

New Mexico Rapid Assessment Method

Montane Riverine Wetlands

Field Guide



Version 2.5

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NMRAM

New Mexico Environment Department
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and
Natural Heritage New Mexico
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Cover and font page photos: Cover: Montane riverine wetlands associated with the upper Mimbres River in the Gila Reference Domain (Photo: Y. Chauvin). First Page: Cross Section measuring the flood-prone width Taylor Creek (Photo: C. Canavan).

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Acronyms

AU	Assessment Unit
CT	Community Type
DBH	Diameter at Breast Height
E	Exotic
GIS	Geographic Information System
GPS	Global Positioning System
LUI	Land Use Index
LUZ	Land Use Zone
M	Mixed Native and Exotic
N	Native
NA	Not Applicable
NMED	New Mexico Environment Department
NMRAM	New Mexico Rapid Assessment Method
OBL	Obligate Wetland Species
PDF	Portable Document Format
RCC	Riparian Corridor Connectivity
RSR	Relative Size Ratio
RWSI	Relative Wetland Size Index
SA	Sampling Area
SQUID	Surface Water Quality Information Database
SWQB	Surface Water Quality Bureau
U	Unknown
USDA	United States Department of Agriculture
UPL	Upland Species
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 for conducting a rapid ecological assessment of wetlands in the Montane Riverine Wetland subclass. Montane riverine wetlands occur along unconfined mountain streams and rivers at elevations between 6,000 and 8,500 ft and in the southern part of the state at elevations as low as 4,800 ft. They generally lie between the subalpine riverine and lowland riverine subclasses. The subclass includes mid-elevation, second- to fourth-order stream segments where valley widths generally exceed 80 m (262 ft) and have a channel width ranging from two to 10 m (6.6–33 ft). Channels have a low degree of confinement from the surrounding landscape and have room for lateral movement leading to moderate sinuosity. Channels have moderate slopes of about 1% to 2% and channel features that may include point bars, runs, riffles, and pools. Under normal conditions, channels are relatively shallow with an entrenchment ratio exceeding 2.2 and a corresponding channel width-to-depth ratio greater than 12. Overbank flooding during peak flows plays a major role in developing and sustaining complex floodplains composed of point bars, terraces, and backwater channels that support the wetland communities. These mobile, meandering single-channel systems correspond to Rosgen (1996; 2006) C-channel types. The Montane Riverine Wetland subclass also includes wetlands associated with montane riverine channel reaches exhibiting steeper channel slopes (2-4%), but still within a wide valley as a result of their geomorphic context. The channel and its riverine wetlands display Rosgen B-channel characteristics. A lower entrenchment ratio (<2.2-1.4) is normal for the reach. It is important to note that other Rosgen B-channel types fit into the Confined Valley Riverine subclass when the river valley is too narrow to accommodate the full width of the flood-prone area and the attendant suite of Montane Riverine wetlands plant communities. (See NMRAM Manual Version 2.0 for additional subclass description detail).

The NMRAM Montane Riverine Wetlands 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 and a glossary of terms.

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). Metrics are measured using maps and aerial imagery or evaluated in the field. 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 Montane Riverine 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
A3. Channel Equilibrium
A4. Stream Bank Stability and Cover
A5. Soil Surface Condition

II. Pre-field Protocols

1. Download the worksheets for NMRAM Montane Riverine Wetlands Version 2.5. Worksheets are provided in Appendix A and a digital version is available from the NMED SWQB.¹
2. 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.
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 gauge data as a 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 1:4,000-6,000 scale that shows the SA(s) in a landscape context, which will aid navigation to the site (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 between 1:1,000-2,500 scale for mapping vegetation communities, abiotic features, and segment and transect locations (see Biotic and

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

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 prior to field reconnaissance and then validated and modified during the survey. Modifications to the SA boundary should also be recorded on both the SA Biotic and SA Abiotic 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.

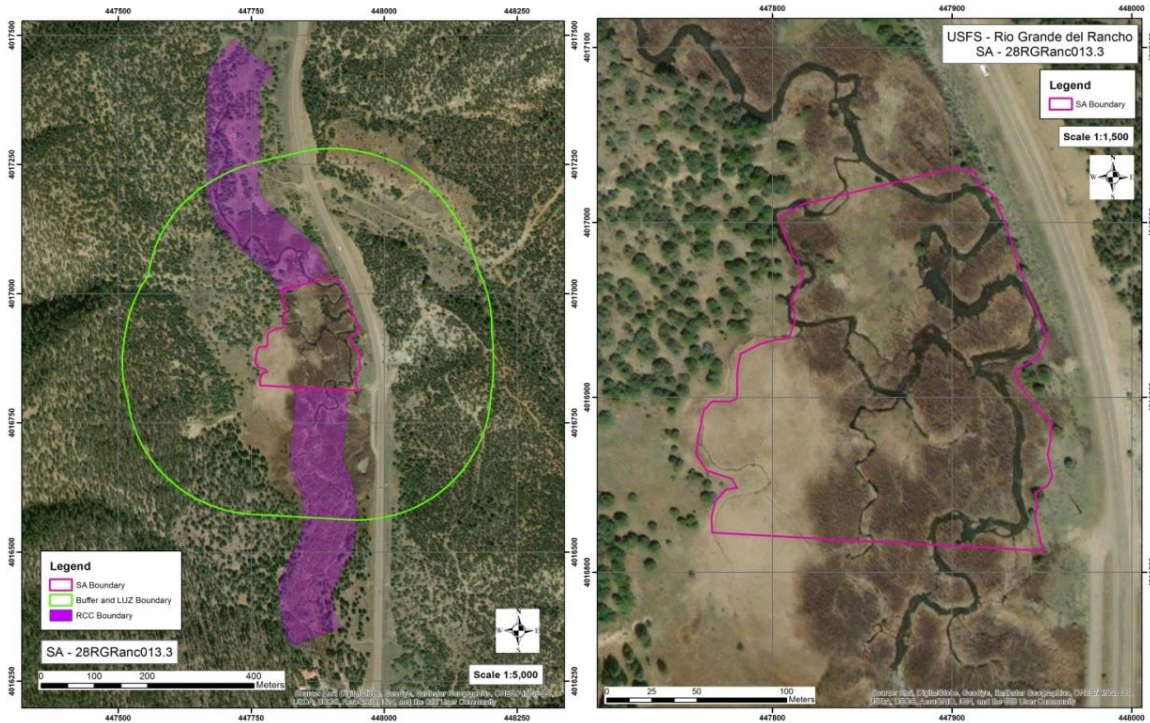


Figure 1. Examples of Landscape and SA field maps. On the left, a landscape-scale map with boundaries for measuring the landscape context metrics. On the right, a fine-scale SA map for field vegetation and abiotic features mapping.

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 maps²). 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

² <http://www.fws.gov/wetlands/>

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.

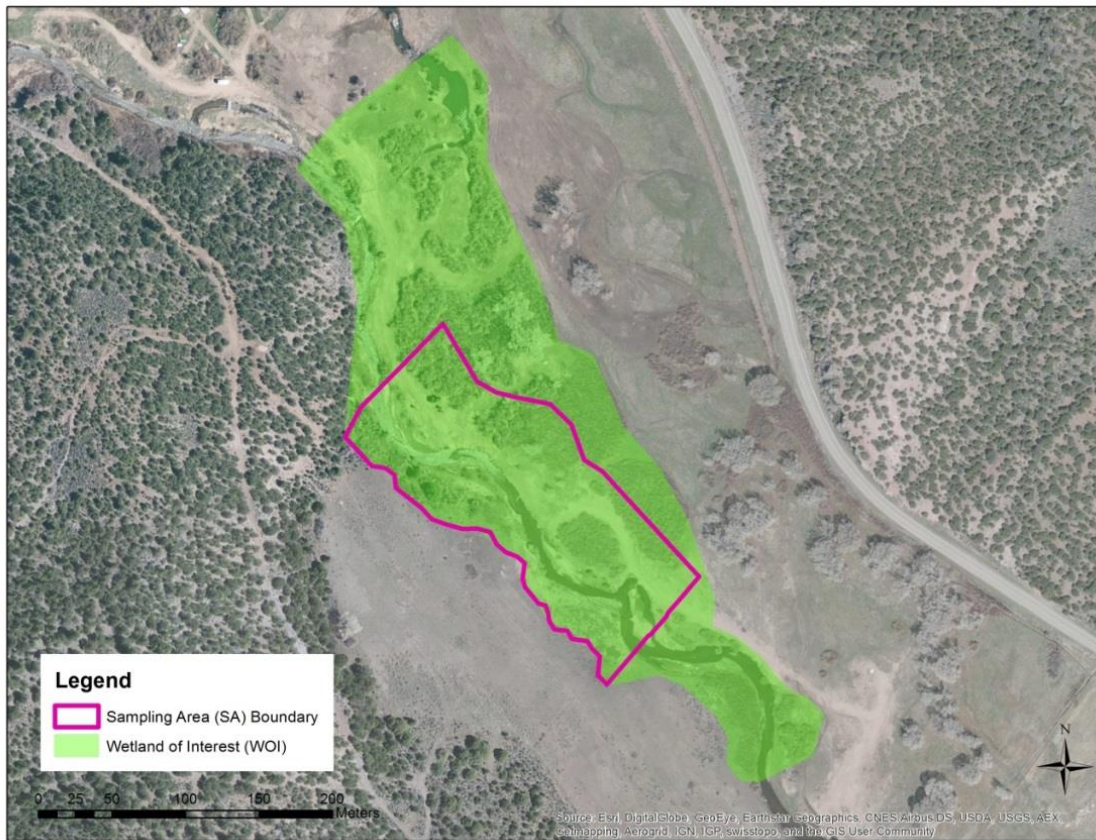


Figure 2. Example of Wetland of Interest (WOI) delineation (green) and the placement of an SA (pink outline) that is representative of the WOI.

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

- For SWQB purposes, enter whether fish species were present within the wetland (not including the adjacent stream).
- 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).

Ideally the SA should include both sides of the river, but occasionally access restrictions may limit the SA to only one side of the river. 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; 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 to the floodplain edge.

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. Accordingly, 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 Montane Riverine SAs will belong to the small size class.

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

The SA should encompass at least three straight runs of the stream channel whenever possible, to accommodate three hydrological stream-channel cross-section measurements for the Floodplain Hydrological Connectivity metric (for either riffle-meander or step-pool streams).

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 placed 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) 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.
- Stadia rod.
- 100-m measuring tape.
- Rebar and clamps to secure the measuring tape during hydrologic connectivity protocol.
- Pin flags to mark and corroborate bankfull indicators and other features in photographs.
- Line level.
- Survey levels for very wide floodplains.
- Plant press for collecting plants requiring identification.
- Bleach and bucket: it is mandatory that all field technicians sterilize boots with a bleach and water mixture before and after entering waterways to prevent the spread of aquatic nuisance species such as didymo (*Didymosphenia geminata*), a microscopic algae, as well as whirling disease and other potential pathogens.
- Waders for crossing and working within channels as the site conditions require. Waders, wading shoes, or other footwear *without* felted soles is recommended; felted soles are known to transport pathogens.

III. Metric Measurement and SA Condition Ranking Overview

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

Assessing Landscape Context Metrics (Level 1)

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

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

Sources for geospatial data include New Mexico Resource Geographic Information System (<http://rgis.unm.edu/browsedata>), 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) evaluates 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 edges relevant to the landscape context metrics. One team member is designated to be responsible for the field review of landscape context metrics. Upon completion of the field survey, the team works together to verify the landscape context metrics, complete the stressor checklists, write the SA narrative summaries, and assign a provisional Wetland Condition Rank.

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. Biotic survey. The biotic team member traverses the SA and maps the major vegetation communities on the SA Biotic Map detailing attributes that are important to the metric scoring. This map becomes the basis for filling out the worksheets and rating the biotic metrics.
3. Abiotic survey. The abiotic team member(s) identifies three segment locations and sets up a transect in each to take channel measurements and assess other abiotic conditions. The transect within each segment should be located in independent straight runs of the stream channel, that is, straight sections separated by bends or pools. Stream-channel cross-section measurements for the Floodplain Hydrological Connectivity metric will be taken at these locations. Additionally, the team should traverse from the channel edge to the floodplain edge in each segment to search for indicators of abiotic conditions and annotate the SA Abiotic Map with supporting information. During each traverse, indicators are checked off metric-specific lists on the worksheets that provide the foundation for rating each metric.
4. Landscape Context review. The Landscape Context metrics can now be reviewed based on field evidence collected during the survey. Each team 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).
5. 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.
6. 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 condition and stressors, and provide a provisional SA Rank and Score and Assessment Summary (signed off with team member initials).
7. Team should verify valley bottom boundaries for Relative Wetland Size Index (RWSI) metric during travel to and from the SA.

Note: If only two team members are available, they both work on the abiotic channel measurements and then split the mapping and metric measurement tasks as appropriate. 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 not always possible to identify hydrologic breaks such as irrigation diversion structures, irrigation returns, or landownership changes, all of which may affect the SA configuration. Therefore, 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) or constraints (e.g., unforeseen ownership restrictions). All changes to the SA configuration or location are recorded on the field maps and noted on the SA Cover Worksheet.

Documentary Photographs

Guidelines for recording important information using documentary photographs are provided in Appendix E. Documentary photographs are taken at each of the cross-sections for the Floodplain Hydrologic Connectivity metric. Four photos are taken at each cross-section; one each upstream and downstream from the middle of the channel if feasible, and one each facing each bank (bank left and bank right). These photo-points are recorded on the Photo Point Log located below the Floodplain Hydrologic Connectivity metric rating table in Appendix A (Table A1d). Documentary photographs are strongly recommended for major vegetation patches, for unknown plant species, and for significant features within or adjacent to the SA and recorded on a supplemental Photo Point Log at the end of Appendix A (Worksheet 16). Features that alter the size of the SA, or significantly impact hydrology are particularly useful to photograph.

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 500 m and 100 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 250 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.

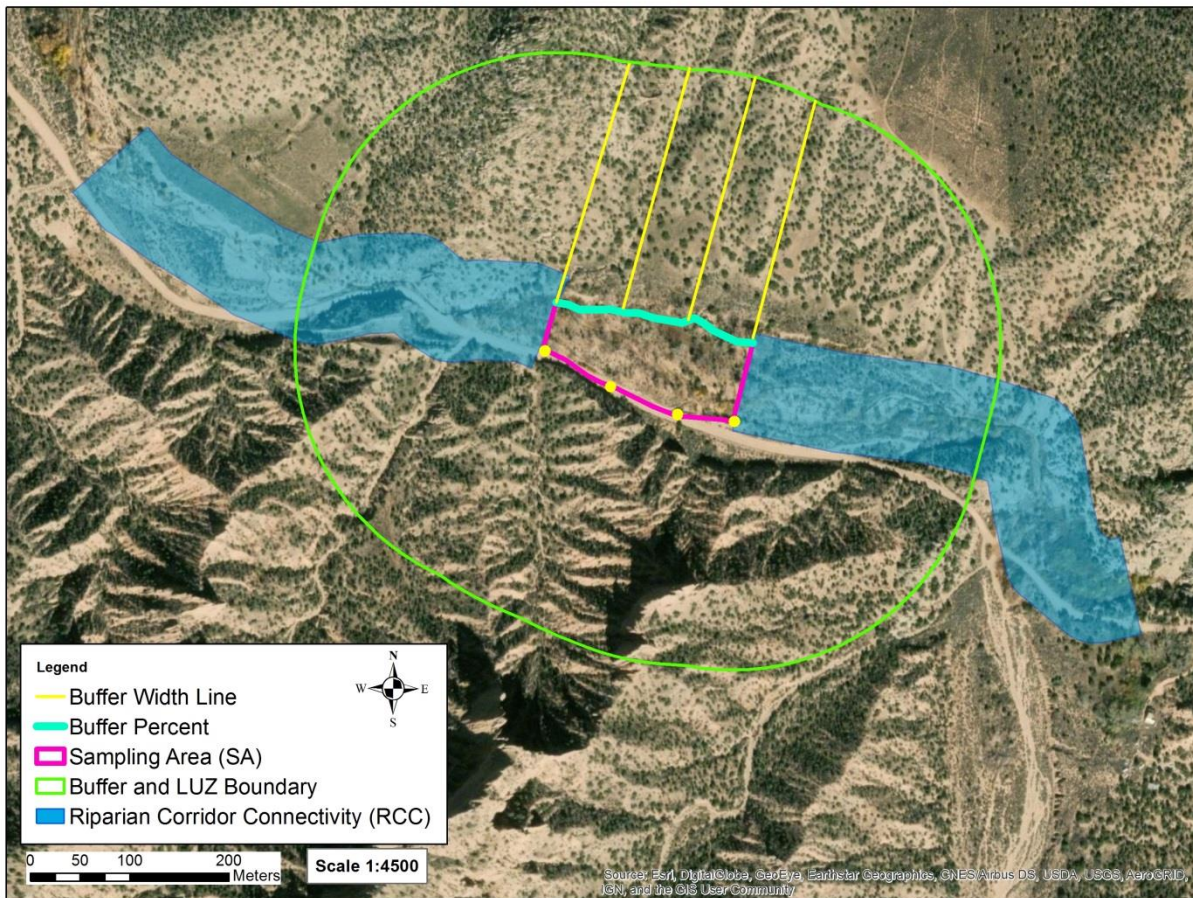


Figure 3. Montane Riverine Landscape Context metrics are measured in three zones around an SA: Buffer and Land Use Zone 250 m (light green line), and Riparian Corridor upstream and downstream 500 m (blue area). Buffer % is measured on the lateral sides of the SA (cyan line) and Buffer Width is measured at eight points extending laterally from the SA boundary (yellow lines and dots). Riparian Corridor Connectivity is evaluated upstream and downstream from the SA (blue bands). Land Use Index (LUI) is evaluated inside 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 the extant buffer lateral to the SA.

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

Protocol: Buffer Percent and Buffer Width are evaluated using aerial photography imagery in a GIS or on paper maps (Figure 3). It is based on “allowed buffer” land-cover elements that provide

protective services such as reducing pollutant contamination within 250 m of the SA boundary versus “excluded non-buffer” land-cover elements that do not (Worksheet 1a).

Buffer Percent

Steps:

1. Using aerial photography in a GIS or 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. Calculate the Buffer Integrity Index Score as the average of the two sub-metric ratings.
2. Rate using Table L1c.
3. 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 500 m upstream and downstream of the SA and 100 m wide.

Steps:

1. Using the most recent imagery available in GIS or from the Landscape Map, delineate the Riparian Corridor Connectivity zone 500 m upstream and 500 m downstream from the SA boundaries along the main channel, and 100 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 on Worksheet 2 (step A). Assign at least the minimum length for any special class, non-connectivity elements that cross the riparian corridor as provided in Table 3 below (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 $(\text{meters of disruption}/1000) \times 100$ 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 $(\text{meters of disruption}/2000) \times 100$ 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, excluded land cover elements bisecting the riparian corridor.

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

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):

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

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

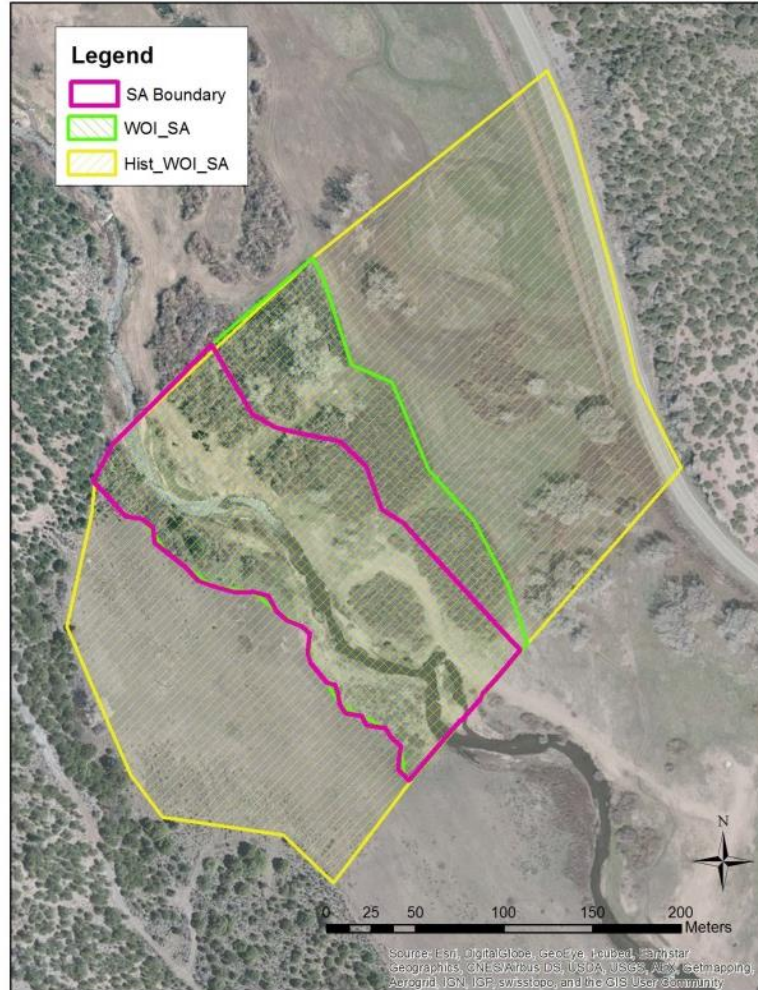


Figure 4. Relative Wetland Size for the riverine subclasses is the ratio of the current WOI (representing the current size – green cross hatch) to the historical size (Yellow area) estimated across the floodplain based on photo interpretation (the historical area includes the SA). Subsequent field checking as part of the reconnaissance survey is advised.

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 250 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 plant species based on the New Mexico list of noxious weeds.

Biotic metric measurements are based on the mapping of vegetation community patches (polygons) on the SA Biotic 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 SA Biotic Map as part of the survey walkthrough.

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

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

- Collect and press a voucher specimen for later confirmation.

- Label each collection with the date, collector, SA code, the CT letter, stratum, and a unique field species code from the CT on Worksheet 6 (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).

Once all metrics have been rated, they are rolled up into a single Biotic Attribute score on the SA Rank Summary Worksheet. The attribute narratives on the SA Cover Worksheet that describe SA biotic conditions and impacts should also be completed at this time.



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

B1. Relative Native Plant Community Composition

Definition: An index of the abundance of native- versus exotic-dominated vegetation communities.

Seasonality: Best assessed during the growing season when dominant species are most easily identified.

Protocols: This metric is based on the vegetation community patch map (SA Biotic Map) and field reconnaissance data in Worksheets 5 and 6 (Figure 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 Strata composed of trees and shrubs greater than 6 m tall (~20 feet); a Short Woody Strata of trees and shrubs 6 m (~20 feet) and under; and an Herbaceous Strata made up of graminoids (grasses and grass-like plants) and forbs. For each of the tall and short woody strata, total strata vegetative canopy cover must exceed 25% before a species is recorded; for the herbaceous strata, total cover must be greater than 10%. The species are recorded in the order of their relative abundance by strata, and a species can appear only once within a CT designation (if a species occurs in two strata, it is assigned to the strata in which it is most abundant). The next polygon visited is either assigned to the same CT on Worksheet 6 if it has the same composition and structure or, if not, the polygon assigned to a new CT. This process is continued for all polygons mapped in the SA. Based on this basic species data a Weighted CT Native Composition Score for the SA is computed, and this, in turn, is used to rate Relative Native Plant Community Composition.

Steps:

1. Beginning with the first polygon visited, assign up to two dominant species by strata (Tall Woody, Short Woody, Herbaceous) within the polygon to the “CT A” on Worksheet 6. Use USDA PLANTS Database Codes³ 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.
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 (Figure 6).
3. Once all polygons have been assigned to the CT list, estimate the relative mapped amount of each CT as a percentage of the entire SA and enter the value as a decimal number in the “% SA” box (this can be done in the GIS or simply visually estimated from the SA Biotic Map).
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.

³ USDA, NRCS. 2022. The PLANTS Database (<http://plants.usda.gov>, 03/22/2022). National Plant Data Team, Greensboro, NC USA.

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.

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 (interspersions among vegetation patch types) within an SA.

Seasonality: The mapped vegetation community patch polygons on the SA Biotic 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 SA Biotic Map after the field reconnaissance.

Steps:

1. Using the SA Biotic 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 using Figure 7 below or 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.

SA CODE :

SA Name :

Date :

Surveyor Initials :

Biotic Metrics

Worksheet 5. Vegetation Community Patch Polygon Data for Biotic Metrics B3, B4, and B5 for Polygons from SA Biotic Map. Enter data for each polygon under a unique number assigned from the SA Biotic Map. Each polygon is evaluated with respect to Vegetation Vertical Structure (B3), Native Tree Regeneration (B4), and Invasive Exotic Plant Species Cover (B5) metrics. 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. Enter the species codes for the invasive exotic species found in the polygon (from NM Noxious Weed List - Appendix D). Use the comments box for documenting and describing vegetation community patch features.

Table with 5 columns: Polygon No, B3 Vertical Structure Type, B4 Tree Regeneration % Cover, B5 Invasive Exotic Species % Cover, Invasive Exotic Species (List Code(s)), and Comments. It contains 6 rows of data for different polygons.

SA CODE : SA Name : Date : 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. Enter the species codes for the two top dominant species in each stratum that appears 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 is either assigned to the same CT if it has the same composition or a new CT is created for the polygon.

Table for B1 - Relative Native Plant Community Composition. It has columns for CT, Polygon Nos., Tall Woody Stratum 1, Short Woody Stratum 2, Herbaceous/Sparse Stratum 3, and CT Score. It includes rows for CT A through O and a final row for Final Weighted Score.

1. Trees and shrubs > 6 m (20 feet) and > 25% total stratum cover; 2. Trees and shrubs ≤6m (20 feet) and >25% total stratum cover; 3. Herbaceous (graminoids and forbs) >10% total stratum cover. 4Raw 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; 6Wt. Score is the product of the Raw Score * % SA; 7The 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 6. Example of data entry on Worksheet 5 based on the mapping of vegetation community patch polygons on the SA Biotic Map, and data entry by CT on Worksheet 6 for Relative Native Plant Community Composition metric. The %SA from Worksheet 6 is also used for Vegetation Vertical Structure.

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)

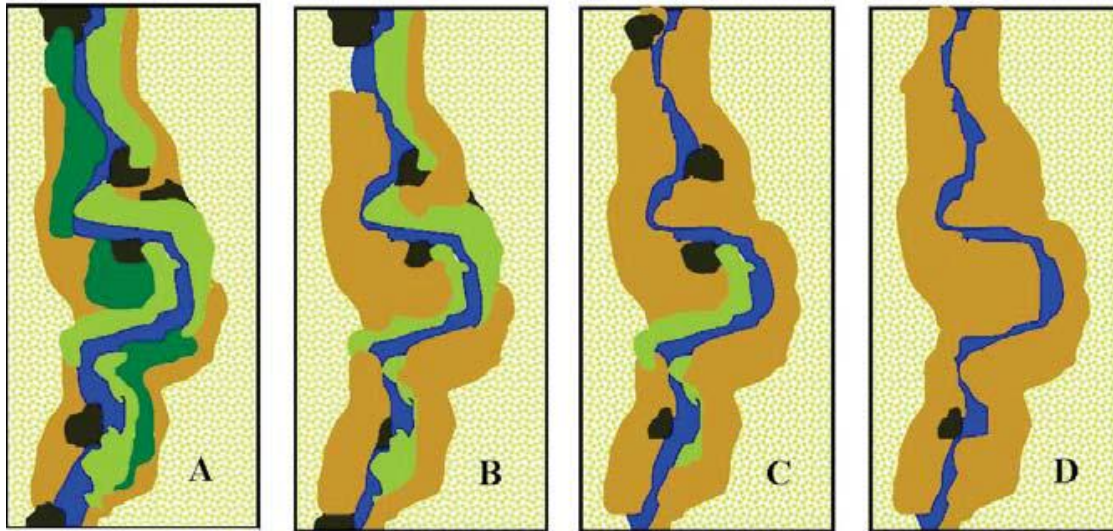


Figure 7. Horizontal Patch Structure pattern A, B, C, or D (Collins et al. 2008).

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 Montane 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 $\geq 25\%$ 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).

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).

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.

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*), Fremont 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 2020 (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 SA Biotic Map), estimate the average percentage cover of invasive exotic species for the entire SA and enter the value on Worksheet 9, being particularly mindful of the percentage break points used for rating this metric (Table B5). (Using the fillable PDF, the average percent cover will be calculated for you. Select the "Calculate" rating method to do this.) For invasive shrubs or trees (e.g., saltcedar), it may be possible to assess this metric in GIS using fine-scaled satellite imagery or aerial photographs with ground control. However, invasive 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

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

- A1. Floodplain Hydrologic Connectivity is an assessment of the ability of water to flow into or out of the wetland.
- A2. Physical Patch Complexity is a measure of the physical structural complexity of a site that contributes to ecological richness.
- A3. Channel Equilibrium is the assessment of the degree of channel aggradation or degradation relative to reference equilibrium conditions.
- A4. Stream Bank Stability and Cover is a measure of stream bank soil/substrate stability and erosion potential that reflect overall stream bank stability.
- A5. Soil Surface Condition reflects anthropogenic soil disturbance impacts within the SA.

The Channel and Floodplain Survey Overview

A channel and floodplain survey is conducted by two team members and uses a combination of direct measurements and checklists with narrative descriptions to arrive at an assessment. The team divides the stream reach into three more-or-less equal segments (upper, middle, and lower) and scopes out stream cross-section locations for measuring Floodplain Hydrologic Connectivity and evaluating Channel Equilibrium and Stream Bank Stability and Cover metrics. Within each

segment, a cross-section site is placed in the straight riffle zone between two meander bends. It is important not to place two cross-sections on the same riffle zone. The cross-section measurements require two people for holding tapes and rods to measure entrenchment variables for Floodplain Hydrological Connectivity. Channel Equilibrium and Stream Bank Stability and Cover metrics are also evaluated at these cross-section locations using metric checklists. Physical Patch Complexity and Soil Surface Condition metrics are evaluated as part of the walk-through of each of the three segments of the floodplain, on both sides of the stream if feasible. The team members use indicator checklists identifying important parameters and characteristics to apply to the ratings tables' narratives.

A sketch map of major features of the floodplain on the SA Abiotic Map is encouraged as an aid in filling out the checklist and for later interpretation. In addition, photographs are taken at each cross section, across the channel to each bank, as well as upstream and downstream, preferably at the mid-point of the channel, if accessible. If it is not feasible to wade to the center of the channel, photos may be taken from the bank edge (see Appendix E for further guidelines). Photo-points are recorded on the Photo Point Log at the end of the Floodplain Hydrologic Connectivity Metric (Table A1d in Appendix A). Additional photographs may be taken of significant features within the floodplain and recorded on the Photo Point Log (Worksheet 16) at the end of the Field Guide Worksheet Packet (Appendix A). 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: There are two methods for assessing Floodplain Hydrologic Connectivity in single-channel systems. Method 1 measures the degree of channel entrenchment as an indicator of the capacity of stream flows to overbank and fill the adjacent floodplain; it relies on the calculation of an entrenchment ratio (Leopold et al. 1964; Rosgen 1996) (Worksheet 10a). This method is rated based on the Rosgen stream type, Rosgen C (riffle-pool) or Rosgen B (step-pool) channel types (Tables A1a and A1b). Method 2 uses a narrative approach for situations where direct measurement of the entrenchment ratio is not possible (Worksheet 10b and Table A1c in Appendix A).

Method 1—Entrenchment Ratio. Entrenchment is a field measurement calculated as the flood-prone width divided by the bankfull width. Bankfull width is the channel width at the height of bankfull flow (the channel-forming flow recurring approximately every one to two years), and flood-prone width is measured at the elevation of twice the maximum bankfull depth (Figure 9).

Entrenchment should be assessed at three typical stream cross-sections, one each in the upper, middle, and lower segments of the reach, depending on the linear extent of the SA. In riffle-pool systems, *cross-section measurements should be made within a riffle section, (the straight section), or inflection point between two meander curves* (Figure 10 (Figure A1a in Appendix B)).

Measurements should not be made in meander bends or in pools where the increased depth will not provide a representative channel depth and thus will lead to an inaccurate entrenchment ratio. Similarly, measurements should not be made where deflectors, such as rocks or logs, make the stream especially narrow or create exceptionally wide backwater conditions, in areas affected by beaver activity, or in areas where management/manipulation confounds the presence of appropriate bankfull indicators. Ideally, the linear extent of the SA will contain two meander bends, allowing for the establishment of three cross-sections. In the event that this condition is not met, the number of cross-sections should be reduced to two to avoid pseudo-sampling (e.g., taking two samples in one riffle section) or sampling in meander bends or pools. In step-pool systems, cross-sections should be located in the runs (rapids) between the pools (Figure 11 (Figure A1b in Appendix B)).

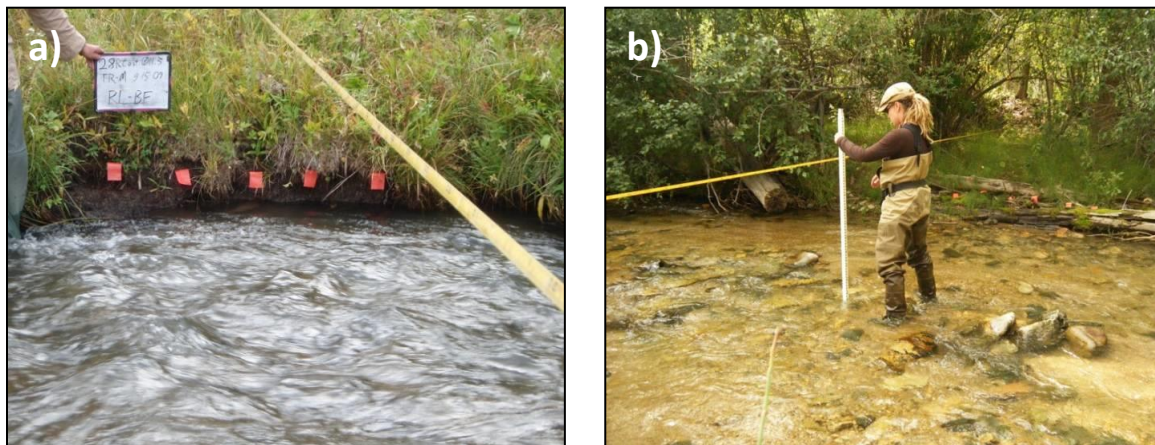


Figure 9. Determining bankfull. a) Pin Flags identify the bankfull elevation using one- to two-year return flow indicators. b) The flood-prone width is measured at twice the bankfull depth and then extending that height out across the floodplain until that height intercepts the floodplain elevation.

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

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

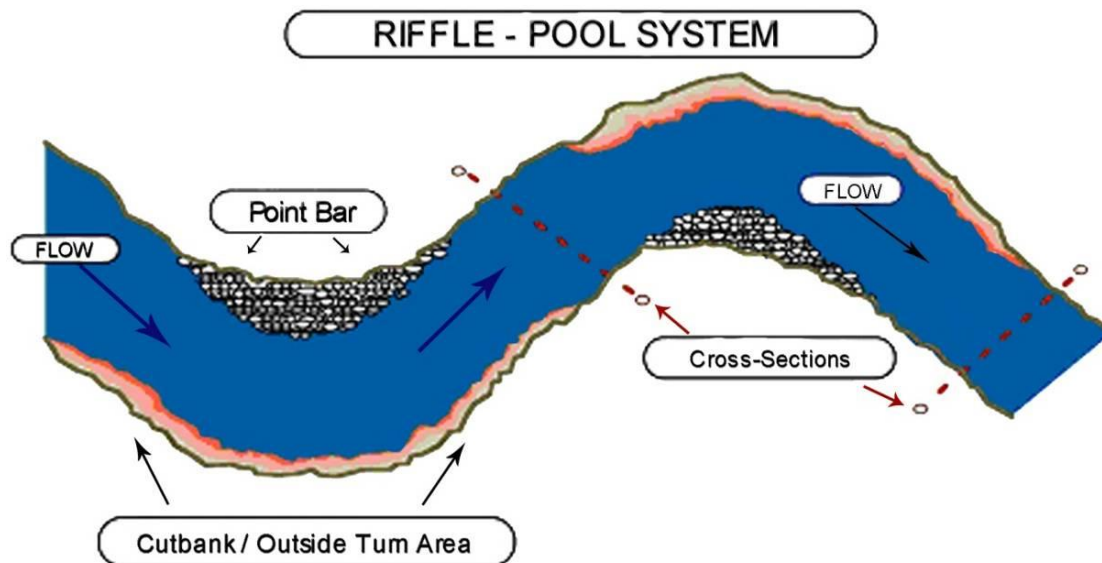


Figure 10. Cross-section locations for riffle-pool systems (reproduced from Rosgen, 1996). Channel sinuosity is characterized by meander bends.

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

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

In smaller streams, such as those predominantly found in the Montane Riverine subclass, a measuring tape, stadia rod (for measuring depth), rebar, clamps and pin flags (to indicate the bankfull elevation) are all that is required to measure Floodplain Hydrologic Connectivity. In areas where there is a very wide, flat floodplain or in areas dominated by dense vegetation, a quality hand level is a recommended addition to the basic equipment list. *If equipment is not available, visually estimate the heights and widths and note in the comment section for this metric.*

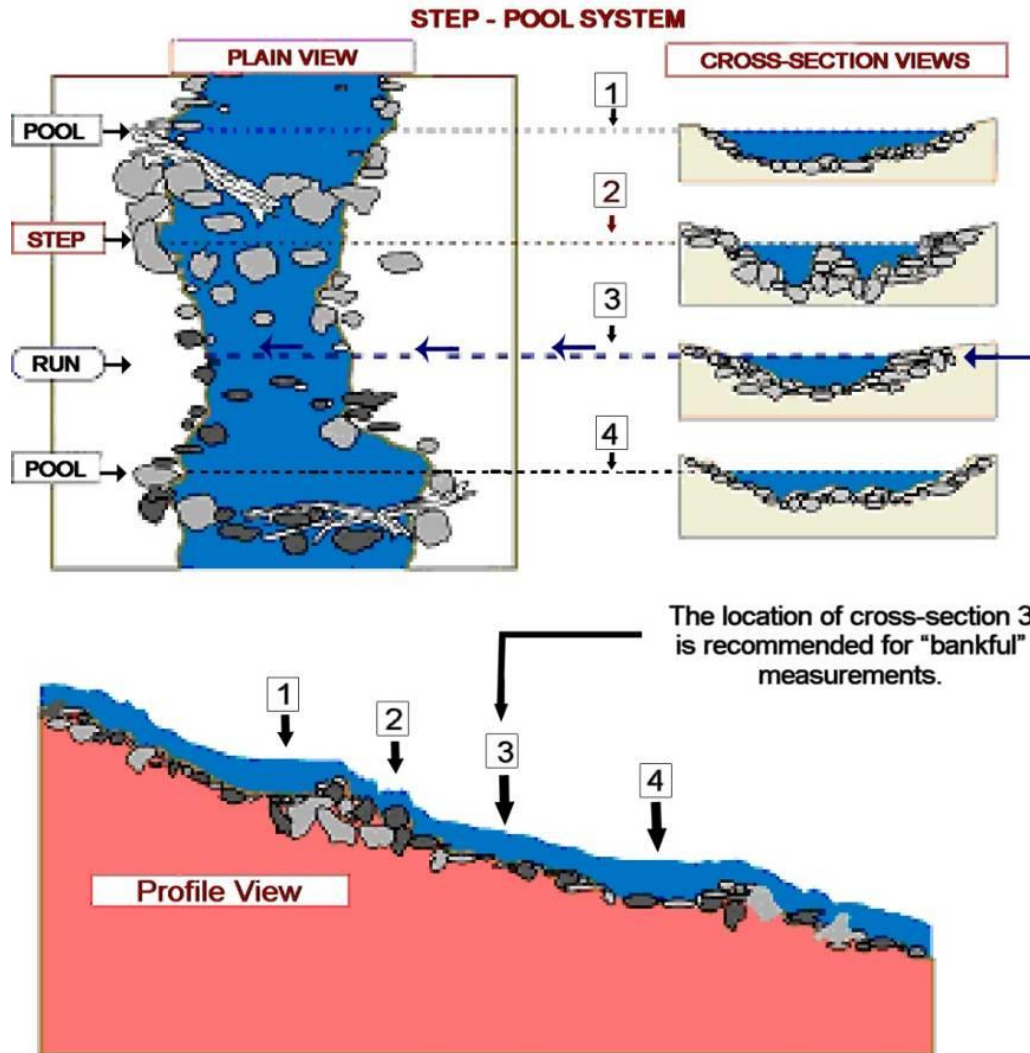


Figure 11. Cross-section locations for step-pool systems (reproduced from Rosgen, 1996). A step-pool system is characterized by lower channel sinuosity and steeper slope than riffle-pool systems.

Steps using Worksheet 10a and Figure 12 (Figure A1c in Appendix B) below:

1. Identify and mark with temporary flags the bankfull elevation (contour) along the channel using the field indicators listed above (see Figure 9).
2. With a tape, measure the bankfull width from bank to bank at the bankfull elevations. (Note that bankfull will be at the same elevation on both sides of the stream. This is a good time to use the level along the tape.)
3. Measure bankfull depth at the maximum depth below the tape (the thalweg of the channel) (see Figures 9 and 12 (Figure A1c in Appendix B)).
4. Calculate the flood-prone depth as twice the bankfull depth.
5. At the flood-prone height (in the thalweg), stretch a tape horizontally across the stream to where it intersects the floodplain on each side — this represents the estimated flood-prone width.

6. Calculate the entrenchment ratio as flood-prone width/bankfull width.
7. Take photographs of the cross-section looking upstream and downstream from the thalweg and from the left and right banks (pointing across-stream). Record the digital names or numbers on the Photo Point Log at the end of the Floodplain Hydrologic Connectivity Metric (Table A1d in Appendix A).

Repeat the above steps at two additional cross-sections.

8. Calculate the mean entrenchment ratio across three sites.
9. Rate the metric using Table A1a for meandering single-channel riffle-pool systems or Table A1b for or single-channel step-pool system.
10. Enter the rating on the SA Rank Summary Worksheet.

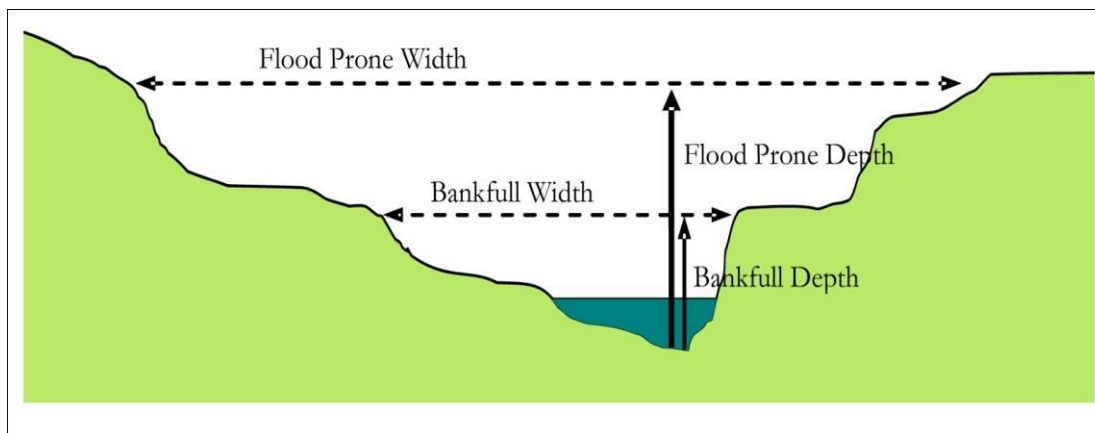


Figure 12. Parameters used to calculate channel entrenchment (from Collins et al. 2008).

Method 2— Narrative approach. The NMRAM recommends using the narrative approach when beaver ponds inundate the normally active floodplain or preclude identification of the bankfull discharge or floodplain width, when users cannot determine bankfull, or cross-sections are otherwise impractical. The narrative approach assesses the connectivity of the stream to its floodplain using indicators listed in Worksheet 10b at each cross-section location. Photographs at the cross-section locations are particularly useful when using this method. Use Table A1d to record photographs at each cross-section location. Use Table A1c to rate the SA and enter the rating on the SA Rank Summary Worksheet.

A2. Physical Patch Complexity

Definition: This metric describes the physical structural richness of riverine wetlands and associated channels that foster habitat complexity and biotic diversity.

Seasonality: This metric can be evaluated during any season.

Protocol: The assessment consists of checking off field indicators of various physical patch types by SA segment using Worksheet 11. 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 also 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 11.

Steps:

1. As part of the segment traverses, check off field indicators representing physical patch types in each SA segment using Worksheet 11.
2. Based on the narrative and using the number of patch types on Worksheet 11 as a guide, rate the metric using Table A2.
 - 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.
 - Note that the fillable PDF version of Appendix A has a “Calculate” button that automatically sums the unique patch types checked on Worksheet 11 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.

A3. Channel Equilibrium

Definition: Channel Equilibrium is the assessment of the degree of channel aggradation or degradation resulting from the departure from the flow regime associated with the characteristic pattern, profile and dimension of the stream or river.

Seasonality: The assessment can be conducted anytime when the river is not at flood stage, but is best conducted during periods of low to moderate flow.

Protocol: The assessment consists of checking off field indicators of channel equilibrium, aggradation, or degradation by SA segment using Worksheet 12. Transient local impacts such as dredging or fill that may affect the scores should be noted. In addition, site-scale field indicators caused by beaver activity should *not* be considered in assessing channel conditions, as they are indicative of a local disturbance rather than overall channel and watershed processes. For example, headcutting after a breach in a beaver dam can be a natural process by which the stream returns to equilibrium as it degrades through sediments deposited in the beaver impoundment area.

Steps:

1. Looking both 25 m (82 feet) up- and down-stream of each cross-section location, check off all observed Field Indicators from the Channel Equilibrium Checklist (Worksheet 12).
2. Using Worksheet 12 as a guide and reflecting on the channel conditions throughout the SA, rate Channel Stability using Table A3.
 - The indicators on the checklist are meant to guide a best professional judgment assessment of channel equilibrium condition, they are not directly additive.
 - If using the fillable PDF, provide the primary process (equilibrium, aggradation, or degradation) and a brief justification for the selected rating in the SA Abiotic Condition Description on Page 1 of Appendix A.

3. The rating should be based on the overall trend of channel condition for the entire SA. Enter the rating on the SA Summary Rank Worksheet.

A4. Stream Bank Stability and Cover

Definition: This metric is a measure of stream bank soil/substrate stability and stream bank erosion potential that reflect overall stream bank stability.

Seasonality: This metric is not sensitive to seasonality, but cannot be assessed when the river is in flood stage.

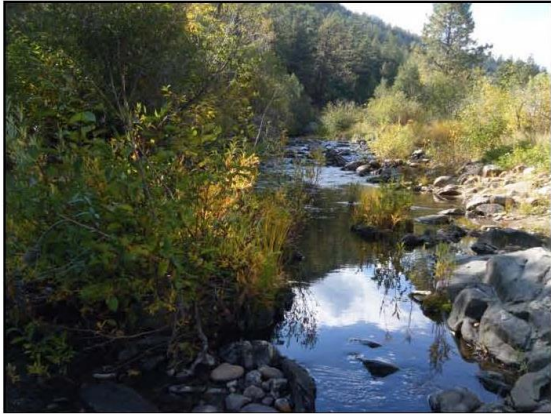
Protocol: This method has two qualitative measures of bank condition that are evaluated using checklists on Worksheet 13:

- 1) Bank Soil Stability is determined by bank soil exposure, disruption and stress factors. Bank Soil Stability is a measure of active, ongoing erosion and consists of an estimation of the percentage of the bank along the riffle section that is stable.
- 2) Stream Bank Erosion Potential is determined by the amount of bank protection (cover) by fibrous, rooted vegetation and armoring by large, resistant interbedded boulders, cobbles and large woody debris. It reflects stability generated by vegetative cover and large bank material capable of limiting bank erosion.

Within each stream segment, the assessment should extend a minimum of 25 m (82 feet) upstream and downstream of the cross-section locations on both sides of the stream, but not within the cut-bank or point bar of a meander curve, or in a pool.

Both Bank Soil Stability and Stream Bank Erosion Potential are assessed vertically from the channel bottom up to the bankfull elevation. However, the effects of vegetation cover and root mass on Stream Bank Erosion Potential should include vegetation growing up to the top of the bank. This is particularly important if the channel bank continues (vertically) uninterrupted above the bankfull elevation, making the upper banks capable of instability due to shear stress on the lower banks. In these cases, the assessor should extend the Stream Bank Erosion Potential survey to cover the entire area between the channel bed and the top of the bank below whatever floodplain is present.

Figure 13a provides an example of a stream with high marks for Stream Bank Stability and Cover. In contrast, stressed and eroding streambanks may feature fractures, slumps, sloughs, loose soil, hoof punching, hoof shearing and absent banks (Figure 13b)(see Figure A4a in Appendix B). A trampled trail crossing, while possibly affecting less than 10% of the segment, could lead to bank soil instability over time. Figure 13c shows an example of the impacts of trampling by livestock where the banks have been completely trampled, the increased width to depth ratio is unstable for the channel type, and the banks are essentially non-existent. This extreme condition would be rated as “1” under Bank Soil Stability and “2” under Stream Bank Erosion Potential. Figure 13d shows the same channel at bankfull following removal of livestock for several years and regrowth of vigorous vegetation covering the banks. This situation would be rated as “3” for Bank Soil Stability since it is impossible to see the banks below bankfull in this photograph and “4” for Stream Bank Erosion Potential.



A) The stream banks here exhibit vigorous vegetative growth and large cobbles and boulders protecting the banks that would support a rating of 4 for Stream Bank Erosion Potential. In addition, little soil is exposed, supporting a 4 Bank Soil Stability rating.



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



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



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

Figure 13. Examples of stream bank soil stability and erosion potential conditions.

Steps:

1. Looking both 25 m (82 feet) up- and down-stream of each cross-section location on both sides of the stream (but not within the cut-bank or point bar of a meander curve, or in a pool), check the Field Indicator that best describes the condition for Bank Soil Stability and for Streambank Erosion Potential (Worksheet 13) for each Segment (Upper, Middle and Lower).
2. Average the six scores to compute the overall Stream Bank Stability and Cover.
3. Use the calculated average to rate Stream Bank Stability and Cover using Table A4.
4. Enter the rating on the SA Summary Rank 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 14. The final rating requires an estimate of total percent area of the SA that has anthropogenic soil disturbance. The following are general guidelines for assessing Soil Surface Condition:

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

Steps:

1. Prior to field work, using available aerial imagery in the GIS or the SA Abiotic Map, identify vehicle tracks, gravel pits, etc., and other recognizable soil surface disturbances within the SA. Mark disturbed areas on the SA Abiotic Map to take in the field and provisionally check them off on Worksheet 14.
2. Conduct soil-surface assessment as part of the segment traverses to ground-truth work completed in Step 1 and to identify additional evidence of disturbance not seen at the scale of the SA Abiotic Map. For each segment, check off all indicators that apply on Worksheet 14. This is especially important since small amounts of disturbance can change the rating for the metric.
3. Estimate the area of soil surface disturbance by segment and average the estimated areas to arrive at the Average Percent Soil Disturbance for 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.

V. Stressor Checklists

The Stressor Checklist 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 collecting field data.

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 stressors per intensity class on Worksheet 15 and enter the results 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 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. Reporting and 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 Wetland Program \(nm.gov\)](http://New Mexico Wetland Program (nm.gov)) for updates.

VIII. References

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Appendix A

New Mexico Rapid Assessment Method

Montane Riverine Wetlands

Field Guide Worksheet Packet

(Version 2.5)

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 Biotic and Abiotic 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.

NMRAM Montane Riverine Wetlands Version 2.5

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					
Biotic					
Abiotic					
Stressors					
Easting (m)	Northing (m)	Zone	Datum	Latitude (DD ft)	Longitude (DD ft)
Survey Date		Start Time		End Time	
SA Description					
SA Landscape Context (summarize the wetland and surrounding landscape; include condition and impacts) <div style="border: 1px solid black; height: 80px; margin-top: 5px;"></div>					
SA Biotic Condition (vegetation patterns, composition and structure, exotics and invasives, disturbance evidence, fire and herbivory) <div style="border: 1px solid black; height: 80px; margin-top: 5px;"></div>					
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) <div style="border: 1px solid black; height: 80px; margin-top: 5px;"></div>					
Assessment Summary (Overall site condition summary and comments after the field data is collected.) <div style="border: 1px solid black; height: 80px; margin-top: 5px;"></div>					
Provisional Field Score _____		Rank _____		Surveyor(s) _____	
Final Score _____		Rank _____		Initials _____	
				Date _____	

SA CODE :

Date :

SA Name :

Surveyor Initials :

NMRAM - SA Rank Summary Worksheet: Montane Riverine Wetlands 2.5			
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 Diversity		0.2	
A3. Channel Equilibrium		0.2	
A4. Stream Bank Stability and Cover		0.2	
A5. Soil Surface Condition		0.1	

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural or semi-natural vegetation patches		Commercial/residential developments, parking lots, dams, bridges, revetments, and other structures	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Small irrigation ditches without levees		Lawns, parks, golf courses, sports fields	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Old fields, unmaintained		Railroads	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Open range land		Maintained levees, sediment piles, construction materials, staging areas	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foot trails, horse trails, unpaved bike trails (low intensity)		Intensive livestock areas, horse paddocks, feedlots	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-channel open water		Intensive agriculture: maintained pastures, hay fields, row crops, orchards, and vineyards	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-functioning abandoned vegetated levees, or naturally occurring levees		Paved roads or developed second-order unpaved but graded roads	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
unpaved two tracks roads		Open water bounded by a levee or other manmade structure	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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
<input type="radio"/> 4	100%
<input type="radio"/> 3	≥80% - <100%
<input type="radio"/> 2	≥50% - <80%
<input type="radio"/> 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
<input type="radio"/> 4	≥190m
<input type="radio"/> 3	≥130 - <190m
<input type="radio"/> 2	≥65 - <130m
<input type="radio"/> 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
<input type="radio"/> 4	>3.5
<input type="radio"/> 3	>2.5 - ≤3.5
<input type="radio"/> 2	>1.5 - ≤2.5
<input type="radio"/> 1	≤1.5

SA CODE :

Date :

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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	
	Left Bank	Right Bank	Left Bank	Right Bank
A) Total Bank Disruption (m)				
B) Total Disruption by Segment (m)				
C) % Segment Disruption = (B/1000)*100				
D) Total Disruption both segments				
E) % Total Disruptions = (D/2000)*100				

Rating	Description
<input type="radio"/> 4	0% total disruption on both segments combined.
<input type="radio"/> 3	<15% total disruption on both segments combined.
<input type="radio"/> 2	≥15% - <40% total disruption on both segments combined.
<input type="radio"/> 1	≥40% total disruption on both segments combined.

L3 - Relative Wetland Size

Worksheet 3a. 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 Index using Table L3 and enter rating on the SA 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
<input type="radio"/> 4	≤10%	Wetland is at or only minimally reduced from its full natural extent
<input type="radio"/> 3	>10% - ≤40%	Wetland remains equal to or more than 60% of its natural size
<input type="radio"/> 2	>40% - ≤70%	Wetland has been reduced by more than 40% its natural size
<input type="radio"/> 1	>70%	Wetland has been reduced by more than 70% its natural size

SA CODE :

Date :

SA Name :

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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) surrounding 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		
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		
LUI Score= Coefficient * % LUZ Area			

Rating	LUI Score
<input type="radio"/> 4	≥95 - 100
<input type="radio"/> 3	≥80 - <95
<input type="radio"/> 2	≥40 - <80
<input type="radio"/> 1	<40

SA CODE:

SA Name:

Date:

Surveyor Initials:

Biotic Metrics

Worksheet 5. Vegetation Community Patch Polygon Data for Biotic Metrics B3, B4, and B5 for Polygons from SA Biotic Map. Enter data for each polygon under a unique number assigned from the SA Biotic Map. Each polygon is evaluated with respect to Vegetation Vertical Structure (B3), Native Tree Regeneration (B4), and Invasive Exotic Plant Species Cover (B5) metrics. 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. Enter the species codes for the invasive exotic species found in the polygon (from NIM Noxious Weed List - Appendix D). Use the comments box for documenting and describing vegetation community patch features.

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

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. Enter the species codes for the two top dominant species in each stratum that appears 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 is either assigned to the same CT if it has the same composition or a new CT is created for the polygon.

CT	Polygon Nos.	Tall Woody Stratum 1				Short Woody Stratum 2				Herbaceous/Sparse Stratum 3				CT Score 4			
		Species 1	E N	Species 2	E N	Species 3	E N	Species 4	E N	Species 5	E N	Species 6	E N	Raw4	% SA5	Wt Score6	
A																	
B																	
C																	
D																	
E																	
F																	
G																	
H																	
I																	
J																	
K																	
L																	
M																	
N																	
O																	

Final Weighted Score7

1. Trees and shrubs > 6 m (20 feet) and > 25% total stratum cover; 2. Trees and shrubs ≤6m (20 feet) and >25% total stratum cover; 3. Herbaceous (graminoids and forbs)> 10% total stratum cover. 4Raw 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; 6Wt. Score is the product of the Raw Score * % SA; 7The 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	
<input type="radio"/> 4	≥ 3.75	<10% non-native
<input type="radio"/> 3	≥ 3.25 and <3.75	10% ≤20% non-native
<input type="radio"/> 2	> 2.0 and <3.25	20% ≤50% non-native
<input type="radio"/> 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. Rating for Vegetation Horizontal Patch Structure

Rating	Description
<input type="radio"/> 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.
<input type="radio"/> 3	Pattern B. SA has a moderate degree of patch diversity (3 patch types present) and complexity. A single, dominant patch type may be present, although the other patch types would be well represented and have more than one occurrence in the SA.
<input type="radio"/> 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.
<input type="radio"/> 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 SA.

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 $VST(\text{type}) = \text{Sum}(\%SA \text{ for CTs with same VST}) \times 100$. 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 structure type plus co- and sub-dominants. Percentage cover required per co- or sub-dominant is a minimum. The types listed in the columns must be the most common VSTs in the SA for the rating to be applicable (Worksheet 8). VSTs 1 and 2 can be inverted in dominance and the rating is still applicable. Work from the top of the table down. As long as the requirements for one row are met, any other types may or may not co-occur without changing the rating. Enter the rating on the SA Rank Summary Worksheet.

Rating	Dominant VST	Co- or Sub-dominant VST ≥15%	Sub-dominant VST ≥5%
<input type="radio"/> 4	1	5	6W and/or 6H
	1	6W	
	2 or 1 and 2	5	6W and/or 6H
<input type="radio"/> 3	1		
	2 or 1 and 2	5	
	2 or 1 and 2	6W	
	5	6W	
<input type="radio"/> 2	2 or 1 and 2		
	5		
	6W		
<input type="radio"/> 1	6S		
	6H		
	7		

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B4 - Native Riparian Tree Regeneration

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

Rating	Description
<input type="radio"/> 4	Native poles, sapling, and seedlings trees well represented, obvious regeneration, many patches or polygons with >5% cover, typically multiple size (age) classes.
<input type="radio"/> 3	Native poles, saplings and/or seedlings common, scattered patches or polygons with 1% -5% cover, size classes few.
<input type="radio"/> 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.
<input type="radio"/> 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 %
<input type="radio"/> 4	0%
<input type="radio"/> 3	>0% - <1%
<input type="radio"/> 2	≥1% - <10%
<input type="radio"/> 1	≥10

Additional CTs and Biotic Metric Comments:

Abiotic Metrics

A1 - Floodplain Hydrologic Connectivity

Method 1

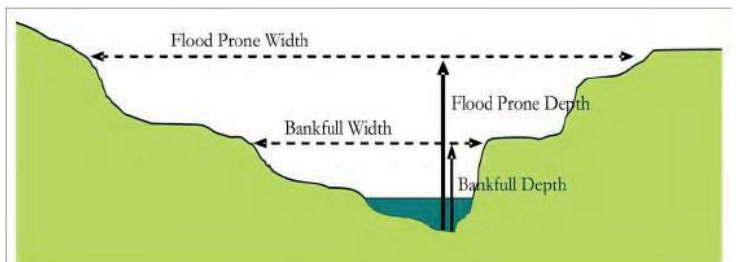
Worksheet 10a. Floodplain Hydrologic Connectivity Measurements. The following six steps are conducted at each of three cross-sections at the approximate mid-points along straight riffles and away from deep pools or meander bends. Use a measuring tape and temporary stakes for horizontal measurements, and a stadia rod or similar measuring stick for vertical measurements. If unavailable, use visual estimates. Where straight channel segments do not occur, or if there is excessive ponding or bankfull indicators are obscured, use the narrative rating approach (Method 2). Enter the rating method in the box below, either meander pool, riffle pool or narrative (Method 2) and choose the corresponding Table (A1a, A1b, or A1c) to rate Floodplain Hydrologic Connectivity. Enter the rating on the SA Rank Summary Worksheet. Photographs of each cross-section are required and recorded in Table A1d.

Steps	Description	Cross-section:	1	2	3
1: Bankfull width	This is a critical step requiring familiarity with field indicators of the bankfull contour. Measure the distance between the right and left bankfull contours with a tape.				
2: Maximum bankfull depth	Keeping the tape level between the right and left bankfull contours, measure the height of the line above the thalweg (the deepest part of the channel). A pocket line level can help here.				
3: Flood-prone depth	Double the estimate of maximum bankfull depth from Step 2.				
4: Flood-prone width	Using a tape, measure the length of a level line at a height equal to the flood prone depth from Step 3 to where it intercepts the right and left banks.				
5: Calculate Entrenchment Ratio	Divide the flood-prone width (Step 4) by the bankfull width (Step 1).				
6: Calculate average ratio	Calculate the average for Step 5 for all three replicate cross-sections. Enter the average here and rate using Table A1a. Enter the rating in the A1 box on the SA Rank Summary Worksheet.				

Rating Method

Table A1a. Rating for Floodplain Hydrologic Connectivity in meandering single-channel riffle-pool systems

Rating	Description
<input type="radio"/> 4	Average entrenchment ratio is ≥ 2.2 ;
<input type="radio"/> 3	Average entrenchment ratio is $\geq 1.9 - < 2.2$
<input type="radio"/> 2	Average entrenchment ratio is $\geq 1.5 - < 1.9$
<input type="radio"/> 1	Average entrenchment ratio is < 1.5



Worksheet 10b. Floodplain Hydrologic Connectivity Indicators. Use this Worksheet in conjunction with Table A1c. Check the boxes for all that apply to each segment.

U	M	L	Indicator
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bankful is slightly below bank height
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bankful is well below bank height and channel is incised
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Channel widening due to bank failure
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Constructed levees preclude floodplain inundation
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stream is straightened/channelized
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Inset floodplain formation
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Decreased peak flows due to hydrologic modification
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bankfull indicators at point of incipient flooding of the floodplain
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Indicators of overbank flow on floodplain
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Floodplain inundation due to beaver activity

Table A1b. Rating for Floodplain Hydrologic Connectivity in single-channel step-pool systems

Rating	Description
<input type="radio"/> 4	Average entrenchment ratio is ≥ 1.9
<input type="radio"/> 3	Average entrenchment ratio is $\geq 1.4 - < 1.9$
<input type="radio"/> 2	Average entrenchment ratio is $\geq 1.2 - < 1.4$
<input type="radio"/> 1	Average entrenchment ratio is < 1.2

SA CODE :

Date :

SA Name :

Surveyor Initials :

Method 2

Table A1c. Narrative Floodplain Hydrologic Connectivity Rating. Select the narrative description that best describes the floodplain hydrologic connectivity. At each cross-section, use Worksheet 10b to record channel incision, bank modification, inset floodplain or other hydrologic evidence that would preclude natural floodplain inundation. Conversely, assess indicators and evidence for overbank flow and floodplain inundation. Record whether beaver activity is obscuring bankfull indicators due to inundation of the floodplain. Select a rating from the table below. Use data from Worksheets 10b to help select rating. Enter Rating on SA Summary Worksheet. Photographs are required at each cross-section and recorded in Table A1d.

Rating	Description
<input type="radio"/> 4	Fully connected to the natural floodplain. Indicators of bankfull discharge are at the bank/floodplain transition, with over-bankfull flows likely to inundate a broad area of floodplain. Floodplain supports riparian vegetation and shows signs of overbank sediment deposition. Or beaver ponds inundate the entire, normally active floodplain and preclude the identification of bankfull indicators and the active floodplain width.
<input type="radio"/> 3	Flow access to the floodplain moderately limited by incision, channelization. Less frequent inundation than fully connected streams described above (as noted by bankfull indicators below floodplain transition). Floodplain supports a riparian overstory, but some understory plants may be upland. An inset floodplain supporting riparian vegetation may also be present.
<input type="radio"/> 2	Incised, channelized or modified with an inset floodplain formed, which is regularly inundated and supports riparian vegetation and sediment regimes. Or the stream has minimal access to the natural floodplain due to incision, channelization, or flow modification, and the natural floodplain does not support riparian vegetation except for relatively long-lived phreatophytes (e.g., cottonwood, salt cedar, etc.).
<input type="radio"/> 1	Fully disconnected from floodplain, either through incision, bank modification/channelization, or hydrologic modification (i.e., abandonment of floodplain due to decreased peak flows). Indicators may include upland vegetation and lack of overbank sediment deposits on the floodplain, etc.

Table A1d. Photo Point Log for Cross-Section Photographs. For each cross-section record the digital names/numbers of photographs taken looking Upstream and Downstream from the thalweg and looking Bank Right* and Bank Left* across the stream from each side of the cross-section. Leave the cross-section tape and flags indicating bankfull in the ground when taking the Bank Right and Bank Left photos. A photo board with SA name and cross-section information is helpful. (*The bank of a stream or river on the right (left) of the observer when facing in the direction of flow or downstream.) See Appendix E for additional details.

Cross Section	Easting (Latitude)	Northing (Longitude)	Upstream	Downstream	Bank Right	Bank Left
1						
2						
3						

Floodplain Hydrologic Connectivity Comments:

SA CODE :

Date :

SA Name :

Surveyor Initials :

A2 - Physical Patch Complexity

Worksheet 11. Physical Patch Complexity checklist. Check off existing physical patch types for the upper, middle and lower segments of the SA; 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)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Active side channels
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Abandoned channels
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Backwater/eddy
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Riffles or rapids
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Shoals, sparsely-vegetated bars
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Channel boulders
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Oxbow lakes/ponds on floodplains
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Vegetated island and side bars
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Terraces
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Channel pools
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Beaver ponds
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Swales, depressional features on floodplains
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Debris jams in channel
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Woody wrack piles on the floodplain
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Floodplain micro-topography (mounds, pits)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Downed logs
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Natural levees
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Standing snags
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Variiegated, convoluted, or crenulated foreshore
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Undercut banks in channels
			No. of unique Patch Types

Table A2. Rating for Physical Patch Complexity

Rating	Description
<input type="radio"/> 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 are present and well distributed throughout the SA (most indicators are found on multiple segments).
<input type="radio"/> 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 are scattered throughout the SA (some on multiple segments).
<input type="radio"/> 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 present in the SA (only a few on multiple segments).
<input type="radio"/> 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 are present in the SA.

A3- Channel Equilibrium

Worksheet 12. Channel Equilibrium Checklist. Check all field indicators that apply to the upper, middle and lower segment of the SA observed at the channel edge of the traverse. Rate using the Table A3 descriptions and based on a preponderance of evidence from this checklist. Enter the rating on the SA Rank Summary Worksheet.

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

Table A3. Rating for Channel Equilibrium

Rating	Description
<input type="radio"/> 4	Most of the channel throughout the SA is in equilibrium condition with little evidence of excessive aggradation or degradation based on the field indicators listed in Worksheet 12.
<input type="radio"/> 3	There is some evidence of excessive aggradation or degradation; the channel throughout the SA seems to approach an equilibrium condition. Circle primary process: aggradation or degradation.
<input type="radio"/> 2	There is evidence of severe aggradation or degradation throughout most of the channel through the SA. Circle primary process: aggradation or degradation.
<input type="radio"/> 1	The channel is artificially hardened, channelized, or is concrete throughout most of the SA.

A4- Stream Bank Stability and Cover

Worksheet 13. Bank Soil Stability and Streambank Erosion Potential Checklist. Check the indicator that best describes the condition looking a minimum of 25 m upstream and downstream at the channel edge of the upper, middle and lower segment of the SA. Average the six scores for both Bank Soil Stability and Streambank Erosion Potential. Rate using the Table A4 and enter the rating on the SA Summary Worksheet.

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

Average Indicator Score

Table A4. Stream Bank Stability and Cover Rating

Rating	Description
<input type="radio"/> 4	>3.5 - 4.0
<input type="radio"/> 3	>2.5 - ≤3.5
<input type="radio"/> 2	>1.5 - ≤2.5
<input type="radio"/> 1	1.0 - ≤1.5

SA CODE :

Date :

SA Name :

Surveyor Initials :

A5 - Soil Surface Condition

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

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

Average % Soil Disturbance: **Table A5. Soil Surface Condition Rating**

Rating	Description
<input type="radio"/> 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 soil surface is less than 1% of the SA.
<input type="radio"/> 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 pits, vehicle tracks or other anthropogenic degradation to the soil surface is between 1% and 5% of the sampling area.
<input type="radio"/> 2	Bare soils from human causes are common. These may include dense livestock trails, vehicle tracks, trails, construction staging areas, 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 greater than 5% or less than 10% of the SA.
<input type="radio"/> 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 equal to or greater than 10% of the SA.

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						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extended low flow dam releases	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Timing of flow releases not concordant	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extended high flow dam releases	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agriculture/Urban flow diversion upstream	
Adverse sediment management						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adverse sediment retention by dams	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sediment loss by dredging	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adverse sediment input (roads/development)	
Artificial water additions						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sewer treatment effluent	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Point source urban runoff	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Factory, feedlot outfall	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agricultural irrigation ditch returns	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mining waste	
Ground water pumping						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Urban depletions	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fracking	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Agriculture irrigation wells	
Watershed alteration						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extensive recent fires in watershed	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extensive recent timber harvest	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extensive open pit mining in watershed	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Livestock/wildlife overgrazing	
Local biodiversity impacts						
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Evidence of excessive grazing (local)	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	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 (Figures A1a, A1b, A1c, and A1d)
- A4. Stream Bank Stability and Cover (Figure A4a)

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.

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

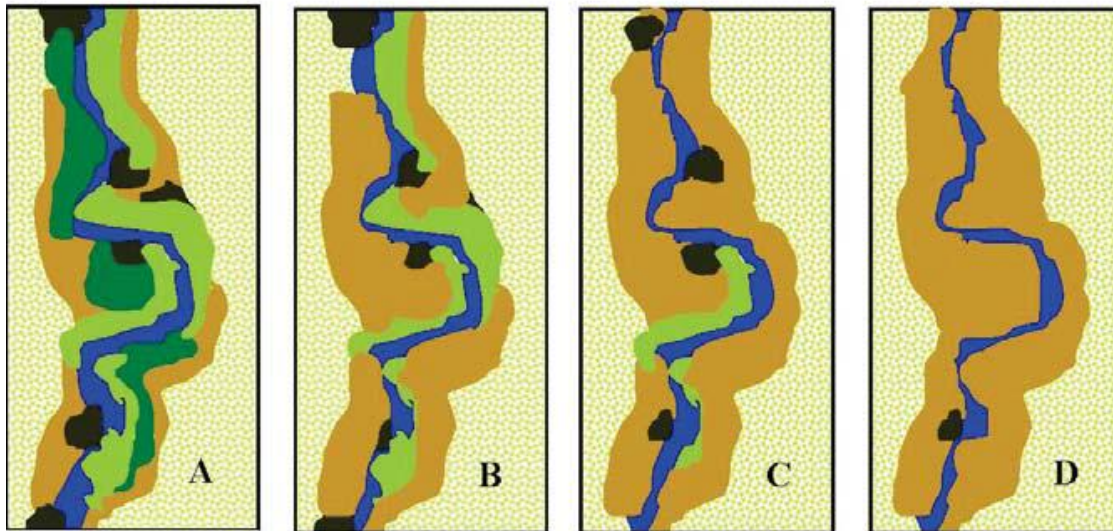


Figure B2c. Horizontal Patch Structure pattern A, B, C, or D (Collins et al. 2008).

B3 – Vegetation Vertical Structure.

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. Using the VST descriptions above, assign VST type to each vegetation polygon listed on Worksheet 5.

A1. Floodplain Hydrologic Connectivity.

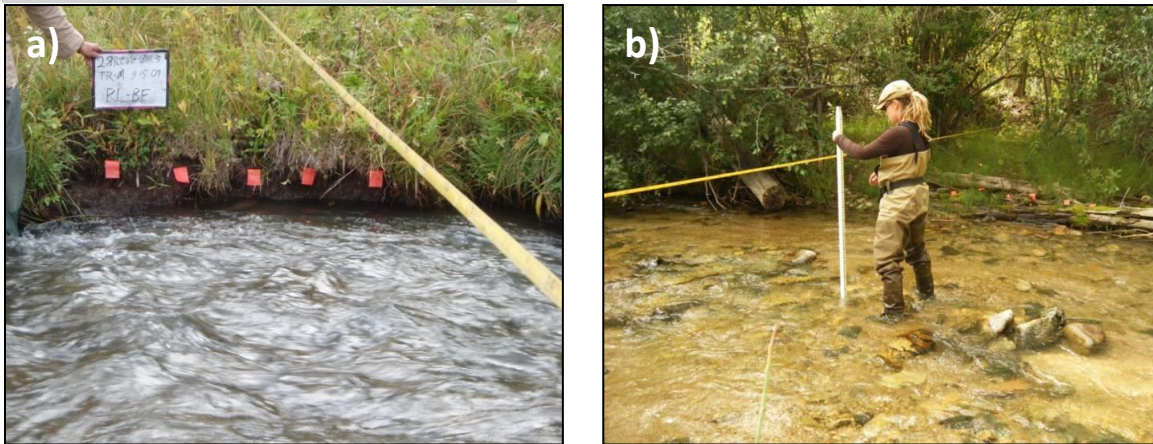


Figure A1a. Determining bankfull. a) Pin Flags identify the bankfull elevation using one- to two-year return flow indicators. b) The flood-prone width is measured at twice the bankfull depth and then extending that height out across the floodplain until that height intercepts the floodplain elevation.

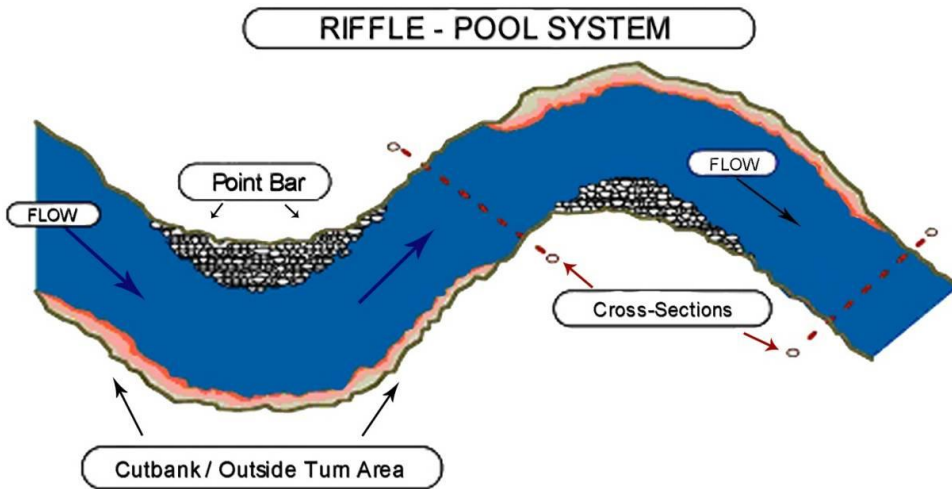


Figure A1b. Cross-section locations for riffle-pool systems (reproduced from Rosgen, 1996). Channel sinuosity is characterized by meander bends.

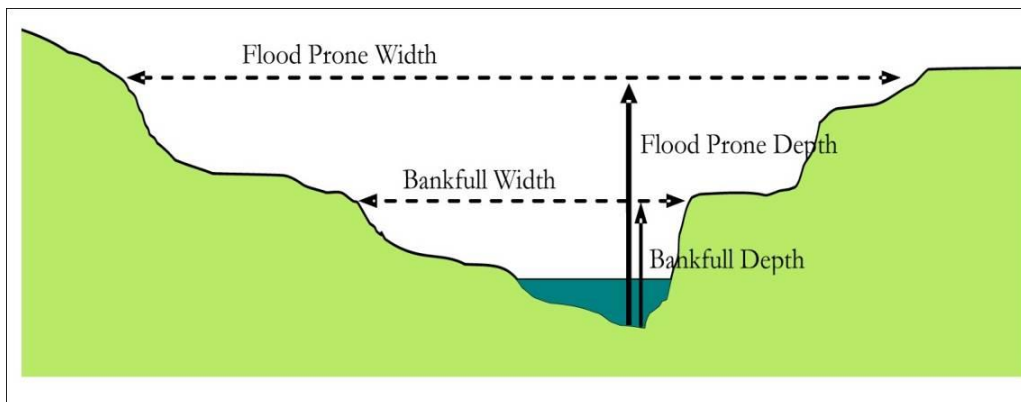


Figure A1c. Parameters used to calculate channel entrenchment (from Collins et al. 2008).

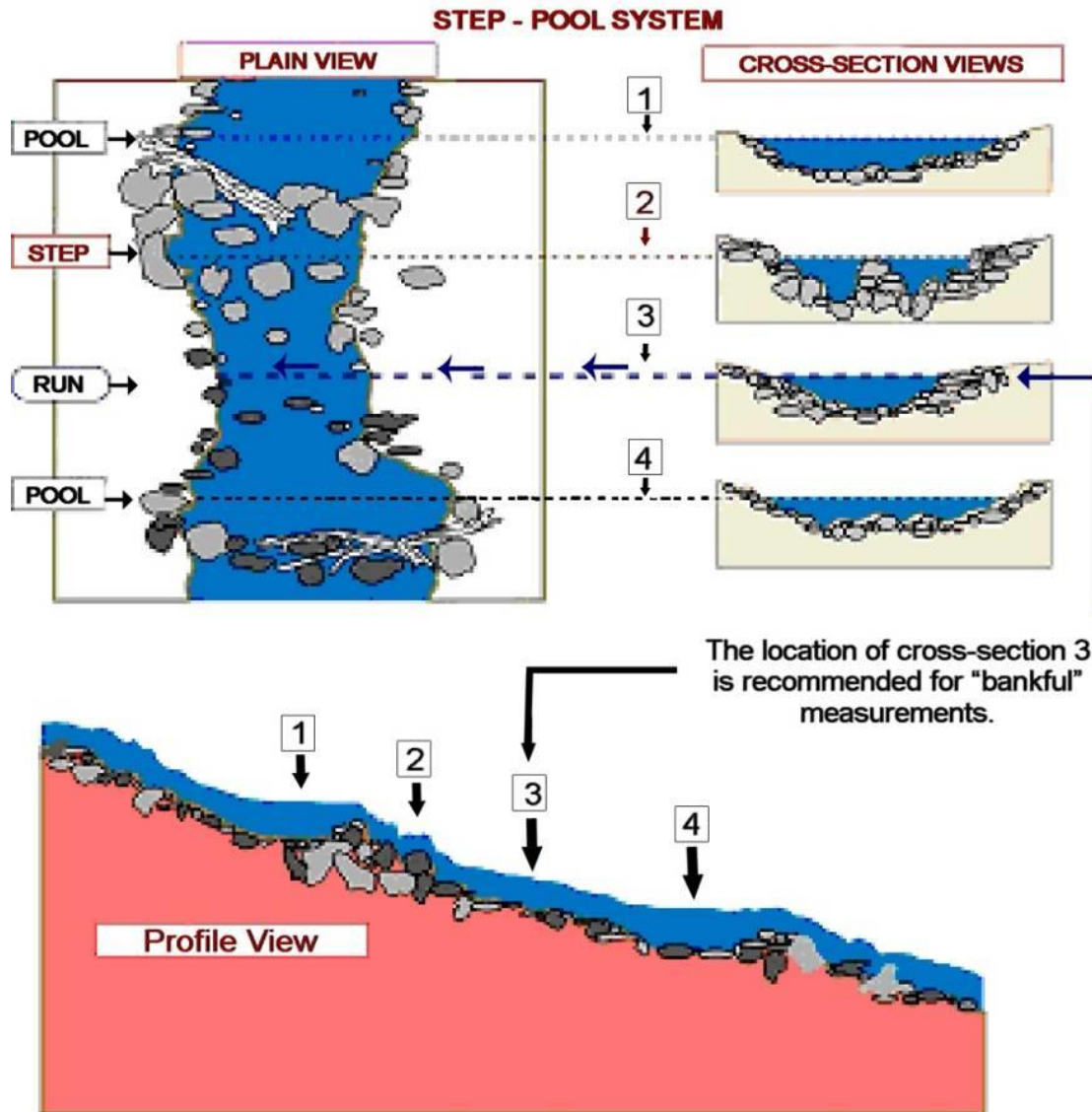


Figure A1d. Cross-section locations for step-pool systems (reproduced from Rosgen, 1996). A step-pool system is characterized by lower channel sinuosity and steeper slope than riffle-pool systems.

A4. Stream Bank Stability and Cover.



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



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



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



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

Figure A4a. Examples of stream bank soil stability and erosion potential conditions.

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

NMRAM Montane Riverine

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
<i>Populus fremontii</i>	Fremont's cottonwood	POFR2		FAC	N
<i>Populus x acuminata</i>	lanceleaf cottonwood	POAC5		FAC	N
<i>Populus tremuloides</i>	quaking aspen	POTR5		FAC	N
<i>Prunus armeniaca</i>	apricot	PRAR3		FACU	E
<i>Quercus gambelii</i>	Gambel's oak	QUGA		UPL	N
<i>Robinia pseudoacacia</i>	black locust	ROPS		FAC	E
<i>Salix amygdaloides</i>	peachleaf willow	SAAM2		FACW	N
<i>Salix gooddingii</i>	Goodding's willow	SAGO		FACW	N
<i>Ulmus pumila</i>	Siberian elm	ULPU	C	UPL	E
<i>Tamarix spp.</i>	Saltcedar	TAMAR2	C	FAC	E
Short Woody Species					
<i>Alhagi maurorum</i>	camelthorn	ALMA12	A	FAC	E
<i>Allenrolfea occidentalis</i>	iodinebush	ALOC2		FACW	N
<i>Ambrosia monogyra</i>	singlewhorl burrobush	AMMO6		FACW	N
<i>Amelanchier utahensis</i>	Utah serviceberry	AMUT		FAC	N
<i>Amorpha fruticosa</i>	desert indigobush	AMFR		FACW	N
<i>Artemisia filifolia</i>	sand sagebrush	ARFI2			N
<i>Artemisia tridentata</i>	big sagebrush	ARTR2			N
<i>Atriplex canescens</i>	fourwing saltbush	ATCA2			N
<i>Baccharis emoryi</i>	Emory's falsewillow	BAEM		FACW	N
<i>Baccharis salicifolia</i>	seepwillow	BASA4		FACW	N
<i>Baccharis salicina</i>	false willow	BASA		FAC	N
<i>Berberis fendleri</i>	Colorado barberry	BEFE		FACU	N
<i>Berberis vulgaris</i>	common barberry	BEVU		FACU	E
<i>Brickelliastrum fendleri</i>	Fendler's brickellbush	BRFE2			N
<i>Brickellia californica</i>	California brickellbush	BRCA3		FAC	N
<i>Brickellia microphylla var. scabra</i>	rough brickellbush	BRMIS			N
<i>Cercocarpus montanus</i>	mountain mahogany	CEMO2		UPL	N
<i>Chilopsis linearis</i>	desert willow	CHLI2		FAC	N
<i>Clematis ligusticifolia</i>	western white clematis	CLLI2		FAC	N
<i>Cornus sericea</i>	redosier dogwood	COSE16		FACW	N
<i>Dasiphora fruticosa</i>	shrubby cinquefoil	DAFR6		FACW	N
<i>Ericameria nauseosa</i>	rubber rabbitbrush	ERNA10		FACU	N
<i>Fallugia paradoxa</i>	Apacheplume	FAPA		FACU	N
<i>Forestiera pubescens</i>	New Mexico olive	FOPU2		FACU	N
<i>Gutierrezia sarothrae</i>	broom snakeweed	GUSA2		UPL	N
<i>Hymenoclea monogyra</i>	singlewhorl burrobush	HYMO			N
<i>Isocoma pluriflora</i>	southern jimmyweed	ISPL			N
<i>Lonicera involucrata</i>	twinberry honeysuckle	LOIN5		FAC	N
<i>Lonicera tatarica</i>	Tatarian honeysuckle	LOTA		FACU	E
<i>Lycium pallidum</i>	wolfberry	LYPA			N
<i>Parthenocissus vitacea</i>	thicket creeper	PAVI5		FAC	N
<i>Pluchea sericea</i>	arrowweed	PLSE		FACW	N
<i>Poliomintha incana</i>	hoary rosemarymint	POIN3			N

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Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
<i>Prosopis glandulosa</i>	honey mesquite	PRGL2		FAC	N
<i>Prosopis pubescens</i>	screwbean mesquite	PRPU		FAC	N
<i>Prunus americana</i>	American plum	PRAM		FACU	E
<i>Prunus virginiana</i>	common chokecherry	PRVI		FAC	N
<i>Rhus trilobata</i>	skunkbush sumac	RHTR		FACU	N
<i>Ribes aureum</i>	golden currant	RIAU		FAC	N
<i>Ribes inerme</i>	whitestem gooseberry	RIIN2		FACW	N
<i>Ribes leptanthum</i>	trumpet gooseberry	RILE		FAC	N
<i>Robinia neomexicana</i>	New Mexico locust	RONE		FACU	N
<i>Rosa woodsii</i>	Woods' rose	ROWO		FACU	N
<i>Rubus idaeus ssp. strigosus</i>	grayleaf red raspberry	RUIDS2		FACU	N
<i>Salix bebbiana</i>	Bebb willow	SABE2		FACW	N
<i>Salix drummondiana</i>	Drummond's willow	SADR		FACW	N
<i>Salix exigua</i>	coyote willow	SAEX		FACW	N
<i>Salix irrorata</i>	bluestem willow	SAIR		FACW	N
<i>Salix ligulifolia</i>	strapleaf willow	SALI		FACW	N
<i>Salix lucida ssp. lasiandra</i>	Pacific willow	SALUL		FACW	N
<i>Shepherdia argentea</i>	silver buffaloberry	SHAR		FACU	N
<i>Suaeda nigra</i>	bush seepweed	SUNI		FACW	N
<i>Symphoricarpos oreophilus</i>	whortleleaf snowberry	SYOR2		FAC	N
<i>Toxicodendron rydbergii</i>	western poison ivy	TORY		FACU	N
<i>Vitis arizonica</i>	canyon grape	VIAR2		FACU	N
Herbaceous (graminoids)					
<i>Achnatherum lettermanii</i>	Letterman's needlegrass	ACLE9		UPL	N
<i>Achnatherum robustum</i>	sleepygrass	ACRO7		UPL	N
<i>Aegilops cylindrica</i>	jointed goatgrass	AECY	C		E
<i>Agropyron cristatum</i>	crested wheatgrass	AGCR			E
<i>Agrostis gigantea</i>	redtop	AGGI2		FACW	E
<i>Agrostis idahoensis</i>	Idaho bentgrass	AGID		FACW	N
<i>Agrostis stolonifera</i>	creeping bentgrass	AGST2		FACW	E
<i>Alopecurus aequalis</i>	shortawn foxtail	ALAE		OBL	N
<i>Aristida purpurea</i>	purple threeawn	ARPU9			N
<i>Aristida ternipes</i>	spidergrass	ARTE3		UPL	N
<i>Aristida ternipes var. gentilis</i>	spidergrass	ARTEG		UPL	N
<i>Arundo donax</i>	giant reed	ARDO4	C	FACW	E
<i>Bolboschoenus maritimus</i>	saltmarsh bulrush	BOMA7		OBL	N
<i>Buchloe dactyloides</i>	buffalograss	BUDA		FACU	N
<i>Bouteloua aristidoides</i>	needle grama	BOAR		UPL	N
<i>Bouteloua barbata</i>	sixweeks grama	BOBA2		UPL	N
<i>Bouteloua curtipendula</i>	sideoats grama	BOCU		UPL	N
<i>Bouteloua gracilis</i>	blue grama	BOGR2		UPL	N
<i>Bromus catharticus</i>	rescuegrass	BRCA6		UPL	E
<i>Bromus ciliatus</i>	fringed brome	BRCI2		FAC	N
<i>Bromus ciliatus var. richardsonii</i>	fringed brome	BRCIR		FAC	N
<i>Bromus inermis</i>	smooth brome	BRIN2		FAC	E

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

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

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<i>Argentina anserina</i>	silverweed cinquefoil	ARAN7		OBL	N
<i>Artemisia campestris</i>	field sagewort	ARCA12		FACU	N
<i>Artemisia carruthii</i>	Carruth's sagewort	ARCA14		UPL	N
<i>Artemisia dracunculus</i>	tarragon	ARDR4		FACU	N
<i>Artemisia ludoviciana</i>	white sagebrush	ARLU		FACU	N
<i>Atriplex micrantha</i>	Russian atriplex	ATMI2		FACW	E
<i>Berula erecta</i>	cutleaf waterparsnip	BEER		OBL	N
<i>Bidens bigelovii</i>	Bigelow's beggarticks	BIBI		FACW	N
<i>Bidens leptoccephala</i>	fewflower beggartick	BILE		FACW	N
<i>Boerhavia coccinea</i>	scarlet spiderling	BOCO		FACU	N
<i>Cardamine cordifolia</i>	heartleaf bittercress	CACO6		OBL	N
<i>Cardaria draba</i>	hoary cress	CADR	A	FACU	E
<i>Carduus nutans</i>	nodding plumeless thistle	CANU4	C	FACU	E
<i>Centaurea calcitrapa</i>	purple starthistle	CECA2	A		E
<i>Centaurea diffusa</i>	diffuse knapweed	CEDI3	A		E
<i>Centaurea melitensis</i>	Malta starthistle	CEME2	B		E
<i>Centaurea solstitialis</i>	yellow starthistle	CESO3	A		E
<i>Centaurea stoebe ssp. micranthos</i>	spotted knapweed	CESTM	A		E
<i>Chamaesyce setiloba</i>	Yuma sandmat	CHSE8		FACU	N
<i>Chamaesyce vermiculata</i>	wormseed sandmat	CHVE5		FACU	N
<i>Chenopodium berlandieri</i>	pitseed goosefoot	CHBE4		FACU	N
<i>Chenopodium fremontii</i>	Fremont's goosefoot	CHFR3		FACU	N
<i>Chenopodium graveolens</i>	fetid goosefoot	CHGR2		FACU	N
<i>Chenopodium pratericola</i>	desert goosefoot	CHPR5		FACU	N
<i>Cichorium intybus</i>	chicory	CIIN	B	FACU	E
<i>Cicuta maculata</i>	spotted water hemlock	CIMA2		OBL	N
<i>Cirsium arvense</i>	Canada thistle	CIAR4	A	FAC	E
<i>Cirsium parryi</i>	Parry's thistle	CIPA		FACW	N
<i>Cirsium vulgare</i>	bull thistle	CIVU	B	FAC	E
<i>Cleome serrulata</i>	Rocky Mountain beeplant	CLSE		FACU	N
<i>Conium maculatum</i>	poison hemlock	COMA2	B	FACW	E
<i>Convolvulus arvensis</i>	field bindweed	COAR4		FACU	E
<i>Conyza canadensis</i>	Canadian horseweed	COCA5		FACU	N
<i>Croton texensis</i>	Texas croton	CRTE4			N
<i>Cosmos parviflorus</i>	southwestern cosmos	COPA12		FAC	N
<i>Cucurbita foetidissima</i>	buffalo gourd	CUFO		FACU	N
<i>Cyclachaena xanthifolia</i>	giant sumpweed	CYXA		FAC	N
<i>Cynoglossum officinale</i>	hound's tongue	CYOF		FACU	E
<i>Datura wrightii</i>	sacred thornapple	DAWR2			N
<i>Descurainia pinnata</i>	western tansymustard	DEPI			N
<i>Descurainia sophia</i>	herb sophia	DESO2			E
<i>Dieteria canescens</i>	hoary aster	MACA2		FAC	N
<i>Dipsacus fullonum</i>	Fuller's teasel	DIFU2	B	FAC	E
<i>Drymaria arenarioides</i>	alfombrilla	DRAR7			E
<i>Egeria densa</i>	Brazilian waterweed	EGDE		OBL	E

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

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

NMRAM Montane Riverine

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

NMRAM Montane Riverine

Species Name	Common Name	PLANTS code	Weed Class	Wetland Status	N/E
<i>Trifolium repens</i>	white clover	TRRE3		FAC	E
<i>Trifolium wormskioldii</i>	cows clover	TRWO		FACW	N
<i>Typha angustifolia</i>	narrowleaf cattail	TYAN		OBL	E
<i>Typha domingensis</i>	southern cattail	TYDO		OBL	N
<i>Typha latifolia</i>	broadleaf cattail	TYLA		OBL	N
<i>Urtica dioica</i>	stinging nettle	URDI		FAC	N
<i>Valeriana edulis</i>	edible valerian	VAED		FAC	N
<i>Verbascum thapsus</i>	common mullein	VETH		FACU	E
<i>Verbesina encelioides</i>	golden crownbeard	VEEN		FAC	N
<i>Veronica americana</i>	American speedwell	VEAM2		OBL	N
<i>Veronica anagallis-aquatica</i>	water speedwell	VEAN2		OBL	N
<i>Viguiera cordifolia</i>	heartleaf goldeneye	VICO			N
<i>Viguiera dentata</i>	toothleaf goldeneye	VIDE3		UPL	N
<i>Xanthisma gracile</i>	slender goldenweed	MAGR10		UPL	N
<i>Xanthisma spinulosum</i>	lacy tansyaster	MAPI			N
<i>Xanthium spinosum</i>	spiny cocklebur	XASP2	B	FAC	E
<i>Xanthium strumarium</i>	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

NMRAM Montane Riverine

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), and latitude and longitude 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 at each of the cross-sections for the Floodplain Hydrologic Connectivity metric. Four photos are taken at each cross-section; one each upstream and downstream from the middle of the channel if feasible, and one each facing each bank (bank left and bank right). These photo-points are recorded on the Photo Point Log located below the Floodplain Hydrologic Connectivity metric rating table in Appendix A (Table A1d).

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.

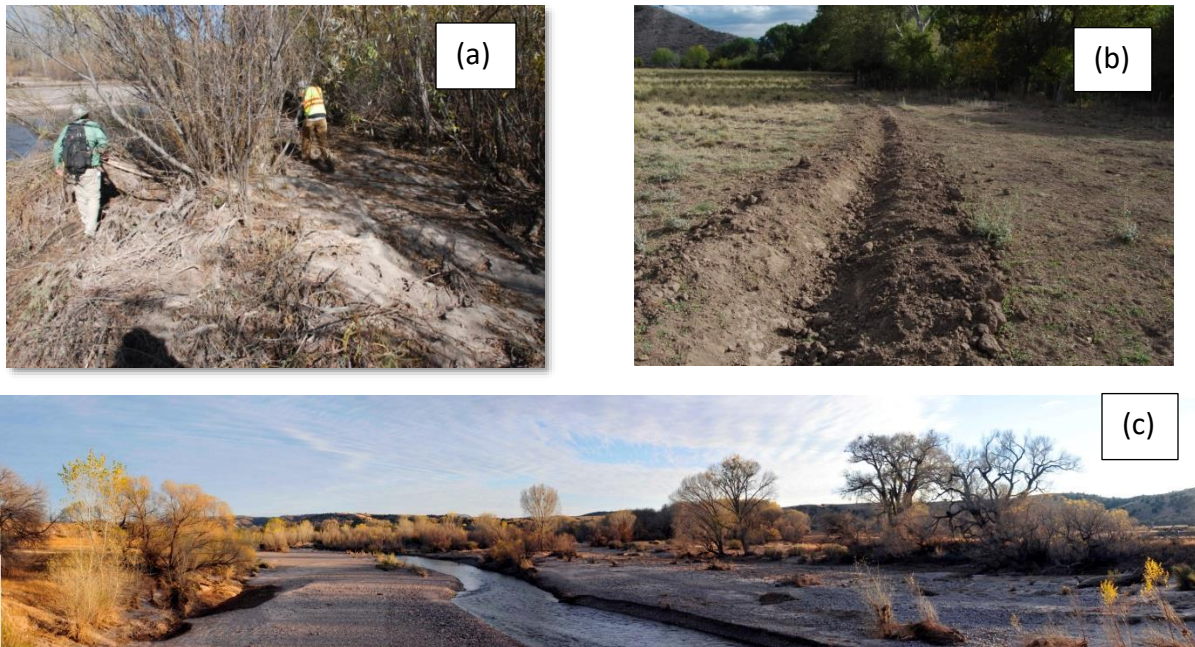


Figure E1. Example photos of conditions (a) along a channel of the SA and after a recent flood event that affected features on the floodplain, (b) of soil disturbance in the SA (ditch), and (c) panoramic overview of channel and floodplain. These photos support Abiotic metrics.

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 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 facing upstream, downstream, and of both banks to capture the bank conditions 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 cross section, and the digital names/numbers of each photograph looking upstream and downstream from the thalweg if feasible, and looking bank left and bank right across the stream from each location. Bank left is on the left of the observer, and bank right is on the right of the observer when facing in the direction of flow or downstream. Leave the cross-section tape and flags indicating bankfull in the ground when taking the bank left and bank right photos. A photo board with the SA name and cross-section information is recommended.

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 Physical Patch Complexity, Channel Equilibrium, Stream Bank Stability and Cover, 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 may be 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 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.