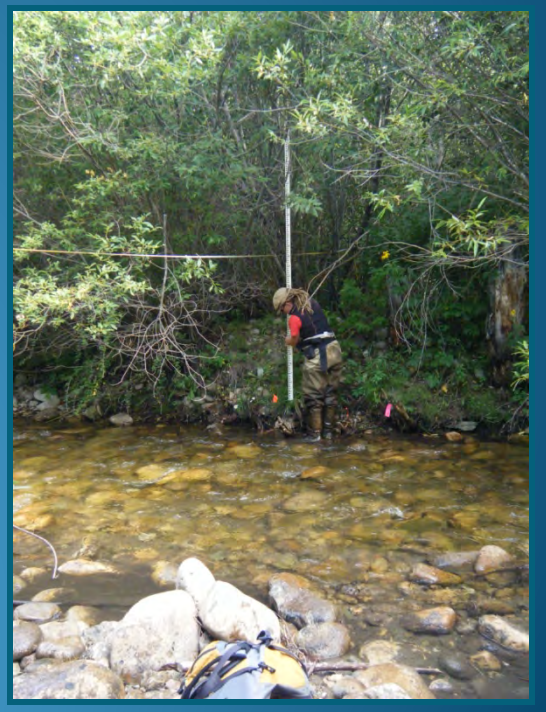
Overview NMRAM purpose, history, and process

Introduction to Attributes and Metrics

- Landscape Context (4)
- Size (1)
- Biotic (5)
- Abiotic (5)

Day 2

- Field site: Rio Grande



Wetlands Assessment Objectives

- Baseline assessments of types, function, condition, quantity, distribution, quality, and overall status.
- Use in conservation planning and mitigation
- Identify stressors and threats to wetlands
- Part of a long-term comprehensive wetlands monitoring program to facilitate adaptive management.
- Coordinate wetland activities among stakeholders using a common framework

The Tiered Approach to Wetland Assessment

Level 1 – Landscape Assessment – evaluation of surrounding watershed and landscape condition

Level 2 – Rapid Assessment Methods - using field indicators to evaluate condition - characterization of stressors that limit wetland functions and ecological integrity

Level 3 - Intensive Site Assessment – higher resolution assessment methods for priority issues and to verify rapid assessment methods

NMRAM combines Level 1 and 2 assessment me

Level 1 Assessment

- Use Imagery or existing maps and data
  - Arial photography
  - Satellite imagery
  - Soils
  - Geology
  - Vegetation
  - Hydrology
  - Land use
  - Impacts
- Create new maps or data from assessment of imagery and existing maps for use in planning or level 2 and 3 assessments
- Primarily non-field

Level 3 Assessment

- Direct measurement of physical and biologic system components
  - Water chemistry
  - Soil description, classification, and chemistry
  - Water flow
  - Weather conditions
  - Vegetation composition and structure
  - Animal presence and density
- Quantitative data, often requires repeat measurement over time and statistical analysis to assess trends
- Most objective level of assessment and sensitive to smaller changes in condition
- Data collection and analysis requires trained technical staff
- Significant field component

What is a Rapid Assessment?

Evaluate wetland status using a suite of metrics based on landscape and observable field indicators of ecological conditions and processes.

Three basic principles:

1) assessments are of current conditions along a disturbance gradient of condition within a given type of wetland.

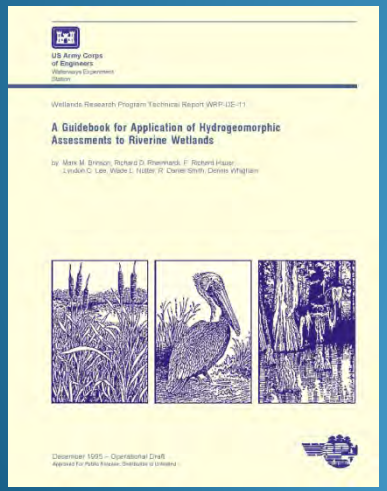
2) the method is rapid such that two people can complete a field assessment at site and the data analysis in one day

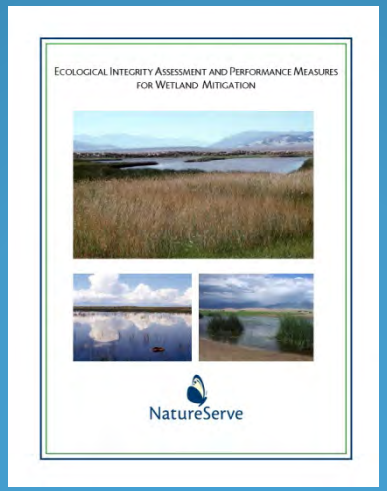
3) the assessment is based primarily on observed field conditions within a specified area.

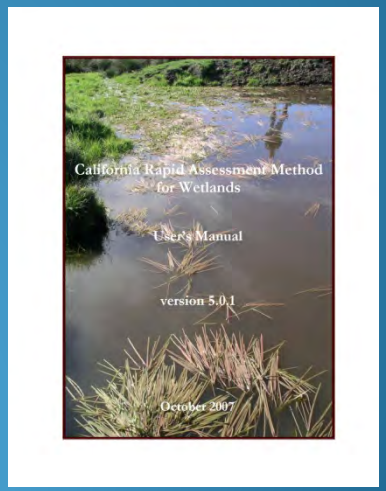
(Fennessy et al. 2004).

Assessment methods fall into two broad categories:

- Functional approach, e.g., Hydrogeomorphic Assessments (HGM)
  - Focus is on measuring factors related to ecological processes, and outcomes in terms of ecosystem services.
- Condition approach, e.g., Ecological Integrity Assessment (EIA)
  - Actual conditions reflect functionality and the integrity of an ecosystem indicates ability to carry out various ecosystem services.
- California Rapid Assessment Method (CRAM) is a bit of both, but streamlined.
- ALL are semi-quantitative that rely on various remotely sensed and field indicators to assess status of wetland.







The NMRAM takes from CRAM, EIA, and HGM, but is primarily condition-based and uses:

- A set of observable landscape and field metrics to express the condition of a particular wetland site relative to:
  - wetlands of a similar type (Subclass)
  - other sites on a disturbance gradient (Reference Set)
  - a given area (Reference Domain)

- Underlying assumptions that wetland condition:
  - will vary from most pristine to highly degraded along the disturbance gradient,
  - can be evaluated and rated in a meaningful way based on the preponderance evidence provided by the set of metrics.
  - reflects ecosystem function and integrity.

What is NMRAM

- NMRAM is a Rapid Assessment Method for Riverine Wetlands in New Mexico (currently developed for the montane riverine wetlands in the Upper Rio Grande watershed, and in development for both montane and lowland riverine wetlands of the Gila watershed)

- NMRAM is for Riparian Wetlands
  - Includes both jurisdictional and non-jurisdictional wetlands
  - Riparian wetlands can be included in the NMRAM based on:
    - Physical
    - Hydrologic and/or
    - Biotic factors
  - Wetlands must be excluded from NMRAM if they are hydrologically or physically disconnected from riverine zone

Wetlands of a similar type

- HGM classification system:
  - Class: Riverine Wetlands

  - **Subclass: Montane Riverine Floodplain Wetlands**
    - moderate gradient (1-4%)
    - middle elevation reaches (6,000 to 8,500 ft)
    - small and mid-order streams (channel width 2 to 10 m)
    - floodplain at least 80 m wide (unconfined)
    - montane riparian vegetation: narrowleaf cottonwood, box elder, thinleaf alder, bluestem willow, water sedge, etc.

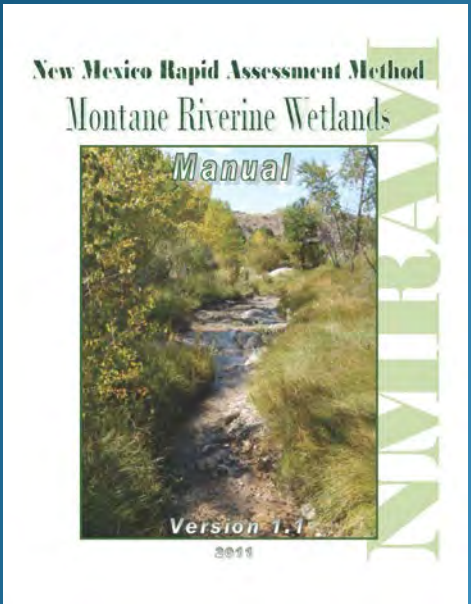
NMRAM Condition Score

- Wetland condition score
  - A = 4
  - B = 3
  - C = 2
  - D = 1
- Four big boxes
  - More robust
  - Less sensitive
  - Aids in rapidity

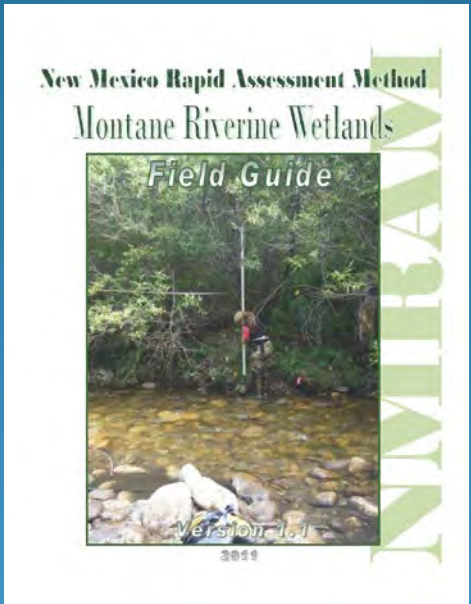
AA WETLAND CONDITION RANK			=
Rank	Score	Description	
A	3.25–4.0	Excellent condition	
B	2.5–3.25	Good condition	
C	1.75–2.5	Fair condition	
D	1.0–1.75	Poor condition	

NMRAM Handbooks

Manual



Field Guide



Appendix A Worksheets


New Mexico Rapid Assessment Method

Montane Riverine Wetlands

Field Guide Worksheets

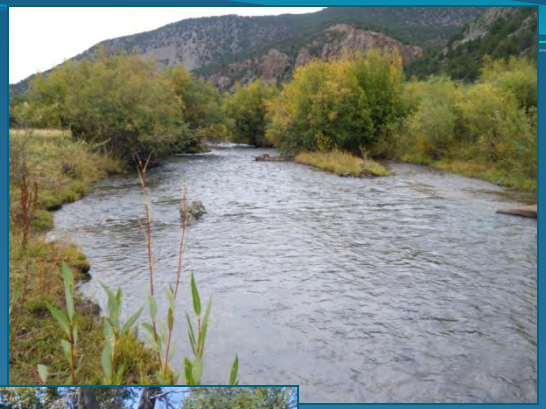
(Version 1.1)

As part of the New Mexico Rapid Assessment Method (NMRAM) Assessment Package, a suite of worksheets is provided which aids the evaluation of both Level 1 metrics (Landscape Context and Size) and the Level 2 field metrics (Biotic and Abiotic). The worksheets are designed not only to gather the assessment data efficiently from a geographic information system (GIS) and in the field, but also to aid in the computation of final weighted ratings and ranks using the Rank Calculator Worksheet in Appendix B and the companion Excel spreadsheet provided in the Electronic Addendum.

The first sheet is the Wetland of Interest (WOI) Cover Worksheet that is used to track the assessment for an entire WOI. For each assessment area (AA) within a WOI, separate sets of worksheets are completed and used in the Rank Calculator. Two metrics, Size and Relative Wetland Site (which relies on a measure of the historical wetland size) are evaluated for the entire WOI and are applied to all subsequent AA ratings. Worksheets are sorted by major attribute (Landscape Context, Biotic, and Abiotic metrics) with brief instructions for each metric and linkages to Rank Calculator Worksheet in Appendix B. In addition, for each metric worksheet, there is a corresponding page reference to the more detailed Field Guide (FG page number). Those worksheet items that require field data are indicated by [FIELD]. Others are optional calculations in the field that may be done prior to and after going to the field (we recommend rating as many metrics as possible while in the field).

Appendix B >

Available for download from the New Mexico Environment Department Surface Water Quality Bureau Wetlands Program website at http://www.nmenv.state.nm.us/swqb/Wetlands/NMRAM/



New Mexico Rapid Assessment Method (NMRAM)

- NMRAM process involves a series of pre-field, field, and post-field tasks:

1. Identifying the target Wetland of Interest (WOI) in a landscape context
2. Defining and describing an Assessment Area (AA) within the WOI
3. GIS/Mapping analysis of landscape context metrics
4. Measuring a suite of biotic/abiotic metrics within and around the AA as part of a field reconnaissance survey
5. Summarizing and reporting the findings.

Identifying the target Wetland of Interest (WOI)

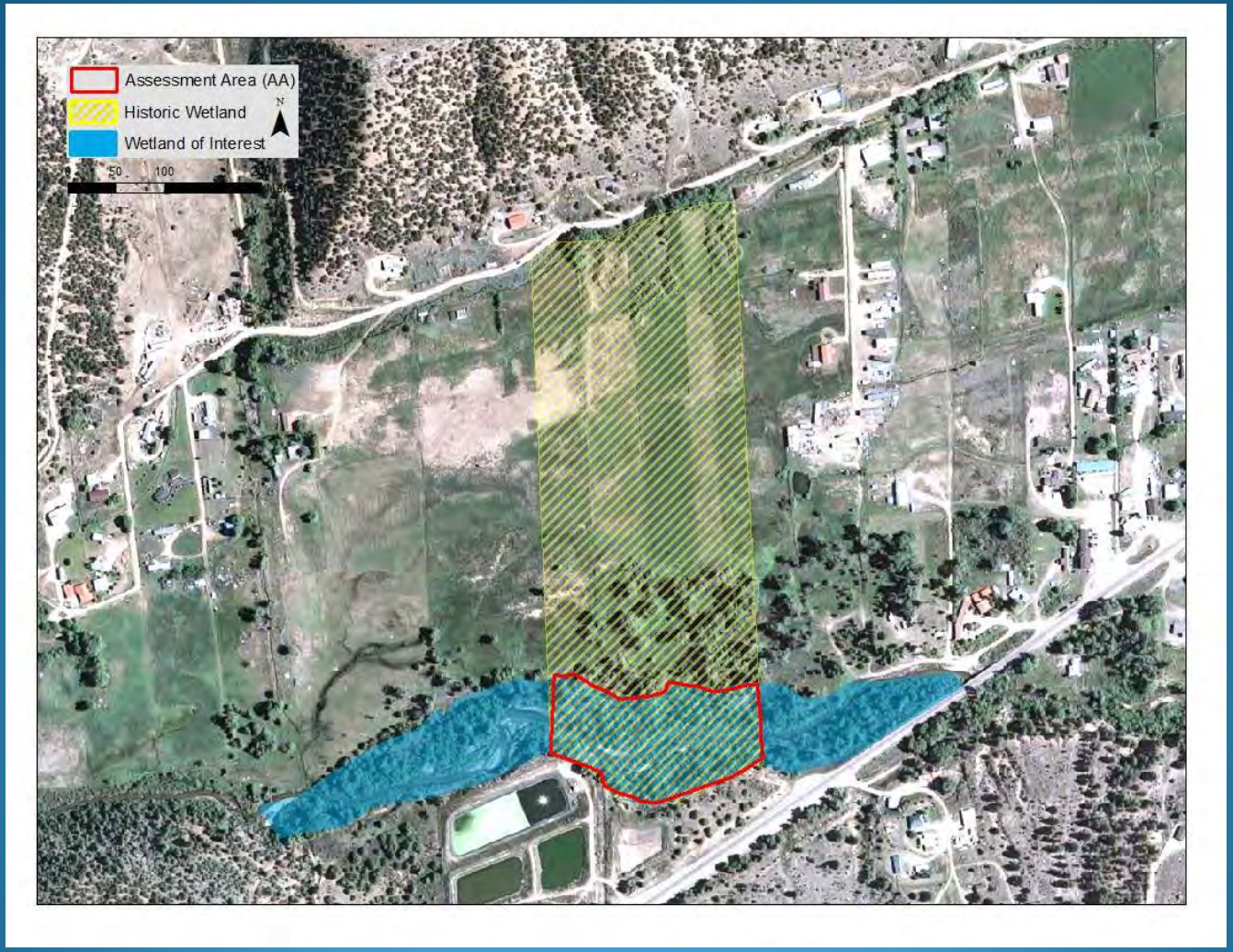
- There are no specific NMRAM rules for defining a WOI
  - May be project dependent or meeting legal requirements

Identifying the target Wetland of Interest (WOI)

- Alternative: "natural rule" that is expert driven
  - Contiguous area of natural wetland vegetation defined by breaks in continuity
  - i.e., significant gaps between natural vegetation and semi-natural vegetation, cultural vegetation, development, roads, etc.
- From existing maps or custom mapping as part of the assessment (1:6,000 scale)

Defining the Assessment Area (AA)

- Limits to lateral and linear extent



Introduction to the NMRAM Metrics

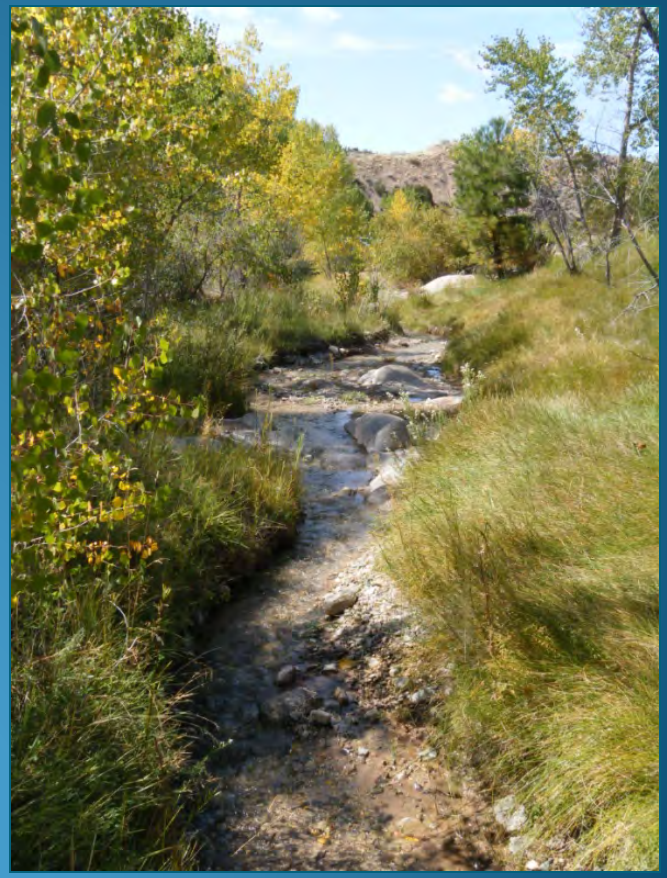
NMRAM Framework

- Attribute: attributes are the basic broad classes of wetland condition:
  - Size
  - Landscape context
  - Abiotic
    - Hydrology
    - Physical structure
  - Biotic

- Metric: a measureable component of an NMRAM attribute class

NMRAM Metrics

- Size Metric
  1. Absolute Wetland size
- Landscape Context Metrics
  1. Buffer Integrity Index
  2. Riparian Corridor Connectivity
  3. Relative Wetland Size
  4. Surrounding Land Use
- Biotic Metrics
  1. Relative Native Plant Community Composition
  2. Vegetation Horizontal Patch Structure
  3. Vegetation Vertical Structure
  4. Native Riparian Tree Regeneration
  5. Invasive Exotic Plant Species Cover
- Abiotic Metrics
  1. Hydrologic Connectivity
  2. Macrotopographic Complexity
  3. Channel Stability
  4. Stream Bank Stability and Cover
  5. Soil Surface Condition



Size Metric

1. Absolute wetland size

Landscape Context Metrics

1. Relative Wetland Size
2. Buffer Integrity Index
3. Riparian Corridor Connectivity
4. Surrounding Land Use

Absolute Wetland Size

- Current size of the WOI
  - Mapping and ground-based as necessary
- Size can be important for maintaining plant and animal populations and the overall biodiversity of a wetland.
- Larger wetlands tend to support more diverse mosaics of vegetation communities and micro-habitat features.
- More resistant to hydrologic stressors and land use impacts
- Larger wetlands may also afford more opportunities for restoration

Relative Wetland Size

- The degree of a wetland's alteration from its historical natural size (and condition) as a function of human-induced disturbances, particularly land-use conversions and major hydrological modifications

- Level 1 : mapping and ground-based as necessary

- Large reductions from potential indicate :
  - alteration to hydrology or ecosystem processes
  - ecological instability
  - reduced viability
  - and tendency to lose diversity in the future (stress)

- Wetland area potentially available for restoration

  - From EIA (Faber-Langendoen et al. 2008).

Historic wetland area

- Delineate the lateral extent of the historic floodplain
- Clip relative to the AA boundary
- Used in the Relative Wetland Size metric

Buffer Integrity Index

- Overall extent and condition of natural and semi-natural buffer in the 250 m zone immediately surrounding the AA .
- Level 1 and 2. GIS and ground-based
- Natural buffers provide functions and services for the WOI by:
  - reducing erosion and sedimentation
  - reducing nutrient loading
  - reducing pollutant contamination
  - and providing riparian and aquatic habitat

Comprised of 3 submetrics:

1. **Buffer %**
2. **Buffer Width**
3. **Buffer Condition.**

CRAM (Collins et al. 2006)

Buffer Integrity Index

- ***Buffer percent***: the percentage of the lateral area surrounding a wetland AA that is considered natural or semi-natural buffer
- ***Buffer Width*:** the average width of the extant buffer
- ***Buffer Condition:*** the extent and quality of buffer vegetation cover and the overall condition of its substrate in the extant buffer
  - Level 2 – ground based

Riparian Corridor Connectivity

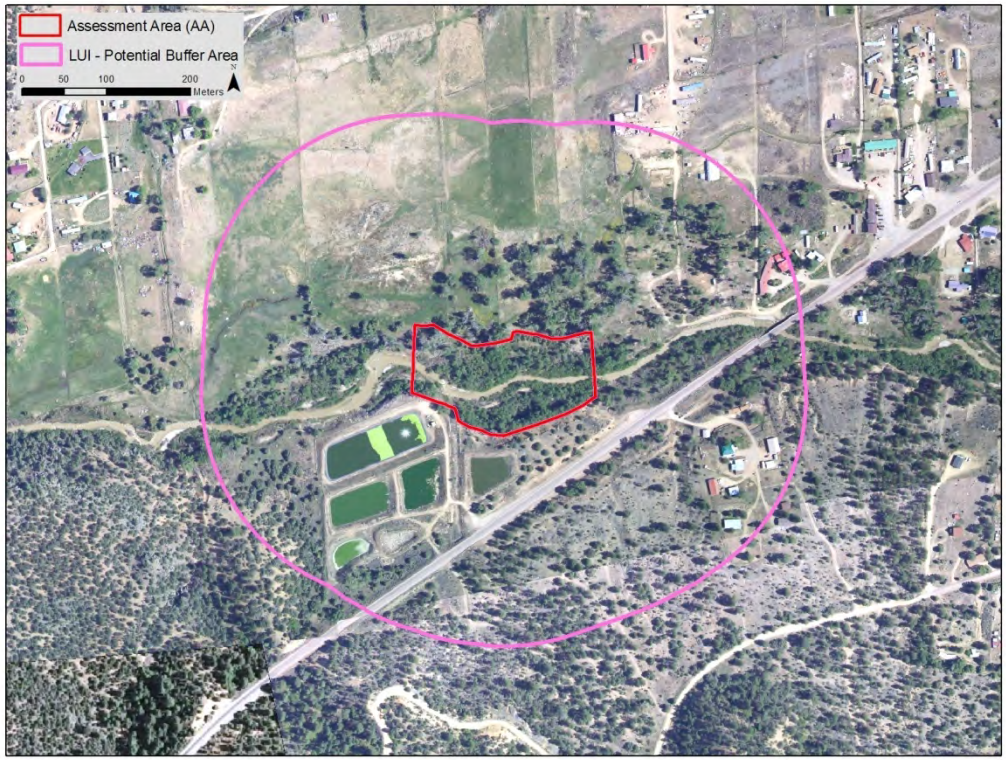
- Degree of connectivity of riparian corridor upstream and downstream of AA.
- Level 1: GIS and field verified.
- corridors allow uninterrupted movement of animals throughout the riparian zone as well as access to adjacent uplands (Gregory et al. 1991).

- corridors also allow for unimpeded movement of surface and overbank flow, critical for the distribution of sediments and nutrients as well as recharging local alluvial aquifers.

Adapted from CRAM (Collins et al. 2006)

Surrounding Land Use

- The extent and intensity of human-dominated land in the floodplain containing the WOI.
- Level 1: GIS and field verified.
- The intensity of human activity in the landscape has a proportionate impact to the ecological processes of natural ecosystems.



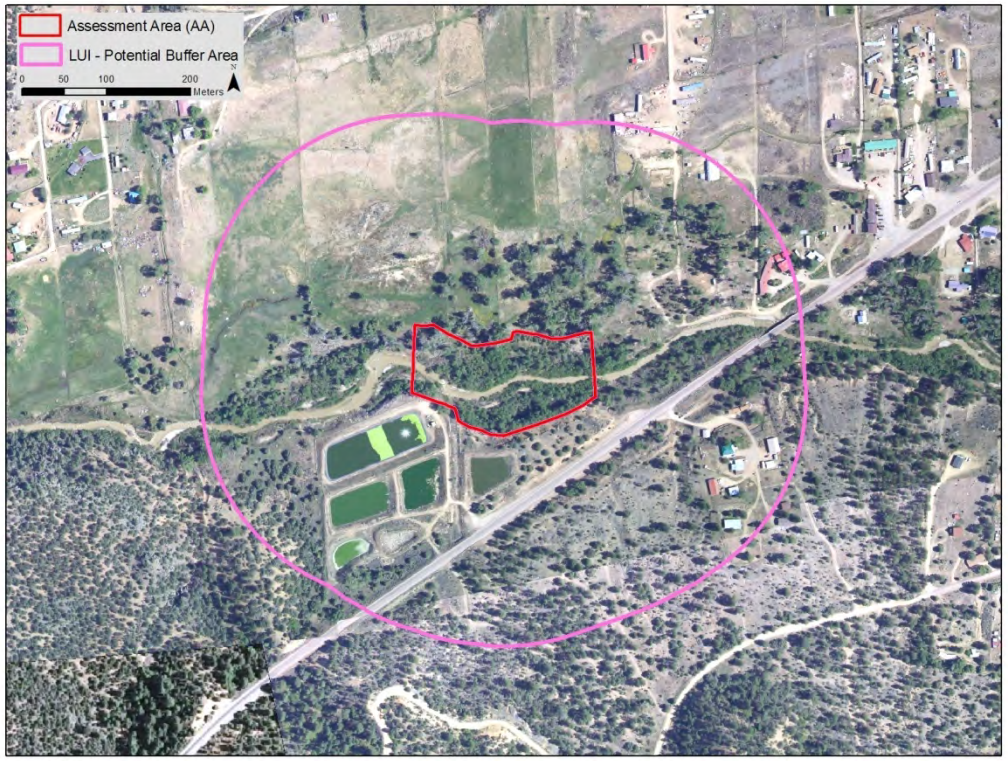
Adapted from CRAM (Collins et al. 2006)

Surrounding Land Use

- Measured using a Land Use Index (LUI) across the AA and within the potential buffer area.
- A suite of 20 land use types weighted by intensity of human disturbance and percentage area occupied.

- Dredging, borrow pits, abandoned mines, water-filled artificial impoundments (ponds and reservoirs) = 0.1 weighting

- Natural area/land managed for native vegetation – No agriculture/logging/development = 1.0 weighting.



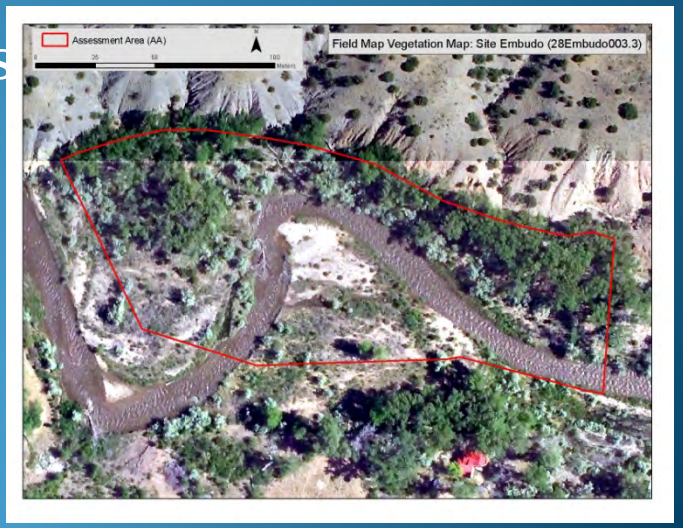
Adapted from Hauer et al. (2002)

Biotic Metrics

1. Relative Native Plant Community Composition
2. Vegetation Horizontal Patch Structure
3. Vegetation Vertical Structure
4. Invasive Exotic Plant Species Cover
5. Native Riparian Tree Regeneration

Field Reconnaissance and Mapping

- Field Reconnaissance
  - Map Vegetation Patches
    - Minimum map unit – 100 m/sq
  - Record patch relevant data for Biotic and some Abiotic metrics
  - Confirm Landscape level metrics
- Mapping for Biotic metrics
  - Map Vegetation Community Patches
  - Used for all Biotic metrics



Relative Native Plant Community Composition

- **Definition:** A measure of the abundance of native wetland vegetation communities versus exotic-dominated communities.

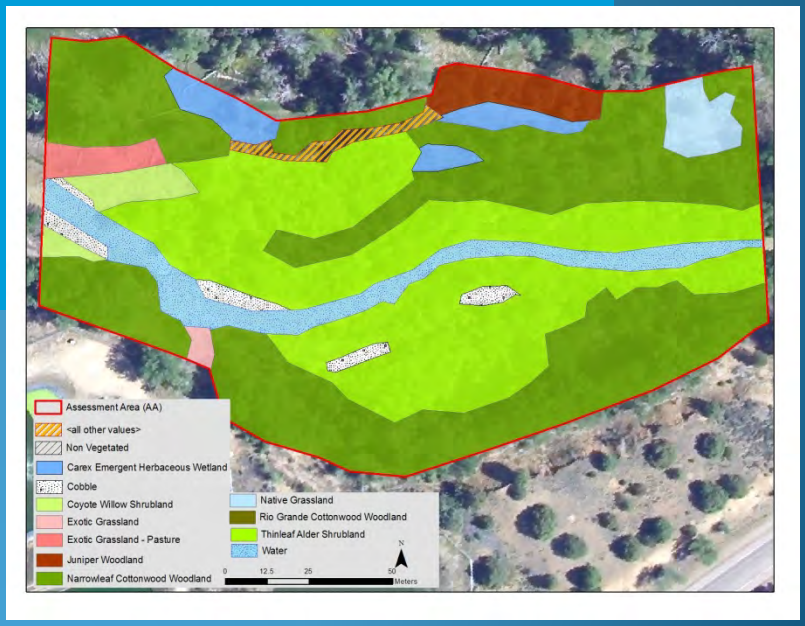
  Greenline (Winward 2000); Faber-Langendoen et al. (2008)

- **Rationale:** High native plant species diversity generally indicates:
  - overall high biotic diversity
  - stability of wetland biotic communities
  - increased wildlife habitat
  - increased species diversity

  High numbers of exotic plant species indicate:
  - degraded or disturbed wetlands.

Relative Native Plant Community Composition

- Map each community type (CT) in the AA
- Calculate the area of each CT
- (Alt: list CTs and rank by abundance)

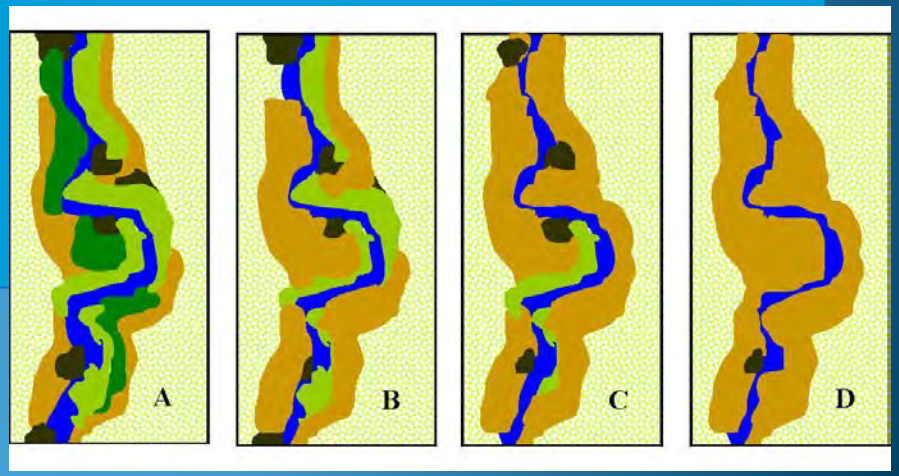


Vegetation Horizontal Patch Structure

- **Definition:** Vegetation Horizontal Patch Structure metric is an assessment of general vegetation patch diversity and complexity of the patch pattern (interspersion among vegetation patch types) within an AA.

  CRAM 5.0.2 Horizontal Interspersion and Zonation (of Biotic Structure) Collins et al. 2008)

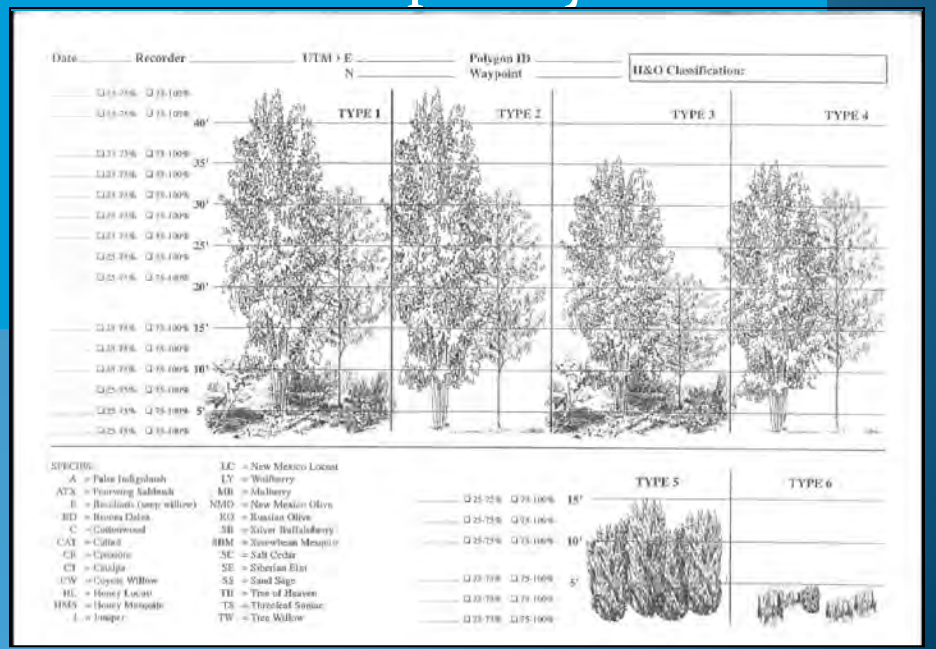
- **Rationale:** Multiple horizontal plant patches across the AA indicate
  - high biotic diversity,
  - diverse habitat structure for wildlife
  - predictable ecosystem processes.



Vegetation Vertical Structure

- **Definition:** An assessment of the overall vertical structural complexity of the vegetation canopy layers, including presence of multiple strata, age/size class, and structural complexity of canopy layers.

- **Rationale:** The more vertical strata and complexity:
  - more habitat for wildlife
    - particularly birds
  - more overall biotic diversity
  - multiple plant life forms



Invasive Exotic Plant Species Cover

- **Definition:** The Invasive Exotic Plant Species Cover is a measure of the total percent cover of a set of exotic plant species that are considered invasive based on the New Mexico list of noxious weeds (NRCS 1999).

  Faber-Langendoen et al. (2008)

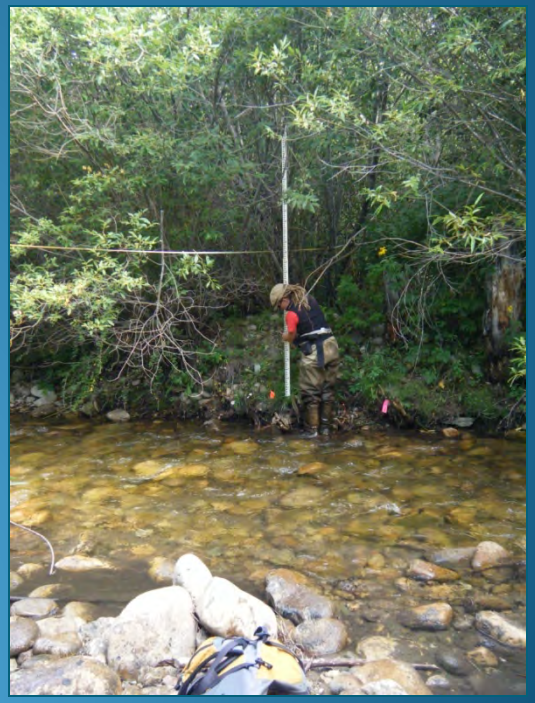
- **Rationale:** Invasive, non-native species can have a significant impact on community diversity and function.
- High levels of invasive exotic species are a threat to:
  - Maintaining wetland function
  - Biodiversity
- Invasive exotic species tend to thrive in riparian systems when natural hydrologic and geomorphic functions have been disturbed.

Native Riparian Tree Regeneration

- **Definition:** This metric assesses the abundance and spatial distribution of riparian tree reproduction across the AA (tree seedling, saplings, and poles under 12.7 cm (5 inches) diameter at breast height (dbh).
- **Rationale:** Healthy riverine wetlands should consist of a mosaic of woody vegetation stands that include both mature and young regeneration trees.
- Reproduction is tied to natural disturbance cycles
- Absence of young trees may indicate ecological dysfunction.

Abiotic Metrics

1. Hydrologic Connectivity
2. Macrotopographic Complexity
3. Channel Stability
4. Stream Bank Stability and Cover
5. Soil Surface Condition

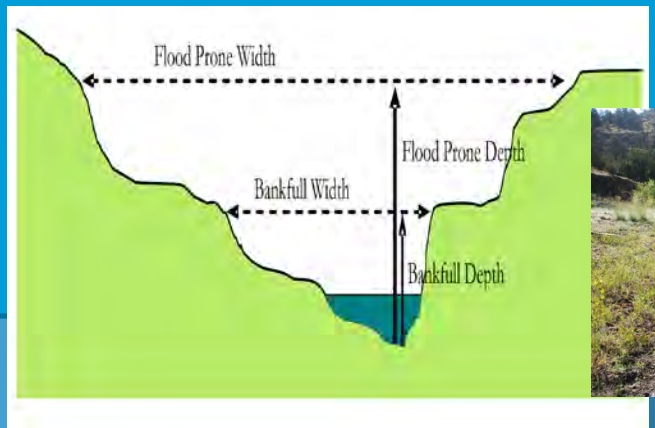


Hydrologic Connectivity

Definition: Hydrologic connectivity is an assessment of the relationship of the river channel to its floodplain at the bankfull stage.

Rationale: Hydrologic connectivity, including overbank inundation and subsurface connectivity with shallow aquifers and hyporheic zones, influence most wetland functions, such as exchange of water, sediment, nutrient cycling and organic carbon inputs, and plant diversity and the wildlife habitat diversity (Collins et al. 2008).

Represents a cross-section view of the channel.



Macrotopographic Complexity

Definition: This metric describes the distribution and relative abundance of channels and connectivity between the main channel, side channels, floodplain scour pools, and other floodplain features.

Rationale: Rivers act as conveyor belts of both water and sediment, the movement of which occurs linearly in the direction of flow and horizontally as rivers periodically overflow their banks and spill onto the floodplain. This interaction between channel and floodplain is indicative a "natural" hydrograph and is manifested by structural complexity, including a main channel, side channels, floodplain scour pools, and other floodplain features.

- Represents a plan view of the AA.

Channel Stability

Definition: Channel stability is the assessment of the degree of channel equilibrium, aggradation, or degradation resulting from the characteristic flow patterns within a river system.

Rationale: Riverine systems are driven by the long-term trends in peak flow, base flow, and average flows and the types and kinds of sediments that form the floodplain and control ecological functions in response to changes in climate, seasonal variations in rainfall, upstream diversions and dam releases, and changes in land use.

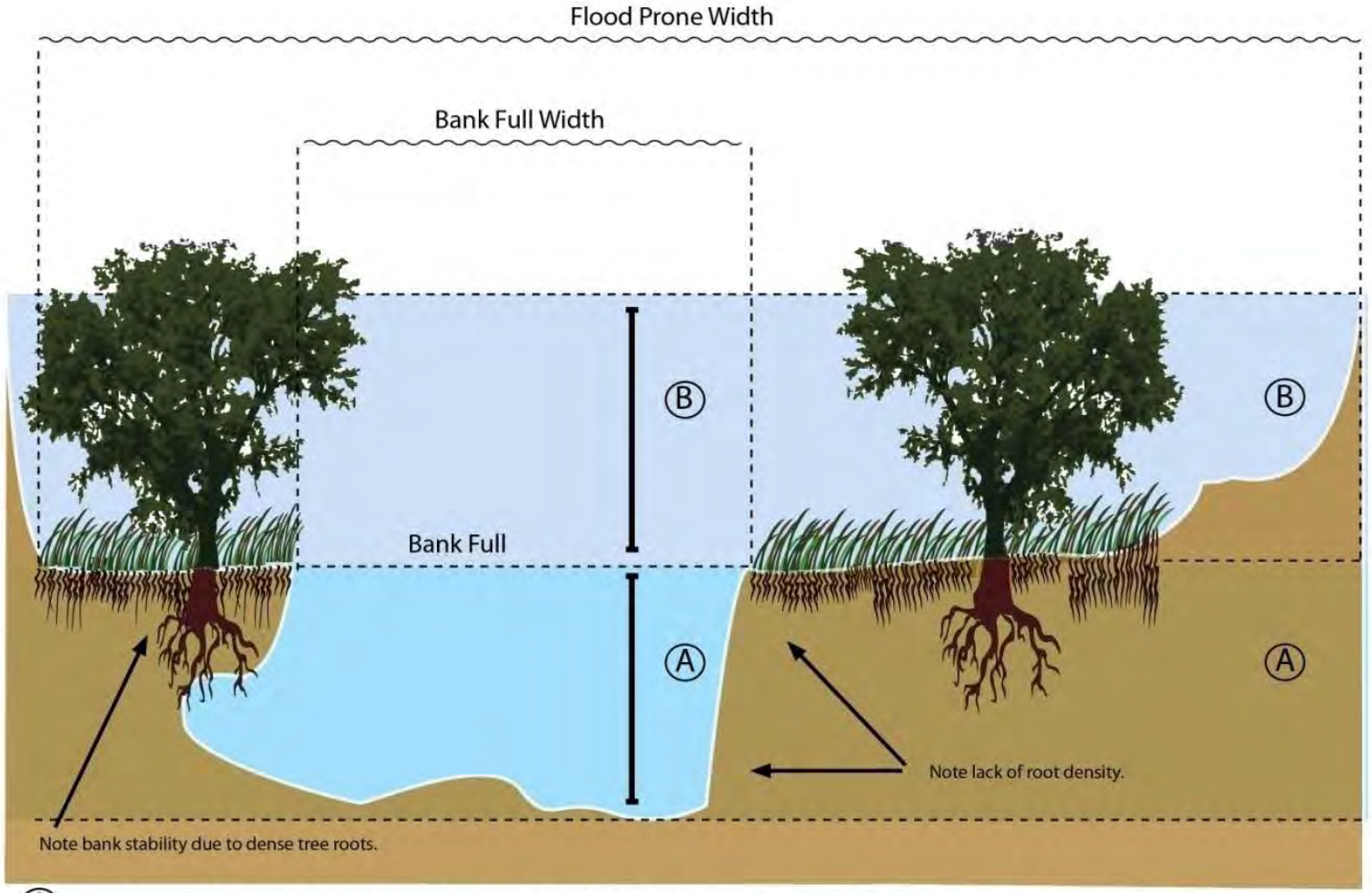
Represents a longitudinal view of the system.

Stream Bank Stability & Cover

Definition: This metric involves a classification of stream bank soil/substrate stability and perennial vegetation cover, leading to an assessment of the stream bank stability. More stable stream banks and banks with little potential for erosion generally indicate less anthropogenic disturbance.

Rationale: The resistance of a stream bank to erosion is important to the integrity stability of associated riverine wetlands. This metric provides a classification and ranking of stream bank stability. Stable stream banks should support more perennial vegetation (greenline), and more stable and healthy wetland communities. Unstable stream banks and those with the potential for erosion are likely suitable candidates for restoration.

Stream Bank Stability & Cover



(A) Assess "bank soil stability" within Zone A — bed to bankfull. Also assess "streambank erosion potential" in this zone.

(B) However, consider the stability provided by the roots of plants growing in Zone B on the "stream erosion potential" of Zone A.

Soil Surface Condition

Definition: The soil surface condition metric is an indirect measure of disturbance to wetland and riparian soils that results in modification of soil characteristics and / or sedimentation of riverine wetlands.

Rationale: Soil surface condition can be an indicator of degradation to the soil ecosystem characterized by nutrient cycling, soil moisture, soil chemistry, soil biodiversity and soil structure. This metric evaluates disturbance to the soil and surface substrates that the affects biological, physical and chemical processes that ultimately define broader wetland ecological condition such as plant establishment and vegetation community type.

Assessment Protocol is GIS-based, field-based and qualitative.

Stressor Checklists

- Used to
  - assess the intensity of stressors that occur within the AA and the Buffer
  - provide additional information that furthers the understanding of the current wetland condition

- Anthropogenic disturbances are expected to have a negative effect on the condition of the wetland

Stressor Checklists Categories

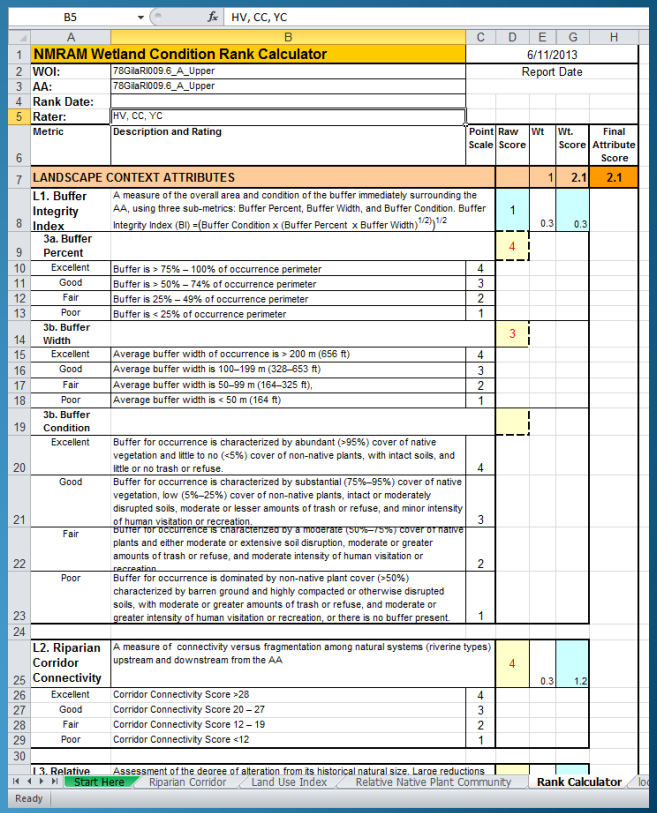
- Landscape
- Biotic
- Hydrologic
- Physical

LANDSCAPE STRESSORS	Buffer		Assessment Area	
	<10%	>10%	<10%	>10%
Urban residential				
Industrial/commercial				
Military training/Air traffic				
Transportation corridor				
Sports fields and urban parklands (golf courses, soccer fields, etc.)				
Intensive row-crop agriculture				
Orchards/nurseries				
Dryland farming				
Commercial feedlots				
Dairies				
Ranching -- moderate(enclosed livestock grazing or horse paddock)				
Ranching -- low intensity (livestock rangeland)				
Passive recreation (bird-watching, hiking, etc.)				
Active recreation (off-road vehicles, mountain biking, hunting, fishing)				
Physical resource extraction, mining, quarrying (rock, sediment, oil/gas)				
Biological resource extraction (aquaculture, commercial fisheries, horticultural and medical plant collecting)				
Comments				

Scoring and Roll-up

Score Calculations

- Site score is created from weighted roll up of Metric scores within Attribute categories then across Attributes using either:
  - Spreadsheet calculator
  - Web database
  - Scores can also be hand calculated



B5 fx HV, CC, YC

	A	B	C	D	E	G	H
1	**NMRAM Wetland Condition Rank Calculator**			6/11/2013			
2	**WOI:**	78GilaRI009.6_A_Upper		Report Date			
3	**AA:**	78GilaRI009.6_A_Upper					
4	**Rank Date:**						
5	**Rater:**	HV, CC, YC					
6	**Metric**	**Description and Rating**	**Point Scale**	**Raw Score**	**Wt**	**Wt. Score**	**Final Attribute Score**
7	**LANDSCAPE CONTEXT ATTRIBUTES**				1	2.1	2.1
8	**L1. Buffer Integrity Index**	A measure of the overall area and condition of the buffer immediately surrounding the AA, using three sub-metrics: Buffer Percent, Buffer Width, and Buffer Condition. Buffer Integrity Index (BI) =(Buffer Condition x (Buffer Percent x Buffer Width)$^{1/2}$)$^{1/2}$		1	0.3	0.3	
9	**3a. Buffer Percent**			4			
10	Excellent	Buffer is > 75% – 100% of occurrence perimeter	4				
11	Good	Buffer is > 50% – 74% of occurrence perimeter	3				
12	Fair	Buffer is 25% – 49% of occurrence perimeter	2				
13	Poor	Buffer is < 25% of occurrence perimeter	1				
14	**3b. Buffer Width**			3			
15	Excellent	Average buffer width of occurrence is > 200 m (656 ft)	4				
16	Good	Average buffer width is 100–199 m (328–653 ft)	3				
17	Fair	Average buffer width is 50–99 m (164–325 ft),	2				
18	Poor	Average buffer width is < 50 m (164 ft)	1				
19	**3b. Buffer Condition**						
20	Excellent	Buffer for occurrence is characterized by abundant (>95%) cover of native vegetation and little to no (<5%) cover of non-native plants, with intact soils, and little or no trash or refuse.	4				
21	Good	Buffer for occurrence is characterized by substantial (75%–95%) cover of native vegetation, low (5%–25%) 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.	3				
22	Fair	Buffer for occurrence is characterized by a moderate (50%–75%) cover of 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.	2				
23	Poor	Buffer for occurrence is dominated by non-native plant cover (>50%) 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.	1				
24							
25	**L2. Riparian Corridor Connectivity**	A measure of connectivity versus fragmentation among natural systems (riverine types) upstream and downstream from the AA		4	0.3	1.2	
26	Excellent	Corridor Connectivity Score >28	4				
27	Good	Corridor Connectivity Score 20 – 27	3				
28	Fair	Corridor Connectivity Score 12 – 19	2				
29	Poor	Corridor Connectivity Score <12	1				
30							
	L3. Relative	Assessment of the degree of alteration from its historical natural size. Large reductions					

Start Here | Riparian Corridor | Land Use Index | Relative Native Plant Community | Rank Calculator

Ready

Metric roll-up table

Weighted scoring by metric and attribute class

WOI CODE_____ AA No._____ Date: Mo_____ Day_____ Year_____ Surveyor Initials____

NMRAM – AA Wetland Condition Rank Calculator Worksheet (Version 1.1)				
Metric	**Description**	**Raw Score**	**Wt**	**Final Score**
Landscape Context Attributes			**Σ**	
L1. Buffer Integrity Index	Buffer Condition x (Buffer Percent x Buffer Width)^{½})^{½}		0.3	
	L1a. Buffer Percent			
	L1b. Buffer Width			
	L1c. Buffer Condition			
L2. Riparian Corridor Connectivity			0.3	
L3. Relative Wetland Size			0.2	
L4. Surrounding Land Use			0.2	
Size			**=**	
S1. Absolute Wetland Size			1	
Biotic Metrics			**Σ**	
B1. Relative Native Plant Community Composition			0.3	
B2. Vegetation Horizontal Patch Structure			0.2	
B3. Vegetation Vertical Structure			0.2	
B4. Native Riparian Tree Regeneration			0.1	
B5. Invasive Exotic Plant Species Cover			0.2	
Abiotic Metrics			**Σ**	
A1. Hydrologic Connectivity			0.3	
A2. Macro-topographic Complexity			0.2	
A3. Channel Stability			0.2	
A4. Stream Bank Stability and Cover			0.2	
A5. Soil Surface Condition			0.1	

Final AA condition score and rank

Weighted scoring by attribute class and final rank assignment

Currently available as a rank calculator spreadsheet and on-line in Fall, 2013

WOI CODE_____ AA No._____ Date: Mo_____ Day_____ Year_____ Surveyor Initials____

NMRAM AA Condition Scoring Summary. Enter summary scores on WOI Cover Worksheet

Major Attribute	# of metrics	Comments	Score	Wt.	Wt. Score
Landscape Context				0.25	
Size				0.15	
Biotic				0.3	
Abiotic				0.3	
AA WETLAND CONDITION SCORE				Σ	
AA WETLAND CONDITION RANK				=	

Rank	Score	Description
A	3.25–4.0	Excellent condition
B	2.5–3.25	Good condition
C	1.75–2.5	Fair condition
D	1.0–1.75	Poor condition

Stressor Summary

	Buffer		Assessment Area		
	Minor	Major	Minor	Major	Total
Total Number of Stressors					

Rank Comments:

Questions?

Buffer Integrity Index

- Buffer and Non-buffer Elements for defining the buffer

Worksheet 1 c. AA Buffer checklist of land cover elements. Land cover elements that are either allowed in riverine buffers, or excluded and considered non-buffer that disrupt ecosystem connectivity. Check off those elements used for the map (M) and/or observed the field (F).

Land Cover Elements .		**Date:**	**Site Code:**		**AA No. :**
Included buffer land cover elements			**Excluded non-buffer land cover elements**		
Map	Field		Map	Field	
		Natural wetland vegetation patches			Commercial developments
		Swales and ditches			Residential developments
		Nature or wildland parks			Urbanized parks with active recreation
		Old fields, unmaintained			Lawns, golf courses, sports fields
		Open range land			Pedestrian/bike trails (i.e. nearly constant traffic)
		Unpaved roads not hazardous to wildlife (e.g., two-track roads)			Intensive livestock areas (horse paddocks, feedlots, turkey ranches, etc.)
		Foot trails, horse trails, unpaved bike trails (low intensity)			Intensive agriculture (row crops, orchards, and vineyards lacking ground cover and other BMPs
		Non-channel open water			Paved roads or developed 2nd order unpaved but graded gravel roads
		Maintained pastures and hay fields			Railroads
		Vegetated levees			Parking lots