Guidance Manual for KY-WRAM, Version 3.0

March 2016

1.0 INTRODUCTION

The Kentucky Wetland Rapid Assessment Method (KY-WRAM) is being developed with the intention of it being used in the Kentucky Division of Water's (KDOW) 401 Water Quality Certification Program or other such regulatory agencies such as the US Army Corps of Engineers (USACE), USDA National Resources Conservation Service (NRCS), and Kentucky Department of Natural Resources (KDNR). Several agencies are responsible for the development of this method, collectively known as the Technical Work Group (TWG), which includes: USFS, KDFWR, USFWS, NRCS, USEPA, KDNR, USACE, KSNPC, KDOW, and EKU. This method and manual is heavily based on the Ohio Rapid Assessment Method for Wetlands v. 5.0 developed by the Ohio Environmental Protection Agency (Mack 2001). Elements of the KY-WRAM differing from ORAM have been adapted from or borrowed in their entirety from the following: Michigan Rapid Assessment Method (MiRAM) (Michigan Department of Natural Resources and Environment 2010), North Carolina Wetland Assessment Method (NCWAM) (North Carolina Wetland Functional Team 2010), and the Tennessee Valley Authority Rapid Assessment Method (TVA-RAM). Much of the wording, formatting, and figures used in the KY-WRAM have been borrowed from or modified from the ORAM and MiRAM. The purpose of this version of the manual is to provide guidance to KY-WRAM Raters for field-testing of the draft method. It is assumed that anyone that can properly perform a Wetland Delineation or who has had KY-WRAM training is qualified to assess wetlands using this method. **It is imperative the Rater scores the wetland in its current state and type even if they can assume the wetland was a different type in the past.**

2.0 DETERMINING THE SCORING BOUNDARIES

Before going into the field, the KY-WRAM boundary should be preliminarily determined using the best available information (i.e., USACE wetland delineation boundaries, National Wetlands Inventory (NWI), USGS topographic, and/or NRCS soils maps if the Rater has not visited the site before) and mapped using ArcGIS. During the field visit the Rater should evaluate the entire Wetland Assessment Area. If this is not possible the Rater should note on the field form why the entire area could not be assessed and the approximate area (percentage) that was evaluated. The main two criteria in determining the Assessment Area are wetland connectivity and size. In many cases, this should correspond to the jurisdictional wetland delineation boundary; however, certain circumstances exist where these are different and are described below. Additionally, for the purposes of scoring the draft KY-WRAM, the entire wetland is evaluated except in the special situations alluded to above. These special circumstances include, but are not limited to, a complex of wetlands, wetlands adjacent to large bodies of water, or wetlands that are greater than 50 acres. In situations where the wetland does not completely fit one of these categories, the Rater should use a combination of the applicable guidelines. Property lines and political boundaries cannot be used to establish the boundary of the Wetland Assessment Area. Lastly, artificial structures such as roads and railroad embankments should not be used to establish the boundary of the Wetland Assessment Area, except when the structure is greater than 100 feet wide (on average). More detailed guidance on these situations is discussed below.

Special Circumstances:

In the following section, there are guidance and diagrams indicating the area that should be evaluated by the KY-WRAM in certain unusual or difficult circumstances. The "X" shown in the following diagrams represents the Proposed Project Site. Shading represents the Wetland Assessment Area, which is the area evaluated by the KY-WRAM (the following figures are used with permission from Todd Losee – Michigan Department of Environmental Quality).

<u>The 100-foot guidelines</u>

1.) **Substantial Upland Break (width exceeds 100 feet) (Figure 1)**

- Assessment area boundaries should be established where a substantial (i.e. width exceeds 100 feet) upland break separates existing wetland areas.
- Assessment area boundaries should be established for roads that exceed, on average, a width of 100 feet, such as multi-lane roads, freeways, and multi-track railroad grades.
- In situations where numerous small wetlands occur within the wetland complex (mosaic including narrow upland areas), all wetlands occurring within 100 feet of one another should be included in the Assessment Area.

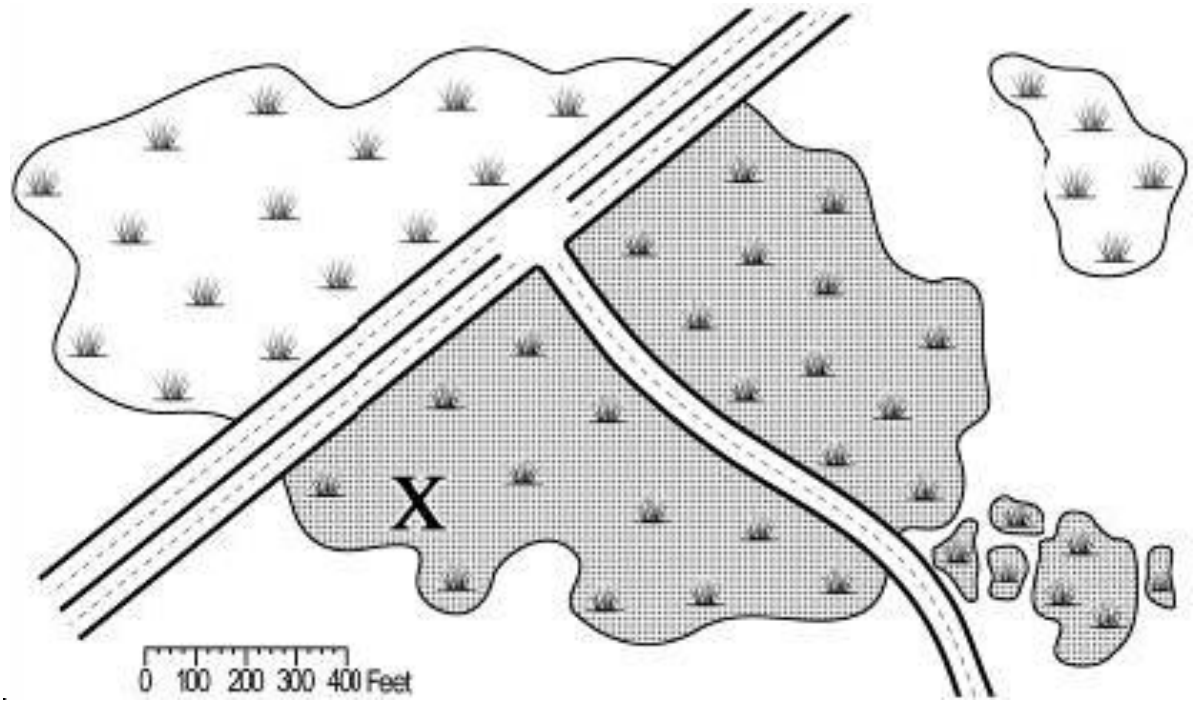


Figure 1. Proposed Project Site is identified by the X. A typical two-lane road and slender areas of upland are too narrow (less than100 feet wide) to qualify as Assessment Area (AA) boundaries. The multi-lane road is wide enough to qualify as an Assessment Area boundary. All wetlands within 100 feet of each other are included in the AA.

2.) Narrow Wetland Corridor (Length exceeds 100 feet and width is less than 100 feet)

- An Assessment Area boundary is established where the wetland narrows to less than 100 feet wide for a distance that exceeds 100 feet (Figure 2).

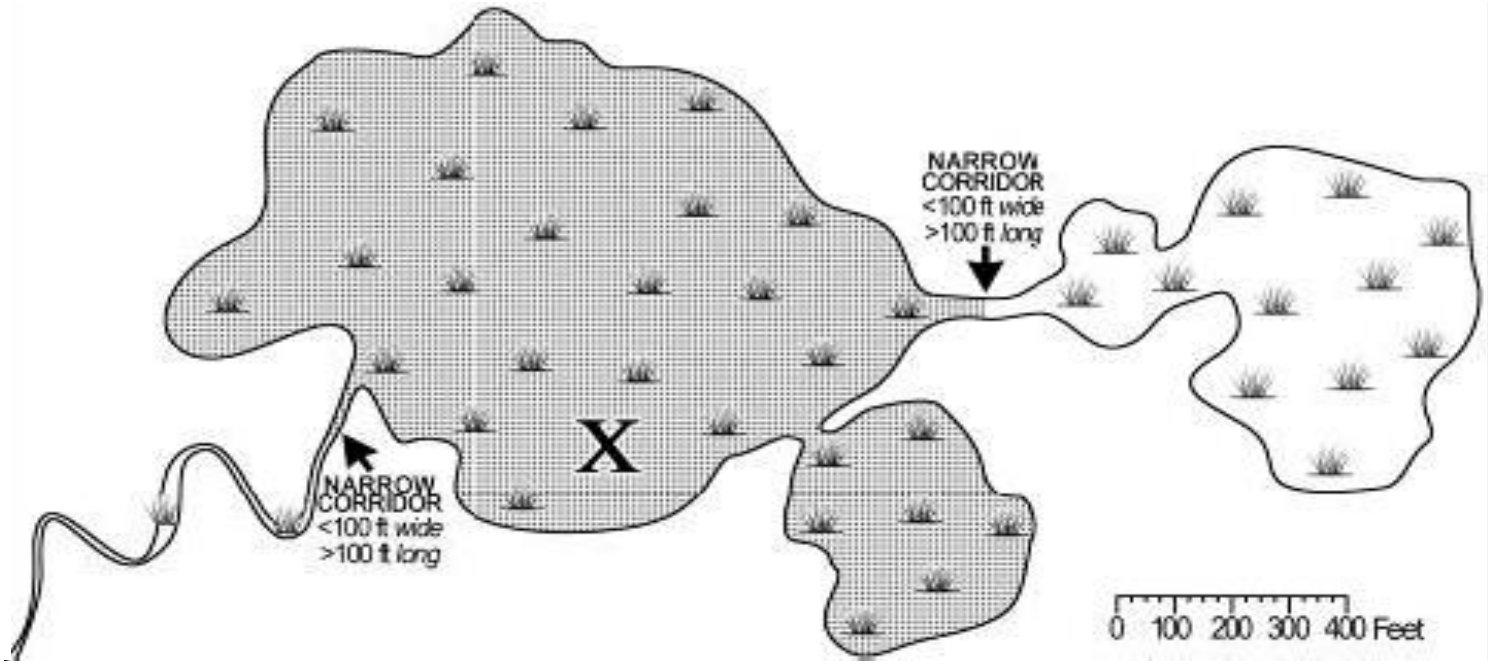


Figure 2. Two of the three wetland corridors depicted in this figure are long and narrow; therefore, Assessment Area boundaries should be established at both constriction areas.

3.) Assessment area is associated with Narrow Wetland Corridor

- If the Assessment Area is located within a wetland corridor narrower than 100 feet and the corridor is greater than 100 feet long, establish the AA boundary at the point where the narrow wetland corridor widens to substantially more than 100 feet (Figure 3).

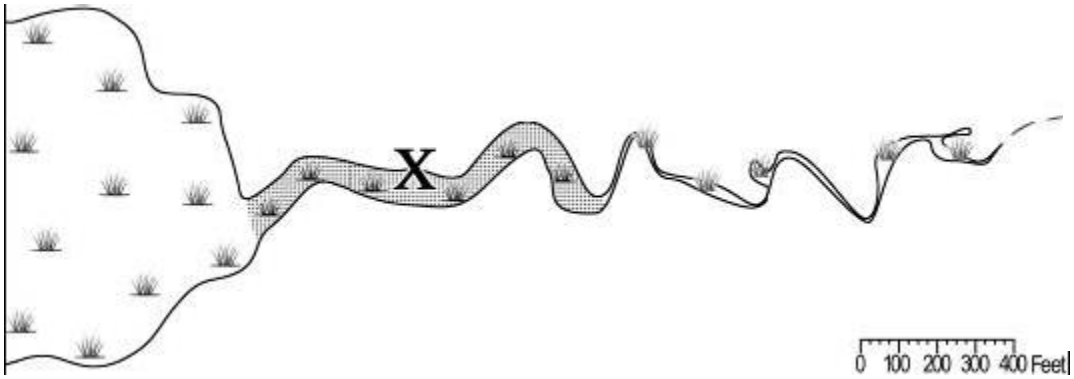


Figure 3. The Proposed Project Site (X) is located within a narrow wetland corridor. The AA boundary is placed where the narrow wetland widens or narrows substantially.

- Extremely narrow (width averaging less than 25 feet) linear stream/ditch wetlands are evaluated using the KY-WRAM (Figure 4).

Figure 4. The Proposed Project Site (X) is adjacent to an *extremely narrow* (width averaging less than 25 feet) linear wetland.

4.) Rivers and Lakes

- An Assessment Area boundary is established where a substantial area of open water exceeds 100 feet in width and separates the wetland areas (Figures 5 and 6) such as a wetland that borders a lake or large river.
- Where this applies, place the Assessment Area boundary 100 feet into the open water and parallel to the water's edge, so that a 100-foot wide "wetland band" is included in the Assessment Area. This is important in the scoring of several metrics.
- Areas dominated by aquatic beds (i.e. submerged aquatic plants) are included as open water.
- Minor open water areas, such as small streams and ponds, do not affect where the boundary of the Assessment Area is placed.

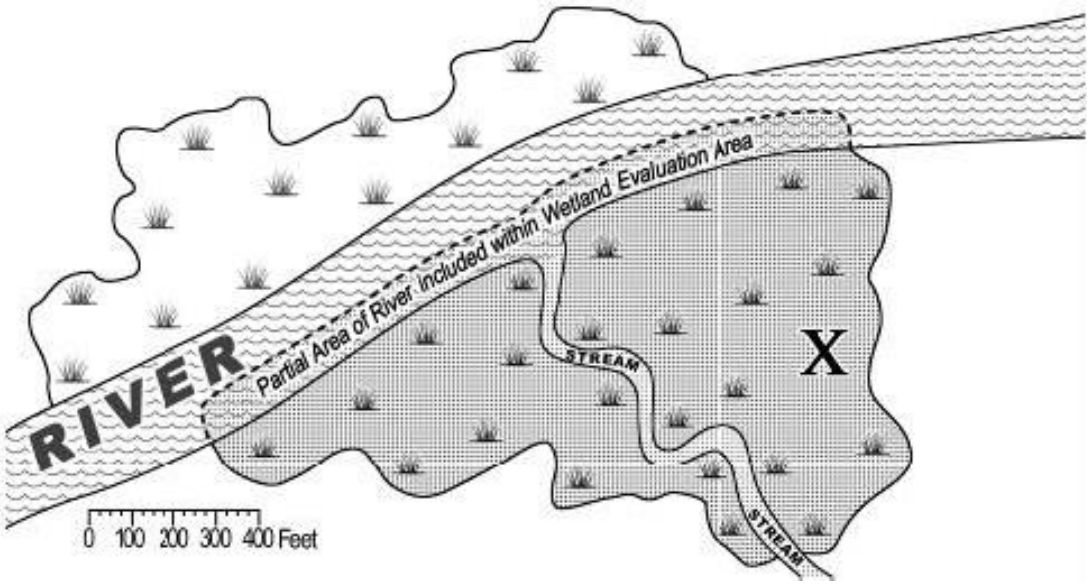


Figure 5. The large river constitutes a wetland break because a substantial area exceeds 100 feet. A 100-foot wide strip of river (approximately four acres) is included within this Wetland Assessment Area. The open water area of the small stream is also included.

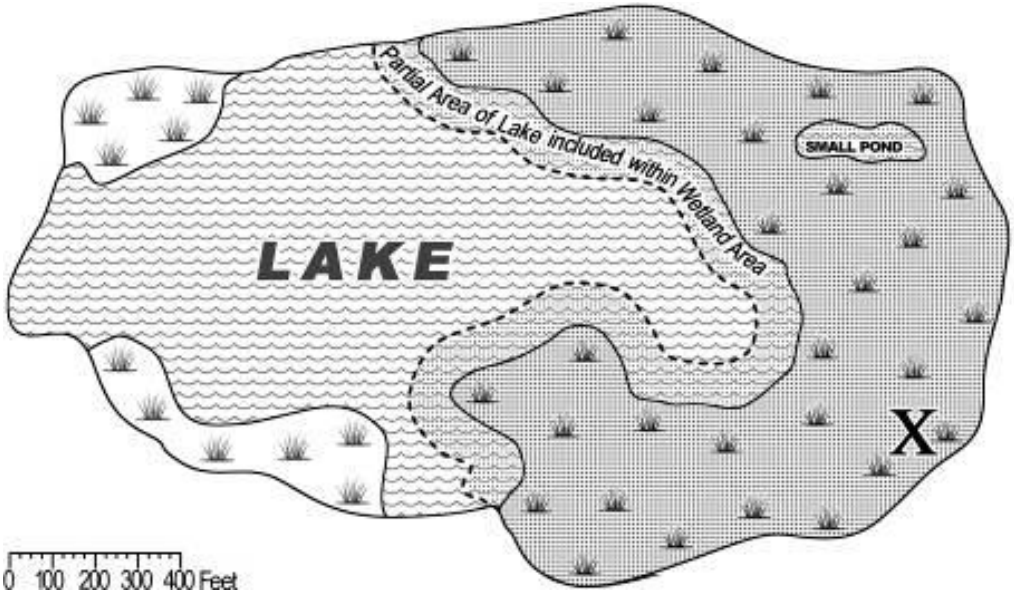


Figure 6. Wide (exceeding 100 feet) areas of open water constitute wetland breaks. A 100-foot wide strip of open water (approximately six acres) is included within this Wetland Assessment Area. The open water area of the small pond is also included within the Wetland Assessment Area.

The 50-acre guideline: Large Wetlands

When other breaks, as described above, do not allow the Rater to draw a boundary, limit the Wetland Assessment Area and boundary placement to approximately 50 acres of wetland adjacent to the Proposed Project Site (Figures 7-9). Please note that if an assessment is required for a wetland greater than 50 acres, several assessments can be completed in order to assess the whole area. Shading represents a 50-acre Wetland Assessment Area with the Proposed Project Site identified by the X.

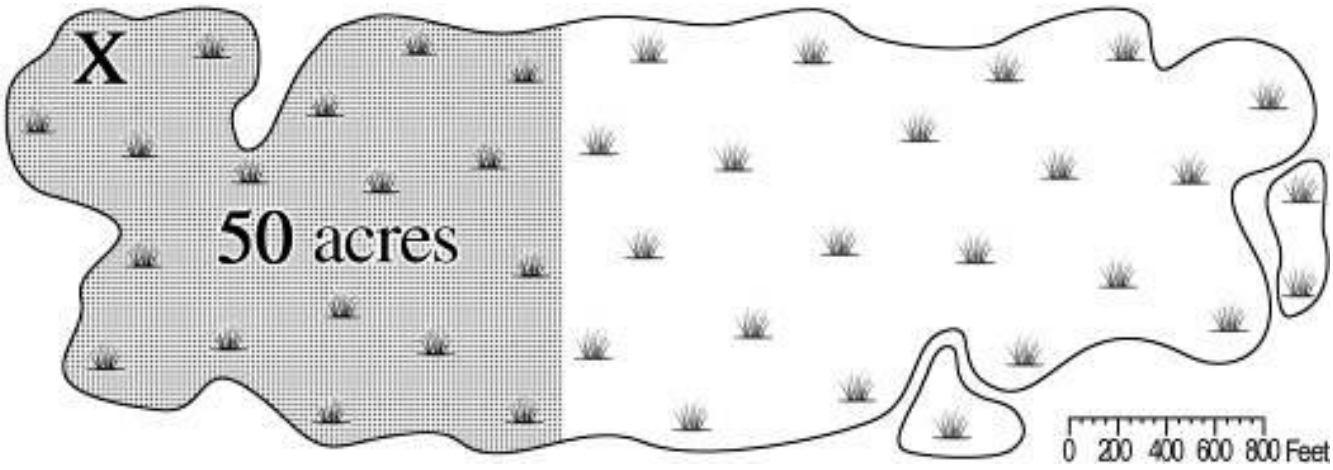


Figure 7. In this example, the Proposed Project Site (X) is located at an extreme end of a large wetland. The Wetland Assessment Area includes only the 50 acres of wetland adjacent to the Proposed Project Site. The acreage is determined by extending the Assessment Area straight outward.

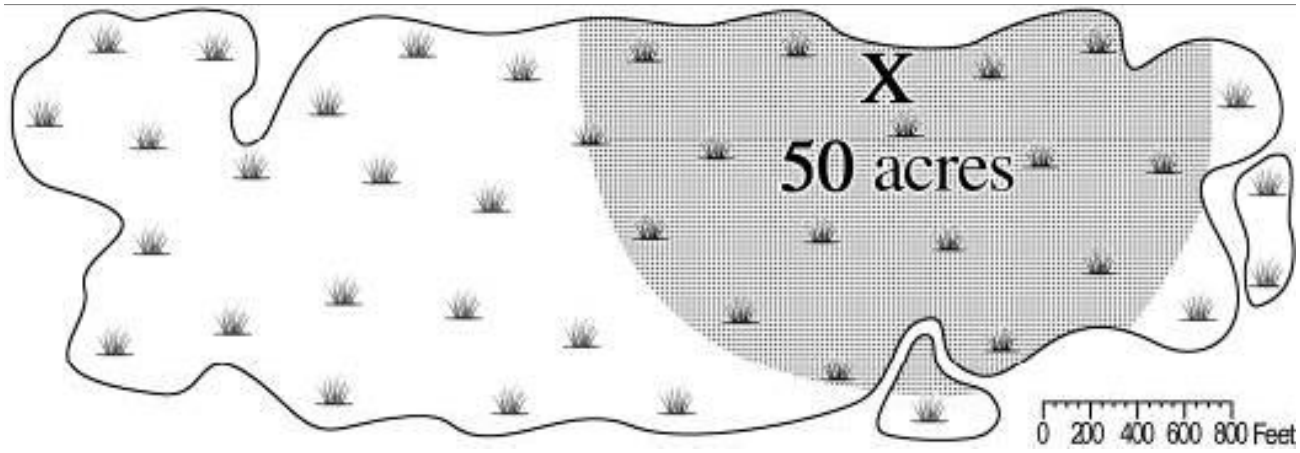


Figure 8. The Wetland Assessment Area includes only the 50 acres of wetland (or wetland complex) adjacent to the Proposed Project Site (X). In this example, part of a small wetland within the complex is also included. Because the Proposed Project Site is closer to the middle of the wetland as compared to the extreme end of the wetland, a 50-acre radius is drawn from the point and with the point in the center.

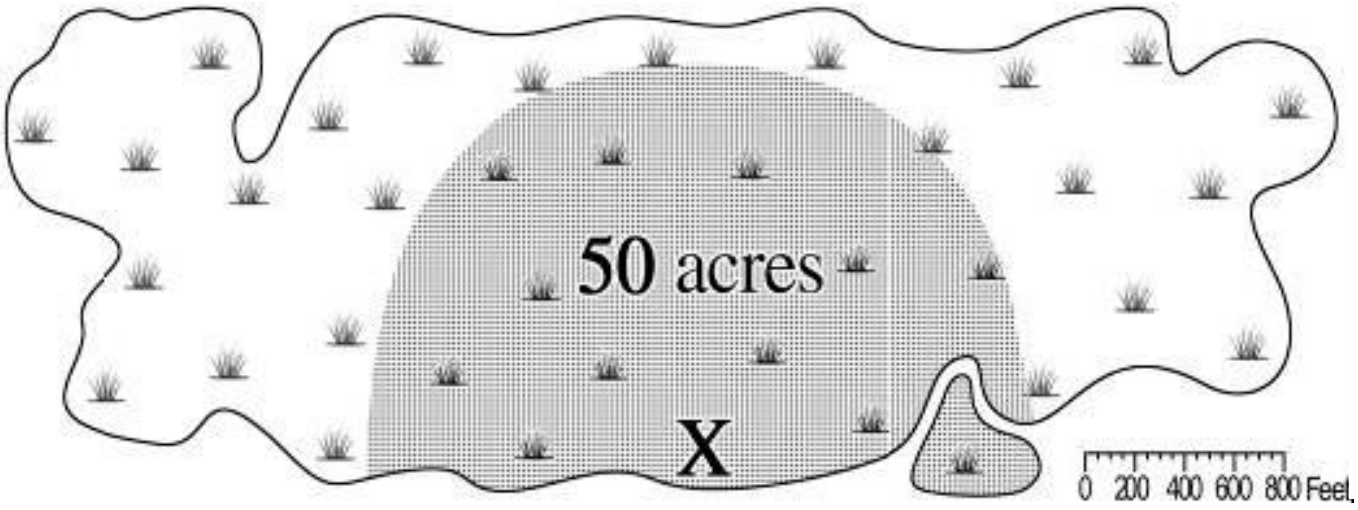


Figure 9. The Wetland Assessment Area includes only the 50 acres of wetland (or wetland complex) adjacent to the Proposed Project Site (X). In this example, all of a small wetland within the complex is also included. As with the previous example, because the Proposed Project Site is in the middle of the wetland, a 50-acre radius is drawn from the point and with the point in the center.

Additional Wetland Assessment Area boundary Considerations:

Vegetation Guidelines:

Wetlands that consist of more than one plant community, but are the same HGM class, are scored together.

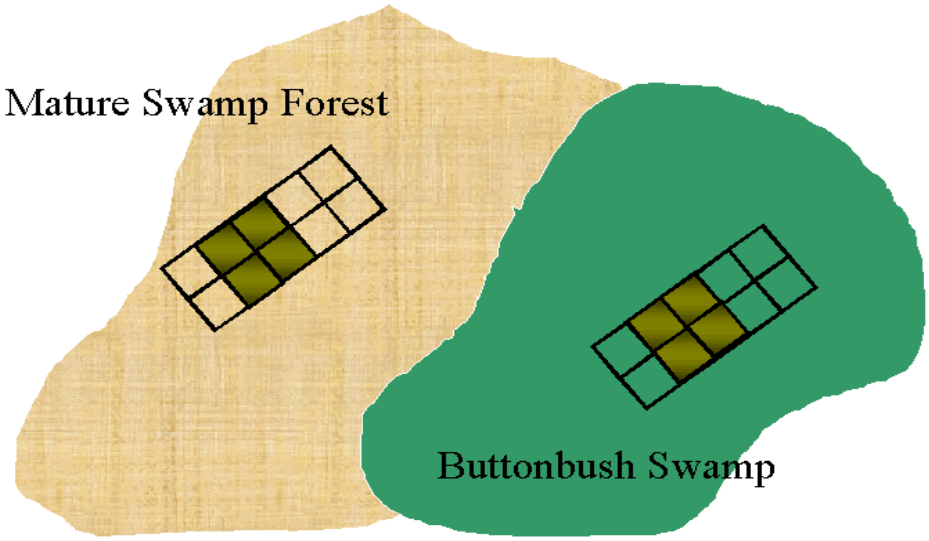


Figure 10. Two different vegetation communities are present in the wetland but because they are both classified as Riverine (HGM) wetlands, there are included in the same Assessment Area (Figure courtesy of Ohio EPA).

3.0 BACKGROUND INFORMATION

This section is to be used to document the general description of the wetland; therefore, it does not directly affect the score or categorization of the wetland. It is important to fill out the information in this section as completely as possible so that the wetland is adequately documented and can be referenced if questions arise later (e.g. score, categorization, etc.). This section requires the Rater to provide information about the wetland such as Name of Wetland, Wetland Type, Date of Evaluation, Latitude and Longitude coordinates, County of wetland location, Start and End time of field assessment, and Precipitation Occurrence (e.g., to help explain presence of pools of water). Further, the Rater must provide their Name, Phone Number, Email Address, and Affiliation/Address. If a Wetland Delineation Report is available, the Rater should note this along with the date the report was completed and the name of the report's author. This section also provides a checklist of items the Rater must make sure to have completed and attached with the KY-WRAM Rating form **before** the field assessment. This includes determining the Wetland Assessment Area and its size, making the Location map, and Landscape Sketch or aerial photograph. The landscape sketch or aerial photo must:

1.) Clearly label an aerial photograph with the Proposed Project Site (i.e., the point provided by probabilistic sampling), Wetland Assessment Area with the appropriate boundaries, quad name latitude and longitude coordinates, and Wetland Size.
2.) Label and indicate the extent of all general wetland community types identified within the wetland (i.e., forest, shrub, emergent). If available, more specific information on the vegetation community should be provided (i.e., marsh, bottomland hardwood, etc.). This information can often be found in the NWI maps.
3.) Identify and label all hydrologic features, such as streams, 100-year floodplains, ponds, vernal pools, and small patches of open water within a swamp or marsh.
4.) Identify and label the surrounding upland features.
5.) Include a north arrow and map scale information.
6.) Attach the landscape sketch or aerial photo to the end of the Rating Form.

Wetland Classification

For the purposes of KY-WRAM validation, wetlands will be classified using a combination of approaches (i.e., NRCS technical note, "Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the National Resources Conservation Service" (USDA-NRCS, 2008) and US Fish and Wildlife publication, "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al., 1979). The approach used for KY-WRAM includes using the first class listed in the NRCS document and the vegetation community modifiers described in Cowardin et al. (1979) and is summarized in Table 1.

Table 1. Preliminary wetland classification proposed by the KY-WRAM Technical Work Group (TWG) for KY-WRAM validation purposes. This represents the combination of descriptors to be used in classifying wetlands (i.e. one HGM class and one vegetation class descriptor per wetland).

HGM CLASSES	COWARDIN ET AL. (1979) VEGETATION CLASSES
- Riverine	- Forested
- Depressional	- Scrub/shrub
- Slope	- Emergent
- Flat (mineral soil)	
- Lacustrine fringe	

To determine which HGM class applies, **refer to Table 1 in the NRCS technical note** mentioned above. To determine which Cowardin vegetation class applies, use the following criteria discussed in Cowardin et al. (1979), and described as follows. The wetland is considered: 1) **forested** if it is dominated by woody vegetation that is 6 meters (20 ft.) high or more; these often have an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer, 2) **scrub/shrub** if the area is dominated by clusters of woody plants less than 6 meters tall and may represent a successional stage leading to a forested wetland or may be relatively stable communities; these can include true shrubs, young trees, and trees and shrubs that are small or stunted due to environmental conditions, and 3) **emergent** if the area is dominated by perennial erect, rooted, and herbaceous hydrophytes (except mosses and lichens); this vegetation is present for most of the growing season in most years. For a plant community to be considered dominant it must account for the greatest coverage of the communities present in the wetland; however, list the percent coverage of all vegetation communities present so that this information can be used for wetland classification purposes and analyses of KY-WRAM data. It is important to note that the vegetation class criteria listed here is different from that used in Sub-metric 6a. This is because we are using the NWI database for site selection and it uses the Cowardin classification of wetlands; therefore, we use Cowardin vegetation classes when classifying and selecting wetlands. Additionally, we assume that the vegetation data consultants collect during the wetland determination will be used to help score Metric 6. Because the protocol for wetland delineation was developed by the Corps, we use these criteria for vegetation strata for scoring this metric.

Narrative Discussion and Rating

The Narrative Discussion is provided for the Rater to document the presence of T/E species, Rare Community Types, and/or Scenic, Recreational, or Cultural uses in the wetland. This information should be attained prior to and during the field assessment and used to answer the questions below. The answers to the questions listed in bullets 1 and 2 should be used to assess Metric 5. Answers to Question 3 do not affect the KY-WRAM score but will be used to help the KDNR in their permitting process.

The Narrative Discussion is also intended to be used to describe any additional site information that may be relevant to assessing the wetland such as disturbances occurring within or near the Wetland Assessment Area such as drain construction or maintenance, recent or past construction projects, filling, or etc. Documentation of disturbances or alterations can be noted prior to or during the field assessment. Where appropriate, this

section can also be used to document recommendations and justification for wetland condition category changes.

1. USFWS Critical Habitat and/or Federal/State Threatened or Endangered (T/E) Species

Using U.S. Fish and Wildlife Services (USFWS) Threatened and Endangered Species (T/E species) maps, determine if T/E species and/or their Critical Habitat occur within the same HUC-12 watershed. This information can be found on the KDOW's website, which is updated with USFWS data as needed, but no less than annually. For state and federal agencies seeking this information, you may consult the KSNPC database. During the field assessment document any T/E species that are present. This information will be used in Metric 5, Special Wetlands. Use this information to answer the questions below.

Question 1. Is any part of the wetland located within the same HUC-12 watershed designated as Critical Habitat?

Question 2. Does any federal (G1 or G2) or state-listed (S1 or S2) T/E plant or animal species occur within the wetland's HUC-12 watershed?

Question 3. Does any S3 (state species of concern) species occur within the wetland's HUC-12 watershed?

2. KSNPC Rare Wetland Community Type (S1, S1S2, S2)

The Kentucky State Nature Preserves Commission (KSNPC) should be consulted for state T/E species occurrence and Rare Community locations by submitting a data request with the geographical coordinates of the site. For state and federal agencies seeking this information, you may consult the KSNPC database. Because not all locations of Rare Communities or T/E species may be known, the Rater should use the guide provided in Appendix B and the KSNPC key to determine if the wetland has a rare wetland community type. Use this information to answer the questions below.

Question 1. Does the wetland include a KSNPC rare community? Consult Appendix B for descriptions and the KSNPC key for further guidance.

Question 2. If YES, list the community type, the size of the rare community, and the percent of the wetland area.

3. Scenic, Recreational, and Cultural/Historical Value

Although it does not affect the score, the Rater is required to indicate if the wetland has any Scenic, Recreational, or Cultural/Historical value because this information can be used by the KDNR in their permitting process. Use the following information to answer Question 1 below.

a. **Scenic and Recreational Value** – Wetlands have scenic value if the public can view the wetland from a public road or public land. Examples include local or state parks, areas on or adjacent to Wild and

Scenic Rivers, state or federal wilderness areas. Wetlands with Recreational value are ones in which the public has access or can be assumed to be used for recreational activities. This includes scenic wetlands along a river used for canoeing, kayaking, or fishing, wetlands accessible by the public in parkland, state forests, wilderness areas, or other such areas used for hunting, wildflower viewing, bird watching, etc. Wetlands with scenic/recreational value would also include areas within a KDFWR Wildlife Management Area, State Nature Preserve, USACE project areas, or any other lands owned or managed by any federal, state, or local government agency.

b. Cultural or Historical Value – Wetlands have Cultural or Historical value if any part has been recognized as such by the Kentucky Heritage Council/State Historic Preservation Office (e.g. archeological sites). However, while there may be no recognized cultural or historic resources within or immediately adjacent to a wetland, unidentified National Register eligible resources may be present. If encountered during the wetland assessment please note any of the following:

i. Graves;
ii. Historic mine sites, including: structures, structural remains, foundations, portals, chimney vents, and mine equipment.
iii. Historic residences and/or farmsteads; (i.e.: structures, structural remains, foundations, chimneys, and wells.)
iv. Potential prehistoric past use areas such as rock outcrops and overhangs within or adjacent to the wetland, wetlands within the floodplains of perennial streams, or wetlands located within the valley bottom outside the floodplain.

Question 1. Does the wetland have scenic, recreational, or cultural value? If YES, describe which is present.

ITEMS TO CHECK OFF BEFORE GOING INTO FIELD:

□ Map of wetland location such as a county road map or USGS 7.5 minute topographic map with the location indicated.
□ NRCS soil maps: look for alluvial soils (e.g. alluvium) to determine if wetland is in a floodplain.
□ Color photographs of the wetland including:
- Landscape shot of entire wetland (if possible)
- Vegetation components
- Habitat types
- Hydrologic features
- Other relevant site features

□ Prints of satellite imagery used for buffer and connectivity sub-metrics including multiple prints at multiple scales (i.e. 150 ft buffer, 1000 ft and 2500 ft connectivity, 2-mile wetland scarcity, et al.). The following features should be marked and labeled only for the appropriate scale:
- Site location
- Wetland Assessment Area
- Plant communities within the wetland
- Streams
- 100 year floodplains
- Ponds
- Patches of open water
- Relevant upland features
- Location of modifications to wetland
- North arrow
- Scale for each print

FEATURES AND CONDITIONS TO NOTE PRESENCE OR ABSENCE OF DURING FIELD ASSESSMENT:

□ Hydrologic Condition and Interactions
□ Hydrologic Alterations
□ Substrate/Soil Disturbances
□ Habitat Reference Comparison
□ Habitat Alterations
□ Amphibian Breeding Pools/Habitat
□ Vegetation Diversity and Condition
□ Presence of Open Water
□ Percent of Invasive/Non-native Species
□ Community Interspersion
□ Vertical/Horizontal Structure
□ S1 or S1S2 Natural Community present

□ **Note how much of the wetland was reviewed during field assessment

3.0 QUANTITATIVE RATING

For all metrics utilizing aerial photography, it is important to determine if current conditions reflect those in the photos. If current conditions are different from pictures, estimate the metrics as accurately as possible by incorporating field observations. If you do not access the entire assessment area for any reason, indicate the location and amount acreage assessed. Be sure to explain why you were not able to assess the entire assessment area.

Although the form may be filled out in a linear manner it is expected that the Rater will make note of wetland characteristics throughout the entire field evaluation. For example, alterations to the hydrology, substrate, or habitat, plant species encountered, and the amount of microtopography features present. This is an important step in evaluating the method properly.

Metric 1: Wetland Size and Distribution

1a: Wetland Size

This sub-metric is GIS-based and it is strongly encouraged that it be completed before going into the field. In ArcGIS, calculate the estimated area of the wetland using the USACE delineation, NWI maps, NRCS soil maps, and/or USGS topographic maps. If it is not possible to use GIS prior to going in to the field, it may be useful to consult table on field form (adapted from ORAM v. 5.0) to estimate the wetland's size. This is appropriate only if the Rater is confident that their estimate puts the wetland in the appropriate size category. Once you get into the field, you might need to recalculate the size if ground-truthing shows changes to assessment area are needed. For instances where it is not possible to make maps prior to assessment, make note of the amount of area you assessed so that maps can be made appropriately later on. Choose only one category.

1b: Wetland Scarcity

This sub-metric is aerial-imagery-based, and it is strongly encouraged that it be completed before going into the field. We suggest using the USFWS National Wetlands Inventory (NWI) maps, other aerial imagery, or other information that allows the Rater to estimate the wetland area remaining within a 2-mile radius from the wetland's edge. This can be done using ArcGIS or by visual estimate. For the purpose of this sub-metric, areas of open water within lakes, streams, rivers, and excavated ponds (i.e., PUBX on NWI maps) **should be excluded** from the wetland percentage. Choose only one category.

Metric 2: Buffers and Intensity of Surrounding Land Use

For each of the metric 2 sub-metrics, set the center of GIS maps at the centroid of the wetland. Additionally, maps should be printed in color so that land uses can be adequately discerned. If it is not possible to print maps in color, perform the assessment for these sub-metrics in the office following the field evaluation and with proper designation of wetland and buffer boundaries.

2a: Average Buffer Width (around the Wetland's Perimeter)

Note to Rater: This sub-metric considers the ability of the buffer to filter water, retain sediment, slow water velocity, and etc.; therefore, it is not intended to rate the buffer in its capacity to serve as habitat for wildlife. For this sub-metric, buffer refers to landscape features that protect the biological, chemical, and physical integrity of the wetland from the effects of human activity. The types of landscape features considered to be buffers in this sub-metric are: shrubland, young or mature forests, natural grasslands (e.g. hay fields or non-mowed areas), natural rock outcrops, cobblebars, vegetated and naturalizing row crop fields (i.e. abandoned crop land), hay fields (i.e. non row-crop), lightly managed forest (i.e. selectively logged), lightly managed parkland (i.e. annually mowed fields), or other wetlands, lakes, or rivers. For the purposes of this sub-metric, impounded rivers, which have formed lakes, do count as buffer habitat. Single-track dirt roads (e.g., mountain biking, hiking trails, horse trails, or other non-motorized vehicle use that is not a source of sediment), re-vegetated roads, and abandoned roads (that are not a source of sediment) do not end the buffer for the purposes of this sub-metric. Non-buffer habitat includes: lawns, golf courses, and manicured parkland, residential, commercial, and industrial areas, roadways (including the shoulders) and parking lots, active agriculture such as row crop field, conservation tillage, grazed pasture (of any intensity), utility right-of-ways, clear-cutting or heavily managed forest, mining or construction activity, and gravel or double-track dirt roads, including All Terrain Vehicle (ATV) trails. Burned lands are considered temporary impacts for the sake of this sub-metric and are to be evaluated based on pre-burn characteristics.

This sub-metric is scored using the most recent aerial photograph available. We suggest using GIS or other program to sketch a 150-ft (50-m) wide "buffer zone" around the wetland centered at the wetland's geometric center (i.e., centroid). Make sure to print maps in color or so that land uses can be adequately discerned (or score this in the office with color images). Either using GIS or by-hand, sketch lines for each of the four cardinal and four ordinal directions from the edge of the wetland to the end of the buffer zone. Once these have been established, measure the distance from the edge of the wetland to the beginning of any non-buffer areas, with a maximum of 150 feet. If the shape of the wetland makes it difficult to determine a centroid with a representative buffer width, it is acceptable to use eight buffer widths that are dispersed equally around the wetland. Again, this can be done either using GIS calculating tool or with a ruler. Average the eight measured buffer widths and select the most appropriate buffer width category. Choose only one category

2b: Intensity of Surrounding Land Use

Using GIS or by hand using the map scale and the most recent aerial photograph available (and printed in color for adequately determining land uses or scored in office with color imagery), sketch a 1000 ft. wide "land-use zone" perpendicular to the edge of the wetland. Within this land-use zone, identify all of the types of land use present and estimate the total coverage of each land-use intensity category. Because it might be difficult to see land-use types on aerial imagery and land use may change between aerial imagery collections, we recommend "ground-truthing" the maps during the field visit of the wetland. Sum the estimated percentages of land-use types for each land-use category. If any of the land-use categories, as a whole, consists of ≥25% of the total land use, it is considered to be a "dominant" land-use category. The Rater is required to indicate the total percent coverage for each land use category on the field form. Sum the points from all the **dominant** land-use categories (only metric where <u>non-adjoining</u> options can be checked) and average them (round to the nearest 0.5 increment). Make sure to consult the topographic map for the area to determine if any features are present that may not show up on aerial imagery (e.g. other wetland areas such as depressional pools, etc.).

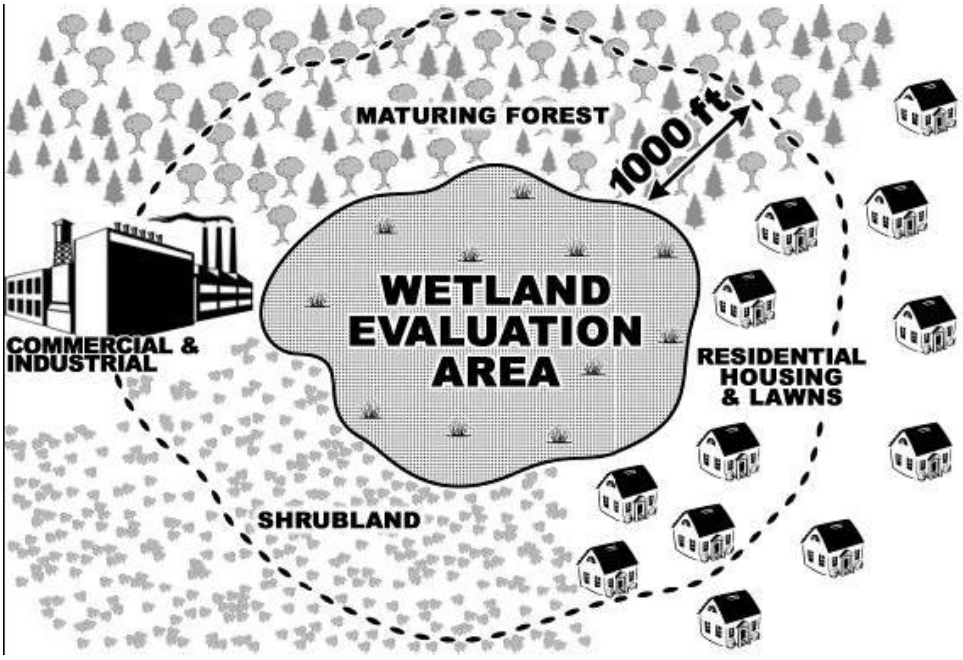


Figure 11. In this example there are three dominant land use types within the 1,000-foot land use zone surrounding the Wetland. The commercial/industrial "High Intensity" land use type represents less than 25 percent of the total, so is not a dominant land use.

2c: Connectivity to Other Natural Areas

This sub-metric evaluates whether the wetland is connected to naturally vegetated habitat patches in the greater landscape so that it supports wildlife movement between the two habitats. The wetland must be connected either contiguously to the patch or via a terrestrial corridor. For the purposes of this sub-metric, corridors that connect patches must be ≥ 30 ft wide. There is no maximum length required for corridors but the corridor must connect the wetland and the patch. Additionally, any portion of a patch that is < 30 ft wide is not included in calculation of area. Further, patches and corridors must be natural terrestrial habitat such as shrubland, forest (of any age), natural rock outcrops and cobble bars, lightly managed forest (selectively logged), or other wetlands. Barriers such as non-natural habitat and roads, no matter their size, end patch and corridor habitat. Because the intention of this metric is to evaluate the ability of terrestrial organism movement between the wetland and upland habitat, patch and corridor habitat must be terrestrial; therefore, large streams and rivers that don't allow terrestrial organisms to move across the landscape act as barriers and end corridor or patch habitat. Basically, the Rater needs to determine how far from the wetland edge one can travel until non-natural habitat is encountered. If the Rater has evidence that native grassland allows movement of organisms between corridors and patches for the wetland, they should make note of this and score the metric as it would be for the examples of natural habitat listed above.

Using GIS or by hand using the map scale and the most recent aerial photograph possible, sketch a 1000 ft. and 2500 ft. wide "connectivity zone" perpendicular to the edge of the wetland. This can be done by adding a 2500 ft. zone to the map created for the Intensity of Land Use sub-metric. **Select only one point value, i.e. the highest amount of patch present**. Take note: at the 1000-2500ft radius, a patch should be at least 10 acres in size to be considered for scoring the <50% point value.

Metric 3: Hydrology

To help score this metric, the Rater can use the same type of information and indicators of wetland hydrology as used in the USACE 1987 Wetland Delineation Manual Regional Supplements (Table 2 listed with Sub-metric 3c).

Functions evaluated by this metric (from USEPA Wetland Fact Sheets):

1. Protecting and improving water quality: slowing water velocity, filtering of excess sediments and nutrients/pollutants
2. Water storage: Slows water's momentum and erosive potential, reduces flood height, and helps recharge surface water during dry months

3a: Sources of Water (Input of Water From an Outside Source) – Select all that apply

In KY-WRAM, if a wetland's water budget comes only from precipitation, the Rater should score this sub-metric as 2.

Groundwater: Points are given for this if the wetland's hydrology is influenced by groundwater. A word of caution: even experienced hydrologists have had situations where they believed true groundwater was present but under further investigation found they were wrong (personal communication, Dr. Tasious Karathansasis, University of Kentucky hydrologist). Therefore, the Rater should only score this if there is direct evidence of groundwater, for example observing a seep or spring, although it should be noted that other wetland types may also receive groundwater. We expect there may be many more instances when groundwater is present but is not detected.

Surface water: Wetlands receive points for having surface water if there is some form of overland surface flow at least once per year (in a typical year) from a lake, pond, or stream.

3b: Hydrological Connectivity – Select all that apply

100-Year Floodplain or Abutting a Stream/Creek:

100-Year Floodplain: To determine if the wetland is in a 100-yr floodplain the Rater should consult flood insurance rate maps (FIRMs) and flood boundary and floodway maps available from the Federal Emergency Management Agency (FEMA). For the purposes of this sub-metric, the Rater may use the following site to generate a FIRM to determine if the wetland in a 100-yr floodplain: https://msc.fema.gov/webapp/wcs/stores/servlet/CategoryDisplay?catalogId=10001&storeId=10001&categoryId=12001&langId=-1&userType=G&type=1&dfirmCatId=12009&future=false. These maps are free to view but must be purchased if you request a copy. Guidance on how to use these FIRMs can be found in the online tutorial, "*How to Read a Flood Insurance Rate Map*". These maps are available for more than 99 percent of the flood-prone areas in the United States. If the wetland to be assessed does not have this information available, NRCS Web Soil Survey should be consulted to determine if alluvial soils exist.

Abutting a Smaller Stream/Creek: Wetlands that abut a smaller creek or stream can be important hydrological links to the landscape and watershed. Points should be given for this if the wetland is located along a smaller stream or creek. This situation describes riparian wetlands that are not included

in the 100-year floodplain because they are found along smaller streams or creeks (i.e., 1st or 2nd order seasonal or perennial streams). If the wetland is in physical proximity to, or part of other nearby wetlands, see below for wetland complex.

Between a Stream/Lake/Pond and Human Land Use: Points should be awarded for this if the wetland is located between a surface waterbody and any human land use, so that run-off from the adjacent land use could flow through the wetland before discharging into the surface waterbody (this discharge can include groundwater). These could include agricultural, commercial, industrial, mining, or residential land uses. This should be scored only if it is clear that water could flow from the land use area through the wetland before entering another waterbody. The land use must be uphill or at least at the same elevation of the wetland so that water drains into the wetland. We recommend using a topographic map as a guide to determine this.

Wetland Complex: This sub-metric evaluates the hydrological connectivity of the wetland. Because a complex of wetlands provides a greater hydrological function in total, this sub-metric is used to give points to wetland complexes. Points should be given for this if the wetland assessment area is part of a complex of *other* wetlands within 2,500' of the wetland assessment area boundary. There may be areas of upland between them, but they must be unmanicured/undeveloped vegetated areas. For the purpose of this sub-metric, do not consider a single wetland in an upland area; connectivity of a single wetland with upland habitat is evaluated in sub-metric 2c.

3c: Duration of Inundation/Saturation

This sub-metric asks the Rater to evaluate the dominant hydrologic characteristic of the wetland. "Dominant" is considered as such if it comprises at least 25% of wetland area. Where more than one dominant hydrologic characteristic exists, circle all that are present and average the points. It is important to note that the Rater does **not** have to be present at the wetland during the wettest time of the year to score this. The growing season (for 28°F base temp; temperature recommended by USACE in Eastern Mountains and Piedmont regional supplement) in Kentucky's Bluegrass region typically lasts from beginning of April to beginning of November (31 weeks or 220 days), although this varies across the state, with more western regions of the state having longer growing seasons and higher elevations in eastern Kentucky having shorter growing seasons. The Rater may use the growing season criteria for Kentucky on the NRCS website to determine the appropriate time period for each county: http://www.wcc.nrcs.usda.gov/climate/wetlands.html . Generally, 25% of the growing season will correspond to mid- to late May and 75% will correspond to the first to second week of September.
This sub-metric may be difficult to score when the wetland is assessed only once in late summer or fall, especially for wetlands that are only seasonally inundated or saturated. It is necessary and expected that the Rater consult the USACE Regional Supplements for wetland hydrology indicators (Table 2 below) for guidance with this sub-metric. The KY-WRAM scoring categories are derived from Table 5 of the 1987 Manual, specifically for Zones II to IV. Also, if the wetland is in the NWI database, the Rater may consult the hydrology modifiers listed in the Classification Code for help in determining the duration of inundation and/or saturation. Lastly, the Rater may use landscape position to infer duration of hydrology. Non-adjoining categories may be checked and then averaged, when appropriate.

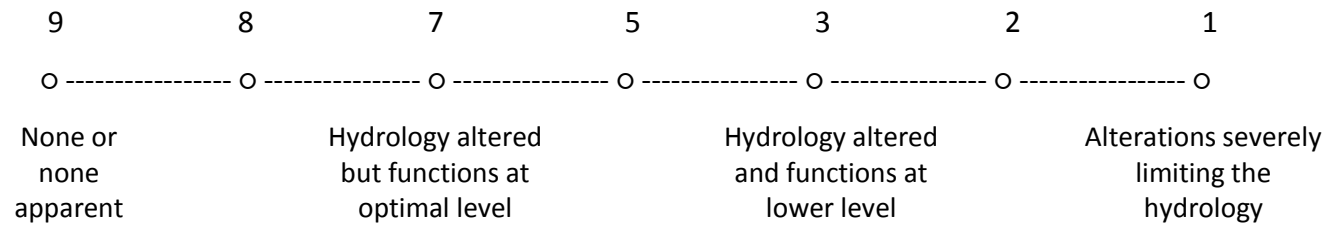
Table 2. Wetland hydrology indicators from Table 10 in USACE Regional Supplements for the Eastern Mountains and Piedmont Region and Atlantic and Gulf Coastal Plain Region. Some indicators are not applicable in both regions and are noted as such below. Refer to the Supplements for any questions regarding the indicators.

Indicator	Category	
	Primary	**Secondary**
Group A – Observation of Surface Water or Saturated Soils		
A1 – Surface water	X	
A2 – High water table	X	
A3 – Saturation	X	
Group B – Evidence of Recent Inundation		
B1 – Water marks	X	
B2 – Sediment deposits	X	
B3 – Drift deposits	X	
B4 – Algal mat or crust	X	
B5 – Iron deposits	X	
B7 – Inundation visible on aerial imagery	X	
B9 – Water-stained leaves	X	
B13 – Aquatic fauna	X	
B14 – True aquatic plants **(Eastern Mountains only)**	X	
B15 – Marl Deposits **(Atlantic & Gulf Coastal Plain only)**	X (LRR U)	
B6 – Surface soil cracks		X
B8 – Sparsely vegetated concave surface		X
B10 – Drainage patterns		X
B16 – Moss trim lines		X
Group C – Evidence of Current or Recent Soil Saturation		
C1 – Hydrogen sulfide odor	X	
C3 – Oxidized rhizospheres along living roots	X	
C4 – Presence of reduced iron	X	
C6 – Recent iron reduction in tilled soils	X	
C7 – Thin muck surface	X	
C2 – Dry-season water table		X
C8 – Crayfish burrows		X
C9 – Saturation visible on aerial imagery		X
Group D – Evidence from Other Site Conditions or Data		
D1 – Stunted or stressed plants **(Eastern Mountains only)**		X
D2 – Geomorphic position		X
D3 – Shallow aquitard		X
D4 – Microtopographic relief **(Eastern Mountains only)**		X
D5 – FAC-neutral test		X
D8 – Sphagnum moss **(Atlantic & Gulf Coastal Plain only)**		X (LRR T, U)

3d: Alterations to Natural Hydrologic Regime

Reminder to the Rater: for this sub-metric especially, make sure you rate the wetland in its current state and type. Do not score the wetland for what the hydrology may have been in the past. This sub-metric evaluates the intactness or lack of disturbance to the natural hydrologic regime of the wetland for the **type** of wetland being evaluated (see Background Information – Wetland Classification section). Check all of observed anthropogenic hydrologic alteration(s) that are potentially influencing the wetland (e.g., do not consider beaver activities as alterations to the hydrology). It is important to note that some alterations do not need to be actively maintained to have permanent negative effects. The Rater can use all available information to assist in determining potential alterations such as: field sites, aerial photos, maps, etc. The Rater may consult Biebighouser (2007, 2011) or other texts for guidance in detecting alterations to hydrology. During the in-field assessment, the Rater needs to determine, what if any, of the potential alterations are present and if they have contributed, more than trivially, to the disturbance of the natural hydrologic regime. The Rater should note that the alteration does not have to be within the wetland or buffer to have an impact of the hydrology; therefore, consider any alteration outside of the wetland that has impacted the wetland. Use the focusing questions below to help determine the score. If alterations have occurred far enough if the past that the current hydrology is not affected, then the present hydrology should be considered "natural" and the hydrology evaluated as such. Select the option that best represents the current hydrologic state. If the Rater believes that the hydrology falls between two categories or if the Rater is uncertain which category is appropriate, the Rater can "double check" two adjoining categories and average the score. For instances where one or several alterations exist but the Rater has determined that they did not alter the hydrologic regime or if the Rater does not observe any alterations, then maximum points should be given. Where alterations have been determined to cause more than trivial changes, a score of 1, 3, 7, or intermediate scores 2 or 5 should be given. In cases where the Rater was uncertain if alterations caused more than trivial alterations or if they did not occur long enough in the past for current conditions to be considered "natural", an intermediate score of 8 (average of 7 and 9) should be given. Any alterations that also impact the soil/substrate or habitat should be evaluated in Metric 4.

Circle one answer.	**YES**	**NO**	**NOT SURE**
Have any of the disturbances identified above caused or appear to have caused more than trivial alterations to the wetland's natural hydrologic regime, or have they occurred so far in the past that current hydrology should be considered to be "natural"?	Assign a score 1, 3, or 7 or an intermediate score, … depending on the degree of function that the wetland retained	Assign a score of 9 because there are no or no apparent alterations	Double check "none or none apparent" and "altered but functions intact or near optimal level" and assign a score of 8



General guidance for low-intensity vs. high-intensity disturbances:
Generally, low-intensity disturbances either affect a small area of the wetland or a larger area but the wetland was resilient to the impact so that the alteration is not very apparent (i.e., alteration no longer functions or the impact occurred far enough in the past). Conversely, high disturbances usually affect a large amount of the wetland either directly or indirectly, such as a ditch that functions to drain a large portion of the wetland.

Metric 4: Habitat Alteration and Habitat Reference Comparison

Functions evaluated by this metric (from USEPA Wetland Fact Sheets):

1. Abundant vegetation and shallow water provide diverse habitats for fish and wildlife
2. Aquatic plant life flourishes in the nutrient-rich environment and this energy is converted by plants is transferred up the food chain to wildlife
3. Plant roots and microorganisms in the soil take up pollutants and convert them

4a: Substrate/Soil Disturbance
This sub-metric asks the Rater to determine what direct physical alterations to the soil or surface substrates are observed. As with hydrological alterations, if the Rater in uncertain which category is appropriate or if the current state falls within two categories, he/she should "double check" adjoining options and average the two scores. The Rater should check all possible observable soil/substrate alterations observed within the wetland and determine if they've contributed more than trivially to the alteration of the wetland. Impacts occurring upstream or other places that alter the wetland's substrate or soil, such as sedimentation or erosion within the wetland, should be considered. Use the focusing questions below to help choose the most appropriate score.

Circle one answer.	**YES**	**NO**	**NOT SURE**
Have any of the disturbances identified above caused or appear to have caused more than trivial alterations to the wetland's substrate or soil, or have they occurred so far in the past that current soil/substrate should be considered "natural"?	Assign a score 1, 2, or 3 or an intermediate score, … depending on the degree of alteration to the wetland	Assign a score of 4 because there are no or no apparent alterations	Double check "none or none apparent" and "altered but resilient to alterations" and assign a score of 3.5

4 3.5 3 2.5 2 1.5 1

O ---------- O ---------- O ---------- O ---------- O ---------- O ---------- O

None or none apparent

Substrate altered but was resilient to alterations

Substrate altered but was only somewhat resilient to alterations

Substrate was altered and not resilient to alterations

General guidance for low-intensity vs. high-intensity disturbances:
Generally, low-intensity disturbances either affect a small area of the wetland or a larger area but the wetland was resilient to the impact so that the alteration is not very apparent (i.e., alteration no longer functions or the impact occurred far enough in the past). Conversely, high disturbances usually affect a large amount of the wetland either directly or indirectly, such as a ditch that functions to drain a large portion of the wetland.

4b: Habitat Alteration
This sub-metric is directly analogous to sub-metric 3e. except here it pertains to alterations of natural habitat. As with 3e, the Rater should consider the intactness or lack of alteration to the habitat representative for the type of wetland being evaluated. All possible alterations to the wetland habitat should be checked and the Rater must determine if these alterations created more than trivial disturbances to the habitat. All available information can be used to evaluate this sub-metric including: field visits, aerial photos, maps, etc. Use the focusing questions below to help choose the most appropriate score. If alterations have occurred so far in the past that current conditions appear to be "natural", then none or no apparent alterations should be checked (9 points). If the Rater believes that the habitat falls between two categories or if the Rater is uncertain which category is appropriate, the Rater can "double check" two adjoining categories and average the score. It is important to note that for instances where one or several alterations exist but the Rater has determined that the alterations did not alter the habitat, or if the Rater does not observe any alterations, then maximum points should be given. Where alterations have been determined to cause more than trivial changes, a score of 1, 3, 7, or intermediate scores 2 or 5 should be given. In cases where the Rater was uncertain if alterations caused more than trivial alterations or if they did not occur long enough in the past for current conditions to be considered "natural", an intermediate score of 8 (average of 9 and 7) should be given.

Circle one answer.	**YES**	**NO**	**NOT SURE**
Have any of the disturbances identified above caused or appear to have caused more than trivial alterations to the wetland habitat, or have they occurred so far in the past that current habitat should be considered "natural"?	Assign a score 1, 3, or 7 or an intermediate score, … depending on the degree of function that the wetland retained	Assign a score of 9 because there are no or no apparent alterations	Double check "none or none apparent" and "altered but functions intact or near optimal level" and assign a score of 8

9 8 7 5 3 2 1

O ---------- O ---------- O ---------- O ---------- O ---------- O ---------- O

None or none apparent	Habitat altered but functions at optimal level	Habitat altered and functions at lower level	Alterations severely limiting the habitat

General guidance for low-intensity vs. high-intensity disturbances:
Generally, low-intensity disturbances either affect a small area of the wetland or a larger area but the wetland was resilient to the impact so that the alteration is not very apparent (i.e., alteration no longer functions or the impact occurred far enough in the past). Conversely, high disturbances usually affect a large amount of the wetland either directly or indirectly, such as a ditch that functions to drain a large portion of the wetland.

4c: Habitat Reference Comparison
This sub-metric asks the Rater to determine an overall qualitative rating of the wetland quality in its current condition in comparison to best of its type remaining in the state (i.e., NOT the best possible). For the purposes of this sub-metric, the wetland's type is defined as any ecologically and/or hydrogeomorphically similar wetland habitat. Do **not** consider the best example for an area (i.e., do not compare the wetland to the best urban wetland if you're in an urban setting; compare, for example, an emergent riverine wetland to other emergent riverine wetlands). Even more than other metrics, this one assumes the Rater has a good idea of the types of wetlands and their range of quality or disturbances throughout the state. Select the option that best represents the wetland habitat structure and for uncertainties in assigning a score, select adjoining options and average the points. For instances where there is a clear distinction between the wetland areas, in terms of habitat structure development, the Rater may double-check non-adjoining options, but justification is required. For example, if there is a road separating areas of the same Wetland Assessment Area and these separate areas would be considered "Excellent" and "Poor", then double-check 7 and 1 for a score of 4 points.

Guidance for scoring this metric:

Well-developed communities, regardless of successional state, often exhibit many of the following habitat characteristics (MiRAM 2010):

- Quality vertical habitat such as hummocks, organic debris, and diverse plant height ranges.
- Quality horizontal habitat, such as varying vegetation density and patchiness, moderate ratios of open space to cover, plant species diversity, and a wide range of plant ages. The number of plant species present in a wetland is typically directly proportional to the number of potential niches available for invertebrates, birds, and mammals (Hruby, et al. 1999, Knops et al. 1999). Therefore, the total number of animal species in a wetland is expected to increase as the number of plant species increases
- Other ecological attributes, such as a diverse assortment of breeding areas, rearing areas, feeding areas, niche space, etc.

Metric 5: Special Wetlands

This metric adds or detracts up 10 points for wetlands with special circumstances. Although multiple categories may pertain to a wetland, the maximum score that can be given is 10 points.

Check all that apply and score as indicated in parenthesis next to each category. Provide documentation for each selection (e.g. photos, checklists, resource specialist occurrence, data sources, references, etc.). For this metric, refer to the Narrative Rating for additional guidance, especially for where to attain necessary information.

5a: Regulatory Protection / Critical Habitat

☐ Known occurrence of federally threatened/endangered species or designated Critical Habitat within a HUC-12 watershed (10 points).

- **Exclude bat occurrences and their critical habitat in the assessment**
- If a wetland assessment area falls at or very close to the boundary of two or more HUC-12 basins, include these records as well.

☐ Other rare species with state rank: S1 (10), S2 (5), S3 (3) in a HUC-12 watershed.

- If there are mixed ranks or qualifiers, use the higher rank (i.e., S1/S2 is 10 points and S2/S3 is 5 points). Also, when there is a breeding and non-breeding rank, use the highest rank listed (e.g. Pied-billed grebe, *Podilymbus podiceps*, is S1 for breeding and S4 for non-breeding populations so use the S1 rank for assigning points).
- Exclude records which are only "historic" (i.e., surveys have documented the species is no longer there). Also, exclude all records that have SH, SX, and S? ranks.
- Only the species record with the highest rank counts toward the overall Metric 5a score (do not sum). For example, if two species are found to be associated with wetland for a site and one has a rank of S3 and the other has a rank of S2, the total points awarded for 5a is 5, not 8.
- The Rater should score points for this unless there is documentation stating they are not present (i.e., consultation with KSPNC records).
- If a wetland assessment area falls at or very close to the boundary of two or more HUC-12 basins, include these records as well.
- The most recent KSNPC document "Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky with Habitat Description" should be used to determine which species are associated with wetlands. If the habitat description does not specifically mention wetland habitat, it should be excluded.
  - Wetland habitat includes, but is not limited to: bogs, seeps, fens, swamps, marshes, sloughs, wet meadows, ponds, wet depressions (e.g., sinkhole forests and isolated wetlands), wet bottomland hardwood forests, and wet prairies. Do **not** include prime habitat that is listed as unknown, fields, mesic forests, floodplains, waterfowl concentrations, Oxbow lakes, cliffs, or backwaters.
  - **Exceptions**: Include truly aquatic species such as fishes, mussels, gastropods, insects, etc. if, using best professional judgment, you think there is a direct hydrological connection with the wetland, regardless of the type of water body the species is associated with.

- Plants:
  - Only consider plants with a wetland indicator status of obligate (OBL), facultative wet (FACW), or facultative (FAC) according to the most recent version of the USACE's National Wetland Plant List (NWPL).
  - Many plant species have synonyms that are not listed in the US Army Corps of Engineers so it is important to make sure that you check for their synonyms as well. In this case, it is helpful to use the Southeast Wetlands Working Group (SEWWG) document "Southeast Wetland Plant Coefficient of Conservatism Database" because it usually lists nearly all of the synonyms. When the species listed in the KSNPC HUC-

12 basin list is a synonym, as determined by consulting the SEWWG document, assign this species the wetland indicator status for the "MAIN" species.

- When a species has a sub-species name included in the KSNPC HUC-12 basin list and the NWPL or SEWWG list does not have the sub-species listed, use the wetland indicator status of the higher taxa (e.g., *Carex atlantica ssp. Capillacea* use the status for *Carex atlantica*).

5b: High Ecological Value/Ranked Communities (see Appendix C for descriptions of these; also, consult KSNPC key for more guidance)

Select all that are observed at the site; however, the maximum score for the metric is 10 points.

- ☐ Appalachian seep/bog (S1S2) **[8]**
- ☐ Bottomland marsh (S1S2) **[8]**
- ☐ Bottomland ridge/terrace forest (S1) **[10]**
- ☐ Bottomland slough OR Coastal Plain Slough (S2) **[5]**
- ☐ Calcareous seep/bog (S1) **[10]**
- ☐ Coastal Plain forested acid seep (S1) **[10]**
- ☐ Cypress (tupelo) swamp (S1) **[10]**
- ☐ Sinkhole/depression marsh (S1S2) **[8]**
- ☐ Sinkhole/depression pond (S2) **[5]**
- ☐ Wet depression/sinkhole forest **[8]**
- ☐ Wet bottomland hardwood forest (S2) **[5]**
  *The KSNPC database also lists bottomland hardwood forest as a special community; however, only consider **wet** bottomland hardwood forests for this sub-metric.
- ☐ Wet meadow (S1) **[10]**
- ☐ Wet prairie (S1) **[10]**

5c: Low-Quality Wetland

Special types of low-quality wetlands are considered here. If any of the below criteria apply, the wetland receives -10 points for this sub-metric. Check all appropriate boxes, but do not score more than -10 points. To qualify, the wetland must be less than 1 acre AND at least one of the following:

- ☐ Have greater than 75% cover of invasive plants
- ☐ Non-vegetated wetlands on mined or excavated sites
- ☐ Constructed stormwater treatment ponds.

Metric 6: Vegetation, Interspersion, and Habitat Features

Notes to the Rater:

1. Several of the sub-metrics assessed in this metric require the Rater to estimate the percentage or amount of the wetland certain features occupy, which can be very difficult in large wetlands. For this reason, and (more importantly) to evaluate this sub-metric properly, the Rater must make note of these features throughout the entire field evaluation.

2. For all sub-metrics included in metric 6, do not consider wetland type for determining the score. For example, do not consider what level of species diversity would be high or low, etc. for a particular wetland type (e.g., In a Cypress Swamp, do not consider the presence of 2-3 native tree species as high diversity.

6a: Wetland Vegetation Components

This sub-metric evaluates qualitative coverage of forest, shrub/saplings, and herbaceous vegetation components. Using the Qualitative Cover Scoring Table (Figure xx), start at the left side and proceed to the right, until a point value is obtained for each Vegetation Component. The flow of this table is as such: vegetation component is: greater or less than 0.1 acre → is greater or less than 25% of the wetland area → native or non-native species dominate the coverage → level of native vegetation diversity. Vegetation Components may exist in overlapping layers, e.g., significant areas of shrub/sapling and/or herbaceous may exist under a forest canopy. Only groups of trees, clusters of shrubs, or dense patches of herbaceous stems may count toward area coverage. We consider dense patches to be a monostand of a species. The Rater can clump patches together to count percentage. Do not include lone trees, lone shrub/saplings, or sparse patches of herbaceous stems. Check the appropriate habitat component as F, S or H on the far right side of the table to indicate how scores were derived.

Forest Overstory Component: forested wetland areas are characterized by a group of trees at least 3 inches in DBH, regardless of height. The wetland does not have a forested component if the trees are widely scattered (e.g., a savanna), located only thinly along the wetland's margin, or if it is clear that most of the trees are actually located on upland around the perimeter of the wetland. Any trees whose canopy provides coverage over wetland areas should be included. This component also includes woody vines.

Shrub/sapling Component: shrub/sapling wetland areas are dominated by clusters of woody plants less than 3 inches in DBH and greater than 3.28 feet in height. Species include true shrubs, young trees, and stunted trees. Shrub wetlands may represent a successional stage leading to a forested wetland or they may be relatively stable plant communities.

Herbaceous Component: herbaceous wetland areas are dominated by dense patches of erect, non-woody plants, regardless of size, and woody plants less than 3.28 feet in height. The KY-WRAM includes the robust-stemmed yellow pond lily (*Nuphar advena*) and American lotus (*Nelumbo lutea*) within the herbaceous component because of their tendency to hold their stems and leaves well above the water. All floating-leaf species (including *Nymphaea* spp.) are excluded from the herbaceous component, and are instead included within the open water component (see Sub-metric 6b).

Problem Situations:

For the herbaceous component, sum all the areas of sparse, tussocky vegetation, including the bare ground between; therefore, don't include just the area of individual tussocks

For the forest and shrub components: when trees and/or shrubs are growing in a narrow row around the perimeter, do not include single rows, but do count wider bands as separate communities. Also, do not scattered individuals of shrubs or trees.

6b: Open Water, Mudflat, and Other Habitats

This sub-metric is designed to give points for wetlands that contain habitat for waterfowl (including wood ducks), shorebirds, bats, fish, and other wildlife such as amphibians. Open water is an unobstructed, inundated area of water with few or no rooted emergent or woody plant species, except rooted trees (discussed below). Open water includes depths up to 6.6 ft; anything greater is considered deepwater habitat and is not evaluated by the KY-WRAM, thus not included in the calculation for this sub-metric. If desired, the Rater may use depths charts, if available, to aid in determining the extent of open water. For KY-WRAM, mudflats are considered areas with exposed mud substrate with little to no vegetation. See the summary below for what habitats can be included in this sub-metric. The KY-WRAM includes the robust-stemmed yellow pond lily (*Nuphar advena*) and American lotus (*Nelumbo lutea*) within the herbaceous component because of their tendency to hold their stems and leaves well above the water. All floating-leaf species (including *Nymphaea* spp.) are included in the open water component. Open water also includes the "understory" below a forest canopy (e.g., vernal pools; see special situations below). Open water can also occur as a distinct zone along a river or lake (see Wetland Assessment Area Scoring Boundaries for guidelines). If the Rater is unable to access the other side of habitats included here, they should use their Best Professional Judgment to determine the extent/amount present.

This Habitat Component includes combined acreage from any of the following areas:

- **Small ponds (including farm ponds), streams and/or their floodwaters, pools, saturated sandbars, or other natural or constructed waters**
- **Seasonal standing water areas** (e.g., mudflats and dried-down vernal pools) that were inundated long enough during the growing season to support aquatic life. This includes the "understory" below a forest canopy.
- **Aquatic bed areas** (submerged aquatic vegetation). Aquatic bed is dominated by plants growing at or below the water surface for most of the growing season in most years. The KY-WRAM includes aquatic bed within the definition of open water, due to the potential difficulty in differentiating the two entities. For the purposes of the KY-WRAM, all floating-leaf aquatic taxa (e.g. water lilies, *Nymphaea* spp.), are included in the definition of aquatic bed (therefore, are included in the definition of open water).
- **100-foot wide strip of open water along a lake or river** (see Wetland Assessment Area guidelines in the *Guidance Manual*). When the Wetland is adjacent to a lake or large river, calculate the acreage of the 100-foot wide open water strip that is included within the Wetland (see KY-WRAM Wetland Assessment Area Boundary Guidelines). Divide the linear feet of shoreline length by 400. For example, if the vegetated portion of the wetland interfaces with 200 linear feet of a lake, then the extent of the lake's open water included within the Wetland would be calculated as: 200/400 = 0.5 acre. Open water ends where water depth is > 6.6 ft; the Rater may use depth charts to establish this, when available.
- **Shallow pools free of dense shrub canopy** (e.g., open area within an inundated shrub swamp).
- **Shallow pools free of densely-packed herbaceous vegetation** (e.g., open area within a marsh or bog).
- The Indicators below are intended to provide guidance in special situations, specifically for determining if open water was present **when the wetland is currently dry.**
    - If the wetland is currently dry, use the appropriate USACE Wetland Delineation Regional Supplement to determine if indicators of open water are present (indicators are listed below).
    - One primary indicator OR two secondary indicators must be present to consider presence of open water. In the section indicated below, describe how you used indicators to determine your score.

Special Situations: Use evidence/indicators of hydrology to determine if open water existed when a wetland is **currently dry**. Guidance for using these indicators can be found in the USACE 1987 Wetland Delineation Manual Regional Supplement (Eastern Mountains and Piedmont Region). One primary indicator or two secondary indicators must be present to consider presence of open water.

Primary Indicators (must have 1)

- ☐ Surface Water present on aerial imagery (A1)
- ☐ Water marks (B1)
- ☐ Inundation Visible of Aerial Imagery (B7)
- ☐ Algal mat or crust (B4)
- ☐ Presence of aquatic fauna (B13)
- ☐ Presence of OBL/FAC aquatic plants (B14)

Secondary Indicators (must have 2)

- ☐ Sparsely vegetated concave surface (B8)
- ☐ Drainage patterns (B10)
- ☐ Moss trim lines (B16)
- ☐ Geomorphic position (D2)

6c: Coverage of Highly Invasive Plant Species

Use the severe and significant threat species lists of invasive species from the Kentucky Exotic Plant Pest Council (KY-EPPC). Refer to their website for the most recent version and print list for use in the field: http://www.se-eppc.org/ky/. Any species that is invasive, whether or not it is native to Kentucky, should be considered when assessing this sub-metric. For the purposes of KY-WRAM validation, write-in any invasive species present in the wetland that we don't have listed already. All of the species in the list below are species that typically inhabit wetlands and are on the KY-EPPC Severe or Significant Threat list. Exceptions are *Alternanthera philoxeroides*, *Phalaris arundinacea*, and *Typha ssp.*, which are not included on the KY-EPPC list but can often be invasive. The Rater may include non-wetland invasive species if they occur within the wetland assessment area.

List of additional invasive wetland plants:

- *Alliaria petiolata* (Garlic Mustard)
- *Alternanthera philoxeroides* (Alligator Weed)
- *Conium maculatum* (Poison Hemlock)
- *Euonymus fortunei* (Winter Creeper)
- *Lespedeza cuneata, L. bicolor, L. stipulacea, L. striata, L. thunbergii* (non-native *Lespedeza*)
- *Ligustrum sinense, L. vulgare* (Privet)
- *Lonicera japonica* (Japanese Honeysuckle)
- *Lonicera maackii* (Bush Honeysuckle)
- *Lythrum salicaria* (Purple Loosestrife)
- *Microstegium vimineum* (Japanese Stilt Grass)
- *Myriophyllum aquaticum, M. spicatum* (parrotfeather and Eurasion watermilfoil)
- *Phalaris arundianacea* (Reed Canary Grass)
- *Phragmites australis* (Common Reed)
- *Polygonum cuspidatum* (Japanese knotweed)
- *Rhamnus cathartica* (Common Buckthorn)
- *Rosa multiflora* (Multiflora Rose)
- *Typha ssp.* (Cattail species)

6d: Horizontal (plan view) Interspersion

The purpose of this metric is to describe habitat heterogeneity within the wetland. Evaluate the wetland from a "plan view," i.e., imagine as if you are hovering above the wetland looking down upon it to allow seeing the other layers. The Rater should focus on distinct patches of dominant plant community types and open water and variation in structure of plant communities but should not consider minor micro-site scale variation within a vegetation class. The graphic shows hypothetical wetlands for estimating the amount of habitat interspersion including growing season vegetation communities and open water. Open water is 6.6 feet deep or less (i.e. does not include deepwater habitat) and does not include inundated areas below herbaceous and shrub vegetation, but can include water under a forest canopy. If unclear, select adjoining options and average the points.

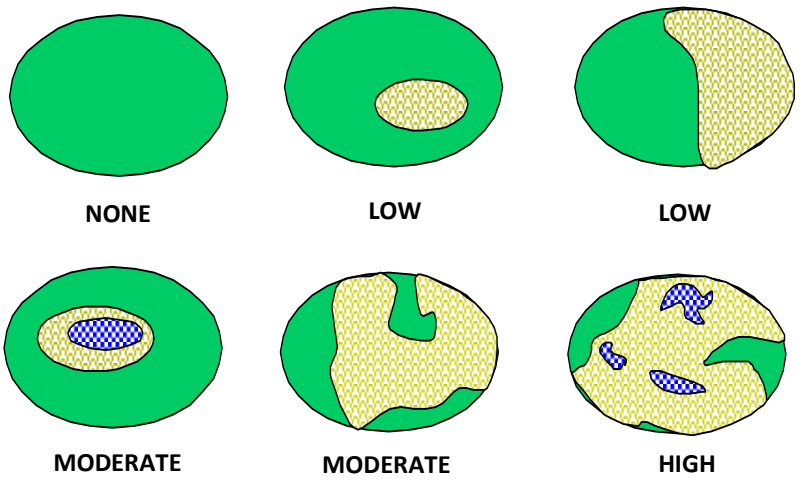


Figure 12. Schematic depicting hypothetical wetlands with varying degrees of horizontal (plan view) interspersion. Different shading indicates different vegetation types and/or presence of open water.

Example: a wetland with a forested component that extends over all, or almost all of the assessment area, with or without a shrub and/or herbaceous component(s) would be considered to have none or low interspersion.

6e: Microtopographic Features

In this sub-metric, the Rater estimates the percentage or amount of the wetland certain features occupy, which can be very difficult in large wetlands. For this reason, and (more importantly) to evaluate this sub-metric properly, the Rater must make note of these features throughout the entire field evaluation.

Hummocks/Tussocks/Tree Mounds

Estimate the percent coverage of hummocks (e.g. sphagnum), tussocks, or tree mounds (e.g., sedge/grass tussocks, decayed nursery logs (remnants of large logs), root tip-up mounds (created by large, uprooted trees). Percent coverage is based on total area of the wetland and includes depressional matrix within any group of raised features.

Large Woody Debris

Large, downed woody debris is utilized as important cover and forage habitat by invertebrates, amphibians, reptiles, birds, and mammals (Hruby et al. 1999). Estimate the number of logs (e.g., fallen trees and/or large branches, etc.) per acre **within** the entire wetland. Only count logs in this estimate if they, per log, average width ≥6 inches.

Large Snags

Large trees (≥12 inches DBH), with their protective canopies, trunk crags, loose bark, and hollow areas, can provide shelter for invertebrates, tree frogs, small mammals, and birds. These areas provide roosting areas for raptors and other large birds, and provide nesting areas for a variety of wildlife (Goodburn and Lorimer 1998). Estimate the number of dead tree snags per acre **within** the entire wetland; snags outside of the wetland area should not be counted, even if they are in close proximity.

Amphibian Breeding/Nursery Habitat

The intention of this sub-metric is to assign points to any wetland that supports any amphibian breeding and development. Estimate the percentage of amphibian breeding or nursery habitat within the entire wetland.

Temporary pools, also known as vernal or ephemeral pools, serve as high-quality amphibian habitat, since they do not contain predatory fish and, therefore, provide the best breeding habitat for a variety of amphibian species (Zedler 2003). These high-quality habitats often occur in wetlands in forested settings and the hydrology is ephemeral, meaning that areas of standing water dry down at some point during the year. This contributes to the absence of fish in these habitats. Although it is important for woodland amphibians for the wetland to dry, it is also important that the wetland holds water long enough to support larval development. The duration is sufficient if standing water is present for at least three contiguous months in the growing season. Because these habitats dry at some time each year, the Rater is not required to observe the presence of standing water or amphibian larvae to award points for this. The Rater may use the indicators of open water from 6b to aid in determining if this habitat was present if the Rater observes the wetland after it has dried. If it is not possible to determine if standing water was present, it is expected that the Rater will not award points for amphibian habitat, although it may have actually been present. It is important to note that wetlands with small amounts of this habitat (>10% of the area or more) can be considered for the highest amounts of points as long they are of highest quality. For this component of the sub-metric, the entire area of a fishless temporary pool should be counted as amphibian breeding and nursery habitat

Permanent areas of standing water along the fringes of ponds, lakes, and some streams also serve as amphibian habitat. For these wetlands that are permanently inundated, the highest quality habitat includes areas that are too shallow or densely vegetated that it precludes large fish from accessing amphibian eggs or larvae. Large fish

are considered any individuals that have the capability to eat live amphibian eggs or larvae (e.g. having a life history of eating amphibians and has a mouth large enough to consume eggs or larvae in whole or in part). Low to moderate quality habitats are those that still support amphibian breeding/development but do not have the characteristics described above as highest quality habitat.

4.0 LITERATURE CITED / REFERENCED

Biebighauser, Thomas R. *Wetland Drainage, Restoration, and Repair*, Lexington, KY, University Press of Kentucky, 2007.

Biebighauser, Thomas R. *Wetland Restoration and Construction - A Technical Guide*. Upper Susquehanna Coalition, 186 pages, 2011.

Cowardin, L.M., Carter V., Golet F.C., LaRoe E.T. et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, D.C.

Environmental Laboratory. 1987. "Corps of Engineers wetlands delineation manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912.

Federal Emergency Management Agency. Online Tutorial: "*How to Read a Flood Insurance Rate Map"* can be accessed at http://www.fema.gov/plan/prevent/fhm/ot_firmr.shtm.

Goodburn, J.M., Lorimer C.G. 1998. Cavity trees and coarse woody debris in old-growth and managed northern hardwood forests in Wisconsin and Michigan. Canadian Journal of Forest Research 28:427-438.

Hruby, T., T. Granger, K. Brunner, S. Cooke, K. Dublonica, R. Gersib, T. Granger, L. Reinelt, K. Richter, D. Sheldon, E. Teachout, A. Wald, and F. Weinmann. 1999. Methods for Assessing Wetland Functions. Volume 1: Riverine and Depressional Wetlands in the Lowlands of Western Washington. Part 1: Assessment Methods. WA State Department of Ecology Publication #99-115.

Kentucky Exotic Plant Pest Council. http://www.se-eppc.org/ky/list.htm Accessed 23 March 2012.

Kentucky State Nature Preserves Commission (KSNPC). 2011. Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky with Habitat Description. Frankfort, Kentucky, USA

Kentucky State Nature Preserves Commission (KSNPC). 2009. Natural Communities of Kentucky. Working Draft. Frankfort, Kentucky, USA.

Knops, J.M.H., D. Tilman, N.M. Haddad, S. Naeem, C.E. Mitchell, J. Haarstad, M.E. Ritchie, K.M. Howe, P.B. Reich, E. Siemann, and J. Groth. 1999. Effects of plant species richness on invasion dynamics, disease outbreaks, insect abundances and diversity. Ecology Letters 2:286-293.

Mack, John J. 2001. Ohio Rapid Assessment Method for Wetlands, Manual for Using Version 5.0. Ohio EPA Technical Bulletin Wetland/2001-1-1. Ohio Environmental Protection Agency, Division of Surface Water, 401 Wetland Ecology Unit, Columbus, Ohio.

Michigan Department of Natural Resources and Environment, 2010. Michigan Rapid Assessment Method for Wetlands (MiRAM), Version 2.1. DNRE, Lansing, Michigan.

National Resources Conservation Service (NRCS). 2008, "Technical Note: Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the National Resources Conservation Service".

National Resource Conservation Service (NRCS). Web Soil Survey Website. Accessed March 26, 2012. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.

North Carolina Wetland Functional Team, 2010. North Carolina Wetland Assessment Method (NCWAM), Version 4.1. Accessed online: http://portal.ncdenr.org/web/wq/swp/ws/pdu/ncwam .

Scott, Barbara. 2011. Kentucky Wetland Rapid Assessment Method Technical Work Group meeting notes, April-December, 2011.

Tennessee Valley Authority Wetland Assessment Method (TVARAM) Development Team, 2004. TVA RAM Field Form Quantitative Rating (last revised 2005-04-29).

U.S. Army Corps of Engineers. 2010. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region, ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-10-9. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Zedler, PH. 2003. Vernal Pools and the concept of "Isolated Wetlands." Wetlands 23:597-607.

5.0 APPENDICES

APPENDIX A: ACRONYMS LIST

EKU: Eastern Kentucky University
FIRM: Flood-Insurance Rate Mate
FEMA: Federal Emergency Management Agency
GIS: Geographic Information System
HGM: Hydrogeomorphic wetland classification system
HUC: Hydrologic Unit Code
KDFWR: Kentucky Department of Fish and Wildlife Resources
KDNR: Kentucky Department of Natural Resources
KDOW: Kentucky Division of Water
KSNPC: Kentucky State Nature Preserves Commission
KY-EPPC: Kentucky Exotic Plant Pest Council
KY-WRAM: Kentucky Wetland Rapid Assessment Method
MiRAM: Michigan Rapid Assessment Method
NCWAM: North Carolina Wetland Assessment Method
NRCS: National Resources Conservation Service
NWI: National Wetlands Inventory
NWPL: National Wetland Plant List
ORAM: Ohio Rapid Assessment Method
T/E: Threatened or Endangered Species
TWG: KY-WRAM Technical Work Group
USACE: United States Army Corps of Engineers
USEPA: United States Environmental Protection Agency
USFS: United States Forest Service
USFWS: United States Fish and Wildlife Service
USGS: United States Geological Survey

APPENDIX B: KSNPC DESCRIPTIONS OF WETLAND COMMUNITIES WITH S1 / S1S2 STATE RANK

Appalachian seep/bog Conservation status: S1S2 – several types
(syn= Appalachian acid seep (Evans 1991))

a. **Cumberland Plateau acid bog/seep (forested and open phases):** Occurs in poorly drained ravines and streamheads on usually flat topography. Soil shallow to deep, saturated and sometimes boggy due to ground water seepage. For forested phase: Tree canopy tall and somewhat open (60-90 %) with well developed sub-canopy and shrub layers. Common canopy trees include *Acer rubrum, Liquidambar* and *Nyssa sylvatica.* Other canopy trees include *Liriodendron tulipifera* and *Quercus alba. Nyssa sylvatica* and *Acer rubrum* are often common in the understory, as well as *Ilex opaca, Ilex verticillata, Lindera benzoin* and *Alnus serrulata*. Herbaceous vegetation is well developed but not always dense. Common or characteristic forbs and small shrubs include *Chelone glabra, Rubus hispidus, Photinia pyrifolia, Platanthera integrilabia, Calopogon tuberosus, Viola primulifolia, Viola cucullata* and many others. Common or characteristic ferns include *Osmunda regalis, Osmunda cinnamomea, Woodwardia areolata* with lesser amounts of *Thelypteris noveboracensis*. Common or characteristic graminoids include *Carex intumescens, Carex crinita, Carex debilis* and *Glyceria septentrionalis*. *Sphagnum* is usually present (and indicative) but ranges from sparse to dense. (Yahn, Unpublished sampling data 2008)
Example: *Platanthera integrilabia* sites.

b. **Cumberland Mountains streamhead acid bog/seep:** Occurs in poorly drained streamheads near the summit of Pine Mountain with usually flat topography. Soil usually deep, saturated and often boggy due to ground water seepage and poor drainage. Tree canopy open (0-30%) with trees usually absent or lightly scattered (often only surround and overhang). Tree species usually more associated with surrounding forest. Herbaceous vegetation dominates with *Solidago patula, Leersia virginica, Scirpus atrovirens?, Impatiens capensis* and *Sagitaria latifolia?* Usually common. *Osmunda spp*. may also be abundant. *Sphagnum* sometimes occurs. (Yahn, Unpublished sampling data 2008).
Example: Blanton Forest bogs, other bogs on Pine Mountain

c. **Cumberland Mountains alluvial open acid bog:** Only known to occur in poorly drained bottoms (old stream meanders, beaver ponds) along Martin's Fork. Examples are few and clustered in one location. One bog is open (no canopy trees) and dominated by *Osmunda regalis, Osmunda cinnamomea* and *Trautvetteria caroliniensis.* Another bog is shrub dominated with high abundance of sphagnum. Common species here include *Tsuga canadensis, Pinus rigida, Rhododendron maximum, Kalmia latifolia, Photinia pyrifolia, Eriophorum virginicum, Osmunda cinnamomea*, *Doellingeria umbellata* and *Eupatorium album.* (Yahn & Evans Unpublished sampling data 2008)
Example: bogs along Martin's Fork, Cumberland Gap NHP

Bottomland marsh Conservation status: S1S2
Occurs in depressions and other low, poorly drained sites in bottomlands. Soils deep and very poorly drained. Surface water present or soil saturated for significant periods of time, often becoming dry in late summer. Dominated by herbaceous, usually graminoid vegetation. Often occurs as a narrow zone around ponds. Composition variable due to water depth and duration of flooding. Scattered shrubs sometimes present. Common or characteristic plants include *Typha latifolia, Scirpus spp., Juncus spp., Carex spp., Polygonum spp., Leersia spp., Iris virginica, Eupatorium fistulosum* and others; (changed from S2 to S1S2 in 2010 by BDY).

Bottomland slough Conservation status: S2
Occurs in floodplains of rivers and large streams. Occupies oxbows, old meanders, and other depressions which hold water. Permanently flooded or seasonally flooded. Vegetation highly variable due to size, water depth and duration of flooding. Characterized by open water or rooted or floating aquatic plants. Shallow sloughs often filled with emergent aquatic plants.
(syn= Floodplain slough (Evans 1991))

Calcareous seep/bog Conservation status: S1
This community is not really documented or known from Kentucky. However in Clinton County, a small hillside seep occurs in which a population of *Parnassia grandifolia* occurs. This species is usually considered an indicator of calcareous seeps or fens. Also, seepages on limestone cliffs occur which harbor several rare or interesting species *(Arenaria fontinalis, Adiantum capillusveneris)* which could be considered calcareous seeps. Maybe these are just wet limestone cliffs.
(syn= Calcareous seep (Evans 1991))

Coastal Plain forested acid seep Conservation status: S1
Occurs at the base of steep to moderate slopes where water percolates out through Cretaceous aged sands and gravels. Soils deep, often boggy and mucky. Common or characteristic trees include *Acer rubrum, Liquidambar styraciflua, Nyssa aquatica, Nyssa sylvatica, Fraxinus profunda?* and *Quercus michauxii*. Small trees and shrubs characteristic of the seeps include *Rhododendron canescens, Carpinus caroliniana, Photinia pyrifolia, Itea virginica, Viburnum nudum* and *Vaccinium corymbosum?.* The ground cover consists of a diverse assemblage of herbaceous species such as *Woodwardia areolata*, *Osmunda regalis, Osmunda cinnamomea*, *Thelypteris palustris?, Carex atlantica ssp. capillacea, Saururus cernuus* and many others. (also *Bartonia virginica, Juncus spp., Rhynchospora capitellata, R. globularis*) (Funk and Fuller 1978, Funk 1975 and 1980, Woods 1983, McKinney et al. 1990, Yahn & Littlefield Unpublished
sampling data 2008).
(syn= Cretaceous Hills forested acid seep (Evans 1991))
Example: Seeps in Calloway County.

Coastal Plain slough Conservation status: S2
Similar to Bottomland slough but restricted to the Mississippi Alluvial Plain and Lower Ohio River and their larger tributaries. Occurs in floodplains of rivers and large streams. Occupies oxbows, old meanders, and other depressions which hold water. Permanently flooded or seasonally flooded. Vegetation highly variable due to size, water depth and duration of flooding. Characterized by open water or rooted or floating aquatic plants. Often contain a diversity of Coastal Plain species with southern affinities. May contain scattered *Taxodium distichum* or *Nyssa aquatica*.

Cumberland Plateau gravel/cobble bar Conservation status: S1S2
Occurs in moderate to high gradient streams and rivers. Substrate consists of variable sized gravels and boulders, sometimes mixed with sand. Soils absent or restricted to pockets and composed of gravelly silt. Subject to annual flood events and scouring. Substrate moisture ranges from hydric to xeric. Tree canopy absent or restricted to scattered individuals. Restricted to the Cumberland Plateau. Shrubs, herbs and grasses dominate, with some areas appearing prairie-like in aspect. *Andropogon gerardii* often dominant in open areas. Other areas are densely shrubby. Vegetation often occurring in distinct zones, but other areas mixed. Common and characteristic species include *Trautvettaria carolinensis, Xanthoriza simplicissima, Rhododendron arborescens, Chionanthus virginicus, Kalmia latifolia, Tripsacum dactyloides, Panicum virgatum, Sorghastrum nutans, Hypericum denticulatum, Liatris microcephala, Physostegia virginiana, Physostegia intermedia (?),*

Tephrosia spicata, Baptisia australis, Comptonia peregrina, Aster saxicastillii, Ceanothus herbaceus, Vitis rupestris, Carex stricta, Orontium aquaticum and many others.

Cypress (tupelo) swamp Conservation status: S1

Occurs in ponded or inundated depressions, oxbow ponds, backwater sloughs and other very wet sites of stream and river floodplains. Restricted to the East Gulf Coastal Plain and the lower Ohio River and its tributaries in the Shawnee Hills region. Soils very poorly drained. Surface water present for extended periods of time, permanently or semi-permanently flooded. Sometimes becoming dry in late summer or during droughts. Soils deep, very poorly drained. Parent material alluvium. Tree canopy tall, variably open depending upon water depth. Understory absent or poorly developed, consisting of scattered hydrophytic shrubs. Herbaceous vegetation sparse consisting of scattered emergents, free-floating aquatic, or epiphytic plants. Common or characteristic trees include *Taxodium distichum* (often occurring in pure stands), *Nyssa aquatica, Gleditsia aquatica* and *Fraxinus tomentosa*. Common shrubs include *Cephalanthus occidentalis, Rosa palustris* and *Itea virginica*. Characteristic herbaceous species include *Cabomba caroliniana, Lemna spp., Hypericum walteri* and others; (note in 2010 on S1 rank: cypress (and/or tupelo) occurring in remnant stands and ponded areas of (western) Kentucky probably occur in more than 25 but less than 100 locations, with the majority of these sites of low quality and poor long term viability).

Sinkhole/depression marsh Conservation status: S1S2

Occurs in sinkholes and depressions in the uplands. Soils deep, very poorly drained. Surface water present or soil saturated for extended periods of time; often becoming dry in late summer and during droughts. Dominated by herbaceous, usually graminoid vegetation. Composition variable due to water depth and duration of flooding. Scattered shrubs sometimes present. Common or characteristic plants include *Typha latifolia, Glyceria spp., Scirpus spp., Eleocharis spp., Dulichium arundinaceum, Rhynchospora spp., Juncus spp., Carex spp*. and others.
Example: Mosley pond (in part).

Sinkhole/depression pond Conservation status: S2

Occurs in plugged sinkholes and other depressions which hold water for all or part of the year. Water levels can fluctuate greatly or remain relatively stable, especially if spring fed. Vegetation highly variable, from floating and submerged aquatics in deeper open water to emergent herbaceous and hydric shrubs around the edges. Common and characteristic species include *Nuphar luteum, Utricularia gibba, Juncus spp., Carex spp., Eleocharis spp., Dulichium*, etc.
Example: Jackson pond, Mosley pond, 100 acre pond.

Wet bottomland hardwood forest Conservation status: S2

Occurs on level floodplain of rivers and large streams. Soils deep, poorly drained, wet for significant periods of time throughout the year; usually becoming drained by late summer. Subject to frequent flooding or prolonged ponding. Ponding due to beaver activity may result in significant variation in vegetation structure (tree mortality). Parent material alluvium. Tree canopy tall with a variable cover depending upon hydrological fluctuations. Understory poorly developed, usually consisting of scattered hydrophytic shrubs. Ground cover sparse most of the year with late season herbs dominating. Species composition varies with some species restricted to certain natural divisions or regions of the state (i.e. Mississippi alluvial bottoms). Common and characteristic trees include *Acer saccharinum, Quercus palustris, Populus deltoides, Populus heterophylla, Betula nigra, Salix nigra, Taxodium distichum, Nyssa aquatica, Planera aquatica,Carya aquatica, Fraxinus profunda* and *Platanus occidentalis*. Shrub layer may include *Forestiera acuminata, Cephalanthus occidentalis, Ilex decidua* and others.
(syn = Bottomland hardwood swamp (Evans 1991))
Examples: Cypress creek (in part), Lees Branch, Charlie Cheeks swamp (in part).

Wet depression/sinkhole forest Conservation status: S1S2

Occurs in the uplands in sinkhole basins and depressions. Soil usually deep, poorly drained. Surface water present for significant periods of time, often becoming dry during late summer or during drought. Parent material usually accumulated alluvium or colluvium. Longer hyrodperiod, the lack of a fragipan? and different topographic position (sloping depression vs. flat) distinguishes this community from Wet flatwoods. Tree canopy tall, closed to partially open. Often forming a zone around sinkhole ponds or marshes. Understory usually poorly developed. Ground cover usually sparse. Common or characteristic trees include *Quercus bicolor, Quercus lyrata, Quercus palustris, Quercus phellos, Liquidambar styraciflua, Acer rubrum, Ulmus americana* and *Populus heterophylla*. Shrubs may include *Cephalanthus occidentalis, Rosa palustris* and others.

(syn = Depression swamp (Evans 1991))
Examples: Mosley pond, Meadow creek swamp, Stateline woods, etc.

Wet meadow Conservation status: S1

New community to KY classification in 2009. More data collection and EO records needed (BDY 2010). One historic record from Laurel County documented by E. Lucy Braun and 3 other existing sites with similar species composition make up this description. Occurs on poorly drained upland flats. Surface water present or soil saturated for extended periods of time. Fragipan usually present? Dominated by herbaceous vegetation, made up mostly of forbs and graminoids. Shrubs and trees are sparse. Common trees include *Acer rubrum, Liquidambar styraciflua, Nyssa sylvatica,* and *Salix niger*. Common shrubs include *Spiraea tomentosa, Alnus serrulata, Ilex verticillata,* and *Lyonia ligustrina.* The herb layer can be mixed with grasses, sedges and forbs but characteristic species include: *Andropogon glomeratus, Drosera* spp., *Eupatorium fistulosum*, *Eupatorium rotundifolium*, other *Eupatorium spp., Hypericum cruxandreae, Juncus spp., Lespedeza capitata, Lobelia nuttallii, Panicum rigidulum, Platanthera*
spp., Polygala spp., Rhexia mariana, *Scutellaria integrifolia, Solidago rugosa, Viola ×primulifolia.,* Examples: Hazeldell Meadow, Sundew Meadow and Greenwood Seep (in part).

Wet prairie Conservation status: S1

Occurs in depressions and other low lying, poorly drained areas in uplands and bottomlands. Soils deep, poorly drained; usually saturated for extended periods of time. Fragipan usually present. Often becomes dry in summer and fall. Dominated by tall grasses and sedges. Dominant grass is *Spartina pectinata*. Other common or characteristic plants include *Carex spp., Phalaris arundinacea(?), Asclepias incarnata, Sium suave, Spiraea alba(?)*. Poorly known and not well documented in Kentucky.
Example: Barkley Prairie (now destroyed).