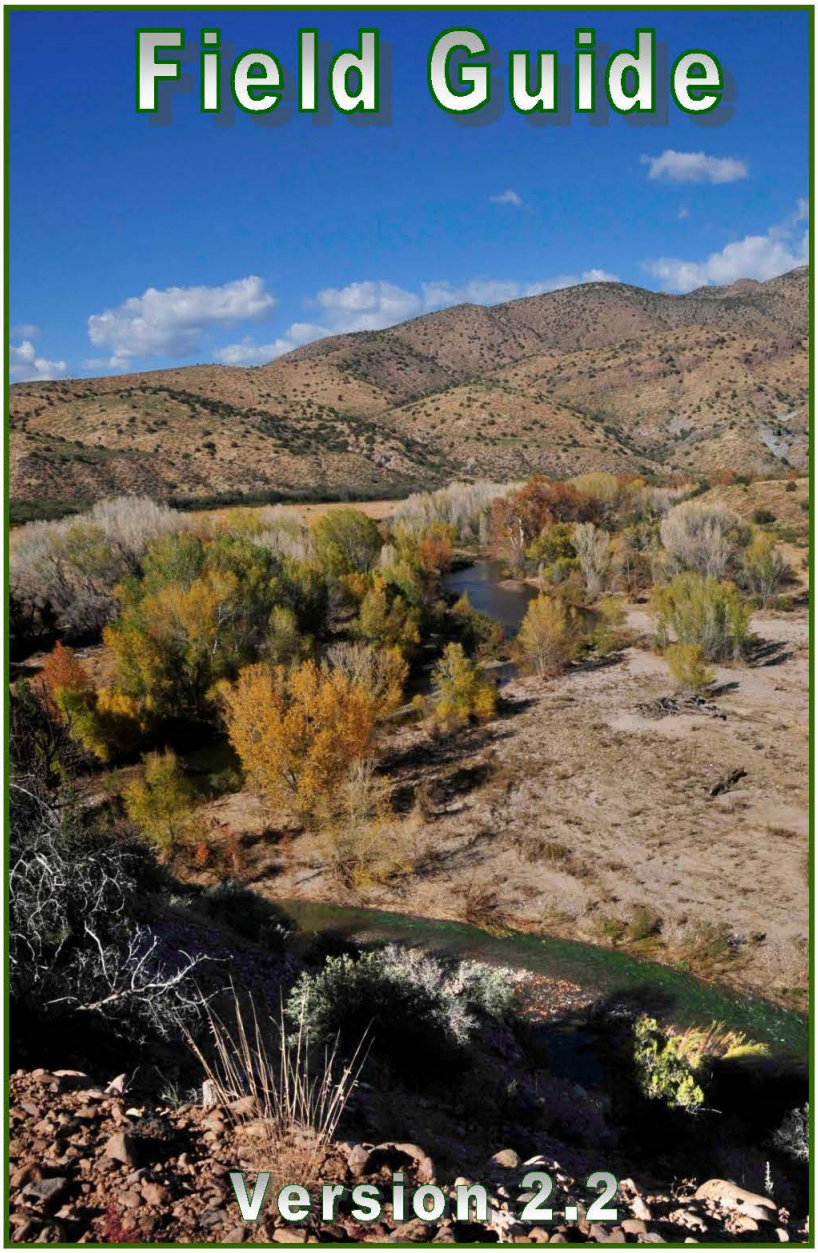
New Mexico Rapid Assessment Method

Lowland Riverine Wetlands

Field Guide



Version 2.2

2022

NMLRAM

New Mexico Environment Department

Surface Water Quality Bureau

and

Natural Heritage New Mexico

Museum of Southwestern Biology

University of New Mexico

Citation: Muldavin, E.H., E.R. Milford, and M.M. McGraw. 2022. New Mexico Rapid Assessment Method: Lowland Riverine Wetlands Field Guide. Version 2.2. New Mexico Environment Department, Surface Water Quality Bureau, Santa Fe, New Mexico.

Acknowledgements: The Authors would like to thank the NMRAM field team for their careful and diligent data collection efforts and their thoughtful insights related to metric performance. This team includes Yvonne Chauvin, Hannah Burnham, Amy Urbanovski (Natural Heritage New Mexico), Chris Canavan, Abraham Franklin, Emile Sawyer, Davena Crosley, John Moeny, Susan Styer (New Mexico Environment Department Surface Water Quality Bureau (SWQB)). Matt Schultz, Dave Menzie & Scott Murray (SWQB) provided technical support for Version 1.1. Thank you also to the NMRAM Technical Advisory Team for their thoughtful comments.

Funding: Funding for the development of the New Mexico Rapid Assessment Method: Lowland Riverine Wetlands Field Guide Version 2.2 was provided by the U.S. Environmental Protection Agency (EPA) Region 6 through a Wetlands Program Development Grant awarded to the New Mexico Environment Department Surface Water Quality Bureau Wetlands Program. Additional funding was provided by Natural Heritage New Mexico, a Division of the Museum of Southwestern Biology, University of New Mexico. The contents of this document do not necessarily reflect the views and policies of the EPA, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Cover and font page photos: Cottonwood and Arizona sycamore riparian wetland forest on the Gila River near Gila (E. Muldavin).

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Abbreviations

AU	Assessment Unit
CT	Community Type
cfs	Cubic feet per second
DBH	Diameter at Breast Height
E	Exotic
FAC	Facultative Species
FACU	Facultative Upland Species
FACW	Facultative Wetland Species
FDLWD	Flood Deposited Large Woody Debris
GIS	Geographic Information System
GPS	Global Positioning System
GW	Ground Water
HC	Herbaceous Composition Rating
HP	Herbaceous Presence
LUI	Land Use Index
LUZ	Land Use Zone
LWD	Large Woody Debris
M	Mixed Native and Exotic
N	Native
NA	Not Applicable
NMED	New Mexico Environment Department
NMRAM	New Mexico Rapid Assessment Method
NRCS	Natural Resources Conservation Service
OBL	Obligate Wetland Species
PDF	Portable Document Format
RCC	Riparian Corridor Connectivity
RSR	Relative Size Ratio
RWSI	Relative Wetland Size Index
SA	Sampling Area
SC	Short Woody Composition Rating
SH	Short Woody Health Coefficient
SP	Short Woody Presence
SQUID	Surface Water Quality Information Database
SWQB	Surface Water Quality Bureau
TC	Tall Woody Composition Rating
TH	Tall Woody Health Coefficient
TP	Tall Woody Presence
U	Unknown
UPL	Upland Species
USDA	United State Department of Agriculture
UTM	Universal Transverse Mercator
VST	Vertical Structure Type
WOI	Wetland of Interest

I. Introduction

This New Mexico Rapid Assessment Method (NMRAM) field guide provides procedures and metric measurement protocols for conducting rapid ecological assessment of wetlands in the Lowland Riverine subclass of the Riverine wetlands class. Lowland riverine wetlands lie along fifth order or greater streams (>1300 cfs bankfull discharge) occurring at elevations below montane riverine wetlands (approximately below 5500 ft) in broad alluvial valleys where the grade falls below 1%. Lowland streams may be perennial or intermittent, particularly in desert reaches or during droughts. Lowland riverine channels have a low degree of confinement from the surrounding landscape and have room for lateral movement often leading to a high degree of channel sinuosity (Rosgen C or F channel types) or multi-channel systems (Rosgen D channel type). Lowland riverine wetlands include riparian areas and wetlands directly supported by overbank flooding, side channel flooding, and hyporheic flow. (See NMRAM Manual Version 2.0 for additional subclass description detail).

This NMRAM field guide complements the NMRAM Manual Version 2.0 by providing specific protocols and datasheets for evaluating fourteen wetland ecological condition metrics using a combination of Geographic Information System (GIS)-based measurements and field surveys. In addition to details on metric measurements, appendices are provided that include the data collection worksheets, a reference guide for taking some metric data, a plant species list with wetland indicator status, the state noxious weed list, photo point guidelines, a glossary of terms, and guidelines for obtaining peak flow data and recurrence intervals.

The assessment is a multi-step process involving a two- or three-person team. It begins with delineating a target Wetland of Interest (WOI) and one or more Sampling Areas (SAs) within the WOI to be assessed. For each SA, fourteen metrics grouped into three attribute categories are evaluated: Landscape Context (4 metrics), Biotic (5), and Abiotic (5) (Table 1). The metrics are measured using a mapping process based on aerial imagery interpretation and a field survey. The Landscape Context metrics are assessed using maps and/or a geographic information system (GIS) and these are termed “Level 1” metrics. Landscape context metrics are preferably completed before going into the field to help familiarize the team with the site. Level 1 metrics are also confirmed or modified as necessary during the field survey. In contrast, Biotic and Abiotic metrics are evaluated in the field (“Level 2” metrics) and include annotated field maps and documentary photographs. In addition, a stressor checklist for evaluating potential drivers of ecological condition at local to watershed scales is completed in the office prior to going in the field and reviewed and updated, if necessary, as part of the field survey. The checklist is not used directly in scoring or ranking the condition of the wetland and accordingly explicitly excludes elements that are already incorporated in NMRAM metrics themselves (e.g., Surrounding Land Use).

A set of worksheets organized by attribute classes has been developed to support efficient data capture (Appendix A). These data collection worksheets are provided as printable forms in Appendix A and as a downloadable fillable PDF file that computes and rates most metrics automatically and rolls up the scores for the user. The worksheet packet contains a cover worksheet for recording basic information, surveyor identification, and narrative descriptions of

the SA by attribute. The worksheets together with maps and photographs make up the NMRAM Assessment Package that becomes the supporting record at a project level and the tool for data entry into the Surface Water Quality Bureau Information Database (SQUID) (a comprehensive database currently under construction by New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) to provide access to information about wetland areas, wetland habitats, and ecological condition).

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 WOI, the SA scores can be averaged to arrive at a final rank for the entire wetland.

Table 1. List of NMRAM Lowland Riverine Wetland metrics. (Numbering refers to NMRAM Manual Version 2.0 descriptions of each metric.)

Metrics
Landscape Context
L1. Buffer Integrity Index
L2. Riparian Corridor Connectivity
L3. Relative Wetland Size
L4. Surrounding Land Use
Biotic
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
A1. Floodplain Hydrologic Connectivity
A2. Physical Patch Complexity
A5. Soil Surface Condition
A6. Channel Mobility
A11. Groundwater Index

II. Pre-field Protocols

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

2. Download the worksheets for NMRAM Lowland Riverine Wetlands Version 2.2. Worksheets are provided in Appendix A and a digital version is available from the NMED SWQB.[1]
3. Verify land ownership, review site background information, and obtain the necessary permissions for sampling.
4. Review recent river flow data for your site using gage data (Appendix G) as background for understanding Floodplain Hydrological Connectivity indicators.
5. Assemble field equipment, guides, worksheets, and maps.

Worksheets

Worksheets are provided in Appendix A and digital versions are available from the NMED SWQB. The downloaded worksheets are smart PDFs where data and ratings can be directly entered in the field using a laptop 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 latitude-longitude grid to help field navigation along with a north arrow and scale bar (Figure 1).

Landscape Map. A map at approximately 1:5,000-10,000 scale 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 potential buffer and include the buffer lines used to measure the Buffer Width sub-metric of the Buffer Integrity Index (see Landscape Context metrics below).

SA Map. A map that encompasses a single SA at scales and between 1:1,500-3,500 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 the biotic and abiotic measurements, respectively. The vegetation communities in an SA can be provisionally mapped on the Biotic SA Map prior to field reconnaissance and then validated and modified during the survey. Modifications to the SA boundary should be recorded on both the Biotic and Abiotic SA Maps.

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

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

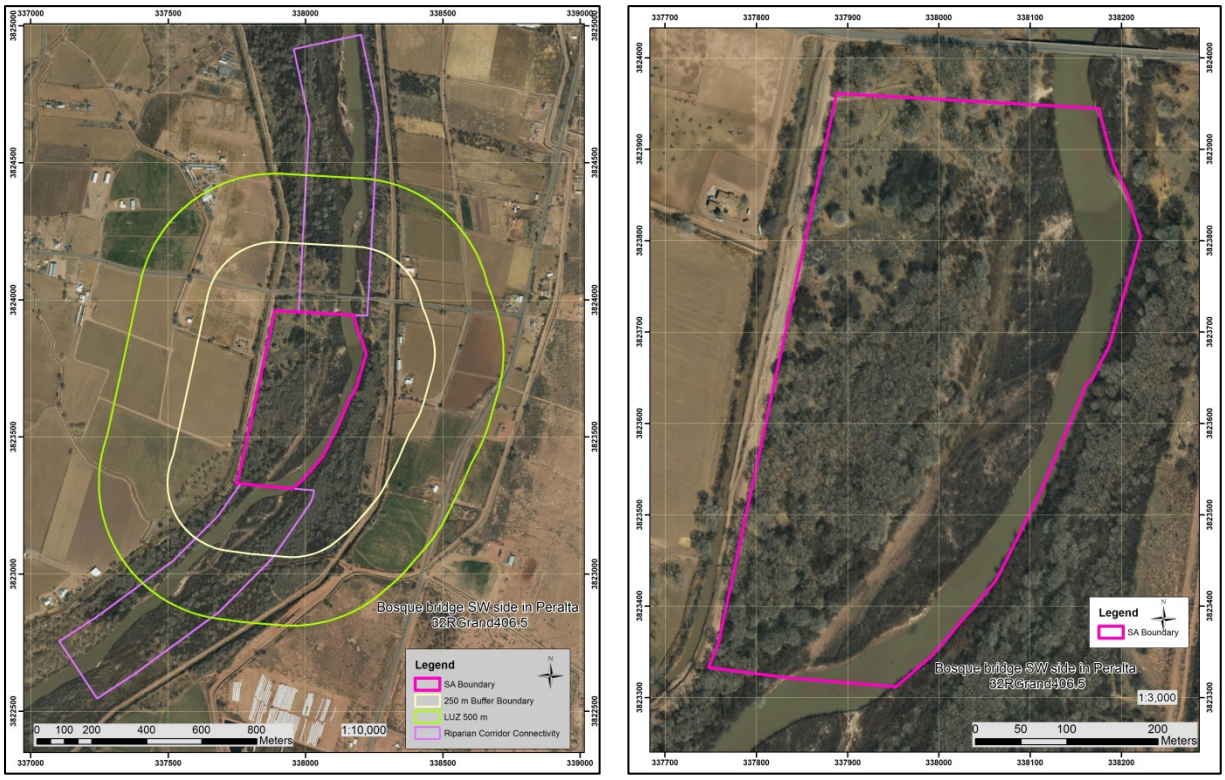


Figure 1. Examples of Landscape and SA field maps. On the left, a landscape-scale map with boundaries for measuring the landscape metrics. On the right, a fine-scale SA Map for field vegetation and abiotic features mapping.

Delineating the Wetland of Interest (WOI)

Delineating a Wetland of Interest (WOI) is necessary for determining the number and placement of SAs and for some metric measurements. A WOI is delineated using a GIS or paper maps and may or may not coincide with the project area. 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 2. This approach is designed to meet the immediate needs of a rapid assessment when other procedures are not required or desired (e.g., jurisdictional wetland delineation). As necessary, the boundary may be modified based on the field reconnaissance or other requirements at a project level.

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

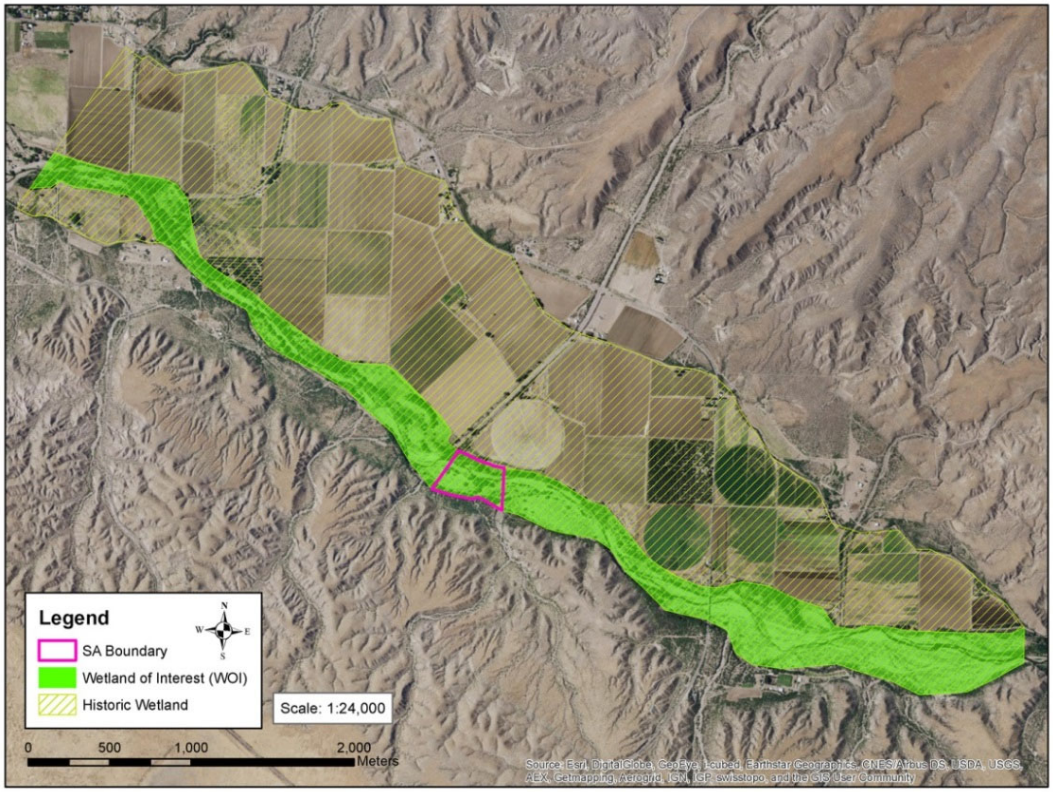


Figure 2. Example of Wetland of Interest (WOI) delineation (green), the historic wetland extent (cross-hatch yellow), and the placement of an SA (pink outline) that is representative of the WOI.

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

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

- Assign a unique SA Code and SA Name, which are user-defined per project needs. For tracking purposes, an SA Code and SA Name cannot duplicate other SAs.
- Enter the project and/or WOI name this SA references or any other relevant site designation that can help track the assessment.
- For SQUID, enter the AU (Assessment Unit) Code and AU Name if available from the NMED SWQB website.
- Describe the general location and SA boundary rationale.
- Provide driving directions and note required permissions for visiting the site.
- Enter the ownership and note any restrictions on data sharing, if applicable.

- For SWQB purposes, enter whether fish species[3] were present within the wetland (not including the adjacent stream).
- Enter the surveyor names and initials by their roles in the assessment.
- Enter the central location in latitude-longitude and UTM coordinates and include the zone and datum.
- Enter the date and start and end times of the field survey.
- In the SA Description, provide narratives of condition by major attribute category and comments on the condition rank of the SA (preferably before leaving the site).
- Before the team leaves the site, they should give the SA a provisional field Score and Rank and provide the surveyors' initials who scored the site for future reference.
- Final Score and Rank are completed in the office after all data have been entered and finalized.

SA Size and Placement

While an SA can be placed randomly, given the limitations of time and personnel resources that often exist in rapid assessment, it should be optimally placed to best represent the predominant vegetation pattern and conditions within the WOI. At a minimum, there is one SA per WOI/project area, but for large WOIs, two or more SAs may be required to capture the range of variation (particularly if randomization is used). In addition, an SA may be constrained by logistical considerations such as ownership and access (keeping in mind this may affect metric scores).

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 to provide context for evaluating the assessment outcome. This is particularly important where project goals may affect the delineation (e.g., mitigation assessments). Overall, the goal is to delineate relatively homogeneous SAs with respect to hydrology and wetland type. That is, an SA is a sampling area 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).

If the WOI of includes both sides of the river, ideally the SA should also include both sides. But for large rivers this may not be practical. In which case, an SA on each side may be warranted. If an SA is on only one bank, it should still include the far channel edge and the channel itself to accommodate certain metrics (e.g., Buffer Integrity Index; Channel Mobility, Floodplain Hydrologic Connectivity) and then extend laterally across the floodplain to the first break in hydrological connectivity such as a levy, irrigation ditch, agricultural field, or other development. If there are no anthropogenic breaks, the SA must extend the entire width of floodplain.

[3] If yes, please add brief details under SA Abiotic Condition.

The length of SA up and down the river corridor is dependent on the size of river. This is because several metrics are scale-dependent in that for a given stream discharge at a site represented by historic floodplain size, as the SA size goes up, the assessment scores go up. Conversely, as SA size goes down from a maximum based on the historic size, scores are likely to decline, but this is considered a measure of lowered ecological integrity and is intrinsic to the assessment scoring. In order to maintain a modicum comparability from small to large rivers while preventing SA sizes from becoming operationally too large for rapid assessment, we provide guidelines for SA sizes in three broad classes of small, medium, and large rivers based on their historical widths and riparian corridor length (Table 2). For example, a medium-sized river with an historical floodplain width of 750 m and a current floodplain width of 400 m would have a SA size of 400 x 500 m or 20 ha. The majority of Lowland Riverine SAs will belong to the medium and large size classes.

Table 2. SA lengths based on historic floodplain size.

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

SA homogeneity. SAs should be relatively homogeneous with respect to hydrological factors and other site conditions; there should not be any major hydrological breaks or significantly different site alterations within an SA. If there are, then two or more SAs should be delineated to assess the range of conditions within the WOI.

Examples of features that should be used to delineate SA boundaries include:

- Acequias and other diversion structures and ditches;
- Ends of large-pipe discharges;
- Grade control or water-elevation control structures;
- Weirs, culverts, dams, levees, and other flow-control structures;
- Major changes in riverine confinement, entrenchment, degradation, aggradation, slope, or bed form;
- Major tributary or channel confluences that significantly alter the shape and structure of the floodplain (including ephemeral channel confluences with significant sediment input);
- Waterfalls;
- Reaches with beaver ponds versus ones without;
- Adjacent springs or seeps that significantly modify the floodplain and/or local groundwater conditions;
- Transitions between wetland subclasses (e.g., unconfined to confined);
- Railroads and other “non-buffer” elements listed in Worksheet 1a that cross the floodplain and active channel.

Land Ownership and Sampling Permissions

In general, sampling permissions can be obtained for public lands, but each land management agency has its own rules and regulations that must be followed to obtain access. Many land management agencies have a formal application process for obtaining a special use permit or other official written permission. Agencies should be contacted as far in advance as possible to determine the correct process for obtaining permission, with a month generally being the minimum amount of time in which a permit can be processed.

When sampling on private lands, permission for access needs to be sought and granted. Allow sufficient time in the planning stage to contact owners and to schedule your visit once permission has been granted. If the ownership is unknown, records can be checked at county courthouses for contact information. Owners should be contacted directly by phone or visit, and written permission for access obtained. While delineation of the SA should be based on biological and physical attributes, lack of owner permission may require adjusting the SA location and boundaries prior to field reconnaissance.

Field Equipment, Guides, and Worksheets

Suggested equipment includes:

- ☐ Two copies of Landscape Maps, one for each field team, and one each of Abiotic and Biotic SA Maps (either paper or writable on a tablet or other device). A third 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 team 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.
- ☐ Pin flags to mark and corroborate bankfull indicators and other features in photographs.
- ☐ Plant press for collecting plants requiring identification.
- ☐ Bleach and bucket: it is mandatory that all field technicians sterilize boots with bleach and water mixture before and after entering waterways to prevent the spread of aquatic nuisance species such as didymo (*Didymosphenia geminata*), a microscopic alga, as well as whirling disease and other potential pathogens.

- ☐ Waders for crossing and working within channels as the site conditions require. Waders, ditch boots, 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; and
- Topographic maps or digital elevation models.

Sources for geospatial data include New Mexico Resource Geographic Information System a 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 five Abiotic metrics that are measured as part of the field survey of the SA (Table 1). The survey requires a field team composed of two to three members: one who evaluates the Biotic metrics, while the other individual(s) evaluate(s) the Abiotic metrics. 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 perimeter 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.

Field Assessment Steps

1. Preliminaries. Together, team members fill in basic survey information (date, time, location, etc.) on the SA Cover Worksheet. The team then conducts a joint rapid reconnaissance of the site to help set up the survey and make SA boundary changes based on local conditions. All changes to the SA boundary are recorded on the field maps and noted on the SA Cover Worksheet with rationale for changes.

2. Transect Survey Setup. Three transects are set up across the floodplain to evaluate metrics representing three segments of the SA. Each extends from the edge of the floodplain to the channel edge and are placed such that they represent the SA divided into more-or-less three equal segments, upper (U), middle (M) and lower (L). Each team starts at one transect from the floodplain edge to river edge and returns via the other transect.

3. Biotic Survey. Along each transect, the biotic team maps the patches of major vegetation communities on the Biotic SA Map and fills out the required data for each community type (CT) encountered. Based on this information, the entire SA is mapped based on aerial image interpretation. If time permits, mapped patches off the transect can be visited and validated. This map becomes the basis for filling out worksheets and rating the Biotic metrics and the Abiotic Groundwater Index metric (A11. Worksheet 10).

4. Abiotic survey. The abiotic team member(s) evaluates the Abiotic metrics along the transects based on visual indicators of abiotic conditions and annotates the Abiotic SA Map with supporting information. During each traverse, indicators are checked off on metric-specific lists on the worksheets that are then used to rate each Abiotic metric. (Note that the biotic team is responsible for the Groundwater Index metric.)

5. 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 on their copy of the Landscape Map, 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).

6. Stressor Checklist. Team members collaboratively review the Stressor Checklist that was completed prior to the field survey to identify potential drivers of ecological condition in the WOI and greater watershed.

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

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

The intent is that a team should be able to complete the field survey in four to six 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 Biotic and Abiotic SA Maps and noted on the SA Cover Worksheet.

Documentary Photographs

Guidelines for recording important information using documentary photographs are provided in Appendix E. Documentary photographs are taken representative of each plant community patch as well as during the floodplain traverse and at the riverbank edge. These photographs are recorded on the Photo Point Log at the end of Appendix A (Worksheet 16). In addition, documentary photographs are strongly recommended for unknown plant species, and for significant features within or adjacent to the SA. Features that alter the size of the SA, or significantly impact hydrology are particularly useful photographic documentation.

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 at least 50 m (165 ft) away from wetlands or surface waters.

IV. Metric Protocols

Landscape Context Metrics

There are four Landscape Context metrics designed to measure the conditions surrounding the SA using a GIS or paper maps:

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 1000 m and 250 m across.

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

L4. Surrounding Land Use evaluates conditions within an area (Land Use Zone (LUZ)) that extends out 500 m from the SA perimeter (overlapping the buffer zone).

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

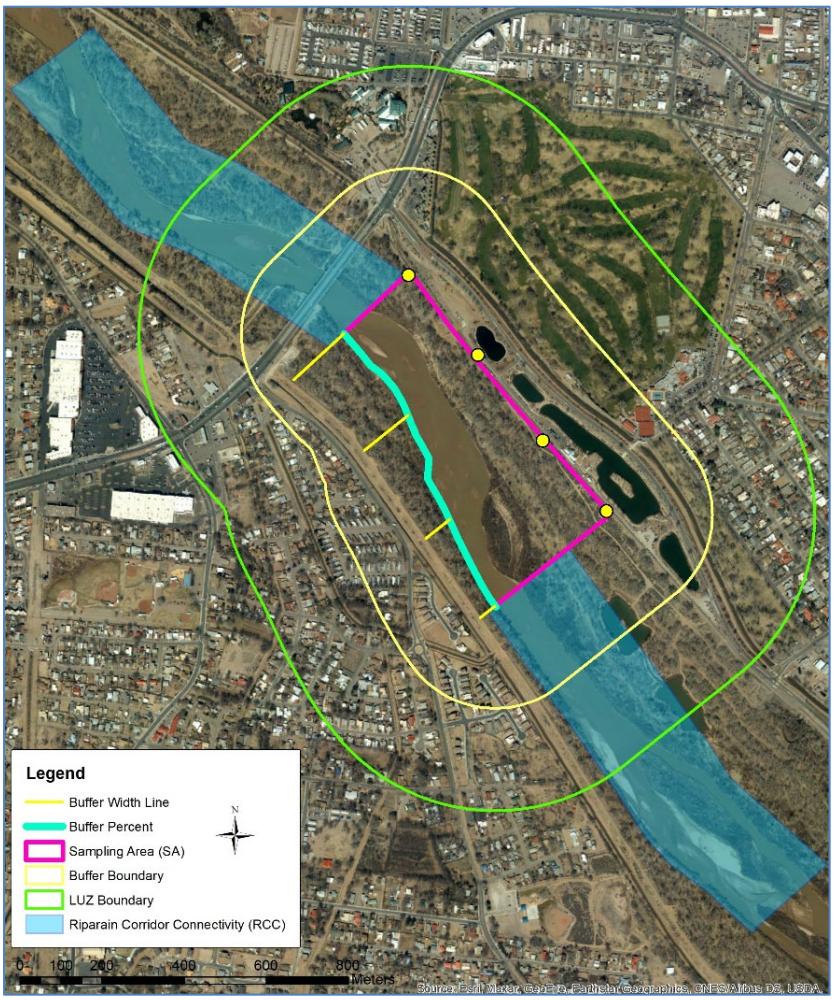


Figure 3. Lowland Riverine Landscape Context metrics are measured in three zones around an SA: Buffer 250 m around the SA (pale yellow line), Land Use Zone 500 m (green line), and Riparian Corridor upstream and downstream 1000 m (blue area). Buffer % is measured on the lateral perimeters of the SA (cyan line) 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 (blue bands). Land Use Index (LUI) is evaluated in the Land Use Zone (LUZ).

L1. Buffer Integrity Index

Definition: The Buffer Integrity Index is a measure of the amount of natural and semi-natural vegetated buffer lateral to the SA. Buffer Integrity Index 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 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 on the Landscape map, enter the source of the imagery and the imagery season and year, 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 and enter the average on Worksheet 1c.
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, but imagery from the growing season will likely enhance interpretations.

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 1000 m upstream and downstream of the SA and 250 m wide.

Steps:

1. Using the most recent imagery available in GIS or from the Landscape map, delineate the Riparian Corridor Connectivity zone 1000 m upstream and 1000 m downstream from the SA boundaries along the main channel, and 250 m in width. 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. Enter the total lengths for each bankside on Worksheet 2 (step A). Assign at least the minimum length for any special class excluded RCC land cover elements that cross the riparian corridor as provided in Table 3 below (Table L2a in Appendix B).
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/2000*100) and enter the value on Worksheet 2 (step C).
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/4000*100) and enter the value on Worksheet 2 (step E).
8. Rate Riparian Corridor Connectivity using the narratives in Table L2 and the data from Worksheet 2. The total length criteria must be met for a given rating.
9. Enter the rating 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 Excluded Land Cover Elements	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" may 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 assumption is that the valley bottom represents the historic floodplain.

Steps:

1. From the upper and lower limits of the SA, extend lines perpendicular from the boundary of the WOI in both directions to the edge of the floodplain where it hits upland slopes or ancient abandoned terraces (i.e., several hundred years old or more) (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 boundary 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 to calculate the Relative Size Ratio (RSR) between the two:

$$RSR = (WOI_c / WOI_h).$$

4. Calculate Relative Wetland Size Index (RWSI) as the percentage reduction from historical size and enter the values on Worksheet 3b (the fillable PDF will do this for you):

$$RWSI(\%) = (1\text{-}RSR)*100$$

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

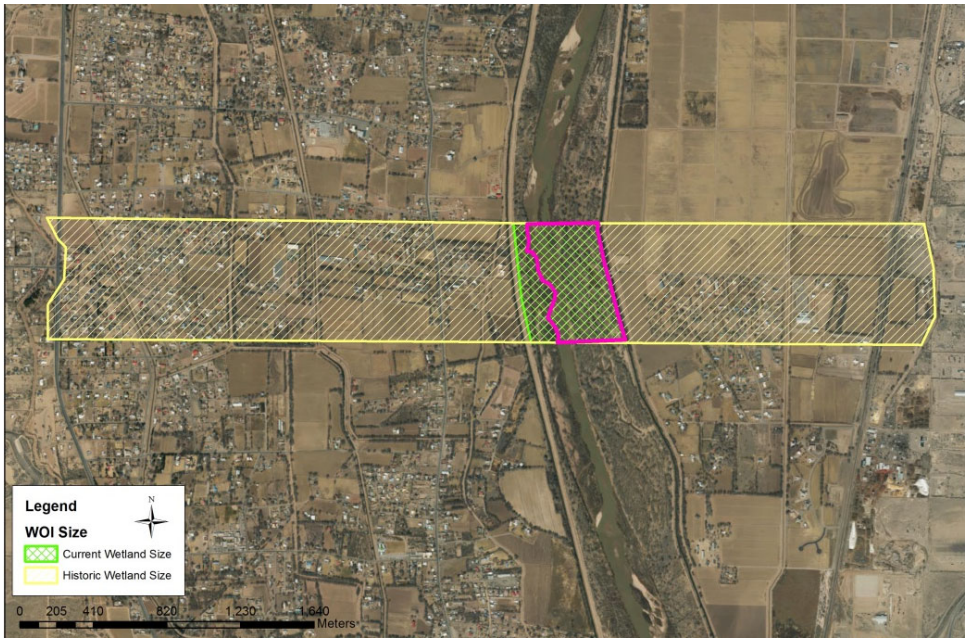


Figure 4. Relative Wetland Size for the riverine subclass is the ratio of the current WOI (representing the current size – green cross hatch) to the historical size (yellow area) estimated across the floodplain based on photo interpretation and topographic maps (the historical area includes the SA).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

L.4 Surrounding Land Use

Definition: The amount and intensity of human land use in the Land Use Zone (LUZ) surrounding the SA.

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

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 500 m out from the SA boundary (LUZ). Each land-use element is weighted for its potential impact on the SA (from 0.0 indicating high impact to 1.0 indicating 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 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 LUI Score column. Sum the scores in the LUI Score column. (This will be done automatically for those using the fillable PDF worksheets.)
3. Rate using the 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 * 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."

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 native riparian tree reproduction.

B5. Invasive Exotic Plant Species Cover is a measure of the total percent cover of invasive exotic plant species based on the New Mexico Noxious Weed List (2020).

In addition, the Abiotic metric Groundwater Index (A11) is evaluated along with the five Biotic metrics.

Biotic metric measurements and the Groundwater Index metric are based on the mapping of vegetation community patches (polygons) on the Biotic SA Map with its aerial imagery base (Figure 5). A draft of the vegetation community patch 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 Biotic SA Map while walking the survey transects.

- When mapping, only polygons of individual patches of homogeneous vegetation greater than 0.25 ha [0.62 acre] are delineated (i.e., the minimum mapping unit polygon size). Patches smaller than 0.25 ha are considered inclusions in the surrounding patch polygon.
- In larger SAs there may be vegetation polygons that are not bisected by survey transects. Composition for such polygons will have to be extrapolated based on image interpretation and comparison to similar polygons that were encountered on the transect. If an unvisited polygon appears distinctly different from those encountered during the transect survey, then, as time allows, that polygon can be visited and evaluated along with transect polygons.

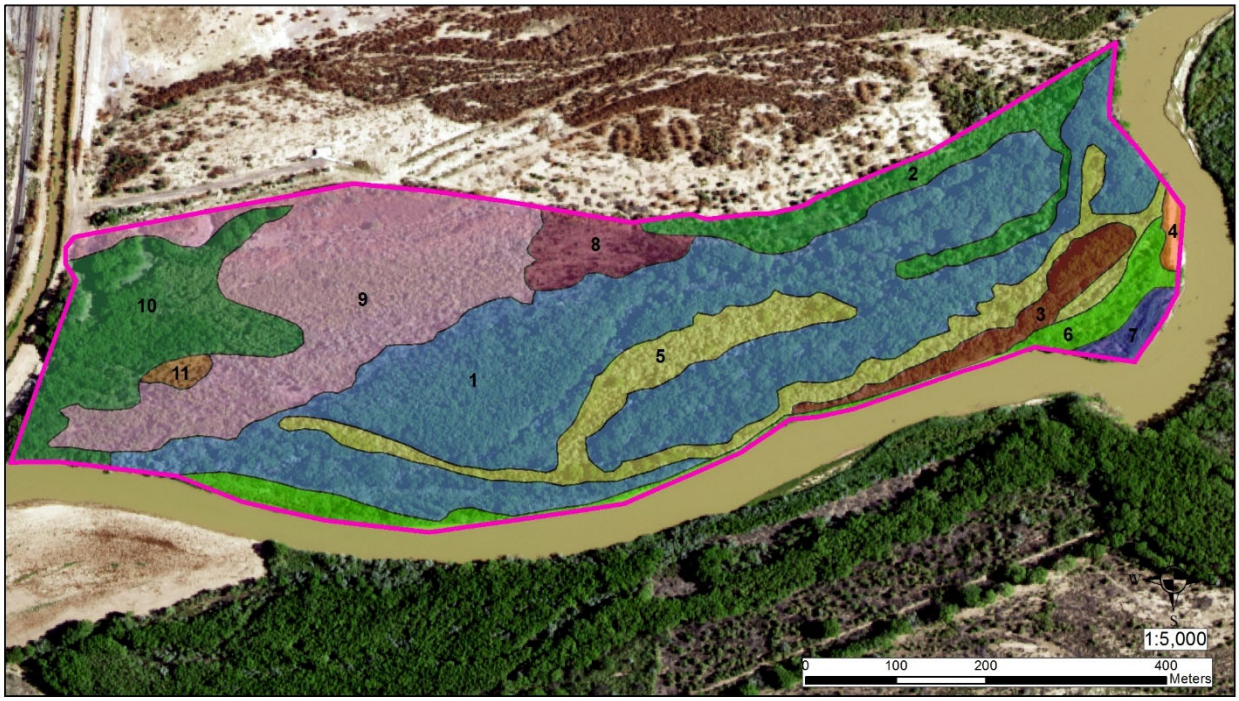


Figure 5. An example of vegetation community patch polygons mapped on the Biotic SA Map that underpins the NMRAM Biotic metrics. Each polygon is labeled with a unique polygon number that corresponds to polygon numbers on Worksheet 5. The different colors reflect the community types (CTs) listed on Worksheet 6 (more than one polygon can belong to a CT).

Each polygon is labeled with a unique number that corresponds to a polygon number on Worksheet 5 and is then evaluated with respect to Vegetation Vertical Structure (B3), Native Riparian Tree Regeneration (B4), Invasive Exotic Plant Species Cover (B5), and composition and health status of each stratum for Groundwater Index (A11) (see specific metric protocols below and Figure 6). The %SA is also recorded for each polygon on Worksheet 5. Each polygon is assigned to a running list of community types (CTs) on Worksheet 6 (Figure 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). Guidelines for photographing vegetation communities are provided in Appendix E.

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 Worksheet 6 (for example: 2FORB-1, 2FORB-2, etc.), 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. Appendix E provides guidelines for photographing plants to aid in identification.

Once all biotic metrics have been evaluated and rated, they are rolled up into a single Biotic Attribute score on the SA Rank Summary Worksheet. Additionally, once all the strata composition and health modifier data are collected on Worksheet 5, the Groundwater Index (A11) Worksheet 10 can be completed, and the Groundwater Index metric rated on Table A11d and added to the Abiotic Attribute score, which will happen automatically with the activated pdf datasheets. The attribute narratives on the SA Cover Worksheet that describe SA Biotic conditions and impacts should also be completed at this time.

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 vegetation community patch map (Biotic SA Map) and field reconnaissance data in Worksheets 5 and 6. Each polygon listed on Worksheet 5 is assigned to 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 stratum composed of trees and shrubs greater than 6 m tall (~20 feet); a Short Woody stratum of trees and shrubs 6 m (~20 feet) and under; and an Herbaceous stratum 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 the dominant species are recorded for the CT on Worksheet 6; for the herbaceous strata, total strata cover must be greater than 10%. The dominant 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).

- If a woody phreatophyte species is present but is comprised completely of standing dead, it is not included in the 25% vegetated cover for the stratum for this metric and the species is not listed on Worksheet 6 as part of the CT. However, the standing dead is included on Worksheet 5 (in the composition rating and health modifier columns), as that information needs to be tracked for the Groundwater Index (A11). (That is, on Worksheet 5 the standing dead species are included in the 25% for the tall woody and shorty woody strata and in the composition ratings and health modifier columns.) (See Groundwater Index for specific protocols). On Worksheet 6, polygons are assigned to CTs based on the living species.

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, the polygon is assigned to a new CT. This process is continued for all polygons mapped in the SA. Based on these 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[4] for species whenever possible. A list of the common dominant riparian species in the subclass with the USDA Plants Database Codes 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 within the polygon.
    - Ignore the herbaceous element in a stratum if it represents less than 10% of the total vegetative cover within the polygon.
    - 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 (U) Unknown.
    - For polygons with sparse or no vegetation (VST 7) and no dominant plant species, select NO DOM in the Herbaceous/Sparse Stratum under Species 6. Then select E if the polygon is human-disturbed ground (0), U if mixed natural/human disturbance (2), or N if naturally unvegetated (4).
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 mapped and 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 visually estimated from the completed Biotic SA Map.) (The fillable PDF version of Appendix A will automatically add up the percentage SAs of the polygons from Worksheet 5.)
4. Using Table 4 below or the Table B1a in Appendix B, 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 weighted scores (Wt. Score) and enter sum into the Final Weighted Score box. (These scores are computed automatically using the fillable PDF version of the data collection worksheets (Appendix A)).
6. Use the Final Weighted Score to rate Relative Native Plant Community Composition for the SA using Table B1.
7. Enter rating on the SA Rank Summary Worksheet.

[4] USDA, NRCS. 2022. The PLANTS Database (http://plants.usda.gov, 03/22/2022). National Plant Data Team, Greensboro, NC USA.

SA CODE: 32RGrand487.8 **Date:** 2024-05-17

SA Name: Middle Rio Grande **Surveyor Initials:** YV

Biotic Metrics

Worksheet 5. Vegetation Community Patch Data for Polygons from the SA Biotic Map for Biotic Metrics B3, B4, and B5 and for Abiotic Metric A11. Enter data for each polygon under a unique number assigned from the SA Biotic Map. Estimate the percentage of the SA (%SA) each polygon covers (expressed as decimal). Each polygon is then evaluated with respect to Vegetation Vertical Structure (B3), Native Tree Regeneration (B4), and Invasive Exotic Plant Species Cover (B5) metrics. Enter the Vertical Structure Type (VST) for B3, tree regeneration % cover within the polygon for B4 and the % cover of invasive exotic species for B5. Use the Tables in Appendix B and the Field Guide for metric instructions. For the Groundwater Index metric (A11) select a composition rating for tall woody, short woody or herbaceous using Table A11a in Appendix B if that stratum occurs in the polygon. A health modifier value is also selected from Table A11b for each woody stratum (tall or short) when riparian woody phreatophytes occur in the polygon. The comments box is used for documenting and describing vegetation community patch features.

Polygon No	% SA	B3 Structure Type	B4 Tree Regeneration % Cover	B5 Invasive Exotic Species % Cover	Invasive Exotic Species (List Code(s))	A11 Tall Woody (TW)	A11 Short Woody (SW)	A11 Herbaceous	A11 TW Health Modifier	A11 SW Health Modifier	Comments
1	0.05	VST 1	0.1	30	ULPU, ELAN, TAMAR2	2	3	2	0.9	0.9	large ULPU and many smaller ULPU, PODE3 and ELAN with patchy SAEX, FOPU2, TACH and MOAB.
2	0.1	VST 6S	0	2	TAMAR2, ELAN, ULPU	-	1	1		1	Open terrace with patchy ATCA2, ARFI2 and SPOA. Dense annual herbaceous dominated by TOAN.
3	0.08	VST 1	0.1	50	TAMAR2, ELAN, ULPU	2	3	2	0.9	0.9	Narrow band along river's edge.
4	0.15	VST 2	0	2	TAMAR2, ELAN, ULPU	1	1		1	1	Same Terrace as Poly 2 but with scattered older PODE3 wrapped in wire.
5	0.6	VST 1	0	5	UPLU, TAMAR2, ELAN	4	-	1	0.75		High terrace just before levee with dense stand of large mature PODE3, Dense understory.
6	0.01	VST 6S	0	2	TAMAR2, ELAN, ULPU	-	1	1		1	Same as Poly 2
7	0.01	VST 7	0	0		-	-	-			Patch of disturbed ground - graded, no veg.

SA CODE: 32RGrand487.8 **Date:** 2024-05-17

SA Name: Middle Rio Grande **Surveyor Initials:** YV

B1 - Relative Native Plant Community Composition

Worksheet 6. CT Plant Species and Polygon Assignments. Starting with CT A, enter the number of the first polygon from Worksheet 5, and the species codes for the two top dominant species in each stratum that appear in the polygon. 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 from Worksheet 5 is then either assigned to the same CT if it has the same composition, or a new CT is created for the polygon. For polygons with sparse or no vegetation (VST 7) and no dominant plant species, select NO DOM in the Herbaceous/Sparse Stratum under Species 6. Then select E if the polygon is human-disturbed ground (0), U if mixed natural/human disturbance (2), or N if naturally unvegetated (4).

		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[4]	% SA[5]	Wt Score[6]
A	1	ULPU	E	PODE3	N	SAEX	N	TAMAR2	E	MUAS	N	DEPI	N	2.1	0.05	0.105
B	2 6					ARFI2	N	ATCA2	N	SPAI	N	TOAN	N	4	0.11	0.44
C	3	ULPU	E	ELAN	E	SAEX	N	FOPU2	N	SCAR	E	MUAS	N	1.4	0.08	0.112
D	4	PODE3	N							SPAI	N	SPCR	N	4	0.15	0.6
E	5	PODE3	N	ULPU	E	FOPU2	N	SAEX	N					2.3	0.6	1.38
F	7											NO DOM	E	0	0.01	0
G																
H																
I																
J																
K																
L																
M																
N																
O																
													Final Weighted Score[7]		1	2.637

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 (Appendix B); [5]%SA is the percentage of the SA area covered by the CT and expressed as a decimal number; the total area %SA must equal 1; [6]Wt. Score is the product of the Raw Score * % SA; [7]The Final Weighted Score is the sum of the Wt. Scores. Rate the CT Final Weighted Score on Table B1 and enter the Rating for Relative Native Plant Community Composition on the SA Rank Summary Worksheet.

Figure 6a and b. Example of data entry on Worksheet 5 based on the mapping of vegetation community patch polygons on the Biotic SA Map, and data entry by CT on Worksheet 6 for Relative Native Plant Community Composition (B1) metric. Worksheet 5 includes columns for Vegetation Vertical Structure (B3), Native Riparian Tree Regeneration (B4), Invasive Exotic Plant Species Cover (B5) and to track composition ratings and woody phreatophyte health modifier values for each polygon to be used to rate the Groundwater Index metric (A11).

Table 4. Raw Community Type Scoring. E = exotic-dominated CT strata; M = mixed exotic/native CT strata; N = native-dominated CT strata; A = absent; U = unknown.

CT Score	Trees (>25% Cover)	Shrubs (>25% Cover)	Herbs (>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

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 mapped vegetation community patch polygons on the Biotic SA Map should be completed during the growing season to accurately assess this metric.

Protocols: Vegetation Horizontal Patch Structure is assessed using vegetation community patch polygons on the Biotic SA Map after the field reconnaissance.

Steps:

1. Using the Biotic SA Map with all the vegetation community patch polygons mapped and assigned to a CT, determine the vegetation patch pattern that best matches the schematic diagrams of idealized riverine vegetation patterns in Figure 7 (Figure B2c in Appendix B), and fill in the chosen Horizontal Patch Structure pattern choice on Worksheet 7. Each CT must comprise at least 5% of the SA to be considered part of patch diversity.
    - The "Horizontal Patch Structure Diagram Details" Table B2a (Appendix B) 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. Using Table B2, assign a rating based on the schematic diagrams in combination with the rating descriptions. The rating is best assigned in the field, but the analysis can happen as a post-field task if necessary.
3. Enter rating on the SA Rank Summary Worksheet.

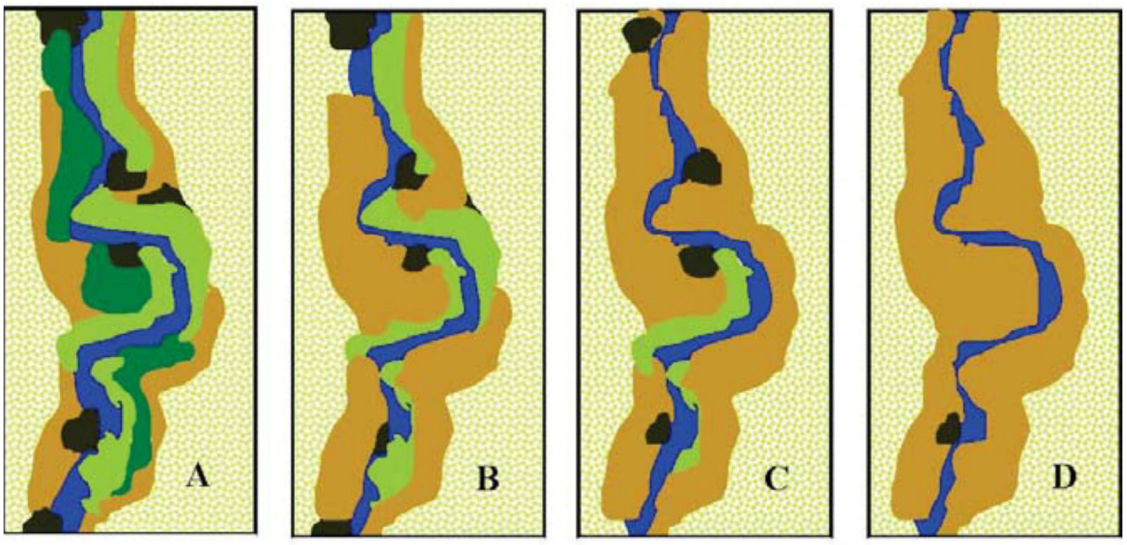


Figure 7. Horizontal Patch Structure pattern A, B, C, or D (Collins et al. 2008).

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.

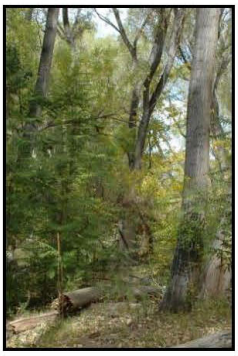
Seasonality: This metric is best assessed in late spring to early fall when vegetation foliage is present.

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 8 below (Figure B3a in Appendix B). Use the descriptions and pictorial aid to guide the assignments. The percent coverage of each VST is computed across the SA (Worksheet 8) using 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 8 (Figure B3a in Appendix B) and enter the 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 Lowland Riverine wetlands can be found in Appendix C.
    - Note that for a forest stand to be considered high structure (VST1) it must include tall shrubs (1.5-6 m) or young trees at ≥25% of the understory layer. A forest stand with a shrub layer composed primarily of short shrubs (< 1.5 m) is considered a low structure forest (VST2).
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).
    - Enter the total %SA for each VST on Worksheet 8. (The fillable PDFs will do this automatically.)
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 VSTs 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.

Multiple-Story Communities (woodlands/forests)



VST 1 – **High Structure Forest** with a well-developed understory. Trees (>6 m) with canopy covering >25% of the area of the community polygon and woody understory layer of tall shrubs or short trees (1.5–6 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 (>6 m) with canopy covering >25% of the area of the community polygon and minimal woody understory layer (1.5–6 m) covering <25% of the area of the community (polygon). Majority of foliage is over 7 m above the ground.

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

VST 5 – **Tall Shrubland**. Young tree and shrub layer (1.5–6 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 8. Guide to vertical structure types (VST).

B4. Native Riparian Tree Regeneration

Definition: This metric assesses the abundance and spatial distribution of native riparian tree regeneration (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 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 x acuminata*), Arizona sycamore (*Platanus wrightii*), peachleaf willow (*Salix amygdaloides*), and Goodding's willow (*Salix gooddingii*).
2. Rate the SA based on polygon percent cover and patch density as presented in Table B4.
3. Enter rating on the SA Rank Summary Worksheet.

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 (NMDA 2022 (Appendix D). 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 however they will not be used in the final score.

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. Note that once you have 10% cover or above of invasive exotic species within the SA, the SA will score a 1.

Using the New Mexico Noxious Weed list provided in Appendix D as a guide, during the reconnaissance survey:

Steps:

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 the percentage cover (%SA) for each mapped vegetation patch polygon (visual estimate of each polygon using the Biotic SA Map), estimate the 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). (Using the fillable PDF, the percent cover will be calculated for you. Select the "Calculate" rating method to do this.) For invasive shrubs or trees (e.g., salt cedar), it may be possible to assess this metric in GIS using fine-scaled satellite imagery or aerial photographs with ground control. However, invasive exotic herbaceous species require an on-the-ground survey of the site.

3. Rate Invasive Exotic Plant Species Cover based on the estimated or calculated percent cover across the SA provided in Table B5.
4. Enter rating on the SA Rank Summary Worksheet.

Abiotic Metrics

For the Abiotic survey there are five Abiotic metrics that reflect the physical status of a wetland and are evaluated along the floodplain transects:

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 structural complexity of a site that contributes to ecological richness.

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.

A11. Groundwater Index is an evaluation of local water table status within the wetland.

While the Groundwater Index (A11) is considered an Abiotic metric it is evaluated along with the Biotic metrics and is that team member's responsibility.

The Channel and Floodplain Survey Overview

A channel and floodplain survey is conducted along the three transects and uses a combination of checklists with narrative descriptions to arrive at an assessment. The surveyor divides the stream reach into three more-or-less equal segments (upper (U), middle (M), and lower (L)). A lateral traverse extending from the SA boundary to the active channel edge is placed in each segment (Figure 9). 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. As part of the survey, major features of the floodplain are sketched on the Abiotic SA Map to aid in filling out the checklist and for later

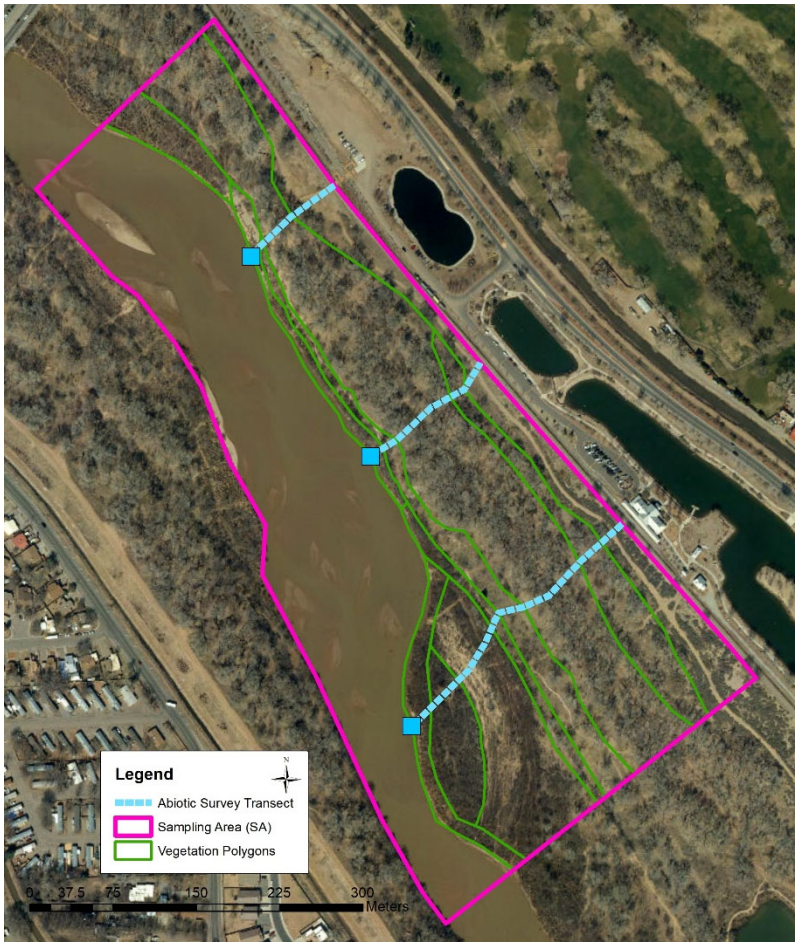


Figure 9. An example of Abiotic SA traverse locations (dashed blue lines) that underpins the NMRAM Abiotic metrics. At the channel edge of each traverse (blue squares) photographs and Channel Mobility (A6) data is taken. Green lines show vegetation polygons.

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 (See Photo Point Guidelines Appendix E). 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.

The attribute narratives on the SA Cover Worksheet that describe SA conditions and impacts should also be completed as part of the survey.

A1. Floodplain Hydrologic Connectivity

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

Protocols: Floodplain Hydrologic Connectivity is evaluated by detecting *recent* channel and floodplain inundation indicators (see Appendix B for examples). 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 a peak flow that has 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 a case the field team must use their best professional judgement and recognize the rating may incorrect due to lack of on-the-ground indicators. The assessment uses a checklist/narrative approach as follows:

Steps:

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 G.
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 (Figures A1a – A1e, 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. Determine the relative number of floodplain indicators for the location (channel edge, SA center, or outer edge) along each traverse from the Abiotic SA Map and estimate the extent of SA wetting of the channel edge, SA center and outer edge of each traverse. Enter percent in the boxes provided in Worksheet 11a2. of Worksheet 11a. In the lower section of Worksheet 11a2., indicate by using M (many), F (few) or A (absent) the presence of channel flooding features or overbank flow features along each transect from Abiotic SA Map.
4. Using Worksheet 11b, 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 Worksheet 11a1. of Worksheet 11a.
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 cumulative surface inundation from Worksheet 11a1., 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.

A2. Physical Patch Complexity

Definition: This metric describes the physical structural complexity of riverine wetlands and associated channels that foster ecological richness, a variety of habitats and biotic diversity.

Seasonality: This metric can be evaluated during any season.

Protocol: The assessment consists of checking off field indicators of various physical patch types by SA segment using Worksheet 12. As various physical features are observed during the segment traverses, they are checked off on the indicator worksheet. Documentation of significant physical features with photographs is strongly recommended. At the completion of all segment traverses the abiotic team rates the SA based on the descriptions in Table A2. The final rating should be based on the team's assessment of the overall physical patch diversity of the SA, guided in part by the count of physical patch types from Worksheet 12.

Steps:

1. As part of the segment traverses, check off field indicators representing physical patch types in each SA segment using Worksheet 12.
2. Based on the narrative and using the number of patch types on Worksheet 12 as a guide, rate the metric using Table A2.
    a. Consider not just the total number of patch types, but the size and distribution of patch types across the SA and the overall complexity of the physical patch matrix.
    b. Note that the fillable PDF version of Appendix A has a "Calculate" button that automatically sums the unique patch types checked on Worksheet 12 and rates the metric on Table A2. This rating can be over-ridden, and a different rating chosen if appropriate. Justification for the new rating choice should be documented in the SA Abiotic Condition Description on Page 1 of Appendix A.
3. Enter the rating on the SA Rank Summary Worksheet.

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 13. 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.

Steps:

1. Prior to field work, using available aerial imagery in the GIS or the Abiotic SA Map, roads and other obvious soil surface disturbances can be identified within the SA and

surrounding landscape area. Mark disturbed areas within the SA on the Abiotic SA Map to take in the field and provisionally check them off on Worksheet 13.

2. Conduct soil-surface assessment as part of the segment traverses to ground-truth work completed in Step 1 and to identify additional evidence of disturbance not identified or seen at the scale of the Abiotic SA Map. For each segment, check off all indicators that apply on Worksheet 13. This is especially important since small amounts of disturbance can change the rating for the metric.
3. Estimate the area of soil surface disturbance by segment and as a percentage of the total area of the SA.
4. Based on the indicators and the percentage disturbance for the segments 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 lateral channel migration at high discharge. Cover of stabilization features is estimated at the bank edge corresponding to the three floodplain transects.

Steps:

1. At the bank end of each transect (upper (U), middle (M), and lower (L)) estimate the percent absolute cover of each of the mobility elements listed in Worksheet 14 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).

Note when recording percent cover, you cannot exceed 100% for either Stabilizing Element - Exotic Woody Cover or Artificial Stabilization Features at Bank Edge or Total Percent Cover. As an example, 100% Jetty Jacks and 100 % Russian Olive growing through the same bank Jetty Jacks; the Total Percent Cover per Bank will be 100%. As another example, you can have 50% Jetty Jacks with salt cedar growing through that same 50% to equal 50% Total Percent Cover. If a bank is covered with 50% Jetty Jacks and the remainder 50% of the bank is covered with Salt Cedar, then you would have Total Percent Cover per Bank equal to 100%.

2. For each 50-m segment, enter the total cover of all elements present for the SA Bank and for the Opposite Bank.
3. Noting that cover elements can overlap, enter the Total Percent Cover per Bank and average the two bank scores per segment to arrive at the sampling point average per segment.

4. Average the three segments for a bank cover average for the SA, and rate using Table A6.
5. Enter the rating on the SA Rank Summary Worksheet.

A11. Groundwater Index

Definition: An index of floodplain water table status based on phreatophyte riparian and wetland species presence and condition.

Seasonality: This metric must be evaluated during the growing season to adequately determine if plant stress indicators such as loss of leaves are due to stress rather than change in seasons.

Protocols: Although this metric is part of the Abiotic attribute category, it is assessed using vegetation species composition and short woody and tall woody phreatophyte vegetation health status. Thus, the data used to rate the metric are collected by the biotic team member during the survey of vegetation patch polygons along with the data required for the Biotic metrics. For each vegetation patch polygon (Worksheet 5) composition is rated for the vegetation strata present (Tall Woody (TW), Short Woody (SW), and Herbaceous (H)) using the Herbaceous Wetlands or Riparian Phreatophyte Species Strata Composition ratings in Table 5 (Table A11a in Appendix B). The Herbaceous Wetlands or Riparian Phreatophyte Species Strata Composition ratings are based on the presence of obligate or facultative-wetland herbaceous species, and phreatophyte trees and shrubs listed in Table 6 (Table A11b in Appendix B). A Health Modifier value is also selected from Riparian Woody Phreatophyte Health Modifier Table 7 (Table A11c in Appendix B) for each woody stratum (tall or short) when riparian woody phreatophytes occur in the polygon.

- Strata composition ratings are only assigned to those strata that are present in a polygon (e.g., if a polygon is comprised of tall woody and herbaceous vegetation only, it will receive no rating for the absent short woody strata, represented by a Dash (-) on Worksheet 5.

- The cover requirements for presence of a stratum for this metric are the same as those used for Relative Native Plant Community Composition. For each of the tall and short woody strata, total stratum vegetative canopy cover must exceed 25% before a stratum is considered present; for the herbaceous stratum, total stratum cover must be greater than 10%.

- Unlike Relative Native Plant Community Composition, a woody stratum that is comprised partly or completely of phreatophyte standing dead species is still given a composition rating if the inclusion of standing dead would have met or exceeded the 25% required cover. These phreatophyte standing dead species will not be listed on Worksheet 6 as part of the CT but should be included in both the composition and health status for the polygon on Worksheet 5 and carried over to Worksheet 10.

Table 5. Herbaceous Wetlands or Riparian Phreatophyte Species Strata Composition ratings.

Rating	Description

4	**Strata Dominant:** Wetland species and/or riparian phreatophytes dominant. Upland species/non-phreatophytes are not present, or very rare and scattered.
3	**Strata Co-Dominant:** Wetland species/phreatophytes are majority species within the strata, but upland species may be common.
2	**Present in Strata:** Strata approximately half or more upland species but wetland/phreatophytes present and at least common.
1	**Absent:** All or vast majority of strata are upland species

Table 6. Phreatophytes to consider in evaluating the Groundwater Index.

	Scientific Name	Common Name
Tree		
	Acer negundo	boxelder
	Alnus incana ssp. tenuifolia	thinleaf alder
	Alnus oblongifolia	Arizona alder
	Fraxinus velutina	velvet ash
	Platanus wrightii	Arizona sycamore
	Populus spp.	cottonwood
	Salix amygdaloides	peachleaf willow
	Salix gooddingii	Goodding's willow
Shrub		
	Baccharis spp.	seepwillow
	Salix spp.	willow

Table 7. Riparian Woody Phreatophyte Health Modifier.

Modifier Value	Description
1.1	**Excellent health:** Very little to no dead foliage or dead limbs, < 5% of potential phreatophyte cover. Standing dead individuals absent or solitary.
0.9	**Good health:** Dead foliage and/or dead limbs present but limited to 5% to < 25% of potential phreatophyte cover. Standing dead individuals rare.
0.75	**Fair health:** Dead foliage and dead limbs represent 25 to < 50% of the potential phreatophyte cover. Standing dead individuals present but scattered.
0.25	**Poor health or standing dead:** Significant dead foliage and dead limbs representing ≥ 50% to of the potential phreatophyte cover. Standing dead individuals common to ubiquitous.
1	**None**: Woody strata present but does not include any phreatophytes.

SA CODE: 32RGrand487.8 **Date:** 2024-05-17

SA Name: Middle Rio Grande **Surveyor Initials:** YV

Abiotic Metrics

A11 - Groundwater Index

Worksheet 10. Groundwater Index. Enter the SA % for each vegetated polygon from Worksheet 5 (polygons with Vertical Structure Type VST 7 are excluded). If a tall woody stratum was present in the polygon (a value entered into A11 Tall Woody (TW) column on Worksheet 5), enter a 3 into the Tall Woody Presence (TP) column. If a short woody stratum was present (a value entered into A11 Short Woody (SW) column on Worksheet 5) enter a 1 in the Short Woody Presence(SP) column. If a herbaceous stratum was present (a value entered into A11 Herbaceous column on Worksheet 5) enter a 1 into the Herbaceous Presence (HP) column. If any stratum was absent, enter a 0 in the corresponding presence column. Fill in Composition (TC, SC and HC) and Health Modifier ratings (Th and SH) from Worksheet 5. Calculate the Health Wtd Groundwater Average using the formula below for each vegetated polygon (excluding the polygons with VST 7). For each polygon multiply the Health Wtd Groundwater Average by its %SA for Area Wtd Groundwater Average. Sum all Area Wtd Groundwater Averages and divide by Total % SA for the GroundWater Index Score. Rate using Table A11d and enter rating on the SA Rank Summary Worksheet.

		TP	SP	HP	TC	TH	SC	SH	HC		
Polygon	%SA	TW Presence	SW Presence	Herbaceous Presence	TW Composition	TW Health Modifier	SW Composition	SW Health Modifier	Herbaceous Composition	Health Wtd Groundwater Average	Area Wtd Groundwater Average
1	0.05	3	1	1	2	0.9	3	0.9	2	2.02	0.1
2	0.1	0	0	1	0	0	1	1	1	2	0.2
3	0.08	3	1	1	2	0.9	3	0.9	2	2.02	0.16
4	0.15	3	0	1	4	0.75	0	0	1	2.5	0.38
5	0.6	3	1	0	4	0.75	2	0.9	0	2.7	1.62
6	0.01	0	0	1	0	0	1	1	1	2	0.02
7											
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Total % SA	0.99							**SUM Area Wtd Groundwater Average**			2.48
								Groundwater Index Score (Area Wtd Groundwater Avg/Total %SA)			2.51

Health Wtd Groundwater Avg = $\frac{((TC*TH)*3)+(SC*SH)+(HC)}{TP+SP+HP}$

Table A11d. Groundwater Index Rating

Rating	Groundwater Index Score
○ 4	≥3.25
◉ 3	>2.5 and <3.5
○ 2	>1.75 and ≤2.5
○ 1	≤1.75

Figure 10. Worksheet 10. Groundwater Index filled in and rated based on data shown in Figures 6a and 6b above. Note that Polygon 7 is not included because it is a VST7 (Worksheet 5).

Riparian Woody Phreatophyte Health Modifier values are based on indications of stress and mortality among tall and short woody phreatophyte species (Table 7). Health Modifier values are applied to those woody strata in a given polygon, including standing dead strata. Additionally, the Health Modifier values are assigned based only on the health of phreatophyte species within a given strata, excluding the health status of any non-phreatophytes. If a woody stratum is present but contains no phreatophyte species, then it is assigned a default Health Modifier value of "1" to allow for calculation of the Health Weighted Groundwater Average of that woody stratum.

Steps:

1. Beginning with the first polygon visited, use Worksheet 5 to assign a Composition rating from Table 5 (Table A11a in Appendix B) to each vegetation strata present in the polygon (Tall Woody (TW), Short Woody (SW), and/or Herbaceous,) based on the total cover of phreatophyte/wetland species. Use Table 6 (Table A11b in Appendix B) to determine which woody species are considered phreatophytes for this metric. Herbaceous wetland species are those with OBL or FACW wetland indicator status (from Appendix C or USDA Plants Database[5]). The A11 Tall Woody (TW), A11 Short Woody (SW), and/or A11Herbaceous columns are used for these Composition values and can be selected from the drop-down lists on the activated PDFs.
    a. Do not assign strata Composition ratings for any vegetation polygon that is completely bare. Use a Dash (-) in those columns.
    b. Do not assign a Health Modifier value for any woody phreatophyte stratum that is dead due to mechanical treatment or fire. Use a one "1"in the Health Modifier column.
    c. When a woody stratum is present, but does not include phreatophytes, assign a value of "1" to both the Composition and Health Modifier columns.
    d. If a short woody or tall woody stratum is all dead and you cannot determine the species, assume a Composition value of "3".
2. Assign a Riparian Woody Phreatophyte Health Modifier (in columns A11 TW Health Modifier, A11 SW Health Modifier) to each of the woody strata present using Table 7 (Table A11c in Appendix B).
3. Repeat Steps #1 and #2 for all mapped polygons.
    a. As each polygon is assigned to a CT, make sure composition and health ratings on Worksheet 5 are the same as for the previous polygons assigned to that CT. If they are not, then a new CT will need to be created for that polygon on Worksheet 6.
4. When the Biotic SA survey is complete, copy the %SA from Worksheet 5 and enter on Groundwater Index Worksheet 10 for all polygons except those that are bare (VST Structure Type 7).

[5] USDA, NRCS. 2022. The PLANTS Database (http://plants.usda.gov, 03/22/2022). National Plant Data Team, Greensboro, NC USA

5. Fill in the Tall Woody Presence, Short Woody Presence and/or Herbaceous Presence columns using the guidance on Worksheet 10.
    a. If a tall woody stratum was present in the polygon (a value entered into A11 Tall Woody (TW) column on Worksheet 5), enter a **3** into the Tall Woody Presence (TP) column.
    b. If a short woody stratum was present (a value entered into A11 Short Woody (SW) column on Worksheet 5) enter a **1** in the Short Woody Presence (SP) column.
    c. If an Herbaceous stratum was present (a value entered into A11 Herbaceous column on Worksheet 5) enter a **1** into the Herbaceous Presence (HP) column.
    d. If any stratum was absent, enter a **0** in the corresponding presence column.
6. Copy the TW Composition Rating, SW Composition Rating and Herbaceous Composition Rating columns ((A11 Tal Woody (TW), A11 Short Woody (SW) and A11 Herbaceous columns) from Worksheet 5 and enter values on Groundwater Index Worksheet 10 (TW Composition, SW Composition, and Herbaceous Composition respectively).
7. Copy the TW and SW Health Modifier ratings from Worksheet 5 and enter on Groundwater Index Worksheet 10. Polygons with VST 7 structure type will be left blank on Worksheet 10 in all columns and will not be included in the Final Groundwater Score. (Worksheet 10 will do this automatically in the activated pdfs.)
8. Calculate the Health Weighted Groundwater Average (Health Wtd Groundwater Average) score for each polygon using the following formula (Worksheet 10 will do this automatically in the activated pdfs):

$$\text{Health Wtd Groundwater Average} = \frac{((TC*TH)*3)+(SC*SH)+(HC)}{TP+SP+HP}$$

9. For each polygon calculate the Area Weighted Groundwater Average (Area Wtd Groundwater Average) by multiplying Health Wtd Groundwater Average by % SA.
10. Calculate the Total % SA for all polygons (this may be <100% in cases where VST 7 polygons were excluded).
11. Sum Area Wtd Groundwater Average and divide by the Total % SA to obtain the Groundwater Index Score.
12. Use the Groundwater Index Score to rate Groundwater Index for the SA using Table A11d.
13. Enter rating on the SA Rank Summary Worksheet.

V. Stressor Checklist

The Stressor Checklist (Worksheet 15) provides a guide for evaluating potential drivers of ecological condition at local to watershed scales that can inform management. The checklist is not used directly in scoring or ranking the condition of the wetland and accordingly explicitly excludes elements that are already incorporated in NMRAM metrics themselves (e.g., Surrounding Land Use). On the checklist, stressors have been grouped into major categories by their potential role in driving declines in wetland condition: 1) adverse water management, 2) adverse sediment management, 3) artificial water additions, 4) ground water pumping, 5) watershed alteration, and 6) local biodiversity impacts (See the NMRAM Manual Version 2.0 for rationales behind these

groups). Note that these drivers may be acting at a watershed scale and may require some research or evidence (local inquiry) before field data collection.

The presence and intensity of stressors are evaluated as follows:

1. On Worksheet 15, evaluate each stressor in terms of intensity and impact on ecological condition of an SA. If a stressor is thought to have a significant impact on ecological processes at the SA, then mark it as either "Major" or "Minor" intensity using direct evidence where available or your best professional judgement otherwise (e.g., a major dam directly upstream that significantly alters water availability, or a recent large wildfire in the watershed that may be generating excess sediment in the SA, etc.). If the stressor is known to be absent, mark "Absent." If the presence of the stressor is uncertain, mark it as "Unknown."
2. Rank the major stressors by their importance. Pick up to three.
3. Provide comments where possible that further describe the stressor and implications for management of the WOI.

Count the major and minor stressors per intensity class on Worksheet 15. Enter the results and the Top 3 on SA Rank Summary Sheet.

VI. SA Condition Ranking

For each SA, there is an *SA Rank Summary Worksheet* (Page 2 in Appendix A) where the metric ratings are compiled, weighted, and an overall weighted Condition Rank for the SA assigned. The metric and attribute weighting hierarchy is built into the summary sheet such that individual and attribute category weighted 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), and assigns a letter SA Wetland Condition Rank as follows:

- A, 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.
- B, 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, the surrounding landscape 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.
- C, 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. Surrounding landscape is typically significantly modified as well but may 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.

- D, 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 will typically have a largely disturbed surrounding landscape. 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 (Page 1 of Appendix A) 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.

VII. Submitting data to the New Mexico 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 SQUID Database managed by the NMED Surface Water Quality Bureau. This database is intended as a comprehensive, central clearing house for information on New Mexico's waters with a web interface providing various reporting tools to facilitate the analysis of single and comparison of multiple sites from around the state. See New Mexico Wetlands Program (nm.gov) for updates.

VIII. References

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Appendix A

New Mexico Rapid Assessment Method

Lowland Riverine Wetlands

Field Guide Worksheet Packet

(Version 2.2)

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 either paper use or as digital application using an interactive PDF available from New Mexico Environment Department Surface Water Quality Bureau (http://www.env.nm.gov/surface-water-quality/WETLANDS/) The PDF version computes some of the metric scores automatically, and auto-fills the SA Rank Summary Worksheet and headers. If field team members use paper versions in the field, they can choose to fill in a PDF later to compute the score and make reports, but regardless, all raw data must be collected first.

Version Date: 08/12/2024

NMRAM Lowland Riverine Wetlands Version 2.2

SA Cover Worksheet				
SA Code	SA Name		Project	
AU Code	AU Name		WOI	
County	HUC 12	Elevation (ft)	(m)	Ecoregion
SA General Location and Boundary (Rationale, comments)				
Driving Directions				
Ownership		Data Sharing Restrictions		Fish Observed in Wetland?

Surveyor Role	Surveyor Name	Surveyor Initials
Landscape Context		
Biotic		
Abiotic		
Stressors		

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

SA Description

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

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

NMRAM - SA Rank Summary Worksheet: Lowland Riverine Wetlands 2.2			
Metric Description	Rating	Wt	Final Score
Landscape Context		Σ	
L1. Buffer Integrity Index		0.25	
L2. Riparian Corridor Connectivity		0.25	
L3. Relative Wetland Size		0.25	
L4. Surrounding Land Use		0.25	
Biotic		Σ	
B1. Relative Native Plant Community Composition		0.2	
B2. Vegetation Horizontal Patch Structure		0.2	
B3. Vegetation Vertical Structure		0.2	
B4. Native Riparian Tree Regeneration		0.2	
B5. Invasive Exotic Plant Species Cover		0.2	
Abiotic		Σ	
A1. Floodplain Hydrologic Connectivity		0.3	
A2. Physical Patch Complexity		0.2	
A5. Soil Surface Condition		0.1	
A6. Channel Mobility		0.2	
A11. Groundwater Index		0.2	

SA Condition Scoring Summary			
Major Attribute	Score	Wt.	Wt. Score
Landscape Context		0.3	
Biotic		0.35	
Abiotic		0.35	
SA WETLAND CONDITION SCORE Σ			
SA WETLAND RANK =			

SA Wetland Rank		
Rank	Score	Description
A	≥3.25 - 4.0	Excellent Condition
B	≥2.5 - <3.25	Good Condition
C	≥1.75 - <2.5	Fair Condition
D	1.0 - <1.75	Poor Condition

Stressor Summary	Major	Minor	Top Three	
	0	0	1	
			2	
			3	

Stressor Comments (Evaluation of risk)

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Landscape Context

L1 - Buffer Integrity Index

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

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/residential developments, parking lots, dams, bridges, revetments, and other structures
☐	☐	Small irrigation ditches without levees	☐	☐	Lawns, parks, golf courses, sports fields
☐	☐	Old fields, unmaintained	☐	☐	Railroads
☐	☐	Open range land	☐	☐	Maintained levees, sediment piles, construction materials, staging areas
☐	☐	Foot trails, horse trails, unpaved bike trails (low intensity)	☐	☐	Intensive livestock areas, horse paddocks, feedlots
☐	☐	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		(m)		(ft)	

Table L1b. Buffer Width

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

Worksheet 1d. Buffer Integrity Summary. Enter the sub-metric Ratings from Tables L1a and L1b above to calculate the Buffer Integrity Index Score using the formula in the box below. Using the Buffer Integrity Index Score, enter rating for Buffer Integrity in Table L1c and on the SA Summary Worksheet.

Buffer % Rating	+	Buffer Width Rating	/2 =	Buffer Integrity Index Score
	+		/2 =	

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

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

L2 - Riparian Corridor Connectivity (RCC)

Worksheet 2. RCC excluded non-buffer elements calculation. Refer to worksheet 1a for excluded non-buffer RCC land cover elements. Following the steps in the Field Guide, enter the summed values in meters for excluded element lengths for each bank within each segment upstream and downstream of the SA. Sum the values for each segment and calculate % Segment Disruption for the upstream side and the downstream side. Add the total disruption for upstream and downstream segments and then calculate the % Total Disruptions for the riparian corridor. Rate Riparian Corridor Connectivity using Table L2 and the data from this worksheet. Enter rating on the SA Summary Worksheet.

Segments	Upstream Segment		Downstream Segment	
Banks	**Left Bank**	**Right Bank**	**Left Bank**	**Right Bank**
A) Total Bank Disruption (m)				
B) Total Disruption by Segment (m)				
C) % Segment Disruption = (B/2000)*100				
D) Total Disruption both segments				
E) % Total Disruptions = (D/4000)*100				

Table L2. RCC Rating

Rating	Description
◯ 4	**0%** total disruption on both segments combined.
◯ 3	**<15%** total disruption on both segments combined.
◯ 2	**≥15%** - **<40%** total disruption on both segments combined.
◯ 1	**≥40%** total disruption on both segments combined.

L3 - Relative Wetland Size

Worksheet 3. Relative Wetland Size Calculation. a. Calculate the Relative Size Ratio (RSR) between the current WOI size and the historic WOI size. **b.** Calculate the Relative Wetland Size Score (RWSI (%)) as (1-RSR)*100. Rate Relative Wetland Size using Table L3 and enter rating on the SA Rank Summary Worksheet.

RSR					RWSI						
Current Size	/	Historic Size	=	RSR	1	-	RSR	X	100	=	RWSI (%)
	/		=		1	-		X	100	=	

Table L3. Relative Wetland Size Rating

Rating	RWSI Score	Description
◯ 4	≤10%	Wetland is at or only minimally reduced from its full natural extent
◯ 3	>10% - ≤40%	Wetland remains equal to or more than 60% of its natual size
◯ 2	>40% - ≤70%	Wetland has been reduced by more than 40% its natural size
◯ 1	>70%	Wetland has been reduced by more than 70% its natural size

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

L4 - Surrounding Land Use

Worksheet 4. Surrounding Land Use. Enter the percent area occupied by a given Land Use Element in the Land Use Zone (LUZ) sourrounding the SA. Calculate the Land Use Index (LUI) Score by element as the product of the element coefficient times the percent of the LUZ Area occupied. (The %LUZ Area must total 100%.) Sum the LUI scores for each element to create the final LUI Score. Rate using Table L4 and enter the rating in the SA Rank Summary Worksheet.

Land Use Element	Coef	% LUZ Area	LUI Score
Paved roads, parking lots, domestic or commercially developed buildings, mining (gravel pit, quarry, open pit, strip mining), railroads	0		0
Unpaved roads (e.g., driveway, tractor trail, unpaved parking lots), Paddock, dirt lot	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 (highly modified channel with severely limited vegetation zone that is altered by human activities but not a completely concrete channel [that goes under paved roads]), 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		
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		
Heavy logging or tree removal with >50% of large trees (e.g., >30 cm diameter at breast height) removed, Woodland/Shrub vegetation conversion (chaining, cabling, rotochopping)	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		
Element Score= Coefficient * % Area			

Table L4. Surrounding Land Use Rating

Rating	LUI Score
◯ 4	≥95 - 100
◯ 3	≥80 - <95
◯ 2	≥40 - <80
◯ 1	<40

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Biotic Metrics

Worksheet 5. Vegetation Community Patch Data for Polygons from the SA Biotic Map for Biotic Metrics B3, B4, and B5 and for Abiotic Metric A11. Enter data for each polygon under a unique number assigned from the SA Biotic Map. Estimate the percentage of the SA (%SA) each polygon covers (expressed as decimal). Each polygon is then evaluated with respect to Vegetation Vertical Structure (B3), Native Tree Regeneration (B4), and Invasive Exotic Plant Species Cover (B5) metrics. Enter the Vertical Structure Type (VST) for B3, tree regeneration % cover within the polygon for B4 and the % cover of invasive exotic species for B5. Use the Tables in Appendix B and the Field Guide for metric instructions. For the Groundwater Index metric (A11) select a composition rating for tall woody, short woody or herbaceous using Table A11a in Appendix B if that stratum occurs in the polygon. A health modifier value is also selected from Table A11b for each woody stratum (tall or short) when riparian woody phreatophytes occur in the polygon. The comments box is used for documenting and describing vegetation community patch features.

Polygon No	% SA	B3 Structure Type	B4 Tree Regeneration % Cover	B5 Invasive Exotic Species % Cover	Invasive Exotic Species (List Code(s))	A11 Tall Woody (TW)	A11 Short Woody (SW)	A11 Herbaceous	A11 TW Health Modifier	A11 SW Health Modifier	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											

SA CODE :

SA Name :

Date :

Surveyor Initials :

Worksheet 5, continued. Vegetation Community Patch Data for Polygons from the SA Biotic Map for Biotic Metrics B3, B4, and B5 and for Abiotic Metric A11.

Polygon No	% SA	B3 Structure Type	B4 Tree Regeneration % Cover	B5 Invasive Exotic Species % Cover	Invasive Exotic Species (List Code(s))	A11 Tall Woody (TW)	A11 Short Woody (SW)	A11 Herbaceous	A11 TW Health Modifier	A11 SW Health Modifier	Comments
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
Total SA		**0**									

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

B1 - Relative Native Plant Community Composition

Worksheet 6. CT Plant Species and Polygon Assignments. Starting with CT A, enter the number of the first polygon from Worksheet 5, and the species codes for the two top dominant species in each stratum that appear in the polygon. 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 from Worksheet 5 is then either assigned to the same CT if it has the same composition, or a new CT is created for the polygon. For polygons with sparse or no vegetation (VST 7) and no dominant plant species, select NO DOM in the Herbaceous/Sparse Stratum under Species 6. Then select E if the polygon is human-disturbed ground (0), U if mixed natural/human disturbance (2), or N if naturally unvegetated (4).

		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[4]	% 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 (Appendix B); [5]%SA is the percentage of the SA area covered by the CT and expressed as a decimal number; the total area %SA must equal 1; [6]Wt. Score is the product of the Raw Score * % SA; [7]The Final Weighted Score is the sum of the Wt. Scores. Rate the CT Final Weighted Score on Table B1 and enter the Rating for Relative Native Plant Community Composition on the SA Rank Summary Worksheet.

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

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. Using Tables B2a and B2c (Appendix B), choose the schematic pattern that best matches the mapped vegetation patch pattern for the SA. 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		

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

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, calculate or estimate the percentage cover of invasive exotic species for the SA and enter below. Rate using Table B5 and enter the rating on the SA Rank Summary Worksheet.

Rating Method

Invasive cover (%)

calculate

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:

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Abiotic Metrics

A11 - Groundwater Index

Worksheet 10. Groundwater Index. Enter the SA % for each vegetated polygon from Worksheet 5 (polygons with Vertical Structure Type VST 7 are excluded). If a tall woody stratum was present in the polygon (a value entered into A11 Tall Woody (TW) column on Worksheet 5), enter a 3 into the Tall Woody Presence (TP) column. If a short woody stratum was present (a value entered into A11 Short Woody (SW) column on Worksheet 5) enter a 1 in the Short Woody Presence(SP) column. If a herbaceous stratum was present (a value entered into A11 Herbaceous column on Worksheet 5) enter a 1 into the Herbaceous Presence (HP) column. If any stratum was absent, enter a 0 in the corresponding presence column. Fill in Composition (TC, SC and HC) and Health Modifier ratings (Th and SH) from Worksheet 5. Calculate the Health Wtd Groundwater Average using the formula below for each vegetated polygon (excluding the polygons with VST 7). For each polygon multiply the Health Wtd Groundwater Average by its %SA for Area Wtd Groundwater Average. Sum all Area Wtd Groundwater Averages and divide by Total % SA for the GroundWater Index Score. Rate using Table A11d and enter rating on the SA Rank Summary Worksheet.

		TP	SP	HP	TC	TH	SC	SH	HC		
Polygon	**%SA**	**TW Presence**	**SW Presence**	**Herbaceous Presence**	**TW Composition**	**TW Health Modifier**	**SW Composition**	**SW Health Modifier**	**Herbaceous Composition**	**Health Wtd Groundwater Average**	**Area Wtd Groundwater Average**
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
Total % SA								**SUM Area Wtd Groundwater Average**			
Groundwater Index Score (Area Wtd Groundwater Avg/Total %SA)											

Health Wtd Groundwater Avg = $\frac{((TC*TH)*3)+(SC*SH)+(HC)}{TP+SP+HP}$

Table A11d. Groundwater Index Rating

Rating	Groundwater Index Score
○ 4	≥3.25
○ 3	>2.5 and <3.5
○ 2	>1.75 and ≤2.5
○ 1	≤1.75

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

A1 - Floodplain Hydrologic Connectivity

Worksheet 11a. 1. Based on evidence observed during the traverse of each segment (Upper (U), Middle (M), and Lower (L)), estimate the percentage of overall level of SA flood inundation **(11a1.)**. For each segment include all SA surfaces inundated due to flooding from the channel, side channels, or groundwater, but ignoring inundation from culverts (or other man-made inputs) and from non-channel sources originating outside the SA. **2.** Estimate extent (percent) of surface inundation **(11a2.)** in each segment in three locations, channel edge, SA center and outer edge. Enter M, F or A for indicators of inundation features present in each segment from Abiotic SA Map.

11a1. SA Surface Inundation - cumulative					**11a2. 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 (location) of SA wetting and pathways for inundation. Lowland systems evidence of flooding should be many across the floodplain. Use the Abiotic SA Map to estimate unvisited locations. Note that abandoned side channels can be inundated through hyporheic (local water table) connections (oxbows) or abandoned through channel avulsion showing no indicators of recent flow.
☐	☐	☐	≥ 50% to < 75%		☐	☐	☐	SA Center	
☐	☐	☐	≥ 35% to < 50%		☐	☐	☐	Outer edge	
☐	☐	☐	≥ 20% to < 35%		**SA Inundation Features: enter a M if many indicators occur, F if few occur, or A if indicators are absent in the SA for each transect from the Abiotic SA Map.**				
☐	☐	☐	≥ 10% to < 20%						
☐	☐	☐	≥ 5% to < 10%		☐	☐	☐	Overbank flow	
☐	☐	☐	≥ 1% to < 5%		☐	☐	☐	Active side channels	
☐	☐	☐	> 0% to <1%		☐	☐	☐	High flow channels	
☐	☐	☐	0%		☐	☐	☐	Abandoned channels	

Worksheet 11b - 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 sediment, or removed downstream. Rate litter depth only on portions of SA were litter producing woody species are present.
☐	☐	☐	**3**	Litter layers scattered in small patches; not deep (< 2 cm thick)	
☐	☐	☐	**2**	Litter layers moderately thick (2-5 cm) and generally large patches	
☐	☐	☐	**1**	Litter layers very thick (>5 cm) and distributed over large areas.	
☐	☐	☐	**X**	Minimal or no litter producing woody species present, or litter removed by human activity	

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

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 11a1., 11a2., and 11b 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. Active side channels are not limited to the SA bank edge.
◯ 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. Active side channels are not limited to the SA bank.
◯ 2	Minimally connected wetlands have limited evidence of inundation of the SA surface (10 to <25%), if active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist.
◯ 1	Disconnected wetlands have minimal or no evidence of inundation across the SA surface (<10%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel.

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. Active side channels are not limited to SA bank edge.
◯ 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 and back channels. Active side channels are not limited to the SA bank edge.
◯ 2	Minimally connected wetlands have minimal evidence of inundation of the SA surface (5% to <10%) , if active side channels exist they are only found near the channels banks,. Most if the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist.
◯ 1	Disconnected wetlands have almost no evidence of inundation across the SA surface (<5%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel.

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. Active side channels are not limited to the SA bank edge.
◯ 3	Moderately connected wetlands have minimal evidence of inundation of the SA surface (5% to <10%) and signs of flow in some side channels. Active side channels are not limited to the SA bank edge.
◯ 2	Minimally connected wetlands have almost no evidence of inundation of the SA surface (1% to <5%) and where active side channels exist they are only be near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist.
◯ 1	Disconnected wetlands have no evidence of inundation across the SA surface (<1%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across Sa but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel.

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. Active side channels are not limited to the SA bank edge.
◯ 3	Moderately connected wetlands have no evidence of inundation of the SA surface (1% to <5%), Side channels do not appear abandoned even though signs of flow maybe lacking, they are not limited to the SA bank edge.
◯ 2	Minimally connected wetlands have no evidence of inundation of the SA surface (<1%) and where active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, or do not exist.
◯ 1	Disconnected wetlands have no evidence of inundation across the a SA surface and no signs of flow in any side channels, ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel.

Rating Adjustment Comments (Use this box when additional flooding evidence recorded supports ratings adjustment.)

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

A2 - Physical Patch Complexity

Worksheet 12. 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.

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.

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

A5 - Soil Surface Condition

Worksheet 13. 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 to 10% of the sampling area.

Soil disturbance comments:

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

A6 - Channel Mobility

Worksheet 14. Channel Mobility. Enter % cover of stabilizing elements on SA Bank and opposite bank (Opp) looking 25m upstream and downstream from channel edge of each segment. If "Other" is chosen for stabilizing element, please specify. Total % cover per bank should not exceed 100% for each of the Stabilizing Elements - Exotic Woody Cover (%) and Artificial Stabilization Features (%) at Bank Edge. Average % bank cover for each segment, and then for the SA. Rate using Table A6 and enter rating on SA Summary Worksheet.

Stabilizing Element	Upper Segment		Middle Segment		Lower Segment	
Exotic Woody Cover (%)	SA Bank	Opp Bank	SA Bank	Opp Bank	SA Bank	Opp Bank
Russian olive						
Saltcedar						
Other						
Artificial Stabilization Features (%) at Bank Edge	SA Bank	Opp Bank	SA Bank	Opp Bank	SA Bank	Opp Bank
Jetty Jacks						
Constructed Levees						
Rip Rap/Concrete						
Other						
Total % Cover per Bank						
Average % Bank Cover per Segment						
Average % Bank Cover all Segments						

Table A6. Channel Mobility

Rating	Description
◯ **4**	<10% channel stabilized: most of the channel has the capacity to migrate under high flows
◯ **3**	≥10%-<25% channel stabillized.
◯ **2**	≥25%-<50% channel stabilized.
◯ **1**	≥50% channel stabilized. Little or no opportunty for channel migration. The channel is artificially hardened, covered by dense exotic woody cover, or covered in concrete on the SA side and opposite banks.

Abiotic Metrics Comments:

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Worksheet 15. Stressor Checklist. Check off stressors by intensity category that may be affecting wetland ecological condition of the SA and WOI. Assign categories using direct evidence where available or your best professional judgement otherwise. If the presence of the stressor is uncertain, mark as "Unknown". Rank Major Stressors in Dominant Stressor column(Pick up to 3)

Rank	Affect				Stressor Group/Stressor	Comments
	Major	Minor	Absent	Unknown		
					Adverse water management	
	☐	☐	☐	☐	Extended low flow dam releases	
	☐	☐	☐	☐	Timing of flow releases not concordant	
	☐	☐	☐	☐	Extended high flow dam releases	
	☐	☐	☐	☐	Agriculture/Urban flow diversion upstream	
					Adverse sediment management	
	☐	☐	☐	☐	Adverse sediment retention by dams	
	☐	☐	☐	☐	Sediment loss by dredging	
	☐	☐	☐	☐	Adverse sediment input (roads/development)	
					Artificial water additions	
	☐	☐	☐	☐	Sewer treatment effluent	
	☐	☐	☐	☐	Point source urban runoff	
	☐	☐	☐	☐	Factory, feedlot outfall	
	☐	☐	☐	☐	Agricultural irrigation ditch returns	
	☐	☐	☐	☐	Mining waste	
					Ground water pumping	
	☐	☐	☐	☐	Urban depletions	
	☐	☐	☐	☐	Fracking	
	☐	☐	☐	☐	Agriculture irrigation wells	
					Watershed alteration	
	☐	☐	☐	☐	Extensive recent fires in watershed	
	☐	☐	☐	☐	Extensive recent timber harvest	
	☐	☐	☐	☐	Extensive open pit mining in watershed	
	☐	☐	☐	☐	Livestock/wildlife overgrazing	
					Local biodiversity impacts	
	☐	☐	☐	☐	Evidence of excessive grazing (local)	
	☐	☐	☐	☐	Excessive noise affecting wildlife	
	0	0		0	Counts by Intensity	

Additional Comments

SA CODE : **Date :**

SA Name : **Surveyor Initials :**

Photo Point Log

Worksheet 16. Photo point Log. Photo points are highly recommended to document 1) general condition of the SA, 2) dominant plant communities, and 3) stream condition. (See metric descriptions for when photo documentation is required.) The photograph number, direction (AZM=azimuth compass direction of photo), photo point coordinates (GPS UTM northing and easting location), and latitude and longitude should be recorded, along with a general description and segment on which the photo was taken and the initials of the photographer.

Photo PT File	AZM	Easting	Northing	Latitude	Longitude	Description	Initial

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:

L2. Riparian Corridor Connectivity (Table L2a)

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.

L2 – Riparian Corridor Connectivity (RCC). Table L2a provides a minimum assessed length for special class Non-Connectivity Land Cover Elements bisecting the riparian corridor

Table L2a	
Special Class Non-Connectivity Land Cover Elements	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 dams	10 m

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

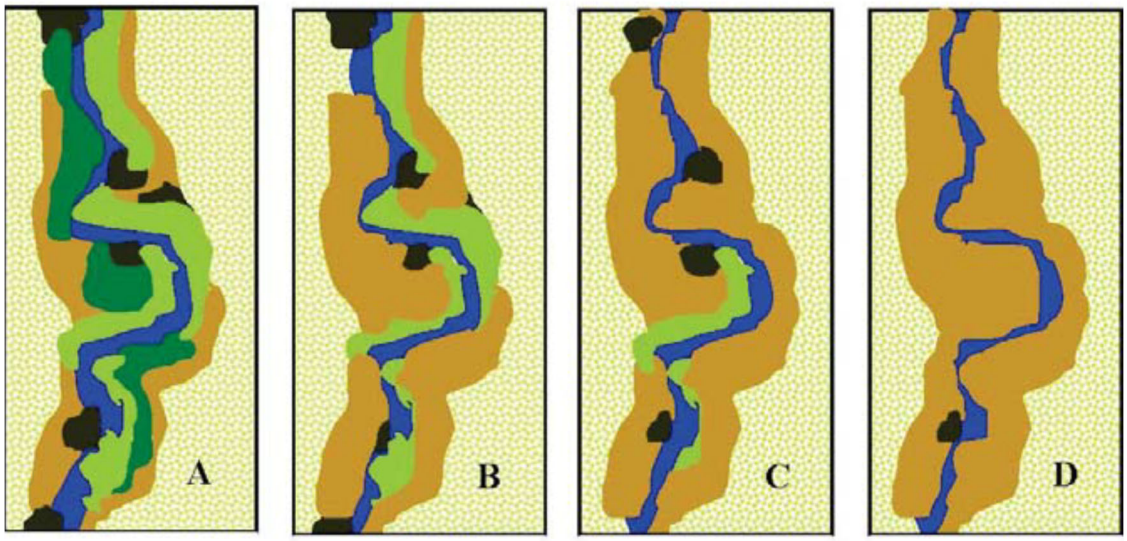
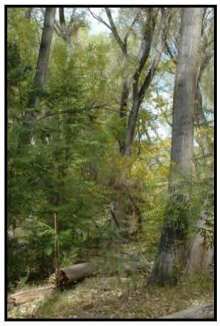


Figure B2c. Horizontal Patch Structure pattern A, B, C, or D (Collins et al. 2008).

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

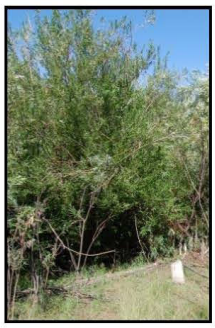
Multiple-Story Communities (woodlands/forests)



VST 1 – High Structure Forest with a well-developed understory. Trees (>6 m) with canopy covering >25% of the area of the community polygon and woody understory layer of tall shrubs or short trees (1.5–6 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 (>6 m) with canopy covering >25% of the area of the community polygon and minimal woody understory layer (1.5–6 m) covering <25% of the area of the community (polygon). Majority of foliage is over 7 m above the ground.

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



VST 5 – Tall Shrubland. Young tree and shrub layer (1.5–6 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 B3a. Vertical Structure Types (VSTs) for assessing the Vegetation Vertical structure metric.

A1. Floodplain Hydrologic Connectivity Examples of Floodplain Hydrological Connectivity indicators on site.

Figure A1a. Recent sediment deposition on the SA surface and in side channels

Figure A1b. Recent fine debris deposited on the SA surface.

Figure A1c. Wrack piles deposited above bankful elevations.

Figure A1d. Wrack piles deposited well above bankful in standing vegetation.

Figure A1e. Soils cracks following the drying of recent sediment deposits.

Figure A1f. Very recently deposited sediment with soil cracks following a large flood.

Figure A1g. Flood deposited large woody debris (FDLWD). The debris in this photos was deposited a long time ago and has weathered in place, but it is amassed together and oriented towards a former direction of flow, rather than randomly scattered in the way non-flood deposited debris would be.

Figure A1h. Large woody debris that is not flood deposited. The debris in this photos is deadfall from the surrounding trees and is jumbled in a random pile with no directional flow lines. The pieces are large and intact showing they are undisturbed and residing in the location on which they fell.

Figure A1i. An area where the litter layer is minimal to scattered, however this is a site that has been treated and cleared for recreation and fire reduction.

Figure A1j. An area where the litter layer is moderately thick and includes a fair amount of fallen wood.

Figure A1k. An area where the litter layer is very thick and includes some fallen wood.

A11. Groundwater Index (Table A11a, Table A11b and Table A11d). Use Table A11a to assign a groundwater composition rating for each vegetation strata present for each vegetation polygon listed on Worksheet 5. Use Table A11b to assign riparian woody phreatophyte health modifiers for each woody strata present on Worksheet 5. Where a woody strata is present but contains no phreatophytes assign a value of "1" for the riparian woody phreatophyte health modifier. Table A11d lists woody species that are considered phreatophytes for the purpose of the NMRAM.

Table A11a. Herbaceous Wetland or Riparian Phreatophyte Species Strata Composition	
Rating	**Description**
4	**Strata Dominant:** Wetland herbaceous species and/or riparian phreatophytes dominant. Upland species/non-phreatophytes are not present, or very rare and scattered.
3	**Strata Co-Dominant:** Wetland herbaceous species/phreatophytes are majority species within the strata, but upland species may be common.
2	**Present in Strata:** Strata approximately half or more upland species but wetland herbaceous species/phreatophytes present and at least common.
1	**Absent:** All or vast majority of strata are upland species

Table A11b. Riparian Woody Phreatophyte Health Modifier	
Modifier Value	**Description**
1.1	**Excellent health:** Very little to no dead foliage or dead limbs, < 5% of potential phreatophyte cover. Standing dead individuals absent or solitary.
0.9	**Good health:** Dead foliage and/or dead limbs present but limited to 5% to < 25% of potential phreatophyte cover. Standing dead individuals rare.
0.75	**Fair health:** Dead foliage and dead limbs represent 25 to < 50% of the potential phreatophyte cover. Standing dead individuals present but scattered.
0.25	**Poor health or standing dead:** Significant dead foliage and dead limbs representing ≥ 50% to of the potential phreatophyte cover. Standing dead individuals common to ubiquitous.
1	**None**: Woody strata present but does not include any phreatophytes.

Table A11d: Groundwater Index Woody Phreatophyte List	
Scientific Name	**Common Name**
Tree	
Acer negundo	boxelder
Alnus incana ssp. tenuifolia	thinleaf alder
Alnus oblongifolia	Arizona alder
Fraxinum velutina	velvet ash
Platanus wrightii	Arizona sycamore
Populus spp.	cottonwood
Salix amygdaloides	peachleaf willow
Salix gooddingii	Goodding's willow
Shrub	
Baccharis spp.	seepwillow
Salix spp.	willow

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 2020, 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
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
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
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
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	C		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
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	C	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
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
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
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
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 July 2, 2020. 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 scientific 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	Plant Symbol
Trees			
C	tree of heaven	Ailanthus altissima	AIAL
C	Russian olive	Elaeagnus angustifolia	ELAN
C	tamarisk	Tamarix spp. (any species)	TAMAR2
C	Siberian elm	Ulmus pumila	ULPU
Shrubs			
A	camelthorn	Alhagi maurorum	ALMA12
Grasses			
C	jointed goatgrass	Aegilops cylindrica	AECY
C	giant reed	Arundo donax	ARDO4
C	cheatgrass	Bromus tectorum	BRTE
B	quackgrass	Elymus repens	ELRE4
A	ravennagrass	Saccharum ravennae	SARA3
Forbs			
C	Russian knapweed	Acroptilon repens	ACRE3
A	hoary cress	Cardaria draba	CADR
C	musk thistle	Carduus nutans	CANU4
A	purple starthistle	Centaurea calcitrapa	CECA2
A	diffuse knapweed	Centaurea diffusa	CEDI3
B	Malta starthistle	Centaurea melitensis	CEME2
A	yellow starthistle	Centaurea solstitialis	CESO3
A	spotted knapweed	Centaurea stoebe ssp. micranthos	CESTM
B	chicory	Cichorium intybus	CIIN
A	Canada thistle	Cirsium arvense	CIAR4
B	bull thistle	Cirsium vulgare	CIVU

NM Weed Class	Common Name	Scientific Name	Plant Symbol
B	poison hemlock	Conium maculatum	COMA2
B	teasel	Dipsacus fullonum	DIFU2
A	leafy spurge	Euphorbia esula	EUES
B	halogeton	Halogeton glomeratus	HAGL
C	hydrilla	Hydrilla verticillata	HYVE3
A	black henbane	Hyoscyamus niger	HYNI
A	Dyer's woad	Isatis tinctoria	ISTI
B	perennial pepperweed	Lepidium latifolium	LELA2
A	oxeye daisy	Leucanthemum vulgare	LEVU
A	Dalmation toadflax	Linaria dalmatica	LIDA
A	Yellow toadflax	Linaria vulgaris	LIVU2
A	purple loosestrife	Lythrum salicaria	LYSA2
A	Scentless camomile	Matricaria perforata	TRPE21
C	parrot feather watermilfoil	Myriophyllum aquaticum	MYAQ2
C	Eurasian watermilfoil	Myriophyllum spicatum	MYSP2
A	Scotch thistle	Onopordum acanthium	ONAC
B	African rue	Peganum harmala	PEHA
C	curly pondweed	Potamogeton crispus	POCR3
A	giant salvinia	Salvinia molesta	SAMO5
B	spiny cockleburr	Xanthium spinosum	XASP2

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 16. The photograph number, direction (azimuth compass direction of photo (AZM)), photo point coordinates (GPS UTM Easting and Northing location) should be recorded along with the segment on which the photo was taken, a general description, and the initials of the photographer.

Documentary photographs are required from the channel edge at each of the floodplain survey lines. Four photos are taken at each channel survey point; one each upstream and downstream from the edge of the channel to the opposite bank, and one each upstream and downstream looking up the bank on which the survey point is located. These photo-points are recorded on the Photo Point Log.

See metric descriptions for when photo documentation is recommended for other metrics.

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.

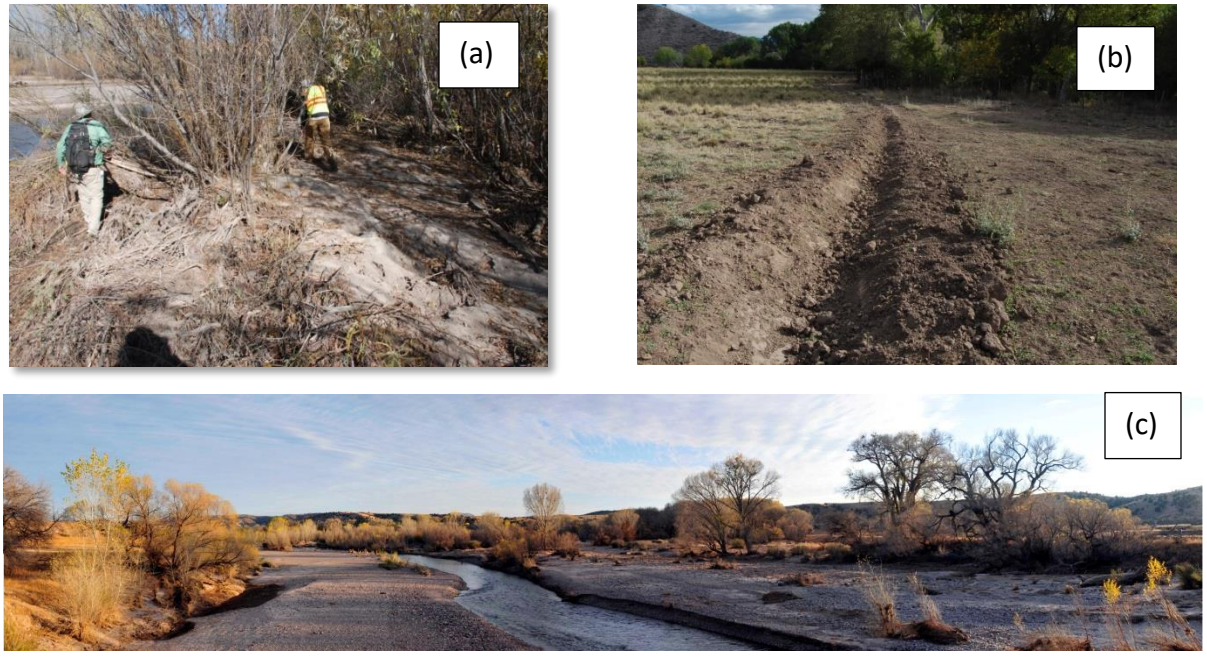


Figure E1. Example photos of conditions (a) along a channel of the SA and after a recent flood event that affected features on the floodplain, (b) of soil disturbance in the SA (ditch), and (c) panoramic overview of channel and floodplain. These photos support Abiotic metrics.

Vegetation Communities

Documenting the dominant vegetation communities (CTs) during the mapping process is highly recommended. Photographs should be taken to capture the central character of the vegetation stand composition and structure types. A photoboard indicating the SA Name and CT is important for cross-referencing photographs (Figure E2).

Figure E2 Example photos of vegetation communities (CTs) to support the mapping and biotic metric ratings. The photograph number, the CT, photo-point coordinates, and direction are recorded on the photo point log (Worksheet 16) along with a brief description. Note the placement of a photo board in an inconspicuous position in the photo frame.

When the species identification of a stratum dominant is uncertain, photographs of the entire plant, as well as close-ups of leaves, flowers and fruits can aid in identification (Figure E3). Record these photographs in the Photo Point Log Worksheet 16.

Figure E3. Plant identification photos should include at least one photo that shows all of the plant, as well as close up photos of any flowers, fruits and leaves.

Stream channel documentation

At the channel edge location of each floodplain traverse (three cross-section locations), a series of photographs are taken to document the condition of the river segment. Photographs are taken 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). These photographs are recorded on Table A1d in Appendix A. For each cross-section, record the easting/northing or latitude/longitude of the survey point, and the digital names/numbers of each photograph.

Additional photos of floodplain characteristics and indicators are recommended and recorded in Photo Point Log Worksheet 16. Note that photos are particularly useful for corroborating evidence for the field indicators for Floodplain Hydrologic Connectivity, Physical Patch Complexity and Soil Surface Condition abiotic metrics.

Figure E4. Examples of stream channel photo points.

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.