New Mexico Rapid Assessment Method

Riverine Wetlands Regulatory

NMRAM

Version 1.2

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New Mexico Environment Department

Surface Water Quality Bureau

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Natural Heritage New Mexico

Museum of Southwestern Biology

University of New Mexico

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Cover page photo: Restoration mitigation site at Taos Ski Valley, New Mexico (photo by D. Cummings)

New Mexico Rapid Assessment Method:

Riverine Wetlands Regulatory Field Guide.

Version 1.2

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Acronyms

ACOE	United States Department of the Army, Corps of Engineers
AU	Assessment Unit
CT	Community Type
DBH	Diameter at Breast Height
E	Exotic
GIS	Geographic Information System
GPS	Global Positioning System

IRCC	Internal Riparian Corridor Connectivity
IRCCZ	Internal Riparian Corridor Connectivity Zone
LUI	Land Use Index
LUZ	Land Use Zone
LUZ LUI	Land Use Zone Land Use Index
M	Mixed Native and Exotic
N	Native
NHNM	Natural Heritage New Mexico
NMED	New Mexico Environment Department
NMRAM	New Mexico Rapid Assessment Method
NRCS	National Resources Conservation Service
PA	Project Area
PDF	Portable Document Format
RCC	Riparian Corridor Connectivity
SA	Sample Area
SA LUI	Sample Area Land Use Index
SWQB	Surface Water Quality Bureau
U	Unknown
UNM	University of New Mexico
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
WOI	Wetland of Interest

I. Introduction

This New Mexico Rapid Assessment Method (NMRAM) Riverine Wetlands Regulatory Field Guide provides procedures and metric measurement protocols for conducting a rapid assessment of wetlands by the Albuquerque District Army Corps of Engineers Regulatory Program. The procedures are designed for use in a regulatory context including effectively gaging mitigation ratios. This Field Guide has been developed for use in wetlands in the Montane and Lowland subclasses of the Riverine Class of wetlands (after Brinson 1993).

The assessment is a multi-step process involving one person or preferably a two-person team. The process begins with delineating the Project Area (PA) and the Wetland of Interest (WOI) that surrounds it. One or more Sample Areas (SA) must be placed within the PA. For large project areas, more than one SA is recommended. For each SA, metrics relevant to the subclass (montane or lowland) are selected from 17 rapid assessment metrics (Table 1) described in this Field Guide. The available metrics are grouped into three attribute categories: Landscape Context (6 metrics), Biotic (5), and Abiotic (6). Landscape Context metrics are assessed using maps and/or a geographic information system (GIS) and preferably drafted before going into the field to help familiarize the team with the site. The Landscape Context metrics are then confirmed or modified during the field survey. The Biotic and Abiotic metrics are evaluated in the field. Field-based stressor checklists grouped by attribute class are also completed in the field and documentary photographs are taken. Worksheets are provided to guide the taking and recording of data (Appendix A). The worksheets together with maps and photographs make up the *NMRAM Regulatory Assessment Package* that becomes the supporting record of a project.

Below are step-by-step protocols for filling out the worksheets and evaluating and rating each metric. Ratings for each metric range from one (poor condition) to four (excellent). To arrive at an overall rating for an SA, individual metric ratings are weighted and rolled up by attribute group into a final overall numeric score. Based on the scores, categorical condition ranks are assigned as follows: A = Excellent (>3.25-4.0); B = Good (>2.5-3.25); C = Fair (>1.75-2.5), and D = Poor (1.0 -1.75). When there are multiple SAs in a PA, the SA scores can be averaged to arrive at a final rank for the entire PA.

Table 1. NMRAM Riverine Wetlands metrics for Regulatory Program use.

Metrics	Subclass
Landscape Context	
L1. Buffer Integrity Index	Montane and Lowland
L2. Riparian Corridor Connectivity (RCC)	Montane and Lowland
L3. Relative Wetland Size	Montane and Lowland
L4. Surrounding Land Use [LUI]	Montane and Lowland
L6. Internal Riparian Corridor Connectivity (IRCC)	Montane and Lowland
L7. SALand Use [SA LUI]	Montane and Lowland
Biotic	
B1. Relative Native Plant Community Composition	Montane and Lowland
B2. Vegetation Horizontal Patch Structure	Montane and Lowland
B3. Vegetation Vertical Structure	Montane and Lowland
B4. Native Riparian Tree Regeneration	Montane and Lowland

B5. Invasive Exotic Plant Species Cover	Montane and Lowland
Abiotic	
A1. Floodplain Hydrologic Connectivity	Montane and Lowland
A2. Physical Patch Complexity	Montane and Lowland
A3. Channel Equilibrium	Montane
A4. Stream Bank Stability and Cover	Montane
A5. Soil Surface Condition	Montane and Lowland
A6. Channel Mobility	Lowland

II. Pre-field Protocols

Pre-field steps include:

1. Download the worksheets (Appendix A) for NMRAM Riverine Regulatory Wetlands Field Guide Version 1.2 from the New Mexico Environment Department Surface Water Quality Bureau (NMED SWQB) NMRAM website or copy worksheets from Appendix A. (Note electronically fillable PDFs can be obtained from NMED SWQB.)

2. Delineate the PA, WOI, and provisional SA(s) boundaries on maps as described below to assess the Landscape Context suite of metrics and guide the field survey.

3. Verify land ownership, review site background information, and obtain the necessary permissions for site access.

4. Review recent river flow data for your site using gage data in Appendix B (this is a key element for the Floodplain Hydrological Connectivity metric).

5. Assemble field equipment, guides, worksheets, and maps.

Worksheets

Worksheets are provided in Appendix A and digital versions are available from the NMED SWQB.[1] The downloaded worksheets are smart PDFs where data and ratings can be directly entered in the field using a laptop, tablet or other digital device, or recorded manually on printed forms and entered later into the digital file. The PDF worksheets are designed to compute some metric ratings automatically when the data are entered; other metric ratings must still be evaluated directly. The worksheets also track the field process, global positioning system (GPS) locations, and photo inventory.

Maps

The foundation for the NMRAM is a set of three field maps on which landscape, biotic and abiotic features are mapped to support metric scoring. Each map should have a 100- or 200-m UTM grid overlay or lat-long grid to help field navigation along with a north arrow and scale bar (Figure 1). In addition, depending on the nature of the regulatory project impacts, the regulatory project area boundaries should be included.

[1] NMED SWQB Wetlands Program – Contact Maryann McGraw at maryann.mcgraw@state.nm.us.

Landscape Map. A map at approximately 1:4,000-10,000 scale (dependent on subclass and SA size) that shows the SA(s) in a landscape context (see Figure 1). Any modifications to the SA location that occur on site along with any features to aid the field validation of Landscape Context metrics around the SA should be sketched on the Landscape Map. Specifically, the map should delineate the maximum extent of the Land Use Zone (LUZ). A second copy of the Landscape Map can include the Regulatory Project Area and waters and jurisdictional wetlands that may be affected by project dredge and fill and mitigation activities (see Landscape Context metrics below).

SA Map. A map that encompasses a single SA at 1:1,000-3,000 scale for mapping vegetation communities, abiotic features, and transect locations (see Biotic and Abiotic metrics below). Two copies of the SA Map are required, one each for measuring biotic and abiotic metrics, respectively. The vegetation communities in an SA can be provisionally mapped on the SA Biotic Map prior to field reconnaissance and then validated and modified during the survey. Modifications to the SA boundary should be recorded on the SA Abiotic map.

Road Map. A third optional map at 1:24,000 or coarser is often useful for locating a site relative to highways and towns.

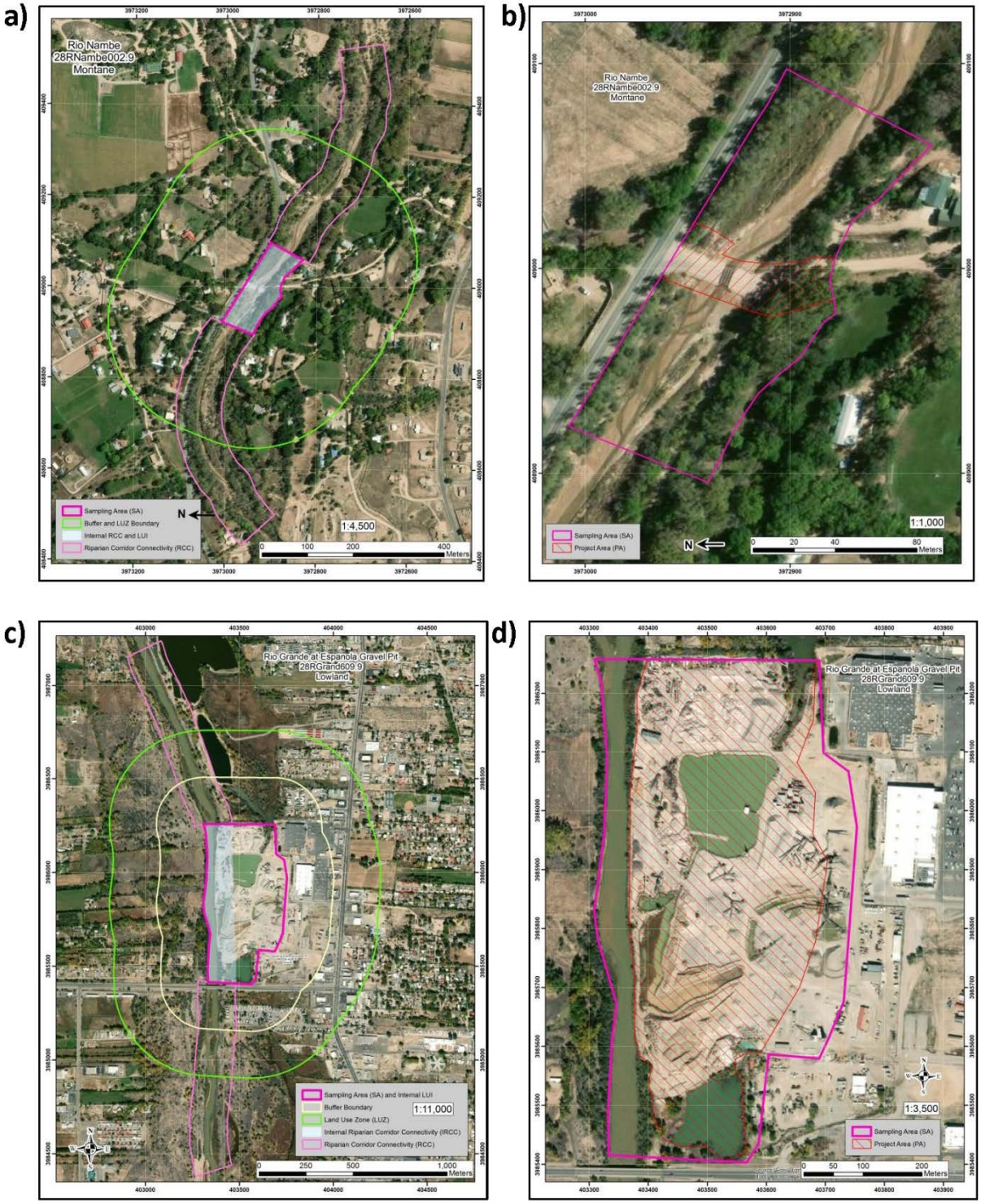

Figure 1. Examples of Landscape and SA field maps for Montane (top) and Lowland (bottom) subclasses. On the left, area the landscape-scale maps with boundaries for measuring the landscape metrics. On the right, are fine-scale SA map for field vegetation and abiotic feature mapping.

Regulatory Project Area

The limits of the regulatory project area are user defined and include all areas that will be affected by dredge and fill activities and/or mitigation. The regulatory project area includes waters and jurisdictional wetland features. These features should be shown on the regulatory project area Landscape Map (Figure 2).

Defining the Wetland of Interest (WOI) Boundaries

Determining the boundaries of the Wetland of Interest (WOI) is necessary for determining the number and placement of SAs and for some metric measurements. A WOI is established using a GIS or paper maps and may or may not coincide with the PA. When it does not, wetland vegetation maps can help inform the boundaries of a WOI in concert with aerial imagery interpretation (e.g., National Wetland Inventory maps[2]). In addition, boundaries should:

- follow the natural feature patterns of the wetland and be relatively homogeneous;
- belong to the target wetland subclass;
- avoid major discontinuities caused by land use (i.e., avoid inclusions of agricultural lands, urban development, and other non-wetland elements).

An example where the WOI boundary follows these natural-features guidelines is shown in Figure 3. This approach is designed to meet the immediate needs of a rapid assessment. As necessary, the boundary may be modified based on the field reconnaissance or other requirements at a project level.

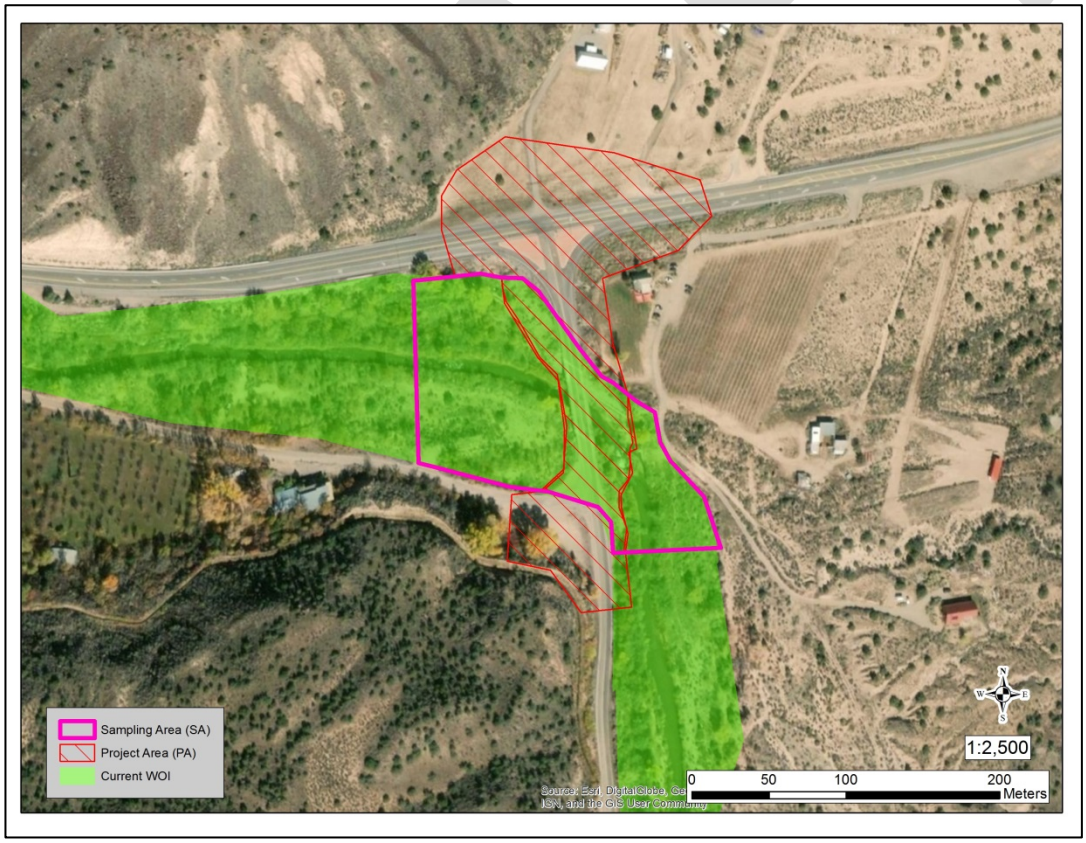

Figure 2. Example of Wetland of Interest (WOI) delineation (green) and the placement of an SA (pink outline) that is representative of the WOI at the PA (red slash area).

[2] https://www.fws.gov/wetlands/

Determining Riverine Subclass

Valid assessment results depend on applying the appropriate subclass protocols. The correct riverine subclass for the project area must be identified prior to delineating the sample area. In general, lower (2^{nd} to 4^{th}) order single-channel unconfined riverine sites above 6000 ft in elevation should be assigned to the Montane riverine subclass, while higher order (5^{th} and greater), and/or multi-channel unconfined rivers, below 6000 ft in elevation should be assigned to the Lowland riverine subclass. Across the state the transition zone from lowland to montane varies from 4500 to 6500 ft in elevation so elevation alone should never be used to determine the subclass. However, elevation is a guide to be used with slope, channel type and overall size to determine subclass. Generally, a river with multiple channels at low elevation and gentle slope (< 0.02) should be assigned to the Lowland subclass, while single channel systems at greater elevation and moderate slope can be assigned to the Montane subclass. If a river is too large to be considered wadable it should be placed in the Lowland subclass regardless of other factors. Small wadable rivers at low elevation with multiple channels and low slope should also be included in the Lowland subclass. (Note: This method should not be used for confined riverine systems (those located in narrow valleys without the natural lateral floodplain extent to allow unimpeded overbank or floodplain flow) because scores will not be reflective of the condition of the subclass.)

Delineating the Sample Area (SA) and the SA Cover Worksheet

Use the *SA Cover Worksheet* (Worksheet Page 1) to track the basic information about a given SA within a WOI/project area.

- Use one set of worksheets for each SA. Assign a Project Name and the Corps File #, select the New Mexico County, enter the project area elevation, and select the New Mexico Ecoregion in which the project resides. Provide ownership information and note any restrictions, if applicable.

- Describe the general location and SA boundary rationale and enter driving directions.

- Provide a brief project description and construction footprint.

- Enter the surveyor names and initials by their roles in the assessment.

- Enter the central location in UTM coordinates, latitude and longitude, and include the zone and datum.

- Enter the date and start time of the field survey.

- Describe the current annual precipitation conditions that might affect the site at the time of the assessment.

- In the SA Attribute Descriptions, provide narratives of conditions by major attribute category. The Assessment Summary should include comments on the condition rank of the sampling area and is preferably completed before leaving the site.

- Before the team leaves the site, they should give the SA a provisional field Score and Rank and the end time of the field survey is entered.

- Final Score and Rank are completed in the office after all data have been entered and finalized.

PA and SA size and placement.

Prior to beginning the NMRAM assessment planned alterations must be clearly defined so that the project area (PA) can be delineated. The PA is the foot print of the planned alterations that lies within the WOI. Where planned alterations extend beyond the boundaries of the WOI the PA should be evaluated in just that portion within the WOI boundary. PA portions of the project that will occur in adjacent uplands or disconnected historic floodplain can be evaluated as part of the LUZ (Landscape Metrics.) The goal is to evaluate PA that remains within the WOI as part of the SA.

The SA should be placed such that it is representative of the entire WOI. The SA must include the PA and either the floodplain on one side of the channel (Lowland) or both sides of the river channel (Montane) at a minimum following the guidelines listed below. If the PA is too large for one SA then two or more SAs are required as the entire wetland portion of the project must be assessed within SAs. Multiple SAs should only be used in cases where the PA significantly exceeds the recommended maximum SA size for the floodplain size (see Table 2).

SAs are provisionally mapped prior to the field visit, then modified as needed based on field indicators and constraints. The delineation of SAs should be done with care and decision rules documented on the SA cover worksheet under Project Description to provide context for evaluating the assessment outcome. This is important as improper SA placement may invalidate the NMRAM assessment. Overall, the goal is to delineate relatively homogeneous SAs with respect to hydrology and wetland type. That is, an SA is a sampling area inclusive of the PA along a channel that best reflects the hydrological processes of the local reach (e.g., flooding, sediment deposition, scour, and groundwater recharge) and is characterized by wetland vegetation communities that are representative of the wetland subclass (non-riparian or non-wetland types may occur internally but they should be relatively minor elements).

Several metrics are scale-dependent where, as the SA size goes up, the assessment scores go up. Conversely, as SA size goes down from the maximum, scores are likely to decline, but this is considered a measure of lowered ecological integrity and is intrinsic to the assessment scoring. To maintain consistency across SA scores upper and lower limits for SA length Table 2. SA size class is based on overall floodplain width. SAs within the Montane subclass will fall into either the small or medium floodplain class, while those in the Lowland will generally fall into the medium or large size class. SA length must stay within the ranges provided below to avoid artificially inflating or reducing the NMRAM score.

The SA width should include all or at least one side of the floodplain. If an SA is limited to one bank (Lowland), it should include the entire floodplain width from the channel edge to the first break in hydrological connectivity, either natural or anthropogenic. If the SA is on both sides of a channel (Montane) then the width may be split between them, however, on at least one side it should extend to the outer edge of the floodplain. In cases where ownership restricts access, portions of the floodplain may need to be estimated from a distance but should still be included in the SA. Because active floodplains may be reduced by natural or artificial constraints there is no minimum width listed. However, the SA width should never be arbitrarily reduced to less than the width of the active floodplain.

Table 2. SA lengths based on historic floodplain size.

Size Class	Historic WOI Width	Riparian Corridor Length
Small	<500 m	250
Medium	500-1000	500
Large	>1000	750

SA homogeneity.

SAs should be relatively homogeneous with respect to overall condition of the WOI, hydrological factors and other site conditions. The primary driver of SA placement is assessment of the project area. Thus, the SA should be centered over the PA and represent fairly the overall condition of the WOI within which the project is located. Placement of the SA should not be highly skewed to one side of the PA to under-represent or avoid an existing hydrologic break, as the PA will often contain a hydrologic break which must be assessed.

Land Ownership and Sampling Permissions

ACOE rules will be followed when obtaining permission to collect data for NMRAM. When owner permission for areas included in the SA but not in the PA cannot be obtained, some portions of the SA may have to be assessed from a distance and/or using remote sensing imagery. Every effort to obtain owner permission for access should be made, as condition scores arrived at remotely will be less accurate than those obtained from on the ground survey. Notation must be made on the SA Abiotic map and the percentage of the SA not visited filled in on the coversheet when access to the entire site is not possible.

Field Equipment, Guides, and Worksheets

Suggested equipment includes:

- ☐ Two copies of Landscape maps, one for landscape context metrics and one for regulatory project area details, and one each of Biotic and Abiotic SA maps (either paper or writable on a tablet or other device). An optional map at 1:24,000 is often useful for locating a site relative to highways and towns.
- ☐ Worksheet sets (Appendix A) and laminated reference guides (Appendix B) for each field representative covering the metrics they will measure.

- ☐ Covered clipboards to protect worksheets and maps (if using paper copies).
- ☐ Optional: a ruggedized tablet or other protected electronic device uploaded with interactive PDF Data Collection Worksheets and Field Guide.
- ☐ Pencils and water-resistant markers for labeling paper maps or other sheets or items which may come in contact with water.
- ☐ GPS unit and directions to site (with GPS coordinates).
- ☐ Camera and photo board.
- ☐ Binoculars for viewing landscape conditions.
- ☐ Compass for accurately orienting field maps and conducting mapping exercises.
- ☐ Stadia rod.
- ☐ 100-m measuring tape.
- ☐ Rebar and clamps to secure the measuring tape during hydrologic connectivity protocol.
- ☐ Pin flags to mark and corroborate bankfull indicators and other features in photographs.
- ☐ Line level.
- ☐ Survey levels for very wide floodplains.
- ☐ Plant press for collecting plants requiring identification.
- ☐ Bleach and bucket: it is mandatory that all field technicians sterilize boots with a bleach and water mixture before and after entering waterways to prevent the spread of aquatic nuisance species such as didymo (*Didymosphenia geminata*), a microscopic algae, as well as whirling disease and other potential pathogens.
- ☐ Waders for crossing and working within channels as the site conditions require. Waders, wading shoes, or other footwear *without* felted soles is recommended; felted soles are known to transport pathogens.

III. Metric Measurement and SA Condition Ranking Overview

There are two levels of investigation: 1) GIS-based assessment of the Landscape Context metrics (Level 1), and 2) field-based semi-quantitative Biotic and Abiotic metrics (Level 2), each with its own set of data worksheets, which are provided in Appendix A. The protocols that follow provide the guidelines for measuring the metrics, completing the worksheets, and assigning assessment ratings to each metric.

Assessing Landscape Context Metrics (Level 1)

For the Landscape Context attribute, metrics are measured in the context of the SA boundary. These are non-field metrics that are evaluated manually or in a GIS framework using maps and aerial photographs and then verified in the field where possible. The basic GIS layers needed are:

- Recent ortho-rectified aerial photography or satellite imagery with a minimum resolution of 1 m (3 feet);
- Roads and trails;
- Ownership;

- Topographic maps or digital elevation models;
- National Wetlands Inventory; and
- USDA SSURGO Soil Maps.

Sources for geospatial data include New Mexico Resource Geographic Information System (https://rgis.unm.edu/rgis6), BING, and Google Earth, among others.

See the Protocols section for specific instructions on metric measurements.

Assessing Field Biotic and Abiotic Metrics (Level 2)

There are five Biotic and six Abiotic metrics that are measured as part of the field survey of the SA (Table 1). The survey recommends a field team composed of two members so that decisions can be corroborated: one who evaluates the biotic metrics, while the other individual evaluates the abiotic metrics, however one person can complete the survey. The team member responsible for the biotic reconnaissance should have a basic understanding of the local flora (common dominant trees and shrubs in particular), and whether they are native or introduced (exotic) (see Appendix C for a list of common species). In addition, the technician should be familiar with state-listed noxious weeds that may occur in the area (Appendix D). The team member(s) responsible for the abiotic metrics should have basic training in measuring hydrological conditions and recognizing floodplain geomorphological characteristics (Rosgen Applied Fluvial Geomorphology training is beneficial). As they work through the SA, both team members should watch for stressors and conditions along the SA edges relevant to the landscape context metrics. One team member is designated to be responsible for the field review of landscape context metrics. Upon completion of the field survey, the team works together to verify the landscape context metrics, complete the stressor checklists, write the SA narrative summaries, and assign a provisional Wetland Condition Rank. Note that if only one team member is available to complete the survey, they should be trained and familiar with both biotic and abiotic basic skills.

Field assessment steps:

1. Preliminaries. Together, team members fill in basic survey information (date, time, location, etc.) on the SA Cover Worksheet. Then a quick joint reconnaissance of the site is recommended to help set up the survey and make SA boundary changes based on local conditions.

2. Biotic survey. The biotic team member traverses the SA and maps the major vegetation communities detailing attributes that are important to the metric scoring. This map becomes the basis for filling out the worksheets and rating the biotic metrics.

3. Abiotic survey. The abiotic team member selects three locations to assess hydrologic connectivity and other abiotic conditions. In Montane sites these should be placed in independent straight runs of the stream channel, that is, straight sections separated by bends or pools. The team should traverse from the channel edge to the floodplain edge at these locations to search for indicators of abiotic conditions and annotate the map with supporting information. During each traverse, indicators are checked off metric-specific lists on the worksheets that provide the foundation for rating each metric.

4. Landscape Context review. The Landscape Context metrics have been measured prior to the field survey and now must be reviewed based on field evidence during the survey. Each team member is likely to survey different areas in the SA and each should note landscape-context condition issues that may affect the ratings, particularly in areas adjacent to the SA boundary. These are reported on the SA Cover Worksheet and can be used to modify metric ranks (with a narrative justification).

5. After completion of the surveys, team members collaboratively complete the narrative summaries on the SA Cover Worksheet; complete all stressor checklists, review and complete the in-field ranking of all metrics and provide a provisional SA Score and Rank and Assessment Summary (signed off with team member initials).

6. Team should verify valley bottom historic wetland boundaries for Relative Wetland Size (RWSI) metric during travel to and from the SA.

The intent is that a team should be able to complete the field survey in two to four hours, depending on the complexity and size of the site, and personnel resources.

SA Boundary adjustments in the field

While the SA boundary is initially mapped in the office prior to heading out to the field it is good practice to first check if the SA size meets the specifications outlined above, as well as any lateral constraints not detected in the imagery. The SA can be shifted or the configuration changed in the field as necessary to accommodate the specifications (e.g., two meander bends, representative vegetation patches, inclusion of stream or channel) or constraints (e.g., unforeseen ownership restrictions). All changes to the SA configuration or location are recorded on the field maps and noted on the SA Cover Worksheet.

Best Management Practices for pest control

To prevent the spread of aquatic diseases and nuisance species, it is imperative that field staff follow procedures to clean and sterilize field equipment. Outside the wetland, at the staging area before the wetland is entered and upon leaving the wetland, boots, waders, and field equipment (e.g., stadia rods, etc.) that come in contact with surface waters must be hosed or washed off. This must occur away from wetlands and surface waters. All porous material (including felt-soled shoes, which are not recommended due to concerns about didymo) must be immersed in a 2% bleach solution for five minutes or until thoroughly soaked, then rinsed or dried thoroughly. Any remaining solution must be poured away from vegetation.

SA Condition Ranking

For each SA, there is an *SA Rank Summary Worksheet* (Worksheet Page 3) where the metric ratings are compiled, and an overall Condition Score and Rank for the SA are assigned. The metric and attribute hierarchy is built into the summary sheet such that individual and attribute category scores can be calculated easily and then rolled up into a final numeric SA Wetland Condition Score. The digital PDF version of the form *automatically* compiles the scores from the various worksheets, computes a ranking score from 1.0 (poor) to 4.0 (excellent), The description of SA Wetland conditions are as follows:

- (>3.25 to 4.0) Excellent Condition – wetlands with intact functions and processes, diverse vegetative communities with almost no exotic weeds, and large relative to its historical size, with

natural buffers. These wetlands are largely undisturbed and surrounded by undisturbed land (buffer) and would be considered to meet the wetland reference standard for a site.

- (>2.5 to 3.25) Good Condition – somewhat degraded in response to environmental stressors. These wetlands have various combinations of relatively minor disturbances or factors negatively affecting condition, e.g., some alteration of the hydrological regimes; evidence of on-site anthropogenic disturbances; a reduction of vegetative community and structural diversity with the presence of some exotic weeds; and moderately reduced size relative to their historical size, although the buffer may still be relatively natural. Often, these wetlands are good candidates for wetland restoration because impacts can be reversed with a high likelihood of recovery. Wetlands in good condition may be the best available.

- (>1.75 to 2.5) Fair Condition – moderately degraded in response to environmental stressors. These wetlands have one or more aspects that significantly affect condition, e.g., significantly disrupted hydrological regimes; degraded vegetative condition marked by monotypic community types often with exotic and noxious weeds; usually small size relative to their historical size. Buffers are typically significantly modified as well but have some natural elements remaining. These wetlands may have restoration potential depending on specific wetland conditions and on the stressors that are affecting that condition. However, restoration measures are expected to be more extensive (and maybe more costly) than B-ranked wetlands.

- (1.0 to ≤ 1.75) Poor Condition – degraded wetlands with highly disrupted hydrological regimes, poor vegetative composition and diversity that is usually dominated by exotic and noxious weeds, usually very small size relative their historic size. These wetlands may also have little or no undisturbed buffer. These wetlands generally would require extensive rehabilitation to realize their natural potential and restore their natural functions.

While final scoring will generally be a post-field process that integrates the GIS-based landscape-context metrics with the field-derived biotic and abiotic metrics, it is good practice to assign a provisional score and rank in the field to address any questions or gaps in the data set. Accordingly, there are boxes at the bottom of the SA Cover Worksheet for a provisional score and rank, along with narrative summaries for each attribute category and the overall assessment that should be completed in the field and refined as needed in the final ranking assignment in the office.

Reporting and the NMED Surface Water Quality Information Database (SQUID)

The worksheets, maps, and photographs together make up the NMRAM Assessment Package. Any of the package components can be used individually in project-level reports, but the package is also designed for entry into the New Mexico Wetlands Assessment Database. This database is intended as a comprehensive, central clearing house for information on New Mexico's wetlands with a web interface providing various reporting tools to facilitate the analysis of single and comparison of multiple sites from around the state. See https://www.env.nm.gov/swqb/ for updates.

IV. Metric Protocols

Landscape Context Metrics

There are four external Landscape Context metrics designed to measure the conditions surrounding the SA using a GIS or paper maps. There are two additional internal landscape metrics designed to measure the conditions inside the SA.

L1. The Buffer Integrity Index is composed of two sub-metrics, Buffer Percent and Buffer Width, which are measured in a buffer zone that extends out 250 m from the SA perimeter (Figure 3).

L2. Riparian Corridor Connectivity is measured in a riparian corridor zone that extends upstream and downstream 500m or 1000 m upstream and downstream (a total of 1000 to 2000 m) and 100 to 250 m width across dependent on whether working in the montane or lowland riverine subclass.

L3. Relative Wetland Size is measured across the entire floodplain, current and historic.

L4. Surrounding Land Use evaluates conditions within an area that extends out 250 m or 500 m from the SA perimeter dependent on subclass (overlapping the buffer zone).

L5. Internal Riparian Corridor Connectivity is measured in a riparian corridor zone that is 100 to 250 m across inside the SA.

L6. Sample Area Land Use evaluates land use conversion within the SA.

Once all metrics have been rated, they are rolled up into a single Landscape Context Attribute score on the SA Rank Summary Worksheet.

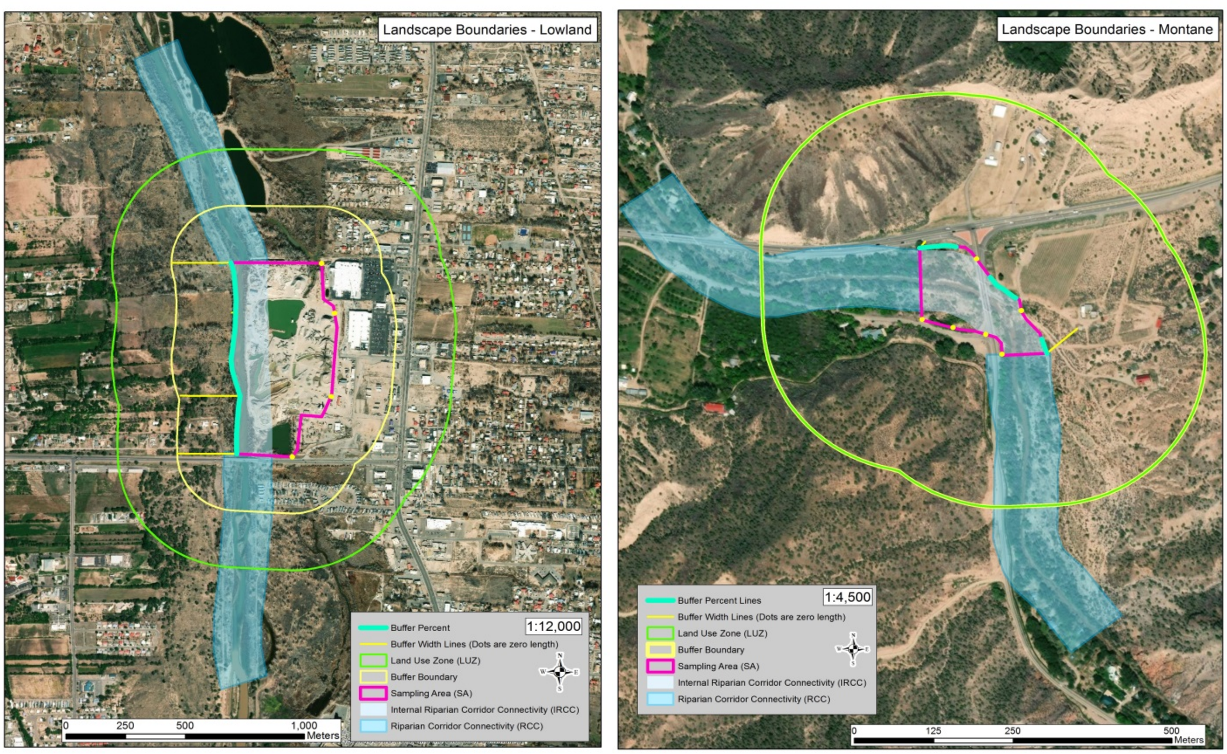

Figure 3. Landscape Context metrics are measured in four zones around an SA and two zones within the SA: Buffer (250 m) (pale yellow line), Land Use Zone (LUZ) (light green line) and Riparian Corridor upstream and downstream 500 m (pale blue area). Buffer % is measured around the perimeter of the SA (cyan lines) and Buffer Width is measured at eight points extending laterally from the SA boundary (yellow lines and dots). Riparian Corridor Connectivity is evaluated upstream and downstream on both banks. Land Use Index (LUI) is evaluated in the LUZ. Internal Riparian [illegible]

L1. Buffer Integrity Index

Definition: The Buffer Integrity Index is a measure of the amount of natural and semi-natural vegetated buffer surrounding the SA and is composed of two sub-metrics:

- *Buffer Percent*: the percentage of the lateral perimeter surrounding a wetland SA that is considered natural or semi-natural buffer;

- *Buffer Width*: the average width of the extant buffer lateral to the SA.

Seasonality: This metric generally is not sensitive to seasonality, but imagery from the growing season will likely enhance interpretations.

Protocol: Buffer Percent and Buffer Width are evaluated using aerial photography imagery in a GIS or on paper maps (Figure 3). It is based on "allowed buffer" land-cover elements that provide protective services such as reducing pollutant contamination within 250 m of the SA boundary versus "excluded non-buffer" land-cover elements that do not (Worksheet 1a).

Buffer Percent

Steps:

1. Using aerial photography in a GIS or the Landscape map, enter the source of the imagery and the imagery date, if available. Check off buffer land-cover elements that occur along the perimeter of the SA on Worksheet 1a. Use only the lateral SA perimeter, ignoring upstream and downstream SA perimeters which cross the channel. Do not include any areas less than 10 m (33 feet) wide as buffer. Any portion of the SA perimeter not bounded by at least 10 m of an allowed buffer element is considered unbuffered.

2. Measure or estimate the percentage of the SA perimeter that is flanked by allowed buffer land cover elements and enter the estimated percentage on Worksheet 1b. Use the percentage to rate the sub-metric using Table L1a.

Buffer Width

Buffer Width is measured as the average distance along eight sample lines perpendicular to the lateral perimeter of the SA, extended to the first non-buffer element encountered or to a maximum of 250 m (Figure 3).

Steps:

1. Along the perimeter of the SA, draw a series of eight lines perpendicular to the lateral perimeter of the SA at even intervals extending out to the first non-buffer element as defined in Worksheet 1a or to the buffer boundary at 250 m. Four lines are placed on each lateral side of the SA, with two lines coming off each corner, and two equally spaced between the corners. Lines are recorded as zero length if there is a non-buffer element within 10m of the SA boundary. Label the lines A through H. No lines should extend upstream, downstream, or parallel to the river channel. All buffer lines should be parallel to each other and as perpendicular to the channel as possible.

2. Measure the length of each line in meters and enter the values on Worksheet 1c.

3. Calculate the average buffer width from the measured lines.

4. Use the average to rate Buffer Width in Table L1b.

Buffer Integrity Index Calculation and Rating

Steps:

1. Enter the sub-metric ratings (Buffer Percent and Buffer Width) in Worksheet 1d.
2. Calculate the Buffer Integrity Index Score as the average of the two sub-metric ratings.
3. Rate using Table L1c.
4. Enter the Buffer Integrity Index rating on the SA Rank Summary Worksheet.

L2. Riparian Corridor Connectivity (RCC)

Definition: Riparian Corridor Connectivity (RCC) measures the disruption of natural land connectivity upstream and downstream of the SA with an emphasis on detecting intervening obstructions that might inhibit wildlife movement and impact plant populations.

Seasonality: This metric generally is not sensitive to seasonality: leaf-off imagery may help in detecting land use impacts.

Protocols: Riparian Corridor Connectivity rating is based on the total segment lengths of Riparian Corridor non-connectivity land cover segments (Worksheet 1a) in the riverine corridor 500 m upstream and downstream of the SA and 100 m wide for the Montane subclass; 1000 m upstream and downstream and 200 m wide for the Lowland subclass.

Steps:

1. Using the most recent imagery available in GIS, delineate the Riparian Corridor Connectivity zone 500 m upstream and 500 m downstream (1000 m upstream and downstream for Lowland) from the SA boundaries along the main channel, and 100 m in width (200m width for Lowland). The Riparian Corridor Connectivity zone should be centered within the river available floodplain, and must include both banks of the river, but does not need to be centered on the active channel per se. The river available floodplain is the floodplain that is not disconnected by anthropogenic features such as levees.
2. For each bankside (left and right) on the upstream and downstream segments, check off all excluded RCC land cover elements that disrupt riparian corridor connectivity on Worksheet 1a.
3. Using the GIS imagery, for each bankside on the upstream and downstream segments, measure in meters along the outside edge of the riparian corridor the total length of all excluded land-cover patches (from Worksheet 1a) that interrupt the corridor for at least 10 m (33 feet). A feature is considered to interrupt the corridor if it either crosses the corridor edge or sits completely inside the corridor. A feature that completely crosses the corridor and intersects both the outside edges is measured as an interruption on both sides. There will be a total length each for upstream bank left, upstream bank right, downstream bank left and downstream bank right. Select either Montane or Lowland on Worksheet 2 and enter the total lengths for each bankside (step A). Assign at least the minimum length for any special class, non-connectivity elements that cross the riparian corridor as provided in Table 3 below.
4. Sum the length of disruptions for each of the upstream and downstream segments separately and enter the values on Worksheet 2 step B.

5. Calculate the percentage disruption per segment (meters of disruption/1000*100 (step C1) or meters of disruption/2000*100 for Lowland (step C2)and enter the value on Worksheet 2. (The interactive PDF Version 1.3 will automatically calculate this for you.)
6. Sum the total length of disruptions for both segments upstream and downstream combined on Worksheet 2 step D.
7. Calculate the percentage total disruption for the SA (meters of disruption/2000*100 for Montane (step E1) and meters of disruption/4000*100 for Lowland (step E2)) and enter the value on Worksheet 2.
8. Rate Riparian Corridor Connectivity using the narratives in Table L2 and the data from Worksheet 2.
9. Enter the rating score in the SA Rank Summary Worksheet.

Table 3. Minimum assessed length for special class, non-connectivity land cover elements bisecting the riparian corridor.

Special Class Non-Connectivity Land Cover Element	Minimum Assigned Impairment
Unpaved graded and/or maintained roads	10 m
Single-lane paved road	20 m
Two-lane paved road/highway	50 m
Four-lane paved road/highway	100 m
Railroad	50 m
Concrete diversion or retention dams	25 m
Small non-concrete (wood, earth) diversion	10 m

L3. Relative Wetland Size

Definition: An index of reduction of the current wetland size relative to its estimated historical extent.

Seasonality: This metric can be evaluated during any season. However, the use of growing-season imagery with adequate "green-up" can improve accuracy.

Protocol: Relative Wetland Size is based on the ratio of the WOI size to its historical size. The key is determining the lateral extent of the historical floodplain based on photo-interpreted features, field verification and historic evidence where possible (Figure 4). The default assumption is that the valley bottom represents the historic floodplain.

Steps:

1. From the upper and lower limits of the SA, extend a pair of parallel lines perpendicular to the SA across the entire floodplain to the edge of the historic floodplain. Use areas of upland slope or ancient terraces (i.e., several hundred years old or more) that appear to support upland vegetation to determine the boundary (Figure 4). The assumption is that this should represent the historic floodplain of bars, channels, and alluvial terraces that were active within the relatively recent past.

2. Connect the lateral lines along the upland on both sides of the channel to create a single polygon representing the historic WOI.

3. Calculate or estimate the areas of both the current WOI and historic WOI, enter the values on Worksheet 3a, and calculate the Relative Size Ratio (RSR) between the two:

RSR= (S_c / S_h).

Where: S_c = current size and S_h = historical size.

4. Using Worksheet 3b, calculate Relative Wetland Size Index (RWSI) as the percentage reduction from historical size:

RWSI(%) = (1-RSR)*100

5. Rate using Rating Table L3 and enter the rating in the *SA Rank Summary Worksheet.*

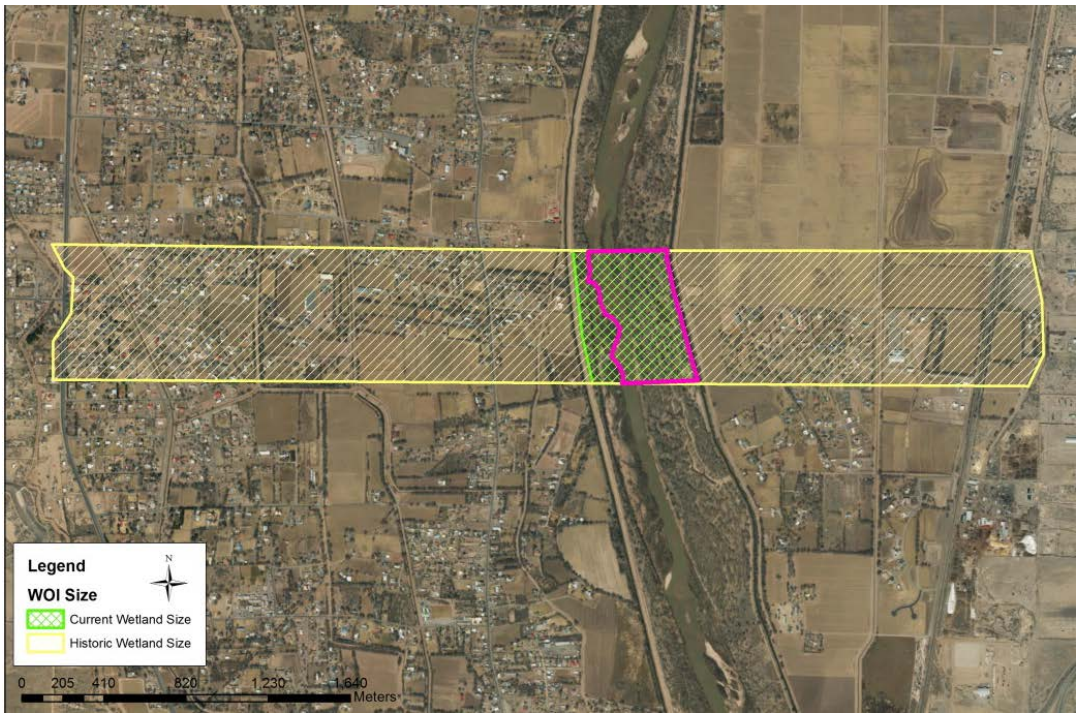

Figure 4. Relative Wetland Size for the riverine subclasses is the ratio of the current WOI (representing the current size – green cross-hatch) to the historical size (yellow area) estimated across the floodplain based on photo interpretation. Subsequent field checking as part of the reconnaissance survey is advised (e.g., for example site historic floodplain boundaries were based on topo lines, irrigation ditch mains and site visit).

L.4 Surrounding Land Use (LUI)

Definition: The amount and intensity of human land use in the buffer and land use zone (LUZ) surrounding the SA.

Protocol: Surrounding Land Use is based on calculating a Land Use Index (LUI) that reflects the relative extent of a suite of land-use elements in an area extending out 250 m for Montane subclass, 500 m for Lowland subclass from the SA boundary. Each land-use element is weighted for its potential impact on the SA (from 0.0 indicating high impact to 1.0 no impact; Worksheet 4).

Steps:

1. Using current aerial photography in a GIS platform or from the Landscape map, estimate the percentage area of each land-use element in the LUZ and enter the whole number value in the % LUZ Area (L4) column on Worksheet 4. Total cover must equal 100%.

2. For each element, multiply the percentage area times the weighting coefficient and record that score in the LUZ LUI Score column. Sum the scores in the LUZ LUI Score column.

3. Rate using the LUZ LUI Rating Table L4.

4. Enter rating on the SA Rank Summary Worksheet.

For example, if 30% of the adjacent area is composed of old fields (0.5 * 30 = 15), 10% of unpaved roads (0.1 * 10 = 1), and 60% of natural area (1.0 * 60 = 60), the total land use score would equal 76 as the sum of 15 + 1 + 60. The rating from Table L4 would be "2."

L6. Internal Riparian Corridor Connectivity (IRCC)

Definition: Internal Riparian Corridor Connectivity (IRCC) measures the disruption of natural land connectivity within the SA with an emphasis on detecting intervening obstructions that might inhibit fluvial processes, wildlife movement and impact plant populations.

Seasonality: This metric generally is not sensitive to seasonality; leaf-off imagery may help in detecting land use impacts.

Protocols: Internal Riparian Corridor Connectivity rating is based on the total segment lengths of Riparian Corridor non-connectivity land cover segments (Worksheet 1a) in the internal riparian corridor connectivity band through the SA.

Steps:

1. Using the most recent imagery available in GIS or on the Landscape Map delineate the Internal Riparian Corridor Connectivity zone (IRCCZ) within the SA boundaries along the main channel, 100 m wide in the Montane subclass or 200 m wide in the Lowland. The Internal Riparian Corridor Connectivity zone should be centered within the river available floodplain, and must include a minimum of 10m on each of the river banks, but does not need to be centered on the active channel per se. The river available floodplain is the floodplain that is not disconnected by anthropogenic features such as levees.
2. The IRCCZ should be completely contained within the SA. Anywhere the IRCCZ exceeds the lateral edges of the SA it should be trimmed to be congruent with the SA boundary. (The buffer metric measures disruption in connectivity outside the lateral SA boundaries.)
3. Enter the length of the SA in meters on Worksheet L6 step A.
4. For both the left and right bank sides measure the total length of all non-connectivity land cover patches from Worksheet 1a that intersect or cross the corridor edge for at least 10 m (33 feet) and enter the values in Worksheet L6 step B. Assign at least the minimum length for any special class, non-connectivity elements that cross the riparian corridor as provided in Table 3.
5. Sum the total length of disruptions for both banksides (left and right combined) (step C) and calculate the percentage total disruption for the SA ((meters of disruption/(2*SA length))*100) step D).
6. Rate Internal Riparian Corridor Connectivity using the narratives in Table L6 and the data from Worksheet L6.
7. Enter the rating score in the SA Rank Summary Worksheet.

L7. SA Land Use (SA LUI)

Definition: The amount and intensity of human land use in the designated SA.

Protocol: SA Land Use is based on calculating a Land Use Index (LUI) that reflects the relative extent of a suite of land use elements within the SA boundary. Each land use element is weighted for its potential impact on the SA (from 0.0 indicating high impact to 1.0 no impact; Worksheet 4).

1. Using current aerial photography in a GIS platform or from the Landscape Map, estimate the percentage of each land use element in the SA and enter the whole number value in the % SA Area(L7) column on Worksheet 4. Total cover for the SA must equal 100%.
2. For each element, multiply the percentage area times the weighting coefficient and record that score in the SA LUI Score column. Sum the scores in the SA LUI Score column.
3. Rate using the SA_LUI Rating Table L7.
4. Enter rating on the SA Rank Summary Worksheet.

For example, if 10% of the SA is composed of Rip-rapped channel (0.3 * 10 = 3), 10% of unpaved roads (0.1 * 10 = 1), and 80% of natural area (1.0 * 80 = 80), the total land use score would equal 84 as the sum of 3 + 1 + 80. The rating from Table L7 would be "2."

Biotic Metrics

There are five Biotic metrics that are designed to measure key biological attributes within a wetland that reflect ecosystem integrity:

B1. Relative Native Plant Community Composition is an index of the abundance of native- versus exotic-dominated vegetation communities.

B2. Vegetation Horizontal Patch Structure is an assessment of general vegetation patch diversity and complexity of the patch pattern.

B3. Vegetation Vertical Structure is an assessment of the overall vertical structural complexity of the vegetation canopy layers.

B4. Native Riparian Tree Regeneration assesses the abundance and spatial distribution of riparian tree reproduction.

B5. Invasive Exotic Plant Species Cover is a measure of the total percent cover of invasive plant species based on the New Mexico list of noxious weeds.

Biotic metric measurements are based on the mapping of vegetation community patches (stands) on the SA Map with its aerial imagery base (Figure 5). A draft of the vegetation community map may be prepared via GIS prior to the field survey and then field-verified. Alternatively, the vegetation patches can be directly drawn in the field on the aerial imagery map as part of the survey walkthrough.

- When mapping, only polygons of individual patches of homogeneous vegetation greater than 0.1 ha [0.25 acre] are delineated for the Montane subclass, and greater than 0.25 ha [0.62 acre] for the Lowland subclass (i.e., the minimum mapping unit polygon size). Patches smaller than the minimum map unit size are considered inclusions in the surrounding patch.

Each polygon is labeled with a number that corresponds to a Polygon Number on Worksheet 5 and then evaluated with respect to Vegetation Vertical Structure (B3), Native Riparian Tree Regeneration (B4), and Invasive Exotic Plant Species Cover (B5) (see specific metric protocols below). Each polygon is also assigned to a running list of community types (CTs) on Worksheet 6, which is used to evaluate Relative Native Plant Community Composition (B1). To help with later interpretations and scoring, documentary photographs representative of each CT are recommended and logged using the photo point log in Appendix A (Worksheet 16). When the species identification of a stratum dominant is uncertain:

- Collect and press a voucher specimen for later confirmation;

- Label each collection with the date, collector, SA code, the CT letter, Stratum and a unique field species code from the CT on Worksheet 6, and polygon number from Worksheet 5

- Note: Photographs of the entire plant, as well as close-ups of leaves, flowers and fruits can also aid in identification (Record these photographs in the Photo Point Log Worksheet 16).

Once all metrics have been rated, they are rolled up into a single Biotic Attribute score on the SA Rank Summary Worksheet.

The team member responsible for the Biotic Metrics reviews the Vegetation Stressor Checklist (Worksheet 15b) taking notes on the SA Biotic map and recording observations of stressors during the walkthrough. These notes and observations will be used for completing stressor checklists after the Biotic

Survey is completed. The attribute narratives on the SA Cover Worksheet that describe SA conditions and impacts should also be completed at this time.

Figure 5. An example of vegetation community patch polygons mapped on the SA Biotic Map that underpins the NMRAM biotic metrics. The polygons are labeled with the polygon numbers from Worksheet 5. The different colors reflect the CTs listed on Worksheet 6.

B1. Relative Native Plant Community Composition

Definition: An index of the abundance of native- versus exotic-dominated vegetation communities.
Seasonality: Best assessed during the growing season when dominant species are most easily identified.
Protocols: This metric is based on the SA vegetation community map and field reconnaissance data in Worksheets 5 and 6. Each polygon listed on Worksheet 5 is assigned to community types (CTs) during the reconnaissance and, in turn, the CTs are evaluated with respect to native species composition and their relative abundance.

Polygon assignment to CTs is an iterative process whereby the first polygon visited is described with respect to the top two dominant species by height strata using Worksheet 6. There are three strata: a Tall Woody Strata composed of trees and shrubs greater than 5 m tall (15 feet); a Short Woody Strata of trees and shrubs under 5 m (15 feet); and an Herbaceous Strata made up of graminoids (grasses and grass-like plants) and forbs. For each of the tall and short woody strata, total strata vegetative canopy cover must exceed 25% before a species is recorded; for the herbaceous strata, total cover must be greater than 10%. The species are recorded in the order of their relative abundance by strata, and a species can appear only once within a CT designation (if a species occurs in two strata, it is assigned to the strata in which it is most abundant). The next polygon visited is either assigned to the same CT on Worksheet 6 if it has the same composition and structure or, if not, a new CT is described and the polygon assigned to it. This process is continued for all polygons mapped in the SA. Based on this basic species data a Weighted

CT Native Composition Score for the SA is computed, and this, in turn, is used to rate Relative Native Plant Community Composition.

Steps:

1. Beginning with the first polygon visited, assign up to two dominant species by strata (Tall Woody, Short Woody, Herbaceous) within the polygon to the "CT A" on Worksheet 6. Use USDA PLANTS Database Codes[3] for species whenever possible. A list of the most common dominant riparian species in the subclass is provided in Appendix C. (The fillable PDF version of Appendix A has drop down boxes from which to choose the USDA Plant Codes from Appendix C.)
    - Ignore a woody stratum if it represents less than 25% of the total vegetative cover.
    - Ignore the herbaceous element in a stratum if it represents less than 10% of the total vegetative cover.
    - If a stratum is a mix of exotic and native dominants, make sure to record one native and one exotic dominant species for that stratum.
    - Each species can only be recorded once per CT. Even if it occurs in multiple strata, pick the one in which it is most prevalent.
    - Indicate if the species is exotic (E), native (N) or unknown (U).

2. Repeat Step #1 for all map polygons recorded during the field reconnaissance on Worksheet 5. If the CT composition of a polygon matches one previously recorded, simply add the polygon number to that CT. If it is different from any previously recorded, add a new CT with an associated list of dominants.
3. Once all polygons have been assigned to the CT list, estimate the relative mapped amount of each CT as a percentage of the entire SA and enter the value as a decimal number in the "% SA" box (this can be done in the GIS or simply visually estimated from the SA vegetation community map).
4. Using Table 4 below (also see Appendix B Reference Sheets), assign a Raw CT Score for each CT based on native versus exotic composition of the dominants in each stratum per the designations in the E/N/U column. Compute the area-weighted score for each CT by multiplying the % SA value times the Raw score and enter the result in the "Wt Score" box.
5. Sum the Weighted Scores and enter into the CT Final Weighted Score box.
6. Use the Final Weighted CT Score to rate Relative Native Plant Community Composition for the SA using Table B1.
7. Enter rating on the SA Rank Summary Worksheet.

[3] USDA, NRCS. 2014. The PLANTS Database (http://plants.usda.gov, 25 August 2014). National Plant Data Team, Greensboro, NC 27401-4901 USA.

Biotic Metrics

B1. Relative Native Plant Community Composition

Worksheet 5. Polygon data from map for Biotic Metrics B3, B4 and B5. See FIELD GUIDE for Structure Type definitions and instructions.

Polygon No	B3 Structure Type	B4 Tree Regeneration % Cover	B5 Invasive Species % Cover	Invasive Species (List Code(s))	Wetlands Species (List Code(s))	Comments
1	Type 6S	0	7	CIAR4, CIVU	ALINT, SALU, CAUT, CARE	Multi-channels not from beaver. Islands in channel with dense herbaceous and patches of willows. Becomes dense SAEX along bank at slope. Young
2	Type 5	0	0.5	CIVU, CIAR4	SALU, SAEX, SALI, CAREX	Dense mixed shrub (3-4m tall) willow - SAEX, SALU, and dense mixed CAREX herbaceous wetland understory.
3	Type 2	0.1	0.1	CIVU	POAN3	Higher terrace with mature POAN3 (some die off) and few young trees and few root sprouts. Dense BRIN2 understory and scattered shrubs. Young
4	Type 6W	0	0.5	CIAR4, CIVU	RAAQ, CAUT, ELEOC, EPIL	Channel with dense RAAQ and unknown aquatic (Unid-F3) banks, mostly herbaceous.
5						
6						
7						
8						
9						
10						

Worksheet 6. B1 - Relative Native Plant Community Composition. Enter species codes and indicate if the species is Exotic (E) or Native (N) in origin. A species code can only occur once per Community Type (CT).

		Tall Woody Stratum [1]				Short Woody Stratum [2]				Herbaceous/Sparse Stratum				CT Score[3]		
CT	Polygon Nos.	Species 1	EN	Species 2	EN	Species 3	EN	Species 4	EN	Species 5	EN	Species 6	EN	Raw	% SA	Wt Score
A	4									RAAQ	N	UNIDF3	U	2	0.05	0.1
B	1					SALU	N	SAEX	N	JUNCU	N	AGGI2	E	3.5	0.05	0.175
C	2					SAEX	N	SALI	N	CAUT	N	CAREX	N	4	0.45	1.8
D	3	POAN3	N							BRIN2	E	POPR	E	3.5	0.45	1.575
E																
F																
G																
H																
I																
J																
K																
L																
M																
N																
O																
													Final Weighted Score		1	3.65

1. Trees and shrubs > 5 m (15 feet) and > 25% total stratum cover; 2. Trees and shrubs <5m (15 feet) and >25% total stratum cover; 3. Herbaceous (graminoids and forbs)>10% total stratum cover. 4. Raw Score is from Table B1a, % SA Is the percentage of the SA area as a decimal number; Wt. Score is the product of the Raw Score * % SA. The final score is the sum of the weighted scores.

Comments and additional CTs:

Figure 6. Examples of completed Worksheets 5 and 6 for the Biotic metrics survey.

B2. Vegetation Horizontal Patch Structure

Definition: The 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 SA.

Seasonality: The SA vegetation community map from which this metric is assessed should be completed during the growing period, and the rating is best assigned in the field, but the analysis can happen as a post-field task if necessary.

Protocols: Vegetation Horizontal Patch Structure is assessed using the field reconnaissance SA vegetation patch map.

Steps:

1. Using the SA vegetation community map developed as part of the reconnaissance survey, determine the vegetation patch pattern that best matches the schematic diagrams of idealized riverine vegetation patterns (see Appendix B Reference Sheets diagram B2c). Each vegetation community must comprise at least 5% of the SA to be considered part of patch diversity.

    - The "Horizontal Patch Structure Diagram Details" (see Appendix B Reference Sheets diagram Table B2a) provides a numerical description of the idealized riverine vegetation pattern schematics with respect to the number of unique CTs and their aerial extent. Use this table as a general guide to help interpret the horizontal patch diversity schematics.

2. Indicate the schematic pattern that best matches the mapped vegetation patch pattern on Worksheet 7 and assign a rating based on the schematic diagrams in combination with the rating descriptions on Table B2.

3. Enter rating on the SA Rank Summary Worksheet.

B3. Vegetation Vertical Structure

Definition: An assessment of the overall vertical structural complexity of the vegetation canopy layers across the SA, including presence of multiple strata and age/size classes.

Seasonality: This metric is best assessed in late spring to early fall when vegetation foliage is present.

Protocols: Vegetation Vertical Structure is evaluated during the reconnaissance and mapping. Each mapped polygon patch is assigned one of the seven vertical structure types (VST) as defined in Figure 7 below (also see Appendix B Reference Sheets). Use the descriptions and pictorial aid to guide the assignments. The percent coverage of each VST is computed across the SA (Worksheet 8) by cross referencing the Structure Type box on Worksheet 5 and the %SA for each CT on Worksheet 6. The ratings are based on the various combinations of dominant and co or sub dominant VSTs (Table B3 in Appendix A).

Steps:

1. For each vegetation map polygon, assign the dominant VST from Figure 7 and enter structure type on Worksheet 5.
    - Note that VST 6W is based on a predominance of wetland obligate (OBL) herbaceous vegetation. The wetland status for vegetation species commonly found in Montane and Lowland Riverine wetlands can be found in Appendix C. Enter wetland species codes on Worksheet 5 and provide a short justification for selecting VST 6W in the comments box.

2. After assigning each vegetation map polygon to a CT type on Worksheet 6, compute the total percentage of the SA occupied by each of the seven VSTs using %SA on Worksheet 6, keeping in mind that more than one CT on Worksheet 6 can belong to a VST. Calculate the %SA occupied by each VST (the sum of %SA for CTs with same VST) x 100. (Note the interactive PDFs will do this automatically).
    - Calculate the %SA occupied by each VST (the sum of %SA for CTs with same VST) x 100.
    - Enter the total %SA for each VST on Worksheet 8.
3. Using the data from Worksheet 8, rate the SA based on criteria in Table B3.
    - Work from the top of the ratings table down, row by row.
    - Pick the first row that best fits the distribution of vertical structure types in the SA.
    - All types listed in a row must meet the minimum-cover threshold for that column to receive that rating.
4. Enter rating on the SA Rank Summary Worksheet.

B4. Native Riparian Tree Regeneration

Definition: This metric assesses the abundance and spatial distribution of riparian tree reproduction (seedling recruitment and clonal) across the SA (established tree seedling (>1 year), saplings, and poles under 12.7 cm (5 inches) diameter at breast height (DBH).

Seasonality: This metric can be measured year-round.

Protocol: Native Riparian Tree Regeneration is evaluated during the reconnaissance and mapping. Note that once you have above 5% cover of native riparian tree regeneration distributed among many polygons within the SA, the SA will score a 4.

Steps:

1. During the reconnaissance survey, estimate total percent cover of native tree seedlings, saplings and poles in each polygon and enter the estimated percentage on the map for each polygon and on Worksheet 5.
    - Team members are not expected to distinguish between seed regeneration and clones.
    - Tree species for which this metric is applicable are narrowleaf cottonwood (*Populus angustifolia*), Plains/Rio Grande cottonwood (*Populus deltoides*), Freemont cottonwood (*Populus fremontii*), lanceleaf cottonwood (*Populus acuminata*), Arizona sycamore (*Platanus wrightii*), peachleaf willow (*Salix amygdaloides*), and Goodding's willow (*Salix gooddingii*).
2. Rate the SA based on polygon percent covers and patch density as presented in Table B4.
3. Enter rating on the SA Rank Summary Worksheet.

Multiple-Story Communities (woodlands/forests)

VST 1 – High Structure Forest with a well-developed understory. Trees (>5 m) with canopy covering >25% of the area of the community polygon and woody understory layer of tall shrubs or short trees (1.5–5 m) covering >25% of the area of the community (polygon). Substantial foliage is in all height layers.

VST 2 – Low Structure Forest with little or no understory. Trees (>5 m) with canopy covering >25% of the area of the community polygon and minimal woody understory layer (1–5 m) covering <25% of the area of the community (polygon). Majority of foliage is over 5 m above the ground.

Single-story Communities (shrublands, herbaceous, and bare ground

VST 5 – Tall Shrubland. Young tree and shrub layer (1.5–5 m) covering >25% of the area of the community polygon. Stands dominated by tall shrubs and young trees, may include herbaceous vegetation underneath the woody vegetation.

VST 6S – Short Shrubland. Short stature shrubs or very young trees (< 1.5 m) covering >25% of the area of the community (polygon). Stands dominated by short woody vegetation, may include herbaceous vegetation among the woody vegetation.

VST 6W – Herbaceous Wetland. Herbaceous wetland vegetation covering >10% of the area of the community polygon. Stands dominated by obligate wetland herbaceous species. Woody species absent, or <25% cover.

VST 6H – Herbaceous vegetation. Herbaceous vegetation covering >10% of the area of the community polygon. Stands dominated by herbaceous vegetation of any type except obligate wetland species. Woody species absent or <25% cover.

VST 7 – Sparse Vegetation, Bare Ground. Bare ground, may include sparse woody or herbaceous vegetation, but total vegetation cover <10%. May be natural disturbance in origin (e.g., cobble bars) or anthropogenic (e.g., roads).

Figure 7. Guide to vertical structure types (VST).

B5. Invasive Exotic Plant Species Cover

Definition: The Invasive Exotic Plant Species Cover is a measure of the total percent cover of invasive plant species that are Class A through Class C on the New Mexico list of noxious weeds (NRCS 2016). Species of specific concern for a given project or those that are not yet on the New Mexico list of noxious weeds can be included on a project-specific basis.

Seasonality: Invasive Exotic cover is best assessed from summer to early fall.

Protocols: Invasive Exotic Plant Species Cover Ratings are based on estimated percent cover across the SA. Using the New Mexico Noxious Weed list provided in Appendix D as a guide, during the reconnaissance survey:

1. List the invasive exotic species found in the SA by polygon on Worksheet 5. Estimate the total cover of invasive exotic species within each mapped polygon in the Invasive Exotic Species % Cover column on Worksheet 5.
2. Based on the polygon Invasive Exotic Species % Cover values and noting the area covered for each mapped vegetation patch polygon (visual estimate of each polygon using the SA Biotic map), estimate the average percentage cover of invasive exotic species for the entire SA and enter the value on Worksheet 9, being particularly mindful of the percentage break points used for rating this metric (Table B5). For invasive shrubs or trees (e.g., saltcedar), it may be possible to assess this metric in GIS using fine-scaled satellite imagery or aerial photographs with ground control. However, invasive herbaceous species require an on-the-ground survey of the site.
3. Rate Invasive Exotic Plant Species Cover using Table B5 based on the estimated percent cover across the SA.
4. Enter rating on the SA Rank Summary Worksheet.

Abiotic Metrics

There are six Abiotic metrics that reflect the physical status of a wetland:

A1. Floodplain Hydrologic Connectivity is an assessment of the ability of water to flow into or out of the wetland.

A2. Physical Patch Complexity is a measure of the physical ecological complexity of a site.

A3. Channel Equilibrium is the assessment of the degree of channel aggradation or degradation relative to reference equilibrium conditions.

A4. Steam Bank Stability and Cover is a measure of stream bank soil/substrate stability and erosion potential that reflect overall stream bank stability.

A5. Soil Surface Condition reflects anthropogenic soil disturbance impacts within the SA.

A6. Channel Mobility is an assessment of impediments to the dynamic capacity of a channel to laterally migrate or avulse

The Channel and Floodplain Survey Overview

A channel and floodplain survey is conducted by one team member and uses checklists and narrative approach to arrive at an assessment. The surveyor divides the stream reach into three more-or-less equal segments (upper, middle, and lower). A lateral traverse extending from the SA boundary to the active channel edge is placed in each segment. The traverse should be placed to end in a straight riffle zone between two meander bends whenever possible. Important floodplain inundation features, floodplain flow features, and supplemental features from the metric checklists plus any feature that is affecting the hydrologic function of the segment regardless of its inclusion on the checklists are noted on the Abiotic

SA map. The indicator checklists are designed to guide surveyors in identifying important parameters and characteristics to apply to the ratings tables' narratives.

A sketch map of major features of the floodplain on the SA abiotic map is encouraged as an aid in filling out the checklists and for later interpretation. In addition, photographs are taken at the channel edge of each traverse - across the channel upstream and downstream and upstream and downstream from the channel edge. If possible, the photos are taken from the mid-point of the channel, if accessible. If it is not feasible to wade to the center of the channel such as in most lowland rivers, photos may be taken from the bank edge (see Appendix E for further guidelines). Photo-points are recorded on the Photo Point Log (Worksheet 16). Additional photographs may be taken of significant features within the floodplain and recorded on the Photo Point Log (Worksheet 16). Features that alter the size of the SA, or significantly impact floodplain connectivity, are particularly useful to photograph.

Stressor checklists are filled out as part of the SA walkthrough for hydrological modifications and soil/substrate impacts caused by human disturbance (Hydrological Modifications and Physical Structure stressor checklists (Worksheets 15c and 15d)). These are used to aid interpretation of channel and floodplain conditions in the overall assessment.

A1. Floodplain Hydrologic Connectivity

Definition: Hydrologic Connectivity is an assessment of the ability of water to flow into or out of the wetland or to inundate adjacent areas.

Protocols: There are two methods for assessing Floodplain Hydrologic Connectivity. Method 1 is intended for lowland riverine systems and is based on evidence of *recent* channel and floodplain inundation rated relative to maximum flows estimated from gage data (Appendix H). Method 2 uses a narrative approach and is intended for montane single channel situations.

Method 1— Inundation Indicator Approach

The Regulatory NMRAM recommends using the inundation indicator approach for lowland rivers or in multi-channel situations. Floodplain Hydrologic Connectivity is evaluated by detecting *recent* channel and floodplain inundation indicators (see Appendix B for examples of floodplain indicators) - that is, evidence of the extent of flood deposits and side channel wetting that has occurred within the last five years. The assessment is also dependent on the size of the largest peak flow that occurred in the last five years—large flows leave more evidence; small flows leave less. When there have only been very small flows in the preceding five years it may be very hard to rate this metric accurately. In such case the field team must use their best professional judgement and recognize the rating may be incorrect due to lack of on-the-ground indicators. The assessment uses a checklist/narrative approach as follows:

1. Prior to the field visit, look and record the largest peak flow that occurred in the last five years at or near the SA using the Guidelines in Appendix H.
2. In the field during each of the segment traverses, note on the Abiotic SA map the presence of floodplain indicators (fresh sediment, scouring surfaces, fine wrack lines, mud cracks in fine sediment (Appendix B)) and channels and swales on the floodplain which could carry flow during flow events, keeping track of relative distance of indicators from side channels and the main channel.
3. Using step 10a2 of Worksheet 10a, estimate the extent of SA wetting, and using M (many) F (few) or A (absent) determine the relative number of floodplain indicators for the location (channel edge, SA center, or outer edge) along each traverse. Also indicate by M, F or A the presence of channel features or overbank flow features along each transect.

4. Using Worksheet 10b, rate supplemental indicators if found along each segment traverse. If no indicators are present, check the x box for the segment.
5. After the traverses are completed, estimate the percentage of floodplain surface inundation by overbank flow and/or by side channel wetting as evident by the presence of the indicators and supplemental indicators. Note for supplemental indicators, absence does not preclude floodplain inundation, but presence corroborates it. For each traverse, check off estimated percentages of floodplain inundation in step 10a1 of Worksheet 10a.
6. Using the largest peak discharge within the last five years at the SA, select the appropriate recent peak discharge return interval rating sub-table from Table A1.
7. Using the narrative in the selected sub-table and the estimated surface inundation from Table 10a1, select the rating that best applies to the SA. Ratings can be adjusted given other flooding evidence recorded above, but provide a justification in the Rating Adjustment Comments box.
8. Enter rating on the SA Rank Summary Worksheet.

Method 2— Narrative approach

The Regulatory NMRAM recommends using the narrative approach for single channel montane systems. The narrative approach assesses the connectivity of the stream to its floodplain. The narrative approach requires a familiarity with bankfull indicators and estimation of the bankfull elevation at three typical stream cross-section sites along the bank edge, one each in the upper, middle, and lower segments of the reach, depending on the linear extent of the SA. In riffle-pool systems, *evidence of bankfull indicators should be recorded on the Abiotic SA map at a riffle section, (the straight section), or inflection point between two meander curves* (Figures 8 and 9). Bankfull indicators should not be identified for the metric rating in meander bends or in pools where the increased channel depth will not provide a representative channel depth and thus will lead to inaccurate bankfull indicators. Similarly, bankfull indicators should not be recorded where deflectors, such as rocks or logs, make the stream especially narrow or create exceptionally wide backwater conditions, in areas affected by beaver activity, or in areas where management/manipulation confounds the presence of appropriate bankfull indicators that will help the team member select the appropriate rating. Ideally, the linear extent of the SA will contain two meander bends, allowing for the establishment of three sites representing three segments. In step-pool systems, the three cross-section sites should be located in the runs (rapids) between the pools (Figure 10).

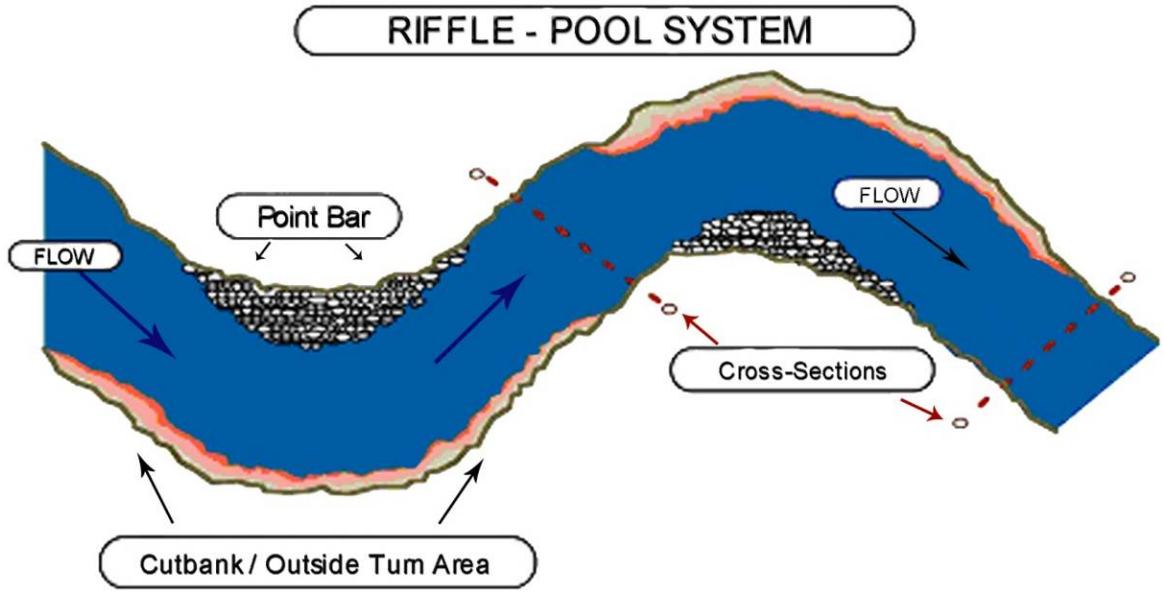

Figure 5. Cross-section locations for riffle-pool systems (reproduced from EPA 2011 after Silvey in Rosgen, 1996). Channel sinuosity is characterized by meander bends.

Figure 9. Example of bankfull indicators along the riffle section of the bank.

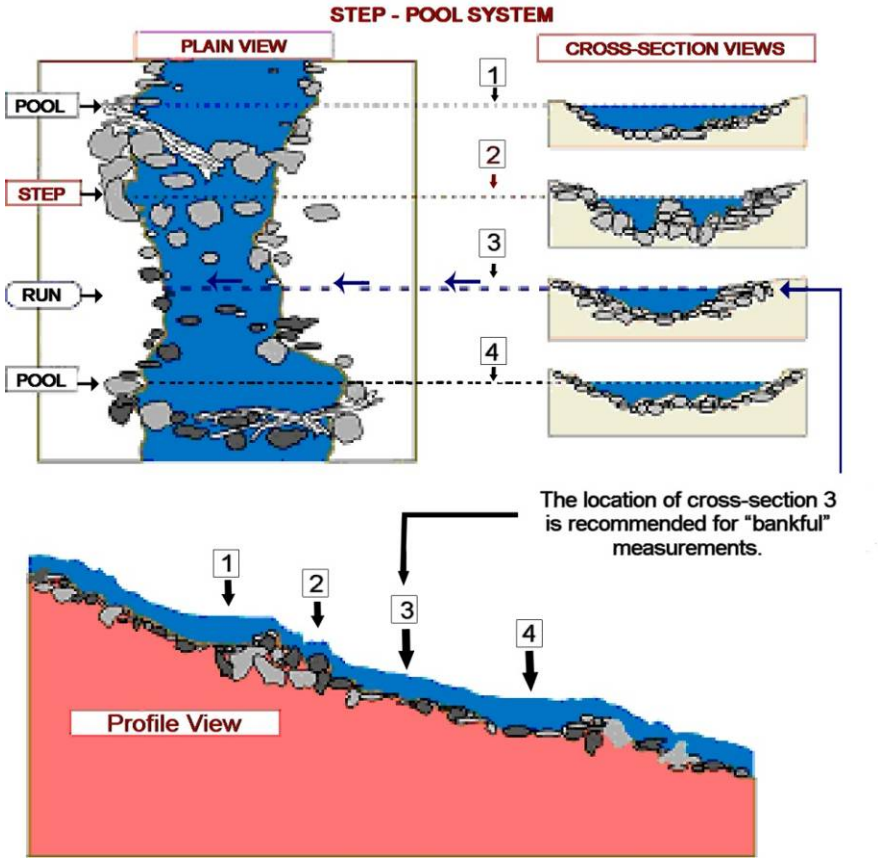

Figure 10. Cross-section locations for step-pool systems (reproduced from EPA 2011 after Silvey in Rosgen, 1996). A step-pool system is characterized by lower channel sinuosity and steeper slope than riffle-pool systems.

1. Walk each transect to determine if there is evidence of overbank flow including riaprian vegetation, and sediment deposition. Record data on the Abiotic SA map.
2. At the end of the transect at along the bank (cross-section site) visually determine bankfull indicators and assess potential overbank flow and for floodplain inundation. Record whether there is beaver activity causing floodplain inundation or an inset floodplain limiting floodplain access on the Abiotic SA map. Conversely, also record whether incision, bank modification, channelization or other hydrologic modification limit or preclude natural floodplain inundation.
3. Take photographs at the channel edge of each traverse - across the channel upstream and downstream and upstream and downstream from the channel edge and record them on the Photo Point Log (Worksheet 16). If possible, the photos are taken from the mid-point of the channel, if accessible.
4. Using Table A1c, select the rating that best matches the conditions at the entire SA and enter the rating on the SA Rank Summary Worksheet.

Determining bankfull. The bankfull stage is the determination of the level of the floodplain and corresponds to the discharge at which channel maintenance is most effective (Dunne and Leopold 1978). Bankfull discharge, which occurs every one to two years (Moody et al. 2003), is the discharge whereby sediments are most effectively moved to form or remove bars, form meanders and bends, and shape the average geomorphic characteristics of the channel. Some common indicators of the bankfull elevation are:[4]

- Changes in bank slope, such as from a steep bank to a more gentle slope or a change from a vertical bank to a flat floodplain;
- Changes in sediment texture of deposited material from clay to sand, sand to pebbles, or boulders to pebbles;
- Vegetation limits or changes in vegetation;
- Consistent alluvial depositional features, such as flood-deposited silt;
- Scour lines;
- Elevation of point bars and other floodplain features.

When assessing the bankfull elevation, it is important to look for consistent and corroborating bankfull indicators (Figure 9). The presence of high-water marks, such as wrack lines or debris hanging in trees or on brush or vegetation that has recently colonized within the boundaries of the bankfull channel (Rosgen 1996), may be deceiving. These indicators may be the result of high flows or may be deposited at a higher elevation than the mean water surface of the flow that deposited it. Conversely, vegetation can encroach within the channel below bankfull during periods of drought or low flow.

[4] Users may find the U.S. Forest Service video "A Guide for Field Identification of Bankfull Stage in the Western United States" helpful for identifying bankfull indictors. This video can be viewed online at: http://www.stream.fs.fed.us/publications/videos.html

A2. Physical Patch Complexity

Definition: This metric describes the physical structural richness of riverine wetlands and associated channels that foster habitat complexity and biotic diversity.
Seasonality: This metric can be evaluated during any season.
Protocol:

1. As part of the segment traverses, check off physical patch types in each SA segment using Worksheet 11.
2. Based on the narrative and using the number of patch types on Worksheet 11 as a guide, rate the metric using Table A2.
3. Enter the rating on the SA Rank Summary worksheet.

A3. Channel Equilibrium

Definition: Channel Equilibrium is the assessment of the degree of channel aggradation or degradation resulting from the departure from the flow regime associated with the characteristic pattern, profile and dimension of the stream or river.
Seasonality: The assessment can be conducted anytime when the river is not at flood stage, but is best conducted during periods of low to moderate flow.
Protocol: The assessment consists of checking off field indicators of channel equilibrium, aggradation, or degradation by SA segment using Worksheet 12. Transient local impacts such as dredging or fill that may affect the scores should be noted. In addition, site-scale field indicators caused by beaver activity should *not* be considered in assessing channel conditions, as they are indicative of a local disturbance rather than overall channel and watershed processes. For example, headcutting after a breach in a beaver dam can be a natural process by which the stream returns to equilibrium as it degrades through sediments deposited in the beaver impoundment area.

1. Using the Worksheet 12 check off field indicators that apply in the Upper, Middle and Lower segments of the SA.
2. Channel Stability using Table A3 and enter the rating on the SA Summary Rank Worksheet.

A4. Stream Bank Stability and Cover

Definition: This metric is a measure of stream bank soil/substrate stability and stream bank erosion potential that reflect overall stream bank stability.
Seasonality: This metric is not sensitive to seasonality, but cannot be assessed when the river is in flood stage.
Protocol: This method has two qualitative measures of bank condition that are evaluated using checklists on Worksheet 13:
1) Bank Soil Stability is determined by bank soil exposure, disruption and stress factors. Bank Soil Stability is a measure of active, ongoing erosion and consists of an estimation of the percentage of the bank along the riffle section that is stable.
2) Stream Bank Erosion Potential is determined by the amount of bank protection (cover) by fibrous, rooted vegetation and armoring by large, resistant interbedded boulders, cobbles and large woody debris. It reflects stability generated by vegetative cover and large bank material capable of limiting bank erosion.
Within each stream segment, the assessment should extend a minimum of 25 m (82 feet) upstream and downstream of the transect on both sides of the stream, but not within the cut-bank or point bar of a meander curve, or in a pool.
Both Bank Soil Stability and Stream Bank Erosion Potential are assessed vertically from the channel bottom up to the bankfull elevation. However, the effects of vegetation cover and root mass on Stream Bank Erosion Potential should include vegetation growing up to the top of the bank (Figure 11). This is

particularly important if the channel bank continues (vertically) uninterrupted above the bankfull elevation, making the upper banks capable of instability due to shear stress on the lower banks. In these cases, the assessor should extend the Stream Bank Erosion Potential survey to cover the entire area between the channel bed and the top of the bank below whatever floodplain is present.

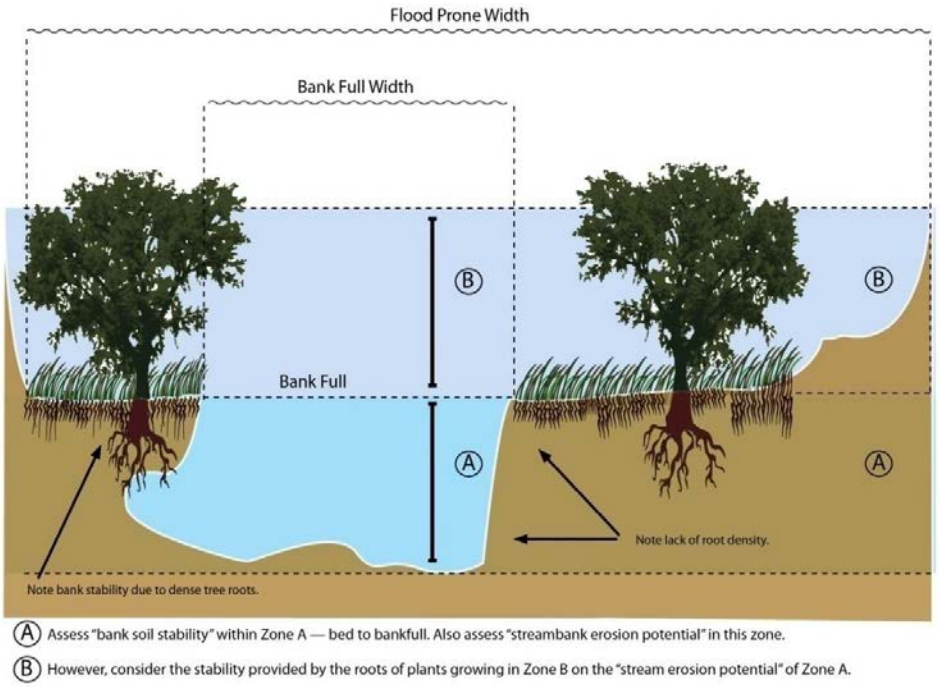

Figure 11. Bank Soil Stability and Stream Bank Erosion Potential assessment zones

Figure 12a provides an example of a stream with high marks for Stream Bank Stability and Cover. In contrast, stressed and eroding streambanks may feature fractures, slumps, sloughs, loose soil, hoof punching, hoof shearing and absent banks (Figure 12b). A trampled trail crossing, while possibly affecting less than 10% of the segment, could lead to bank soil instability over time. Figure 12c shows an example of the impacts of trampling by livestock where the banks have been completely trampled, the increased width to depth ratio is unstable for the channel type, and the banks are essentially non-existent. This extreme condition would be rated as "1" under Bank Soil Stability and "2" under Stream Bank Erosion Potential. Figure 12d shows the same channel at bankfull following removal of livestock for several years and regrowth of vigorous vegetation covering the banks. This situation would be rated as "3" for Bank Soil Stability since it is impossible to see the banks below bankfull in this photograph and "4" for Stream Bank Erosion Potential.

Upon completion of the visual evaluation, all six scores (Bank Soil Stability and Stream Bank Erosion Potential for the upper, middle, and lower segments in the reach) are averaged to compute the overall bank stability rating using the Table A4. Enter the rating on the SA Rank Summary Worksheet.

A) The stream banks here exhibit vigorous vegetative growth and large cobbles and boulders protecting the banks that would support a high Stream Bank Erosion Potential. In addition, little soil is exposed, supporting a high Bank Soil Stability rating.

B) These banks display vigorous vegetation but also raw banks, slumping and exposed soils. The stream is unstable and overwide, leading to lower rating.

C) Due to bank trampling and grazing, this stream channel has a flattened stream bank, which would rate a 1 for bank stability. Hoof punching is affecting the vegetation continuity as indicated by the exposed soil on between 25 and 50% of the bank surface, leading to a 2 rating for Stream Bank Erosion Potential.

D) This image was taken in approximately the same location as Figure C but after grazing and trampling had been removed for several years. The banks have been able to regain a more stable profile, and the banks are covered with vigorous wetland vegetation. The site would now rate a 4 for Stream Bank Erosion Potential and a 3 for Bank Soil Stability.

Figure 12. Examples of stream bank soil stability and erosion potential conditions.

A5. Soil Surface Condition

Definition: The Soil Surface Condition metric is a measure of anthropogenic disturbance of wetland and riparian soils that results in modification of soil characteristics.

Seasonality: This metric may be conducted in any season when the soil surface is visible or disturbance evident.

Protocols: Soil Surface Condition is based on a visual assessment of anthropogenic soil disturbance indicators and an estimate of the percentage of soil disturbance relative to the total area of the SA. As part of the survey walkthrough, a running checklist of field indicators by SA segment is completed using Worksheet 14. The final rating requires an estimate of total percent area of the SA that has anthropogenic soil disturbance. The following are general guidelines for assessing Soil Surface Condition:

- Assume there are zones of active, naturally occurring erosion and deposition within the active floodplain of the SA. Portions of the SA may be natural sources of and sinks for sediment.
- Differentiate, to the extent possible, anthropogenic soil disturbance that could contribute to degradation of the riverine wetland.
- For systems that can be waded, assess both sides of the SA. For those that cannot, only assess the accessible side of the SA.

Steps:

1. Prior to field work, using available aerial imagery in the GIS or the SA abiotic map, identify roads and other soil surface disturbances within the SA and surrounding landscape area. Mark disturbed areas on the SA abiotic map to take in the field and provisionally check them off on Worksheet 14.
2. Conduct soil-surface assessment as part of the segment traverses in order to ground-truth work completed in Step 1 and to identify additional evidence of disturbance not seen at the scale of the SA abiotic map. For each transect, check off all indicators that apply on Worksheet 14. This is especially important since small amounts of disturbance can change the rating for the metric.
3. Estimate the area of soil surface disturbance as a percentage of the total area of the SA.
4. Based on the indicators and the percentage disturbance for the transects combined, rate the overall SA using the narratives in Table A5 and enter the rating on the SA Rank Summary Worksheet.

A6. Channel Mobility.

Definition: Channel Mobility is an assessment of the dynamic capacity of a channel to laterally migrate or avulse, leading to the development of a dynamic patch mosaic of fluvial landforms that support wetland and riparian communities.

Seasonality: This metric is best assessed in late spring to early fall when vegetation foliage is present.

Protocols: Channel mobility is based on the presence and extent of artificial channel stabilization features (e.g. riprap, jetty jacks) or non-native perennial woody vegetation that potentially limit the lateral channel migration at high discharge. Cover of stabilization features is estimated at the bank edge corresponding to the three floodplain traverses.

Steps:

1. At each of the three sampling points, estimate the percent absolute cover of each of the mobility elements listed in Worksheet 13 in 50-m segments on each bank (looking about 25 m upstream and 25 m downstream on the SA side and on the opposite bank side).
2. For each 50-m segment, sum the total cover of all elements.

3. Average the two bank scores to arrive at the sampling point average.
4. Average the three sampling locations and rate using Table A6.
5. Enter the rating on the SA Rank Summary Worksheet.

Stressor Checklists – Worksheets 15a, b, c, &d

Stressor checklists are designed to assess the intensity of stressors that occur within the SA and the buffer area. Stressors are anthropogenic disturbances that would be expected to have a negative effect on the condition of the SA. The purpose of the stressor checklists is to provide additional information that furthers the understanding of the current wetland condition. Therefore, they are not used in scoring or ranking the condition of the wetland.

Stressor checklists are grouped into four categories: 1) Landscape Context Stressors (Worksheet 15a); 2) Vegetation Stressors (Worksheet 15b); 3) Physical Structure Stressors (Worksheet 15c); and 4) Hydrologic Stressors (Worksheet 15d). Stressor checklists identify stressors that occur within the SA and the buffer.

To complete the stressor checklist,

1. For each checklist, record absent, minor (<10% of the area), moderate (mod) (10-50% of the area) and significant (>50% of the area) stressors that occur in the buffer area and the SA.

2. Summarize the SA by counting the stressors per attribute category, by location and intensity class, on Worksheet 15e. (The interactive PDF will calculate this.)

3. Enter the total number of stressors by location on the SA Rank Summary Sheet and any summary comments on the SA Cover Worksheet.

Appendix A

New Mexico Rapid Assessment Method

USACE Riverine Wetlands

Field Guide Worksheet Packet

(Version 1.3)

For conducting the New Mexico Rapid Assessment Method (NMRAM), a packet of worksheets is provided for evaluation of both Level 1 GIS mapping metrics (Landscape Context) and the Level 2 field metrics (Biotic and Abiotic). These worksheets are to be used in conjunction with the Landscape and SA field maps. The worksheets are designed for paper use in combination with the provided Lowland Riverine and Montane Riverine Field guides. This set of datasheets includes all metrics for both subclasses of the riverine NMRAM. Each metric will be marked with a note as to which subclass it is relevant to (some will be relevant to both subclasses.) Also included are two metrics that are specifically for the USACE Riverine Wetlands.

Please use the appropriate SA size for the subclass in which you are working. Montane Riverine SAs should be 100-200m in longitudinal length, with a maximum width of 100-150m, while Lowland SAs should be roughly 15 ha in size (300-400m length, 200-300m width). SAs should not be significantly smaller than these recommended sizes unless the active floodplain has been reduced to a smaller size by alterations or natural conditions. Reducing SA size because of limited access, or for convenience will result in many metrics scoring lower than they would if the correct SA size had been used. Before leaving a site check that all relevant field metrics have been completed.

NMRAM USACE Riverine Wetlands Version 1.3

SA Cover Worksheet			
Project Name		CORPS File #	- - -
County	Elevation (ft)	(m)	Ecoregion
Ownership			
Project General Location and Boundary (Rationale, comments)			
Driving Directions			
Brief project description and construction footprint			

Surveyor Role	Surveyor Name	Surveyor Initials
Landscape		
Biotic		
Abiotic		
Stressors		

Project Center Point					
Northing	**Easting**	**Zone**	**Datum**	**Latitude**	**Longitude**
Survey Date		**Start Time**		**End Time**	

SA Description

Describe current annual precipitation conditions that might affect the site at the time of assessment

SA Landscape Context (summarize the wetland and surrounding landscape; include condition and impacts)

SA Biotic Condition (vegetation patterns, composition and structure, exotics and invasives, disturbance evidence, fire and herbivory)

SA Abiotic Condition (hydrological alterations {e.g., dams, walls etc.]; flooding characteristics and evidence of overbank flooding; soil disturbance and other site impacts; explain the hydrologic breaks or other factors that define the SA limits)

Assessment Summary (Overall site condition summary and comments after the field data is collected.)

Provisional Field Score		Rank		Surveyor(s)			
Final Score		Rank		Initials		Date	

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

NMRAM - SA Rank Summary Worksheet: USACE Riverine Wetlands 1.3	
Metric Description	Rating
Landscape Context Metrics	
L1. Buffer Integrity Index (Buffer Percent+ Buffer Width)/2	
L2. Riparian Corridor Connectivity	
L3. Relative Wetland Size	
L4. Surrounding Land Use	
Internal Landscape Metrics	
L6. Internal Riparian Corridor Connectivity	
L7. Sample Area Land Use	
Biotic Metrics	
B1. Relative Native Plant Community Composition	
B2. Vegetation Horizontal Patch Structure	
B3. Vegetation Vertical Structure	
B4. Native Riparian Tree Regeneration	
B5. Invasive Exotic Plant Species Cover	
Abiotic Metrics	
A1. Floodplain Hydrologic Connectivity	
A2. Physical Patch Diversity	
A3. Channel Equilibrium	
A4. Stream Bank Stability and Cover	
A5. Soil Surface Condition	
A6. Channel Mobility	

SA Condition Scoring Summary	
Major Attribute	Average Score
Landscape Context	
Internal Landscape	
Biotic	
Abiotic	
SA WETLAND CONDITION SCORE AVG Σ	

Score	Description
>3.25-4.0	Excellent Condition
>2.5-3.25	Good Condition
>1.75-2.5	Fair Condition
1.0-1.75	Poor Condition

Stressor Summary	Buffer			Sample Area		
	Minor	Mod	Intense	Minor	Mod	Intense
Total # Stressors						

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

Landscape Context

L1 - Buffer Integrity Index

Worksheet 1a. Buffer and RCC Checklist. Check off land-cover elements within the buffer area or the RCC corridors that are either allowed or excluded and considered non-buffer elements that disrupt ecosystem connectivity. Indicate the imagery type and date.

Imagery		Image Date	

Allowed buffer/RCC land cover elements			Excluded non-buffer/RCC land cover elements		
Buffer	RCC		Buffer	RCC	
☐	☐	Natural or semi-natural vegetation patches	☐	☐	Commercial and residential developments,parking lots, dams and other structures.
☐	☐	Small irrigation ditches without levees	☐	☐	Lawns, parks, golf courses, sports fields
☐	☐	Old fields, unmaintained	☐	☐	Railroads
☐	☐	Open range land	☐	☐	Maintained levees
☐	☐	Foot trails, horse trails, unpaved bike trails (low intensity)	☐	☐	Intensive livestock areas (horse paddocks, feedlots, etc.)
☐	☐	Non-channel open water	☐	☐	Intensive agriculture: maintained pastures, hay fields, row crops, orchards, and vineyards
☐	☐	Non-functioning abandoned vegetated levees, or naturally occurring levees	☐	☐	Paved roads or developed second-order unpaved but graded roads
☐	☐	unpaved two tracks roads	☐	☐	Open water bounded by a levee or other manmade structure
☐	☐ Other		☐	☐ Other	

Worksheet 1b. Buffer Percent Sub-metric. Measure or estimate the percentage of the SA perimeter composed of allowed buffer elements and enter into the Buffer Percent Box below. Rate the sub-metric using Table L1a and enter the rating on the Buffer Integrity Summary Worksheet 1d.

Buffer Percent (%)=	

Table L1a. Buffer Percent

Rating	Buffer Percent
◯ 4	100%
◯ 3	>80% - <100%
◯ 2	≥50% - ≤80%
◯ 1	<50%

Worksheet 1c. Buffer Width Sub-metric. Measure the length of each buffer line in meters in the GIS or on the map. Average the line lengths and rate using Table L1b. Enter the rating on the Buffer Integrity Summary Worksheet 1d.

Line	Buffer Width (m)	Buffer Width (ft)	Line	Buffer Width (m)	Buffer Width (ft)
A			**E**		
B			**F**		
C			**G**		
D			**H**		
Average					

Table L1b. Buffer Width

Rating	Average buffer width
◯ 4	≥190m
◯ 3	≥130 - <190m
◯ 2	≥65 - <130m
◯ 1	<65m

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

Worksheet 1d. Buffer Width Summary. 1) Enter the sub-metric ratings from Tables L1a and L1b above. 2) Calculate the Buffer Integrity Index Score with the following formula

Buffer Integrity Index Score = (Buffer % + Average Buffer Width) / 2

3) Using the Buffer Integrity Index Score, enter a final rating for Buffer Integrity in Table L1c and enter the rating on the SA Summary Worksheet.

Sub-metric	Rating	Comments
Buffer Percent		
Average Buffer Width		
Buffer Integrity Index Score		

Table L1c. Summary Rating for Buffer Integrity

Rating	Score
◯ 4	>3.5
◯ 3	>2.5 - ≤3.5
◯ 2	>1.5 - ≤2.5
◯ 1	≤1.5

L2 - Riparian Corridor Connectivity (RCC)

Refer to worksheet 1a for allowed riparian corridor (RCC) elements and excluded non-buffer RCC land cover elements. Following the steps in the FIELD GUIDE enter the values for non-buffer elements in Worksheet 2. Using Table 2 in the FIELD GUIDE, use the minimum assessed width for certain non-buffer elements bisecting the riparian corridor. Complete the RCC calculation using Table L2d and enter the rating (L2 box) on the SA Rank Summary Worksheet. ☐ **Montane** ☐ **Lowland**

Segment	Upstream		Downstream	
Bank	**Left**	**Right**	**Left**	**Right**
A) Total Disrupted Bank (m)				
B) Total Segment Disruption (m)				
C1) % Segment Disruption = (B/1000)*100				
C2) % Segment Disruption = (B/2000)*100				
D) Total Disruption all segments (m)				
E1) % Total Disruptions = (D/2000)*100				
E2) % Total Disruptions = (D/4000)*100				

Table L2. Riparian Corridor Connectivity rating table based on overall and segment disruption by non-buffer elements.

Rating Score	Description
◯ 4	0% total disruption on all segments combined.
◯ 3	<15% (< 600 m) total disruption on all segments combined.
◯ 2	≥15% to <40% (≥ 600 to < 1600 m) total disruption on all segments combined.
◯ 1	≥40% (≥1600 m) or more total disruption on all segments combined.

L3 - Relative Wetland Size

Worksheet 3. a. Calculate the Relative Size Ratio (RSR) between the current wetland size and the historic wetland size. **b.** Calculate the Relative Wetland Size Index (RWSI) as (1-RSR)*100.

3a. Relative Size Ratio (RSR)						3b. Relative Wetland Size Index (RWSI)						
Current Size		Historic Size		RSR				RSR				RWSI (%)
	/		=			1	-		X	100	=	

Table L3. Relative Wetland Size Rating Based on the RWSI percentages from Worksheet 3.

Rating	RWSI Score	Description
◯ 4	<10%	Wetland is at, or only minimally reduced from its full original, natural extent and has not been artificially reduced in size.
◯ 3	10% - 39%	Wetland remains more than half the size of its natural extent.
◯ 2	40% - 69%	Wetland has been reduced to nearly half its natural extent
◯ 1	≥70%	Wetland has been greatly reduced from its full original, natural extent.

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L4 - Surrounding Land Use and L7 - Sample Area Land Use

Worksheet 4. Land Use Index (LUI). Enter the percent land use are occupied by a given land use element. Calculate LUI Score by element as the product of the element coefficient times the percent of the LUI area occupied (total will equal 100%). Sum the element scores to create the final LUI scores. Rate using Table L4 and enter the rating in the SA Rank Summary Worksheet.

Land Use Element	Coef	% LUZ Area (L4)	LUZ LUI Score	% SA Area (L7)	SA LUI Score
Paved roads, parking lots, domestic or commercially developed buildings, mining (gravel pit, quarry, open pit, strip mining), railroads	0				
Unpaved roads (e.g., driveway, tractor trail, unpaved parking lots)	0.1				
Dredging, borrow pits, abandoned mines, water-filled artificial impoundments (ponds and reservoirs)	0.1				
Filling or dumping of sediment or soils	0.1				
Intense recreation (all-terrain vehicle use, camping, popular fishing spot, etc.)	0.3				
Rip-rapped channel, junkyards, trash dumps, disturbed ground (not including roads)	0.3				
Ski area	0.4				
Dam sites and flood-disturbed shorelines around water storage reservoirs	0.5				
Abandoned artificial impoundments (ponds and reservoirs) and associated disturbed flood zones	0.5				
Artificial/Constructed wetlands, irrigation ditches	0.7				
Developed/Managed trail system (high use trail)	0.8				
Paddock, dirt lot	0.1				
Agriculture - active tilled crop production	0.2				
Agriculture - permanent crop (vineyards, orchards, nurseries, berry production)	0.3				
Manicured lawns, sport fields, and golf courses; urban manicured parks	0.3				
Floodplain leveled with current or historic mowing	0.4				
Old fields and other disturbed fallow lands dominated by ruderal and/or exotic species (e.g., kochia, Russian thistle, mustards, annual vegetation)	0.5				
Mature old fields and other fallow lands with natural composition, introduced hay field and pastures (e.g., perennial vegetation cover)	0.7				
Restoration areas in process to natural conditions (re-conversion in process)	0.8				
Haying of native grassland (e.g., no tillage, haying and baling only)	0.9				
Woodland/Shrub vegetation conversion (chaining, cabling, rotochopping)	0.3				
Heavy logging or tree removal with >50% of large trees (e.g., >30 cm diameter at breast height) removed	0.3				
Commercial tree plantation, christmas tree farms	0.6				
Selective logging or tree removal with <50% of large trees (e.g., >30 cm diameter at breast height) removed	0.8				
Mature restoration areas returned to natural conditions (re-converted)	0.9				
Natural area, land managed for native vegetation - No agriculture, logging, development	1				
LUZ LUI Score= Coefficient * % LUZ Area, SA LUI score = Coefficient * % SA Area					

Table L4. Surrounding Land Use Rating	
Rating	**Land Use Zone LUI Score**
◯ 4	≥95 - 100
◯ 3	≥80 - <95
◯ 2	≥40 - <80
◯ 1	<40

Table L7. Sample Area Land Use Rating	
Rating	**Sample Area LUI Score**
◯ 4	>99
◯ 3	≥90 - ≤99
◯ 2	≥75 - <90
◯ 1	<75

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L6 - Internal Riparian Corridor Connectivity (IRCC)

Worksheet L6 IRCC Non-Connectivity Calculation. Sum the length of disruptions for each bankside inside the SA and calculate percentage disruption per bankside. Sum the total length of disruptions for total SA (left and right bankside combined) and calculate the percentage disruption for the SA		
Bankside		
A) SA Length (m)		
B) Total Disrupted Bankside (m)	Left=	Right=
C) Total Disruption SA (m) = D		
D) % Total SA Disruptions = (D/(SA length * 2)) * 100		

Table L6. IRCC rating table based on overall and segment disruption by non-connectivity	
Rating	**Description**
◯ 4	<1% total disruption on both sides combined.
◯ 3	≥1 and <10% total disruption on both sides combined.
◯ 2	≥10 and <25% total disruption on both sides combined.
◯ 1	>25% or more total disruption on both sides combined.

Landscape context metrics comments:

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Biotic Metrics

Worksheet 5. Polygons from SA Biotic Map, and Vegetation Community Patch Polygon field data for Biotic metrics B3, B4 and B5. For each polygon enter a unique number from the SA Biotic Map. Each polygon is evaluated with respect to Vegetation Vertical Structure (B3) Native Tree Regeneration (B4) and Invasive Exotic Plant Species Cover (B5) metrics. (See Field Guide for metric instructions.) In addition, wetland species are used in the Vegetation Vertical Structure metric and the comments box is used for documenting when the VST 6W is selected (see Field Guide for instructions). The comments box is also used for documenting and describing vegetation community patch features.

Polygon No	B3 Structure Type	B4 Tree Regeneration % Cover	B5 Invasive Species % Cover	Invasive Species (List Code(s))	Wetlands Species (List Code(s))	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

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B1 - Relative Native Plant Community Composition

Worksheet 6. CT Plant Species and Polygon Assignments. For each CT, enter the species codes for the two top dominant species in each stratum. See footnotes for special instructions. If a species appears in more than one strata, assign the species to the stratum in which it is more abundant. Each polygon is either assigned to the same CT if it has the same composition or a new CT is created for the polygon.

		Tall Woody Stratum [1]				Short Woody Stratum [2]				Herbaceous/Sparse Stratum [3]				CT Score [4]		
CT	Polygon Nos.	Species 1	E N	Species 2	E N	Species 3	E N	Species 4	E N	Species 5	E N	Species 6	E N	Raw	% SA[5]	Wt Score 6
A																
B																
C																
D																
E																
F																
G																
H																
I																
J																
K																
L																
M																
N																
O																
													Final Weighted Score[7]			

1. Trees and shrubs > 5 m (15 feet) and > 25% total stratum cover; 2. Trees and shrubs ≤5m (15 feet) and >25% total stratum cover; 3. Herbaceous (graminoids and forbs)>10% total stratum cover. 4. Raw Score is from Table B1a; 5. % SA is the percentage of the SA area as a decimal number; 6. Wt. Score is the product of the Raw Score * % SA; 7. The Final Weighted Score is the sum of the weighted scores.

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Table B1. Relative Native Plant Community Composition Rating			
Rating		CT Final Weighted Score	
○	4	≥ 3.75	<10% non-native
○	3	≥ 3.25 and <3.75	10% ≤20% non-native
○	2	> 2.0 and <3.25	20% ≤50% non-native
○	1	≤2.0	>50% non-native

B2 - Vegetation Horizontal Patch Structure

Worksheet 7. Indicate the schematic pattern that best matches the mapped vegetation patch pattern. Rate using Table B2 and enter rating on the SA Rank Summary Worksheet.

Horizontal Patch Structure pattern A,B,C, or D:

Table B2. Ratings for Vegetation Horizontal Patch Structure	
Rating	Description
○ 4	Most closely matches Pattern A. SA has a diverse patch structure (>4 patch types) and complexity. A dominant patch type would be difficult to determine.
○ 3	Pattern B. SA has a moderate degree of patch diversity (3 patch types present) and complexity. A single, dominate patch type may be present, although the other patch types would be well represented and have more than one occurrence in the SA.
○ 2	Pattern C. SA has a low degree of patch diversity and complexity. Two or three patch types may be present; however, a single, dominant patch type exists with the others occupying a small portion of the SA.
○ 1	Pattern D. SA has essentially little to no patch diversity or complexity. The SA is dominated by a single patch type. Other patch types, if present, occur infrequently and occupy a small portion of the floodplain.

B3 - Vegetation Vertical Structure

Worksheet 8. Percentage of SA by vertical structure type (VST). Using the Structure Type from Worksheet 5 and the %SA from Worksheet 6 calculate the total area of the SA occupied by each VST using the formula VST(type) = Sum (%SA for CTs with same VST) x 100. Enter the total %SA for each VST below.

	VST 1 High Structure Forest	VST 2 Low Structure Forest	VST 5 Tall Shrubland	VST 6S Short Shrubland	VST 6W Herbaceous Wetland	VST 6H Herbaceous Vegetation	VST 7 Sparse Vegetation
Total % of SA							

Table B3. Rating for Vegetation Vertical Structure. Using the data from Worksheet 8 rate the SA based on the criteria in Table B3. Pick the row that best fits the distribution of VSTs in the SA. Each row specifies the required dominant VST plus co- and sub-dominants. Dominance is based on percentage cover, with the highest percentage cover VST being the dominant. The listed percentage cover of the co- or sub-dominant VSTs is a minimum. The VSTs listed in the columns must be the most common VSTs in the SA for the rating to be applicable Woksheet 8). Column 1 and 2 can be inverted in dominance, and the rating will still apply (i.e. the VST in the "dominant" column can be the the co- or sub-dominant VST, when the VST from the "co- or sub-dominant" column is dominant VST). Work from the top of the table down. As long as the requirements for a row are met, any other VSTs may or may not co-occur without changing the rating.

Rating	Dominant VST	Co- or Sub-dominant VST ≥15%	Sub-dominant VST ≥5%
○ 4	1	5	6W and/or 6H
	2	5	6W
	1	6W	
○ 3	1		
	2 or (2 & 1 combined)	5 or 6W	
	5	6W	
○ 2	2		
	5		
	6W		
○ 1	6S		
	6H		
	7		

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B4 - Native Riparian Tree Regeneration

Table B4. Native Riparian Tree Regeneration rating. Using the polygon percent cover of native tree seedlings, saplings and poles from worksheet 5, rate the SA based on polygon percent cover and patch density. Enter the rating on SA Rank Summary Worksheet .

Rating	Description
○ 4	Native poles, sapling, and seedlings trees well represented; obvious regeneration, many patches or polygons with >5% cover; typically multiple size (age) classes.
○ 3	Native poles, saplings and/or seedlings common; scattered patches or polygons with 1% -5% cover; size classes few.
○ 2	Native poles, saplings and/or seedlings present but uncommon; restricted to one or two patches or polygons with, typically <1% cover); little size class differentiation.
○ 1	Native poles, saplings, and/or seedlings absent (0% cover).

B5 - Invasive Exotic Plant Species Cover

Worksheet 9. Based on worksheets 5 and 6, estimate the percentage cover of invasive exotic species for the SA and enter below. Rate using Table B5 and enter the rating in the B5 box on the SA Rank Summary Worksheet.

Invasive cover (%) ☐

Table B5. Ratings for Invasive Exotic Plant Species Cover

Rating	Invasive Species Cover %
○ 4	0%
○ 3	>0% - <1%
○ 2	≥1% - <10%
○ 1	≥10%

Biotic metrics comments:

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Abiotic Metrics

A1 - Floodplain Hydrologic Connectivity

Worksheet 10a - Based on evidence observed during the traverse of each segment, estimate the percentage of overall level of SA flood inundation (10a1). For each segment include all SA surfaces inundated due to flooding from the channel, side channels, o groundwater, but ignoring inundation from culverts (or other man-made inputs) and form non-channel sources originating outside of the SA. Estimate the extent of surface inundation (10a2) in each segment in three locations, channel edge, SA centre and outer edge. Enter M, F or A for inundation features present in each segment. U (upper) M (middle) L (Lower)

10a1. SA Surface Inundation - cumulative					10a2. SA Surface Inundation - extent				
U	M	L	% of SA	Description	% U	% M	%L	General Location	Description
☐	☐	☐	≥ 75%	The degree that recent large flood events have inundated the SA surface depositing fresh sediments, scouring surfaces, depositing fine wrack lines, and leaving mud cracks in fine sediment. Watch for indicators during each traverse, then select the percentage range that best fits the observed evidence.	☐	☐	☐	Channel edge	The extent of SA wetting: Lowland systems evidence of flooding should be in many places across the floodplain. Use the map to estimate for unvisited locations
☐	☐	☐	≥ 50% to < 75%		☐	☐	☐	SA Center	
☐	☐	☐	≥ 35% to < 50%		☐	☐	☐	Outer edge	
☐	☐	☐	≥ 20% to < 35%		**SA features: for each indicator enter a M if many occur, F if few occur, or A if featured are absent in the SA as represented by each transect.**				
☐	☐	☐	≥ 10% to < 20%						
☐	☐	☐	≥ 5% to < 10%		☐	☐	☐	Active side channels	
☐	☐	☐	≥ 1% to < 5%		☐	☐	☐	High flow channels	
☐	☐	☐	> 0% to <1%		☐	☐	☐	Abandoned channels	
☐	☐	☐	0%		☐	☐	☐	Overbank flow	

Worksheet 10b - Floodplain Hydrologic Connectivity Supplemental Inundation Indicators - For each supplemental indicator estimate the rating for each segment using the rating description. If no indicators are present, check the X box for the segment.

U	M	L	Rating	Rating Description	Supplemental Indicator
☐	☐	☐	**4**	Fresh FDLWD found scattered throughout the SA	**A. Recent Flood Deposited large Woody Debris(FDLWD):** Presence of FDLWD that looks recently transported by flow (i.e., minimal disturbance from animals, no recent termite infestation, etc). Does not include non-fluvial woody debris piles (slash, deadfall, etc); does include reworked or old woody debris with new deposits on top. Woody debris must be >4" diameter to count as large.
☐	☐	☐	**3**	Fresh FDLWD has limited distribution across SA; only near large active side channels or main channel	
☐	☐	☐	**2**	Fresh FDLWD rare and close to the main channel	
☐	☐	☐	**1**	FDLWD present, but no fresh deposits	
☐	☐	☐	**X**	No FDLWD of any kind present in SA	
☐	☐	☐	**4**	Side channels have indicators of recent flow throughout SA	**B. Side Channel Wetting:** Side channels, when present, should be actively connected to the main channel, i.e. one or more side channels disperse peak flows across the floodplain. Indicators of active flow within the channels are recently deposited or scoured sediments, ripple-marks, pushed over or recently buried vegetation, fine wrack, lack of litter, or litter buried by sediment.
☐	☐	☐	**3**	Some side channels show indications of flow, but limited in extent or volume	
☐	☐	☐	**2**	Side channels show indications of very limited flow extent and volume	
☐	☐	☐	**1**	Side channels show no indications of flow	
☐	☐	☐	**X**	No side channels present	
☐	☐	☐	**4**	Minimal litter present, or litter very recent or covered by sediment	**C. SA Surface Litter:** Recent flooding will reduce natural tree and shrub litter, most litter is either decomposed rapidly under moist conditions or is covered by sediments, or removed downstream. Rate litter depth only on potions of SA were litter producing woody species are present.
☐	☐	☐	**3**	Little layers scattered in small patches; not deep (< 2 cm thick)	
☐	☐	☐	**2**	Little layers moderately thick (2-5 cm) and generally undistributed; large patches	
☐	☐	☐	**1**	Litter layers very thick (>5 cm) and largely undistributed over large areas.	
☐	☐	☐	**X**	Minimal or no litter producing woody species present, or litter removed by human activity	

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☐ **Method 1**

Table A1: Floodplain Hydrologic Connectivity Ratings. Select a ratings table based on estimated return interval for the peak stream discharge that occurred on the SA within last five years. Use data from worksheets A10a and A10b to help select ratings.

>25 year recent peak discharge return interval ☐

Rating	Description
◯ 4	Highly connected wetlands that have evidence of inundation across the majority of the SA surface (≥50%) and signs of flow in all but the oldest side channels
◯ 3	Moderately connected wetlands have moderate evidence of inundation of the SA surface (25 to <50%) but still show signs of flow in the majority of side and back channels
◯ 2	Minimally connected wetlands have limited evidence of inundation of the SA surface (1 to <25%) but should still show some signs of flow in side and back channels
◯ 1	Disconnected wetlands have minimal evidence of inundation across the SA surface (<10%) and very little to no signs of flow in any side channels.

10-25 year recent peak flow return interval ☐

Rating	Description
◯ 4	Highly connected wetlands have moderate evidence of inundation of the SA surface (≥25%) and signs of flow in all but the oldest side channels
◯ 3	Moderately connected wetlands have limited evidence of inundation of the SA surface (10% to <25%) and signs of flow in the majority of side channels
◯ 2	Minimally connected wetlands have minimal evidence of inundation of the SA surface (5% to <10%) and some signs of flow in side channels
◯ 1	Disconnected wetlands have almost no evidence of inundation across the SA surface (<5%) and no signs of flow in any side channels

2-10 year recent peak discharge return interval ☐

Rating	Description
◯ 4	Highly connected wetlands have limited evidence of inundation of the SA surface (≥10%) and signs of flow in many side channels.
◯ 3	Moderately connected wetlands have minimal evidence of inundation of the SA surface 9<1%) and signs of flow in some side channels
◯ 2	Minimally connected wetlands have almost no evidence of inundation of the SA surface (1% to <5%) and signs of flow in a few side channels.
◯ 1	Disconnected wetlands have no evidence of inundation across the SA surface (<1%) and no signs of flow in any side channels

1-2 year recent peak discharge return interval ☐

Rating	Description
◯ 4	Highly connected wetlands have minimal evidence of inundation of the SA surface (≥5%) and signs of flow in most side channels.
◯ 3	Moderately connected wetlands have no evidence of inundation of the SA surface (1 to <5%) and signs of flow in few side channels.
◯ 2	Minimally connected wetlands have no evidence of inundation of the SA surface (<1%) and with signs of flow in at least one side channel
◯ 1	Disconnected wetlands have no evidence of inundation across the a SA surface and no signs of flow in any side channels.

Rating adjustment comments

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☐ **Method 2**

Table A1c. Narrative Rating Approach for Floodplain Hydrologic Connectivity for single channel Montane Riverine subclass.	
Rating	**Description**
○ 4	Fully connected to the natural floodplain. Broad floodplain except where naturally constricted by valley. Stream provides adequate hydrology to utilize floodplain. Indicators of bankfull discharge are at the bank/floodplain transition, with over-bankfull flows likely to inundate a broad area of floodplain. Floodplain supports riparian vegetation and shows signs of overbank sediment deposition. Or beaver ponds inundate the entire, normally active floodplain and preclude the identification of bankfull indicators and the active floodplain width.
○ 3	Flow access to the floodplain moderately limited by incision, channelization, etc., or not limited but less frequent inundation than fully connected streams described above (as noted by bankfull indicators below floodplain transition). Floodplain supports a riparian overstory, but some understory plants may be upland. An inset floodplain supporting riparian vegetation may also be present.
○ 2	Incised, channelized or modified with an inset floodplain formed, which is regularly inundated and supports appropriate vegetation and sediment regimes. Or the stream has no access to the natural floodplain due to incision, channelization, or flow modification, and the natural floodplain does not support riparian vegetation except for relatively long-lived phreatophytes (e.g., cottonwood, salt cedar, etc.).
○ 1	Fully disconnected from floodplain, either through incision, bank modification/channelization, or hydrologic modification (i.e., abandonment of floodplain due to decreased peak flows). Indicators may include upland vegetation and lack of fresh sediment deposits on the floodplain, etc.

Photo Point Log for Cross-Section Photographs						
Cross Section	**Easting**	**Northing**	**Upstream**	**Downstream**	**Bank Right**	**Bank Left**
1						
2						
3						

Floodplain Hydrologic Connectivity Comments:

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A2 - Physical Patch Complexity

Worksheet 11. Physical Patch Complexity checklist. Check off existing physical patch types for each segment; count the number of unique patch types and rate using Table A2 in combination with the narrative description. Enter the rating on the SA Rank Summary Worksheet Box A2.

Upper Segment	Middle Segment	Lower Segment	Field Indicators (check all existing conditions)
☐	☐	☐	Active side channels
☐	☐	☐	Abandoned channels
☐	☐	☐	Backwater/eddy
☐	☐	☐	Riffles or rapids
☐	☐	☐	Shoals, sparely-vegetated bars
☐	☐	☐	Channel boulders
☐	☐	☐	Oxbow lakes/ponds on floodplains
☐	☐	☐	Vegetated island and side bars
☐	☐	☐	Terraces
☐	☐	☐	Channel pools
☐	☐	☐	Beaver ponds
☐	☐	☐	Swales, depressional features on floodplains
☐	☐	☐	Debris jams in channel
☐	☐	☐	Woody wrack piles on the floodplain
☐	☐	☐	Floodplain micro-topography (mounds, pits)
☐	☐	☐	Downed logs
☐	☐	☐	Natural levees
☐	☐	☐	Standing snags
☐	☐	☐	Variegated, convoluted, or crenulated foreshore
☐	☐	☐	Undercut banks in channels
			No. of unique Patch Types

calculate

Table A2. Ratings for Physical Patch Complexity

Rating	Description
○ **4**	**High** degree of physical patch complexity across the floodplain. There are many floodplain micro-habitats present (mounds and pits, woody wrack piles, etc.); many fluvial geomorphic surfaces (swales, side channels; terraces, side bars, etc.), and there is high in-channel complexity (pools and riffles, large woody debris, undercut banks, etc.). As a guide, 12 or more unique indicators present and well distributed throughout the SA (most indicators are found on multiple segments).
○ **3**	**Moderate** physical patch complexity scattered across the floodplain. There are several floodplain micro-habitats present; several fluvial geomorphic surfaces, and there is moderate in-channel complexity. As a guide, 9 - 11 indicators that are scattered throughout the SA (some on multiple segments).
○ **2**	**Limited** physical patch complexity scattered across the floodplain. There are some floodplain micro-habitats present; some fluvial geomorphic surfaces, and there is limited in-channel complexity. As a guide, on average there are 6 - 8 unique indicators that are present in the SA (only a few on multiple segments).
○ **1**	**Little** or no physical patch complexity on the floodplain. There are few or no floodplain micro-habitats present; few different fluvial geomorphic surfaces, and there is little or no in-channel complexity. As a guide, ≤ 5 unique indicators in the SA.

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A3 - Channel Equilibrium

Worksheet 12. Channel Equilibrium Checklist. Check all field indicators that apply in upper, middle, and lower segments of the SA. Rate using Table A3 and enter the rating into the A3 box on the SA Rank Summary Worksheet.

Condition	Upper Segment	Middle Segment	Lower Segment	Field Indicators(check all existing conditions)
Indicators of Channel Equilibrium	☐	☐	☐	The channel has a well-defined bankfull contour that clearly demarcates the point of incipient flooding where moderate frequent flow events spread flow across the floodplain.
	☐	☐	☐	Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☐	☐	☐	There is leaf litter, thatch, or wrack in most pools.
	☐	☐	☐	The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐	☐	☐	There is little or no active undercutting or burial of riparian vegetation.
	☐	☐	☐	There are no bars that are densely vegetated with perennial vegetation (neither mid-channel bars or point bars).
	☐	☐	☐	Channel and point-bars consist of well-sorted bed material.
	☐	☐	☐	The channel bed is not planar and without an abundance of fine materials filling the interstitial spaces between larger stream substrate.
	☐	☐	☐	There are channel pools at meander bends and some deep pools within the reach.
Indicators of Active Degradation	☐	☐	☐	The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☐	☐	☐	There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated.
	☐	☐	☐	Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐	☐	☐	Channel bed is scoured to large cobbles or boulders and entrained bank material is filling the cobble interstices and pools.
	☐	☐	☐	There are active headcuts within the channel.
	☐	☐	☐	An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
Indicators of Active Aggradation	☐	☐	☐	There is abundant fresh splays of coarse sediment covering the floodplain above the natural point bar elevation.
	☐	☐	☐	There are partially buried living tree trunks or shrubs along the banks.
	☐	☐	☐	The bed is planar overall. The stream lacks well-defined channel pools at meander bends, or pools are filled with sediment.
	☐	☐	☐	There are partially buried or sediment-choked culverts.
	☐	☐	☐	Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐	☐	☐	There are avulsion channels on the floodplain or adjacent valley floor.

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Table A3. Ratings table for Channel Equilibrium	
Rating	**Description**
○ 4	Most of the channel throughout the SA is in equilibrium condition with little evidence of excessive aggradation or degradation based on the field indicators listed in Worksheet 10.
○ 3	There is some evidence of excessive aggradation or degradation; the channel throughout the SA seems to approach an equilibrium condition. Circle primary process: aggradation or degradation.
○ 2	There is evidence of severe aggradation or degradation throughout most of the channel through the SA. Circle primary process: aggradation or degradation.
○ 1	The channel is artificially hardened, channelized, or is concrete throughout most of the SA.

A4- Stream Bank Stability and Cover

Worksheet 13. Bank Soil Stability and Stream Bank Erosion Potential checklists. Check the indicator that best describes the condition upstream and downstream of each Floodplain Hydrologic Connectivity cross-section.

Condition	Upper Segment	Middle Segment	Lower Segment	Field Indicators
Indicators of Bank Soil Stability	☐4	☐4	☐4	Infrequent raw banks, less than 10% of steam bank under stress from trampling, slumping, vegetation removal or active erosion, etc.
	☐3	☐3	☐3	Raw banks and loose soil intermittently and 10%-25% of stream bank under stress from trampling, trail crossing, hoof punching, vegetation removal, erosion etc.
	☐2	☐2	☐2	Significant raw banks and loose soil, 25%-50% of stream bank under stress, trampled, slumping or eroding etc.
	☐1	☐1	☐1	Raw banks almost continuous with greater than 50% of stream bank under stress, loose soil, slumping, trampled or eroding; or channel appear to lack banks due to trampling; or channel that is artificially hardened or concrete along most of its length.
Indicators of Stream Bank Erosion Potential	☐4	☐4	☐4	Over 80% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass or by boulders, large cobbles and/or large woody debris that prevent bank erosion.
	☐3	☐3	☐3	50%-80% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass or by cobble or larger material. Those areas not covered by vegetation are protected to allow only minor erosion.
	☐2	☐2	☐2	25%-49% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass or by cobble or larger material. Those area not covered by vegetation or stabilized by roots, are covered by materials or vegetation that give limited protection.
	☐1	☐1	☐1	Less than 25% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass or by cobble or larger material. Those areas not covered by vegetation provide little or no control over erosion and excess shear stress, and the banks are susceptible to erosion by high water flows.

Average 6 Segment Score ☐

Table A4. Stream Bank Stability and Cover Rating Table	
Rating	**Average Score**
○ 4	4.0-3.5
○ 3	3.4-2.5
○ 2	2.4-1.5
○ 1	1.4-1.0

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

A5 - Soil Surface Condition

Worksheet 14. Soil Surface Condition. Check all that apply in the upper , middle and lower SA segments during the field reconnaissance. The absence of these indicators would signify that disturbances are naturally occurring (e.g., flood deposition or low-density wildlife trails). Estimate the percent soil disturbance by segment area and referring to the SA abiotic map. Rate using Table A5 and enter into the A5 box on the SA Rank Summary Worksheet.

Upper Segment	Middle Segment	Lower Segment	Field Indicators (Check all existing conditions)
☐	☐	☐	Active erosion features due to anthropogenic disturbance (eg. rills, gullies, plant pedestals).
☐	☐	☐	Multiple livestock and other (fishing,hiking) trails,
☐	☐	☐	Vehicle tracks including off-road and construction, etc.
☐	☐	☐	Impervious compacted surfaces or pavement
☐	☐	☐	Grading, plowing, historic leveling, mowing
☐	☐	☐	Fill
☐	☐	☐	Gravel pits
☐	☐	☐	Anthropogenic levees and berms
☐	☐	☐	Irrigation-driven salinity and mineral crusts
☐	☐	☐	Fire pits
☐	☐	☐	Other:
			Estimate % soil disturbance by segment area

Average of Estimates: _____

Table A5. Soil Surface Condition Rating Table

Rating	Description
○ 4	Bare soil areas due to anthropogenic disturbance absent or very limited. No human-caused impervious surfaces or gravel pits are found within the SA. Total disturbance, including erosion, impervious surfaces, fill, or other anthropogenic degradation to the solid surface is less than 1% of the sampling area.
○ 3	Some amount of bare soil from human causes is present but the extent is limited. Area of impervious surfaces are minimal in extent. Total disturbance, including erosion, impervious surfaces, fill, gravel, mining, or other anthropogenic degradation to the soil surface is between 1% and 5% of the sampling area.
○ 2	Bare soils from human causes are common. These may include dense livestock trails, off-road vehicle tracks,tracks, other mechanical rutting, or irrigation-driven salinity. Soil disturbance, while apparent, is limited to specific areas and not found across the majority of the SA. Total disturbance, including erosion, impervious surfaces, fill, gravel mining, or other anthropogenic degradation to the soil surface is between 5% and 10% of the sampling area.
○ 1	Bare soil areas degrade portions of the site because of altered hydrology or other long-lasting impacts. Deep ruts from off-road vehicles or machinery are present. Livestock disturbance or trails are widespread and several inches deep. Water is channeled into rills or ponded. Additional human-caused impervious surfaces or soil compaction are present. Total disturbance, including erosion, impervious surfaces, fill,gravel mining or other anthropogenic degradation to the soil surface, is greater than or equal 10% of the sampling area.

Soil disturbance comments:

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

A6 - Channel Mobility

Worksheet 13. Channel Mobility. Enter total % cover of SA Bank and Opposite (Opp.) Bank stabilized exotic woody vegetation and/or artificial bank stabilizing features. Total cover per bank should not exceed 100%. Average cover by sampling point, and then by SA, and rate using Table A6. Enter rating on SA rank summary worksheet.

percent of bank; 25m up and down stream

Element	Sampling point	U		M		L	
Exotic Woody Cover (%)		**SA Bank**	**Opp Bank**	**SA Bank**	**Opp Bank**	**SA Bank**	**Opp Bank**
Russian olive							
Saltcedar							
Other:							
Artificial Stabilization Features (%)							
Jetty jacks on bank edge							
Constructed levees at bank edge							
Riprap/concrete on bank edge							
Other:							
Total Bank Cover							
Average Sampling Point Cover							
Average SA Cover							

Table A6. Channel Mobility

Rating		Description
◯	**4**	<10% channel stabilized in the reach of the SA and opposite bank; most of the channel has the capacity to migrate under high flows.
◯	**3**	10-25% channel stabilized
◯	**2**	25-50% channel stabilized
◯	**1**	>50% stabilized; little or no opportunity for channel migration. The channel is artificially hardened, channelized, or is concrete throughout most of the SA and opposite bank.

Abiotic metrics comments:

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

Stressor Checklists

Worksheet 15a. Land Use. Check all that apply during the field reconnaissance and whether they are absent, occupy less than 10%, 10-50% or more than 50% of the buffer or SA area. Naturally occurring disturbances (e.g., flood deposition, or low-density wildlife trails) are not included on these checklists.

Land Use	Buffer				Sampling Area			
	Absent	Minor <10%	Mod 10-50%	Intense >50%	Absent	Minor <10%	Mod 10-50%	Intense >50%
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, recreational camping)	☐	☐	☐	☐	☐	☐	☐	☐
Physical resource extraction, mining, quarrying (rock, sediment, oil/gas)	☐	☐	☐	☐	☐	☐	☐	☐
Biological resource extraction (aquaculture, commercial fisheries, horticultural and medical plant collecting)	☐	☐	☐	☐	☐	☐	☐	☐
Temporary settlement/housing	☐	☐	☐	☐	☐	☐	☐	☐

Comments

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

Worksheet 15b. Vegetation. Check all that apply during the field reconnaissance and whether they are absent, occupy less than 10%, 10-50% or more than 50% of the buffer or SA area. Naturally occurring disturbances (e.g., flood deposition, or low-density wildlife trails) are not included on these checklists..

Vegetation	Buffer				Sampling Area			
	Absent	Minor <10%	Mod 10-50%	Intense >50%	Absent	Minor <10%	Mod 10-50%	Intense >50%
Mowing	☐	☐	☐	☐	☐	☐	☐	☐
Grazing, excessive herbivory	☐	☐	☐	☐	☐	☐	☐	☐
Excessive human visitation -trampling	☐	☐	☐	☐	☐	☐	☐	☐
Predation and habitat destruction by non-native vertebrates, including feral introduced naturalized species (domestic livestock, exotic game animals, and pet predators)	☐	☐	☐	☐	☐	☐	☐	☐
Tree/Sapling or shrub removal (cutting, chaining, cabling, herbiciding)	☐	☐	☐	☐	☐	☐	☐	☐
Removal of woody debris	☐	☐	☐	☐	☐	☐	☐	☐
Treatment of non-native and nuisance plant species	☐	☐	☐	☐	☐	☐	☐	☐
Pesticide application or vector control	☐	☐	☐	☐	☐	☐	☐	☐
Biological resource extraction or stocking (various)	☐	☐	☐	☐	☐	☐	☐	☐
Excessive organic debris (e.g. recently logged)	☐	☐	☐	☐	☐	☐	☐	☐
Lack of vegetation management to conserve natural resources	☐	☐	☐	☐	☐	☐	☐	☐
Comments								

Worksheet 15c. Hydrologic Modifications. Check all that apply during the field reconnaissance and whether they are absent, occupy less than 10%, 10-50% or more than 50% of the buffer or SA area. Naturally occurring disturbances (e.g., flood deposition, or low-density wildlife trails) are not included on these checklists.

Hydrologic Modifications	Buffer				Sampling Area			
	Absent	Minor <10%	Mod 10-50%	Intense >50%	Absent	Minor <10%	Mod 10-50%	Intense >50%
Point source discharges, other non-storm water discharge)	☐	☐	☐	☐	☐	☐	☐	☐
Non-point source discharges (urban runoff, farm drainage)	☐	☐	☐	☐	☐	☐	☐	☐
Flow diversions or unnatural inflows (restrictions and augmentations)	☐	☐	☐	☐	☐	☐	☐	☐
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)	☐	☐	☐	☐	☐	☐	☐	☐
Dikes/Levees	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater extraction	☐	☐	☐	☐	☐	☐	☐	☐
Ditches (borrow, agricultural drainage, mosquito control, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Actively managed hydrology (e.g., lake levels controlled)	☐	☐	☐	☐	☐	☐	☐	☐
Comments								

PROJECT NAME: **Date :**

CORPS FILE # : **Surveyor Initials :**

Worksheet 15d. Physical Structure. Check all that apply during the field reconnaissance and whether they are absent, occupy less than 10%, 10-50% or more than 50% of the buffer or SA area. Naturally occurring disturbances (e.g., flood deposition, or low-density wildlife trails) are not included on these checklists.).

Physical Structure (Soil/Substrate)	Buffer				Sampling Area			
	Absent	Minor <10%	Mod 10-50%	Intense >50%	Absent	Minor <10%	Mod 10-50%	Intense >50%
Filling or dumping of sediment or soils (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Grading/Compaction (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Plowing/Disking (N/A for restoration areas)	☐	☐	☐	☐	☐	☐	☐	☐
Resource extraction (sediment, gravel, oil and/or gas)	☐	☐	☐	☐	☐	☐	☐	☐
Vegetation management as negative impact (terracing, root plowing, pitting, drilling seed, or other practices that disturb soil surface)	☐	☐	☐	☐	☐	☐	☐	☐
Disruption of leaf litter/humus, or peat/organic layer, or biological soil crust	☐	☐	☐	☐	☐	☐	☐	☐
Excessive sediment or organic debris (e.g. excessive erosion, gullying, slope failure)	☐	☐	☐	☐	☐	☐	☐	☐
Pesticides or trace organics impaired (point source or non-point source pollution)	☐	☐	☐	☐	☐	☐	☐	☐
Trash or refuse	☐	☐	☐	☐	☐	☐	☐	☐
Comments								

Worksheet 15e. Stressor Summary. Sum the number of stressors checked above for the buffer and the SA. Enter sums in the Stressor Summary boxes on the SA Rank Summary Worksheet.

Stressor Summary	Buffer			Sampling Area		
	Minor	Mod	Intense	Minor	Mod	Intense
Total # Landscape Context Stressors						
Total # Vegetation (Biotic) Stressors						
Total # Hydrologic Condition Stressors						
Total # Physical Structure Stressors						
Total # Stressors						

Appendix B. Reference Sheets for Recording Field Data

The following tables and figures are reference material to be used in conjunction with the Field Guide Worksheet Packet (Appendix A) for the following metrics:

B1. Relative Native Plant Community Composition (Table B1a)
B2. Vegetation Horizontal Patch Structure (Table B2a and Figure B2c)
B3. Vegetation Vertical Structure (Figure B3a)

A1. Floodplain Hydrologic Connectivity (Figure A1a)
A11. Groundwater Index (Table A11a, Table A11b and Table A11d)

It is suggested that a copy of these reference sheets be taken into the field as the information contained herein is essential to completing the scoring of the related NMRAM metrics.

B1 – Relative Native Plant Community Composition. Table B1a provides the raw CT scores for all possible combinations of native and exotic plant species dominants that could be recorded on Worksheet 6. The fillable pdf version of the worksheets calculates these scores automatically. E = exotic-dominated CT strata; M = mixed exotic native CT strata; N = native-dominated CT strata; A = absent; U = unknown

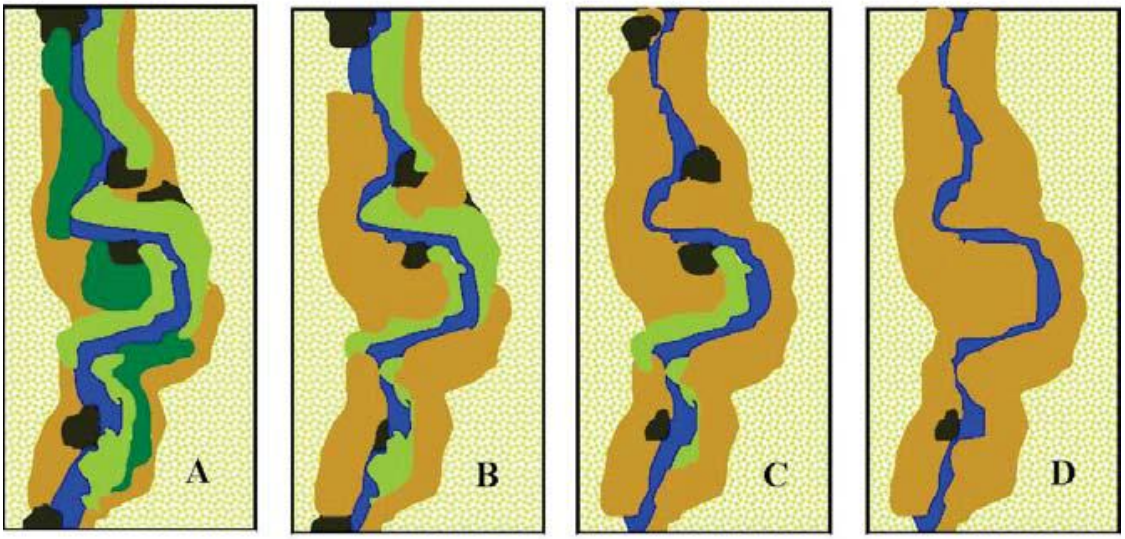
Table B1a			
CT Score	**Tall Woody (>25% Cover)**	**Short Woody (>25% Cover)**	**Herbaceous (>10% Cover)**
Forested Wetland			
0.00	E	E or A	E or A
0.25	E	E or A	M or U
0.50	E	E or A	N
0.75	E	M or U	E or A
1.00	E	M or U	M or U
1.15	E	M or U	N
1.30	E	N	E or A
1.40	E	N	M or U
1.50	E	N	N
1.60	M or U	E	E
1.70	M or U	E	M or A or U
1.80	M or U	E	N
1.90	M or U	M or U or A	E
2.00	M or U	M or U or A	M or U or A
2.10	M or U	M or U or A	N
2.20	M or U	N	E
2.30	M or U	N	M or A or U
2.40	M or U	N	N
2.50	N	E	E
2.60	N	E	M or U
2.70	N	E	N or A
2.85	N	M or U	E
3.00	N	M or U	M or U
3.25	N	M or U	N or A
3.50	N	N or A	E
3.75	N	N or A	M or U
4.00	N	N or A	N or A
Shrub Wetland			
0.00		E	E or A
0.50		E	M or U
1.00		E	N
1.50		M or U	E
2.00		M or U	M or U or A
2.50		M or U	N
3.00		N	E
3.50		N	M or U
4.00		N	N or A
Herbaceous Wetland			
0.00			E
2.00			M or U
4.00			N
Sparsely Vegetated			
0.00			E = Human-disturbed ground (e.g., roads, cleared areas)
2.00			M = Mixed natural/human-disturbed ground
4.00			N = Natural disturbed ground (e.g., sand bars, side channels)

B2 – Vegetation Horizontal Patch Structure. Use community patch size percentages from Table B2a and patch structure pattern examples from Figure B2c in conjunction with rating descriptions on Table B2 (within the data collection worksheets) to rate the Vegetation Horizontal Patch Structure for the SA.

Table B2a. Horizontal Patch Structure Diagram Details

	A	B	C	D
	30%	60%	80%	95%
	30%	30%	10%	5%
	30%	10%	10%	
	10%			
No. CTs	4	3	3	2

Figure B2c. Horizontal Patch Structure pattern A, B, C, or D



B3 – Vegetation Vertical Structure. Figure B3a. Using the VST descriptions below, assign VST type to each vegetation polygon listed on Worksheet 5.

Multiple-Story Communities (woodlands/forests)

VST 1 – High Structure Forest with a well-developed understory. Trees (>5 m) with canopy covering >25% of the area of the community polygon and woody understory layer of tall shrubs or short trees (1.5–5 m) covering >25% of the area of the community (polygon). Substantial foliage is in all height layers.

VST 2 – Low Structure Forest with little or no understory. Trees (>5 m) with canopy covering >25% of the area of the community polygon and minimal woody understory layer (1–5 m) covering <25% of the area of the community (polygon). Majority of foliage is over 5 m above the ground.

Single-story Communities (shrublands, herbaceous, and bare ground

VST 5 – Tall Shrubland. Young tree and shrub layer (1.5–5 m) covering >25% of the area of the community polygon. Stands dominated by tall shrubs and young trees, may include herbaceous vegetation underneath the woody vegetation.

VST 6S – Short Shrubland. Short stature shrubs or very young trees (< 1.5 m) covering >25% of the area of the community (polygon). Stands dominated by short woody vegetation, may include herbaceous vegetation among the woody vegetation.

VST 6W – Herbaceous Wetland. Herbaceous wetland vegetation covering >10% of the area of the community polygon. Stands dominated by obligate wetland herbaceous species. Woody species absent, or <25% cover.

VST 6H – Herbaceous vegetation. Herbaceous vegetation covering >10% of the area of the community polygon. Stands dominated by herbaceous vegetation of any type except obligate wetland species. Woody species absent or <25% cover.

VST 7 – Sparse Vegetation, Bare Ground. Bare ground, may include sparse woody or herbaceous vegetation, but total vegetation cover <10%. May be natural disturbance in origin (e.g., cobble bars) or anthropogenic (e.g., roads).

A1. Floodplain Hydrologic Connectivity (Figure A1a). Examples of Floodplain Hydrological Connectivity indicators on site.

Figure B1. Recent sediment deposition on the SA surface and in side channels

Figure B2. Recent fine debris deposited on the SA surface.

Figure B3. Wrack piles deposited above bankful elevations.

Figure B4. Wrack piles deposited well above bankful in standing vegetation.

Figure B5. Soils cracks following the drying of recent sediment deposits.

Appendix C. Common Dominant Species

The following list identifies common riverine species in New Mexico. The lists are organized alphabetically by scientific name within stratum (life form) groups with trees listed first, followed by shrubs, graminoids (grasses and grass like plants) and finally forbs. Though these are grouped by the stratum (life form) that they achieve at maturity, woody species may be found in any of the NMRAM strata. The list also includes the NM weed classification as of 2016, the Region 7 wetland status as found in USDA's PLANTS database, and the origin of the species, - native (N) or exotic (E).

Region 7 Wetland Status Indicator Codes explained.

Indicator Code	Indicator Status	Designation	Comment
OBL	Obligate Wetland	Hydrophyte	Almost always occur in wetlands
FACW	Facultative Wetland	Hydrophyte	Usually occur in wetlands, but may occur in non-wetlands
FAC	Facultative	Hydrophyte	Occur in wetlands and non-wetlands
FACU	Facultative Upland	Non-hydrophyte	Usually occur in non-wetlands, but may occur in wetlands
UPL	Obligate Upland	Non-hydrophyte	Almost never occur in wetlands

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Tall Woody Species					
Abies concolor	white fir	ABCO		UPL	N
Acer glabrum	Rocky Mountain maple	ACGLG2		FAC	N
Acer grandidentatum	bigtooth maple	ACGR3		FAC	N
Acer negundo	boxelder	ACNE2		FACW	N
Ailanthus altissima	tree of heaven	AIAL	C	FACU	E
Alnus incana ssp. tenuifolia	thinleaf alder	ALINT		FACW	N
Alnus oblongifolia	Arizona alder	ALOB2		FACW	N
Betula occidentalis	water birch	BEOC2		FACW	N
Celtis laevigata var. reticulata	netleaf hackberry	CELAR		FAC	N
Elaeagnus angustifolia	Russian olive	ELAN	C	FAC	E
Fraxinus velutina	velvet ash	FRVE2		FAC	N
Juglans major	Arizona walnut	JUMA		FACW	N
Juniperus deppeana	alligator juniper	JUDE2		FACU	N
Juniperus monosperma	oneseed juniper	JUMO		UPL	N
Juniperus scopulorum	Rocky Mountain juniper	JUSC2		FACU	N
Morus alba	white mulberry	MOAL		UPL	E
Picea pungens	blue spruce	PIPU		FAC	N
Pinus ponderosa	ponderosa pine	PIPO		FACU	N
Platanus wrightii	Arizona sycamore	PLWR2		FACW	N
Populus angustifolia	narrowleaf cottonwood	POAN3		FACW	N
Populus deltoides	cottonwood	PODE3		FAC	N
Populus deltoides ssp. wislizeni	Rio Grande cottonwood	PODEW		FAC	N
Populus fremontii	Fremont's cottonwood	POFR2		FAC	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Populus x acuminata	lanceleaf cottonwood	POAC5		FAC	N
Populus tremuloides	quaking aspen	POTR5		FAC	N
Prunus armeniaca	apricot	PRAR3		FACU	E
Quercus gambelii	Gambel's oak	QUGA		UPL	N
Robinia pseudoacacia	black locust	ROPS		FAC	E
Salix amygdaloides	peachleaf willow	SAAM2		FACW	N
Salix gooddingii	Goodding's willow	SAGO		FACW	N
Ulmus pumila	Siberian elm	ULPU	C	UPL	E
Tamarix spp.	Saltcedar	TAMAR2	C	FAC	E
Short Woody Species					
Alhagi maurorum	camelthorn	ALMA12	A	FAC	E
Allenrolfea occidentalis	iodinebush	ALOC2		FACW	N
Ambrosia monogyra	singlewhorl burrobush	AMMO6		FACW	N
Amelanchier utahensis	Utah serviceberry	AMUT		FAC	N
Amorpha fruticosa	desert indigobush	AMFR		FACW	N
Artemisia filifolia	sand sagebrush	ARFI2			N
Artemisia tridentata	big sagebrush	ARTR2			N
Atriplex canescens	fourwing saltbush	ATCA2			N
Baccharis emoryi	Emory's falsewillow	BAEM		FACW	N
Baccharis salicifolia	seepwillow	BASA4		FACW	N
Baccharis salicina	false willow	BASA		FAC	N
Berberis fendleri	Colorado barberry	BEFE		FACU	N
Berberis vulgaris	common barberry	BEVU		FACU	E
Brickelliastrum fendleri	Fendler's brickellbush	BRFE2			N
Brickellia californica	California brickellbush	BRCA3		FAC	N
Brickellia microphylla var. scabra	rough brickellbush	BRMIS			N
Cercocarpus montanus	mountain mahogany	CEMO2		UPL	N
Chilopsis linearis	desert willow	CHLI2		FAC	N
Clematis ligusticifolia	western white clematis	CLLI2		FAC	N
Cornus sericea	redosier dogwood	COSE16		FACW	N
Dasiphora fruticosa	shrubby cinquefoil	DAFR6		FACW	N
Ericameria nauseosa	rubber rabbitbrush	ERNA10		FACU	N
Fallugia paradoxa	Apacheplume	FAPA		FACU	N
Forestiera pubescens	New Mexico olive	FOPU2		FACU	N
Gutierrezia sarothrae	broom snakeweed	GUSA2		UPL	N
Hymenoclea monogyra	singlewhorl burrobush	HYMO			N
Isocoma pluriflora	southern jimmyweed	ISPL			N
Lonicera involucrata	twinberry honeysuckle	LOIN5		FAC	N
Lonicera tatarica	Tatarian honeysuckle	LOTA		FACU	E
Lycium pallidum	wolfberry	LYPA			N
Parthenocissus vitacea	thicket creeper	PAVI5		FAC	N
Pluchea sericea	arrowweed	PLSE		FACW	N
Poliomintha incana	hoary rosemarymint	POIN3			N
Prosopis glandulosa	honey mesquite	PRGL2		FAC	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Prosopis pubescens	screwbean mesquite	PRPU		FAC	N
Prunus americana	American plum	PRAM		FACU	E
Prunus virginiana	common chokecherry	PRVI		FAC	N
Rhus trilobata	skunkbush sumac	RHTR		FACU	N
Ribes aureum	golden currant	RIAU		FAC	N
Ribes inerme	whitestem gooseberry	RIIN2		FACW	N
Ribes leptanthum	trumpet gooseberry	RILE		FAC	N
Robinia neomexicana	New Mexico locust	RONE		FACU	N
Rosa woodsii	Woods' rose	ROWO		FACU	N
Rubus idaeus ssp. strigosus	grayleaf red raspberry	RUIDS2		FACU	N
Salix bebbiana	Bebb willow	SABE2		FACW	N
Salix drummondiana	Drummond's willow	SADR		FACW	N
Salix exigua	coyote willow	SAEX		FACW	N
Salix irrorata	bluestem willow	SAIR		FACW	N
Salix ligulifolia	strapleaf willow	SALI		FACW	N
Salix lucida ssp. lasiandra	Pacific willow	SALUL		FACW	N
Shepherdia argentea	silver buffaloberry	SHAR		FACU	N
Suaeda nigra	bush seepweed	SUNI		FACW	N
Symphoricarpos oreophilus	whortleleaf snowberry	SYOR2		FAC	N
Toxicodendron rydbergii	western poison ivy	TORY		FACU	N
Vitis arizonica	canyon grape	VIAR2		FACU	N
Herbaceous (graminoids)					
Achnatherum lettermanii	Letterman's needlegrass	ACLE9		UPL	N
Achnatherum robustum	sleepygrass	ACRO7		UPL	N
Aegilops cylindrica	jointed goatgrass	AECY	C		E
Agropyron cristatum	crested wheatgrass	AGCR			E
Agrostis gigantea	redtop	AGGI2		FACW	E
Agrostis idahoensis	Idaho bentgrass	AGID		FACW	N
Agrostis stolonifera	creeping bentgrass	AGST2		FACW	E
Alopecurus aequalis	shortawn foxtail	ALAE		OBL	N
Aristida purpurea	purple threeawn	ARPU9			N
Aristida ternipes	spidergrass	ARTE3		UPL	N
Aristida ternipes var. gentilis	spidergrass	ARTEG		UPL	N
Arundo donax	giant reed	ARDO4	C	FACW	E
Bolboschoenus maritimus	saltmarsh bulrush	BOMA7		OBL	N
Buchloe dactyloides	buffalograss	BUDA		FACU	N
Bouteloua aristidoides	needle grama	BOAR		UPL	N
Bouteloua barbata	sixweeks grama	BOBA2		UPL	N
Bouteloua curtipendula	sideoats grama	BOCU		UPL	N
Bouteloua gracilis	blue grama	BOGR2		UPL	N
Bromus catharticus	rescuegrass	BRCA6		UPL	E
Bromus ciliatus	fringed brome	BRCI2		FAC	N
Bromus ciliatus var. richardsonii	fringed brome	BRCIR		FAC	N
Bromus inermis	smooth brome	BRIN2		FAC	E
Bromus japonicus	Japanese brome	BRJA		FACU	E

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Bromus polyanthus	Great Basin brome	BRPO		UPL	N
Bromus tectorum	cheatgrass	BRTE	C	UPL	E
Calamagrostis canadensis	Canada reedgrass	CACA4		FACW	N
Carex atherodes	wheat sedge	CAAT2		OBL	N
Carex emoryi	Emory's sedge	CAEM2		OBL	N
Carex nebrascensis	Nebraska sedge	CANE2		OBL	N
Carex occidentalis	western sedge	CAOC2		UPL	N
Carex pellita	woolly sedge	CAPE42		OBL	N
Carex praegracilis	clustered field sedge	CAPR5		FACW	N
Carex rossii	Ross' sedge	CARO5		UPL	N
Carex simulata	analogue sedge	CASI2		OBL	N
Carex utriculata	Northwest Territory sedge	CAUT		OBL	N
Chloris virgata	feather fingergrass	CHVI4		FACU	N
Cynodon dactylon	bermudagrass	CYDA		FACU	E
Cyperus niger	black flatsedge	CYNI2		FACW	N
Dactylis glomerata	orchardgrass	DAGL		FACU	E
Distichlis spicata	inland saltgrass	DISP		FACW	N
Echinochloa crus-galli	barnyardgrass	ECCR		FACW	E
Eleocharis palustris	common spikerush	ELPA3		OBL	N
Eleocharis parishii	Parish's spikerush	ELPA4		FACW	N
Eleocharis rostellata	beaked spikerush	ELRO2		OBL	N
Elymus canadensis	Canada wildrye	ELCA4		FAC	N
Elymus glaucus	blue wildrye	ELGL		FACU	N
Elymus repens	quackgrass	ELRE4	B	FAC	E
Elymus trachycaulus	slender wheatgrass	ELTR7		FAC	N
Elymus x pseudorepens	false quackgrass	ELPS		FACU	N
Eragrostis cilianensis	stinkgrass	ERCI		FACU	E
Eragrostis intermedia	plains lovegrass	ERIN		UPL	N
Eragrostis mexicana	mexican lovegrass	ERME		FAC	N
Eriochloa acuminata var. acuminata	tapertip cupgrass	ERACA		FACW	N
Festuca arundinacea	tall fescue	FEAR3		FAC	E
Festuca pratensis	meadow fescue	FEPR		FACU	E
Glyceria grandis	American mannagrass	GLGR		OBL	N
Hordeum jubatum	foxtail barley	HOJU		FACW	N
Hordeum murinum ssp. glaucum	smooth barley	HOMUG			E
Juncus arcticus var. balticus	Baltic rush	JUARB5		FACW	N
Juncus dudleyi	slender rush	JUDU2		FACW	N
Juncus ensifolius var. montanus	Rocky Mountain rush	JUENM2		FACW	N
Juncus torreyi	Torrey's rush	JUTO		FACW	N
Leersia oryzoides	rice cutgrass	LEOR		OBL	N
Leptochloa fusca ssp. fascicularis	bearded sprangletop	LEDU		FACW	N
Lycurus setosus	bristly wolfstail	LYSE3		UPL	N
Muhlenbergia asperifolia	alkali muhly	MUAS		FACW	N
Muhlenbergia depauperata	sixweeks muhly	MUDE		UPL	N
Muhlenbergia repens	creeping muhly	MURE		FACU	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Muhlenbergia richardsonis	Mat muhly	MURI		FAC	N
Muhlenbergia wrightii	spike muhly	MUWR		FACU	N
Panicum capillare	witchgrass	PACA6		FAC	N
Panicum obtusum	vine mesquite	PAOB		FACW	N
Pascopyrum smithii	western wheatgrass	PASM		FAC	N
Paspalum distichum	knotgrass	PADI6		FACW	N
Phalaris arundinacea	reed canarygrass	PHAR3		FACW	N
Phleum pratense	timothy	PHPR3		FAC	E
Phragmites australis	common reed	PHAU7		FACW	N
Poa palustris	fowl bluegrass	POPA2		FACW	N
Poa pratensis	Kentucky bluegrass	POPR		FAC	E
Polypogon monspeliensis	annual rabbitsfoot grass	POMO5		FACW	E
Psathyrostachys juncea	Russian wildrye	PSJU3		FAC	E
Saccharum ravennae	ravennagrass	SARA3	A	FACW	E
Schedonorus phoenix	tall fescue	SCPH		FAC	E
Schoenoplectus pungens	common threesquare	SCPU10		OBL	N
Schoenoplectus tabernaemontani	softstem bulrush	SCTA2		OBL	N
Scirpus microcarpus	panicled bulrush	SCMI2		OBL	N
Setaria grisebachii	Grisebach's bristlegrass	SEGR6		FACU	N
Sorghum halepense	johnsongrass	SOHA		FAC	E
Sorghastrum nutans	Indiangrass	SONU2		FACW	N
Sporobolus airoides	alkali sacaton	SPAI		FAC	N
Sporobolus compositus var. compositus	tall dropseed	SPCOC2		UPL	N
Sporobolus contractus	spike dropseed	SPCO4		FACU	N
Sporobolus cryptandrus	sand dropseed	SPCR		FACU	N
Sporobolus giganteus	giant dropseed	SPGI		FAC	N
Sporobolus wrightii	big sacaton	SPWR2		FAC	N
Thinopyrum intermedium	intermediate wheatgrass	THIN6		FACU	E
Herbaceous (forbs)					
Achillea millefolium	common yarrow	ACMI2		FACU	N
Aconitum columbianum	Columbian monkshood	ACCO4		FACW	N
Acroptilon repens	Russian knapweed	ACRE3	B		E
Agrimonia striata	roadside agrimony	AGST		FACU	N
Amaranthus hybridus	slim amaranth	AMHY		FACU	N
Ambrosia acanthicarpa	flatspine burr ragweed	AMAC2		FACU	N
Ambrosia confertiflora	weakleaf bur ragweed	AMCO3		UPL	N
Ambrosia psilostachya	Cuman ragweed	AMPS		FACU	N
Ambrosia trifida	great ragweed	AMTR		FAC	N
Ambrosia tomentosa	skeletonleaf burr ragweed	AMTO3		FACU	N
Anemone canadensis	Canada anemone	ANCA8		FACW	N
Anemopsis californica	yerba mansa	ANCA10		FACW	N
Apocynum androsaemifolium	spreading dogbane	APAN2		FACU	N
Apocynum cannabinum	Indianhemp	APCA		FAC	N
Arctium minus	lesser burdock	ARMI2		FACU	E
Argentina anserina	silverweed cinquefoil	ARAN7		OBL	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Artemisia campestris	field sagewort	ARCA12		FACU	N
Artemisia carruthii	Carruth's sagewort	ARCA14		UPL	N
Artemisia dracunculus	tarragon	ARDR4		FACU	N
Artemisia ludoviciana	white sagebrush	ARLU		FACU	N
Atriplex micrantha	Russian atriplex	ATMI2		FACW	E
Berula erecta	cutleaf waterparsnip	BEER		OBL	N
Bidens bigelovii	Bigelow's beggarticks	BIBI		FACW	N
Bidens leptocephala	fewflower beggartick	BILE		FACW	N
Boerhavia coccinea	scarlet spiderling	BOCO		FACU	N
Cardamine cordifolia	heartleaf bittercress	CACO6		OBL	N
Cardaria draba	hoary cress	CADR	A	FACU	E
Carduus nutans	nodding plumeless thistle	CANU4	B	FACU	E
Centaurea calcitrapa	purple starthistle	CECA2	A		E
Centaurea diffusa	diffuse knapweed	CEDI3	A		E
Centaurea melitensis	Malta starthistle	CEME2	B		E
Centaurea solstitialis	yellow starthistle	CESO3	A		E
Centaurea stoebe ssp. micranthos	spotted knapweed	CESTM	A		E
Chamaesyce setiloba	Yuma sandmat	CHSE8		FACU	N
Chamaesyce vermiculata	wormseed sandmat	CHVE5		FACU	N
Chenopodium berlandieri	pitseed goosefoot	CHBE4		FACU	N
Chenopodium fremontii	Fremont's goosefoot	CHFR3		FACU	N
Chenopodium graveolens	fetid goosefoot	CHGR2		FACU	N
Chenopodium pratericola	desert goosefoot	CHPR5		FACU	N
Cichorium intybus	chicory	CIIN	B	FACU	E
Cicuta maculata	spotted water hemlock	CIMA2		OBL	N
Cirsium arvense	Canada thistle	CIAR4	A	FAC	E
Cirsium parryi	Parry's thistle	CIPA		FACW	N
Cirsium vulgare	bull thistle	CIVU	B	FAC	E
Cleome serrulata	Rocky Mountain beeplant	CLSE		FACU	N
Conium maculatum	poison hemlock	COMA2	B	FACW	E
Convolvulus arvensis	field bindweed	COAR4		FACU	E
Conyza canadensis	Canadian horseweed	COCA5		FACU	N
Croton texensis	Texas croton	CRTE4			N
Cosmos parviflorus	southwestern cosmos	COPA12		FAC	N
Cucurbita foetidissima	buffalo gourd	CUFO		FACU	N
Cyclachaena xanthifolia	giant sumpweed	CYXA		FAC	N
Cynoglossum officinale	hound's tongue	CYOF		FACU	E
Datura wrightii	sacred thornapple	DAWR2			N
Descurainia pinnata	western tanseymustard	DEPI			N
Descurainia sophia	herb sophia	DESO2			E
Dieteria canescens	hoary aster	MACA2		FAC	N
Dipsacus fullonum	Fuller's teasel	DIFU2	B	FAC	E
Drymaria arenarioides	alfombrilla	DRAR7	A		E
Egeria densa	Brazilian waterweed	EGDE	A	OBL	E
Epilobium ciliatum	hairy willowherb	EPCI		FACW	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Equisetum arvense	field horsetail	EQAR		FAC	N
Equisetum laevigatum	smooth horsetail	EQLA		FACW	N
Erigeron flagellaris	trailing fleabane	ERFL		FAC	N
Eriogonum polycladon	sorrel buckwheat	ERPO4		UPL	N
Eritrichium nanum	arctic alpine forget-me-not	ERNA		UPL	N
Euphorbia davidii	David's spurge	EUDA5		FACU	E
Euphorbia esula	leafy spurge	EUES	A		E
Eustoma exaltatum	catchfly prairie gentian	EUEX5		OBL	N
Euthamia occidentalis	western goldenrod	EUOC4		OBL	N
Fragaria virginiana ssp. glauca	Virginia strawberry	FRVIG2		FACU	N
Funastrum cynanchoides	fringed twinevine	FUCY		FAC	N
Galium aparine	stickywilly	GAAP2		FACU	N
Gaura coccinea	scarlet beeblossom	GACO5			N
Gaura mollis	velvetweed	GAMO5		FACU	N
Geranium caespitosum	pineywoods geranium	GECA3		FAC	N
Geranium richardsonii	Richardson's geranium	GERI		FAC	N
Geum aleppicum	yellow avens	GEAL3		FACW	N
Geum macrophyllum	largeleaf avens	GEMA4		FACW	N
Glycyrrhiza lepidota	American licorice	GLLE3		FAC	N
Gnaphalium exilifolium	slender cudweed	GNEX		FACW	N
Grindelia squarrosa	curlycup gumweed	GRSQ		FACU	N
Halogeton glomeratus	halogeton	HAGL	B		E
Helianthus annuus	common sunflower	HEAN3		FACU	N
Helianthus nuttallii	Nuttall's sunflower	HENU		FACW	N
Heliomeris multiflora	showy goldeneye	HEMU3		UPL	N
Heracleum maximum	cow parsnip	HEMA80		FACW	N
Heterotheca subaxillaris	camphorweed	HESU3			N
Heterotheca villosa	hairy goldenaster	HEVI4		UPL	N
Hydrilla verticillata	hydrilla	HYVE3	C	OBL	E
Hymenopappus filifolius	fineleaf hymenopappus	HYFI			N
Hyoscyamus niger	black henbane	HYNI	A		E
Ipomopsis longiflora	flaxflowered ipomopsis	IPLO2		FAC	N
Iris missouriensis	Rocky Mountain iris	IRMI		FACW	N
Isatis tinctoria	Dyer's woad	ISTI	A		E
Iva axillaris	povertyweed	IVAX		FACW	N
Kochia scoparia	common kochia	BASC5		FAC	E
Lactuca serriola	prickly lettuce	LASE		FAC	E
Lepidium latifolium	perennial pepperweed	LELA2	B	FAC	E
Lepidium montanum	mountain pepperweed	LEMO2			N
Lesquerella fendleri	Fendler's bladderpod	LEFE			N
Leucanthemum vulgare	oxeye daisy	LEVU	A	FACU	E
Linaria dalmatica	Dalmation toadflax	LIDA	A		E
Linaria vulgaris	butter and eggs	LIVU2	A	FACU	E
Lycopus americanus	American bugleweed	LYAM		OBL	N
Lycopus asper	rough bugleweed	LYAS		OBL	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Lythrum salicaria	purple loosestrife	LYSA2	A	OBL	E
Machaeranthera tanacetifolia	tanseyleaf aster	MATA2		FACU	N
Maianthemum racemosum	feathery false lily of the vally	MARA7		FAC	N
Maianthemum stellatum	starry false Solomon's seal	MAST4		FAC	N
Matricaria perforata	Scentless camomile	TRPE21	A		E
Medicago lupulina	black medick	MELU		FAC	E
Medicago sativa	alfalfa	MESA		UPL	E
Melilotus officinalis	yellow sweetclover	MEOF		FACU	E
Mentha arvensis	wild mint	MEAR4		FACW	N
Mentha spicata	spearmint	MESP3		OBL	E
Mentzelia albicaulis	whitestem blazingstar	MEAL6			N
Mentzelia multiflora	manyflowered mentzelia	MEMU3			N
Mentha arvensis	wild mint	MEAR4		FACW	N
Mentha spicata	spearmint	MESP3		FACW	I
Mimulus glabratus	roundleaf monkeyflower	MIGL		OBL	N
Mirabilis longiflora	sweet four o'clock	MILO2		FACU	N
Mirabilis oxybaphoides	smooth spreading four o'clock	MIOX			N
Myriophyllum aquaticum	parrot feather watermilfoil	MYAQ2	C	OBL	E
Myriophyllum spicatum	Eurasian watermilfoil	MYSP2	C	OBL	E
Nasturtium officinale	watercress	NAOF		OBL	E
Oxalis dillenii	Dillen's oxalis	OXDI2		FACU	N
Oxypolis fendleri	Fendler's cowbane	OXFE		FACW	N
Oenothera elata ssp. hirsutissima	Hooker's eveningprimrose	OEELH		FACW	N
Oenothera pallida	pale eveningprimrose	OEPA			N
Onopordum acanthium	Scotch thistle	ONAC	A		E
Peganum harmala	African rue	PEHA	B		E
Persicaria lapathifolia	curlytop knotweed	PELA22		OBL	N
Phacelia integrifolia	gypsum scorpionweed	PHIN			N
Physalis longifolia	longleaf groundcherry	PHLO4		FACU	N
Physalis virginiana	Virginia groundcherry	PHVI5			N
Phyla nodiflora	Frog fruit	PHNO2		OBL	N
Plantago major	common plantain	PLMA2		FAC	E
Polygonum aviculare	prostrate knotweed	POAV		FACW	E
Polygonum lapathifolium	curlytop knotweed	POLA4		OBL	N
Portulaca oleracea	common purslane	POOL		FAC	N
Potamogeton crispus	curly pondweed	POCR3	C	OBL	E
Potentilla hippiana	woolly cinquefoil	POHI6		FAC	N
Potentilla pulcherrima	beautiful cinquefoil	POPU9		FAC	N
Pseudognaphalium stramineum	cottonbatting cudweed	PSST7		FAC	N
Ranunculus aquatilis	white water crowfoot	RAAQ		OBL	N
Ranunculus cardiophyllus	heartleaf buttercup	RACA4		FACW	N
alkali buttercup	Ranunculus cymbalaria	RACY		OBL	N
Ranunculus flammula var. ovalis	greater creeping spearwort	RAFLO		OBL	N

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Ratibida columnifera	upright prairie coneflower	RACO3		FACU	N
Ratibida tagetes	green prairie coneflower	RATA		FACU	N
Rorippa sinuata	spreading yellowcress	ROSI2		FACW	N
Rudbeckia laciniata	cutleaf coneflower	RULA3		FAC	N
Rumex acetosella	common sheep sorrel	RUAC3		FAC	E
Rumex altissimus	pale dock	RUAL4		FACW	N
Rumex crispus	curly dock	RUCR		FAC	E
Rumex salicifolius	willow dock	RUSA		FACW	N
Sagittaria cuneata	arumleaf arrowhead	SACU		OBL	N
Salsola tragus	prickly Russian thistle	SATR12		FACU	E
Salvinia molesta	giant salvinia	SAMO5	A	OBL	E
Securigera varia	crownvetch	SEVA4		FACU	E
Senecio eremophilus	desert groundsel	SEER2		FAC	N
Senecio flaccidus	threadleaf ragwort	SEFL3			N
Senecio riddellii	Riddell's ragwort	SERI2			N
Senecio triangularis	arrowleaf groundsel	SETR		FACW	N
Sicyos ampelophyllus	streamside bur cucumber	SIAM			N
Sidalcea candida	white checkermallow	SICA3		FACW	N
Sisymbrium altissumum	tall tumblemustard	SIAL2		FACU	E
Sisymbrium irio	London rocket	SIIR		FAC	E
Sisyrinchium demissum	dwarf blue-eyed grass	SIDE4		OBL	N
Sisyrinchium montanum	mountain blue-eyed grass	SIMO2		FACW	N
Solanum elaeagnifolium	silverleaf nightshade	SOEL			N
Solanum nigrum	black nightshade	SONI		FACU	E
Solanum rostratum	buffalobur nightshade	SORO			N
Solidago canadensis	Canada goldenrod	SOCA6		FACU	N
Sonchus arvensis	field sowthistle	SOAR2		FAC	E
Sonchus asper	spiny sowthistle	SOAS		FAC	E
Sphaeralcea coccinea	scarlet globemallow	SPCO			N
Sphaerophysa salsula	alkali swainsonpea	SPSA3		FAC	E
Stuckenia pectinata	sago pondweed	STPE15		OBL	N
Suaeda calceoliformis	Pursh seepweed	SUCA2		FACW	N
Symphyotrichum ericoides var. ericoides	heath aster	SYERE		FAC	N
Symphyotrichum lanceolatum	white panicle aster	SYLA6		OBL	N
Taraxacum officinale	common dandelion	TAOF		FACU	E
Thalictrum fendleri	Fendler's meadowrue	THFE		FAC	N
Thalictrum revolutum	waxyleaf meadow-rue	THRE		FACW	N
Thalictrum venulosum	veiny meadow-rue	THVE		FAC	N
Thelesperma megapotamicum	Hopi tea greenthread	THME			N
Thermopsis montana	mountain goldenbanner	THMO6		FAC	N
Townsendia annua	annual townsend daisy	TOAN			N
Tribulus terrestris	puncturevine	TRTE			E
Trifolium pratense	red clover	TRPR2		FACU	E
Trifolium repens	white clover	TRRE3		FAC	E

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
Trifolium wormskioldii	cows clover	TRWO		FACW	N
Typha angustifolia	narrowleaf cattail	TYAN		OBL	E
Typha domingensis	southern cattail	TYDO		OBL	N
Typha latifolia	broadleaf cattail	TYLA		OBL	N
Urtica dioica	stinging nettle	URDI		FAC	N
Valeriana edulis	edible valerian	VAED		FAC	N
Verbascum thapsus	common mullein	VETH		FACU	E
Verbesina encelioides	golden crownbeard	VEEN		FAC	N
Veronica americana	American speedwell	VEAM2		OBL	N
Veronica anagallis-aquatica	water speedwell	VEAN2		OBL	N
Viguiera cordifolia	heartleaf goldeneye	VICO			N
Viguiera dentata	toothleaf goldeneye	VIDE3		UPL	N
Xanthisma gracile	slender goldenweed	MAGR10		UPL	N
Xanthisma spinulosum	lacy tansyaster	MAPI			N
Xanthium spinosum	spiny cockleburr	XASP2	B	FAC	E
Xanthium strumarium	rough cocklebur	XAST		FAC	N

Appendix D. New Mexico Noxious Weed List

The following is the New Mexico Noxious Weed List from the New Mexico Department of Agriculture as of October 19, 2016. The NMRAM metric B5 Invasive Exotic Plant Species Cover uses Class A through C species, so those are the only species contained on this list. Species are ordered alphabetically by weed class and then common name within lifeform group (tree, shrub, grass or forb). Class A species are currently not present in New Mexico, or have limited distribution. Preventing new infestation of these species and eradicating existing infestations is the highest priority. Class B species are limited to portions of the state. In areas with severe infestations, management should be designed to contain the infestation and stop any further spread. Class C species are wide-spread in the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation.

NM Weed Class	Common Name	Scientific Name	PLANTS Symbol	Family
Trees				
C	tree of heaven	Ailanthus altissima	AIAL	Simaroubaceae
C	Russian olive	Elaeagnus angustifolia	ELAN	Elaeagnaceae
C	saltcedar	Tamarix spp.	TAMAR2	Tamaricaceae
C	Siberian elm	Ulmus pumila	ULPU	Ulmaceae
Shrubs				
A	camelthorn	Alhagi maurorum	ALMA12	Fabaceae
Grasses				
A	ravennagrass	Saccharum ravennae	SARA3	Poaceae
B	quackgrass	Elymus repens	ELRE4	Poaceae
C	jointed goatgrass	Aegilops cylindrica	AECY	Poaceae
C	giant reed	Arundo donax	ARDO4	Poaceae
C	cheatgrass	Bromus tectorum	BRTE	Poaceae
Forbs				
A	hoary cress	Cardaria draba	CADR	Brassicaceae
A	purple starthistle	Centaurea calcitrapa	CECA2	Asteraceae
A	diffuse knapweed	Centaurea diffusa	CEDI3	Asteraceae
A	yellow starthistle	Centaurea solstitialis	CESO3	Asteraceae
A	spotted knapweed	Centaurea stoebe ssp. micranthos	CESTM	Asteraceae
A	Canada thistle	Cirsium arvense	CIAR4	Asteraceae
A	alfombrilla	Drymaria arenarioides	DRAR7	Caryophyllaceae
A	Brazilian waterweed	Egeria densa	EGDE	Hydrocharitaceae
A	leafy spurge	Euphorbia esula	EUES	Euphorbiaceae
A	black henbane	Hyoscyamus niger	HYNI	Solanaceae
A	Dyer's woad	Isatis tinctoria	ISTI	Brassicaceae
A	oxeye daisy	Leucanthemum vulgare	LEVU	Asteraceae

A	Dalmation toadflax	Linaria dalmatica	LIDA	Plantaginaceae
A	Yellow toadflax	Linaria vulgaris	LIVU2	Plantaginaceae
A	purple loosestrife	Lythrum salicaria	LYSA2	Lythraceae
A	Scentless camomile	Matricaria perforata	TRPE21	Asteraceae
A	Scotch thistle	Onopordum acanthium	ONAC	Asteraceae
A	giant salvinia	Salvinia molesta	SAMO5	Salviniaceae
B	Russian knapweed	Acroptilon repens	ACRE3	Asteraceae
B	Malta starthistle	Centaurea melitensis	CEME2	Asteraceae
B	chicory	Cichorium intybus	CIIN	Asteraceae
B	bull thistle	Cirsium vulgare	CIVU	Asteraceae
B	poison hemlock	Conium maculatum	COMA2	Apiaceae
B	teasel	Dipsacus fullonum	DIFU2	Dipsacaceae
B	halogeton	Halogeton glomeratus	HAGL	Chenopodiaceae
B	perennial pepperweed	Lepidium latifolium	LELA2	Brassicaceae
B	African rue	Peganum harmala	PEHA	Zygophyllaceae
B	spiny cockleburr	Xanthium spinosum	XASP2	Asteraceae
C	nodding plumeless thistle	Carduus nutans	CANU4	Asteraceae
C	hydrilla	Hydrilla verticillata	HYVE3	Hydrocharitaceae
C	parrot feather watermilfoil	Myriophyllum aquaticum	MYAQ2	Haloragaceae
C	Eurasian watermilfoil	Myriophyllum spicatum	MYSP2	Haloragaceae
C	curly pondweed	Potamogeton crispus	POCR3	Potamogetonaceae

Appendix E. Photo point guidelines

Photo points are highly recommended to document 1) general condition of the SA, 2) dominant plant communities, and 3) stream condition. Photo-point documentation provides a visual record of the condition of the wetland that may be useful for future reference. Photographs are logged in Worksheet 15 and include the photograph number, photo point coordinates, and direction should be recorded, along with a general description.

SA Condition

The general condition of the SA and the surrounding buffer area should be documented to support the assessment, e.g., evidence of recent flooding, and human impacts (Figure E1). In addition, photos that provide an overview of the SA and surrounding landscape, including panoramas, can be helpful in describing the site.

Figure E1. Example photos of a general conditions along a channels of the SA and after a recent flood event that affected features on the floodplain to support metrics such a Floodplain Hydrological Connectivity.

Vegetation Communities

Documenting the dominant vegetation communities during the mapping process is highly recommended. Photographs should be taken to capture the central character of the vegetation stand composition and structure types (Figure E2).

Figure E2 Example photo of vegetation communities to support the mapping and biotic metric ratings. Record the photo number, photo-point coordinates, and direction are recorded on the photo point log along with a brief description. Note the placement of a photo board in an inconspicuous position in the photo frame.

Stream channel documentation for Montane and Lowland

For Montane SAs: At the channel location of each floodplain traverse, a series of photographs are taken to document the condition of the river segment. Photographs should be taken facing upstream, downstream, and of both banks to capture the bank armoring and floodplain condition on each side of the river at that location (Figure E3). Additional photos of floodplain characteristics are recommended.

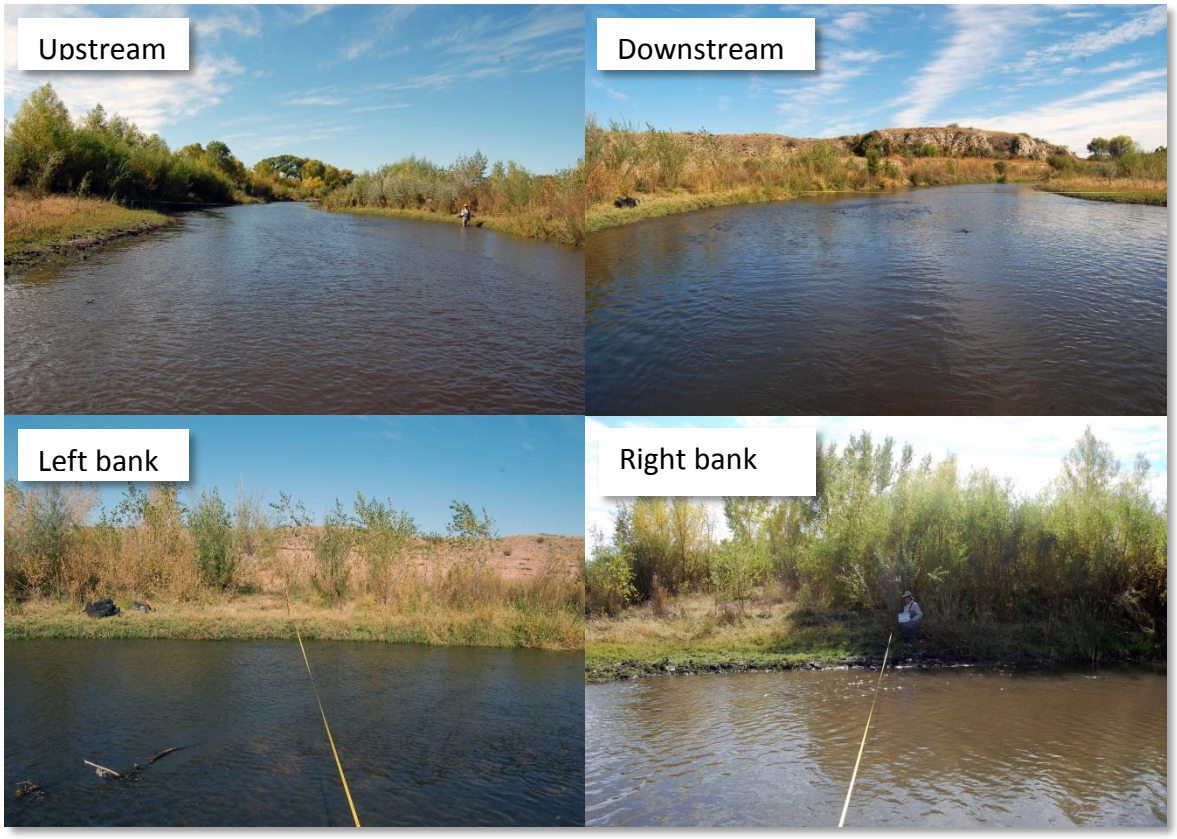


Figure E3. Examples of stream channel photo points for a Montane SA.

For Lowland SAs: At the channel location of each floodplain traverse, a series of photographs are taken to document the condition of the river segment. Photographs are taken at the channel edge of each traverse - across the channel upstream and downstream and upstream and downstream from the channel edge, to capture the bank armoring and floodplain condition on each side of the river at that location (Figure E4). Additional photos of floodplain characteristics and indicators are recommended.

Figure E4. Examples of stream channel photo points for a Lowland SA.

Appendix F. Glossary

The following list defines terms used throughout the NMRAM field guide and datasheets. The terms are listed alphabetically.

Abandoned Floodplain: A portion of the floodplain that no longer receives overbank flooding events because of avulsion of the channel away from this floodplain area, permanently altered river flow, or entrenchment of the active channel. Often deep rooted riparian vegetation communities are still supported with a dryer herbaceous understory, some upland trees and shrubs such as Ponderosa pine and Junipers species maybe present.

Abandoned Side Channel: Side channels that never, or only very rarely during extreme events, carry river flows as evidenced by their vegetated surfaces and lack of flood deposited sediment or wrack.

Abandoned Terrace: A relatively flat topographical feature formed through alluvial processes that is elevated above the current flood-prone height, and is considered far enough removed from the current active floodplain that it no longer receives overbank flood flow. Often these may support deep rooted riparian vegetation communities with a dryer herbaceous understory, and may also feature non-wetland trees and shrubs such as Ponderosa pine and Juniper species.

Active Channel: The portion of a channel that carries the fluvial system sediment.

Active Floodplain: Area of the floodplain that carries surface flow, ponding, or is surrounded by surface flow during flood events.

Active Side Channel: A secondary channel in a multi-channel system that is hydrologically connected to the main channel upstream and carries water flows regularly at or below bankfull depths. It may flow year round or intermittently, but carries water at least periodically, and frequently. It is smaller than the main channel and carries less water. An avulsion channel may be considered an active side channel if it functions as described above. A side channel is considered a high flow channel if it only carries flow during flood stages.

Animal Mounds/Burrows: Holes and mounds in the floodplain surface created by the activity of burrowing animals.

Assessment Area (AA): Term used in early versions of the NMRAM for the Sample Area (SA).

Assessment Unit (AU): Descriptive name of a specific waterbody (limited to 60 characters). Assessment units are designed to represent surface waters with assumed homogenous water quality (WERF 2007), and are generally defined by various factors such as hydrologic or watershed boundaries, water quality standards (WQS) found in 20.6.4 New Mexico Administrative Code (NMAC), geology, topography, incoming tributaries, surrounding land use/land management, etc.

Attribute: A broad class of wetland properties such as landscape context, hydrology, biology, etc., under which specific measurements of condition (metrics) might fall.

Avulsion Channel: Channels that have functioned as the primary channel in the past until an event or obstruction caused the channel to shift to another location. They may also become active side channels, or abandoned side channels, depending on how frequently they carry stream and flood flow. Oxbow lakes are often found along avulsion channels.

Backwaters: Backwaters are still eddies that provide aquatic and fisheries habitat outside the main current of the stream. These features may be disconnected at low water and open-access during high water.

Bank Right: Looking downstream the bank on the right side of the observer.

Bank Left: Looking downstream the bank on the left of the observer.

Bankfull: The incipient elevation on the bank where flooding begins, associated with moderate frequent flow events.

Bankfull Flow: The discharge at which channel maintenance is most effective resulting in the average morphological characteristics of channels, and which has a recurrence interval of 1-2 years.

Berm: Mounded soil due to human earthwork that was intended to impact the flow paths of water across a floodplain.

Beaver Pond: Shallow palustrine wetlands created by beaver dams occupying all or some of the main or side channels and associated floodplain.

Bars: Depositional features that are "built" from repeated depositional events instead of being "cut from" pre-existing features through erosive processes. This includes channel bars that form longitudinally within the channel, and point bars that form at the inside of meander bends. They are considered vegetated if woody, perennial vegetation has become established and is more than five years old.

Boulder: A rock separated from the bedrock that exceeds 10.1 inches in diameter measured along the b-axis.

Buffer Zone: The area adjacent to the Sample Area that, in natural condition protects the wetland from impacts, encroachment and invasion.

Community Type (CT): A repeating, classified and recognizable assemblage or grouping of plant species.

Complex Bank Edge: A river bank that has complex morphology of crenulations, rather than a straight or uniform edge.

Cobble: Individual rock pieces that are between 2.5-10.1 inches in diameter measured along the b-axis.

Cut Bank: A steep eroding channel bank at the outside of a meander bend. For purposes of the NMRAM, only cut banks along channels that have perennial flow or that flow often are considered.

Deep Pools: Areas in the active channel that retain water during low flow and are generally too deep to support emergent vegetation. Can be considered a separate indicator if riffle-pool complexes are not present.

Debris Jams: Accumulation of woody debris in an active channel that can partially re-direct or completely obstruct water flow, and have the ability to retain sediment and alter channel morphology.

Depressional Features on Floodplains: Shallow, seasonally inundated depressions composed of very fine depositional sediments.

Downed Logs: Logs, over three feet in length and six inches in diameter that are not part of a living tree, and are lying on the ground.

Eddy: An area of counter-current water movement, usually along a bank edge, that can create a small whirlpool, and provides a refuge from the main current.

Fallow field: An area formerly plowed for agriculture that has been allowed to return to non-production vegetation. This term does not include active agricultural fields that are rested between seasons, prior to planting, or recently plowed active fields that are currently without vegetative cover.

Fill: An area where soil has been deposited by human activity, as opposed to natural or fluvial processes.

Fire Pits: A burn scar from a camp fire.

Flood Prone Width: The area on the floodplain adjacent to the active channel whose outside edge corresponds to the elevation of double the maximum bankfull depth measured at the thalweg of a channel cross-section.

Floodplain: The area lateral to the stream that is generally flat-lying, and formed through alluvial processes which dissipate energies of higher flows under current climatic and hydrologic conditions.

Grading or Plowing: Alteration of the soil surface by road grader or plow.

Gravel Pit: Pit or hole created by removal of soil for use in another location.

Gully: A steep-sided erosional channel from 1 m to about 10 m across, larger than a rill.

High Flow Side Channel: Secondary channels parallel to the existing channel which carry water at flows that are higher than bankfull stages of the river.

Hydrophyte: A plant species found growing in areas where soils in the rooting zone are saturated much or all of the growing season**.**

Impervious Compacted Surfaces: Soil surfaces that are so compacted that water runs across these surfaces rather than infiltrating.

Inset Floodplain: The accretion of floodplain materials within the meander belt width and the abandonment of the former wider floodplain bench indicating a reduction in overall stream discharge.

Irrigation Channel: A manipulated open channel used for transporting water to support agriculture.

Irrigation-Driven Saline Mineral Crusts: The build-up of salts and mineral crusts on the soil surface due to irrigation. Often identified by white crust on the soil surface, usually in a patch with sparse vegetation.

Land Use Index (LUI): An index of the intensity of human activity in the landscape surrounding the wetland SA based on the relative impact to wetland function.

Land Use Zone (LUZ): Boundary created for measuring the condition of surrounding land use conversions. Within the Montane Riverine Subclass the LUZ extends out 250m from the SA boundary, for Lowland Riverine subclass the LUZ extends 500m from the SA boundary.

Large Woody Debris (LWD): Accumulation of large wood and debris on the floodplain due to flood flow or other processes. At minimum, LWD should include wood with a three inch diameter.

Levee: A constructed or manipulated linear berm-like feature intended to act as a barrier to stream flow across the floodplain surface.

(Constructed-Abandoned) the feature no longer functions as intended, and is no longer maintained.

(Constructed-Maintained) the feature is a barrier to surface flow and is maintained.

(Natural) a feature that has formed through natural overbank depositional processes that acts like a barrier to small flooding events except through crevasse splays.

Metric: A distinct measurable component of an attribute class, such as Exotic Annual Plant Abundance within the Biotic attribute class. Metric measurements are the basis of the NMRAM condition score.

Minimum Map Unit: The minimum size that a vegetation patch must meet in order to be mapped for the NMRAM. This is size differs depending on wetland subclass, and is provided in the Field Guides.

Fresh Sediment, New Depositional Features: Sediment that has been recently deposited as evidenced by sedimentary structures indicating flow and accretion.

Phreatophyte: A deep-rooted plant that obtains a significant portion of the water that it needs from the phreatic (zone of saturation) or the capillary fringe above the phreatic zone.

They can usually be found along streams where there is a steady flow of surface or groundwater in areas where the water table is near the surface.

Plant Pedestal: An erosional feature between plant bases which causes the plant to appear elevated, as if on a pedestal.

Oxbow Lakes: Permanently ponded areas formed in cut-off meanders or in abandoned channels.

Rapid: A section of a river where the river bed has a relatively steep gradient, causing an increase in water velocity and turbulence.

Riffle: A riffle is a short, relatively shallow and coarse-bedded length of stream over which the stream flows at higher velocity and turbulence during low flow, than in comparison to a pool.

Rills: Small parallel rivulets formed by soil erosion.

River Available Floodplain: The floodplain that is potentially available to the river, and not disconnected by anthropogenic features such as levees and other constructed impediments. Ancient terraces are not considered river available floodplain.

Sample Area (SA): A delineated area within a Wetland of Interest in which NMRAM data collection is focused, and for which the final condition rating applies. The size and placement of a Sample Area is determined by the wetland subclass and described in the Field Guide.

Seeps/Springs: Water flowing from an aquifer to the surface.

Shoal: A submerged ridge, bank, or bar that rises near the surface of the river, and is exposed at low flows.

Standing Snags: Dead trees taller than six feet that remain rooted and upright.

Swale: Linear depressions on the floodplain lacking defined channels, but supporting vegetation communities that differ from the surrounding uplands, either in composition or productivity, due to increased water availability.

Terraces (Lateral and Island): relatively flat topographical features formed through alluvial processes that are above the active floodplain.

Undercut Bank: An area along a streambank that is concave, and creates an overhang.

Vegetation Map Polygon: A created map feature of relatively homogenous vegetation which is used in evaluating a number of the NMRAM biotic metrics.

Wrack Lines: Accumulation of debris at the high-water line that occurs along the ground or in standing vegetation.

Appendix G. Estimating recent peak stream discharges and recurrence intervals for Floodplain Hydrologic Connectivity rating.

The choice of rating table for Floodplain Hydrologic Connectivity metric (A1) is dependent on estimating the peak discharge of the river or stream within the last five years at the Sampling Area (SA) and the recurrence interval for that peak flow. For higher the peak flows the expectation is that more of the floodplain and associated side channels should show indications of inundation. Hence, the rating tables are scaled to the size of peak discharges and their recurrence intervals. This appendix provides a rough guide to estimating the peak discharge and recurrence intervals using available USGS stream gage data. The closer your site is to a gage the more accurate will be the estimation of peak discharge within the last five years. For sites on rivers that lack gage data, use the nearest available gage to the site that is within the same HUC watershed. For example, if you are working on a small lowland stream that feeds into the Gila River, you would pick the Gila gage that is closest to your site and use that gage data as the best available estimate for recurrence interval of the largest flood in the last five years. To access gage data for the state of New Mexico see: http://nwis.waterdata.usgs.gov/nm/nwis/peak)

Steps:

1) Choose the gage nearest your SA location from the USGS National Water Information System web interface: https://waterdata.usgs.gov/nm/nwis/rt
    a. Only pick a gage that is still active and that has at least a 30 year record available for download.
    b. Whenever possible pick a gage that does not include or exclude a major tributary between your SA location and the gage location.
    c. The closest gage can be either upstream or downstream of your SA provided it meets the two criteria above.
2) Once you have chosen a gage click on the station number to open its information page. The blue bar in the upper center of the page contains available data from the site.
    a. Choose peak streamflow. This will generate a graph of these that should be examined for general trends.
    b. Choose the "Table" choice in the Output Formats screen. Sort the streamflow in the obtained table in descending order by clicking on the button in the spreadsheet (highest to lowest flow).
3) Copy and paste the sorted stable into an Excel file.
4) Create another column in the spreadsheet called "Rank" and sort the discharge from 1 for the highest, 2 for second highest, 3 for third highest etc., until all discharges have been ranked.
5) Create a second column for Exceedance Probability and use the formula Rank/(n+1) to fill in the cells where "n" is the highest Rank value (in the case of the Gila gages, they span 85+ years so the highest Rank is 85+1).
    a. Use the formula =(X)/(n+1) where column X is the column with the Rank values.

6) Create a final column for Recurrence Interval using the formula =1/(Y). Where Y is the column with your calculated Exceedance Probabilities.
    a. Review this column for the flows between 1.6 and 2 years to estimate bankful discharge. You may also chose 2 years as the upper limit. Decide on a value for the bankful discharge. This will be correlated with the bankful indicators in the field to aid in determining potential capacity of the channel in the assessment area, and to evaluate the bankful indicators.
7) Because recent data remains provisional it will not appear on peak flow tables from the USGS web site. Thus it will be necessary to look at the recent provisional data available on the website to calculate estimated peaks for the 1-2 years prior to your survey date. To obtain that data follow the steps below:
    b. Restarting on step 2 above, choose daily data from the blue bar in the upper center of the page.
    c. Select Mean Discharge as the parameter of interest, Table as the output format, and enter the dates for the missing provisional data dates.
    d. Sort the table by discharge
    e. Select the maximum discharge for each provisional year missing a peak flow value in on the peak flow table.
    f. Add these values to your excel table.
8) Resort the data according to date, from most recent to oldest. Determine the recurrence interval for the largest peak flow within the last 5 years.
9) Use that recurrence interval to identify the correct ratings table to be used to rate the Floodplain Hydrologic Connectivity Metric.