Montana Department of Transportation

Montana Wetland Assessment Method





Prepared for:

Montana Department of Transportation
Environmental Services
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March 2008

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INTRODUCTION

In 1989, the Montana Department of Transportation (MDT) and the Montana Department of Fish, Wildlife & Parks (MFWP) developed a wetland evaluation method to be applied to highway projects in Montana. Substantial revisions of the method and corresponding field forms were undertaken in 1994 and again in 1996. The 1996 version (Berglund 1996) was tested for three field seasons at several hundred wetlands and then revised in 1999. Between 1999 and 2007, use of the Montana Wetland Assessment Method (MWAM) continued in Montana and elsewhere. Opportunities to improve assessment accuracy and evaluator consistency were noted during this eight-year period and have been incorporated into the 2008 revision. The instructions and the corresponding field forms in this document comprise the 2008 version of this functional assessment method.

As with previous versions, the 2008 MWAM discussed in this user's manual was primarily designed to address highway and other linear projects, such as pipelines and transmission lines. However, MWAM can be applied to other types of projects, including mitigation projects, at the discretion of the user. It is important to note that this method is intended to *evaluate* wetland functions and values, and is not to be used to *delineate* wetland boundaries. Wetland delineation of a site should be conducted prior to evaluation using the 1987 Corps of Engineers (COE) wetland delineation manual (Environmental Laboratory 1987) or other COE-approved methods (e.g., regional wetland delineation supplements).

MWAM applicability is not limited to transportation corridors. It has been and can be applied to a variety of other project types, such as ski areas, wetland mitigation projects, and reference wetlands.

MWAM assessments result in a relative rating for up to 12 functions and values. Though useful, this rating provides no information on the rate at which an applicable function (such as flood attenuation, sediment/nutrient/toxicant retention and removal, production export, groundwater discharge/recharge, etc.) is performed. The actual rate at which a "measurable" function is performed is dependent on site specific conditions, requires specialized equipment and repeated measurements, and is beyond the scope of this methodology.

The objectives of the 2008 version of MWAM are consistent with previous versions and are to provide a rapid, economical, and repeatable wetland evaluation method applicable to Montana (and other western states) that:

- meets the needs of local regulatory agencies in terms of rating wetland functions and values for the majority of proposed wetland disturbance-related projects and wetland mitigation projects in the state, particularly highway projects;
- minimizes subjectivity and variability between evaluators;
- allows for the comparison of different wetland types;
- provides a means of rating wetlands to facilitate the prioritization of impact avoidance and minimization measures; and
- incorporates current and relevant information on wetland functions.

METHOD DEVELOPMENT

The 2008 version of MWAM builds on the 1999 version. This was accomplished by soliciting comments from a variety of agency and private industry professionals and by reviewing relevant findings and advances in wetland science documented in technical literature. Comments on specific problems or issues with the 1999 version and suggested edits for improvement of the 1999 version were solicited in February/March 2006 from MDT wetland staff, the COE, U.S. Environmental Protection Agency Region – VIII (EPA), U.S. Fish and Wildlife Service (USFWS), Federal Highway Administration (FHWA), Natural Resources Conservation Service (NRCS), U.S. Forest Service (USFS), Montana Department of Environmental Quality (MDEQ), MFWP, academics, and the wetland consultant community working in Montana. Comments/edits/ suggestions were carefully reviewed and incorporated into MWAM when considered appropriate.

Relevant literature on wetland functions and their assessment was reviewed and suitable elements were adapted for use in the 2008 version of MWAM. The primary literature sources used include:

- *A Hydrogeomorphic Classification of Wetlands* (Brinson 1993)
- *An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices* (Smith et al. 1995)
- *A Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands* (Brinson et al. 1995)
- *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Riverine Floodplains in Northern Rocky Mountains* (Hauer et al. 2002b)
- *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing the Functions of Intermontane Prairie Pothole Wetlands in the Northern Rocky Mountains* (Hauer et al. 2002a)
- *Evaluation of Planned Wetlands* (Bartoldus et al. 1994)
- *Stream Visual Assessment Protocol* (NRCS 1998)
- *Riparian Assessment – Using the NRCS Riparian Assessment Method* (Pick et al. 2004)
- *Applied Fluvial Geomorphology* (Rosgen 1996)
- *The U.S. Army Corps of Engineers' Guidance for Compensatory Mitigation and Mitigation Banking in the Omaha District* (Lawrence 2005)
- *A Comprehensive Review of Wetland Assessment Procedures* (Bartoldus 1999)
- *Oregon Freshwater Wetland Assessment Methodology* (Roth et al. 1993)
- *Minnesota Routine Assessment Method for Evaluating Wetland Functions* (Minnesota Interagency Wetland Group 1996)
- *Wetland Evaluation Technique* (Adamus et al. 1991)
- *Highway Methodology Workbook* (COE 1995)

The remainder of this user's manual provides guidance on the appropriate use of MWAM.

INSTRUCTIONS AND DISCUSSION

This section of the user's manual provides discussion and instructions for completing each of the fields on the data form provided in **Appendix A**. Note that the form has been revised and that completion of the form without use of the user's manual guidebook is highly discouraged. Many of the indicators used to assign ratings and scores are very specific and will require reference to this manual.

The COE Regulatory Division must consider impacts to wetland functions and values when evaluating Section 404 permit applications. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society, and relate to ecological significance without regard to subjective human values (COE 1995). Groundwater discharge is an example of a wetland function. Values are benefits that derive from either one or more functions and the physical characteristics associated with a wetland (COE 1995). The value of a given wetland function, or combination of functions, is based on human judgment of the worth, merit, importance, or quality attributed to those functions.

Overview

Depending on the wetland being evaluated, up to 12 functions/values can be evaluated through the use of MWAM, including:

- Habitat for federally listed or proposed threatened or endangered plants or animals
- Habitat for plants or animals rated S1, S2, or S3 by the Montana Natural Heritage Program (or applicable State's Natural Heritage Program)
- General wildlife habitat
- General fish habitat
- Flood attenuation
- Long and short-term surface water storage
- Sediment/nutrient/toxicant retention and/or removal
- Sediment/shoreline stabilization
- Production export/terrestrial and aquatic food chain support
- Groundwater discharge/recharge
- Uniqueness
- Recreation/education potential

It is highly recommended that the User's Manual be referenced during every assessment. This will reduce errors caused by misinterpretation of the indicator categories and improve consistency.

MWAM is designed to be applied by resource professionals familiar with wetland science and its terminology. Typical assessment staff qualifications include a Bachelor's degree in a natural resources field and at least two years of experience in wetland related work. A glossary is included at the end of the user's manual to assist evaluators and to facilitate the consistent understanding and use of this method.

Using the form and user's manual, the evaluator assesses and assigns applicable functions and values ratings of "low", "moderate", or "high" (or, in some cases, "exceptional"), and generally scores each on a scale of 0.1 (lowest) to 1.0 (highest) "functional points". The scoring scale for each function and value is similar to that of the hydrogeomorphic (HGM) method, although HGM does not generally consider values. Also, only

selected variables (i.e., indicators) used by the various regional HGM models with respect to a given function were included in this method.

Functional points are summed on the data form and expressed as a percentage of the possible total; functions that do not apply to a given wetland are assigned a rank of "Not Applicable" or "NA", and are **not included** in possible point totals (e.g., do not affect the calculated percentage of the possible total points). This percentage is then used in conjunction with other criteria to provide an overall wetland ranking into one of four categories. Category I is the highest overall ranking a wetland can receive, followed by Category II, Category III, and Category IV. Functional points can be multiplied by the total existing or expected (post-project) acreage in the assessment area (AA) to determine the total "functional units" existing, expected to be lost, or expected to be gained at a given site. Wetland categories and functional units are further discussed in the latter portion of this section.

When completing fields 14A through 14L (the functions and values assessment portion of the form), if it is the evaluator's best professional opinion that a rating for a particular function is inadequately represented on the form due to specific site conditions, it is appropriate to override the calculated value and note the justification in the comment space provided. It is important to note, however, that this should be treated as the exception rather than the rule.

In specific instances, the evaluator may override the calculated value and note the justification in the comment space provided.

Generally, it is appropriate to evaluate AAs individually on separate data forms. However, it is also appropriate to address several AAs on one data form if the AAs are very similar with respect to size, hydrology, species composition, exposure to disturbance, and other features. For example, several very similar roadside ditch wetland AAs along a proposed highway project might be assessed on one data form. It is important to note, however, that when several similar AAs are assessed on one form, they should not be assessed cumulatively (e.g., do not add the wetland or AA areas or "pool" scores). Rather, they should be assessed individually – the idea being that if each of these similar AAs were assessed on separate forms, the scores and ratings would be identical. AAs that differ enough from one another such that they would result in different ratings for various functions and values should be assessed on separate data forms.

Several attributes throughout the form are rated by working through matrices. Variables used within these matrices are addressed in a dichotomous, "top to bottom" fashion, resulting in an assignment of functional points and a rating for each evaluated function. An example based on the matrix used to evaluate flood attenuation is provided below. In this example, it was estimated that the AA is slightly entrenched, > 75 percent of the flooded wetland is forested, scrub-shrub, or both, and the site contains an unrestricted outlet, receiving a score of 0.9 and a rating of "high" for this function.

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	Slightly entrenched - C, D, E stream types			Moderately entrenched – B stream type			Entrenched-A, F, G stream types		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains **unrestricted outlet**	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

Completing the Data Form

1. Project Name: Enter the appropriate project name.

2. Project # and Control #: Enter the appropriate MDT project and control numbers, if applicable.

3. Evaluation Date: Enter the date(s) that the field evaluation was conducted.

4. Evaluator(s): Enter the name(s) and/or affiliation of the personnel conducting the evaluation.

5. Wetland/Site #(s): Enter the wetland identification number(s) and/or name(s), if applicable.

6. Wetland Location(s): Enter the appropriate legal descriptions, stationing or mileposts, eight-digit watershed descriptor (from the *Hydrologic Unit Map – 1974: State of Montana* [U.S. Geological Survey 1976]), watershed name (see map in **Appendix B**), county, global positioning system (GPS) waypoint # (if available; not required), and other desired location information for the evaluated wetlands.

7. Evaluating Agency and Purpose: Fill in the appropriate agency (for MDT projects, this will generally be "MDT") and check the appropriate project category.

8. Estimated Total Wetland Size: Enter the estimated or measured (not required) size of the entire wetland that includes the (often smaller) assessment area (AA). If the AA is delineated such that the entire wetland is included, the responses to 8 and 9 will be the same. If evaluating more than one AA on a single data form, enter the range of wetland sizes and the average wetland size. Note that when more than one AA is evaluated on a single form that functional unit calculations cannot be performed using the average size of the AAs; this is done on an individual AA basis.

9. Estimated Acreage of Assessment Area (AA): Indicate the estimated or measured (not required) acreage within the boundaries of the AA using the guidance below and summarized in **Chart 1**. If splitting a wetland into more than one AA, indicate the AA boundaries on the wetland delineation map. Wetlands bisected by roads (or other features) may be considered as a single AA or as more than one AA, depending on the perceived degree of hydrologic/biological interaction between the two halves. If evaluating more than one AA on a single data form, enter the range of sizes and the average AA size. Several example AAs relative to highway projects are provided in **Figure 1**.

The AA includes the portion of a wetland that is (see **Figure 1**):

A. within a proposed project right-of-way, construction easement, permit area, known detour area, etc. (e.g., within the area of interest) *and* contiguous to a distance determined by B or C below, whichever distance is *closer* to the proposed project.

B. contiguous up and downstream from the project to physical points of significant hydrologic change (these can include jurisdictional boundaries, points where wetlands are no longer adjacent to a non-wetland channel, natural [geomorphic] or man made constrictions or expansions, points where the gradient changes rapidly, points of significant inflow [e.g., tributaries], or places where other factors limit hydrologic interaction) *or*

C. contiguous up and downstream from the project to maximum distances of 0.5 mile if no points of significant hydrologic change (including termination of the wetland) occur within this distance.

Chart 1: ***Assessment Area Determination Flowchart***

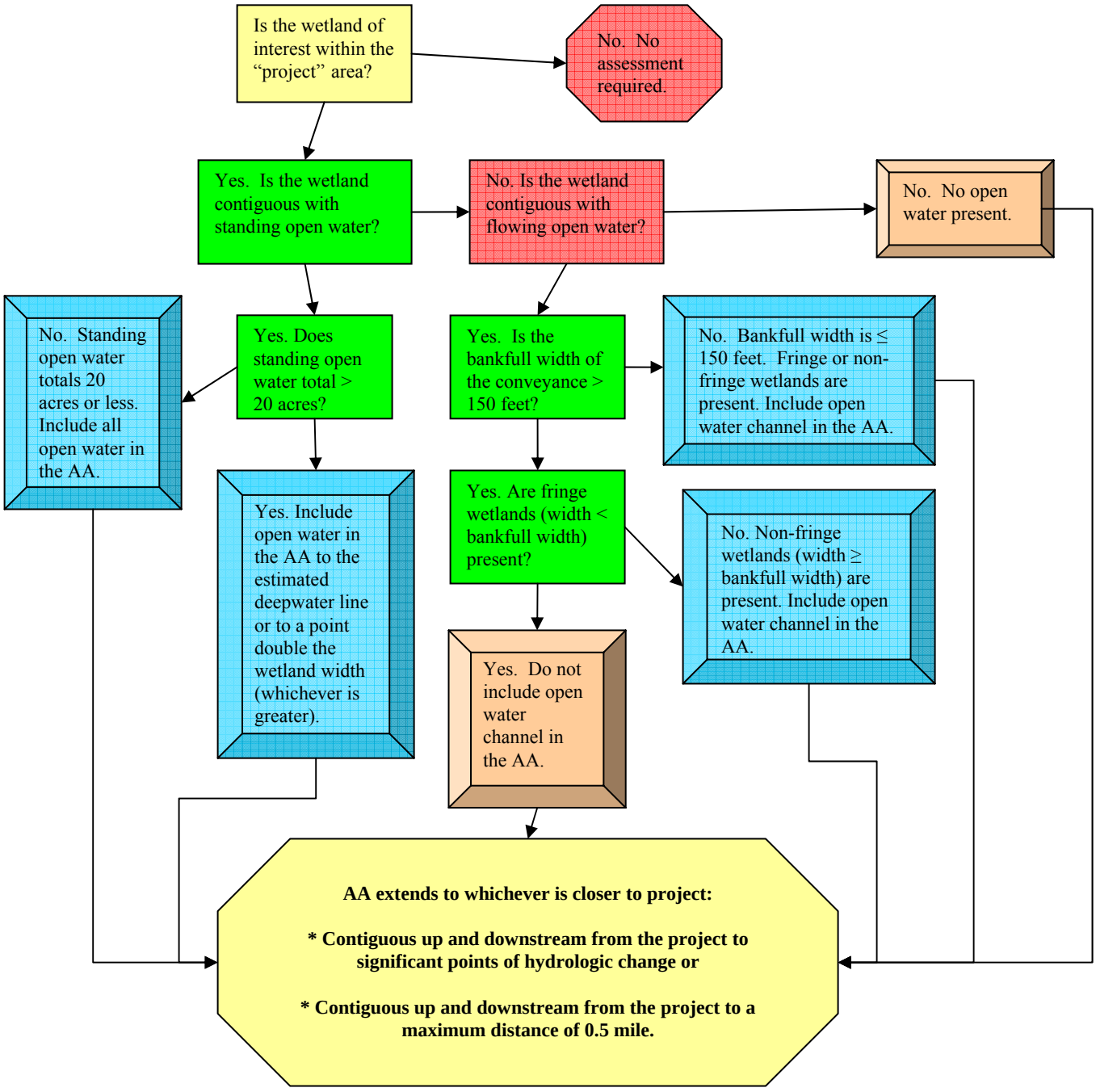
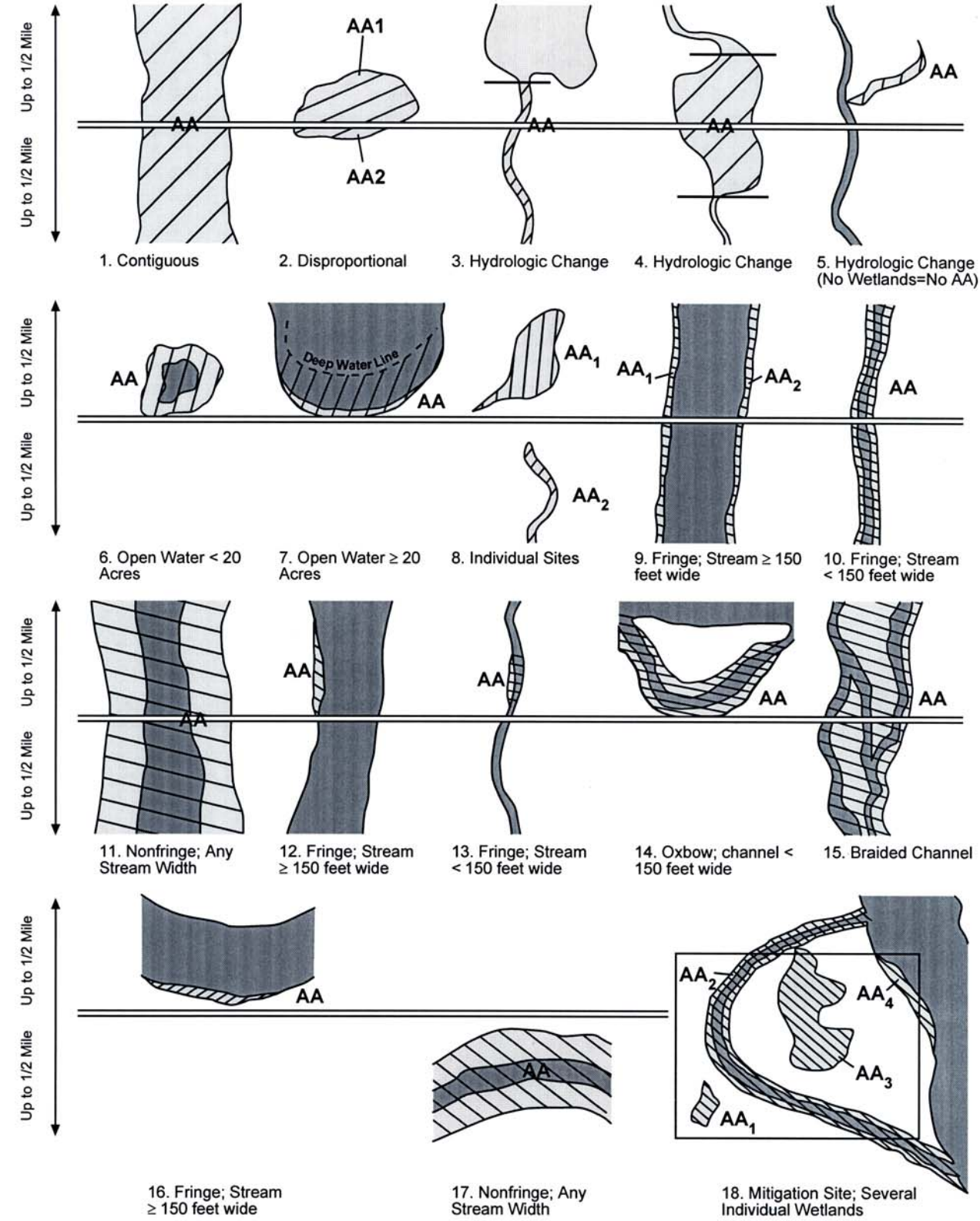


Figure 1 - Sample Assessment Areas



The following conditions apply to wetlands contiguous with open water. Open water is defined as *any area of standing or flowing water without emergent (not including pioneer species), scrub-shrub, or forested vegetation (e.g., in most cases a flooded wet meadow would not be considered to contain open water)* .

Where wetlands are contiguous with **standing** non-wetland water bodies (lakes, ponds):

If wetlands are contiguous with < 20 acres of open water (e.g., prairie pothole), include all open water in the AA to a distance from the project determined by A, B, and C above (see **Figure 1**, Panel #6).

If wetlands are contiguous with ≥ 20 acres of open water (e.g., Flathead Lake), include open water in the AA to the estimated deep water line (>6.6 feet) or to a point that is double the wetland shoreline width, whichever is greater (see **Figure 1**, Panel #7).

Where wetlands are contiguous with **flowing** non-wetland water bodies (rivers, streams, irrigation canals):

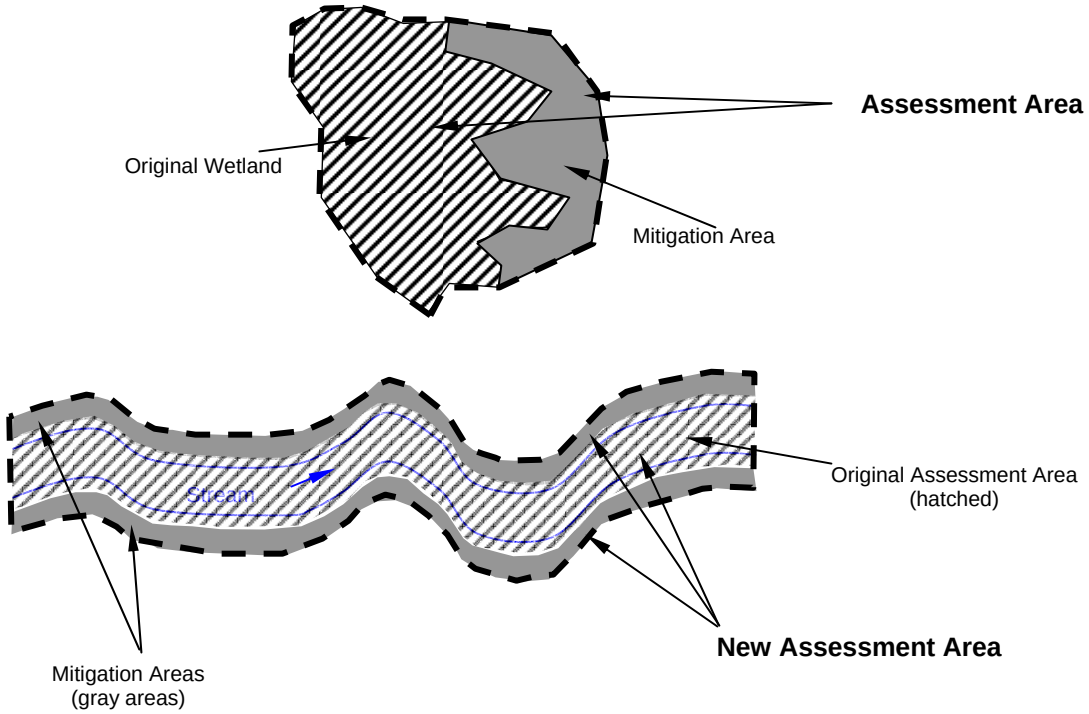
For all wetlands adjacent to a channel with a bankfull width < 150 feet (e.g., Little Blackfoot River) and for all non-fringe (*wetland width is ≥ bankfull channel width*) wetlands adjacent to a channel of any width, include the entire channel in the AA to a distance from the project determined by A, B, and C (see **Figure 1**, Panel #s 10, 11, 13, 14, 15, 17, and 18). Note that there can be exceptions to this when, in the evaluator's professional opinion, wetlands technically contiguous with a stream are at some point of such horizontal or vertical distance from the actual channel that they no longer substantively influence, or are influenced by, channel attributes and processes, such as fish habitat or flooding. In this situation, it is appropriate to break out separate AAs that do not include the channel.

For fringe wetlands (*wetland bank width is less than the bankfull channel width*) adjacent to a channel with a bankfull width ≥ 150 feet (e.g., Missouri River), only include the *actual wetlands* in the AA to a distance from the project determined by A, B, and C. Do not include the main channel in the AA unless the wetlands extend into it (see **Figure 1**, Panel #s 9, 12, 16, 18).

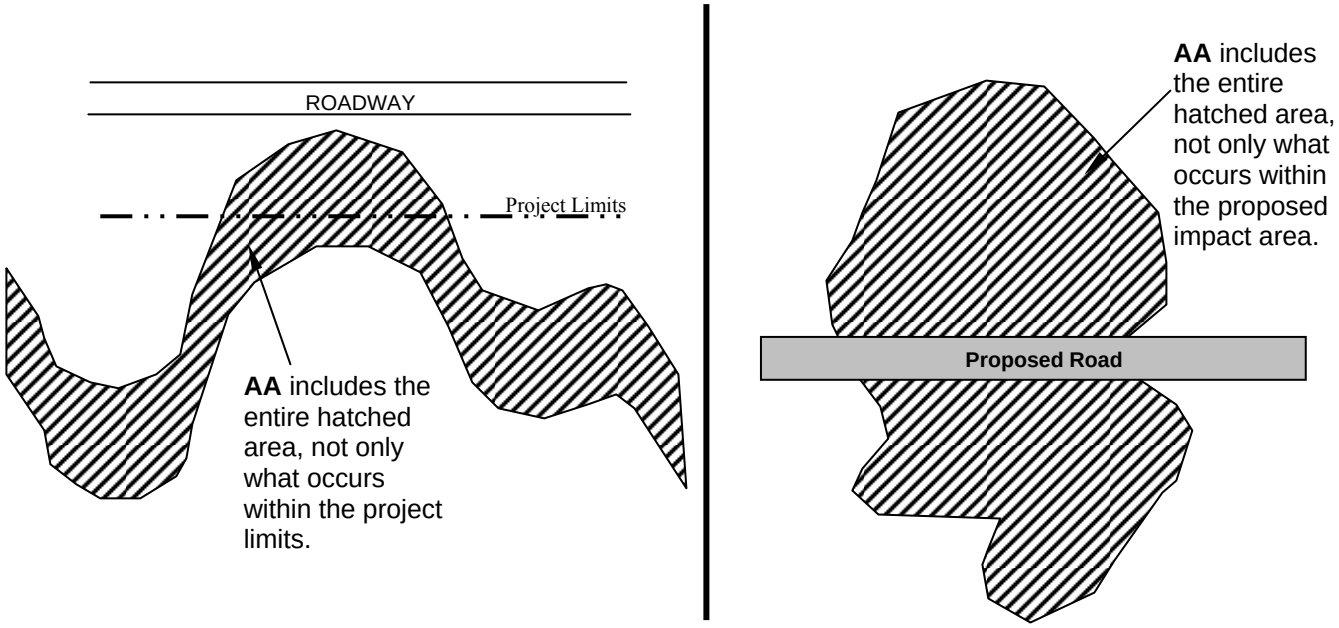
> ***NOTE:*** *In some cases, wetlands technically contiguous with a stream are at some point of such horizontal or vertical distance from the actual channel that, in the evaluator's professional opinion, they no longer substantively influence, or are influenced by, channel attributes and processes such as fish habitat or flooding. In this situation, it is appropriate to break out separate AAs that do not include the channel, noting as such in the comments.*

Additional Examples of Assessment Areas

EXAMPLE 1: When a wetland mitigation area is constructed adjacent to an existing wetland, consider the entire contiguous wetland to physical points of significant hydrologic change or a maximum distance of 0.5 miles, not only the mitigation area.



EXAMPLE 2: A common mistake made by evaluators is to assess only the wetland area within a specific project impact area or area for which site access has been granted. It is important to remember that the AA will frequently extend beyond these areas.



10. Classification of AA: Both the hydrogeomorphic (HGM) and USFWS classifications systems are included in this field because they provide different types of information potentially useful to regulators or in mitigation design. Be aware that although terms used in the two systems can be similar, their meaning can vary when applied in the context of either classification system. In column 1 enter the HGM class(es) (Smith et al. 1995) pertaining to the AA (**Table 1**). HGM classes applicable to Montana are riverine, depressional, slope, mineral soil flats, organic soil flats, and lacustrine fringe. A key to these classes is provided in **Appendix C**. Class descriptions are provided in Smith et al. (1995). Smith et al. (1995) describes the HGM classification as being:

> "*…based on three fundamental factors that influence how wetlands function, including geomorphic setting, water source, and hydrodynamics. Geomorphic setting refers to the landform of a wetland, its geologic evolution, and its topographic position in the landscape. Water source refers to the location of water just prior to entry into the wetland. Hydrodynamics refers to the energy level of moving water, and the direction that surface and near-surface water moves in the wetland.*"

Table 1: ***Hydrogeomorphic Wetland Classes in Montana***

Hydrogeomorphic Class (Geomorphic Setting)	Dominant Water Source	Dominant Hydrodynamics	Montana Examples
Riverine	Overbank flooding from river channel or subsurface hydraulic connections between stream channel and wetlands	Unidirectional, horizontal	Floodplain areas adjacent to the Middle Fork Flathead or Yellowstone Rivers
Slope	Groundwater	Unidirectional, horizontal	Fens and other seeps on hillsides, such as those often occurring in avalanche chutes
Depressional	Groundwater and interflow	Vertical	Prairie potholes
Lacustrine Fringe	Overbank flow from lake	Bi-directional, horizontal	Marshes around Flathead Lake
Mineral and Organic Flats	Precipitation	Vertical	Salt flats

Source: Adapted from Smith et al. (1995) and Brinson et al. (1995)

For columns 2-4 on the form, enter the classes, special modifiers, and water regimes that apply to the AA using the USFWS classification system (Cowardin et al. 1979). A classification hierarchy showing systems, subsystems, and classes from Cowardin et al. (1979) is included in **Appendix C**. For column 5, enter the estimated percentage of the AA that corresponds to each Cowardin wetland class. Guidance for estimating percent cover is included in **Appendix D**.

Vegetated classes are distinguished on the basis of what species constitute the uppermost layer of vegetation and that cover more than 30% of the substrate (Cowardin et al. 1979). For example, an area with 50% areal coverage of trees over a shrub layer with 60% areal coverage would be classified as a forested wetland; an area with 20% areal coverage of trees over a shrub layer with 60% areal coverage would be classified as a scrub-shrub wetland. When trees or shrubs alone cover less than 30% of an area but in combination cover 30% or more, the wetland is classified as scrub-shrub. When trees and shrubs cover less than 30% of an area but the total vegetative cover is 30% or greater, the wetland is assigned to the appropriate class for the predominant life form (e.g., emergent) below the shrub layer. Vegetated classes likely to be encountered are defined below:

Aquatic bed class: Any area of open water dominated by plants that grow principally on or below the water surface for most of the growing season. Vegetation is non-persistent and includes submerged or floating-leaved rooted vascular plants, free-floating vascular plants, submergent mosses, and algae.

Emergent class: Vegetated wetland characterized by erect, herbaceous hydrophytes (e.g., sedges, rushes, grasses, bulrush, cattail), excluding mosses and lichens.

Scrub-shrub class: Vegetated wetland dominated (>30% areal cover) by woody vegetation less than 6m (20 ft) tall. Species include shrubs, young trees, and stunted trees and shrubs.

Forested class: Vegetated wetland characterized by woody vegetation that is 6m (20 ft) tall or taller and has a minimum of 30% areal cover.

Moss-lichen class: Wetland where mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30% of areal cover.

Source: Cowardin et al. (1979)

11. Estimated Relative Abundance of Similarly Classified Sites within Major Montana Watershed Basin:

Circle the estimated relative abundance of sites that are similar in vegetative composition and hydrology to the AA and occur within the same major Montana watershed basin (**Appendix B**) using the following definitions:

Rare	estimated < 10% of wetlands in basin similar to AA
Common	estimated 10-50% of wetlands in basin similar to AA
Abundant	estimated >50% of wetlands in basin similar to AA

The Major Montana Watershed Basin Map (**Appendix B**) is based on a modification of the 1974 United States Geological Survey Hydrologic Unit Map for Montana, and is used by MDT and regulatory agencies to determine the suitability of mitigation project locations relative to impact locations.

12. General Condition of AA:

i. **Regarding Disturbance.** Disturbance at the AA is based on land use both within the AA and in the surrounding area. Land use in surrounding areas can provide a measure of disturbance within AAs and negatively influence their overall quality and functionality, even though the AAs themselves may be relatively undisturbed. Use the matrix on the form to arrive at an overall determination of "low", "moderate", or "high" disturbance at the AA. Fill in comments as desired. The term 'noxious weeds' refers to weed species listed as noxious by the State of Montana (or in the state where this method is being applied). Information on Montana-listed noxious weeds and aquatic nuisance vegetation species (ANVS) is included in **Appendix E**.

ii. Prominent Noxious, Aquatic Nuisance, and other Exotic Vegetation. List prominent noxious weeds, aquatic nuisance species and other exotic vegetation that occurs within the AA.

iii. Descriptive Summary. Provide a brief (1 to 2 sentence) description of the AA and surrounding area. The description may include dominant species, adjacent land use, proximity to other wetlands, topography, etc.

13. Structural Diversity: This refers to the number of vertical vegetative strata found in AA wetlands and is evaluated by the number of Cowardin et al. (1979) vegetated wetland classes identified in #10 (adapted from Roth et al. 1993). For wetlands with only one vegetated class (if not a monoculture), the AA's natural vegetative class potential is also considered.

Using the table provided on the form, first determine the existing structural diversity rating for the AA. Count only those classes listed under #10 that are vegetated; *do not include unvegetated (e.g., rock bottom, unconsolidated shore, etc.) classes*. Rate the existing structural diversity based on the "best case" for a given wetland. For example, if non-persistent floating-leaved vegetation is absent during the evaluation, but the reviewer knows or strongly suspects that such vegetation is present during some portion of the year, then this class should be counted in addition to other vegetated classes.

For wetlands with one vegetated class, where that class does not comprise a monoculture, in the middle table column answer the question, "*Is current management preventing (passive) existence of additional vegetated classes?*". The intent of this question is to discern, based on the evaluator's best professional judgment, whether the structural diversity at the AA is essentially at its natural potential, or whether it is impaired (e.g., structural diversity is somehow being repressed) and could be improved if the site were managed differently (this does not include planting). If the site is relatively undisturbed by humans, is on a natural successional pathway and may eventually support more classes (e.g., cottonwood overstory), then the initial rating should not be modified. Considered management changes must be reasonable and capable of implementation. Examples of appropriate management changes to consider include:

- Removing grazing
- Eliminating mowing, timber harvest, or ground disturbing activities
- Eliminating broad-spectrum herbicide application
- Treatment of targeted weed or nuisance species
- Eliminating site draining or dewatering
- Removing fill from wetlands or other waters
- Eliminating sources of sedimentation or contamination

Examples of management changes inappropriate for consideration include:

- Planting or seeding to increase diversity
- Supplementing site hydrology (other than by eliminating draining or dewatering)
- Excavation or berm placement to create wetlands or other waters

It may be useful to visit other wetlands of the same HGM class in the area that are undisturbed, or minimally disturbed by humans, to determine the site's potential if man-induced disturbance were to be removed. For example, if the AA is a depressional wetland, then its potential structural diversity could be determined by examining undisturbed or minimally disturbed depressional wetlands in the area. The HGM classification can be useful because it ensures that compared sites are in similar topographic positions within the landscape, and that they have similar sources of hydrology and water regimes. Please note that restored, enhanced or created wetland areas should not be used as reference areas to determine a site's potential structural diversity. Other recommended parameters for better understanding a site's structural diversity potential include physiographic province, elevation, potential seed sources, and the natural disturbance regime (e.g., flooding, beaver, fire, etc.). It may also be useful to refer to *Classification and Management of Montana's Riparian and Wetland Sites* by Hansen et al. (1995).

Note that the term monoculture is defined as one species comprising 90 percent or more of the total vegetated cover on the site. Examples of monotypic stands of vegetation in Montana include, but are not limited to, inland saltgrass flats, cattail marshes, common reed stands, and reed canarygrass marshes or fringes along streams.

14A. Habitat for Federally Listed or Proposed Threatened or Endangered (T&E) Plants or Animals: A "red flag" attribute, this field assesses habitat for species receiving protection under provisions of the Endangered Species Act; that is, *listed or proposed threatened or endangered species*. Potential effects to threatened and endangered species are examined by the COE during 404 permit application reviews. According to the COE general conditions for Nationwide 404 permits, "no activity is authorized which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species." Visit the USFWS Montana website for the most current list of proposed, candidate, threatened and endangered species in the state. Their Montana web site is: http://montanafieldoffice.fws.gov/Endangered_Species/Listed_Species.html

i. Circle D or S to indicate whether habitat for listed or proposed T&E species is documented or suspected to occur *within* the AA at the ascertained level using the definitions provided below. For a species to be considered *documented* within the AA, an individual or group of individuals should have been reported as physically occurring within the AA itself, not merely in the vicinity. For a species to be *suspected* of occurring within the AA, the species should have been documented as occurring in the general vicinity of the AA and there should be reasonable certainty that the species could occur in the AA based on its life history requirements. It may be appropriate to indicate more than one use level for multiple species. For example, an AA may contain secondary habitat for bull trout and incidental habitat for grizzly bears. List the species that correspond to each habitat level determined to apply to the AA. If no T&E species use is known or suspected in the AA, then select the "suspected no usable habitat" option.

Primary Habitat: Habitat essential to the short- or long-term viability of individuals or populations. The presence of traditional breeding, spawning, nesting, denning, or critical migratory habitat, large seasonal congregations (including communal roosts, staging habitat, traditional foraging congregations, etc.), or USFWS-designated critical habitat or core areas in the AA indicates primary habitat, as does any occurrence of a T&E plant.

Secondary Habitat: Habitat that is occasionally or semi-regularly used by a given species, but that is not necessarily essential to the short or long-term viability of individuals or populations. Examples would include non-specific migration areas and occasional forage or perch sites. Primary habitat, as defined above, may occur in the general vicinity (e.g., within the project area, section, drainage, watershed, etc.), but not in the AA.

Incidental Habitat: Habitat that receives chance, inconsequential use by a given species or habitat conditions or the known distribution of the species would indicate this level of use. This term implies that, while it may be conceivable that a given species may occur at an AA at some point, the chance is remote and the use is not likely to be repeated.

ii. Rating. Use the highest level habitat rating (e.g., the level that corresponds to the highest functional point value) determined under **i** to determine the functional point value for the AA. If T&E species habitat is documented at the AA, indicate the source of the documentation.

***14B. Habitat for Plants or Animals Rated S1, S2, or S3 by the Montana Natural Heritage Program*:** This field assesses use of the AA by species rated S1 (critically imperiled), S2 (imperiled), or S3 (vulnerable) by the Montana Natural Heritage Program (MTNHP) (not including "watch list" species). Species within these MTNHP categories are inclusive of USFS-listed sensitive species and USFWS candidate species that are not subject to the provisions of the Endangered Species Act. *To avoid duplication, do not include species listed above under 14A*. Lists of plants and animals rated S1, S2, and S3 by the MTNHP are provided on their website: http://mtnhp.org/SpeciesOfConcern/

i. Circle D or S to indicate whether habitat for these species is documented or suspected within the AA at the ascertained level using the definitions provided above under 14A. For a species to be considered *documented* within the AA, an individual or group of individuals should have been reported as physically occurring within the AA itself, not merely in the vicinity. For a species to be *suspected* of occurring within the AA, the species should have been documented in the general vicinity of the AA, and there should be reasonable certainty that the species could occur in the AA based on its life history requirements. As discussed under 14A, it may be appropriate to indicate more than one habitat level for multiple species. List the species that correspond to each habitat level applying to the AA. If no sensitive species use is known or suspected in the AA, then select the "suspected no usable habitat" option.

ii. Rating. Complete the top row of the matrix for S1 species, and the bottom row for S2 and S3 species. Use the highest level habitat rating (e.g., the level that corresponds to the highest functional point value) determined under **i** to determine the functional point value for the AA. If sensitive species habitat is documented at the AA, indicate the source of the documentation.

14C. General Wildlife Habitat: This field assesses general wildlife habitat potential of the AA based upon evidence of wildlife use and habitat features. The combination of these two variables is considered to more accurately assess this function than if habitat features alone were used. A site may contain what are perceived to be outstanding habitat features for wildlife, but for reasons difficult to detect (such as presence of toxins, etc.) may only receive minimal to moderate use. Opportunities for enhancement may exist if such a situation were correctable. Conversely, a site may contain few desirable habitat features, but may receive significant use due to a general lack of habitat in the area or other factors and may be under-rated for this function if wildlife use was not considered.

With respect to habitat features, variables assessed include structural diversity, evenness of vegetated classes, duration of surface water in at least 10 percent of the AA, and degree of disturbance. Structural diversity and evenness of vegetated classes relate to the amount of niches available in an area. More niches are potentially available as more layers of habitat occur, so more wildlife species potentially are supported by more structurally complex habitats (Cooperrider et al. 1986). Similarly, Hauer et al. (2002a) state that pothole wetlands with the highest level of ecosystem complexity and diversity tend to have a relatively even spatial distribution of wetland zones.

The duration of surface water, whether perennial or intermittent, plays an important role in the habitat function of wetlands. Free water is an extremely important habitat component of wetlands, particularly during summer (Brown 1985). Generally, the longer surface water is present during the year, the more

available it is for wildlife use at a variety of life stages. Degree of disturbance at a wetland can greatly influence its use by wildlife. Examples of disturbance include direct conversion, conversion of upland supporting habitats, and encroachment by human activities, such as residences, roads, and recreation.

i. Evidence of Overall Wildlife use in the AA. First determine the level of evidence indicating wildlife use in the AA based on direct observations (auditory detections are counted as observations), presence of wildlife sign, adjacent upland food sources, presence of extremely limiting habitat features, and/or interviews with local biologists with knowledge of the AA. Whether or not a habitat feature would be considered as extremely limiting depends on the feature itself as well as the estimated availability of that feature in the general vicinity. For example, bogs or warm springs observed where these features rarely occur would be considered extremely limiting habitat features. Circle "substantial", "moderate", or "minimal" *evidence of use* based on the criteria listed on the data form. For further guidance, refer to the definitions of substantial, moderate, or minimal use provided below. *Evidence of use* is considered to be indicative of *level of use*.

Substantial use: AA is regularly used in high numbers relative to local or transient populations.

Moderate use: AA is regularly used in small to moderate numbers relative to local populations, or infrequently or sporadically used in small to high numbers relative to local or transient populations.

Minimal use: AA is used by extremely small numbers relative to local populations, or receives chance, inconsequential use in any numbers relative to transient populations.

ii. Wildlife Habitat Features. Working from top to bottom within the double vertical lines, circle the appropriate AA attributes in the matrix provided on the data form to arrive at an exceptional (E), high (H), moderate (M), or low (L) rating. The first variable considered is the structural diversity rating from #13. The second variable is class cover distribution. For class cover to be considered evenly distributed, percent composition of the AA for the most and least prevalent vegetated classes must be within 20% of each other (refer to the percentages listed under #10).

The duration of surface water in > 10 % of the AA criterion should be considered a rule of thumb. The intent of this criterion is to recognize the benefit to wildlife that significant amounts of surface water impart to an area.

The third variable is the maximum duration of surface water (any water above the ground surface that is available to wildlife; not necessarily open water) covering at least 10% of the AA. The 10 % criterion should be considered a rule of thumb and is intended to be applied primarily at smaller (e.g., less than 1 or 2 acres), rather than larger sites. For example, 9 acres of surface water should not be dismissed at a 100-acre AA simply because this 10 percent guidance is not met. The intent of this criterion is to allow consideration of significant surface water amounts within an AA relative to wildlife habitat, while disallowing insignificant surface water amounts. The final call will depend on the specific situation at hand, and is therefore left to the evaluator. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent where:

Permanent/perennial: Surface water is present throughout the year except during years of extreme drought.

Seasonal/intermittent: Surface water is present for extended periods, especially early in the growing season, or may persist throughout the growing season, but may be absent at the end of the growing season; or surface water does not flow continuously, as when water losses from evaporation or seepage exceed the available streamflow.

Temporary/ephemeral: Surface water is present for brief periods during the growing season, but the water table is well below the surface for most of the year; or surface water flows briefly in direct response to precipitation in the immediate vicinity and the channel is above the water table.

Adapted from Cowardin et al. (1979)

The relationship between the MWAM and Cowardin et al (1979) water regimes is presented in **Table 2**. Distinctions between how water regime data are applied to various evaluated functions are listed in **Table 3**.

The final variable is the degree of disturbance at the AA as determined under #12. This will determine the habitat features rating.

iii. Rating. Determine and circle the general wildlife habitat rating and functional points for the AA by applying the results of **i** and **ii** to the matrix provided in the data form.

Table 2: ***Correlations Between MWAM and Cowardin et al. (1979) Water Regimes***

2008 MDT Wetland Assessment Method Surface Water Regimes	Cowardin et al. (1979) Water Regimes
Permanent / Perennial	Permanently Flooded
	Intermittently Exposed
Seasonal / Intermittent	Semi-permanently Flooded
	Seasonally Flooded
Temporary / Ephemeral	Saturated
	Temporarily Flooded
	Intermittently Flooded

Table 3: ***Correlations Between Functions and Water Regime Applications***

Function	Water Regime Application
Wildlife Habitat	Record the longest duration of surface water ***in ≥ 10% of the AA***. This may be different from the longest duration present in the AA if the longest duration occurs in < 10% of the AA.
Fish Habitat	Record the longest duration of surface water ***in the AA,*** unless this duration does not correspond to the actual fish habitat being evaluated in the AA. Example: the AA includes a small permanent pond with no fish, and a seasonal stream with fish. In this case, seasonal / intermittent duration would be selected as it applies to fish habitat.
Short and Long Term Surface Water Storage	Record the longest duration of surface water ***at wetlands in the AA***. This does not include non-wetland aquatic habitats in the AA, and so may be different from the longest duration present in the AA.

Function	Water Regime Application
Sediment/Shoreline Stabilization	Record the longest duration of surface water ***adjacent to rooted vegetation in the AA.*** This may be different from the longest duration present in the AA.
Production Export	Record the longest duration of surface water ***in the AA.***
Groundwater Discharge / Recharge	Record the duration of inundation ***or soil saturation*** attributed to ***groundwater discharging from the wetland or surface water that is reasonably estimated to be recharging the water table***. This may be different from the longest duration present in the AA.

14D. General Fish Habitat: This field assesses general fish habitat within the context of fishery type (i.e., cold-water or warm-water). Assess this function only if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish (e.g., fish use is precluded by perched culvert or other barrier, etc.). If the AA is not used by fish due to lack of habitat (including duration of surface water), excessive gradient, etc. (e.g., the AA does not have the opportunity to provide habitat for fish), fish use is not restorable or correctable due to habitat constraints, or fish use is not desired from a management perspective (e.g., fish entrapped in an irrigation canal), circle **NA** on the data form and proceed to the next function.

Variables assessed to determine a rating for fish habitat quality include duration of surface water, useable aquatic hiding, resting, or escape cover, and the presence or absence of thermal cover. Presence of surface water is an obvious critical component of fish habitat. Seasonally flooded areas can be important nursery and foraging areas for fish (and can result in "high" habitat quality ratings using this assessment); however, longer duration of surface water generally results in higher ratings because surface waters of such duration are available to fish for greater periods of time and number of life stages. Flow or water level stability is an important habitat component for many Montana fish species (Raleigh 1982, Raleigh et al. 1984, Raleigh et al. 1986, McConnell et al. 1984, Hickman and Raleigh 1982, Marcus et al. 1984, Inskip 1982, Stuber et al. 1982).

Abundant structural cover and well-vegetated streambanks and shorelines are also important habitat components for several Montana fish species (Raleigh 1982, Raleigh et al. 1984, Raleigh et al. 1986, McConnell et al. 1984, Hickman and Raleigh 1982, Inskip 1982, Stuber et al. 1982, Krieger et al. 1983, Edwards et al. 1983). Structural cover includes:

- submerged logs and vegetation,
- other woody debris,
- undercut banks,
- floating-leaved vegetation, and
- large rocks

Structural cover provides resting areas, refuge from predators, hiding areas for predators, and functions as a substrate for insect larva (an important food source for many fish species). Aquatic cover categories are provided in **Table 4** (adapted from Bartoldus et al. 1994).

Thermal cover refers to refugia that protect fish from seasonal temperature extremes. Thermal cover categories are provided in **Table 4**. In the summer, thermal cover and thermal refugia are important to fish

and other aquatic organisms because of: a) how temperature affects organismal metabolism; and b) the relationship between temperature and dissolved oxygen content in the water column (Mathews 1998; FISRWG 1998; Moyle and Cech 1988). Water temperature is inversely proportional to dissolved oxygen content; therefore, as water temperature increases, dissolved oxygen decreases. The effects of temperature on different fish species vary dramatically (Moyle and Cech 1988) and therefore can complicate a site evaluation.

Table 4: ***Aquatic and Thermal Cover Categories and Criteria***

Cover Categories	Warm Water Fishery	Cold Water Fishery
Aquatic Cover		
Optimal	26-75% cover	20-50% cover
Adequate	5-25% or 76–90% cover	5-19% cover
Poor	<5% or >90% cover	<5% or >50% cover
Thermal Cover (optimal only – if listed criteria are not met, then conditions are suboptimal)		
Streams ≤150 ft wide	25% to 90% of water surface shaded by vegetation, side slopes, and/or overhanging banks with mixed, interspersed areas of sun and shade from 10 am to 2 pm in the summer.	≥50% of the stream channel shaded by vegetation, side slopes, and/or overhanging banks from 10 am to 2 pm in the summer.
Lakes and ponds ≤ 20 acres in size	25% to 90% of water surface shaded by vegetation, side slopes, and/or overhanging banks from 10 am to 2 pm in the summer, or maximum depth at baseflows (e.g., August, winter) is ≥ 6.6 ft.	≥50% shading of the water surface by vegetation, side slopes, and/or overhanging banks from 10 am to 2 pm in the summer, or maximum depth at baseflows (e.g., August, winter) is ≥ 6.6 ft.
Streams > 150 ft wide and lakes and ponds > 20 acres in size	Maximum depth at baseflows (e.g., August, winter) is ≥ 6.6 ft.	

In general terms, warm-water fishes such as the fathead minnow and channel catfish are better adapted to warmer stream temperatures and lower levels of dissolved oxygen than cold water fishes, such as trout or sculpin (Moyle and Cech 1988). Several factors can affect water temperature in riverine, depressional and lacustrine systems, including but not limited to latitude, elevation, time of year, orientation of the stream channel (e.g., north-south, east-west), stream width, water depth and velocity, number of pools, turbidity, degree and quality of shading by vegetation or topographic features, and volume and temperature of groundwater inputs (Morrow and Fischenich 2000; Overton et al. 1995, Maloney et al. 1999; Torgerson et al. 1999).

In winter months, ice cover and depth of ice provide their own suite of issues for fish. Low dissolved oxygen content can become an issue to fish in winter, especially in lakes and ponds, due to a reduction in surface mixing and ongoing respiration and decomposition processes, both of which deplete oxygen from the water column and can result in winter anoxia (Mathews 1998). In general, MFWP indicates that minimum depths needed for winter fish survival in ponds in Montana range between 12 and 15 feet (Phillips pers. comm.).

For purposes of this assessment methodology, this complex assortment of factors and their interactions have been greatly simplified. In this method, the level of shading the waterbody receives from vegetation and

topographic features from 10 am to 2 pm during the growing season is used to evaluate thermal cover for streams less than 150 feet wide. This is the time of day typically thought to represent the most direct sunlight on the water surface, and therefore represents the most critical time of the day for thermal loading. The general shading categories used in this assessment were derived from the NRCS' *Stream Visual Assessment Protocol* (NRCS-AAW 1998). The width of 150 feet is related to the size limits of the AA defined previously, and is correlated to thermal loading and the height of cottonwood trees and topographic features in Montana. For example, the maximum height of plains cottonwood (*Populus deltoides*) is approximately 100 feet (USFS – FEIS 2006). Shade generated by a 100 foot tall tree can be calculated using the angle of incoming solar radiation and the known height of the tree. For example, on August 1, 2006 in Lewistown, MT the predicted shadow length of a 100 foot tall tree would range between 88 feet at 10 am, to 58 feet at noon, and 70 feet at 2 pm. The average shadow length for this time period is 72 feet, or nearly half of the 150-foot wide channel AA consideration.

For lakes and ponds greater than 20 acres in size, and streams greater than 150 feet wide, water depth is thought to be more important than shade for mitigating thermal loading in the summer, and for providing areas of unfrozen water in the winter. Frequently, the maximum depth of an AA is 6.6 feet in these areas, and coincides with the upper limit of deepwater habitat (see Cowardin et al. 1979). For the purposes of MWAM it is assumed that if the AA includes areas of 6.6 feet in depth, that thermal cover is generally provided, and the potential for deeper (i.e., 12 feet or deeper) habitat existing in neighboring aquatic habitat is significant. For lakes and ponds less than 20 acres in size, either the percent of the water surface shaded by vegetation or maximum water depth can be used to assign the thermal cover rating.

Although not required under this assessment method, for all AAs containing an open water component, actual temperature data indicating optimal thermal conditions for target fish species would take precedence over indicators listed in **Table 4** and would result in optimal thermal cover ratings.

The presence of certain groups of fish in the AA is considered along with habitat features to derive an overall fish habitat rating. This was included in the assessment to reflect MFWP fisheries management priorities. The ranking of such groups was based on the guiding principles of MFWP's *Montana's Comprehensive Fish and Wildlife Conservation Strategy* (MFWP 2005) and *Strategic Plans FY06-07* (MFWP 2004).

The conservation strategy assigned species to Tiers (I-IV) based on conservation need, with Tier I indicating greatest conservation need, Tier II indicating moderate conservation need, Tier III indicating lower conservation need, and Tier IV indicating species that are non-native, incidental, or on the periphery of their range and are either expanding or very common in adjacent states (MFWP 2005). A primary fisheries management goal stated in *Strategic Plans FY06-07* is to "protect, maintain, and restore native fish populations, life cycles, and genetic diversity and continue to provide angling opportunities wherever possible" (MFWP 2004).

Given these management priorities (managing for native fish populations and angling opportunities), the following groups of fish are considered in the assessment in order of descending "rank": MFWP-listed Tier I species; MFWP-listed Tier II or native game species; MFWP-listed Tier III or introduced game species; MFWP-listed Tier IV or no fish present. MFWP fish species tier rankings, native verses introduced status, and game verses non-game status are provided in **Table 5**. As listed in the Montana Code Annotated (2007), "game fish" means all species of the family *Salmonidae* (chars, trout, salmon, grayling, and whitefish); all species of the genus *Stizostedion* (sandpike or sauger and walleyed pike or yellowpike perch); all species of the genus *Esox* (northern pike, pickerel, and muskellunge); all species of the genus *Micropterus* (bass); all

species of the genus *Polyodon* (paddlefish); all species of the family *Acipenseridae* (sturgeon); all species of the genus *Lota* (burbot or ling); the species *Perca flavescens* (yellow perch); all species of the genus *Pomoxis* (crappie); and the species *Ictalurus punctatus* (channel catfish).

Table 5: ***MFWP Fish Tier Rankings, Native Status, and Game Status***

Species	FWP Tier	Native Species	Introduced Species	Montana Statute Game Species
White Sturgeon	1	X		X
Pallid Sturgeon	1	X		X
Paddlefish	1	X		X
Shortnose Gar	1	X		
Yellowstone Cutthroat Trout	1	X		X
Westslope Cutthroat Trout	1	X		X
Columbia Basin Redband Trout	1	X		X
Bull Trout	1	X		X
Lake Trout (native lakes)	1	X		X
Arctic Grayling	1	X		X
Sturgeon Chub	1	X		
Sicklefin Chub	1	X		
Pearl Dace	1	X		
Blue Sucker	1	X		
Trout-perch	1	X		
Burbot	1	X		X
Sauger	1	X		X
Torrent Sculpin	2	X		
Spoonhead Sculpin	2	X		
Northern Redbelly X Finescale Dace	2	X		
Bigmouth Buffalo	2	X		
Freshwater Drum	2	X		
Mottled Sculpin	3	X		
Slimy Sculpin	3	X		
Shovelnose Sturgeon	3	X		
Goldeye	3	X		
Lake Whitefish	3	X		X
Pygmy Whitefish	3	X		X
Mountain Whitefish	3	X		X
Lake Chub	3	X		
Western Silvery Minnow	3	X		
Brassy Minnow	3	X		
Plains Minnow	3	X		
Peamouth	3	X		
Emerald Shiner	3	X		
Sand Shiner	3	X		
Northern Redbelly Dace	3	X		
Fathead Minnow	3	X		
Northern Pikeminnow	3	X		

Species	FWP Tier	Native Species	Introduced Species	Montana Statute Game Species
Longnose Dace	3	X		
Redside Shiner	3	X		
Creek Chub	3	X		
Flathead Chub	3	X		
River Carpsucker	3	X		
Longnose Sucker	3	X		
White Sucker	3	X		
Largescale Sucker	3	X		
Mountain Sucker	3	X		
Smallmouth Buffalo	3	X		
Shorthead Redhorse	3	X		
Channel Catfish	3	X		X
Stonecat	3	X		
Brook Stickleback	3	X		
Iowa Darter	3	X		
Cisco	4		X	X
Kokanee Salmon	4		X	X
Chinook Salmon	4		X	X
Rainbow Trout	4		X	X
Golden Trout	4		X	X
Brown Trout	4		X	X
Brook Trout	4		X	X
Rainbow Smelt	4		X	
Northern Pike	4		X	X
Goldfish	4		X	
Common Carp	4		X	
Utah Chub	4		X	
Golden Shiner	4		X	
Spottail Shiner	4		X	
Black Bullhead	4		X	
Yellow Bullhead	4		X	
Plains Killifish	4		X	
Western Mosquitofish	4		X	
Sailfin Molly	4		X	
Shortfin Molly	4		X	
Green Swordtail	4		X	
Variable Platyfish	4		X	
White Bass	4		X	
Rock Bass	4		X	
Green Sunfish	4		X	
Pumpkinseed	4		X	
Bluegill	4		X	
Smallmouth Bass	4		X	X
Largemouth Bass	4		X	X
White Crappie	4		X	X
Black Crappie	4		X	X

Species	FWP Tier	Native Species	Introduced Species	Montana Statute Game Species
Yellow Perch	4		X	X
Walleye	4		X	X
Tiger Muskellunge	N/A		X	X

Although the physical habitat attributes of a site may be attractive to fish, use of the area may be significantly reduced or precluded due to the presence of inadequately-sized culverts, dikes, continual sources of degradation, or other causes. Consequently, such potential "habitat modifiers" are also considered in the assessment. In addition to the presence of undersized culverts, dikes, and other such structural habitat modifiers, the method considers whether a waterbody within the AA is listed on the MDEQ list of *Waterbodies in Need of Total Maximum Daily Load (TMDL) Development* with listed "probable impaired uses" that include *warm water fishery*, *cold water fishery*, or *aquatic life support*. Fish use and aquatic habitat quality of such listed waterbodies have been determined by MDEQ to be "impaired". The impaired waterbody list is lengthy and dynamic and is not included in an appendix to this document; however, the 2006 list is available on the internet at: http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp

Cover can include gravel sized rocks (16 mm) in warm-water fisheries.

i. Habitat Quality and Known/Suspected Fish Species In AA and Initial Rating. Working from top to bottom within the double vertical lines, circle the appropriate AA attributes in the matrix provided on the data form to arrive at an exceptional (E), high (H), moderate (M), or low (L) rating. The first variable considered is the maximum duration of surface water in the AA (see **Tables 2** and **3**). Use the definitions provided above under 14C. The second variable is useable aquatic hiding/resting/escape cover. Estimate the percentage of the waterbody within the AA that contains cover objects such as submerged logs, large rocks and boulders, overhanging banks, and submerged and floating-leaved vegetation and refer to the cover categories provided previously in this section. Note that cover can include gravel sized rocks (16 mm) for warm-water fisheries (Bramblett et al. 2005).

The final habitat quality variable is thermal cover. Thermal cover has been divided into two main categories (cold-water and warm-water fisheries) and two subcategories (optimal or suboptimal). Refer to the thermal cover categories provided previously in **Table 4** to evaluate this indicator. Note that shade covering the waterbody may be provided by vegetation, topographical features and by the streambanks themselves. Determine whether or not the specified conditions for the type of fishery and site specific conditions are present (optimal) or not (suboptimal).

Next, consulting **Table 5**, determine the dominant types of fish known or suspected to occur in the AA – MFWP-listed Tier I species; MFWP-listed Tier II or native game species; MFWP-listed Tier III or introduced game species; or MFWP-listed Tier IV or no fish present. The term "native" implies a species indigenous to Montana; not necessarily to a given drainage or waterbody. Native game fish in Montana include: white, pallid, and shovelnose sturgeon; paddlefish; mountain whitefish; pygmy whitefish; westslope cutthroat, Yellowstone cutthroat, interior redband, bull and lake trout; arctic grayling; channel catfish; burbot; and sauger (**Table 5**). Note that a fish census is not necessary to determine which species occur at a site; data from MFWP's website MFISH (http://maps2.nris.mt.gov/scripts/esrimap.dll?name=MFISH&Cmd=INST), information from a local fisheries biologist, and/or other reliable sources are typically sufficient.

ii. Modified Rating. There are several factors that can decrease or increase the overall general fish habitat score; however, the final score for this function cannot exceed 1.0 or be less than 0.1.

On the data form, circle the appropriate response to the following questions and modify the rating from **i** as specified.

a). *Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity **or** is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support, **or** do aquatic nuisance plant or animal species (see **Appendix F**) occur in fish habitat?* If the answer is "Yes", then reduce the habitat quality rating determined in **i** by 0.1 point. If the answer is "No", then do not modify the habitat quality rating determined in **i**.

b). *Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc. – specify in comments) for native fish or introduced game fish?*
If the answer is "Yes", then increase the habitat quality rating determined in **i** or **ia** by 0.1 point. If the answer is "No", then do not modify the habitat quality rating determined in **i** or **ia**.

14E. Flood Attenuation: This field assesses the capability of *wetland* in the AA to slow in-channel or overbank flow during high water/flood events. This parameter applies only if the AA occurs within, or contains, a discernible floodplain (e.g., is subject to overbank flooding and possesses the opportunity to attenuate flood waters). This is determined by floodwater proximity, and is based on evidence of flood deposits (e.g., drift/debris lines, sediment deposits, watermarks, etc.), FEMA maps, or other sources, and can apply to any AA that includes a flowing water/channel component (i.e., riverine HGM class such as rivers, streams, and flowing ditches). If the wetland within the AA does not occur within a channel or discernible floodplain, circle **NA** where indicated on the form and proceed to the next function.

Water velocity is reduced by spreading water over a larger area, increasing surface roughness, and/or obstructing flow (Brinson et al. 1995). Variables used to assess this function are: the area of wetland subject to periodic flooding; percent composition of woody vegetation in this area; and the presence/absence of a restricted outlet. Generally, the less incised (entrenched) the channel, the greater its ability to attenuate flood flows. A measure of entrenchment is the entrenchment ratio, as described by Rosgen (1994, 1996), which is an expression of how much access a stream has to its floodplain. It is calculated by dividing the flood-prone width by the bankfull width. The flood-prone width is determined by doubling the maximum bankfull depth and determining where that hypothetical elevation would intersect the floodplain in a perpendicular line from the creek (**Figure 2**). The flood-prone width generally corresponds to the area that would be inundated by a 50-year flood event (Rosgen 1996). Entrenchment ratios generally range from 1 (entrenched) to greater than 2.2 (slightly entrenched). **Table 6** provides typical ranges of entrenchment ratios for different Rosgen stream types (Rosgen 1996). To facilitate the evaluation of this indicator, cross-section diagrams of different Rosgen stream types are also provided below.

Figure 2: ***Schematic of a Stream Cross-Section Showing the Relationship between Bankfull Height and the Flood-Prone Area***

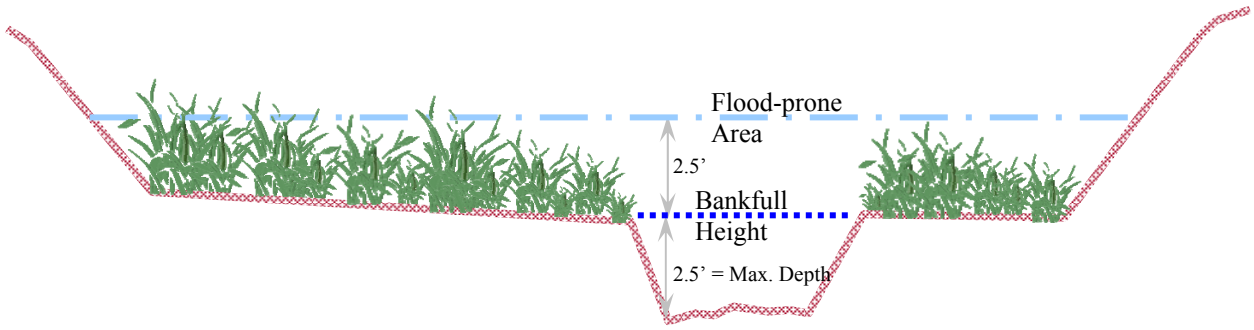
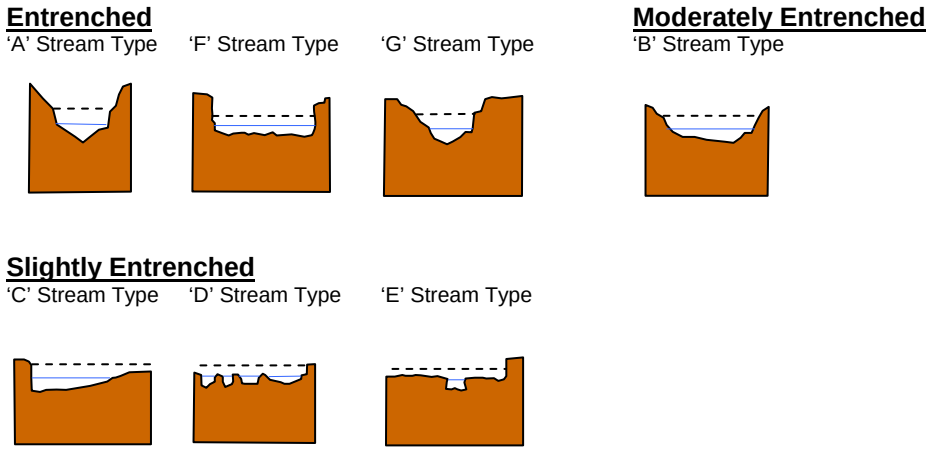


Table 6: ***Typical Ranges of Entrenchment Ratios for Different Rosgen Stream Types***

Entrenchment Ratio	Description/Rosgen Stream Types
1.0 to 1.4	Entrenched/A, F, G
1.41 to 2.2	Moderately entrenched/B
> 2.2	Slightly entrenched/C, D, E



Source: Adapted from Rosgen 1994, 1996.

Legend

Bankfull discharge

Floodprone discharge

Wetlands with dense woody vegetation are better able to slow floodwaters than are wetlands dominated by open water or low-growing vegetation, which offer little resistance to such flows. Wetlands with no outlets or with restricted outlets can attenuate and capture floodwaters more effectively than wetlands with unrestricted outlets. Examples of restricted outlets include oxbows or other topographical features that function to retain floodwaters. Culverts and bridges that substantially constrict flow and thereby slow floodwaters could also be considered restricted outlets under this function. However, this is typically considered an undesirable condition because it can cause channel instability (e.g., flooding and sediment accumulation upstream of the bridge/culvert and incision downstream of it).

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

First, determine the Rosgen stream type and determine from the diagrams above if the stream is considered to be entrenched, moderately entrenched or slightly entrenched. It is often useful to visually estimate bankfull width and flood-prone width and calculate the entrenchment ratio. Space is provided for this on the data form. Next, determine the approximate percentage of wetland subject to flooding that is classified as forested or scrub-shrub. Finally, determine whether or not the wetland contains a restricted outlet and circle the appropriate functional points and rating.

NOTE: *In some cases it may be appropriate to consider dense, extensive stands of hardy, persistent emergent vegetation (e.g., cattail), as scrub-shrub for purposes of this form, as these stands act as primary floodwater attenuators in some parts of the state. It may also be appropriate to consider rough terrain (e.g., boulder strewn areas), as scrub-shrub because the surface roughness will also attenuate flood waters. If either of these situations apply, note in the comments section.*

is

ii. Indicate whether there are residences, businesses, or other features (parks, sports fields, historic sites, roads, etc.) that could be damaged by floodwaters located within 0.5 mile downstream of the AA. Describe these features in the comments section. This factor is considered in the final overall rating of the AA.

14F. Short and Long Term Surface Water Storage: This field assesses the potential of the AA to capture, retain, and make available surface water originating from flooding, precipitation, upland surface (sheetflow) or subsurface (groundwater) flow. This function is sometimes referred to as the "sponge effect" of wetlands. If wetlands in the AA are not subject to flooding or ponding, circle **NA** on the data form and proceed with the evaluation.

Variables used to assess this function are: estimated maximum acre feet of water contained in wetlands that are subject to flooding or ponding; duration of surface water; and flood frequency. Wetlands able to contain more water volume (acre-feet) are more effective at storing water than wetlands restricted to less capacity under the same conditions. The acreage categories used were adapted from Roth et al. (1993). Wetlands that contain surface water for longer periods are capable of storage for slower release into the local system than are wetlands that store surface waters for shorter periods, thereby assisting in the stabilization of local flow regimes. Wetlands that frequently flood or pond provide water storage functions more often than do wetlands that flood or pond less frequently.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. First, estimate the maximum acre-feet of water contained within *wetland* subject to periodic flooding or ponding within the AA (see **Table 3**). This can be based on observation, aerial photos, water marks, and other physical evidence (indicate basis in comments). Next, determine the maximum duration of surface water in flooded or ponded wetlands using the definitions provided above under 14C. Finally, estimate (based on aerial photographs, NRCS data, interviews, knowledge of the area, etc.) whether the wetlands that flood or pond do so at a frequency greater than or less than 5 out of every 10 years and circle the appropriate functional points and rating.

14G. Sediment/Nutrient/Toxicant Retention and Removal: This field assesses the ability of the AA to retain sediments and retain and remove excess nutrients and toxicants, and is sometimes referred to as the "water quality improvement" function of wetlands. This field only applies to wetlands with potential to

receive sediments and excess nutrients or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** on the data form and proceed with the evaluation.

Nitrogen and phosphorus are the nutrients most often associated with water pollution; both occur in high concentrations in fertilizers and discharges from sewage treatment plants and livestock operations, and excessive amounts of either can result in algal blooms and subsequent oxygen deficiencies in receiving waters. Toxicants include pesticides, herbicides, petroleum products, metals, and other potentially harmful constituents. The assessment is based on the site's proximity to sediment/nutrient/toxicant sources; percent cover of vegetation; evidence of flooding or ponding; and presence or absence of an outlet. Wetlands with the potential to receive *and successfully process* sediment, nutrients, and toxicants provide these functions at a higher capacity than do wetlands that receive excessive amounts of these constituents such that other functions are impaired. Generally, a wetland's ability to uptake nutrients and toxicants and filter sediment increases with the density of its vegetation. Flooded or ponded wetlands are indicative of sites that retain water; these areas allow sediments to settle out and increase nutrient/toxicant contact time with vegetation/soil/microbes, facilitating uptake. Sites with no outlets or restricted outlets retain water longer (allow more settling and vegetation/soil contact) than do sites with unrestricted outlets.

Examples and additional guidance for determining whether this function should be evaluated are provided below.

- A slope wetland down-gradient from an impact or disturbance area (e.g., logging, grazing), where contaminants are likely to reach the wetland, would likely be evaluated.
- A road-side ditch wetland, subject to stormwater runoff, sanding impacts, etc. would likely be evaluated.
- A depressional wetland within a field that is cropped, grazed, fertilized routinely, or where runoff from a disturbance would flow into the wetland would likely be evaluated.
- A depressional wetland within a field that is hayed with no ground disturbance, where fertilizer is not applied, would likely not be evaluated.
- If it is *conceivable* that the AA could receive pollutants from the surrounding landscape, but unlikely and there is no evidence that pollutants are being transported to the site by overland flow, then this function should **not** be evaluated. For example, if an AA occurs below a dam and it is conceivable, but unlikely, that the dam could someday fail and deliver sediment and other pollutants to the site, this function would not be evaluated. Similarly, if an abandoned mine occurs several hundred meters up-gradient of an AA and dense vegetated ground cover occurs between the AA and the abandoned mine, it is conceivable, but unlikely that pollutants from the mine could reach the AA, and therefore this function would **not** be evaluated.
- The degree of upland buffer integrity is important to the applicability of this function. If the buffer surrounding a wetland is fully functional then it may be that the buffer, rather than the wetland, is performing the bulk of water quality improvement. In this instance, this function would **not** be evaluated.

The location of a riverine system in the landscape can be considered when evaluating the level of functionality of the adjacent wetlands in improving water quality. In a broad sense, streams and rivers occur in three main types of landforms that dictate their sediment transport capabilities, and thus the ability of adjacent wetlands to perform water quality improvement: erosional, transport, and depositional. Erosional stream types occur in steep gradient (e.g., headwater) areas and have little overbank flow and capability for

water quality improvement. Rosgen 'Aa+', 'A', and 'G' stream types fall into this category. Transport stream types are efficient at moving sediment and other materials, occur in areas with less gradient than erosional areas, and will generally have a moderate capability for water quality improvement. Rosgen 'B' stream types fall into this category. Depositional stream types occur in lower gradient areas and have the highest capability for improving water quality. Rosgen 'C', 'D', 'E', and 'F' stream types fall into this category. Exceptions to these generalizations occur; however, information on stream types can be used to logically evaluate this function and to justify an increase or decrease to the rating.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

First, determine if the AA receives or surrounding lands have the potential to deliver low to moderate levels of sediments, nutrients, or toxicants such that other functions in the AA are not substantially impaired (e.g., the wetland is processing these inputs but is not significantly affected by them). Observation of some sedimentation, relatively minor potential sources of nutrients or toxicants, or signs of minor to moderate eutrophication would be indicative of this input level.
If the waterbody within the AA is listed on the most recent MDEQ 303(d) list with "probable causes" related to sediment, nutrients, or toxicants (e.g. not based exclusively on flow alteration, other habitat alterations, etc.) then the second column of the matrix should be used. Such related probable causes include "metals", "nutrients", "organic enrichment/DO", "suspended solids", "unionized ammonia", "priority organics", "siltation", "other inorganics", "salinity/TDS/chlorides", etc. The impaired waterbody list is lengthy and dynamic and is not included in an appendix to this document; however, the 2006 list is available on the internet at: http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp

If the AA is not included on the MDEQ TMDL list, but high levels of these inputs are observed or expected and are impairing other functions at the AA, as evidenced by observations of major sedimentation, major contaminant sources, major eutrophication, etc., then the second column of the matrix should be used.

The next two variables address the percent of wetland vegetated cover and whether evidence of ponding or flooding occurs in the AA, respectively. The final variable determines the appropriate functional points and rating and pertains to whether or not the AA contains a restricted (or no) outlet or an unrestricted outlet.

14H. Sediment/Shoreline Stabilization: This field assesses the ability of the AA to dissipate flow or wave energy, reducing erosion. Complete this field only if the wetland within the AA occurs on the banks of a river, stream, or other natural or manmade channel, or occurs on the shoreline of a standing water body that is subject to wave action. If this field does not apply, circle **NA** on the data form and proceed to the next function. Variables to consider when determining if a waterbody is subject to wave action include estimated wind velocity, water depth, and fetch (distance across the water). Although not required for application of this assessment method, Linsley and Franzini (1979) cite the following equation for determining wave height: rise of wave (ft) = [(wind velocity [mph])^2 x fetch (miles)]) (1,400 x water depth [ft]).

Variables used to assess this function are: percent cover of the wetland streambank or shoreline by species with deep, binding rootmasses (**Appendix F**); and duration of surface water adjacent to rooted vegetation. Generally, plant species with deep, binding rootmasses are more efficient at stabilizing streambanks and shorelines than are species with minor root systems. Wetlands adjacent to surface waters of longer duration generally provide this function more frequently than wetlands adjacent to surface waters of less duration.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Species and community types with deep, soil binding rootmasses are considered to be those that have a plant stability rating of 6 or greater (see **Appendix F**). If plant stability is expressed as a range for a community type, and the upper end of the range is 6 or greater, the community is considered to have deep, binding rootmasses. Scientific names for the species and communities in **Appendix F** are listed in Winward (2000). In an instance where only one of the *dominant* species in an AA community is on the list, then the stability rating for the plant on the list should be used to assist in rating the site. For example, a sandbar willow/spotted knapweed community type is not listed, but may be encountered in the field. In this example, the stability rating for sandbar willow would be used.

When AA plant communities do not appear on the list in **Appendix F**, use the following guidance. All trees and shrubs are considered to have deep, binding rootmasses. Annual herbaceous plants are considered to lack such rootmasses, while perennial herbaceous species vary with respect to their root masses and should be considered individually. Sedges and rushes, for example, are usually considered to provide deep, binding rootmasses, while Kentucky bluegrass is not. There may be other overriding factors affecting bank stability, such as soil texture (sand/gravel is highly erosive whereas clay is highly cohesive) or soil layering (e.g., a layer of cobbles or gravel). Where such factors apply, best professional judgment should be used when rating this function and should supersede guidance on plant stability.

Next, determine the longest duration of surface water *adjacent to rooted vegetation* in the AA using the definitions provided above under #14C (see **Table 3**) and circle the appropriate functional points and rating.

14I. Production Export/Terrestrial and Aquatic Food Chain Support: This field assesses the potential of the AA to produce and export food/nutrients for both terrestrial and aquatic organisms. For the purposes of this assessment, "food/nutrients" include particulate and dissolved organic matter, plant forage species, invertebrates, wildlife prey species, etc. Variables used to assess this function are: area of vegetated wetland area in the AA; level of biological activity; outlet (surface or subsurface) presence or absence; duration of surface water; and presence of a vegetated upland buffer.

Generally, wetlands with greater areas of vegetation have potential for more forage plant production and particulate and dissolved organic material production than do wetlands containing smaller areas of vegetation. Due to their proximity and interconnectedness to wetlands, the vegetated upland areas adjacent to wetlands (i.e. vegetated buffers) contribute to this function and are also considered in the ultimate rating. The buffer width threshold of 50 feet used in MWAM was adapted from COE guidance on riparian buffer widths (Fischer and Fischenich 2000). This width should incorporate most buffers that provide detrital input to waterbodies, while also incorporating habitat considerations to some extent.

The level of biological activity is evaluated by synthesizing the ratings for the General Fish Habitat function and the General Wildlife Habitat function. The rationale for this indicator is that the greater the wildlife and fish species use and habitat quality of the AA, the greater the AA is contributing to terrestrial and aquatic foodchains in the area.

Wetlands with surface or subsurface outlets can more readily export organic material to downstream habitats than can wetlands without outlets. In general, wetlands that have seasonal variability in soil saturation are more productive than wetlands that are permanently inundated (Mitsch and Gosselink 2000); however this does not address the importance of permanent water to wildlife, fish, crustaceans, and insect species in the

area, and their contribution to production export. For this reason, perennial surface water is considered superior to seasonal-intermittent or temporary-ephemeral hydrologic regimes. In addition, opportunities for breakdown and export of organic materials to downstream aquatic habitats via surface water are generally greater at wetlands containing water for longer, rather than shorter, durations.

i. Level of Biological Activity. Use the general wildlife habitat rating from 14C.**iii** and the general fish habitat rating from 14D.**iii** to determine the composite biological activity rating on the table provided.

ii. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. For Factor A, estimate the acreage of the vegetated component (all vegetation including persistent, non-persistent, rooted, and floating) within the AA. Factor B pertains to the biological activity level rating, determined under **i** above. For Factor C, indicate (yes or no) whether the AA contains a surface or likely subsurface outlet (see indicators of recharge under 14J below). Next, circle the appropriate initial functional points and rating based on the longest duration of surface water in the AA (see **Table 3**) using the definitions provided above under #14C.

iii. Modified Rating. Answer the following question, based on the following definition for Vegetated Upland Buffer (VUB): Area with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control). *a). Is there an average ≥ 50 foot-wide vegetated upland buffer around ≥ 75% of the AA circumference?* If yes, add 0.1 to the score in **ii** above and adjust the rating accordingly.

14J. Groundwater Discharge/Recharge: This field assesses groundwater discharge and recharge potential at the site. Indicators of discharge include observed springs or seeps (e.g., slope wetlands), vegetation growing during dormant or drought seasons, wetlands at the toe of a natural slope, permanent flooding during drought periods, and presence of an outlet but no inlet. Indicators of recharge can be more difficult to discern in the field and include observation of a permeable substrate without an underlying impeding layer, or presence of an inlet but no outlet.

The indicators used to assess this function include the duration of inundation or soil saturation in the upper 12 inches of the soil profile attributed to: 1) groundwater discharging from the wetland, or 2) surface water that is determined or reasonably estimated to be recharging the water table.

i and **ii** provide a list of common groundwater discharge and recharge indicators. Check all that apply. Other site-specific indicators may be added as necessary.

iii. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, L = low, N/A = Not Applicable] for this function. Use the matrix on the data form to determine the corresponding rating and functional points. First select the corresponding duration of inundation or soil saturation attributable to *groundwater* (for discharge) or to water recharging the groundwater system (for recharge) (see **Table 3**), then rate the function accordingly. If it is determined that groundwater discharge/recharge potential cannot be reasonably ascertained in the AA at this level of analysis, explain this in the comments section and indicate the rating as *Insufficient Data/Information* and functional points as "**NA**" on the data form.

14K. Uniqueness: This field expresses the general uniqueness of the AA in terms of its replacement potential and habitat diversity; relative abundance in the same major Montana watershed basin; and degree

of human disturbance.

The Montana Natural Heritage Program has compiled a list of vegetation associations occurring in Montana. Each has been assigned a state "rank" based on its estimated number of occurrences in the state and its estimated total area within the state. This list is dynamic, and the user should consult the most current list. See MTNHP's website for the most up to date list: http://nhp.nris.state.mt.us/community/guide.asp

Vegetation associations classified as 'S1' are considered to be critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction. Vegetation associations classified as 'S2' are considered to be imperiled because of rarity and/or other factors making it vulnerable to extinction (MTNHP 2002).

Bogs, fens, warm springs, and mature forested wetlands are very difficult, and in some cases are not possible, to successfully replicate at mitigation sites. In the absence of these types, wetlands with higher structural diversity or higher MTNHP rank are considered more difficult to replicate than sites with low structural diversity or lower MTNHP ranks. Wetland types that occur rarely within a watershed are considered to be more unique than wetlands that occur commonly or abundantly within a watershed. Finally, wetlands with low disturbance that are functioning under primarily natural conditions are considered more unique than are wetlands exposed to moderate or high disturbance levels.

i. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. First, determine whether the AA is or contains a bog, fen, warm springs, or mature forested wetland (average age of dominant trees is greater than 80 years) using the definitions provided below. When determining if the wetland is/contains mature forested wetland, take care to ensure that non-wetland riparian area is not counted as wetland. If the AA does not contain any of these four wetland types, use the associations listed on MTNHP's website. If none of these associations are present, use the structural diversity rating determined under #13.

Bog: A peat-accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly sphagnum (Mitch and Gosselink 2000).

Fen: A peat-accumulating wetland that receives some drainage from surrounding mineral soil and usually supports marsh-like vegetation (Mitch and Gosselink 2000).

Forested Wetland: See discussion and definition under #10, Classification of AA.

Next, indicate the estimated occurrence frequency of similarly classified sites within the same major Montana watershed basin using the answer from #11. Finally, circle the appropriate functional points and rating based on the degree of disturbance at the AA as determined under #12.

14L. Recreation/Education Potential: This field presents the evaluator an opportunity to assign "bonus points" to an AA based on its potential to support recreation or education activities. If a site does not potentially support such activities, then this field does not affect the overall rating. In the absence of known recreational or educational properties of a site, the rating is determined based on the evaluator's assessment of potential for such use, along with ownership of and degree of disturbance at the AA. Sites that are publicly owned or contain public easements generally offer better access opportunities than do privately

owned sites.

i. Is the AA a Known or Potential Recreation or Education Site? If the AA is a known or potential recreation or education site, circle "Yes" and continue with the evaluation. If the site is not a known or potential recreation/education site then circle **NA**; no further assessment is completed for this function.

ii. Recreation and Education Categories That Apply to the AA. Check the categories that apply to the AA.

iii. Rating. Working from top to bottom, use the matrix on the data form to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. First, indicate whether the site is a known education/recreation site or if it is a potential education/recreation site. Next, determine ownership and level of access permitted at the site based on the three options provided. Finally, circle the appropriate functional points and rating.

Tribal lands are a special situation with regard to this function. For example, tribal members may have access to the entire reservation, while non-tribal members may not, or may be required to purchase a recreation pass. For this reason it is suggested that prior to completing a functional assessment on tribal lands, the tribe should be consulted as to how they would like the issue of access evaluated for this function.

Function & Value Summary and Overall Rating: Transfer the ratings and functional points assigned for each of the 12 functions/values in items 14A through 14L to the appropriate fields on the summary form. Record values of 1 under the Possible Functional Points column for functions that apply to the AA but for which no default values appear on the form. For functions that do not apply to a given AA (e.g., flood attenuation), enter "NA" under each of the column headings. Taking into consideration site specific conditions and adjacent land uses (i.e., landscape setting) indicate with an asterisk (*) the four most prominent functions that the evaluator perceives for this site. Although judgment-based and therefore somewhat subjective, labeling prominent functions can assist with the development of target mitigation site functions.

Note that when more than one AA is evaluated on a single form, functional unit calculations cannot be performed using an average size of the AAs evaluated.

If desired, calculate the functional units for each function by multiplying the actual functional points by the estimated acreage in the AA (from #9). This is optional and will not affect the site's overall rating. When more than one site is assessed on a single form, this column should be left blank. If desired, a separate table or other means to depict functional units for each of the AAs evaluated on a single assessment form could be developed. Record the totals from the Actual Functional Points, Possible Functional Points, and Functional Units columns (if completed) in the Totals row. Calculate the percentage of the possible functional points that the AA achieved using the following equation: *% of possible = total actual functional points / total possible functional points X 100*.

Determine the appropriate overall rating (described below) based on the criteria indicated on the form. These overall ratings are useful in establishing wetland avoidance/protection strategies at the planning and project levels. For example, if wetland impacts are unavoidable for a given project, and alternatives are available such that a choice can be made between affecting a Category I or a Category III site, the applicant and reviewing agencies could direct impacts to the Category III site. Other applications of the overall rating concept may include proposing mitigation ratios specific to each Category.

Category I wetlands are of exceptionally high quality and are generally rare to uncommon in the state or are important from a regulatory standpoint. Category I wetlands can: provide primary habitat (see definition) for federally listed or proposed threatened or endangered species; represent a high quality example of a rare wetland type; provide irreplaceable ecological functions (e.g., are not replaceable within a human lifetime, if at all); exhibit exceptionally high flood attenuation capability; or are assigned high ratings for most of the assessed functions and values. To be rated as a Category I site, the AA must:

- Score 1 functional point for Threatened or Endangered Species (e.g., is documented primary habitat); or
- Score 1 functional point for Uniqueness (e.g., be rare in the watershed such as a bog, fen, warm springs or mature forested wetland or "S1" plant association in an undisturbed condition); or
- Score 1 functional point for Flood Attenuation and answer to Question 14E.ii is "yes" (e.g., AA is slightly entrenched and contains flooded wetlands in excess of 10 acres that are comprised of more than 75% woody vegetation, has a restricted outlet, and there is potential for flood damage downstream); or
- Total actual functional points > 80% (round to nearest whole number) of total possible functional points.

Category II wetlands are more common than Category I wetlands, and are those that provide habitat for sensitive plants or animals, function at very high levels for wildlife/fish habitat, are unique in a given region, or are assigned high ratings for many of the assessed functions and values. To be rated as a Category II site, the AA must not qualify as a Category I site and must:

- Score 1 functional point for Species Rated S1 by the Montana Natural Heritage Program (e.g., is documented primary habitat); or
- Score 0.9 or 1 functional point for General Wildlife Habitat (e.g., evidence of wildlife use is substantial and habitat quality is high to exceptional or evidence of wildlife use is moderate and habitat quality is exceptional); or
- Score 0.9 or 1 functional point for General Fish Habitat (e.g., is perennial, contains MFWP Tier I, Tier II, or native game fish, optimal aquatic cover and optimal or suboptimal thermal cover or is seasonal/intermittent, contains MFWP Tier I fish, optimal aquatic cover, and optimal thermal cover); or
- Achieve "High" or "Exceptional" ratings for both General Wildlife Habitat and General Fish/Aquatic Habitat; or
- Score 0.9 functional point for Uniqueness (e.g., bog, fen, warm springs, mature forested, or "S1" wetland community common in the watershed but with low disturbance or bog, fen, warm springs, mature forested, or "S1" wetland community rare in the watershed but with moderate disturbance); or
- Total actual functional points > 65% (round to nearest whole number) of total possible functional points.

Category III wetlands are more common and generally less diverse than Category I and II wetlands. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands. To be rated as a Category III site, the AA must not qualify as a Category I, II, or IV site.

Category IV wetlands are generally small, isolated, and lack vegetative diversity. These sites provide little in the way of wildlife habitat, and are often directly or indirectly disturbed. To be rated as a Category IV site, the AA must not qualify as a Category I or II site and:

- Achieve a "Low" rating for Uniqueness ; and

- Vegetated wetland component < 1 acre (do not include upland buffer); and
- Total actual functional points < 35% (round to nearest whole number) of total possible functional points.

Functional units are not used in determining the overall rating, but are provided for the evaluator's consideration in assessing project impacts, mitigation needs, or in assessing mitigation plans or the success of constructed projects. An example of how functional units could be used to develop mitigation that would replace overall (cumulative) functions and values for a given project is presented below.

The total actual functional points for a given 8-acre AA is 6.3. Total functional units for the AA would be calculated by multiplying 6.3 points x 8 acres = 50.4 functional units. A proposed highway project would impact 2 acres of the AA. Assuming a relatively uniform distribution of functional capacity across the AA, the loss in functional units to the AA would be 2 acres x 6.3 points = 12.6 functional units. To compensate for lost wetland functions and values, mitigation would need to be designed that would replace the 12.6 functional units. If the predicted total actual functional points for a mitigation project was 5.1, and the goal were to replace 12.6 functional units, the applicant would need at least 2.5 acres of mitigation to compensate for the loss (2.5 x 5.1 = 12.6). If limited to a two-acre mitigation site, the applicant could, in theory, design the mitigation project such that the predicted functional points met or exceeded 6.3, resulting in the replacement of at least 12.6 functional units (2 x 6.3 = 12.6), or could obtain an additional site such that the sum of the functional units for the two sites met or exceeded the total 12.6 point replacement requirement.

Functional units can also be examined on a function by function basis to compare existing pre-project conditions with predicted post-project conditions. This concept is employed by the HGM method (Smith et al. 1995), and is illustrated by the following table, which assumes a 2-acre impact to a 10-acre AA for a hypothetical project.

Function/ Value	**Pre-project**			**Post-Project**			
	Functional Points	Size of AA in Acres	Functional Units	Functional Points	Size of AA in Acres	Functional Units	Change in Functional Units
A	0.8	10	8	0.4	8	3.2	- 4.8
B	1	10	10	0.6	8	4.8	- 5.2

There are several possible ways to determine mitigation needs using this approach, including:

- designing mitigation for individual functions or cumulatively for all functions using the **greatest** predicted loss in functional units as the replacement target (*in this case, designing mitigation such that each function provides a minimum 5.2 functional units or designing the mitigation such that, cumulatively, 5.2 + 5.2 = 10.4 functional units are replaced*); or

- designing mitigation for individual functions or cumulatively for all functions using the **average** predicted loss in functional units as the replacement target (*in this case, designing mitigation such that each function provides a minimum 5 functional units [(4.8 + 5.2) / 2 = 5] or designing the mitigation such that, cumulatively, 5 + 5 = 10 functional units are replaced*); or

- designing mitigation for individual functions or cumulatively for all functions using **individual** predicted changes in functional units as the target (*in this case, 4.8 for function A and 5.2 for function B, or cumulatively using 4.8 + 5.2 = 10 functional units*).

In virtually all cases, appropriate mitigation of lost wetland functions and values will be subject to coordination/negotiation with the regulatory agencies involved with the project.

There may be circumstances that simply preclude the replacement of a given function/value parameter at the same level at which it is rated for an affected wetland. For example, if a project impacts a wetland rated "high" for uniqueness due to the presence of a fen, it is very unlikely that the uniqueness parameter could be mitigated at the same level at a replacement wetland because of the difficulty associated with fen replacement. In virtually all cases, appropriate mitigation of lost wetland functions and values will be subject to coordination/negotiation with the regulatory agencies involved with the project.

It is not the purpose of this evaluation form to dictate wetland mitigation policy. What is and is not considered appropriate mitigation will ultimately be determined by the regulatory agencies; primarily the COE, EPA, and Tribal wetland permitting entities. While this evaluation method does provide a means for quantifying predicted impacts to wetland functions and values, it is important to stress that coordination with the regulatory agencies as to the application of this evaluation method and associated functional unit-based mitigation strategies to a given project is crucial and needs to be carried out on a project by project basis.

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GLOSSARY

Abundant: An estimated 50% or more of wetlands in the same Major Montana Watershed Basin are similar in composition to the AA.

Aquatic wetland bed class: Any areas of open water dominated by plants that grow principally on or below the water surface for most of the growing season. Vegetation is non-persistent and includes submerged or floating-leaved rooted vascular plants, free-floating vascular plants, submergent mosses, and algae.

Bankfull discharge: The discharge that corresponds with the water level when the water just begins to leave the channel and spread out onto the floodplain (FISRWG 1998).

Bog: A peat-accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly sphagnum (Mitsch and Gosselink 2000).

Common: An estimated 10-50% of wetlands in the same Major Montana Watershed Basin are similar in composition to the AA.

Depressional wetland: These occur in topographic depressions with a closed elevation contour that allows accumulation of surface water. Dominant sources of water are precipitation, groundwater discharge, and interflow from adjacent uplands (Smith et al. 1995).

Emergent wetland class: Vegetated wetland characterized by erect, herbaceous hydrophytes (e.g., sedges, rushes, grasses, bulrush, cattail), excluding mosses and lichens.

Entrenchment ratio: A ratio used to describe stream channel incisement, calculated by dividing flood-prone width by bankfull width (Rosgen 1994, 1996). The lower the ratio, the greater the incisement.

Fen: A peat-accumulating wetland that receives some drainage from surrounding mineral soil and usually supports marsh-like vegetation (Mitsch and Gosselink 2000).

Flood-prone width: That area of the floodplain that is inundated by flows 2 times the maximum bankfull depth (Rosgen 1994, 1996).

Forested wetland class: Vegetated wetland characterized by woody vegetation that is 6m (20 ft) tall or taller and comprises > 30% areal cover.

Functional unit: A figure derived by multiplying functional points for a given AA by its estimated acreage.

Functional point: A numerical rating, ranging from 0 to 1, assigned to a particular function/value based on given criteria.

Game fish: As listed in the Montana Code Annotated (2007), "game fish" means all species of the family *Salmonidae* (chars, trout, salmon, grayling, and whitefish); all species of the genus *Stizostedion* (sandpike or sauger and walleyed pike or yellowpike perch); all species of the genus *Esox* (northern pike, pickerel, and muskellunge); all species of the genus *Micropterus* (bass); all species of the genus *Polyodon* (paddlefish); all species of the family *Acipenseridae* (sturgeon); all species of the genus *Lota* (burbot or ling); the species *Perca flavescens* (yellow perch); all species of the genus *Pomoxis* (crappie); and the species *Ictalurus punctatus* (channel catfish).

Groundwater: That portion of the water below the ground surface that is under greater pressure than atmospheric pressure (Environmental Laboratory 1987).

Incidental habitat: Habitat that receives chance, inconsequential use by a given species, or habitat conditions or the known distribution of the species would indicate this level of use. This term implies that, while it may be conceivable that a given species may occur at an AA at a given point in time, the chance is remote and the use is not likely to be repeated.

Minimal (wildlife) use: AA is used by extremely small numbers relative to local populations, or receives chance, inconsequential use in any numbers relative to transient populations.

Moderate (wildlife) use: AA is regularly used in small to moderate numbers relative to local populations, or infrequently or sporadically used in small to high numbers relative to local or transient populations.

Moss-lichen wetland class: Wetland where mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30% of areal cover.

Native fish species: Implies a species indigenous to Montana; but not necessarily to a given drainage or water body.

Open water: Any area of standing or flowing water without emergent (not including pioneer species), scrub-shrub, or forested vegetation (e.g., in most cases, a flooded wet meadow would not be considered to contain open water) .

Permanent/perennial: Surface water is present throughout the year except during years of extreme drought.

Primary Habitat: Habitat essential to the short or long-term viability of individuals or populations. The presence of traditional breeding, spawning, nesting, denning, or critical migratory habitat, large seasonal congregations (including communal roosts, staging habitat, traditional foraging congregations, etc.), or USFWS-designated critical habitat or core areas in the AA indicates primary habitat, as does any occurrence of a T&E plant.

Rare	An estimated < 10% of wetlands in the same Major Montana Watershed Basin are similar in composition to the AA.
Scrub-shrub class:	Vegetated wetland dominated (> 30% areal cover) by woody vegetation less than 6m (20 ft) tall. Species include shrubs, young trees, and stunted trees and shrubs.
Seasonal/intermittent:	Surface water is present for extended periods, especially early in the growing season, or may persist throughout the growing season, but may be absent at the end of the growing season; or surface water does not flow continuously, as when water losses from evaporation or seepage exceed the available streamflow.
Secondary Habitat:	Habitat that is occasionally or semi-regularly used by a given species, but that is not necessarily essential to the short or long-term viability of individuals or populations. Examples would include non-specific migration areas and occasional forage or perch sites. Primary habitat, as defined above, may occur in the general vicinity (e.g., within the project area, section, drainage, watershed, etc.), but not in the AA.
Substantial (wildlife) use:	AA is regularly used in high numbers relative to local or transient populations.
Temporary/ephemeral:	Surface water is present for brief periods during the growing season, but the water table is well below the surface most of the year; or surface water flows briefly in direct response to precipitation in the immediate vicinity and the channel is above the water table.
Vegetated Wetland Buffer:	Area adjacent to AA with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
Wetland:	Wetlands are areas where the presence of water, at or near the surface, creates conditions leading to the development of redoxomorphic soil conditions and the presence of a flora and fauna adapted to the permanently or periodically flooded or saturated conditions (Smith et al. 1995). The code of federal regulations defines wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR Part 328.3).
Wetland Functions:	The normal activities or actions that occur in wetland ecosystems, or simply, the things that wetlands do. Wetland functions result directly from the characteristics of a wetland ecosystem and the surrounding landscape and their interaction (Smith et al. 1995).

Appendix A

2008 MDT Montana Wetland Assessment Method Form

MDT Montana Wetland Assessment Form (revised March 2008)

1. Project Name:_____ **2. MDT Project #:** _____ **Control #:**_____

3. Evaluation Date: Mo._____ Day_____Yr._____ **4. Evaluator(s):**_____ **5 . Wetlands/Site #(s):**_____

6. Wetland Location(s): i. Legal: T ____ N or S; R ____ E or W; S _____ ; T ____ N or S; R ____ E or W; S _____ ;
ii. Approx. Stationing or Mileposts:_____

iii. Watershed: __ __ __ __ __ __ __ __ **Watershed Name, County:**_____

7. a. **Evaluating Agency:** _____;
b. **Purpose of Evaluation:**
1.____Wetlands potentially affected by MDT project
2.____ Mitigation wetlands; pre-construction
3.____ Mitigation wetlands; post-construction
4.____ Other _____

8. Wetland size: (total acres) _____ (visually estimated)
_____ (measured, e.g. by GPS [if applies])

9. Assessment area (AA): (acres, see instructions on determining AA) _____ (visually estimated)
_____ (measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% of AA

Abbreviations: (*see manual for definitions*)

HGM Classes: Riverine (**R**), Depressional (**D**), Slope (**S**), Mineral Soil Flats (**MSF**), Organic Soil Flats (**OSF**), Lacustrine Fringe (**LF**);

Cowardin Classes: Rock Bottom (**RB**), Unconsolidated bottom (**UB**), Aquatic Bed (**AB**), Unconsolidated Shore (**US**), Moss-lichen Wetland (**ML**), Emergent Wetland (**EM**), Scrub-Shrub Wetland (**SS**), Forested Wetland (**FO**)

Modifiers: Excavated (**E**), Impounded (**I**), Diked (**D**), Partly Drained (**PD**), Farmed (**F**), Artificial (**A**)

Water Regimes: Permanent / Perennial (**PP**), Seasonal / Intermittent (**SI**), Temporary / Ephemeral (**TE**)

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)

(Circle one) Unknown Rare Common Abundant

12. General condition of AA:

i. Disturbance: (use matrix below to determine [circle] appropriate response – see instructions for Montana-listed noxious weed and aquatic nuisance vegetation species (**ANVS**) lists)

Conditions within AA	*Predominant conditions adjacent to (within 500 feet of) AA*		
	Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed or ANVS cover is ≤15%.	Land not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed or ANVS cover is ≤30%.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed or ANVS cover is ≤15%.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed or ANVS cover is ≤30%.	moderate disturbance	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.):

ii. Prominent noxious, aquatic nuisance, & other exotic vegetation species:

iii. Provide brief descriptive summary of AA and surrounding land use/habitat:

13. Structural Diversity: (based on number of "Cowardin" ***vegetated*** classes present [do not include unvegetated classes], see #10 above)

Existing # of "Cowardin" Vegetated Classes in AA	**Initial Rating**	**Is current management preventing (passive) existence of additional vegetated classes?**		**Modified Rating**
≥3 (or 2 if 1 is forested) classes	H	NA	NA	NA
2 (or 1 if forested) classes	M	NA	NA	NA
1 class, but not a monoculture	M	←NO	YES→	L
1 class, monoculture (1 species comprises ≥90% of total cover)	L	NA	NA	NA

Comments:

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. **Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:**

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**) D S _____
Secondary habitat (**list species**) D S _____
Incidental habitat (**list species**) D S _____
No usable habitat S

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	None
Functional Points and Rating	1H	.9H	.8M	.7M	.3L	.1L	0L

Sources for documented use (e.g. observations, records, etc):

14B. **Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program:** (not including species listed in14A above)

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**) D S _____
Secondary habitat (**list species**) D S _____
Incidental habitat (**list species**) D S _____
No usable habitat S

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	None
S1 Species: *Functional Points and Rating*	1H	.8H	.7M	.6M	.2L	.1L	0L
S2 and S3 Species: *Functional Points and Rating*	.9H	.7M	.6M	.5M	.2L	.1L	0L

Sources for documented use (e.g. observations, records, etc.):

14C. **General Wildlife Habitat Rating:**

i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):
__ observations of abundant wildlife #s or high species diversity (during any period)
__ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ presence of extremely limiting habitat features not available in the surrounding area
__ interviews with local biologists with knowledge of the AA

Minimal (based on any of the following [check]):
__ few or no wildlife observations during peak use periods
__ little to no wildlife sign
__ sparse adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):
__ observations of scattered wildlife groups or individuals or relatively few species during peak periods
__ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ adequate adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

ii. Wildlife habitat features (Working from top to bottom, circle appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent **vegetated** classes must be within 20% of each other in terms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms])

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	M	H	H	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	Moderate	Low
Substantial	1E	.9H	.8H	.7M
Moderate	.9H	.7M	.5M	.3L
Minimal	.6M	.4M	.2L	.1L

Comments:

14D. General Fish Habitat Rating: (Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]. If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then circle **NA** here and proceed to 14E.)

Type of Fishery: Cold Water (**CW**)____ Warm Water (**WW**)____ **Use the CW or WW guidelines in the user manual to complete the matrix**

i. Habitat Quality and Known / Suspected Fish Species in AA (use matrix to arrive at [circle] the functional points and rating)

Duration of surface water in AA	Permanent / Perennial						Seasonal / Intermittent						Temporary / Ephemeral					
Aquatic hiding / resting / escape cover	Optimal		Adequate		Poor		Optimal		Adequate		Poor		Optimal		Adequate		Poor	
Thermal cover optimal / suboptimal	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S
FWP Tier I fish species	1E	.9H	.8H	.7M	.6M	.5M	.9H	.8H	.7M	.6M	.5M	.4M	.7M	.6M	.5M	.4M	.3L	.3L
FWP Tier II or Native Game fish species	.9H	.8H	.7M	.6M	.5M	.5M	.8H	.7M	.6M	.5M	.4M	.4M	.6M	.5M	.4M	.3L	.2L	.2L
FWP Tier III or Introduced Game fish	.8H	.7M	.6M	.5M	.5M	.4M	.7M	.6M	.5M	.4M	.4M	.3L	.5M	.4M	.3L	.2L	.2L	.1L
FWP Non-Game Tier IV or No fish species	.5M	.5M	.5M	.4M	.4M	.3L	.4M	.4M	.4M	.3L	.3L	.2L	.2L	.2L	.2L	.1L	.1L	.1L

Sources used for identifying fish sp. potentially found in AA:

ii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1)

*a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity **or** is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support, **or** do aquatic nuisance plant or animal species (see **Appendix E**) occur in fish habitat?* **Y N** *If yes, reduce score in **i** above by 0.1:*_____

b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for native fish or introduced game fish? **Y N** *If yes, add 0.1 to the adjusted score in **i** or **iia** above:*_____

iii. Final Score and Rating: _____ **Comments:**

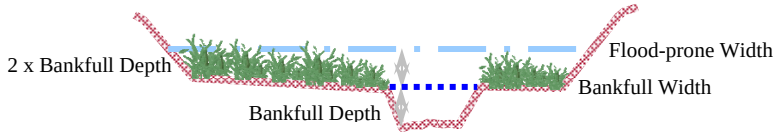
14E. Flood Attenuation: (Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle **NA** here and proceed to 14F.)

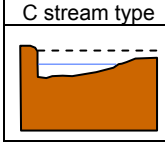
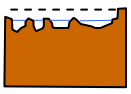
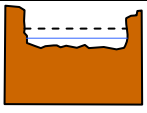
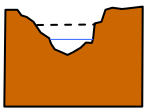
i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	Slightly entrenched - C, D, E stream types			Moderately entrenched – B stream type			Entrenched-A, F, G stream types		
% of flooded wetland classified as forested and/or scrub/shrub	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1H	.9H	.6M	.8H	.7M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.8H	.5M	.7M	.6M	.4M	.3L	.2L	.1L

Entrenchment ratio (ER) estimation – see User's Manual for additional guidance. Entrenchment ratio = (flood-prone width)/(bankfull width)
Flood-prone width = estimated horizontal projection of where 2 x maximum bankfull depth elevation intersects the floodplain on each side of the stream.

/	=	
Flood-prone width	*Bankfull width*	*Entrenchment ratio (ER)*



Slightly Entrenched ER = >2.2			**Moderately Entrenched ER = 1.41 – 2.2**	**Entrenched ER = 1.0 – 1.4**		
C stream type	D stream type	E stream type	B stream type	A stream type	F stream type	G stream type
						

ii. Are ≥10 acres of wetland in the AA subject to flooding **AND** are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA (circle)? **Y N** **Comments:**

14F. Short and Long Term Surface Water Storage: (Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow. If no wetlands in the AA are subject to flooding or ponding, circle **NA** here and proceed to 14G.)

i. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			1.1 to 5 acre feet			≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	1H	.9H	.8H	.8H	.6M	.5M	.4M	.3L	.2L
Wetlands in AA flood or pond **< 5 out of 10 years**	.9H	.8H	.7M	.7M	.5M	.4M	.3L	.2L	.1L

Comments:

14G. **Sediment/Nutrient/Toxicant Retention and Removal:** (Applies to wetlands with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** here and proceed to 14H.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low])

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with potential to deliver levels of sediments, nutrients, or compounds at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding / ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1H	.8H	.7M	.5M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.7M	.6M	.4M	.4M	.3L	.2L	.1L

Comments:

14H Sediment/Shoreline Stabilization: (Applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If 14H does not apply, circle **NA** here and proceed to 14I.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

*% Cover of **wetland** streambank or shoreline by species with stability ratings of ≥6 (see* **Appendix F***).*	*Duration of surface water adjacent to rooted vegetation*		
	Permanent / Perennial	Seasonal / Intermittent	Temporary / Ephemeral
≥ 65%	1H	.9H	.7M
35-64%	.7M	.6M	.5M
< 35%	.3L	.2L	.1L

Comments:

14I. Production Export/Food Chain Support:

i. Level of Biological Activity (synthesis of wildlife and fish habitat ratings [circle])

General Fish Habitat Rating (14D.iii.)	**General Wildlife Habitat Rating (14C.iii.)**		
	E/H	M	L
E/H	H	H	M
M	H	M	M
L	M	M	L
N/A	H	M	L

ii. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14I.i.); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P, S/I, and T/E are as previously defined, and A = "absent" [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.7M	.8H	.5M	.6M	.4M	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.6M	.6M	.4M	.3L	.2L
S/I	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.5M	.5M	.3L	.3L	.2L
T/E/ A	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.4M	.5M	.2L	.3L	.1L	.6M	.4M	.4M	.2L	.2L	.1L

iii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1.) **Vegetated Upland Buffer (VUB)**: Area with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
a) Is there an average ≥ 50 foot-wide vegetated upland buffer around ≥ 75% of the AA circumference? **Y** **N** *If yes, add 0.1 to the score in* ***ii*** *above and adjust rating accordingly:*_____

iv. Final Score and Rating: _____ **Comments:**

14J. **Groundwater Discharge/Recharge:** (check the appropriate indicators in i & ii below)

i. Discharge Indicators

____ The AA is a slope wetland
____ Springs or seeps are known or observed
____ Vegetation growing during dormant season/drought
____ Wetland occurs at the toe of a natural slope
____ Seeps are present at the wetland edge
____ AA permanently flooded during drought periods
____ Wetland contains an outlet, but no inlet
____ Shallow water table and the site is saturated to the surface
____ Other:_____

ii. Recharge Indicators

____ Permeable substrate present without underlying impeding layer
____ Wetland contains inlet but no outlet
____ Stream is a known 'losing' stream; discharge volume decreases
____ Other:_____

iii. Rating (use the information from i and ii above and the table below to arrive at [circle] the functional points and rating)

Criteria	**Duration of saturation at AA Wetlands *FROM GROUNDWATER DISCHARGE OR WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	P/P	S/I	T	None
Groundwater Discharge or Recharge	1H	.7M	.4M	.1L
Insufficient Data/Information	N/A			

Comments:

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Replacement potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland **or** plant association listed as "S1" by the MTNHP			AA does not contain previously cited rare types **and** structural diversity (#13) is high **or** contains plant association listed as "S2" by the MTNHP			AA does not contain previously cited rare types or associations **and** structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1H	.9H	.8H	.8H	.6M	.5M	.5M	.4M	.3L
Moderate disturbance at AA (#12i)	.9H	.8H	.7M	.7M	.5M	.4M	.4M	.3L	.2L
High disturbance at AA (#12i)	.8H	.7M	.6M	.6M	.4M	.3L	.3L	.2L	.1L

Comments:

14L. Recreation/Education Potential: (affords "bonus" points if AA provides recreation or education opportunity)

i. Is the AA a known or potential rec./ed. site: (circle) **Y N** (if 'Yes' continue with the evaluation; if 'No' then circle **NA** here and proceed to the overall summary and rating page)

ii. Check categories that apply to the AA: ___ Educational/scientific study; ___ Consumptive rec.; ___ Non-consumptive rec.; ___Other

iii. Rating (use the matrix below to arrive at [circle] the functional points and rating)

Known or Potential Recreation or Education Area	Known	Potential
Public ownership or public easement with general public access (no permission required)	.2H	.15H
Private ownership with general public access (no permission required)	.15H	.1M
Private or public ownership without general public access, or requiring permission for public access	.1M	.05L

Comments:

General Site Notes

FUNCTION & VALUE SUMMARY & OVERALL RATING FOR WETLAND/SITE #(S):_____

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units: (Actual Points x Estimated AA Acreage)	Indicate the four most prominent functions with an asterisk (*)
A. Listed/Proposed T&E Species Habitat			1		
B. MT Natural Heritage Program Species Habitat			1		
C. General Wildlife Habitat			1		
D. General Fish Habitat					
E. Flood Attenuation					
F. Short and Long Term Surface Water Storage					
G. Sediment/Nutrient/Toxicant Removal					
H. Sediment/Shoreline Stabilization					
I. Production Export/Food Chain Support			1		
J. Groundwater Discharge/Recharge					
K. Uniqueness			1		
L. Recreation/Education Potential (bonus points)			NA		
Totals:					
Percent of Possible Score			%		

Category I Wetland: (must satisfy **one** of the following criteria; otherwise go to Category II)
___ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
___ Score of 1 functional point for Uniqueness; **or**
___ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
___ Percent of possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; otherwise go to Category IV)
___ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
___ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
___ Score of .9 or 1 functional point for General Fish Habitat; **or**
___ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish/Aquatic Habitat; **or**
___ Score of .9 functional point for Uniqueness; **or**
___ Percent of possible score > 65% (round to nearest whole #).

Category III Wetland: (Criteria for Categories I, II, or IV not satisfied)

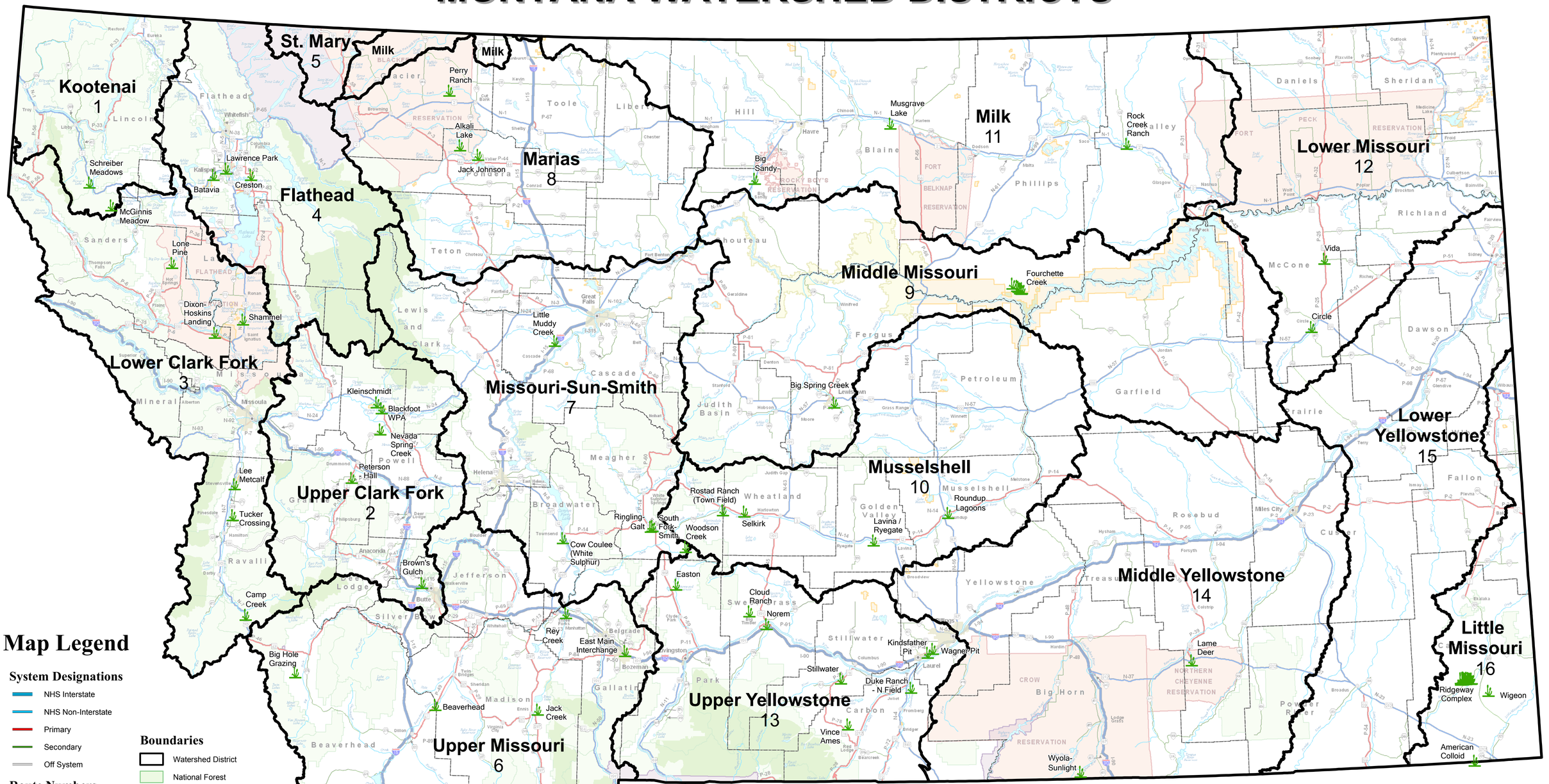
Category IV Wetland: (Criteria for Categories I or II are not satisfied and all of the following criteria are met; otherwise go to Category III)
___ "Low" rating for Uniqueness; **and**
___ Vegetated wetland component < 1 acre (do not include upland vegetated buffer); **and**
___ Percent of possible score < 35% (round to nearest whole #).

OVERALL ANALYSIS AREA RATING: (circle appropriate category based on the criteria outlined above) **I II III IV**

Appendix B

Map of Major Montana Watershed Basins

MONTANA WATERSHED DISTRICTS



Map Legend

System Designations
- NHS Interstate
- NHS Non-Interstate
- Primary
- Secondary
- Off System

Route Numbers
- Interstate
- U.S.
- Montana
- Secondary

Cities and Towns
- Urban Area
- State Capital
- Incorporated City

Boundaries
- Watershed District
- National Forest
- Wilderness Area
- Reservation
- National Park
- Wildlife Refuge
- National Monument Area
- County

Other Symbols
- Constructed Wetland

Scale in Miles
10 0 10 20 30 40
Scale in Kilometers
10 0 10 20 30 40
ONE INCH EQUALS APPROXIMATELY 17.36 MILES OR 27.94 KILOMETERS
1:1,100,000

PREPARED BY THE
STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION
ROAD INVENTORY AND MAPPING SECTION
Created October 2006 in ArcGIS 9.1 using ArcMap. ESRI, Inc.
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Lambert Conformal Conic

serving you with pride

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Appendix C

Keys to HGM Wetland Classes (Smith et al. 1995) and Cowardin et al. (1979) Wetland Types

Appendix C -
KEYS TO HGM WETLAND CLASSES AND COWARDIN ET AL. (1979) WETLAND TYPES

Key to Hydrogeomorphic Wetland Classes and Regional Subclasses *

1. Wetland is under the influence of tides 2
1. Wetland is not under the influence of tides 4

2. Salinity greater than 30 ppt ..... Tidal Fringe (Euhaline)
2. Salinity less than 30 ppt 3

3. Salinity 5-30 ppt ..... Tidal Fringe (Mixohaline)
3. Salinity less than 5 ppt ..... Riverine (Tidal)

4. Wetland is topographically flat and has precipitation as a dominant source of water 5
4. Wetland is not topographically flat and does not have precipitation as a dominant source of water 6

5. Wetland has a mineral soil ..... Mineral Soil Flats
5. Wetland has an organic soil ..... Organic Soil Flats

6. Wetland is associated with a stream channel, floodplain, or terrace 7
6. Wetland is associated with a topographic depression or on a topographic slope or flat 9

7. Stream is intermittent or ephemeral ..... Riverine (Nonperennial)
7. Stream is perennial 8

8. Stream is 1st or 2nd order ..... Riverine (Upper perennial)
8. Stream is 3rd order or higher ..... Riverine (Lower perennial)

9. Wetland located in a natural or artificial (dammed) topographic depression 10
9. Wetland located on a topographic slope 13

10. Topographic depression has permanent water >2 meters deep, and wetland is restricted to the margin of the depression ..... Lacustrine Fringe
10. Topographic depression does not contain permanent water >2 meters deep 11

11. Topgraphic depression closed without discernable surface water inlets, outlets, or other connections ..... Depression (Closed)
11. Topographic depression open with discernable surface water inlets, outlets, or other connections 12

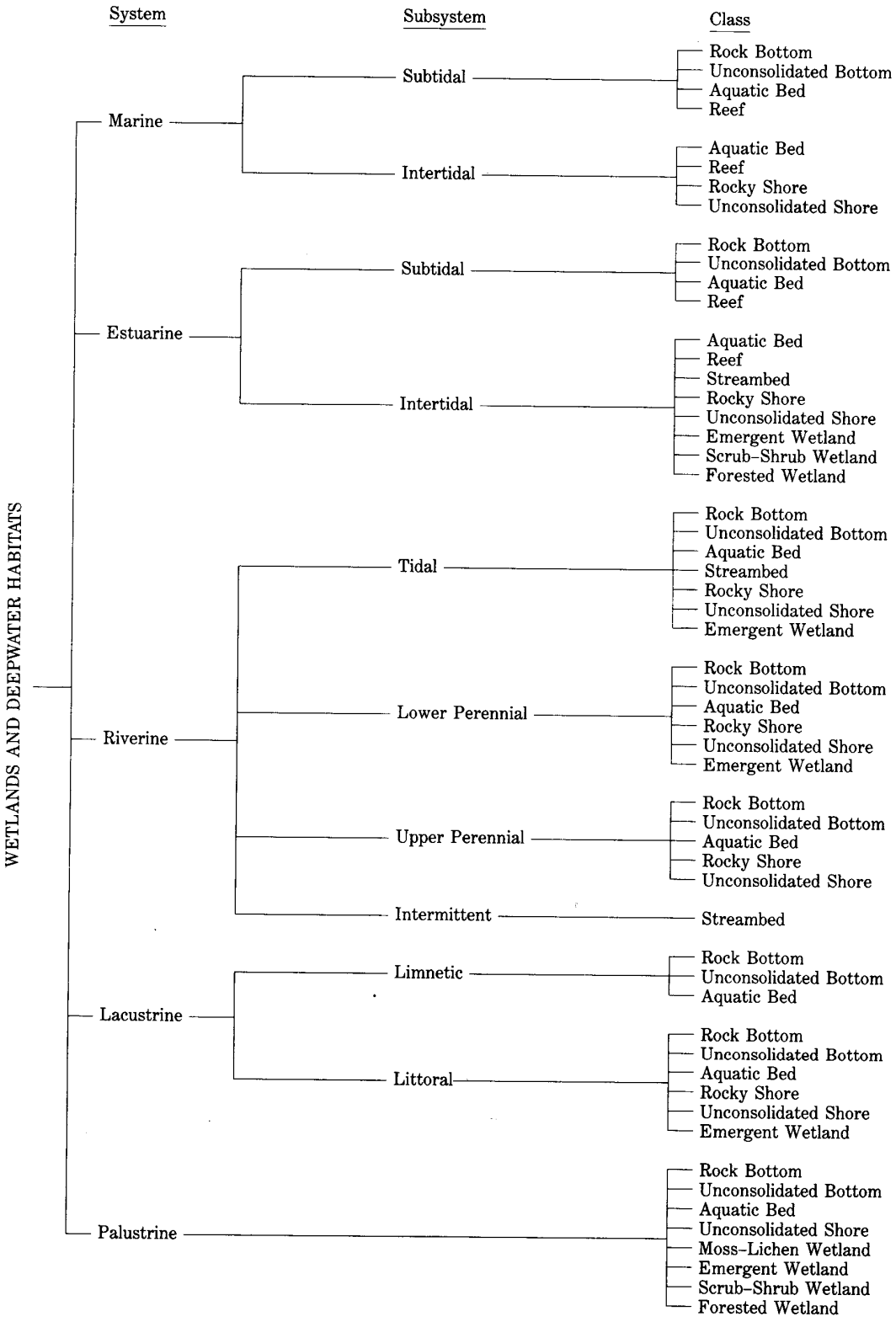
12. Primary source of water is ground water ..... Depression (Open, Ground Water)
12. Primary source of water is precipitation, overland flow, or interflow ..... Depression (Open, Surface Water)

13. Primary source of water is ground water ..... Slope
13. Primary source of water is precipitation ..... Organic Soil Flats

* Hydrogeomorphic classes are followed by regional subclass in parenthesis

Source: Smith et al. 1995.

Classification hierarchy of wetland and deepwater habitats, showing Systems, Subsystems, and Classes (Cowardin et al. 1979). The Palustrine System does not include Deepwater Habitats.

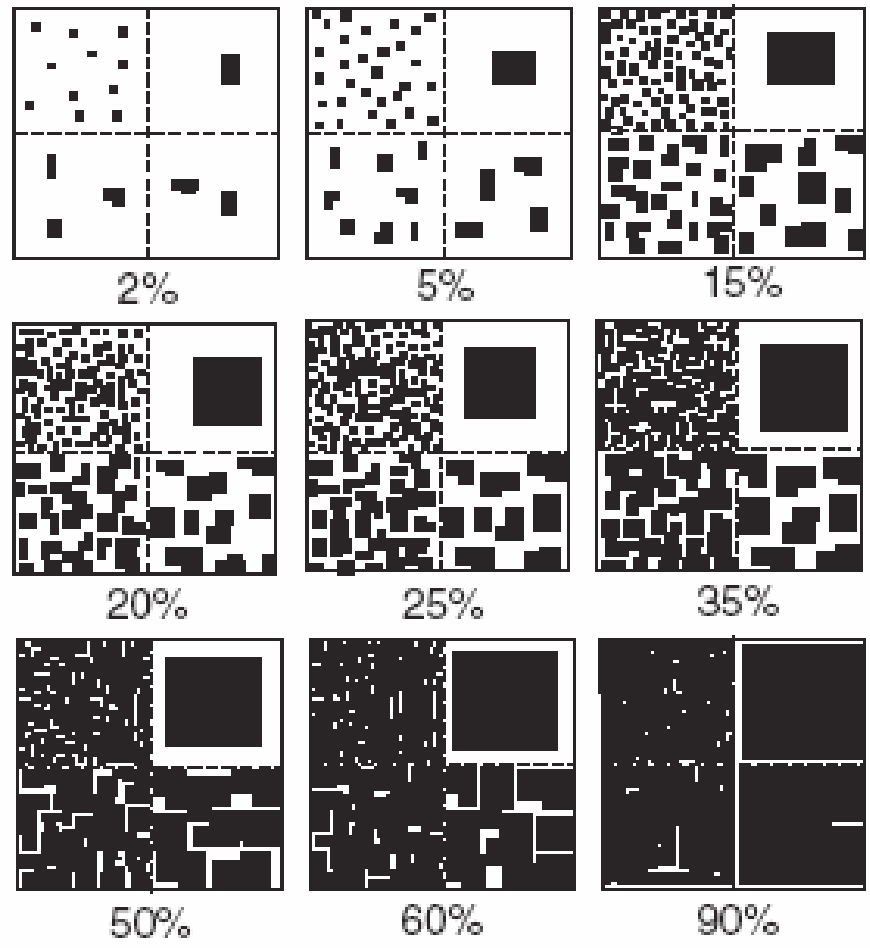


Appendix D

Guide to Estimating Percent Cover

Appendix D – GUIDE TO ESTIMATING PERCENT COVER

Source: National Soil Survey Center (NSSC). 2002. *Field Book for Describing and Sampling Soils*. Natural Resources Conservation Service, U.S. Department of Agriculture, Washington, DC.



Appendix E

Montana Noxious Weed Species
Montana Aquatic Nuisance Species

MONTANA NOXIOUS WEED SPECIES (March 2008)

Scientific Name	Common Name
Cardaria draba	whitetop; hoarycress
Cardaria. pubescens	globepodded hoarycress
Cardaria chalepensis	Chalapa hoarycress
Centaurea diffusa	diffuse knapweed
Centaurea maculosa	spotted knapweed
Centaurea repens (syn. *Acroptilon repens*)	Russian knapweed
Chrysanthemum leucanthemum	oxeye daisy
Cirsium arvense	Canada thistle
Convolvulus arvensis	field bindweed
Cynoglossum officinale	hound's-tongue
Euphorbia esula	leafy spurge
Hypericum peforatum	St. John's-wort
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	yellow toadflax
Potentilla recta	sulfur cinquefoil
Tanacetum vulgare	common tansy
Hieracium aurantiacum	orange hawkweed
Hieracium pratense (syn. *Hieracium caespitosum*)	meadow hawkweed complex
Hieracium floribundum	meadow hawkweed complex
Hieracium piloselloides	meadow hawkweed complex
Isatis tinctoria	dyer's woad
Lepidium latifolium	perennial pepperweed
Lythrum salicaria	purple loosestrife
Lythrum virgatum	purple loosestrife
Ranunculus acris	tall buttercup
Senecio jacobea	tansy ragwort
Tamarix spp.	tamarisk; saltcedar
Centaurea solstitialis	yellow starthistle
Chondrilla juncea	rush skeletonweed
Crupina vulgaris	common crupina
Iris pseudacorus	yellowflag iris
Myriophyllum spicatum	Eurasian water milfoil

MONTANA AQUATIC NUISANCE SPECIES (ANS) PRIORITY CLASSES

Priority Class 1
These species are not known to be present in Montana, but have a high potential to invade and there are limited or no known management strategies for these species. Appropriate action for this class includes prevention of introductions and eradication of pioneering populations.

Priority Class 2
These species are present and established in Montana and have the potential to spread further and there are limited or no known management strategies for these species. These species can be managed through actions that involve mitigation of impact, control of population size, and prevention of dispersal to other waterbodies.

Priority Class 3
These species are not known to be established in Montana and have a high potential for invasion and appropriate management techniques are available. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations.

Priority Class 4
These species are present and have the potential to spread in Montana but there are management strategies available for these species. These species can be managed through actions that involve mitigation of impact, control of population size, and prevention of dispersal to other waterbodies.

Source: Montana Fish Wildlife and Parks Aquatic Nuisance Species website
http://fwp.mt.gov/fishing/fishingmontana/ans/default.html (Site accessed 2/27/2006)

For more information please refer to:
Montana Fish Wildlife and Parks Aquatic Nuisance Species Website
http://fwp.mt.gov/fishing/fishingmontana/ans/default.html

Montana Aquatic Nuisance Species (ANS) Management Plan - Final
Produced by: Montana Aquatic Nuisance Species (ANS) Technical Committee, A subgroup of The Montana ANS Steering Committee. October 15, 2002.
Available on the world wide web at: http://fwp.mt.gov/fishing/fishingmontana/ans/default.html

USGS – Nonindigenous Aquatic Species Website
http://nas.er.usgs.gov/

Aquatic Nuisance Species Task Force Website
http://www.anstaskforce.gov/default.php

Walleyes Unlimited – Billings Chapter
http://www.walleyesunlimited.com/invasive/invasive.html

MONTANA AQUATIC NUISANCE SPECIES (ANS) PRIORITY CLASSES

Common Name	Scientific Name	ANS Priority Class*
Fish		
Asian Carp		
Bighead Carp	*Hypophthalmichthys nobilis*	1
Black Carp	*Mylopharyngodon piceus*	1
Grass Carp	*Ctenoparyngodon idella*	1
Silver Carp	*Hypophthalmichthys molitrix*	1
Eurasian Ruffe	*Gymnocephalus cernuus*	1
Round Goby	*Neogobius melanostomus*	1
Tench	*Tinca tinca*	1
Zander	*Sander lucioperca*	1
Northern Snakehead	*Channa argus*	Federal Injurious Wildlife Species
Plants		
Curley Pondweed	***Potamogeton crispus***	**4**
Egeria	*Egeria densa*	1
Eurasian Watermilfoil	*Myriopyllum spicatum*	3
Flowering Rush	***Butomus umbellatus***	**4**
Hydrilla	*Hydrilla verticillata*	1
Purple Loosestrife	***Lythrum salicaria***	**4**
Salt Cedar	***Tamarix sp.***	**4**
Yellow Flag Iris	***Iris pseudacorus***	**4**
Molluscs		
New Zealand Mudsnail	***Potamopyrgus antipodarum***	**2**
Zebra Mussel	*Dreissena polymorpha*	1 and Federal Injurious Wildlife Species
Mammals		
Nutria	*Myocastor coypus*	1
Parasites and Pathogens		
Asian Tapeworm	*Bothriocephalus acheilognathi*	3
Heterosporosis		1
Infectious Hematopoietic Necrosis (IHN) Virus		1
Whirling Disease		**2**

***Bolded** ANS species are those that presently occur in Montana.

Appendix F

Plant Stability Rating Table

Appendix F - PLANT STABILITY RATING TABLE

Source:
Winward, Alma H. 2000. *Monitoring the vegetation resources in riparian areas*. Gen. Tech. Rep. RMRS-GTR-47. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, UT 49 p.
and
Pick T., P. Husby, W. Kellogg, B. Leinard, R. Apfelbeck. 2004. *Riparian Assessment: Using the NRCS Riparian Assessment Method*. Bozeman, MT. Available on the world wide web at: www.mt.nrcs.usda.gov/technical.

1 = Least stability rating; 10 = greatest stability rating

Plant Name	Stability Rating	Plant Name	Stability Rating
Grass/Grasslike dominated communities		***Tall Willow dominated communities***	
Grasslikes		Bebb willow/mesic graminoid	7-10
Baltic rush	9	Booth willow/water sedge	10
Beaked sedge	9	Booth willow/bluejoint reedgrass	10
Buxbaum sedge	8	Booth willow/Nebraska sedge	10
Creeping spikerush	6	Booth willow/beaked sedge	10
Douglas sedge	4	Booth willow/horsetail	7
Few flowered spikerush	5	Booth willow/mesic forb	7-8
Holm Rocky Mt. sedge	9	Booth willow/mesic graminoid	7-10
Lentil fruit sedge	4	Booth willow/fowl bluegrass	7
Mud sedge	8	Booth willow/Kentucky bluegrass	7
Nebraska sedge	9	Booth willow/false Solomon seal	7
Rock sedge	8	Drummond's willow communities	7
Short beaked sedge	8	Coyote willow/barren community	6
Small fruited bulrush	9	Coyote willow/horsetail	7
Small winged sedge	4	Coyote willow/mesic forb	7-8
Swordleaf rush	7	Coyote willow/mesic graminoid	7-10
Three square bulrush	9	Coyote willow/Kentucky bluegrass	6
Water sedge	9	Coyote willow/woods rose	8
Woolly fruit sedge	8	Geyer's willow/water sedge	10
Woolly sedge	9	Geyer's willow/bluejoint reedgrass	9
		Geyer's willow/beaked sedge	10
Grasses		Geyer's willow/tufted hairgrass	7
Bluejoint reedgrass	8	Geyer's willow/mesic forb	7-8
Brookgrass	3	Geyer's willow/mesic graminoid	7-10
Common reedgrass	9	Geyer's willow/fowl bluegrass	6
Creeping bentgrass	3	Geyer's willow/Kentucky bluegrass	6
Garrison creeping foxtail		Pacific willow/mesic forb	7-8
Kentucky bluegrass	3	Lemmon willow/Holm Rocky Mt. sedge	10
Mannagrass	8	Lemmon willow/water sedge	10
Mat muhly	3	Lemmon willow/mesic forb	7-8
Meadow barley	3	Lemmon willow/mesic graminoid	7-10
Nevada bluegrass	3	Lemmon willow/tall forb community	7
Orchardgrass	2	Yellow willow community	6
Quackgrass	3	Yellow willow/mesic forb	6-10
Prairie Cordgrass	8	Yellow willow/mesic graminoid	6-10

Plant Name	Stability Rating	Plant Name	Stability Rating
Redtop	2	Yellow willow/Kentucky bluegrass	6
Reed canarygrass	9	willow/rose	8
Shortawn foxtail	3	willow/beaked sedge	10
Slimstem reedgrass	7	willow/mesic forb	6-8
Smooth brome	3	willow/mesic graminoid	6-10
Timber oatgrass	3	willow/Kentucky bluegrass	6
Timothy	2	willow/tall forb community	7
Tufted hairgrass	4		
Water foxtail	3		
Short willow dominated communities		***Tall deciduous tree dominated communities***	
low willow/mesic forb	6-8	Box elder/red osier dogwood	9
Eastwood willow community	7	Box elder/horsetail	8
Eastwood willow/Holm Rocky Mountain sedge	9	cottonwood or aspen/water birch	8
Planeleaf willow community	7	cottonwood or aspen/red osier dogwood	8
Planeleaf willow/water sedge	9	cottonwood or aspen/Kentucky bluegrass	6
Planeleaf willow/bluejoint reedgrass	9	cottonwood or aspen/rose	6-7
Planeleaf willow/Holm Rocky Mountain sedge	9	cottonwood/bar	6
Planeleaf willow/tufted hairgrass communities	7	cottonwood or aspen/willow	8
Wolf's willow/water sedge	9	cottonwood or aspen/dry graminoid	6
Wolf's willow/beaked sedge	9		
Wolf's willow/Holm Rocky Mountain sedge	9		
Wolf's willow/tufted hairgrass	7		
Wolf's willow/mesic forb	6-8		
Coniferous tree dominated communities		***Short deciduous tree dominated communities***	
conifer/monkshood	6		
conifer/baneberry	6	alder or water birch/red osier dogwood	8
conifer/water birch	8	alder or water birch/horsetail	7
conifer/bluejoint reedgrass	8	alder or water birch/mesic forb	6-8
conifer/redosier dogwood	8	alder or water birch/mesic graminoid	6-8
conifer/tufted hairgrass	5		
conifer/blue wildrye	6		
conifer/horsetail	7		
conifer/mesic forb	6		
conifer/shrubby cinquefoil	6		
conifer/Kentucky bluegrass	5		
conifer/woods rose	7		
conifer/tall forb	6		
spruce/bluejoint reedgrass	8		
spruce/redosier dogwood	8		

Plant Name	Stability Rating	Plant Name	Stability Rating
spruce/bog birch	9		
spruce/horsetail	7		
spruce/bedstraw	6		
lodgepole pine/Holm Rocky Mt sedge	8		
Silver sagebrush/tufted hairgrass	4	aster/bunchgrass communities	3
Silver sagebrush/K. bluegrass	4	marshmarigold communities	6
Silver sagebrush/mesic graminoid	4-6	bittercress communities	4
Big sagebrush/woods rose	5	Canada thistle communities	6
Redosier dogwood/willow	8	Jeffrey shootingstar communities	3
Redosier dogwood/cow parsnip	7	horsetail communities	5-7
Shrubby cinquefoil/Idaho fescue	5	Rocky Mt. iris/dry graminoid	6
Shrubby cinquefoil/Kentucky bluegrass	5	Rocky Mt. iris/mesic graminoid	6-8
Silver sagebrush/dry graminoid	4	lupine/groundsel	5
Silver sagebrush/Idaho or sheep fescue	4	field mint communities	5
Woods rose communities	6	mountain bluebells communities	7
Redosier dogwood communities	7	mesic forb meadow communities	4-6
Redosier dogwood/bedstraw	7	monkeyflower communities	3
Shrubby cinquefoil/tufted hairgrass	5	watercress communities	6
Shrubby cinquefoil/ligusticum	5	water buttercup communities	6
chokecherry/woods rose	6	cattail communities	9
buckthorn communities	8	stinging nettle communities	7
		American speedwell communities	3
		California falsehellebore	6
Barren	1		
Anchored rock	10		
Anchored log	10		