New Mexico Rapid Assessment Method

Montane Riverine Wetlands

Field Guide

Version 1.2

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NMRAM

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J. Welch measuring a stream cross-section on the Rio Santa Barbara 2009. Photo C. Flynn. Layout G. King

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(Version 1.2)

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The NMRAM Field Guide is available at http://www.nmenv.state.nm.us/swqb and http://nhnm.unm.edu.

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List of Acronyms

AA	assessment area
ac	acre
BI	Buffer Integrity Index
CRAM	California Rapid Assessment Method
CT	community type
dbh	diameter at breast height
EPA	U.S. Environmental Protection Agency
FG	Field Guide
GIS	geographic information system
GPS	global positioning system
ha	hectare
LUI	Land Use Index
m	meter
NAD27	North American Datum 27
NMRAM	New Mexico Rapid Assessment Method
QA/QC	quality assurance/quality control
RWSI	Relative Wetland Size Index
Sc	current size
Sh	historic size
sqr	square root
UTM	Universal Transverse Mercator
WGS83	World Geodetic System 83
WOI	wetland of interest

Introduction

This field guide complements the New Mexico Rapid Assessment Method (NMRAM) Manual by providing the specific protocols for metric measurements in a concise format to aid efficient and accurate implementation and data collection in the field. In addition to details on metric measurements, a suite of appendices is provided that includes field worksheets, a spreadsheet metric calculator to compute assessment scores, a New Mexico invasive species list, and examples of how to complete an assessment at a given wetland of interest (WOI).

This NMRAM Field Guide describes procedures for determining 1) the WOI and the Assessment Area (AA) and, 2) the rapid assessment measurements. The Field Guide is hierarchically organized into four attribute categories with associated metrics to evaluate the ecological condition of montane riverine wetlands. The four attribute categories are: Landscape Context, Size, Biotic, and Abiotic. Landscape Context contains four metrics that are evaluated before going into the field using maps and/or a geographic information system (GIS). Size is also usually mapped beforehand for a WOI and, together with the Landscape Context metrics, these are termed "Level 1" metrics. Below are specific protocols and associated worksheets for measuring and scoring pre-field Level 1 metrics and validating them in the field as necessary. The Biotic and Abiotic attributes contain five metrics each, and these are primarily evaluated in the field. Hence, these are termed "Level 2" metrics, with their own set of field worksheets (some elements of these metrics can be evaluated at Level 1, if appropriate, and high-quality maps are available).

The NMRAM is designed so that scores of individual metrics can be considered together, weighted, and rolled up into a single rank score representing the overall condition and function of a WOI. The rationale behind scoring procedures and the efficacy of any given metric are provided in the NMRAM Manual. Here, the field guide provides a Rank Calculator Worksheet and a companion electronic spreadsheet intended to be user-friendly tools for arriving at a final rank while tracking all the individual metric weights and scores. Using the worksheets, each metric is assigned a metric score using the rating tables embedded in the calculator or database and weighted by their percentage contribution within an attribute category.

The metric worksheets and Rank Calculator, 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 New Mexico Wetlands database (a comprehensive database currently under construction to provide free public access to information about wetland projects, habitats, and habitat condition).

NMRAM Assessment Package Overview

Pre-field Procedures

Pre-field steps include:

1. Determining and mapping the WOI in a GIS.
2. Defining and delineating the AA or multiple AAs within a WOI.
3. Verifying land ownership and obtaining the necessary permissions for sampling.
4. Generating field maps.
5. Acquiring and compiling the field equipment, guides, and worksheets.

Determining and Mapping the Wetland of Interest

Determining the boundary WOI is the first step in the NMRAM process, but how that determination is made may vary depending on user needs and objectives. The NMRAM requires no specific criteria but, as a minimum, the "natural rule" is suggested whereby **a wetland delineated in a mapping process should be at least 0.5 ha (1.2 acres) in size** and be composed of continuous natural wetland vegetation unbroken by major anthropogenic disturbance patches (e.g., roads, urban development over 10 m [33 feet] wide). The wetland may be a complex of one or more natural vegetation types, but all of them should be part of the same wetland subclass (i.e., Montane Riverine). The key is the lack of significant internal fragmentation caused by direct human disturbance and clear separation from other wetlands or wetland types. Figure 1 provides an example of a WOI delineation where the boundary follows this natural rule. While this natural rule is by default an approximation, it provides an operational guideline designed to meet the immediate needs of a rapid assessment when other procedures are not required or desired (e.g., jurisdictional wetland delineation). As necessary, the boundary may be modified based on the field reconnaissance or requirements at a project level. But regardless of how the boundary is determined, the designation of the WOI provides the foundation for delineation of the AAs and subsequent metric measurements.

Defining and Delineating the Assessment Area or Areas

An AA is a focus area unit within the WOI where the suite of assessment metrics is evaluated. While an AA can be placed randomly, given the limitation of time and personnel resources that often occurs, it should be placed to best capture the range of variation of vegetation patches within the WOI. At a minimum, there is one AA per WOI, but **for large WOIs two or more AAs may be required** to capture the range of variation (particularly if randomization is used). In addition, an AA may be constrained by logistical considerations such as ownership and access.

Following the guidelines below, a provisional AA is identified prior to going into the field and then modified as needed based on field indicators and constraints. The delineation of AAs should be done with care and decision rules documented because they are the context for most of the metric measurements.

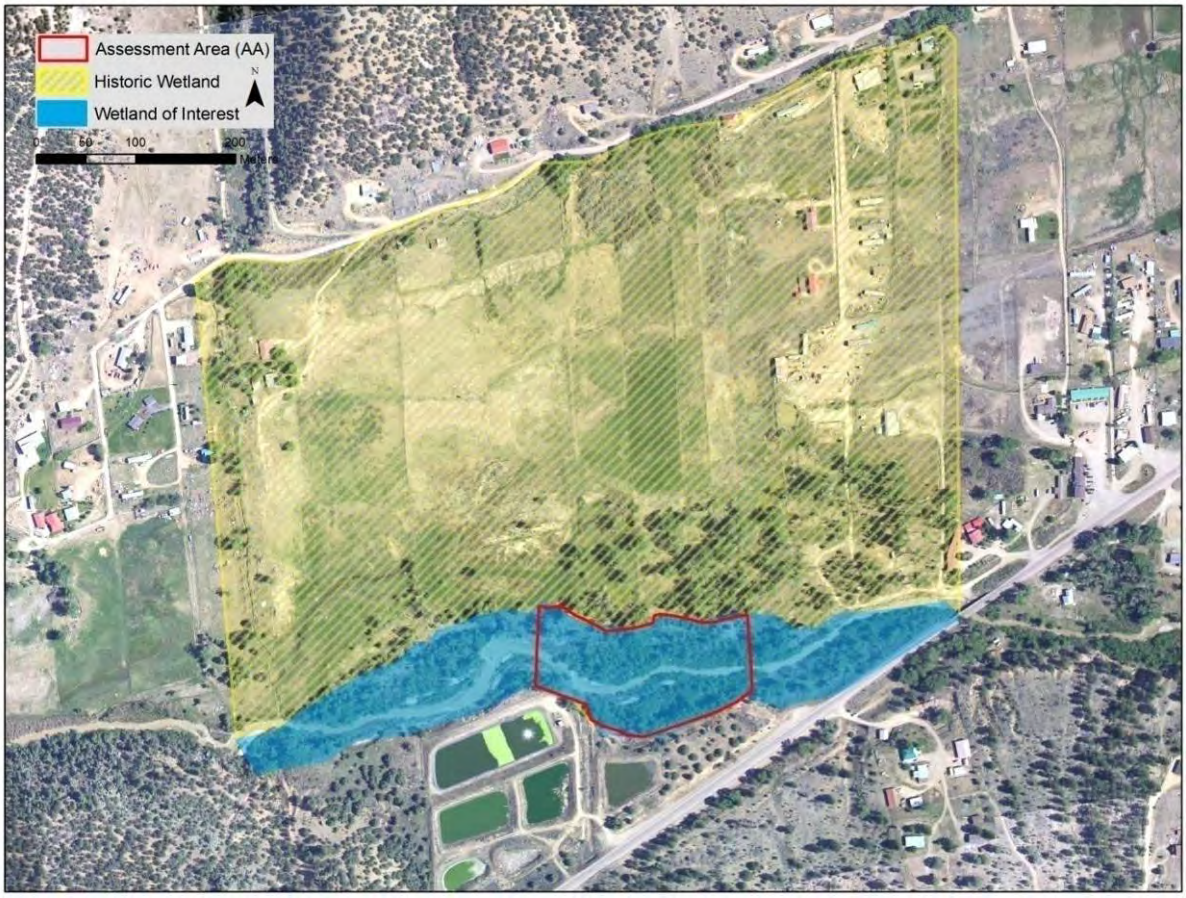

Figure 1. Delineation of the WOI relative to the historic wetland and the placement of an AA that is representative of the WOI. (Multispectral image produced by the University of Montana Flathead Biological Station.)

Lateral Extent of the AA

For the purposes of the NMRAM, the lateral extent (width) of the AA within the WOI is defined as the area that: influences the stream channel through allochthonous input; is influenced by active hydrological processes such as flooding, sediment deposition, scour, and groundwater recharge; and is characterized by wetland vegetation communities. Although this area may not correspond directly to the maximum area that may be flooded, for simplicity this lateral extent is referred to as the flood-prone width. Indicators of flood-prone width include, but are not limited to:

- Deposition of sand, gravel, and silt;
- Flat surfaces or terracing;
- Recent flood deposits or racking;
- Disturbance caused by water;

- Changes in soil type or vegetation communities (note that the transition from hydrophytic to upland vegetation is a surrogate measure of hydrology and fluvial processes); and
- Hydrological modifications that restrict flooding and could result in an artificially narrow flood-prone width, such as berms or levees.

It is also important to note that the flood-prone width should not be defined by land use.

For practical purposes of rapid field sampling, **the lateral extent is should not exceed 100 m (328 feet)** and may be less based on the above parameters.

Linear Extent of the AA

The NMRAM adopts a modification of the California Rapid Assessment Method (CRAM) (Collins et al. 2008) approach to determining the linear extent of the AA. **The linear extent should be roughly 10 times the channel width but at least 100 m (328 feet) and encompass at least two meander bends of the stream channel.** Optimally, the extent should not exceed 200 m (656 feet) to support rapid assessment, but may be longer to ensure the incorporation of two meander bends (if this is impractical, then the number of subsequent cross-section measurements will be reduced to at least two cross-section measurements). In addition, the AA should not cross hydrologic boundaries that affect flow volume or channel morphology. Changes in land use are not sufficient to delineate the AA boundary unless a notable change in hydrological conditions is evident. Examples of features that should be used to delineate AA 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;
- Tributary or channel confluences;
- Waterfalls; and
- Transitions between wetland types, such as beaver ponds, spring or seep-fed adjacent wetlands, or changes in subclass.

The linear extent of each AA is delineated in the GIS using aerial imagery interpretation and then verified in the field. For the calculation of the extent as 10 times the stream width, the stream width is determined as the distance between the greenlines—the line of perennial terrestrial vegetation closest to the barren shoreline, parallel to each shoreline. A series of three to five stream-width measurements should be made on either side of the center point of the location to be assessed and averaged for use in the calculation.

Land Ownership and Sampling Permissions

In general, sampling permissions on public lands will not be an issue unless the WOI is considered sensitive for management reasons. Local land management agencies should be contacted to confirm that the site is unrestricted with respect to access.

For sampling on private lands, permission for access should be sought as soon as the WOI has been identified and delineated. If the ownership is unknown, county 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 the delineation of the AA should be based where possible on biological and physical attributes, **lack of ownership permission may require adjusting the AA location and boundaries prior to field reconnaissance**.

Field Maps

Once the AA has been determined, field maps need to be generated in a format that is conducive to field mapping and supports the field reconnaissance survey. At least two maps are recommended. A WOI Map is at approximately 1:6,000 scale and shows the WOI and AA(s) in a landscape context (see Figure 1). A map at this scale will aid navigation to the site. Any modifications to the AA location that occur on site along with any field validation of Level 1 metrics that involve the buffer area around the AA should be sketched on the WOI Map. Specifically, the map should delineate the maximum extent of the potential buffer and include the buffer lines used to measure the Buffer Width submetric of the Buffer Integrity Index. A second AA Map at around 1:1,000 of the AA itself is necessary for on-site mapping and evaluation of vegetation communities and hydrological transect locations. The vegetation communities in an AA can be mapped prior to field reconnaissance and then validated and modified accordingly (see Assessing Level 2 Metrics). **Map copies should be made for each field team member** because of the different duties that each will be performing. A third optional map at 1:24,000 is often useful for locating a site relative to highways and towns.

Field Equipment, Guides, and Worksheets

Suggested equipment includes:

- One copy each of the WOI and AA maps for each team member;
- Data forms;
- Clipboards;
- Pencils;
- Water-resistant markers for labeling pin flags or other equipment that may come in contact with water;
- Global positioning system (GPS) unit and directions to site (with GPS coordinates);
- Digital camera;
- Compass, which is useful for accurately orienting field maps and conducting mapping exercises;

- Two stadia rods;
- 100-m measuring tape;
- Rebar and clamps to secure the measuring tape during hydrologic connectivity protocol;
- Pin flags to mark and corroborate bankfull indicators;
- Line levels or survey levels for very wide floodplains;
- Plant press;
- 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 didymo (*Didymosphenia geminata*), a microscopic algae that is considered a nuisance species, as well as whirling disease and other potential pathogens; and
- Waders: working in montane wetlands can be cold and footing unstable. Waders, wading shoes, or other footwear *without* felted soles is recommended; felted soles are known to transport didymo.

Rapid Assessment Metric Measurements

The rapid assessment of a WOI has two levels of investigation:

1. Level 1 metrics assessment using a GIS or other mapping tools; and
2. Level 2 metrics assessment and validation of Level 1 metrics during a field survey of the AA.

The assessment data are recorded on a suite of worksheets provided in Appendix A. For each WOI there is a WOI Cover Worksheet where the basic location and ownership data about a wetland and associated AA(s) are recorded, tracked, and then used along with summary descriptions and assessment information (see Appendix A). Following the WOI Cover Worksheet are worksheets for each metric that are primarily for use in pre-field GIS steps and for the field survey. The data from the worksheets are then used for metric rating and the assignment of a Condition Score and Rank for each AA using condition rank worksheets (Appendix B) or the companion spreadsheet calculator (Electronic Addendum). Some metrics are easily rated as part of the field survey, while others are better suited for post-field processing using the spreadsheet calculator. The final WOI condition score and rank assignment is primarily a post-field process, but results are posted to the WOI Cover Worksheet (see Post-field Procedures below).

Assessing Level 1 Metrics

Level 1 metrics include measurement of the WOI's current size and four Landscape Context metrics (Buffer Integrity Index, Riparian Corridor Connectivity, Relative Wetland Size, and Surrounding Land Use) that are measured in the context of the AA. While Level 1 metrics can be evaluated manually using topographic maps and aerial photographs, they are most easily measured using a GIS. The basic layers needed are:

1. Recent ortho-rectified aerial photography or satellite imagery with a minimum resolution of 1 m (3 feet), preferably less;
2. Roads and trails;
3. Ownership; and
4. 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.

The metrics are measured using the specific protocols provided below and are then entered into the various worksheets and the Rank Calculator as specified. To aid field validation of Level 1 metrics, the Level 1 worksheets are added to the field worksheet set.

Assessing Level 2 Metrics

Level 2 assessment includes five Biotic and five Abiotic metrics that are measured as part of the field survey of the AA. The field survey has two components:

1. A **reconnaissance** of the AA to map the major vegetation communities, evaluate the Biotic metrics, and validate targeted Level 1 metrics as needed.
2. A **channel and floodplain survey** that focuses on the evaluation of the Abiotic metrics related to the hydrology, geomorphology, and soils of the AA.

The **survey team is preferably composed of three members,** with one individual responsible for evaluating the Biotic metrics and verifying the Landscape Context and Size metrics, while the other individuals are responsible for evaluating the Abiotic metrics. The team member responsible for the Biotic reconnaissance should have a basic understanding of the local flora, particularly common dominant trees and shrubs, and whether they are native or introduced (exotic). In addition, this person should be familiar with state-listed noxious weeds that may occur in the area (Appendix C). For the channel and floodplain survey, team members should have basic training in measuring hydrological characteristics and recognizing floodplain geomorphic characteristics (Rosgen **Applied Fluvial Geomorphology** training is beneficial). A three-member team should divide the work as follows:

1. All team members conduct the reconnaissance survey.
2. The biotic team member completes the biotic assessment, verifies the Landscape Context and Size metrics, and completes the vegetation stressor checklist.
3. The two abiotic team members take the channel measurements and complete the abiotic assessment and the Hydrologic Modifications and Physical Structure stressor checklists.
4. The entire team collaborates to complete the Land Use stressor checklist.

Note: If only two team members are available, then they both work on the 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 of the site and personnel resources.

The Reconnaissance and Vegetation Mapping

The reconnaissance begins with confirming and filling in data on the WOI Cover Worksheet. It provides fields for location data, date, surveyors, WOI size, AA(s) location, etc., along with sections for narrative descriptions on landscape context, biota, hydrology, and soils of the WOI that are filled in as part of a walkthrough of the AA(s). If multiple AAs are being considered, they should be listed on the WOI Cover Worksheet with their own GPS locations and have their own sets of metric worksheets.

The first task for a given AA is to confirm the location and configuration of the AA before proceeding with the remainder of the metric evaluations. While the AA is initially mapped in the office prior to heading out into 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 AA configuration. Therefore, it is good practice to first check if the AA length meets the specifications outlined above, as well as any lateral constraints not detected in the imagery. The AA can be shifted or the configuration changed in the field as necessary to accommodate the specifications (e.g., three meander bends) or constraints (e.g., unforeseen ownership restrictions). **All changes to the AA configuration or location are recorded on the field maps and noted on the WOI Cover Worksheet.** Once the AA is confirmed, the Universal Transverse Mercator (UTM) coordinates at or near the center of the AA are recorded on the Cover Worksheet (taken from a GPS unit or U.S. Geological Survey topographic map).

As the foundation for evaluating the five Biotic metrics, a walkthrough of the AA is then conducted where vegetation communities are mapped by strata dominance (tall- and short-woody, and herbaceous)**.** A mapping procedure is followed because it makes fewer demands on the practitioner to know all vegetation species at a site (i.e., it requires only a basic knowledge of the major dominants in an area and limits the need for later identification when a given dominant species is not known).

While a draft of the vegetation community map may be prepared via GIS prior to the field survey, it will need to be field-verified. Hence, the simplest approach will likely be to chart the vegetation on a hardcopy aerial photograph map of the AA as part of the walkthrough of the AA. **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). Each polygon is labeled with a number, recorded on a polygon list (see Worksheet 6), and then evaluated with respect to **Vegetation Vertical Structure, Native Riparian Tree Regeneration, and Invasive Exotic Plant Species Cover metrics** (see Biotic metrics section). Polygons are also assigned to a running list of community types (CTs) based on the top two dominants in each strata. The CT list is used to evaluate **Relative Native Plant Community Composition**. To help with later interpretations and scoring, documentary photographs representative of each CT are recommended. A photo log datasheet is provided in Appendix A to track photographs and locations. When the species identification of a stratum dominant is uncertain:

- Collect and press a voucher specimen for later confirmation;
- Label each collection with the field species code and WOI and AA codes; and
- Circle the corresponding species code on the field worksheet for reference.

The reconnaissance also involves evaluating the **Buffer Condition submetric** of the Buffer Integrity Index (See Landscape Context metrics section) along the perimeter of the AA using the buffer lines as a guide to verify the **Buffer Percent** and **Buffer Width**, and to assess the **Buffer Condition**. In addition, other Level 1 elements may need to be validated as indicated on the Level 1 worksheets that were developed prior to the field survey. Lastly, a **Vegetation Stressor Checklist** is completed as part of the walkthrough to aid in interpretation of conditions. The attribute narratives on the WOI Cover Worksheet that describe AA conditions and impacts should also be completed at this time.

The Channel and Floodplain Survey

A channel and floodplain survey is conducted by two team members to evaluate five Abiotic metrics (See Abiotic metrics section). The channel and floodplain survey team should scope out where cross-sections for the **Hydrologic Connectivity** measurements will be placed during the initial site reconnaissance. The stream reach is divided into three more-or-less equal segments (upper, middle, and lower). Each segment should encompass at least one meander bend with a riffle zone where Hydrologic Connectivity can be measured using stream cross-sections. The cross-section measurements require two people for holding tapes and rods to measure entrenchment variables. In addition, photographs are taken in each direction on the cross-section, upstream and downstream, preferably at the mid-point of the channel. Photo-points are logged. **Channel Stability** and **Stream Bank Stability** are evaluated in each segment along the channel using field indicator checklists.

Macrotopographic Complexity and **Soil Surface Condition** also use checklists by segment but are evaluated as part of a walkthrough of the flood-prone width (a sketch map of major features of the floodplain is encouraged as an aid to filling out the checklist and for later interpretation). The field indicator checklists are designed to guide and remind surveyors in identifying important parameters and characteristics, but surveyors can add other indicators that are deemed important in a given AA. In addition to the field indicator checklists, there are **stressor checklists** for hydrological and soil/substrate impacts caused by human disturbances that are used to aid interpretation of channel and floodplain conditions.

Best Management Practices

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 away from wetlands and surface waters. All porous material (including felt-soled shoes, which are not recommended due to concerns about didymo) must be immersed in a 2%

bleach solution for five minutes or until thoroughly soaked, then rinsed or dried thoroughly. Any remaining solution must be poured away from vegetation.

Post-field Procedures

Assessment Scoring and the Rank Calculator

To arrive at a final **Wetland Condition Score** and **Wetland Condition Rank** for an AA, a Rank Calculator is provided as a manual worksheet in Appendix B or the companion spreadsheet calculator (Electronic Addendum). The Rank Calculator is hierarchically structured by major attribute categories with associated metrics and provides for weighting each metric and attribute class. Using the worksheets, ratings for each metric are entered into the calculator (see Rank Calculator Instructions below). The NMRAM metric and attribute weighting structure is built into the calculator such that individual and attribute category weighted scores can be calculated easily and then rolled up into a final numeric Wetland Condition Score between 4.0 (excellent) and 1.0 (poor) and a letter Wetland Condition Rank (A = Excellent, B = Good, C = Fair, and D = Poor). There is also a field to enter a summary of the ranking process and comments on the condition, stressors, or other issues as they relate to the WOI as a whole. Separate rank calculator worksheets are completed for each AA within a WOI.

A wetland in **excellent condition (A)** would be expected to have intact wetland functions and processes, diverse vegetative communities with no exotic weeds, and a large size relative to other wetlands and its historical size. These wetlands are undisturbed and would be considered reference communities.

A wetland in **good condition (B)** exhibits degradation in condition in response to an environmental stressor. These wetlands may have disrupted hydrological regimes, on-site anthropogenic disturbances, a reduction of vegetative community and structural diversity with the presence of exotic weeds, and a reduced size. Oftentimes, these wetlands would benefit from restoration. Wetlands in good condition may be the best available.

A wetland in **fair condition (C)** is heavily degraded in response to environmental stressors. These wetlands often exhibit disrupted hydrology, have a degraded vegetative condition marked by monotypic community types often with exotic and noxious weeds, and are small in size relative to other wetlands and its historical size. These wetlands may have some potential for restoration, depending on the stressor that is affecting the wetland condition and the nature of the existing wetland condition.

A wetland in **poor condition (D)** is not considered functioning wetlands. They are heavily degraded with a disrupted hydrology, poor vegetative composition and diversity often dominated by exotic and noxious weeds, and may be extremely small. These wetlands generally would not be considered good candidates for restoration.

Reporting and the New Mexico Wetlands Database

The final scores and ranks for all AAs sampled in the WOI are entered on the WOI Cover Worksheet. If there is more than one AA, the scores and rating are averaged and the final values entered. The final step is to complete a narrative **Assessment Summary** based on the condition ratings and stressor information from all AAs.

The worksheets, the ratings from the Rank Calculator, maps, and photographs together make up the **NMRAM Assessment Package,** which can be used in various ways as a reporting tool. Any of the package components can be used individually in project-level reports, but the package is also designed to aid direct entry into the New Mexico Wetlands Database. This database is intended as a comprehensive, central clearing house for information on New Mexico's wetlands. The database is currently under construction. When completed, the web interface will provide various reporting tools to facilitate the analysis of single and comparison of multiple sites from around the state. An update regarding the development of this database can be found on either the Natural Heritage New Mexico or NMED SWQB website along with the NMRAM Manual and Field Guide.

Metric Protocols

Wetland of Interest Cover Worksheet

The WOI Cover Worksheet tracks the assessment information of a WOI as whole and summary data on individual AAs.

Wetland of Interest General Information

General information to be recorded on the WOI Cover Worksheet includes:

1. Field Guide (FG) Page: refers back to the location of the protocol description in the Field Guide.
2. WOI Code: a unique database code that uses the official state alpha-numeric designation for a watershed and stream followed by the kilometers upstream from its confluence with the next lower designated stream segment (e.g., 28Cabres004.1 or 29RTusas008.6). The WOI code is assigned in GIS and is measured to the center of the WOI.
3. WOI Name: a descriptive name assigned to a WOI Code.
4. Wetland Subclass: the NMRAM wetland subclass that the WOI falls within.
5. Other Site Designation: alternative names or codes for a WOI from agencies, organizations, or other relevant database.
6. General Location: descriptive narrative of location in relation to local landmarks, towns, highways, etc.
7. Ownership: specify public and/or private owners and contact information where available.
8. Surveyors: list up to three field surveyors and their roles (e.g., botany, hydrology, etc.).

Assessment Area List

Lines are provided for listing up to three AAs for the WOI with their GPS locations in UTM coordinates with datum (World Geodetic System 83 [WGS83] or North American Datum 27 [NAD27]) and zone (e.g., most of New Mexico is Zone 13, the western edge is Zone 12), field survey dates, and start and end times of the field survey.

WOI Description

Size data and summary descriptive narratives for the WOI based on the AA(s) include:

1. WOI Size: the size of the extant wetland following the natural-rule mapping criteria proposed above or other procedure (indicate in comments). Check-off as either hectares (ha) or acres (ac).

2. Landscape Context: narrative summary of the WOI surrounding landscape that includes condition and impacts and an explanation of the hydrologic breaks or other factors that may define AA(s) limits.
3. Biotic Condition: narrative summary of WOI vegetation patterns, composition and structure, exotics and invasives, disturbance evidence of fire and herbivory, and other biotic features based on the AA(s).
4. Abiotic Condition: narrative summary of hydrological conditions and alterations (e.g., dams, walls, etc.), flooding characteristics and evidence of over-bank flooding, soil disturbance, and other site impacts.

WOI Assessment Summary

The rating scores for each AA are posted here by major attribute class and overall numeric Condition Score and assigned Condition Rank from the Rank Calculator(s) (see Appendix B).

1. WOI Summary: the average of the AA scores by attribute class.
2. WOI Condition Score: the average numeric condition score for the WOI.
3. WOI Condition Rank: the final assigned Condition Rank where A = Excellent, B = Good, C = Fair, and D = Poor condition.
4. WOI Assessment Summary: narrative summary of the assessment including any remarks on contingencies and significant characteristics of the WOI (both positive and negative).

Landscape Context Metrics

Buffer Integrity Index [Worksheets 1a, 1b, and 1c]

The Buffer Integrity Index is composed of three submetrics:

1. *Buffer Percent*: the percentage of the area surrounding a wetland AA that is considered a natural or semi-natural buffer.
2. *Buffer Width*: the average width of the extant buffer.
3. *Buffer Condition*: the extent and quality of vegetation cover and the overall condition of substrate in the extant buffer.

Buffer Percent [Worksheet 1a]

The following is used to determine Buffer Percent:

1. Using aerial photography or field reconnaissance, delineate the outer boundary of the AA buffer based on *allowed* buffer elements per Worksheet 1a (Figure 2).
2. Check off buffer elements that occur on the worksheet. The maximum width of the buffer from the AA boundary is 250 m (820 feet).

3. Do not include any areas less than 5 m (16 feet) wide as buffer; i.e., the minimum buffer width is 5 m (16 feet).
4. Estimate the percentage of the AA perimeter that is flanked by "included" buffer elements and then score the AA using Table 1 below.
5. Enter value on the worksheet. Enter the rating in the L1a box of the Rank Calculator Worksheet (or spreadsheet).

Table 1. Buffer Percent rating table

Rating	States
4	Buffer is 75%–100% of occurrence perimeter
3	Buffer is 50%–74% of occurrence perimeter
2	Buffer is 25%–49% of occurrence perimeter
1	Buffer is < 25% of occurrence perimeter

Source: Collins et al. (2008); Faber-Langendoen (2008a).

Buffer Width [Worksheet 1b]

Buffer width is measured using the following steps (modified from Collins et al. 2008):

1. Identify areas in which open water is within 5 m (16 feet) of the AA. These areas are excluded from buffer calculations.
2. Draw a series of 8 lines perpendicular to the perimeter of the AA at even intervals around the AA where buffer occurs and extending to the buffer boundary or a non-buffer element as defined under Buffer Percent. Label the lines A through H. No lines should extend upstream or downstream or parallel to the river channel.
3. Measure the length of each line and enter the values on Worksheet 1b.
4. Calculate the average buffer width among the measured lines and rate the AA using Table 1b. Enter score in the L1b box of the Rank Calculator Worksheet (or spreadsheet).

Refer to Figure 2 below for an example.

Table 1b. Buffer Width Rating Table

Rating	States
4	Average buffer width > 200 m (>656 feet)
3	Average buffer width 100–199 m (328–653 feet)
2	Average buffer width 50–99 m (164–325 feet)
1	Average buffer width < 50 m (<164 feet)

Buffer Condition [Worksheet 1c]

As part of the field reconnaissance, the buffer condition along the perimeter of the AA is evaluated. Estimate the percentage of non-native vegetation cover in the buffer and qualitatively assess the degree of soil disturbance within the last three years, trash or refuse accumulation, and human visitation and/or recreation intensity using Table 2. Enter the score in the L1c box of the Rank Calculator Worksheet (or spreadsheet).

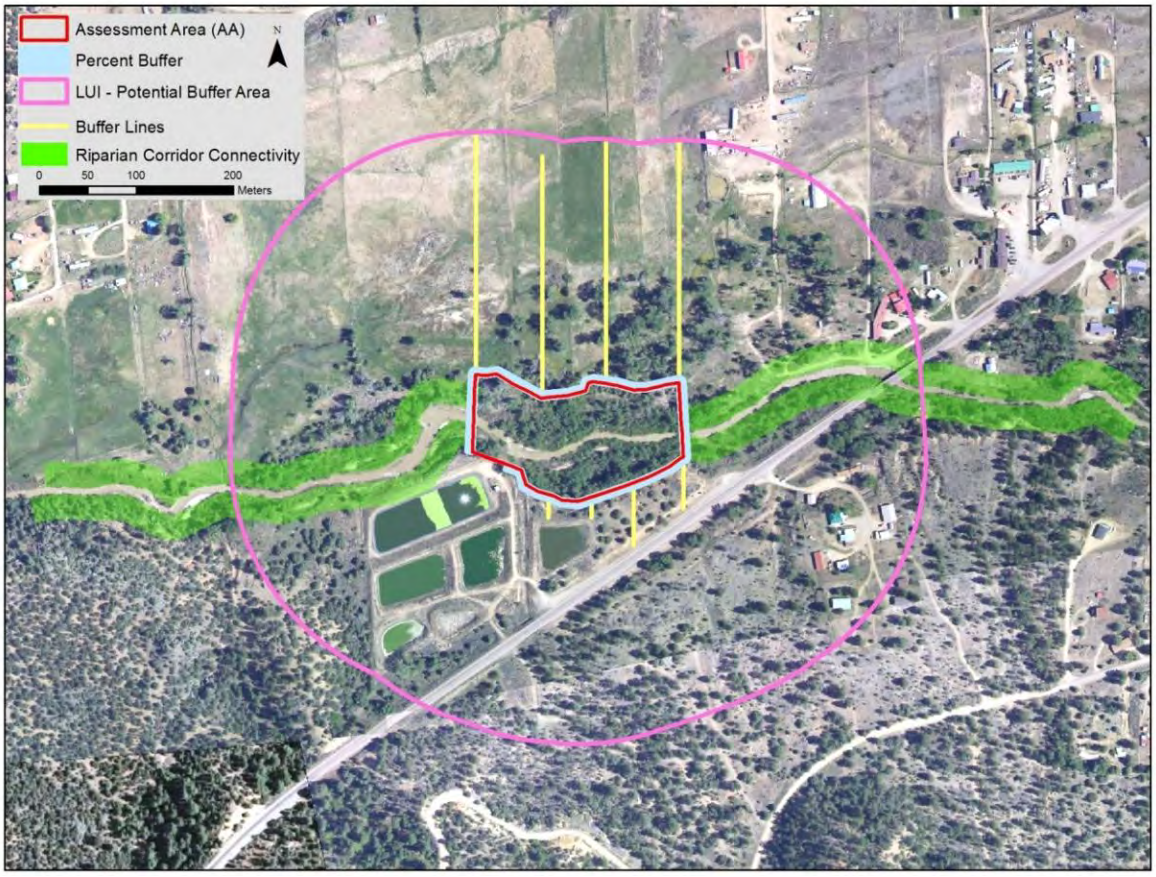

Figure 2. Buffer Integrity and Riparian Corridor Connectivity delineation and measurement. Buffer lines along the southern boundary were terminated at "non-buffer" elements such as roads and artificial ponds. The blue line represents the portion of the AA perimeter bounded by "included" buffer elements. Riparian Corridor Connectivity is evaluated 500 m (1,640 feet) upstream and downstream on both banks. The Potential Buffer Area extends out 250 m (820 feet) from the AA boundary and also serves as the area for evaluating the Land Use Index (LUI). (Multispectral image produced by the University of Montana Flathead Biological Station)

Table 2. Buffer Condition Rating Table

Rating	States
4	Buffer for occurrence is characterized by abundant (>95%) cover of native vegetation and little to no (<5%) cover of non-native plants, with intact soils and little or no trash or refuse.
3	Buffer for occurrence is characterized by substantial (75%–95%) cover of native vegetation, low (5%–25%) cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
2	Buffer for occurrence is characterized by a moderate (50%–75%) cover of native plants and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
1	Buffer for occurrence is dominated by non-native plant cover (>50%) characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation, or there is no buffer present.

Buffer Integrity Index Rating [Worksheet 1d]

The following is used to calculate the Buffer Integrity Index Rating:

1) Enter the metric sub-scores (Buffer Percent, Buffer Width, and Buffer Condition) in the L1 box of the Rank Calculator Worksheet and calculate the Buffer Integrity Index with the formula Buffer Integrity Index = (Buffer Condition x (Buffer Percent x Buffer Width)^{½})^{½}. The score can also be calculated manually on the field worksheet.
2) Using Table 3, enter a final rating in the L1 box of the Rank Calculator Worksheet (can be calculated automatically using the spreadsheet version as part of post-field procedures)**.**

Table 3. Overall Summary Rating Table for the Buffer Integrity

Rating	Description
4	Buffer Integrity Index Score > 3.5
3	Buffer Integrity Index Score = 2.5–3.4
2	Buffer Integrity Index Score = 1.5–2.4
1	Buffer Integrity Index Score < 1.5

Riparian Corridor Connectivity [Worksheet 2a, 2b, and 2c]

This metric can be evaluated using a spatial analysis in a GIS (Level 1) assessment and/or with a field reconnaissance (Level 2).

Modified from Collins et al. (2008), this metric is assessed as the total length of non-connectivity land cover elements that interrupt the riparian corridor within 500 m (1,640 feet) upstream or downstream of the AA (see Figure 2). For this metric, a break in the riparian corridor is defined as any non-connectivity land-cover element that comes within 25 m (82 feet) of the active channel bank and extends for 10 m (33 feet) or more (**see Worksheet 2a for definitions of land cover elements that pertain to the riparian corridor)**. Unlike the CRAM (Collins et al. 2008), areas of non-natural vegetation, unpaved roads, and vegetated levees are considered interruptions of connectivity.

The guidelines for assessing Riparian Corridor Connectivity are:

- Assume a minimum riparian width of 25 m (82 feet) from each river bank upstream and downstream of the AA for a total corridor width of 50 m (164 feet) plus the width of the stream.
- Assume that open water areas serve as connectivity.
- Limit the minimum length for any non-buffer segment (measured parallel to the channel) to at least 10 m (33 feet). Assign all roads a minimum width of 10 m (33 feet).
- For wadeable systems or GIS-determined evaluations, assess both sides of the channel upstream and downstream of the AA.
- For systems that cannot be waded, only assess the accessible side of the channel, upstream and downstream of the AA.

The procedural steps for assessing Riparian Corridor Connectivity are:

- Extend 500 m (1,640 feet) upstream and downstream along both river banks from the AA boundaries.

- Using the site imagery or field reconnaissance, measure the length of all non-connectivity land-cover patches (see Worksheet 2a) that interrupt the riparian area on at least one side of the channel over the 500-m (1,640-foot) length and that are within 25 m (82 feet) of the active river channel and at least 10 m (33 feet) long. Do not consider open water as an interruption. Record lengths by segment and bank (L = left bank or R = right bank facing downstream) in the respective map or field columns on Worksheet 2b. Check off elements used on Worksheet 2a.

- Sum the length of non-connectivity patches identified in the upstream and downstream segments. Enter on Worksheet 2b.

- Calculate the percentage of non-connectivity for the upstream and downstream segments by dividing by 500 m [1,640 feet] if only one side of the channel was measured or by 1,000 m [3,281] feet if both sides were measured. Enter on Worksheet 2b.

- Use Table 4 to assign sub-scores for the upstream and downstream segments based on the percentage of non-connectivity. Enter on Worksheet 2b.

- Add the sub-scores together for the upstream and downstream lengths, which will provide the raw metric score. Enter on Worksheet 2c. Convert the raw score to a final rating score for Riparian Corridor Connectivity using Table 5. Enter the value in the L2 box of the Rank Calculator Worksheet (or spreadsheet).

Table 4. Riparian Corridor Connectivity Sub-score Assignments Based on Upstream and Downstream Segments Percent Fragmentation

Percent Fragmented	Sub-score
≤ 5%	16
> 5 and ≤ 10	15
> 10 and ≤ 15	14
> 15 and ≤ 20	12
> 20 and ≤ 25%	9
> 25 and ≤ 30%	8
> 30 and ≤40%	6
>40%	4

Table 5. Overall Summary Rating Table for Riparian Corridor Connectivity

Rating Score	Raw Score (sum of sub-scores)
4	>28
3	20–27
2	12–19
1	<12

Relative Wetland Size [Worksheet 3]

Determining the historical size of riverine wetlands can be problematic given their potential for extended linear distribution upstream and downstream, plus the difficulty in ascertaining the limits of the lateral extent of the historical active floodplain. Accordingly, the NMRAM takes a proximal, pragmatic index approach that can provide a first approximation of wetland size reduction. The steps for determining historical size are:

1. Using the mapped WOI, extend lines laterally (perpendicular to the channel) from the upstream and downstream ends of the current wetland polygon in both directions to the edge of the floodplain within the drainage. Exclude ancient alluvial terraces, e.g., several thousand years old or more and that appear to support upland type vegetation.
2. Connect the lateral lines along the upland on both sides of the channel to create a single polygon (see Figure 2 above). Calculate or estimate the area and enter the value as WOI historical size on Worksheet 3.

   This is an estimate of potential maximum size of the riverine wetland constrained by the current WOI extent upstream and downstream. The Relative Wetland Size Index (RWSI) metric is computed as the percent reduction from historical size:

   $$RWSI = (1-(S_c / S_h)) *100$$

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

3. Compute the RWSI using Worksheet 3 and rate using Table 6 or the Rank Calculator Worksheet (or spreadsheet).

Table 6. Relative Wetland Size Rating Based on the Ratio of Current Size to Historical Size

Rating	Description
4	RWSI <10%. Wetland is at, or only minimally reduced from its full original, natural extent and has not been artificially reduced in size.
3	RWSI between 10% and 39% wetland reduction.
2	RWSI between 40% and 79% wetland reduction.
1	RWSI ≥80% wetland reduction from its original, natural extent.

Surrounding Land Use [Worksheet 4]

This metric is measured by documenting the intensity of land use in the area that represents the potential buffer area, that is, the area extending from the boundary of the AA out 250 m (820 feet) (see Figure 2 above) and includes the AA and that portion of the riparian corridor within 250 m (820 feet) of the AA. This is primarily a Level 1 metric where, using current aerial photography and/or GIS data, a Land Use Index (LUI) is calculated based on estimating the percent cover across the target area of each land use type provided in Worksheet 4. The assessor should indicate if the area estimate is map- or field-based.

A spreadsheet calculator for the metric has been provided to simplify the scoring process. If the spreadsheet is not available, the LUI can be calculated by hand using Worksheet 4 that follows the formula:

Land Use Index (LUI) = ∑ LU Coefficient x Percent of Buffer Area

Where: LU Coefficient = Land Use Coefficient for a land use type (Table 3.12); Percent of Buffer = percentage of the buffer for a land use type.

1. Rate Surrounding Land Use based on Table 7 and enter the value in the L4 Box of the Rank Calculator Worksheet (or spreadsheet).

Table 7. Ratings for Surrounding Land Use Based on the Ranges of LUI Scores

Rating	Land Use Index Score
4	95–100
3	80–94
2	40–79
1	< 40

Size Metric

Absolute Wetland Size [Worksheet S1]

Absolute Wetland Size can be determined from existing maps or through a custom-mapping process described under the assessment methods here (using either GIS or manually). Once a wetland area site has been delineated, the total area is then calculated using either GIS or manually estimated using a dot-grid or similar manual area estimator. After determining Absolute Wetland Size,

1. **Enter the area on the Cover Worksheet**.
2. Rate Absolute Wetland Size based on the area calculation using Table 8. Enter the value on the Rank Calculator Worksheet.

Table 8. Ratings for Absolute Wetland Size

Rating	Size	Description
4	> 10 ha (>25 acres)	Wetland size is very large compared to other examples of the same type and potentially capable of supporting a wealth of biodiversity in a functional sustaining ecosystem.
3	> 5 and ≤ 10 ha (>12 and ≤25 acres	Wetland size is large compared to other examples of the same type (e.g., within 10%–30%, based on known and historic occurrences).
2	>2 and ≤ 5 ha (>5 and ≤ 12 acres)	Wetland size is moderate compared to other examples of the same type (e.g., within 30%–70% of known or historic sizes).
1	≤ 2 ha (≤ 5 acres)	Wetland size is too small to sustain full diversity and full function of the type (e.g., smallest 30% of known or historical occurrences).

Biotic Metrics

Relative Native Plant Community Composition [Worksheets 5 and 6]

This metric is based on the vegetation map polygons (Worksheet 5) described above in which each polygon is assigned to community types (CTs) during the reconnaissance and, in turn, the CTs are evaluated with respect to native species composition and their relative abundance. The polygon assignment to CTs is an iterative process whereby the first polygon visited is described with respect to the two top dominant species by height strata using Worksheet 6. There are three strata: a Tall Woody Strata composed of trees and shrubs greater than 5 m tall (15 feet); a Short Woody Strata of trees and shrubs under 5 m (15 feet); and a 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 10% before a species is recorded; for the herbaceous strata, total cover must be greater than 5%. The species are recorded in the order of their relative abundance by strata, and a species can only appear 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 polygon number from Worksheet 5 is recorded in the respective CT "Polygon No.'s" box on Worksheet 6. The next polygon visited is either assigned to the same CT on Worksheet 6 if it has the same composition and structure or, if not, a new CT is designated and the polygon assigned to it. This process is continued for all polygons mapped in the AA. **Collect voucher specimens for unknown species** (circle the code)**. Documentary photos of the various CTs are recommended and are logged on the Photo Point Log Sheet** (Worksheet 14f).

Once the CT list has been compiled and the polygons assigned, the relative abundance of each CT is estimated as a percentage of the entire AA and entered as a decimal number in the "% AA" box on Worksheet 6 (this can be done in the GIS or simply visually estimated). For each mapped CT, a Raw Community Type Native Score is assigned based on native versus exotic composition of the dominants in each strata following the guidelines in Table 9. This value is entered into the "Raw score" box on Worksheet 6 and multiplied by the % AA value to arrive at an area-weighted score ('Wt score" box). The weighted scores are summed to give the Final Weighted CT Native Composition Score for the AA, and this, in turn, is used to rate the Relative Native Plant Community Composition metric using Table 10 (also available in the spreadsheet calculator).

Evaluating species composition of a herbaceous wetland along the Rio Hondo (Photo: C. Flynn)

Table 9. CT Native Composition Scoring. E = exotic-dominated CT strata; N/E = mixed exotic native CT strata; N = native-dominated CT strata or strata naturally absent.

CT Score	Trees (>10% Cover)	Shrubs (>10% Cover)	Herbs (>5% Cover)
Forested Wetland			
0.00	E	E or absent	E or absent
0.25	E	E or absent	N/E or unknown
0.50	E	E or absent	N
0.75	E	N/E or unknown	E or absent
1.00	E	N/E or unknown	N/E or unknown
1.15	E	N/E or unknown	N
1.30	E	N	E or absent
1.40	E	N	N/E or unknown
1.50	E	N	N
1.60	N/E or unknown	E	E
1.70	N/E or unknown	E	N/E or absent or unknown
1.80	N/E or unknown	E	N
1.90	N/E or unknown	N/E or unknown or absent	E
2.00	N/E or unknown	N/E or unknown or absent	N/E or unknown or absent
2.10	N/E or unknown	N/E or unknown or absent	N
2.20	N/E or unknown	N	E
2.30	N/E or unknown	N	N/E or absent or unknown
2.40	N/E or unknown	N	N
2.50	N	E	E
2.60	N	E	N/E or unknown
2.70	N	E	N or absent
2.85	N	N/E or unknown	E
3.00	N	N/E or unknown	N/E or unknown
3.25	N	N/E or unknown	N or absent
3.50	N	N or absent	E
3.75	N	N or absent	N/E or unknown
4.00	N	N or absent	N or absent
Shrub Wetland			
0.00		E	E or absent
0.50		E	N/E or unknown
1.00		E	N
1.50		N/E or unknown	E
2.00		N/E or unknown	N/E or unknown or absent
2.50		N/E or unknown	N
3.00		Native	E
3.50		Native	N/E or unknown
4.00		Native	N or absent
Herbaceous Wetland			
0.00			E
2.00			N/E or unknown
4.00			N
Sparsely Vegetated			
0.00			Human-disturbed ground (e.g., roads, cleared areas)
2.00			Mixed natural/human-disturbed ground
4.00			Natural disturbed ground (e.g., sand bars, side channels)

Table 10. Relative CT Native Composition Rating. Sites are rated into classes based on the range of the Site CT Native Score.

Rating	Site CT Native Score
4	≥ 3.5 (≈ <10% non-native)
3	≥ 2.75 and <3.5 (≈ 10%–20% non-native)
2	≥ 2.0 and <2.75 (≈ 20%–50% non-native)
1	<2.0 (≈ <50% non-native)

Vegetation Horizontal Patch Structure [Worksheet 7]

Horizontal Patch Structure is an assessment of the general vegetation patch diversity and complexity of the patch pattern. The following is used to assess Horizontal Patch Structure:

1. Using the vegetation patch map developed as part of the reconnaissance survey, rate the mapped vegetation pattern that best matches the schematic diagram (Figure 3) using Worksheet 7 and the rating value assigned per Table 11. Each patch comprises at least 5% and is a minimum of 0.1 ha (0.25 acres) of the AA. Enter the value on the Rank Calculator Worksheet.

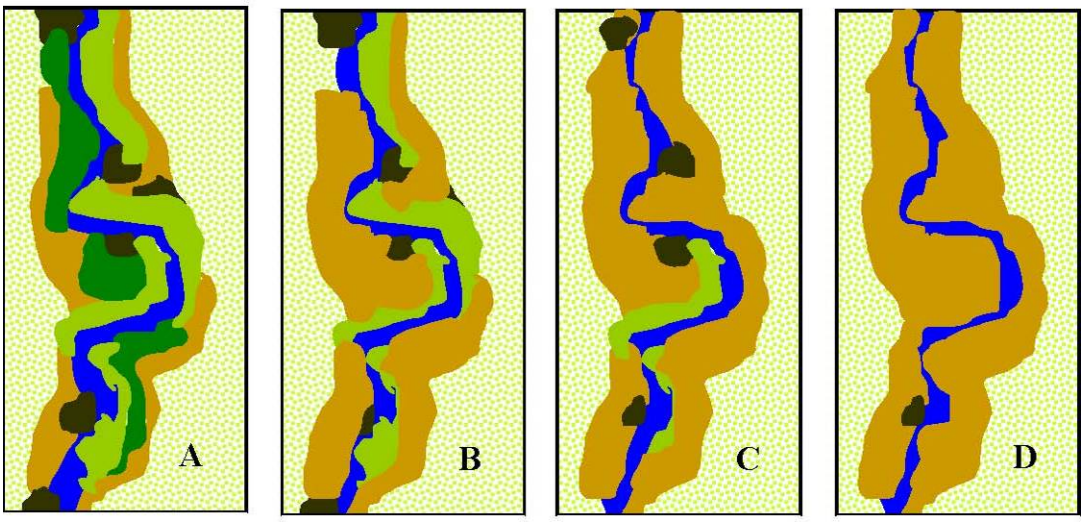

Figure 3. Schematic diagrams illustrating varying degrees of interspersion of plant patches for riverine wetlands (from Collins et al. 2008).

Overall vegetation horizontal patch structure ratings are provided in Table 11 (from Collins et al. 2008).

Table 11. Ratings for Overall Vegetation Horizontal Patch Structure

Rating	Alternative States
4	AA has a diverse patch structure (>4 patch types) and complexity. A dominant patch type would be difficult to determine.
3	AA has a moderate degree of patch diversity (3 patch types present) and complexity. A single, dominate patch type may be present, although the other patch types would be well represented and have more than one occurrence in the AA.
2	AA 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 AA.
1	AA has essentially little to no patch diversity or complexity. The AA is dominated by a single patch type. Other patch types, if present, occur infrequently and occupy a small portion of the floodplain.

Vegetation Vertical Structure [Worksheet 5]

Vegetation Vertical Structure is evaluated during the reconnaissance and mapping. Each mapped patch is assigned one of the six vertical structure classes, as defined by Hink and Ohmart (1984) (**see figures following**). For each mapped patch type,

1. Assign the dominant structure type and enter values on Worksheet 5.
2. Rate the AA based on criteria in Table 12 using the data from Worksheet 5 and enter the rating score on the Rank Calculator Worksheet.

Vegetation Vertical Structure ratings for the AA are based on various combinations of the structure type classes. The more structural types that are present, the higher the rating.

Table 12. Ratings for Vegetation Vertical Structure

Rating	Alternative States
4	High-structure forest (Type 1 or 3) **plus** shrubland (Type 5) **and/or** herbaceous (Type 6) or Low-structure forest (Type 2 or 4) **plus** shrubland (Type 5) **and** herbaceous (Type 6)
3	High-structure forest (Type 1 or 3) alone or High-structure forest (Type 1 or 3) **plus** only low structure forest (Type 2 or 4) or Low-structure forest (Type 2 or 4) **plus** shrubland (Type 5) **or** herbaceous (Type 6)
2	Low-structure forest (Type 2 or 4) alone or Shrubland (Type 5) **and** herbaceous (Type 6)
1	Shrubland (Type 5) alone or Herbaceous (Type 6) alone

Vegetation Vertical Structure Type Definitions (from Callahan and White 2004)

Multiple-Story Communities (Woodlands/Forests)

Type 1 – Tall trees with a well-developed understory.

Tall or mature to mixed-aged trees (>12 m [40 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (0–4.6 m [0–15 feet]) covering >25% of the area of the community (polygon). Substantial foliage is in all height layers. Photograph from Callahan and White (2004).

Type 2 – Tall trees with little or no understory.

Tall or mature to mixed-aged trees (>12 m [40 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (0–4.6 m [0–15 feet]) covering <25% of the area of the community (polygon). Majority of foliage is over 9 m (30 feet) above the ground. Photograph from Callahan and White (2004).

Type 3 – Intermediate-sized trees with dense understory.

Intermediate-sized trees (6–12 m [20–40 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (0–4.6 m [0–15 feet]) covering >25% of the area of the community (polygon). Majority of foliage is between 0 and 9 m (0–30 feet) above the ground. Photograph from Callahan and White (2004).

Type 4 – Intermediate-sized trees with little or no understory.

Intermediate-sized trees (6–12 m [20–40 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (0–4.6 m [0–15 feet]) covering <25% of the area of the community (polygon). Majority of foliage is between 4.6 and 9 m (15–30 feet) above the ground. Photograph from Callahan and White (2004).

Single-story Communities (Shrublands and Herbaceous)

Type 5 – Stands with dense, shrubby growth.

Young tree and shrub layer only (1.5–4.6 m [5–20 feet]) covering >25% of the area of the community (polygon). The majority of vegetation is between 0 and 4.6 m (0–15 feet] and may include herbaceous vegetation underneath the woody vegetation. Photograph from Callahan and White (2004).

Type 6 – Very young, low growth, and herbaceous.

Young understory layer (0–1.5 m [0–5 feet]) or herbaceous vegetation covering >25% of the area of the community (polygon). Majority of foliage is between 0 and 1.5 m (0–5 feet). Photograph of upper Rio Santa Barbara by Y. Chauvin, 2009.

Native Riparian Tree Regeneration [Worksheet 5]

The following is used to evaluate Native Riparian Tree Regeneration:

1. During the reconnaissance survey, estimate percent cover of native tree seedlings, saplings and poles in each polygon in Worksheet 5.

   Seedlings: <5 cm [2 inches] diameter at breast height [dbh] <1.5 m [5 feet] height).
   Saplings (<5 cm [2 inches] dbh; > 1.5 m [5 feet] height.
   Poles (5–13 cm [2–6 inches] dbh).
2. Rate the AA based on polygon percent covers and patch density as presented in Table 13. Enter rating score on the Rank Calculator Worksheet (or spreadsheet).

Table 13. Native Riparian Tree Species Regeneration Rating

Score	Native Riparian/Wetland Tree Seedling and Saplings Regeneration
4	Native poles, saplings, and seedling trees well represented; obvious regeneration, many patches or polygons with >5% cover; typically multiple size (age) classes
3	Native poles, saplings and/or seedlings common; scattered patches or polygons with 1%–5% cover; size classes few.
2	Native poles, saplings and/or seedlings present but uncommon; restricted to one or two patches or polygons with, typically <1% cover); little size class differentiation.
1	Native poles, saplings, and/or seedlings absent (0% cover).

Source: Lemly and Rocchio (2009).

Invasive Exotic Plant Species Cover [Worksheets 5 and 8]

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

1. List the invasive exotic species found in the AA and estimate the total cover of invasive species within each mapped polygon on Worksheet 5.
2. Based on the polygon values and roughly noting the percentage coverage by each mapped patch type, estimate the average percentage cover of invasive exotic species for the AA and enter the value on Worksheet 8, being particularly mindful of the percentage break points used for rating this metric (Table 14). For invasive shrubs or trees (e.g., saltcedar), it may be possible to assess this metric in GIS using fine-scaled satellite imagery or aerial photographs with ground control. However, invasive herbaceous species require on-the-ground survey of the site.
3. Rate Invasive Exotic Plant Species Cover based on the estimated percent cover across the AA provided in Table 14. Enter the rating score on the Rank Calculator Worksheet.

Table 14. Ratings for Invasive Exotic Plant Species Cover Based on Percent Cover across the AA

Rating	Relative Cover of Invasive Exotic Plant Species
4	Key invasive species <1% cover
3	Key invasive species 1%–5%
2	Key invasive species 5%–10%
1	Key invasive species >10%

Modified from Faber-Langendoen et al. (2008).

Abiotic Metrics

Hydrologic Connectivity [Worksheet 9]

Hydrologic Connectivity is assessed based on the degree of channel entrenchment (Leopold et al. 1964; Rosgen 1996). 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, and flood-prone width is measured at the elevation of twice the maximum bankfull depth.

Hydrologic Connectivity should be assessed at three typical cross-sections, one each in the upper, middle, and lower segments of the reach, depending on the linear extent of the AA. **The measurements should be made within each riffle section, the straight section, or inflection point between two meander curves (Figure 4).** 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 overestimate the 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 AA will contain two meander bends, allowing for the establishment of three transects. In the event that this condition is not met, the number of transects 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, transects should be located in the rapids between the pools (Figure 5).

Identifying bankfull and measuring the flood prone width based on twice the bankfull depth (Photos: C. Flynn)

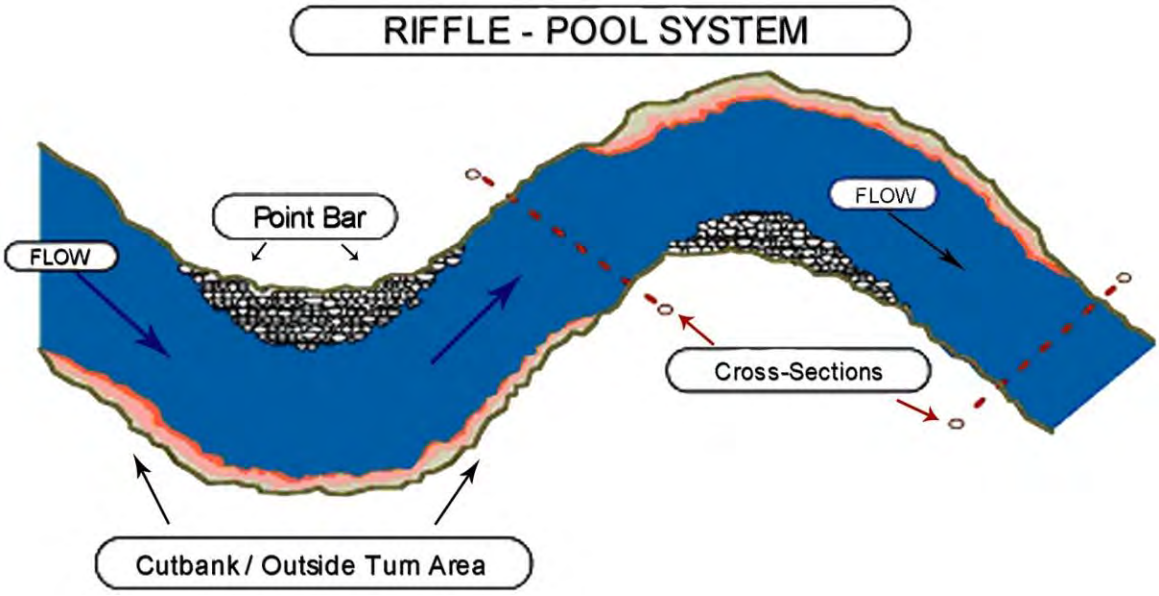

Figure 4. Cross-section locations for riffle-pool systems (reproduced from EPA 2011 after Silvey in Rosgen, 1996).

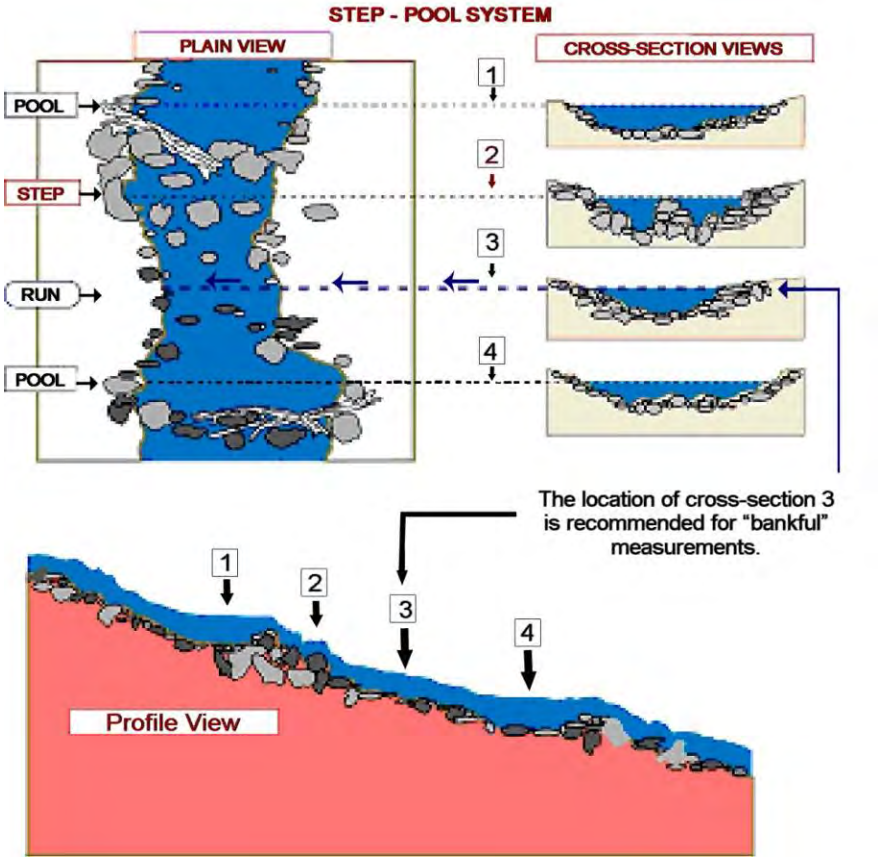

Figure 5. Cross-section locations for step-pool systems (reproduced from EPA 2011 after Silvey in Rosgen, 1996).

The procedural steps, modified from Collins et al. 2008, for assessing Hydrologic Connectivity are (the values are entered on Worksheet 9):

1. Measure the bankfull width using field indicators to identify the bankfull elevation, e.g., 13.2 m (Figure 6).
2. Measure bankfull depth (maximum depth below the bankfull indicators at the bankfull width, used to estimate the flood-prone width), e.g. 3.5 m.
3. Calculate the flood-prone depth as twice the bankfull depth, e.g., 3.5 X 2 = 7.
4. Measure the flood-prone width from bank to bank at the height of the flood-prone depth, e.g., 21.6 m.
5. Calculate the entrenchment ratio as flood-prone width/bankfull width, e.g., 21.6/13.2 = 1.6.
6. Repeat at two additional cross-sections.
7. Calculate the mean entrenchment ratio across three sites and rate using Table 15.

The key measurement is determining the bankfull width. 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 in New Mexico (Moody et al. 2003), is the discharge where sediments are most effectively moved to form or remove bars, form meanders and bends, and shape the average geomorphic characteristics of the channel. In the field, evidence of the bankfull elevation[1] includes:

- 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; and
- 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

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

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 Mid-montane subclass, a measuring tape, stadia rod (for measuring depth), rebar, and clamps and pin flags (to indicate the bankfull elevation) are all that is required to measure Hydrologic Connectivity. In areas where there is a very wide, flat floodplain or in areas dominated by dense vegetation, a quality hand level and stadia rod are recommended additions to the basic equipment list. **If equipment is not available, visually estimate the heights and widths.**

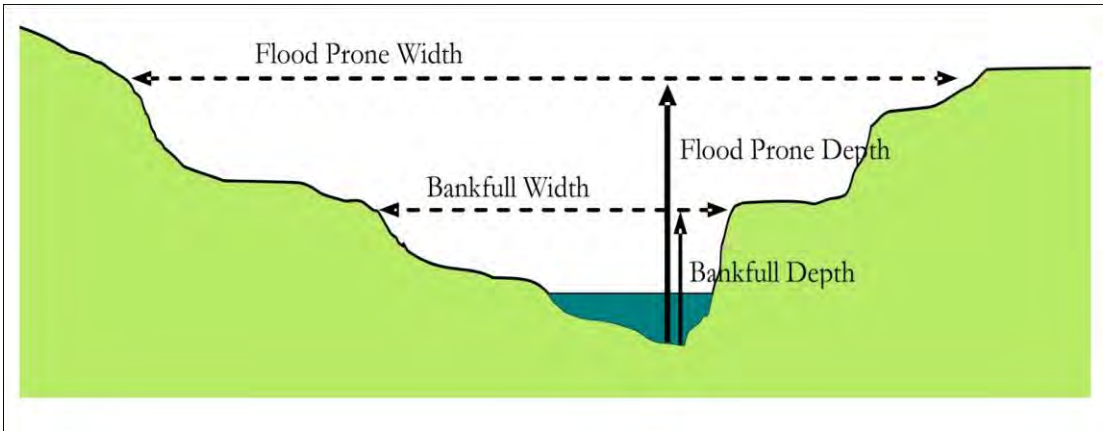

Figure 6. Parameters used to calculate channel entrenchment (from Collins et al. 2008).

Rate Hydrologic Connectivity based on the ranges of the entrenchment ratio as outlined in Table 15.

Table 15. Ratings for Overall Hydrologic Connectivity

Rating	Alternative States
4	Average entrenchment ratio is > 2.2;
3	Average entrenchment ratio is 1.9 to 2.2
2	Average entrenchment ratio is 1.5 to 1.8
1	Average entrenchment ratio is < 1.5

Alternative narrative approach

The NMRAM recommends using the narrative approach (Table 16) when beaver ponds inundate the entire, normally active floodplain or preclude identification of the bankfull discharge or floodplain width, when users cannot determine bankfull discharge, or if the bankfull discharge extends beyond what can be accurately measured with the equipment at hand. The narrative approach assesses the connectivity of the stream to its floodplain, but is not based on channel entrenchment. The rating score is entered in the Rank Calculator Worksheet (or spreadsheet).

Table 16. Narrative Rating Approach for Hydrologic Connectivity

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

Macrotopographic Complexity [Worksheet 10]

This protocol is field-based and qualitative. As part of the reconnaissance survey, assessors should walk the length and width of the AA to familiarize themselves with the abiotic conditions by checking off Macrotopographic Indicators on Worksheet 9 and creating a sketch map of these features to guide the rating (below Worksheet 9). Fluvial geomorphic features created by the movement of water and sediment include:

- Tributaries or swales – While perennial tributaries serve as a way to demarcate the linear extent of an AA, intermittent tributaries or swales (that lack a defined bed and bank) that convey seasonal runoff to the main channel act as zones of infiltration and groundwater recharge should be identified.
- Backwaters – Backwaters or large, still eddies that provide fish-spawning habitat outside the main current of the stream. These features may be disconnected at low water and open-access during high water.
- Side channels – Secondary channels or swales parallel to the existing channel which may carry water at times of high flow.
- Riffle-pool complex – A feature of channel-bed topography in which alternating deep (pools) and shallow (riffles) reaches form through a combination of scour and deposition at higher flows and are maintained at lower flows. Riffles result in a turbulent surface and high dissolved-oxygen levels in the water. Pools are characterized by a slower stream velocity, a smooth surface, and a finer substrate.
- Oxbow lakes – Permanent off-channel ponded areas.

- New depositional areas – Evidence of sediment transport. Areas of transient bedload that may not form into bars.
- Point or in-channel bars – Depositional areas on the inside bend in a stream or within a straight channel.
- Terraces – An abandoned floodplain.
- Deep pools – Areas in the fluvial 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.
- Beaver ponds – Shallow palustrine wetlands occupying all or some of the channel, converting it from a lotic to lentic aquatic system.
- Depressional features on floodplains – Shallow, seasonally inundated depressions composed of very fine depositional sediments that may have concentric rings of vegetation.
- Debris jams – Accumulation of large woody debris in channel that partially obstructs water flow.
- Wrack lines – Accumulation of natural and non-natural debris at the high-water line.

The overall Macrotopographic Complexity ratings are found in Table 17, which is used to select the description most applicable to conditions within the AA. The rating score is entered on the Rank Calculator Worksheet (or spreadsheet).

Table 17. Ratings for Macrotopographic Complexity

Rating	Description
4	Multiple side and/or backwater channels and a mix of old and new depositional surfaces are present in the channel and on the floodplain, e.g., point bars and wrack lines, respectively. Oxbows may also be present within an active floodplain. The channel includes pool/riffle complexes with limited or no runs, especially at lower water. Additional indicators occur outside the channel and may include terraces, tributaries, and swales. Eight or more indicators from the checklist present, although this varies depending on their size and watershed location.
3	One side and/or backwater channel is present with some evidence of active floodplain development. Floodplain surfaces exhibit some new depositional areas. Channels include at least one pool/riffle complex. AAs dominated by beaver ponds receive a 3 rating. Six to eight indicators from the checklist present.
2	Side and backwater channels are few, obscure, and very old. No new or recently inundated channels are present. Floodplain surfaces are generally old and no active deposition occurs on these surfaces. The floodplain and associated side channels are only inundated during the very highest flood events, >10 years. Limited deposition in the form of point bars is apparent. Channels lack a diverse pool/riffle complex interspersed with runs, although one of these features may be present. Three to five indicators from the checklist present, although this varies depending on their size and watershed location.
1	No side and backwater channels are present on the floodplain surface. The channel is dominated by runs and lacks pool/riffle complexes. The channel is almost devoid of complexity and habitat variability. Two or fewer indicators from the checklist present, although this varies depending on their size and watershed location.

Channel Stability [Worksheet 11]

The assessment consists of evaluating field indicators of channel equilibrium, aggradation, or degradation throughout the AA. 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 impoundment area. It is recommended that the field indicator checklist be completed for the upper, middle, and lower parts of the reach using the Worksheet 11 checklist to reflect the channel conditions throughout the entire AA.

Overall Channel Stability ratings are provided in Table 18. The ratings reflect channel conditions throughout the entire assessment reach, taking into consideration the condition of the upper, middle, and lower segments of the reach. The rating score is entered on the Rank Calculator Worksheet (or spreadsheet).

Table 18. Ratings for Channel Stability

Rating	Description
4	Most of the channel throughout the AA is in equilibrium condition with little evidence of aggradation or degradation based on the field indicators listed in Worksheet 11.
3	There is some evidence of aggradation or degradation; the channel throughout the AA seems to approach an equilibrium condition. Circle primary process: aggradation or degradation
2	There is evidence of severe aggradation or degradation throughout most of the channel through the AA. Circle primary process: aggradation or degradation
1	The channel is artificially hardened, channelized, or is concrete throughout most of the AA.

Stream Bank Stability and Cover [Worksheet 12]

This method has two qualitative measures of bank condition: bank soil stability and stream bank erosion potential. The former is a measure of active, ongoing erosion and consists of an estimation of the percentage of the bank that is stable. The latter relates to the stability generated by vegetative cover and large bank material capable of limiting bank erosion as a measure of erosion potential. Both are scaled from 1 to 4, using the ratings shown in Table 19 and Table 20. The assessment method relies on visual estimation of each qualitative measure throughout the upper, middle, and lower segments of the assessment reach, so that the entire reach is evaluated. The entire reach should be walked for this assessment, noting the condition of the two measures in each segment using the Worksheet 12 checklist by checking the condition in the upper, middle, and lower segments that best describes the bank condition upstream and downstream of the Hydrologic Connectivity transects in the upper, middle, and lower segments of the AA. Assessments of the bank condition should extend a minimum of 25 m (82 feet) upstream and downstream of the transect locations on both sides of the stream, but not within a meander curve, cut-bank, or point bar.

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 erosion potential should include vegetation growing up to the flood-prone elevation (Figure 7).

Table 19. Ratings for Bank Soil Stability

Rating	Description
4	Infrequent raw banks; less than 10% of stream bank under stress or eroding.
3	Raw banks intermittently at outcurves and 10%–25% of stream bank under stress or eroding.
2	Significant raw banks; 25%–50% of stream bank under stress or eroding.
1	Raw banks almost continuous with greater than 50% of stream bank under stress or eroding, or channel is artificially hardened or concrete along most of its length.

Note: Minor typical scour near the base of banks associated with normal conditions can be ignored unless it appears to be producing instability in the upper banks. Enter the rating score on the Rank Calculator Worksheet.

Table 20. Stream Bank Erosion Potential

Rating	Description
4	Over 80% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by boulders and large cobbles. If the stream bank is not covered by vegetation, it is protected by materials that do not allow bank erosion.
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 by materials that allow only minor erosion.
2	25%–49% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by gravel or larger material. Those areas not covered by vegetation are covered by materials that give limited protection.
1	Less than 25% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by gravel or larger material. The area not covered by vegetation provides little or no control over erosion and the banks are susceptible to erosion each year by high water flows.

Note: Minor typical scour near the base of banks associated with normal conditions can be ignored unless it appears to be producing instability in the upper banks.

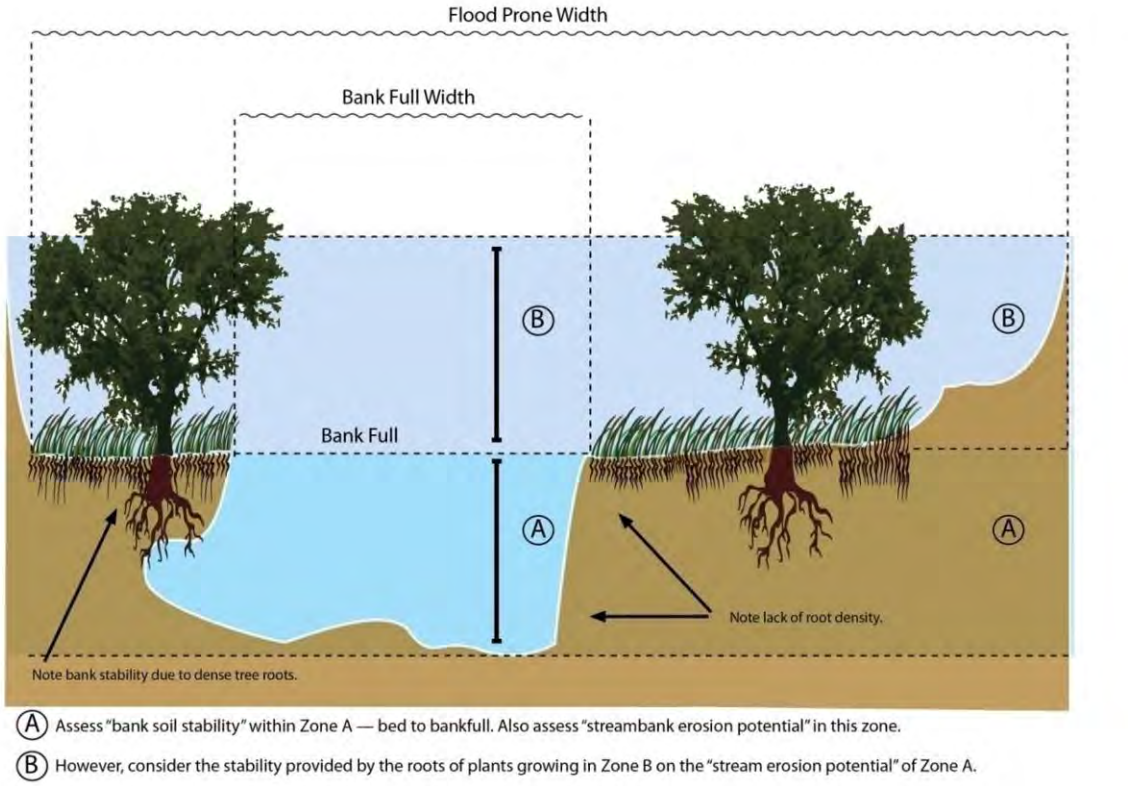

Figure 7. Stream Bank Stability and Cover metric assessment zones.

Under all circumstances, the area between the channel bed and the bankfull elevation should be assessed. If a floodplain is present directly above the bankfull elevation (as shown in Figure 7 above), the assessment of bank soil stability should be limited to the "bed to bankfull zone" (Zone A in Figure 7 above).

However, if the channel bank continues (vertically) uninterrupted by the floodplain above the bankfull elevation, then the upper banks are also capable of contributing sediment to the stream. In these cases, the assessor should extend the survey to cover the entire area between the channel bed and the flood-prone elevation (or top of the bank below whatever floodplain is present).

Upon completion of the visual estimations, all six scores (bank soil stability and stream bank erosion potential for the upper, middle, and lower segments in the reach) are averaged to compute the overall bank stability rating using the rating Table 21. The rating score is entered on the Rank Calculator Worksheet.

Table 21. Stream Bank Stability and Cover Rating Table

Rating	Stream Bank Stability and Cover Average Score*
4	4.0–3.5
3	3.4–2.5
2	2.4–1.5
1	1.4–1.0

* Average of bank soil stability and stream bank erosion potential along the upper, middle, and lower segments of the assessment reach (six estimates total).

Soil Surface Condition [Worksheet 13]

Soil Surface Condition is based on a visual assessment of anthropogenic soil disturbance indicators and a semi-quantitative estimate of the percentage of soil disturbance relative to the total area of the AA. This protocol has a GIS-based component, but is primarily field-based and semi-quantitative. As part of the reconnaissance survey, assessors should walk the length and width of the AA to familiarize themselves with the Biotic and Abiotic conditions, keeping a running checklist of features identified in the rating table (Worksheet 13). Either way, the final rating requires an estimate of total percent area of the AA that has anthropogenic soil disturbance. The detailed steps of the assessment protocol are:

1. Using available aerial imagery, identify roads and other soil surface disturbances within the AA and surrounding landscape area. Mark disturbed areas on aerial photographs to take in the field.
2. Conduct soil surface assessment as part of the general reconnaissance in order to ground-truth work completed in Step 1. Limit assessment outside the AA to a buffer of 30.5 m (100 feet).
3. Calculate the area of soil surface disturbance as a percentage of the total area of the AA.
4. Record disturbance to the landscape surrounding the AA in the stressor checklist.

5. Enter the rating score that best matches the Soil Surface Condition (Table 22) on the Rank Calculator Worksheet (or spreadsheet).

The following are general guidelines for assessing Soil Surface Condition in riverine floodplain wetlands:

- Assume that there are zones of active, naturally occurring erosion and deposition within the active floodplain of the AA. Portions of the AA may be natural sources and sinks for sediment.
- Differentiate, to the extent possible, anthropogenic soil disturbance that could contribute to degradation of the riverine wetland.
- Within the broader context of wetland restoration, consider those conditions that can limit restoration potential such as salinity or impervious surfaces and/or be priorities for restoration such as erosion or discharge of fill material.
- For wadeable systems, assess both sides of the AA and buffer area.
- For systems that cannot be waded, only assess the accessible side of the AA and buffer area.

Table 22. Soil Surface Condition Rating Table

Rating	Description
4	Bare soil areas are limited to naturally occurring disturbances such as flood deposition, e.g., sand and gravel and/or low-density wildlife trails. Also, plant density may be naturally low because of soil type. No human-caused impervious surfaces are found within the AA. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 0% and 2% of the AA.
3	Some amount of bare soil from human causes is present but the extent is minimal. The depth of disturbance is limited to the soil surface and does not show evidence of ponding or channeling water. Very few imperious surfaces are present. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 2% and 5% of the AA.
2	Bare soils from human causes are common. These may include dense livestock trails, off-road vehicle tracks, other mechanical rutting, or irrigation-driven salinity. Soil disturbance, while apparent, is limited to specific areas and not found across the majority of the AA. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 5% and 10% of the AA.
1	Bare soil areas substantially degrade most 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 with no connection to groundwater. Additional human-caused impervious surfaces or other forms of soil stabilization are present. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface, is greater than 10% of the AA.

Stressor Checklists [Worksheets 14a, 14b, 14c, 14d and 14e]

Stressor checklists are designed to assess the intensity of stressors that occur within the AA and the buffer. Stressors are anthropogenic disturbances that would be expected to have a negative effect on the condition of the WOI. Stressor checklists are grouped into four categories: 1) Landscape Context Stressors (Worksheet 14a); 2) Vegetation Stressors (Worksheet 14b); 3) Physical Structure Stressors (Worksheet 14c); and 4) Hydrologic Stressors (Worksheet 14d). Stressor checklists identify stressors that occur within the AA and the buffer. The purpose of the stressor checklists is to provide additional information that furthers the understanding of the current wetland condition. Therefore, they are not used in scoring or ranking the condition of the wetland. To complete the stressor checklist,

1. Record negative, non-significant (<10% of the area) and negative significant (>10% of the area) for all occurrences that occur in the buffer and the AA.

The results are summarized for each attribute by totaling the number of stressors that are negative, non-significant (<10% of the area) and negative, significant (>10% of the area) for the buffer and AA, respectively (Worksheet 14e).

Photo Points [Worksheet 15]

Photo points are recommended to photo-document 1) the general condition of the AA, 2) dominant plant communities, and 3) stream condition. Photographs may also be taken of any other unusual or otherwise noteworthy feature. Photo point documentation provides a visual record of the condition of the wetland that may be useful for future reference. Photographs are logged in Worksheet 15.

AA Condition

The general condition of the AA and the surrounding buffer area should be documented through a series of three to four photo points taken on each side of the stream. Photographs should be taken in each of the cardinal directions (north, south, east, and west) at each point. The photograph number, photo point coordinates, and direction should be recorded, along with a general description for each photograph in Worksheet 15.

Vegetation Communities

Documenting the dominant vegetation communities present is highly recommended. Photographs should be taken to capture the essence of the community and capture dominant species and structure types. The photo number, photo point coordinate, and direction should be recorded, along with a brief description in Worksheet 15.

Stream Condition

At the location of each Hydrological Connectivity transect, a series of photographs should be taken to document the condition of the stream. Photographs should be taken facing upstream, downstream, and across each transect to capture the floodplain condition on each side of the

stream. The photo number, photo point coordinates, and direction should be recorded, along with a brief description in Worksheet 15.

Quality Assurance Checklist [Worksheet 16]

Upon completion of the assessment of the AA, the assessment team should meet in the field to review the assessment and discuss the metric ratings and stressor checklists. This gives an opportunity address any questions that may arise and ensure the data are complete and the worksheets filled in correctly. A quality assurance/quality control (QA/QC) checklist is provided in Worksheet 16 to guide this process.

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APPENDIX A
FIELD GUIDE WORKSHEETS

NEW MEXICO RAPID ASSESSMENT METHOD

Montane Riverine Wetlands

Field Guide Worksheets

(Version 1.2)

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

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

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

Wetland of Interest (WOI) Cover Worksheet -- NMRAM (Version 1.2)	**FG page: 12**

WOI Code:	**WOI Name:**
Wetland Subclass:	Other Site Designation:
General Location:	
Ownership:	

Surveyors:		Role:
		Role:
		Role:

AA No.	**Northing**	**Easting**	**Zone**	**Datum**	**Survey Date**	**Start time**	**End**
1					Mo: Day: Yr:		
2					Mo: Day: Yr:		
3					Mo: Day: Yr:		

WOI Description

WOI SIZE (Worksheet S1): _____	Ha Ac	WOI/AA Size Comments:

WOI Landscape Context (summarize the wetland and surrounding landscape; include condition and impacts; explain the hydrologic breaks or other factors that define the WOI/AA limits):

WOI Biotic Condition (vegetation patterns; composition and structure; exotics and invasives; disturbance evidence fire and herbivory):

WOI Abiotic Condition (hydrological alterations [e.g., dams, walls, etc.]; flooding characteristics and evidence of over-bank flooding ; soil disturbance; other site impacts):

WOI Assessment Summary

AA No.	**Landscape Context**	**Size**	**Biotic**	**Abiotic**	**Condition Score**	**Condition Rank**	**Rank Date**	**Assessor**
1							Mo Day: Yr:	
2							Mo Day: Yr:	
3							Mo Day: Yr:	
WOI							Mo Day: Yr:	

WOI Assessment Summary:

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

Wetland of Interest (WOI) and AA Delineation and Size

S1 – Absolute Wetland Size (FG page 19)

Worksheet S1. Delineate the Wetland of Interest (WOI) and AA(s) on a map and measure or estimate the WOI size. Enter size below and on the WOI Cover Worksheet. If a map from a GIS is unavailable, provide a sketch map below. Rate Absolute Wetland Size using Table S1, and enter rating in the S1 box on the Rank Calculator Worksheet (or spreadsheet). Provide comments on delineation criteria.

WOI SIZE: _____Ha	**_____Ac**	**Method:**

WOI/AA criteria comments/sketch map:

Table S1. Overall Ratings for Absolute Wetland Size

X	Rating	Size	Description
☐	4	> 10 ha (>25 acres)	Wetland size is very large compared to other examples of the same type and potentially capable of supporting a wealth of biodiversity in a functional sustaining ecosystem.
☐	3	> 5 and ≤ 10 ha (>12 and ≤25 acres)	Wetland size is large compared to other examples of the same type (e.g., within 10%–30%, based on known and historic occurrences).
☐	2	>2 and ≤ 5 ha (>5 and ≤ 12 acres)	Wetland size is moderate compared to other examples of the same type (e.g., within 30%–70% of known or historic sizes).
☐	1	≤ 2 ha (≤ 5 acres)	Wetland size is too small to sustain full diversity and full function of the type (e.g., smallest 30% of known or historic occurrences).

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

Landscape Context

L1 – Buffer Integrity Index (FG Page 13)

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

Imagery:	Image date:

	Allowed buffer land cover elements		Excluded non-buffer land cover elements
☐	Natural wetland vegetation patches	☐	Commercial developments
☐	Swales and ditches	☐	Residential developments
☐	Nature or wildland parks	☐	Urbanized parks with active recreation
☐	Old fields, unmaintained	☐	Lawns, golf courses, sports fields
☐	Open range land	☐	Developed pedestrian/bike trails
☐	Unpaved roads not hazardous to wildlife (e.g., two-track roads)	☐	Intensive livestock areas (horse paddocks, feedlots, turkey ranches, etc.)
☐	Foot trails, horse trails, unpaved bike trails (low intensity)	☐	Intensive agriculture (row crops, orchards, and vineyards lacking ground cover)
☐	Non-channel open water	☐	Paved roads or developed second order unpaved but graded gravel roads
☐	Maintained pastures and hay fields	☐	Railroads
☐	Vegetated levees	☐	Parking lots
☐		☐	

Buffer Percent Submetric. Measure or estimate the percentage of the AA perimeter composed of allowed buffer elements. Rate the submetric and enter the rating in the L1a box on the Rank Calculator Worksheet (or spreadsheet) and on the sub-metric summary table below.

Buffer Percent (%) =	

Table L1a. Buffer Percent

X	Rating	States
☐	4	Buffer is 75%–100% of occurrence perimeter
☐	3	Buffer is 50%–74% of occurrence perimeter
☐	2	Buffer is 25%–49% of occurrence perimeter
☐	1	Buffer is < 25% of occurrence perimeter

Worksheet 1b. Buffer Width Submetric. Measure the length of each buffer line in meters or feet from the GIS or map. Average the lines and rate using Table 1b. Enter rating in the L1b box on the Rank Calculator Worksheet (or spreadsheet) and on the sub-metric summary table below.

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

Table L1b. Buffer Width Rating Table

X	Rating	States
☐	4	Average buffer width > 200 m (>656 feet)
☐	3	Average buffer width 100–199 m (328–653 feet)
☐	2	Average buffer width 50–99 m (164–325 feet)
☐	1	Average buffer width < 50 m (<164 feet)

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

Worksheet 1c [Field]. Buffer Condition Submetric. Based on the field survey and walking the perimeter of the AA, evaluate and rate the condition of buffer using ratings Table L1c below. Enter rating in the L1c box on the Rank Calculator Worksheet and and on the submetric summary table below.

Table L1c. Buffer Condition Rating Table		
	Rating score	**States**
☐	4	Buffer for occurrence is characterized by abundant (>95%) cover of native vegetation and little to no (<5%) cover of non-native plants, with intact soils and little or no trash or refuse.
☐	3	Buffer for occurrence is characterized by substantial (75%–95%) cover of native vegetation, low (5%–25%) cover of non-native plants, intact or moderately disrupted soils, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
☐	2	Buffer for occurrence is characterized by a moderate (50%–75%) cover of native plants and either moderate or extensive soil disruption, moderate or greater amounts of trash or refuse, and moderate intensity of human visitation or recreation.
☐	1	Buffer for occurrence is dominated by non-native plant cover (>50%) characterized by barren ground and highly compacted or otherwise disrupted soils, with moderate or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation, or there is no buffer present.

Worksheet 1d. Buffer Integrity Index calculation. Calculate the Buffer Integrity Index (BI) from the submetric scores using the equation boxes below and rate using Table L1d. (SQR = square root). Enter rating score in the L1 box on the Rank Calculator Worksheet (or spreadsheet).

Buffer Integrity Submetric summary table for computing Buffer Integrity Index		
Sub-metric	**Score**	**Comments**
Buffer %		
Buffer Width Average Score		
Buffer Condition :		

Buffer Integrity Index (BI) = [Buffer Condition × (Buffer Percent × Buffer Width) $^{1/2}$] $^{1/2}$

1)

A		**Buffer % Score**		**Buffer Width Score**
	=		X	

2)

B		
	=	**SQR (A)**

3)

C		**B**		**Buffer Condition Score**
	=		X	

4)

BI		
	=	**SQR (C)**

Table L1d. Overall Summary Rating Table for the Buffer Integrity (I)		
X	**Rating Score**	**Description**
☐	4	Buffer Integrity Index Score > 3.5
☐	3	Buffer Integrity Index Score = 2.5–3.4
☐	2	Buffer Integrity Index Score = 1.5–2.4
☐	1	Buffer Integrity Index Score < 1.5

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

L2 - Riparian Corridor Connectivity (FG Page 16)

Worksheet 2a. Riparian Corridor Connectivity Checklist of Land Cover Elements. Land-cover elements that are either allowed in riverine buffers or excluded and considered non-buffer that disrupt ecosystem connectivity. Using aerial photography, check off those elements observed in the imagery. Enter the type of imagery and scale if known and the image date.

Imagery:	**Image Date:**

Allowed buffer land cover elements		**Excluded non-buffer land cover elements**	
☐	Natural wetland vegetation patches	☐	Commercial developments
☐	Swales and ditches	☐	Residential developments
☐	Nature or wildland parks	☐	Urbanized parks with active recreation
☐	Old fields, unmaintained	☐	Lawns, golf courses, sports fields
☐	Open range land	☐	Pedestrian/bike trails (i.e., nearly constant traffic)
☐	Unpaved roads not hazardous to wildlife (e.g., two-track roads)	☐	Intensive livestock areas (horse paddocks, feedlots, turkey ranches, etc.)
☐	Foot trails, horse trails, unpaved bike trails (low intensity)	☐	Intensive agriculture (row crops, orchards, and vineyards lacking ground cover and other best management practices
☐	Non-channel open water	☐	Paved roads or developed second order unpaved but graded gravel roads
☐		☐	Railroads
☐		☐	Parking lots
☐		☐	Maintained pastures and hay fields
☐		☐	Vegetated levees

Worksheet 2b. Riparian Corridor Non-connectivity Elements Length. Record the length of non-buffer elements per bank and river segment. Sum the totals by bank and segment, compute the percentage non-buffer by segment, and enter the segment sub-score using Table L2a (also available in the spreadsheet calculator). Indicate if a segment should be field validated.

Segment	**Upstream**		**Downstream**		**Comments**
	Bank 1 (L)	**Bank 2 (R)**	**Bank 1 (L)**	**Bank 2 (R)**	
0–100 m					
100–200 m					
200–300 m					
300–400 m					
400–500 m					
Total Bank (m)					
Total Segment (m)					
Segment Non-buffer %					
Segment Sub-score					

Worksheet 2c. Riparian Corridor Connectivity Score. Sum the segment scores and rate using Table L2b. Enter the rating in the L2 box on the Rank Calculator Worksheet (or spreadsheet).

Upstream Segment Sub-score		**Downstream Segment Sub-score**		**Rip Connectivity Raw Score**
	+		**=**	

Table L2a. Sub-score Assignments	
Percent Fragmented	**Sub-score**
≤ 5%	16
> 5 and ≤ 10	15
> 10 and ≤ 15	14
> 15 and ≤ 20	12
> 20 and ≤ 25%	9
> 25 and ≤ 30%	8
> 30 and ≤40%	6
>40%	4

Table L2b. Overall Rating Table for Riparian Corridor Connectivity		
X	**Rating Score**	**Raw Score**
☐	4	>28
☐	3	20–27
☐	2	12–19
☐	1	<12

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

L3 - Relative Wetland Size (FG Page 18)

Worksheet 3. Delineate the WOI historic size on a map and measure or estimate its size (or using sketch box in S1). **3a.** Calculate the ratio (A) of WOI size (S1 from above) to WOI historic size. **3b.** Calculate the Relative Wetland Size Index (RWSI) as a function of A. Using the RWSI, rate the wetland using Table L3 and enter rating in the L3 box on the Rank Calculator Worksheet (or spreadsheet).

3a. Relative Size Ratio (A)						3b. Relative Wetland Size Index (RWSI)						
A		WOI Size		WOI Hist. Size		RWSI (%)				A		
	=		/				=	1	–		X	100

Table L3. Relative Wetland Size Rating Based on the Ratio of Current Size to Historical Size		
X	**Rating**	**Description**
☐	4	RWSI <10%. Wetland is at, or only minimally reduced from its full original, natural extent and has not been artificially reduced in size.
☐	3	RWSI between 10% and 39% wetland reduction.
☐	2	RWSI between 40% and 79% wetland reduction.
☐	1	RWSI ≥80% wetland reduction from its original, natural extent.

Additional landscape context and biotic metrics comments:

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

L4 - Surrounding Land Use (FG Page 18)

Worksheet 4. Land Use Index (LUI). Enter the percent of the buffer area occupied by a given land use element. Calculate LUI scores by element as the product of the element coefficient times the percent of the AA buffer area occupied (total area percentage must total to 100%). Sum the element scores to create the final LUI score. Rate using Table L4 and enter rating in the L4 box on the Rank Calculator Worksheet (also available in the rank calculator spreadsheet).

Land Use Element	Coefficient	% of Buffer	LUI Score
Paved roads/parking lots/domestic or commercially developed buildings/mining (gravel pit, quarry, open pit, strip mining)	0.0		
Unpaved roads (e.g., driveway, tractor trail, unpaved parking lots)	0.1		
Dredging, borrow pits, abandoned mines, water-filled artificial impoundments (ponds and reservoirs)	0.1		
Filling or dumping of sediment or soils	0.1		
Intense recreation (all-terrain vehicle use/camping/popular fishing spot, etc.)	0.3		
Rip-warped 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 but not a road	0.3		
Ski area	0.4		
Dam sites and flood-disturbed shorelines around water storage reservoirs	0.5		
Abandoned artificial impoundments (ponds and reservoirs) and associated disturbed flood zones	0.5		
Artificial/Constructed wetlands, irrigation ditches	0.7		
Developed/Managed trail system (high use trail)	0.8		
Paddock, dirt lot	0.1		
Agriculture – active tilled crop production	0.2		
Agriculture – permanent crop (vineyards, orchards, nurseries, berry production)	0.3		
Manicured lawns, sport fields, and golf courses	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		
Woodland/Shrub vegetation conversion (chaining, cabling, rotochopping)	0.3		
Heavy logging or tree removal with >50% of large trees (e.g., >30 cm diameter at breast height) removed	0.3		
Commercial tree plantation/Christmas tree farms	0.6		
Selective logging or tree removal with <50% of large trees (e.g., >30 cm diameter at breast height) removed	0.8		
Mature restoration areas returned to natural conditions (re-converted)	0.9		
Natural area/land managed for native vegetation – No agriculture/logging/development	1.0		
Sum of Land Use Index element scores		100%	

Table L4. Ratings for Surrounding Land Use Based on the LUI Scores

X	Rating	Land Use Index Score range
☐	4	95–100
☐	3	80–94
☐	2	40–79
☐	1	< 40

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

Biotic Metrics (FG Page 20)

Worksheet 5 [Field]. Biotic Metrics B3, B4 and B5. Refer to Table B3a on the next page for vertical structure type definitions.

Map Polygon No.	B3 Vertical Structure Type	B4 Tree Regen. % Cover	B5 Invasive Species % Cover	Comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

B5 [Field] -Invasive Species List:	

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

CT	Polygon Nos.	Tall Woody Stratum [1]				Short Woody Stratum [2]				Herbaceous Stratum				CT Score [3]		
		T_Spp_1	EN	T_Spp_2	EN	S_Spp_1	EN	S_Spp_2	EN	H_Spp_1	EN	H_Spp_2	EN	Raw	% AA	Wt Score
A																
B																
C																
D																
E																
F																
G																
H																
I																
J																
K																
													CT Final Weighted Score ∑		1.0	

1. Trees and shrubs > 5 m (15 feet) and > 10% cover; **2**. Trees and shrubs <5m (15 feet) and > 5% cover; **3.** Raw Score is from Table B1a; % AA Is the percentage of the AA area as a decimal number; Wt. Score is the product of the Raw Score X % AA. The final score is the sum of the weighted scores. **Circle those species that were vouchered.**

Comments and additional CTs:

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

Table B1a. CT Native Composition Raw Scoring			
Raw CT Score	Trees (>10%Cover)	Shrubs(>10% Cover)	Herbs (>5% Cover)
Forested Wetland			
0.00	E	E or absent	E or absent
0.25	E	E or absent	N/E or unknown
0.50	E	E or absent	N
0.75	E	N/E or unknown	E or absent
1.00	E	N/E or unknown	N/E or unknown
1.15	E	N/E or unknown	N
1.30	E	N	E or absent
1.40	E	N	N/E or unknown
1.50	E	N	N
1.60	N/E or unknown	E	E
1.70	N/E or unknown	E	N/E or absent or unknown
1.80	N/E or unknown	E	N
1.90	N/E or unknown	N/E or unknown or absent	E
2.00	N/E or unknown	N/E or unknown or absent	N/E or unknown or absent
2.10	N/E or unknown	N/E or unknown or absent	N
2.20	N/E or unknown	N	E
2.30	N/E or unknown	N	N/E or absent or unknown
2.40	N/E or unknown	N	N
2.50	N	E	E
2.60	N	E	N/E or unknown
2.70	N	E	N or absent
2.85	N	N/E or unknown	E
3.00	N	N/E or unknown	N/E or unknown
3.25	N	N/E or unknown	N or absent
3.50	N	N or absent	E
3.75	N	N or absent	N/E or unknown
4.00	N	N or absent	N or absent
Shrub Wetland			
0.00		E	E or absent
0.50		E	N/E or unknown
1.00		E	N
1.50		N/E or unknown	E
2.00		N/E or unknown	N/E or unknown or absent
2.50		N/E or unknown	N
3.00		Native	E
3.50		Native	N/E or unknown
4.00		Native	N or absent
Herbaceous Wetland			
0.00			E
2.00			N/E or unknown
4.00			N
Sparsely Vegetated			
0.00			Human-disturbed ground (e.g., roads, cleared areas)
2.00			Mixed natural/human-disturbed ground
4.00			Natural disturbed ground (e.g., sand bars, side channels)

Table B3a. Vertical structure types definitions								
	Trees			Understory			Foliage	
	Ht		Cov	Ht		Cov	Ht	
Type	m	ft	%	m	ft	%	m	ft
1	>12	>40	>25	0-4.6	0-15	>25	Throughout	
2	>12	>40	>25	0-4.6	0-15	<25	>9	>30
3	6-12	20-40	>25	0-4.6	0-15	>25	0-9	0-30
4	6-12	20-40	>25	0-4.6	0-15	<25	4.6-9	15-30
5	1.5-6	5-20	>25	0-4.6	0-15	>25	< 4.6	<20
6	NA	NA	[<10]	0-1.5	0 5	>25	<1.5	<5

B1 - Relative Native Plant Community Composition (FG Page 20)

Calculate the final B1 raw score on Worksheet 6, and rate using Table B1b (or use the spreadsheet calculator). Enter rating in the B1 box on the Rank Calculator Worksheet.

Table B1b. Relative Native Plant Community Composition Rating		
X	**Rating**	**CT Final Weighted Score**
☐	4	≥ 3.5 (≈ <10% non-native)
☐	3	≥ 2.75 and <3.5 (≈ 10%–20% non-native)
☐	2	≥ 2.0 and <2.75 (≈ 20%–50% non-native)
☐	1	<2.0 (≈ <50% non-native)

B2 - Vegetation Horizontal Patch Structure Worksheet (FG Page 22)

Worksheet 7 [Field]. Indicate the schematic pattern that best matches the mapped vegetation patch pattern. Rate using Table B2 and enter rating in the B2 box on the Rank Calculator Worksheet (spreadsheet calculator).

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

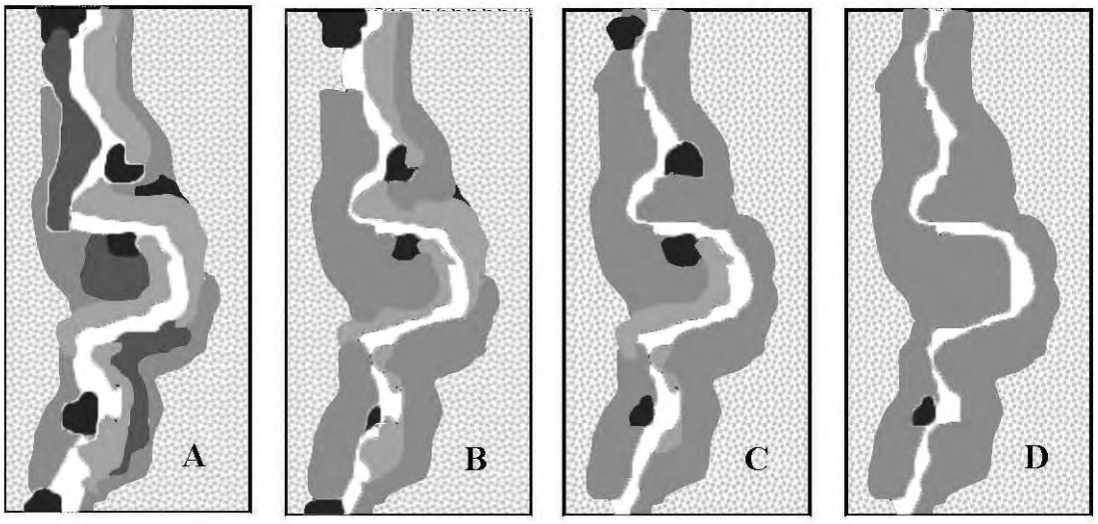

Table B2. Ratings for Overall Vegetation Horizontal Patch Structure		
X	**Rating**	**Alternative States**
☐	4	Most closely matches Pattern A. AA has a diverse patch structure (>4 patch types) and complexity. A dominant patch type would be difficult to determine.
☐	3	Pattern B. AA has a moderate degree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

B3 - Vegetation Vertical Structure (FG Page 23)

Based on Worksheet 5, rate using Table B3b, and enter the rating in the B3 box on the Rank Calculator Worksheet (or spreadsheet).

Table B3b. Ratings for Vegetation Vertical Structure		
X	**Rating**	**Alternative States**
☐	4	High-structure forest (Type 1 or 3) **plus** shrubland (Type 5) **and/or** herbaceous (Type 6) or Low-structure forest (Type 2 or 4) **plus** shrubland (Type 5) **and** herbaceous (Type 6)
☐	3	High-structure forest (Type 1 or 3) alone or High-structure forest (Type 1 or 3) **plus** only low structure forest (Type 2 or 4) or Low-structure forest (Type 2 or 4) **plus** shrubland (Type 5) **or** herbaceous (Type 6)
☐	2	Low-structure forest (Type 2 or 4) alone or Shrubland (Type 5) **and** herbaceous (Type 6)
☐	1	Shrubland (Type 5) alone or Herbaceous (Type 6) alone

B4 - Native Riparian Tree Regeneration (FG Page 26)

Based on Worksheet 5, rate using Table B4, and enter the rating in the B4 box on the Rank Calculator Worksheet (or spreadsheet).

Table B4. Native Riparian Tree Regeneration rating		
X	**Score**	**Native Riparian/Wetland Tree Seedling and Saplings Regeneration**
☐	4	Native poles, sapling, and seedlings trees well represented; obvious regeneration, many patches or polygons with >5% cover; typically multiple size (age) classes
☐	3	Native poles, saplings and/or seedlings common; scattered patches or polygons with 1%–5% cover; size classes few.
☐	2	Native poles, saplings and/or seedlings present but uncommon; restricted to one or two patches or polygons with, typically <1% cover); little size class differentiation.
☐	1	Native poles, saplings, and/or seedlings absent (0% cover).

B5 - Invasive Exotic Plant Species Cover (FG Page 26)

Worksheet 8. Based on worksheets 5 and 6, estimate the percentage cover of invasive exotic specie for the AA and enter below. Rate using Table B5 and enter the rating in the B5 box on the Rank Calculator Worksheet (or spreadsheet).

Invasives percent cover (%)	

Table B5. Ratings for Invasive Exotic Plant Species Cover		
X	**Rating**	**Relative Cover of Invasive Exotic Plant Species**
☐	4	Key invasive species <1% cover
☐	3	Key invasive species 1%–5%
☐	2	Key invasive species 5%–10%
☐	1	Key invasive species >10%

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

Abiotic Metrics

A1 - Hydrologic Connectivity (FG Page 27)

Worksheet 9 [Field]. A1 - Hydrologic Connectivity. The following five steps are conducted at each of three cross-sections at the approximate mid-points along straight riffles or glides, 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. Photographs of each cross-section are taken for future reference. **Where straight channel segments do not occur, or if there is excessive ponding or bankfull indicators are obscured, use the narrative rating approach in Table A1b.**

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 Rank Calculator Worksheet.**				

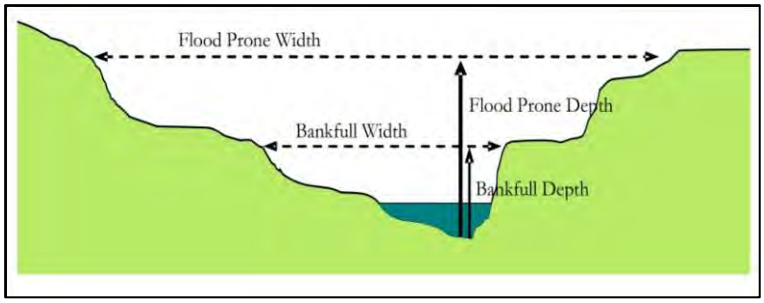

Table A1a. Ratings for Hydrologic Connectivity

X	Rating	Alternative States
☐	4	Average entrenchment ratio is > 2.2;
☐	3	Average entrenchment ratio is 1.9 to 2.2
☐	2	Average entrenchment ratio is 1.5 to 1.8
☐	1	Average entrenchment ratio is < 1.5

Table A1b. Narrative Rating Approach for Hydrologic Connectivity

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

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

A2 - Macrotopographic Complexity (FG Page 31)

Worksheet 10 [Field]. Macrotopographic Complexity Checklist. Check all that apply in upper, middle, and lower segments. A sketch map is also suggested to inform the rating. Rate using Table A2 and enter rating into the A2 box on the Rank Calculator Worksheet**.**

Upper Segment	Middle Segment	Lower Segment	Field Indicators (check all existing conditions)
☐	☐	☐	Side channels
☐	☐	☐	Backwater
☐	☐	☐	Pool riffle complex
☐	☐	☐	New depositional area
☐	☐	☐	Oxbow lakes
☐	☐	☐	Point or in-channel bars
☐	☐	☐	Terraces
☐	☐	☐	Deep pools
☐	☐	☐	Beaver ponds
☐	☐	☐	Depressional features on floodplains
☐	☐	☐	Debris jams
☐	☐	☐	Wrack lines
☐	☐	☐	Other

Table A2. Ratings for Macrotopographic Complexity

x	Rating	Description
☐	4	Multiple side and/or backwater channels and a mix of old and new depositional surfaces are present in the channel and on the floodplain, e.g., point bars and wrack lines, respectively. Oxbows may also be present within an active floodplain. The channel includes pool/riffle complexes with limited or no runs, especially at lower water. Additional indicators occur outside the channel and may include terraces, tributaries, and swales. Eight or more indicators from the checklist present, although this varies depending on their size and watershed location.
☐	3	One side and/or backwater channel is present with some evidence of active floodplain development. Floodplain surfaces exhibit some new depositional areas. Channels include at least one pool/riffle complex. AAs dominated by beaver ponds receive a 3 rating. Six to eight indicators from the checklist present.
☐	2	Side and backwater channels are few, obscure, and very old. No new or recently inundated channels are present. Floodplain surfaces are generally old and no active deposition occurs on these surfaces. The floodplain and associated side channels are only inundated during the very highest flood events, >10 years. Limited deposition in the form of point bars is apparent. Channels lack a diverse pool/riffle complex interspersed with runs, although one of these features may be present. Three to five indicators from the checklist present, although this varies depending on their size and watershed location.
☐	1	No side and backwater channels are present on the floodplain surface. The channel is dominated by runs and lacks pool/riffle complexes. The channel is almost devoid of complexity and habitat variability. Two or less indicators from the checklist present, although this varies depending on their size and watershed location.

Macrotopographic Features Sketch Map

Additional Abiotic Metrics Comments:

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

A3- Channel Stability Worksheet (FG Page 33)

Worksheet 11 [Field]. Channel Stability Checklist. Check all field indicators that apply in upper, middle, and lower segments of the AA. Rate using Table A3 and enter the rating into the A3 box on the Rank Calculator Worksheet (or spreadsheet)**.**

Condition	Upper Segment	Middle Segment	Lower Segment	Field Indicators
Indicators of Channel Equilibrium	☐	☐	☐	The channel has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☐	☐	☐	Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☐	☐	☐	There is leaf litter, thatch, or wrack in most pools.
	☐	☐	☐	The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐	☐	☐	There is little or no active undercutting or burial of riparian vegetation.
	☐	☐	☐	There are no bars that are densely vegetated with perennial vegetation (neither mid-channel bars nor point bars).
	☐	☐	☐	Channel bars consist of well-sorted bed material.
	☐	☐	☐	There are channel pools, the bed is not planar, and the spacing between pools tends to be regular.
Indicators of Active Degradation	☐	☐	☐	The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☐	☐	☐	There are abundant bank slides or slumps, or the lower banks are uniformly scoured and not vegetated.
	☐	☐	☐	Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐	☐	☐	Channel bed is highly armored; it is scoured to large cobbles or boulders.
	☐	☐	☐	An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
Indicators of Active Aggradation	☐	☐	☐	There is an active floodplain with fresh splays of coarse sediment.
	☐	☐	☐	There are partially buried living tree trunks or shrubs along the banks.
	☐	☐	☐	The bed is planar overall. The stream lacks well-defined channel pools, or pools are uncommon and irregularly spaced.
	☐	☐	☐	There are partially buried or sediment-choked culverts.
	☐	☐	☐	Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐	☐	☐	There are avulsion channels on the floodplain or the adjacent valley floor.

Table A3. Ratings for Overall Channel Stability

X	Rating	Description
☐	4	Most of the channel throughout the AA is in equilibrium condition with little evidence of aggradation or degradation based on the field indicators listed in Worksheet 11.
☐	3	There is some evidence of aggradation or degradation; the channel throughout the AA seems to approach an equilibrium condition. Circle primary process: aggradation or degradation
☐	2	There is evidence of severe aggradation or degradation throughout most of the channel through the AA. Circle primary process: aggradation or degradation
☐	1	The channel is artificially hardened, channelized, or is concrete throughout most of the AA.

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

A4- Stream Bank Stability and Cover (FG Page 33)

Worksheet 12 [Field]. Bank Soil Stability and Erosion Potential Checklist. For each stream segment, score Bank Soil Stability and Erosion Potential sub-metrics based on the field indicators that best describe the conditions upstream and downstream of the Hydrologic Connectivity cross-section transects. Compute the average the six scores and rate using Table A4c. Enter overall rating into the A4 box on the Rank Calculator Worksheet.

Condition	Upper Segment	Middle Segment	Lower Segment	Field Indicators
Bank Soil Stability	☐ 4	☐ 4	☐ 4	Infrequent raw banks, less than 10% of stream bank under stress or eroding.
	☐ 3	☐ 3	☐ 3	Raw banks intermittently at outcurves and 10%–25% of stream bank under stress or eroding.
	☐ 2	☐ 2	☐ 2	Significant raw banks, 25%–50% of stream bank under stress or eroding.
	☐ 1	☐ 1	☐ 1	Raw banks almost continuous with greater than 50% of stream bank under stress or eroding, or channel is artificially hardened or concrete along most of its length.
Stream Bank Erosion Potential	☐ 4	☐ 4	☐ 4	Over 80% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by boulders and large cobbles. If the stream bank is not covered by vegetation, it is protected by materials that do not allow bank erosion.
	☐ 3	☐ 3	☐ 3	50%–80% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by cobble or larger material. Those areas not covered by vegetation are protected by materials that allow only minor erosion.
	☐ 2	☐ 2	☐ 2	25%–49% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by gravel or larger material. Those areas not covered by vegetation are covered by materials that give limited protection.
	☐ 1	☐ 1	☐ 1	Less than 25% of the stream bank surfaces are covered by vegetation in vigorous condition with dense root mass, or by gravel or larger material. The area not covered by vegetation provides little or no control over erosion and the banks are susceptible to erosion each year by high water flows.

Average 6 segment scores	=	

Table A4c. Stream Bank Stability and Cover Rating Table

X	Rating	Avg. Score
☐	4	4.0–3.5
☐	3	3.4–2.5
☐	2	2.4–1.5
☐	1	1.4–1.0

A5 - Soil Surface Condition (FG Page 35)

Worksheet 13 [Field]. Soil Surface Condition. Check all that apply in the upper, middle, and lower AA segments during field reconnaissance. The absence of these indicators would indicate that disturbances are naturally occurring (e.g., flood deposition or low-density wildlife trails). Estimate percent soil disturbance by segment using map polygon values from Worksheet 5. Rate using Table A5 and enter into the A5 box on the Rank Calculator Worksheet.

Condition	Upper Segment	Middle Segment	Lower Segment	Field Indicators (check all existing conditions)
Soil Surface Indicators	☐	☐	☐	Active erosion due to anthropogenic disturbance
	☐	☐	☐	Dense livestock trails
	☐	☐	☐	All-terrain vehicle or off-road vehicle tracks
	☐	☐	☐	Impervious surfaces
	☐	☐	☐	Fill
	☐	☐	☐	Mining
	☐	☐	☐	Evidence of soil stabilization
	☐	☐	☐	Other:
	_____	_____	_____	Estimate % soil disturbance by segment area.

Table A5. Soil Surface Condition Rating Table

X	Rating	Description
☐	4	Bare soil areas are limited to naturally occurring disturbances such as flood deposition, e.g., sand and gravel and/or low-density wildlife trails. Also, plant density may be naturally low because of soil type. No human-caused impervious surfaces are found within the AA. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 0% and 2% of the AA.
☐	3	Some amount of bare soil from human causes is present but the extent is minimal. The depth of disturbance is limited to the soil surface and does not show evidence of ponding or channeling water. Very few imperious surfaces are present. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 2% and 5% of the AA.
☐	2	Bare soils from human causes are common. These may include dense livestock trails, off-road vehicle tracks, other mechanical rutting, or irrigation-driven salinity. Soil disturbance, while apparent, is limited to specific areas and not found across the majority of the AA. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface is between 5% and 10% of the AA.
☐	1	Bare soil areas substantially degrade most 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 with no connection to groundwater. Additional human-caused impervious surfaces or other forms of soil stabilization are present. Total disturbance, including erosion, impervious surfaces, fill, mining, or other anthropogenic degradation to the soil surface, is greater than 10% of the AA.

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

Stressor Checklists (FG Page 37)

Worksheet 14a [Field]. Landuse. Check all that apply during the field reconnaissance and whether they occupy less than or greater than 10% of the buffer or AA area. The absence of these indicators indicates that disturbances are naturally occurring (e.g., flood deposition, or low-density wildlife trails).

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

Comments:

Worksheet 14b [Field]. Vegetation. Check all that apply during the field reconnaissance and whether they occupy less than or greater than 10% of buffer or AA area. The absence of these indicators suggests that disturbances are naturally occurring (e.g., flood deposition or low-density wildlife trails).

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

Comments:

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

Worksheet 14c [Field]. Physical Structure. Check all that apply during the field reconnaissance and whether they occupy less than or greater than 10% of area in the buffer or AA. The absence of these indicators indicates that disturbances are naturally occurring (e.g., flood deposition or low-density wildlife trails).

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

Comments:

Worksheet 14d [Field]. Hydrologic Modifications. Check all that apply during the field reconnaissance and whether they occupy less than or greater than 10% of area in the buffer or AA.

Hydrologic Modifications	Buffer		Assessment Area	
	<10%	>10%	<10%	>10%
Point source discharges, other non-storm water discharge)				
Non-point source discharges (urban runoff, farm drainage)				
Flow diversions or unnatural inflows (restrictions and augmentations)				
Dams (reservoirs, detention basins, recharge basins)				
Flow obstructions (culverts, paved stream crossings)				
Weir/Drop structure, tide gates				
Dredged inlet/channel				
Engineered channel (riprap, armored channel bank, bed)				
Dikes/Levees				
Groundwater extraction				
Ditches (borrow, agricultural drainage, mosquito control, etc.)				
Actively managed hydrology (e.g., lake levels controlled)				

Comments:

Worksheet 14e. Stressor Summary. Sum the number of stressors checked above for the buffer and the AA. Enter sums in the Stressor Summary boxes on the Rank Calculator Worksheet (or spreadsheet).

Stressor Summary	Buffer		Assessment Area	
	<10%	> 10%	<10%	> 10%
Total # Landscape Context Stressors				
Total # Vegetation (Biotic) Stressors				
Total # Hydrologic Condition Stressors				
Total # Physical Structure Stressors				
Total # Stressors				

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

Photo Point Log (FG Page 37). AZM = azimuth compass direction of photo; GPS UTM northing and easting location.

Worksheet 15 [Field]. Photo Point Log.

Photo PT File	**AZM**	**Northing**	**Easting**	**Description**	**Initial**

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

QA/QC Checklist (FG Page 38)

Worksheet 16 [Field]. QA/QC Checklist			
Worksheets	**Metric**	**√**	**Indicators**
WOI Cover Worksheet		☐	WOI General Information fields at top of worksheet completed
		☐	AAs listed
		☐	Review narrative summaries with the group for concurrence and completeness
		☐	Data for computing scores and completing WOI Assessment Summary completed
For Each AA		☐	Fields for 1) AA Number, 3) Date and 4) Surveyor's Initials are filled in for each work sheet in the NMRAM Assessment Package
Landscape Context Worksheets	Buffer Integrity	☐	Maps attached for Buffer Integrity and Riparian Corridor Connectivity
		☐	Worksheets 1a, 1b, and 1c completed
		☐	Metric sub-scores entered on Rank Calculator Worksheet
	Riparian Corridor Connectivity	☐	Worksheets 2a, 2b, and 2c completed
		☐	Final rating score entered on Rank Calculator Worksheet
	Relative Wetland Size	☐	Map attached
		☐	Historical Wetland Size entered on WOI Cover Worksheet
		☐	Size Rating (from Worksheet 3) is entered on Rank Calculator Worksheet
	Surrounding Land Use	☐	Percent buffer area for elements equals 100% on Worksheet 4
		☐	LUI Score calculated for each element and summed
		☐	Rating entered on Rank Calculator Worksheet
Size Worksheets	Absolute Wetland Size	☐	Attach map, note any revisions
		☐	Absolute Wetland Size entered on WOI Cover Worksheet (Office)
		☐	Rating entered on Rank Calculator Worksheet (Office)
Biotic Worksheets	Relative Native Plant Community Composition	☐	Plant community map attached
		☐	Unknown voucher specimens collected and labeled
		☐	Review all Vegetation Data forms
		☐	Worksheet 6 completed for each community type
		☐	Scores calculated (Office)
		☐	Rating entered on Rank Calculator Worksheet (Office)
	Vegetation Horizontal Patch Structure	☐	Mapped vegetation pattern entered on Rank Calculator Worksheet
	Vegetation Vertical Structure	☐	Values entered for each polygon on Worksheet 5
		☐	Rating entered on Rank Calculator Worksheet
	Native Riparian Tree Regeneration	☐	Values entered for each polygon on Worksheet 5
		☐	Rating entered on Rank Calculator Worksheet
	Invasive Exotic Plant Cover	☐	Values entered for each polygon on Worksheet 5
		☐	Invasive species listed on Worksheet 5
		☐	Rating entered on Rank Calculator Worksheet
Abiotic Worksheets	Hydrologic Connectivity	☐	Cross-section locations indicated on AA map
		☐	Worksheet 9 completed for each cross-section
		☐	Average entrenchment ration calculation entered on Rank Calculator Worksheet
		☐	If narrative approach used, noted in comments on Abiotic Comments Box
		☐	If fewer than three cross-sections are measured, noted in comments on Abiotic Comments box
	Macrotopographic Connectivity	☐	Worksheet 10 completed for each segment
		☐	Rating entered on Rank Calculator Worksheet
	Channel Stability	☐	Worksheet 11 completed for each segment
		☐	Rating entered on Rank Calculator Worksheet
	Stream Bank Stability and Cover	☐	Worksheet 12 completed for each segment
		☐	Ranking entered on Rank Calculator Worksheet
	Soil Surface Condition	☐	Values entered for each polygon on Worksheet 13
		☐	Averaged percent values entered on Rank Calculator Worksheet
Stressor Checklists		☐	Complete checklists with the team for concurrence
		☐	Values entered on Stressor Summary Worksheet (Worksheet 14e)
Equipment and Supplies		☐	Account for and organize all equipment and supplies for transport back to the vehicle
		☐	Remove all flagging and markers, unless the site will receive a repeat sampling visit
		☐	To prevent spread of potentially harmful organisms and invasive species between WOIs, decontaminate equipment, shoes, clothing, and person as thoroughly as possible at the staging area

APPENDIX B
CONDITION RANK CALCULATOR

New Mexico Rapid Assessment Method

Montane Riverine Wetlands

Condition Rank Calculator

(Version 1.2)

As part of the New Mexico Rapid Assessment Method (NMRAM) Assessment Package, a Rank Calculator is provided as a manual worksheet or the companion **spreadsheet calculator** (Electronic Addendum). The Rank Calculator is hierarchically structured by major attribute categories with associated metrics and provides for weighting each metric and attribute class. Using the worksheets in Appendix A, ratings for each metric are entered into the Rank Calculator. The NMRAM metric and attribute weighting structure is built into the calculator such that individual and attribute category weighted scores can be calculated easily and then rolled up into a final numeric **Wetland Condition Score** between 4.0 (excellent) and 1.0 (poor) and a letter **Wetland Condition Rank** (A = Excellent, B = Good, C = Fair, and D = Poor). There is also a field to enter a summary of the ranking process and comments on the condition, stressors, or other issues as they relate to the wetland of interest (WOI) as a whole. Separate rank calculator worksheets are completed for each assessment area (AA) within a WOI.

To complete the reporting, the final scores and ranks for all AAs sampled in the WOI are entered on the WOI Cover Worksheet (see Appendix A). If there is more than one AA, the scores and rating are averaged and the final values entered. The final step is to complete a narrative **Assessment Summary** based on the condition ratings and stressor information from all AAs.

The reporting package is designed to aid direct entry into the New Mexico Wetlands Database. This database, currently under construction, is intended as a comprehensive, central clearing house for information on New Mexico's wetlands. When completed, the web interface will provide various reporting tools to facilitate the analysis of single and comparison of multiple sites from around the state. An update regarding the development of this database can be found on either the Natural Heritage New Mexico or New Mexico Environment Department Surface Water Quality Bureau website, along with the NMRAM Manual and Field Guide.

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

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

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

NMRAM AA Condition Scoring Summary. Enter summary scores on WOI Cover Worksheet					
Major Attribute	**# of metrics**	**Comments**	**Score**	**Wt.**	**Wt. Score**
Landscape Context				0.25	
Size				0.15	
Biotic				0.3	
Abiotic				0.3	
AA WETLAND CONDITION SCORE				**Σ**	
AA WETLAND CONDITION RANK				**=**	

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

Stressor Summary						
	Buffer		Assessment Area			
	Minor	Major	Minor	Major	**Total**	
Total Number of Stressors						

Rank Comments:

APPENDIX C
NEW MEXICO NOXIOUS WEED LIST

NMRAM Appendix C. New Mexico Noxious Weed List

M Weed Class	Common Name	Scientific Name	PLANTS Symbol	Family
Trees				
B	tree of heaven	*Ailanthus altissima*	AIAL	Simaroubaceae
C	Russian olive	*Elaeagnus angustifolia*	ELAN	Elaeagnaceae
C	saltcedar	*Tamarix* spp.	TAMAR2	Tamaricaceae
C	Siberian elm	*Ulmus pumila*	ULPU	Ulmaceae
Shrubs				
A	camelthorn	*Alhagi maurorum*	ALMA12	Fabaceae
Graminoids				
A	ravennagrass	*Saccharum ravennae*	SARA3	Poaceae
C	cheatgrass	*Bromus tectorum*	BRTE	Poaceae
C	jointed goatgrass	*Aegilops cylindrica*	AECY	Poaceae
W	crimson fountaingrass	*Pennisetum setaceum*	PESE3	Poaceae
W	giant reed	*Arundo donax*	ARDO4	Poaceae
W	quackgrass	*Elymus repens*	ELRE4	Poaceae
W	Uruguayan pampas grass	*Cortaderia selloana*	COSE4	Poaceae
Forbs				
A	black henbane	*Hyoscyamus niger*	HYNI	Solanaceae
A	butter and eggs, or yellow toadflax	*Linaria vulgaris*	LIVU2	Scrophulariaceae
A	Canada thistle	*Cirsium arvense*	CIAR4	Asteraceae
A	Dalmation toadflax	*Linaria dalmatica*	LIDA	Scrophulariaceae
A	diffuse knapweed	*Centaurea diffusa*	CEDI3	Asteraceae
A	Dyer's woad	*Isatis tinctoria*	ISTI	Brassicaceae
A	Eurasian watermilfoil	*Myriophyllum spicatum*	MYSP2	Haloragaceae
A	giant salvinia	*Salvinia molesta*	SAMO5	Salviniaceae
A	hoary cress	*Cardaria draba*	CADR	Brassicaceae
A	leafy spurge	*Euphorbia esula*	EUES	Euphorbiaceae
A	oxeye daisy	*Leucanthemum vulgare*	LEVU	Asteraceae
A	parrot feather watermilfoil	*Myriophyllum aquaticum*	MYAQ2	Haloragaceae
A	purple loosestrife	*Lythrum salicaria*	LYSA2	Lamiaceae
A	purple starthistle	*Centaurea calcitrapa*	CECA2	Asteraceae
A	sandwort drymary or alformbrilla	*Drymaria arenarioides*	DRAR7	Caryophyllaceae
A	Scotch thistle	*Onopordum acanthium*	ONAC	Asteraceae
A	spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	CESTM	Asteraceae
A	waterthyme, or hydrilla	*Hydrilla verticillata*	HYVE3	Hydrocharitaceae
A	yellow starthistle	*Centaurea solstitialis*	CESO3	Asteraceae
B	African rue	*Peganum harmala*	PEHA	Zygophyllaceae
B	chicory	*Cichorium intybus*	CIIN	Asteraceae
B	Fuller's teasel	*Dipsacus fullonum*	DIFU2	Dipsacaceae
B	Malta starthistle	*Centaurea melitensis*	CEME2	Asteraceae
B	nodding plumeless thistle or musk thistle	*Carduus nutans*	CANU4	Asteraceae
B	perennial pepperweed	*Lepidium latifolium*	LELA2	Brassicaceae
B	poison hemlock	*Conium maculatum*	COMA2	Apiaceae
B	Russian knapweed	*Acroptilon repens*	ACRE3	Asteraceae
B	saltlover, or halogeton	*Halogeton glomeratus*	HAGL	Chenopodiaceae
C	bull thistle	*Cirsium vulgare*	CIVU	Asteraceae
W	Asian mustard	*Brassica tournefortii*	BRTO	Brassicaceae
W	perennial wallrocket	*Diplotaxis tenuifolia*	DITE4	Brassicaceae
W	spiny cockleburr	*Xanthium spinosum*	XASP2	Asteraceae
W	Tyrol knapweed	*Centaurea nigrescens*	CENI3	Asteraceae

PLANTS symbol from USDA (NRCS) PLANT database (http://plants.usda.gov); A = Species with limited distribution; B = Species limited to portions of the state; C = Species that are wide spread; W = Watch list