



**INDIANA DEPARTMENT OF TRANSPORTATION**

# Waters of the United States (WOTUS) Documentation

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- USACE Regulatory Guidance Letter No. 90-7, 26 September 1990, SUBJECT: Clarification of the Phrase “Normal Circumstances” as it Pertains to Cropped Wetlands
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## I. Introduction

The purpose of the Waters of the United States (WOTUS) chapter of the ecology manual is to provide guidance on how to complete a waters report for INDOT. In addition, the chapter is designed to provide an accessible reference for the major concepts required to document water resources on a project site and provide a general outline and format for INDOT reports. This chapter is not intended to replace the applicable federal and state regulatory agency guidance.

### A. Background

The waters report provides documentation of the federal and state jurisdictional wetland and water features and the non-jurisdictional status of other features within and adjacent to a project area. The report documents site conditions prior to disturbance and identifies jurisdictional features for avoidance and minimization of impacts. It is used to determine and support the quantity and type of impacts and mitigation requirements reported in the permit application. The regulatory agencies use the report during their evaluation of the permit application. A well-written and accurate report may preclude the need for an agency field visit to complete a jurisdictional determination. The report is also used to minimize INDOT regulatory compliance risk. The reports may be used for administrative appeals, compliance monitoring, enforcement, and legal actions. The report is completed as part of the National Environmental Policy Act (NEPA) process.

### B. Getting Started

1. Consultant Pre-Qualification. In order to complete a waters report for INDOT, a consultant must be pre-qualified by INDOT under the qualifications listed in the current Consultant Prequalification Manual. For further information see the resources on the [Doing Business with INDOT](#) webpage.
2. Report Review. There are several phases leading to a complete waters report: desk top survey; field data collection; report preparation, and INDOT review and approval. The Ecology and Waterway Permit Specialist assigned to the district where the project is located is responsible for reviewing and approving most district reports. The project may also be reviewed by another Specialist based on EWPO workload. The current assignment map can be found on the [Ecology and Waterway Permitting Office \(EWPO\) webpage](#). First drafts should be submitted through the Electronic Records and Management System (ERMS) with email notice to the team lead. Subsequent drafts should be provided directly to the reviewer. Approved documents should be loaded into ERMS with a note that it is the final copy and no further review is required. The report will be evaluated based on the waters report checklist, but not exclusively. See Appendix E or the [EWPO webpage](#) for the current version.
3. When to complete a Waters Report. Some questions to consider when evaluating whether a waters report is required are:
  - Will work be done outside of the existing pavement?
  - Does the project scope indicate the potential to impact regulated resources?

- Are National Wetland Inventory (NWI) features or other water resources located within the project area?
- Will there be permanent impacts to a regulated resource such as fill, encapsulation, lost linear footage or relocation?
- Will temporary impacts, such as causeways, cofferdams, pump-arounds, or other measures, be required in order to construct the project?
- Will site access result in permanent or temporary impacts to potential jurisdictional features?

A “yes” answer to any of these questions would indicate that the project requires a WOTUS report.

4. A waters report is valid for five years from the first field date. The permit will need to be issued prior to the end of the five year period. The agencies may require an updated report to validate current conditions if permit submittal is close to the end of the five years. If the project scope or footprint changes, an amendment may be required to verify the presence or absence of regulated resources in the additional area.

## II. Preparing a Waters Report

### A. Desktop Survey

1. The desktop survey is the first step in preparing a waters report and sets the stage for field work. The survey will determine what available resources can show about the project area and what will need to be field verified. The benefits of conducting a desktop survey prior to field work include:

- a. More efficient use of field time by pre-identifying areas of concern;
- b. Reducing the need for a follow-up visit;
- c. Provides draft maps required for the waters report;
- d. Provides resources for field data collection, and;
- e. Understanding how water resources are connected to each other.

2. General Guidelines

- a. The desktop survey should identify features requiring field verification such as historical drainage, NWI mapped wetlands, hydric soils, water signatures visible on aerials, USGS identified wetlands and waterways, changes in vegetation and darker soils, and depressions identified by contours or shaded relief.
- b. The desktop survey should result in a field data collection plan to include data points, photo documentation plan, and survey methods. The procedures should suit the complexity of the site and the purpose of the delineation.

3. Investigated Area. The minimum study area for a waters investigation should be based upon the project footprint as provided by the designer, preliminary project plans, engineer's report or project scope. It should include all INDOT right-of-way (ROW) immediately adjacent to the project to include contractor staging areas and site access. All medians located within the project area should be investigated and documented in the report. It may also include areas outside of the INDOT ROW or proposed footprint if additional information is required to validate the presence or absence of a regulated resource, such as a wetland that extends beyond the ROW. Another example would be non-INDOT property adjacent to the project where regulated resources could be indirectly impacted, such as from sediment discharge from construction activities or secondary impacts to a wetland through modification of the water budget. Notice of Entry for Survey letters should be sent to all adjacent property owners prior to the field investigation.

4. Maps

- a. It is beneficial to have drafts of key maps made prior to the field visit. They are useful for note taking and can be evaluated for missing information or layout while in the field.
- b. Maps should be easy to understand, have a clear purpose, have a scale that is appropriate for the project and be easily readable. Multiple layers of information may be included on a map if

the information is visible. Irrelevant information should not be included. Maps should be clear when printed at the final map size of 8 ½ x 11 inches.

- c. Preliminary maps should be prepared to include: project location, NWI features, floodway/floodplain (FEMA/FIRM), soil survey (SSURGO), USGS quadrangle/topographic (one at a distance and one close in), watershed (12 digit HUC), photo orientation and aerial maps.
- d. Maps should include the following information: project type; route; DES number; county; map type; north arrow; scale bar; applicable legend (only include displayed layers); labeled resources; source/citation; date; and author or creator.
- e. The project location map is one map that can get someone to the project site from anywhere in the state. It should be scaled (small state, medium county, large/closer project location), include major intersections such as state routes, highway or interstates. If these aren't available include two readily recognizable landmarks. All roads and features should be labeled.
- f. Include property, project and investigated area boundaries, sampling data points and plot IDs, wetland boundaries and karst features.
- g. Maps should include the direction of water flow, and stream and wetland names and IDs.
- h. The USDA NRCS Web Soil Survey or data layer (if using ArcGIS) should be used to create the soils map. NRCS soil rating polygons are: hydric (100%), hydric (66 to 99%), hydric (33 to 65%), hydric (1 to 32%), not hydric (0%) and not rated or not available. The map, with supporting information, should include the map unit symbol, map unit name, and hydric rating.
- i. The photo orientation map can be at a closer scale than the other maps in order to provide visible photo data point labels and orientation arrows. Topographic maps at a different scale may be required to highlight specific project areas.
- j. Multiple maps showing different areas of the investigated area may be required depending on the size of the project.
- k. The maps may need to be updated to reflect the results of the field investigation or additional maps created for the final report.

## **B. Field Data Collection**

1. Growing Season. Field work for waters reports prepared for INDOT must be done during the growing season as defined by the USACE. An accurate assessment of the three wetland indicators cannot be made outside of the growing season. INDOT may approve collecting field data outside of the growing season for an emergency project or a project that has been moved forward on the letting list. If out-of-season data collection is approved, problematic findings must be field verified during the growing season.

2. Field Equipment. Some of the equipment that should be taken to the field are plant identification references, plastic bags, shovel (spade), ruler/measuring tape, water bottle to moisten soils, Munsell® book, camera, GPS unit, hand lens, maps, aerial photos, wetland data sheets, writing instrument, note pad, clipboard, flags, measuring wheel, and compass.

### 3. Photographs

- a. The purpose of photographs is to document site conditions prior to disturbance and provide sufficient evidence to support a determination without a field visit. They document the presence or absence of regulated features.
- b. Photographs should be easy to understand, have a clear purpose, be in focus, account for the time of day/weather (light), show structures in context with surroundings, support the waters report narrative conclusions, provide a desktop tour of the project area, be of sufficient quantity to support determination and cover the entire study area.
- c. Photos should be labeled to include a description of contents (to include data point), direction, upstream/downstream, key points/features, date taken, and include arrows pointing to features that are difficult to identify.
- d. What to photograph -
  - i. Roadway - Photos should be taken from the roadway - upstream, downstream, roadway and adjacent landscape (both directions) and other features to help provide documentation of conditions in the four quadrants around the structure. The roadway should not be the dominant feature.
  - ii. Areas of concern - Areas of concern identified during pre-field desktop survey should be photographed. For example - NWI polygons, suspicious water signatures or vegetation, and areas of inundation.
  - iii. Data points - There should be a minimum of two photos per data point. For each wetland and upland plot
    - Before digging/trampling, the surrounding plot vegetation that shows the relation of point to the surrounding terrain. A shovel should be used as a reference point.
    - Soil profile (cut on shovel with measuring/scaling device).
    - Additional photos, such as a close up of prominent hydric soil features and hydrology can also be included.
  - iv. Features with an OHWM - Include sufficient quantity (a minimum of two) to document observations, for example, OHWM terminates or changes significantly within project area. For example:
    - Small structure located over a stream - From the stream bed (if possible, or closest point), downstream looking through the structure, further downstream looking at the structure, upstream looking through the structure, further upstream looking at the structure, photos should allow documentation of the OHWM measurements, and the four quadrants to document features or lack of features.
  - v. Non-jurisdictional features should be documented with a minimum of two photos.
  - vi. Structures - Include all structures (pipes, box culverts, bridges, etc.), inlet/outlet (include surrounding area), through the structure (upstream/downstream), Unnamed Tributaries (UNT's), existing riprap, up and downstream looking at the structure. These photos should be taken from the water level. This is a minimum of four photos per structure/waterway.



- vii. Birds and bats - If present, document the use of the structure by birds and bats. In particular, take photos of each type of bird nest, nest location or grouping, and bat guano or staining on the structure and the ground.
- viii. Photo documentation map - For each photo include the photo number and direction arrow. The scale can be different than other maps and multiple maps may be required for larger projects.
- ix. Photo pages - Two to four photos per page to largest size possible. Size can vary based on subject.
- x. Photo captions - Include number with description (direction, subject, and other key points).

#### 4. Wetland Analysis

- a. The wetland boundary delineation should be obtained using GPS.
- b. Wetland data points should be taken in each suspected wetland and as close to the boundary as possible. An upland data point should be taken to determine the wetland boundary. The upland point should not be on the road embankment. For complex projects, additional data points may be required to determine the boundary between different wetland types.

#### 5. Stream Analysis

- a. Stream classification is based on NWI Cowardin class designation on the USGS topographic map (solid-perennial or dashed-intermittent blue line) or field observations. Ephemeral streams are often not indicated on topographic maps.
- b. Verify and note the direction of flow.
- c. The width and depth of the OHWM should be measured. The measurements should be taken upstream and downstream **outside of the influence of the structure**. The stream summary table should include the widest measurement while the other measurements should be discussed in the narrative.
- d. Determine and note the main types of substrate. Substrate types are: bedrock, boulder, cobble, gravel, sand, silt, hardpan, marl, detritus, muck and artificial. See Appendix I.
- e. Determine the quality of the stream (poor, average, or excellent) to be included in the stream summary table. To determine stream quality look at the substrate, overhead cover, presence of aquatic organisms or habitat, and opacity. Discuss determination in the narrative.
- f. Headwaters Habitat Evaluation Index (HHEI) and Qualitative Habitat Evaluation Index (QHEI) will be required for a limited number of INDOT or local agency projects. Conduct a HHEI or QHEI **only** when mitigation will be required for impacts to the resource, there are aquatic federal endangered or threatened or state species of concern that could be impacted, or when the stream is designated as a state wild or scenic river. Appendix I includes a Quick Guide to Completing the OhioEPA QHEI Field Sheet and links to other online resources.

#### 6. Labeling Features

- a. Accurate feature labeling is important because it identifies the regulatory status of a feature and reduces confusion. For example, an ephemeral stream should not be labeled as a roadside ditch but as an Unnamed Tributary (UNT) to the nearest named feature on the USGS topographic map.
- b. Rivers, streams and ditches should be named using what is on the topographic map. If a common name is used, as is often the case with regulated drains, the common name can be provided in parenthesis. If the waterway is not labeled in the area of the project site, look downstream to the nearest named water feature. The feature would then be labeled as UNT to that named feature. If there are multiple UNTs to the same stream label them as UNT1, UNT2, etc. If only one named water feature is downstream of the project then the stream name is not required. Non-regulated resources such as a roadside ditch (RSD) should be labeled as RSD1, RSD2, etc.
- c. Wetland data points should be labeled in a way that ties the wetland data points to the upland data points. For example, the first wetland data point is A1 and the corresponding upland point is labeled A2.
- d. Open water features should be named using what is on the topographic map. If a common name is used, the common name can be provided in parenthesis. If there isn't a name, label them as Open Water 1, Open Water 2, etc. In some circumstances waters flowing into a structure may enter into a labeled open water feature. This would be labeled as UNT to that labeled open water feature.

## **C. Preparing a Waters Report**

1. The format presented in this section should be followed for all reports prepared for INDOT state projects and is recommended for Local Public Agency (LPA) projects. This will provide a consistent format for INDOT and FHWA review of NEPA documents and regulatory agency review of the documents that support the permit application. The report should stand on its own and the results should be replicable by an independent party.

### **2. General Report Guidelines**

- a. The information should be portrayed in an organized and understandable manner and provide the results and rationale for decisions.
- b. Embellishments that do not add value to the content of the report should be avoided.
- c. Table of contents and separation pages such as those in front of appendixes, maps, etc., are appropriate only for very large reports.
- d. Consultant logos and "preferred" layout are allowed as long as it doesn't add to length of document or impact the presentation of information.
- e. Page numbers of the main document are preferred. Appendixes don't have to be numbered as long as they are sufficiently identified.
- f. Label the tables, figures and maps.

## D. Waters Report Layout

### 1. Title Block

<p style="text-align: center;"><b>Waters Report</b> <b>“Road Type and Number” in ____ County, Indiana</b> <b>“Project Type”</b> <b>DES Number (s)</b> <b>Asset ID #: _____</b> Prepared by: Name(s) Contact Information: [email, phone number] Company Name or INDOT CO or ____ District Completed Date: ____</p>
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- a. For projects with more than two DES numbers provide the lead DES number in the title. Include sub DES numbers with asset ID numbers if there are others associated with the project. USACE and IDEM permits will be requested under the lead DES. Indiana Department of Natural Resources permits will use the structure DES number(s). For example, two bridges on a four lane, bifurcated road will each have separate DES numbers.
- b. Asset identification numbers - Bridges (> 20 feet) and culverts (4 to 20 feet) are assigned asset identification numbers and tracked in the Bridge Inspection Application System (BIAS). The inclusion of the asset identification number for all assets located in the project area will ensure that the waters report relating to that structure is searchable through BIAS. Tables should be used to provide this information for complex projects and be included as in appendix. Information provided in the table may include: subordinate DES numbers, project types, reference posts, asset identification number, etc.

### 2. Project Information

**Date(s) of Field Reconnaissance:** [Waters reports are valid for five (5) years from the first field date. Include all dates that the site was visited to collect data for the report.]

**Location:**

Section \_\_\_\_, Township \_\_\_\_, Range \_\_\_\_  
[Quadrangle Name] Indiana, Quadrangle  
\_\_\_\_ County, Indiana  
Latitude/Longitude - in decimal degrees.

### 3. Project Description

**Project Description:**

Provide a short project description that supports study area determination, site location, description (topography, vegetation, water features, and other important characteristics of the site).

### 4. Desktop Reconnaissance

**Soils:**

According to the Soil Survey Geographic (SSURGO) Database for \_\_\_\_\_ County, Indiana, the project area does/does not contain soil areas with nationally listed hydric soils.

Soil Name

Map Abbreviation

Hydric Range

[Include all soils within project area. Classification - Hydric (100%), Hydric (66 to 99%), Hydric (33 to 65%), Hydric (1 to 32%), Not Hydric (0%), or Not Rated or Not Available]

**National Wetland Inventory (NWI) Information:**

There are/are not wetlands or linear water features identified in or near the project area.

Wetland/Water Feature Type

Location

[Include all NWI features in or within 0.5 mile of the project area or visible on NWI map included in report.]

**HUC:** 12 digit and name [used for permitting]

**Attached documents:** [list all]

- Maps (Project Location, Aerial, Topographic, NRCS Soils, NWI, Floodplain, LiDAR, etc.)
- Photographs with location/orientation map
- Wetland Data Sheets [if required]
- QHEI and/or HHEI Data Sheets [if required]

### 5. Field Reconnaissance

**Field Reconnaissance:**

Type of wetland delineation, describe any deviations from standard methods found in the manual, describe special techniques (GPS, GIS, survey methods) and supporting materials used (such as plant list, soil survey report, hydric soil list, aerial topography, USGS topo map, NWI map, and NTCHS field indicators).

## 6. Stream Feature Discussion

### **Stream Feature(s):** [if applicable]

For each stream feature discuss:

- Upstream drainage area for blue line streams
- OHWM width and depth (location outside the influence of the structure, indicate general location photo)
- Linear feet in project area
- Quality - This should be done using information similar to that collected from a QHEI analysis. Completion and submission of a form to support the determination is not required. Look for overhead cover, presence of riffle and pool complexes, type of bottom substrate, water clarity, presence of aquatic organisms and natural sinuosity. A regulated drain would be classified as either average or poor due to the unnatural state of the feature. A natural stream would generally be classified as either average or excellent, unless the evidence indicates otherwise.
- Jurisdiction to include federal and state
- Connectivity to navigable waters
- Cowardin classification - as labeled on NWI map, correct if inaccurate, provide a minimum of system and class, can include subclass and modifier

7. Stream Summary Table. Complete the information for each regulated feature. If no streams are present, as discussed in the text, the stream summary table is not required.

Water Feature Name - Corresponds with the feature name used in the document and labeled on maps.

Photos - Reference the photos for each feature.

Lat/Long- In decimal degrees.

OHWM Width (ft or in) - The width is what is found outside of the influence of the structure. If a scour hole is present discuss in the text and provide width and depth.

OHWM Depth (ft or in) - The depth is what is found outside of the influence of the structure.

USGS Blue-line? Type? - Yes or no. Perennial or intermittent type.

Riffles? Pools? - Yes or no.

Quality - Classifications are poor, average and excellent. The reasons for the classification should be discussed in the findings for each feature. Examples include overhead cover, presence of riffle and pool complexes, bottom substrate, water clarity, presence of aquatic organisms and natural sinuosity. A regulated drain would be classified as either average or poor due to the unnatural state of the feature. A natural stream would generally be classified as either average or excellent, unless the evidence indicated otherwise.

Substrate - Common types are silt, sand, gravel, cobble, bedrock, or muck.

Likely Water of the U.S.? - Yes or no. Determination supported by discussion in text.

**Stream Summary Table**

Water Feature Name	Photos	Lat/Long	OHWL Width (ft or in)	OHWL Depth (ft or in)	USGS Blue-line? Type?	Riffles? Pools?	Quality	Substrate	Likely Water of U.S.?
		°N °W							

8. Wetland Feature Discussion

**Wetlands:** Each sample point classified as a wetland must have a corresponding upland sample point. Additional sample points may be required to verify the classification of a feature identified through aerials, NWI maps, or soils classification.

For each data point discuss:

- Sample Point ID
- Location, size (acres), type, jurisdiction
  - Include the indicators met for vegetation, soils and hydrology
  - Quality
  - Jurisdiction (WOTUS, water of the state and exemption status)

Wetland boundary determination - Discuss what factors were used to determine the wetland boundary and size and location of the wetland to include a discussion of extent outside of study area.

9. Data Point Summary Table. Complete a data point summary table and include all wetland and upland data points included with the permit application. For each data point include whether the vegetation, soils and hydrology criteria were met and whether the feature qualified as a wetland.

**Data Point Summary Table**

Data Point	Vegetation	Soils	Hydrology	Wetland
	Yes/No	Yes/No	Yes/No	Yes/No

10. Wetland Summary Table. Complete the information for each regulated feature. If no wetlands are present, as discussed in the text, the wetland summary table is not required.

Wetland Name - Corresponds with the feature name used in the document and labeled on maps.

Photos - Reference the photos for each feature.

Lat/Long - In decimal degrees.

Type - This is the Cowardin classification, at a minimum to class.

Total Area (acres) - Of feature delineated. Roadside ditch wetlands should also include LF.

Quality - Classifications are poor, average and excellent. The reasons for the classification should be discussed in the findings for each feature.

Likely Water of the U.S.? - Yes or no. Determination supported by discussion in text

Wetland Summary Table						
Wetland Name	Photos	Lat/Long	Type	Total Area (acres)	Quality	Likely Water of the U.S.?
		°N °W				

#### 11. Open Water Discussion

Open Water: [if applicable]

For each open water feature discuss:

- Description
- Quality
- Jurisdiction
- Cowardin classification - as labeled on NWI map, correct if inaccurate, provide a minimum of system and class, can include subclass and modifier
- Unusual circumstances (if any)

12. Open Water Summary Table. Complete the information for each feature. If no open water features are present, as discussed in the text, the open water summary table is not required.

Open Water Name - Corresponds with the feature name (use USGS name if available) used in the document and labeled on maps.

Photos - Reference the photos for each feature.

Lat/Long - In decimal degrees.

Total Area (acres) - Of feature delineated.

Likely Water of the U.S.? - Yes or no. Determination supported by discussion in text.

<b>Open Water Summary Table</b> <b>“Road Type and Number” in _____ County, Indiana</b> <b>DES Number (s)</b>				
Open Water Name	Photos	Lat/Long	Total Area (acres)	Likely Water of U.S.?
		°N °W		

### 13. Other Features Discussion

**Other Features:** [if applicable, may be discussed in an earlier section]

- Areas that did not have an OHWM but have concentrated flow
- All roadside ditches
- Historic drainage within project limits
- Unusual circumstances

### 14. Conclusions

**Conclusions:**

- Purpose of the conclusion is to provide a short summary of the findings.
- Identify number and types of waters/non-waters features investigated:
  - Wetlands (field identified, number of each type - emergent, forested, scrub-shrub)
  - Streams (rivers, streams, creeks, roadside ditches, etc. and type)
  - Open water features (ponds, lakes, etc.)
  - Drainage features (roadside ditch, swale, storm water conveyance, etc.)
- Identify number and types of jurisdictional and non-jurisdictional features:
  - Wetlands (NWI and field identified) including Cowardin classification
  - Linear water features (rivers, streams, creeks, etc.) including Cowardin classification
  - Open water features (ponds, lakes, etc.)
  - Drainage features without OHWM
  - Non-jurisdictional features
  - Karst features (if any)
  - Description and location of bat and bird use (if any)



Include the statement:

“These waterways are likely Waters of the U.S. Every effort should be taken to avoid and minimize impacts to the waterway and wetlands. If impacts are necessary, then mitigation may be required. The INDOT Environmental Services Division should be contacted immediately if impacts will occur. The final determination of jurisdictional waters is ultimately made by the U.S. Army Corps of Engineers. This report is our best judgment based on the guidelines set forth by the Corps.”

#### 15. Acknowledgement

##### **Acknowledgement:**

This waters determination has been prepared based on the best available information, interpreted in the light of the investigator’s training, experience and professional judgement in conformance with the 1987 *Corps of Engineers Wetlands Delineation Manual*, the appropriate regional supplement, the USACE *Jurisdictional Determination Form Instructional Guidebook*, and other appropriate agency guidelines.

Printed Name

Signature

Title

Consultant/Sub-consultant Firm(s)/INDOT District

#### 16. Supporting Documentation

##### **Supporting Documentation:**

Maps - See II.A.5

Photos - See II.B.3

Wetland Delineation Data Sheets (if required), see Appendix G

QHEI/HHEI Data Sheets (if required), see Appendix I

### **E. Approved Jurisdictional and Preliminary Jurisdiction Determinations**

The USACE issued Regulatory Guidance Letter (RGL) No. 16-01 in October 2016 to explain the differences between the approved jurisdictional determination (AJD) and the preliminary JDs (PJDs) and provide guidance to USACE project managers and the regulated entities on the appropriate use of AJDs, PJDs and no JD. The three USACE districts that oversee Indiana are interpreting the RGL differently. RGL 16-01 is included in Appendix F. Other resources are included in Appendix H. Each USACE district web page includes approved JD forms that can be used as a reference. In general, the majority of projects will require a pre-JD form. The Approved JD will be required for the USACE Louisville district when

INDOT desires to have resources classified as state isolated wetlands in order to reduce the mitigation requirement. Contact the EWP Specialist assigned to the district where the project is located for current guidance.

## III. Key Concepts

### A. Jurisdictional Waters

1. The waters report documents the jurisdictional and non-jurisdictional features in the project area. Jurisdictional waters includes wetlands, rivers, streams, lakes and ponds.
2. The Department of the Army, acting through the U.S. Army Corps of Engineers (USACE), has authority to permit the discharge of dredged or fill material in waters of the U.S. under Section 404 of the Clean Water Act (CWA), and permit work and the replacement of structures in navigable waters of the U.S. under Sections 9 and 10 of the Rivers and Harbors Act of 1889 (RHA). The USACE Jurisdictional Determination Form Instructional Guidebook should be referenced when making preliminary jurisdictional determinations in a waters report. The USACE must approve the recommendation either through signing the pre-JD form, issuing a permit based on the waters report submitted with a permit application or the completion and approval of a jurisdiction determination form. Additional information is included in Appendix H.
3. The CWA (33 CFR 328.3(a)) defines “Waters of the U.S.” as:
  - (a) (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
  - (2) All interstate waters including interstate wetlands;
  - (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    - (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    - (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    - (iii) Which are used or could be used for industrial purpose by industries in interstate commerce;
  - (4) All impoundments of waters otherwise defined as waters of the United States under the definition;
  - (5) Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;
  - (6) The territorial seas;
  - (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section.

4. Under 33 CFR 328.3(a)(8) waters of the U.S. does not include “prior converted cropland.” Prior converted cropland must be certified by NRCS. To qualify as prior converted cropland, the farmland must have been:

- a. Cropped prior to December 23, 1985 with an agricultural commodity (an annually tilled crop such as corn);
- b. Cleared, drained or otherwise manipulated to make it possible to plant a crop;
- c. Continued to be used for agricultural purposes (cropping, haying or grazing), and;
- d. The land does not flood or pond for more than 14 days during the growing season. 7 CFR 12.2

5. Under 33 CFR 329.4, navigable waters of the U.S. are:

those waters that ... are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity.

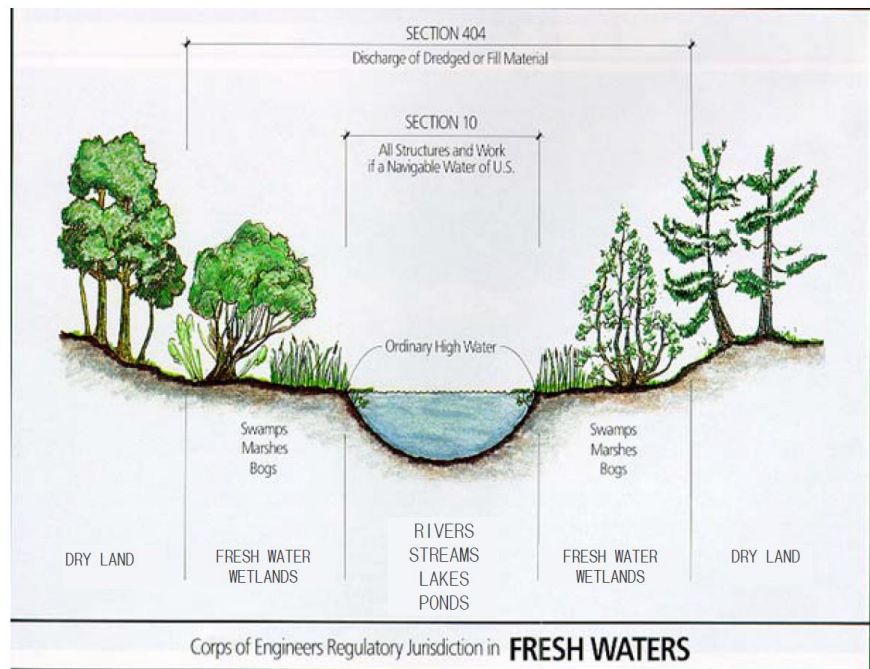
6. There are several additional terms that must be understood to make a jurisdiction determination that are discussed in more detail in the guidebook. This is a quick summary. See the guidebook for details. Many of the terms were defined through the legal process.

- a. Traditionally Navigable Waterways (TNW) - Includes all of the “navigable waters of the U.S.” as defined in 33 CFR Part 329 and court decisions and all other waters that are navigable-in-fact.
- b. Abutting - For a wetland, it abuts a tributary if it is not separated from the tributary by uplands, a berm, dike, or similar feature.
- c. Adjacent - For wetlands adjacent to TNWs it means bordering, neighboring or contiguous. It also includes wetlands separated by other waters of the U.S. by man-made dikes or barriers, natural river berms, beach dunes, and the like.
- d. Non-wetland water bodies - Includes TNWs and tributaries that flow directly or indirectly into TNWs.
- e. Relatively Permanent Water (RPW) - Where flow is year-round or continuous at least seasonally.
- f. Significant nexus - The evaluation of significant nexus includes:
  - i. An assessment of the flow characteristics and functions of the tributary, itself, in combination with the functions performed by any wetlands adjacent to the tributary to determine if they have more than an insubstantial or speculative effect on the chemical, physical and/or biological integrity of the TNWs;
  - ii. A consideration of biological factors such as:
    - volume, duration, and frequency of flow, including consideration of certain; physical characteristics of the tributary;

- proximity to the TNW;
  - size of the watershed, and;
  - average annual rainfall.
- iii. A consideration of ecological factors such as:
- the ability of the tributary and its adjacent wetlands (if any) to carry pollutants and flood waters to TNWs;
  - the ability of the tributary and its adjacent wetlands (if any) to provide aquatic habitat that supports biota of a TNW;
  - the ability of adjacent wetlands to trap and filter pollutants or store flood waters, and;
  - the ability to maintain water quality.
- g. Tributary - A natural, man-altered, or man-made water body. Examples include rivers, streams, and lakes that flow directly or indirectly into TNWs.
7. The regulatory agencies will assert CWA jurisdiction over the following waters:
- a. TNWs and wetlands adjacent to TNWs, and;
  - b. Non-navigable tributaries of TNWs that are relatively permanent and wetlands that directly abut such tributaries.
  - c. The following waters based on a fact-specific analysis that determines that they have a significant nexus with a TNW:
    - i. Non-navigable tributaries that are not relatively permanent;
    - ii. Wetlands adjacent to non-navigable tributaries that are not relatively permanent;
    - iii. Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary;
  - d. Two Supreme Court decisions, *Rapanos v. U.S.* and *Carabell v. U.S.*, addressed the jurisdictional scope of Section 404 of the CWA. The guidance relevant to Indiana includes:
    - i. Certain geographical features (e.g. ditches, canals) that transport relatively permanent (continues at least seasonally) flow directly or indirectly into TNWs or between two (or more) waters of the U.S., including wetlands, are jurisdictional waters regulated under the CWA;
    - ii. Certain geographical features (e.g., swales, ditches, pipes) may contribute to a surface hydrologic connection where the features:
      - replace or relocate water of the U.S., or
      - connect a water of the U.S. to another water of the U.S., or
      - provide relatively permanent flow to a water of the U.S.;
    - iii. Certain geographical features generally not jurisdictional waters:
      - swales, erosional features (e.g. gullies) and small washes characterized by low volume, infrequent, and sort duration flow;
      - ditches (including roadside ditches) excavated wholly in and draining only uplands and do not carry a relatively permanent flow of water, and;

- uplands transporting over land flow generated from precipitation (i.e. rain events and snowmelt).

**Figure 1. USACE  
Regulatory Jurisdiction  
in Fresh Waters.**



## B. Ordinary High Water Mark

1. The Ordinary High Water Mark (OHWM) is used to determine the limits of USACE jurisdiction for rivers, streams, lakes and ponds. USACE jurisdiction of Section 10 navigable waters ends at the ordinary high water line. USACE jurisdiction under Section 404 also includes adjacent wetlands or those with a significant nexus to navigable waters.
2. The OHWM is a line on the shore established by fluctuations of water and indicated by physical characteristics, such as:
  - clear, natural line impressed on bank,
  - the presence of litter or debris,
  - changes in the character of the soil,
  - destruction or absence of terrestrial vegetation,
  - shelving,
  - the presence of a wrack line (line of debris),



- vegetation matted down, bent, or absent,



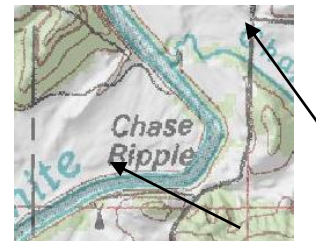
- leaf litter disturbed or washed away,
- scour,
- sediment sorting, →
- sediment deposition,
- multiple observed, predicted flow events
- water staining, and
- abrupt change in plant community.



## C. Stream

A stream is a drainage feature that has an ordinary high water mark and is a regulated resource that must be documented in the waters report. They are also called creeks, brooks, or rivers. The 401 Regional General Permit (RGP) also includes natural streams, artificial channels, encapsulated channels and ditches. There are three types of streams:

1. Perennial - A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow, but can be supplemented by runoff from rainfall. They are indicated by a solid blue line on a USGS topo map.



2. Intermittent - An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow. They are indicated by a dashed blue line on a USGS topo map.



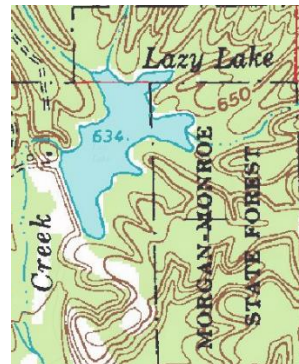
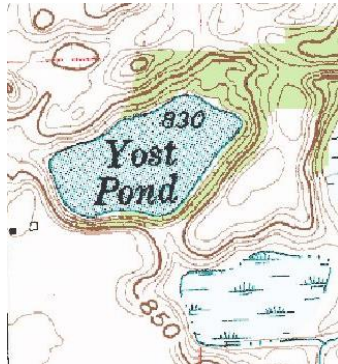




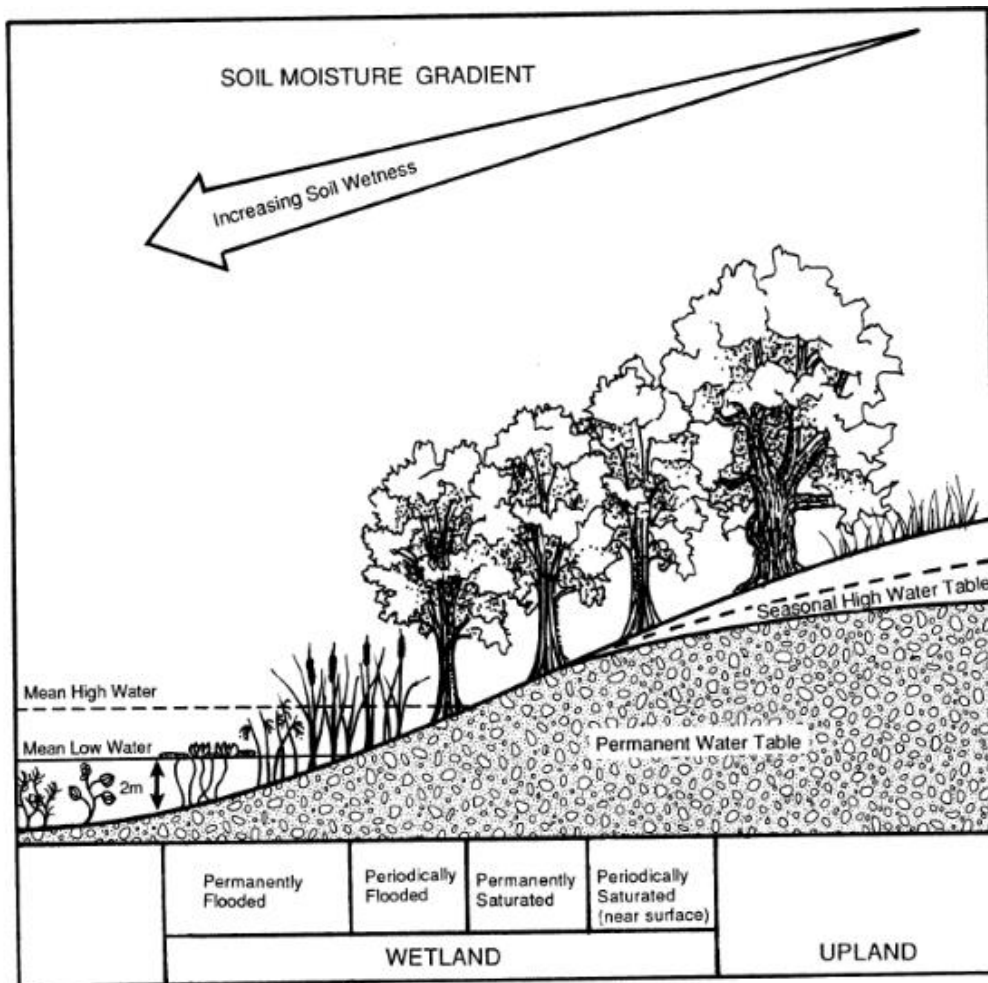
3. Ephemeral - An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Runoff from rainfall is the primary source of water for stream flow. Groundwater is not a source of water for the stream. They may be indicated by contour lines on a USGS topo map or are field identified.

## D. Open Water

Open water features may require mitigation if they are impacted by a project and the ones located in the project area should be documented in the waters report. Open water has permanent year-round water that excludes non-floating plants. Floating plants, such as duckweed and water lily, may be present. Bulrushes found at the edge of open water would be included in the wetland fringe. Open water located within the project area must be identified in the waters report. They are a jurisdictional water feature.

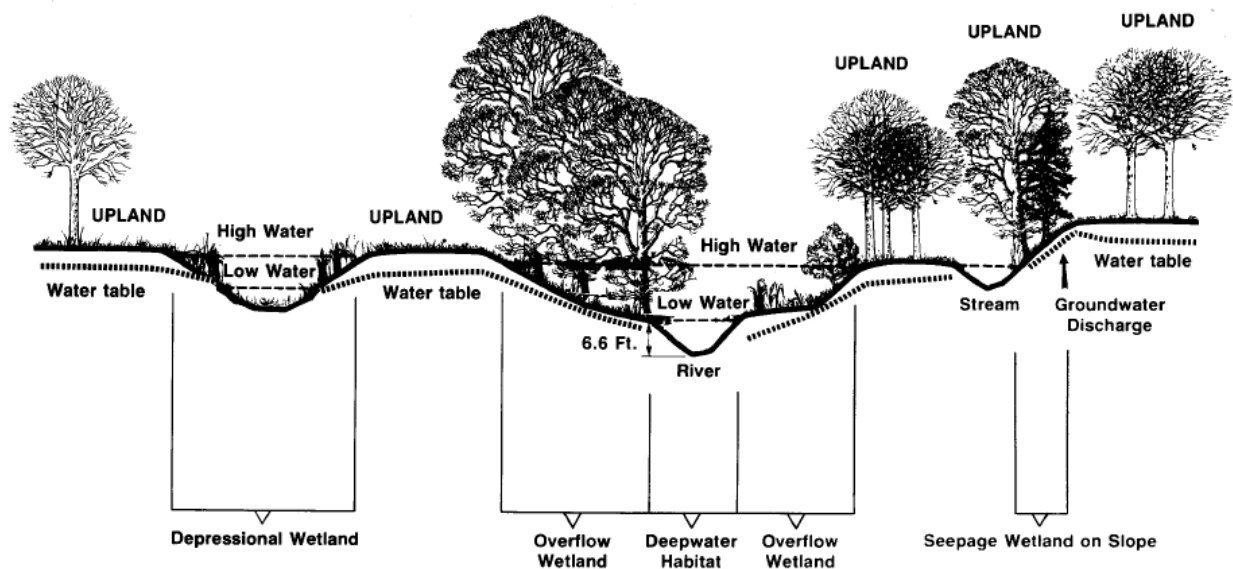






**Figure 2. The general location of wetlands along the soil moisture gradient. The seasonal high water table represents the average height of the water table for a significant period during the wet part of the growing season in most years.**

Source: Tiner, Ralph W. BioScience 41(4):236-247, April, 1991



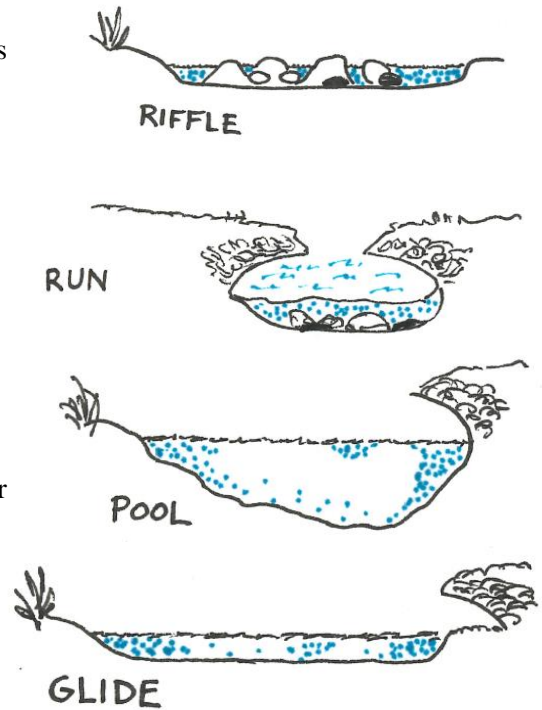
**Figure 3. Schematic diagram showing wetlands, deepwater habitats, and uplands on landscape.**  
**Note differences in wetlands due to hydrology and topographic location.**

Source: U.S. Department of Interior, Fish and Wildlife Service, Wetlands of the United States:  
 Current Status and Recent Trends. March 1984.

#### **E. Qualitative Habitat Evaluation Index (QHEI) and Headwater Habitat Evaluation Index (HHEI)**

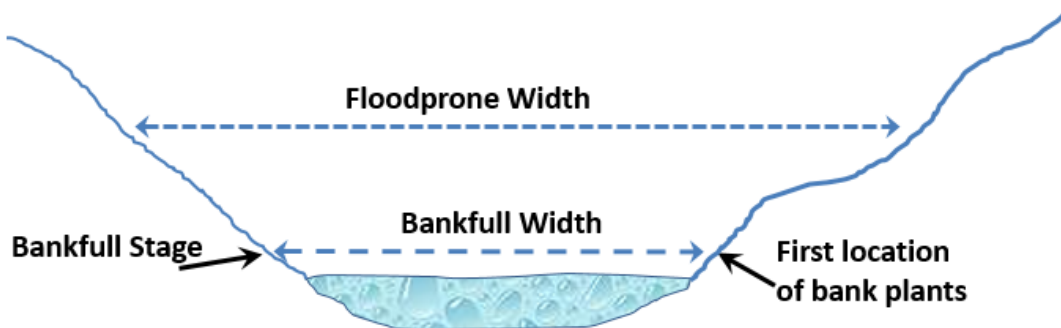
1. The Qualitative Habitat Evaluation Index (QHEI) is a physical habitat index designed to provide an empirical, quantified evaluation of the general lotic macro habitat characteristics that are important to fish communities. It can be used to document the quality of a resource that may be impacted by a project. It is not required for the majority of INDOT projects.
2. The QHEI is composed of six metrics: (1) substrate; (2) instream cover; (3) channel morphology; (4) riparian zone and bank erosion; (5) pool/glide and riffle/run quality, and; (6) map gradient. The Ohio EPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet and *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* are the primary references. Additional terms are discussed in the **Quick Guide to Completing the Ohio EPA QHEI Field Sheet** found in Appendix I.
3. The Headwater Habitat Evaluation Index (HHEI) is used to evaluate primary headwater streams. A primary headwater stream has a surface watercourse with a defined bed and bank. It has either continuous or periodical flowing water. The watershed is less than one square mile and the deepest pools are less than 40 cm (15.75"). They contain widely divergent community's base upon in-stream biology.
4. There are four habitat types: riffle, run, pool and glide.

- a. Riffle - Areas of the stream with fast current velocity and shallow depth; the water surface is visibly broken.
- b. Run - Areas of the stream that have rapid non-turbulent flow; runs are deeper than riffles with a faster current velocity than pools and are generally located downstream from riffles where the stream narrows; the stream bed is often flat beneath a run and the water surface is not visibly broken.
- c. Pool - An area of the stream with slow current velocity and a depth greater than riffle and run areas; the stream bed is often concave and stream width frequently is the greatest; the water surface slope is nearly zero.
- d. Glide - An area common to most modified stream channels that do not have a distinguishable pool, run, and riffle habitats. The current and flow is similar to that of a canal and the water surface gradient is nearly zero.



4. Maximum pool depth. Maximum pool depth is a key indicator of whether the stream can support a well-balanced fish community. Streams with pools of less than 40 cm in depth are less likely to have well balanced fish communities. Maximum pool depth is also related to the stream channel (i.e. continuous, intermittent, interstitial), and thus serves as a good discriminator of the various classes of primary headwater habitat (PHWH) streams. Pools or glides with maximum depths of less than 20 cm are considered to have lost their function.

5. Channel width. Bankfull width is “the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.” Dunne and Loepold (1978). The bankfull width of a stream channel should be measured in riffle areas (or in a glide/run in the absence of riffles.) A relatively straight stream segment should be selected which is not affected by the deposition of debris. The boundary line where terrestrial vegetation begins along the stream margin can also indicate the edge of the bankfull width.



**Figure 4. Average Bankfull Width**

## F. Wetland

1. A wetland is an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are transitional areas between aquatic resources and upland areas. They are also called swamps, marshes, bogs and fens. Wetlands are a regulated resource. All wetlands found in a project area must be documented in the WOTUS report. Wetlands identified on the USGS topo or NWI maps must always be field verified.
2. Three diagnostic environmental characteristics are used to identify a wetland:
  - a. Hydrophytic vegetation - The prevalent vegetation consists of macrophytes typically adapted to wetland hydrology and soil conditions. Hydrophytic species have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. It is also described as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present. The density of vegetation must be considered.
    - i. Prevalence of vegetation - This is an evaluation of the plant community or communities present in an area. It is characterized by the dominant species. Dominant plant species are those that contribute more to the character of a plant community than other species present. Measures of dominance include basal area for trees and percent areal cover for herbaceous plants. If the dominant species in a plot are typically adapted for life in saturated soil conditions then hydrophytic vegetation is prevalent.
    - ii. Typically adapted - Species are normally or commonly suited to a given set of environmental conditions due to a morphological, physiological, or reproductive adaptation.
  - b. Hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. The soil will be classified as hydric or it will possess characteristics that are associated with reduced soil conditions.
  - c. Wetland hydrology - The area is inundated either permanently or periodically at mean water depths  $\leq 6.6$  feet, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation. It is also indicated when the area is inundated or saturated to the surface for 5 percent or more of the growing season in most years. The national range for 5 percent is from 7 to 18 days. The National Academy of Science recommends a minimum of 14 consecutive days.
3. Forested wetland - Is dominated by woody plants greater than 3.2 feet in height and greater than 3 inch dbh.
4. Scrub-shrub wetland - Is dominated by woody plants greater than 3.2 feet in height but less than 3 inch dbh.

5. Emergent wetland - Is dominated by non-woody species or woody species less than 3.2 feet in height.
6. Farmed wetland - To determine if the area is a farmed wetland a reference area must be identified. Examine the soils and hydrology of the reference area. Is the vegetation criteria not met due to active management? What vegetation is present in adjacent unfarmed or reference area? What volunteer species are present in the farmed area?
7. Isolated Wetland - Wetlands that are not adjacent to nor have a connection with navigable waterways or their non-navigable tributaries. They are regulated by the Indiana Department of Environmental Management (IDEM) as Waters of the State. They should be documented and if impacted would require an isolated wetlands permit from IDEM.
8. Non-wetlands - The prevalent vegetation consists of plant species that are typically adapted for life only in aerobic soils or soils that are not classified as hydric. The average annual duration of inundation or soil saturation does not preclude the occurrence of plant species typically adapted for life in aerobic soil conditions.
9. Topography - Wetlands occur along a natural soil-moisture gradient between permanently flooded deepwater areas and uplands. See Figure 12. They can also be found in depressions in the land surface.

## G. Hydric Soils

1. Hydric soil is one of the three wetland indicators. The NRCS Web Soil Survey ([WSS](#)) can be used to determine the mapped soil type for a project area. Field verification the presence of hydric soil must be completed for each required data point.
2. Soil is a natural body that occurs on the land surface and occupies space. It is characterized by horizons or layers and/or the ability to support rooted plants in a natural environment. The upper limit is air or shallow (2.5 m/8.2 feet) water and the lower limit is either bedrock or the limit of biological activity. Soil consists of organic layers of decomposed organic material and mineral layers primarily of sand, silt, and clay, with varying amounts of organic matter. There are three types of decomposed organic material:

Peat (fibric)	↔	Mucky Peat (hemic)	↔	Muck (sapric)
Least decomposed				Most decomposed

3. Hydric soils are formed under conditions of saturation, flooding, or ponding during the growing season that is of sufficient duration to develop anaerobic conditions in the upper layers. The chemical reduction of iron (Fe) and manganese (Mn) leads to the development of soil characteristics that indicate the presence of hydric soils. There are four hydric soil criteria:

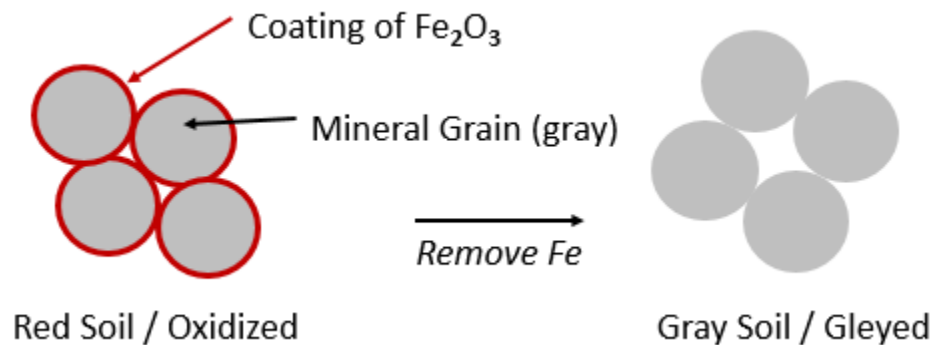
- a. organic soils (includes most Histosols and Histels);

- b. mineral soils with high water tables (generally  $\leq 12$  inches below the surface);
- c. soils that are frequently ponded for long (7-30 days) or very long ( $\geq 30$  days) duration during the growing season, and;
- d. soils that are frequently flooded for long or very long duration during the growing season.

Artificial drainage will not alter hydric soil status but it can alter soil properties, such as decreasing the amount of organic matter, increased soil compaction, shift in microbial populations and changed pH and salinity. The primary reference for this section is the Natural Resource Conservation Service, *Field Indicators of Hydric Soils in the United States* and the Regional Supplements.

- a. Frequently - at least five years in ten or 50% probability in any one year.
- b. Long duration - a single event that lasts seven to 30 days.
- c. Very long duration - a single event that last more than 30 days.

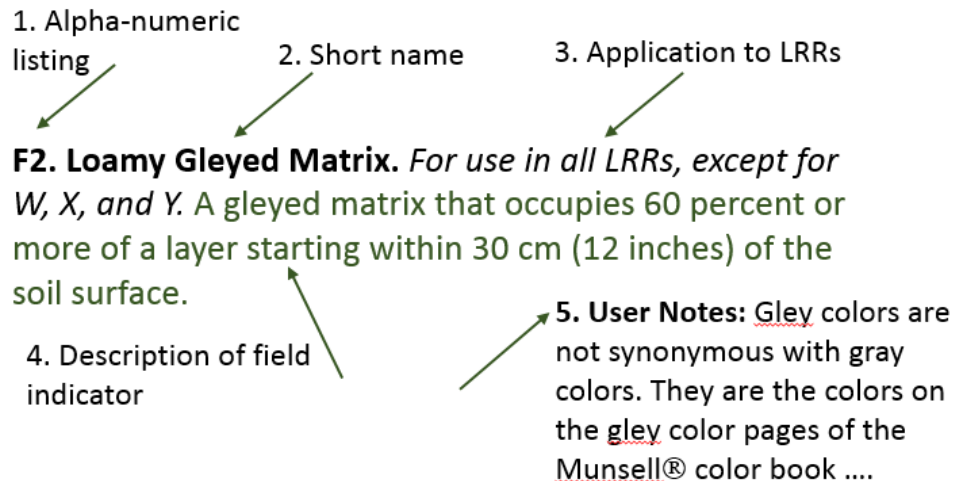
4. Hydric soils are developed through a process of inundation or soil saturation that leads to anaerobic conditions. The anaerobic conditions result in the chemical reduction of Fe, Mn, and other elements and leads to the development of distinct soil characteristics such as dark or grey soils or redox features. When saturated and reduced, Fe and Mn are mobile and can be stripped from soil particles. This will lead to a mineral grain color, usually a neutral gray.



**Figure 5. Oxidation/reduction and soil color**

5. A hydric soil indicator is a distinctive characteristic of the soil that persists during both wet and dry periods. Indicators have a five-part structure:





**Figure 6. Structure of a hydric soil indicator**

There are three indicator categories:

A - All soils, regardless of texture. Exercise caution, this requires exacting amounts of organic carbon. Amount is often over-estimated.

S - Sandy soils

F - Fine soils (loamy/clayey)

6. Each field indicator includes specific control section or zone requirements that must be met in order for the soil to qualify for that indicator.

Layers with: - high value, low chroma or;  
- redoximorphic features or;  
- organic matter accumulations

At a depth

Of a certain thickness

**F3. - Depleted Matrix.**

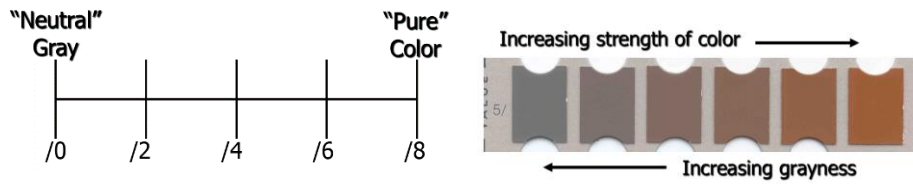
A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

- a. 5 cm (2 inches) if the 5 cm starting at a depth  $\leq 10$  cm (4 inches) of the soil, or
- b. 15 cm (6 inches), starting at a depth  $\leq 25$  cm (10 inches) from the soil surface.

7. Determining Soil Color Using the Munsell® System. Each layer of the soil profile must be evaluated to determine the color, to include its hue, value and chroma. The Munsell Soil Color Book is one of several available to analyze soil samples for color characteristics. The most common Soil-Color Chart used in Indiana is the 10YR hue. Hue is the spectral color in relation to red (R), yellow (Y), yellow-red (YR), and gray (GY). Value is the lightness or darkness of color. The range is from 0 (absolute black) to 10 (absolute white) and are listed on the left of each chart.

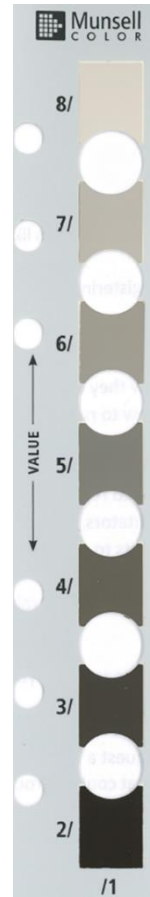
Chroma indicates the strength of color. The range is from 0 (neutral grays) to 8 (for soils) and are listed on the bottom of each chart. Color increases as you move to the right on the chart and grayness increases as you move to the left. A color may occur between Munsell chips. A soil matrix with a

chroma between 2 and 3 should be listed as having a chroma of 2.5. The Munsell notation includes the hue, value and chroma. For example 10YR 5/6 indicates a hue of 10YR, a value of 5 and a chroma of 6.



**Figure 7. Chroma or strength of color**

**Figure 8. Value or lightness or darkness or color Munsell® 10YR**



8. Depleted matrix - Refers to a soil horizon or subhorizon from which iron has been removed or transformed by processes of reduction and translocation to create colors of low chroma and high value. A depleted matrix may change color upon exposure to air resulting in a reduced matrix.

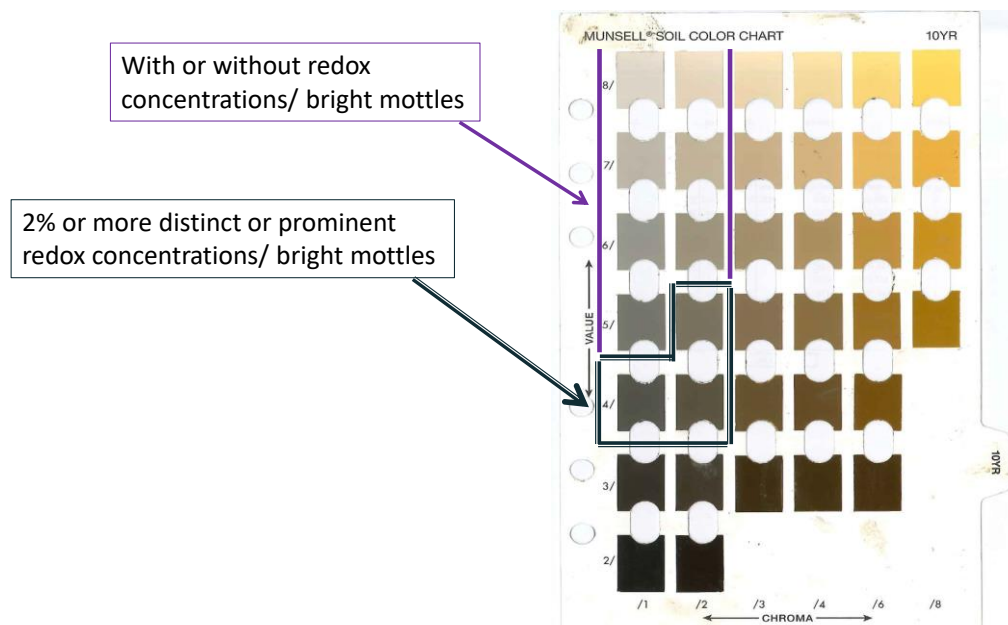
A depleted matrix is identified by:

- matrix value of 5 or more and chroma of 1, with or without redox concentrations as soft masses and/or pore linings; or
- matrix value of 6 or more and chroma of 1 or 2, with or without redox concentrations as soft masses and/or pore linings; or
- matrix value of 4 or 5 and chroma of 2, and has 2 percent or more distinct or prominent redox concentrations as soft masses and/or pore linings; or
- matrix value of 4 and chroma of 1, and has 2 percent or more distinct and prominent redox concentrations as soft masses and/or pore linings.



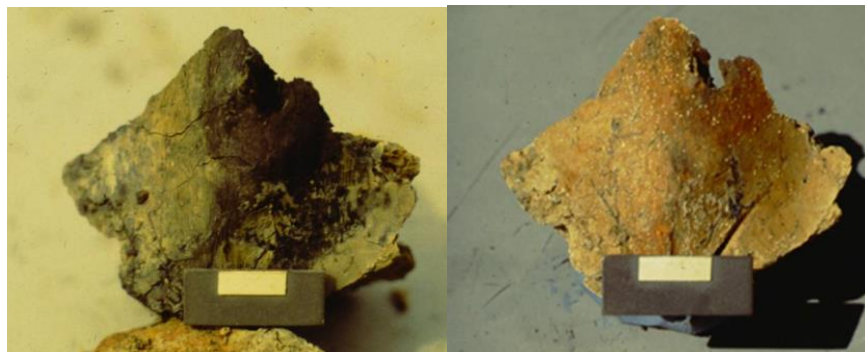
**Depleted matrix**





**Figure 9. Depleted matrix on 10YR Munsell® Soil Color Chart**

9. Reduced Matrix - A reduced matrix is a matrix that upon initial exposure to air that fits the color requirements of a depleted matrix or a gleyed matrix. After exposure to air for about 30 minutes, it changes color to a redder hue or higher chroma. This indicates that reduced Fe is present.  $\text{Fe}^{2+}$  is oxidized to  $\text{Fe}^{3+}$  upon exposure.



**Reduced matrix.**

Left photo has a depleted/gleyed matrix upon initial exposure to air. The right photo is the soil sample after being air dried for seven days. The darker red areas are the most reduced.

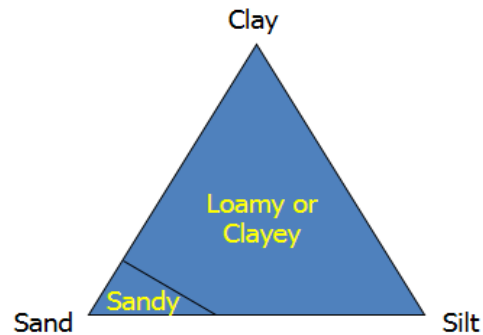
10. Gleyed Matrix - A gleyed matrix has the following values of hue, value and chroma and the soils are not glauconitic:

- a. 5G with value of 4 or more and a chroma of 1 or 2;
- b. N with value of 4 or more, or;

- c. 10Y, 5GY, 10GY, 10G, 5BG, 10BG, 5B, 10B, or 5PB with value of 4 or more and a chroma of 1.
- d. May be found in Indiana bogs and fens.
- e. See Gley 1 and Gley 2 in the Munsell® Soil Color Charts.

11. See the Natural Resource Conservation Service, *Field Indicators of Hydric Soils in the United States* and the Regional Supplements for information on the hydric soil indicators listed on the data form.

12. Soil Texture - The soil texture indicates the mineral component of the soil. A simple test is called the “rub test.” See Appendix C. It differentiates between sand (0.05-2.00 mm), silt (0.002-0.05 mm) and clay (<0.002 mm). For wetland delineation purposes, the ability to classify soil textures into sandy, loamy, or clayey is usually sufficient.



**Figure 10. Basic soil texture triangle**

## H. Growing Season

1. The Midwest Regional Supplement states that the growing season dates are determined through onsite observations of the following indicators of biological activity in a given year: (1) above ground growth and development of vascular plants, and/or; (2) soil temperature. If onsite data gathering is not practical, growing season dates may be approximated by using Wetlands (WETS) climate tables available from the Natural Resources and Conservation Service (NRCS) [National Water and Climate Center](#) to determine the median dates of 28°F air temperatures in spring and fall based on long-term records gathered at the nearest appropriate National Weather Service’s meteorological station.
2. Soil temperature and vegetation growth are used to make an onsite measurement of the growing season:
  - a. Soil temperature measured at 12” depth that must be 41°F or higher. A one-time temperature measurement during a field visit is sufficient.
  - b. Vegetation growth or development is confirmed when two (or more) of the following are present:
    - i. Emergence of herbaceous plants from the ground.

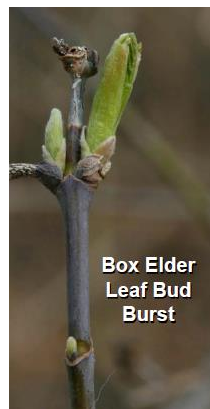
- ii. Appearance of new growth from vegetative crowns.



- iii. Cotyledon emergence from seed.



- iv. Bud burst on woody plants.



- v. Emergence or elongation of leaves of woody plants

vi. Emergence or opening of flowers



- c. The investigator will need to be experienced in vegetation identification to be able to identify early growth, particularly of herbaceous plants.
- d. Supporting data should be recorded on the data sheet to include the type of biological activity observed. Photo documentation is also recommended.

5. The growing season should be similar throughout the state. As an example, the growing season for the Chicago area is April 6 to November 2, whereas it is from April 3 to November 3 for the Cincinnati area. The Indiana growing season is generally considered to be mid-April through mid-October.

6. The growing season ends when woody deciduous species lose their leaves and/or the last herbaceous plants cease flowering and their leaves become dry or brown as a result of cold temperatures and/or reduced moisture availability.

## **I. Cowardin Classification System**

1. The Cowardin Classification System is used to classify the water resources located in the project area. The system was developed by the U.S. Fish and Wildlife Service to support the detailed classification, inventory and monitoring of wetland habitats. It was used in the development of the NWI and is currently represented by the 2013 edition of the Wetlands Classification Standard published by the Federal Geographic Data Committee (FGDC). The classification code for each system, class, subclass and modifier is included in parenthesis.

2. The FGDC defines wetlands as:

Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with

water or covered by shallow water at some time during the growing season of each year. (FGDC, p. 6-7)

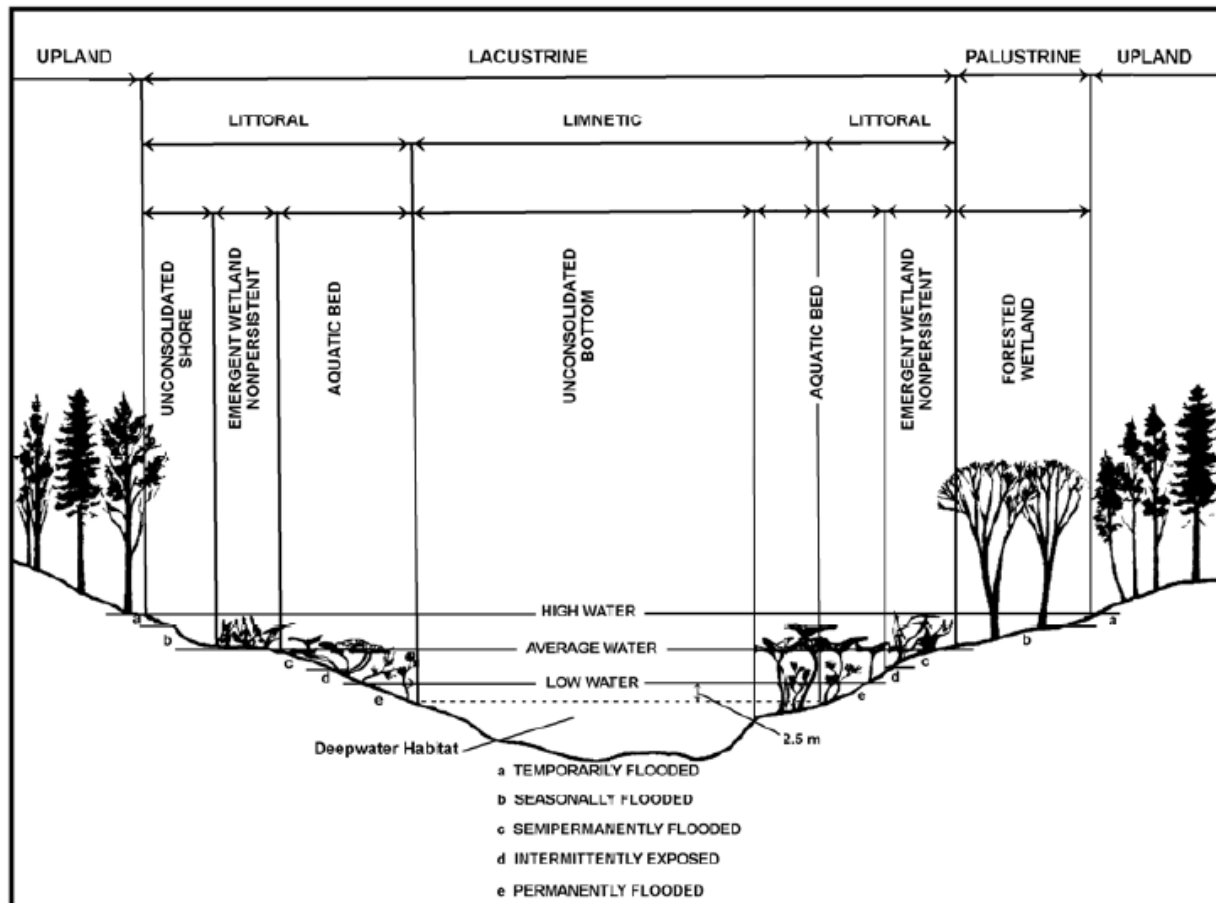
3. The FGDC defines deepwater habitats as:

Permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live, whether or not they are rooted in, or attached to, the substrate. (FGDC, p. 8)

4. The FGDC characterizes the upland limit of wetlands by:

(1) the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or zerophytic cover; (2) the boundary between soils that is predominantly hydric and soil that is predominantly nonhydric; and (3) the boundary between land that is flooded or saturated at some time during the growing season each year and land that is not. ... The boundary between wetlands and deepwater habitat in the Riverine and Lucastrine Systems lies at a depth of 2.5 m (8.2 ft) below low water; however, if emergent, shrubs or trees grow beyond this depth at any time, their deepwater edge is the boundary. (FGDC, p. 8)

5. There are five Cowardin Classification systems. A system is a complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical or biological factors. Marine and estuarine systems are associated with salt water environments. The fresh water systems, lucastrine, palustrine and riverine, can be found in Indiana.



**Figure 11. Distinguishing Features and Habitats of the Lucastrine System**

Source: FGDC-STD-004-2013

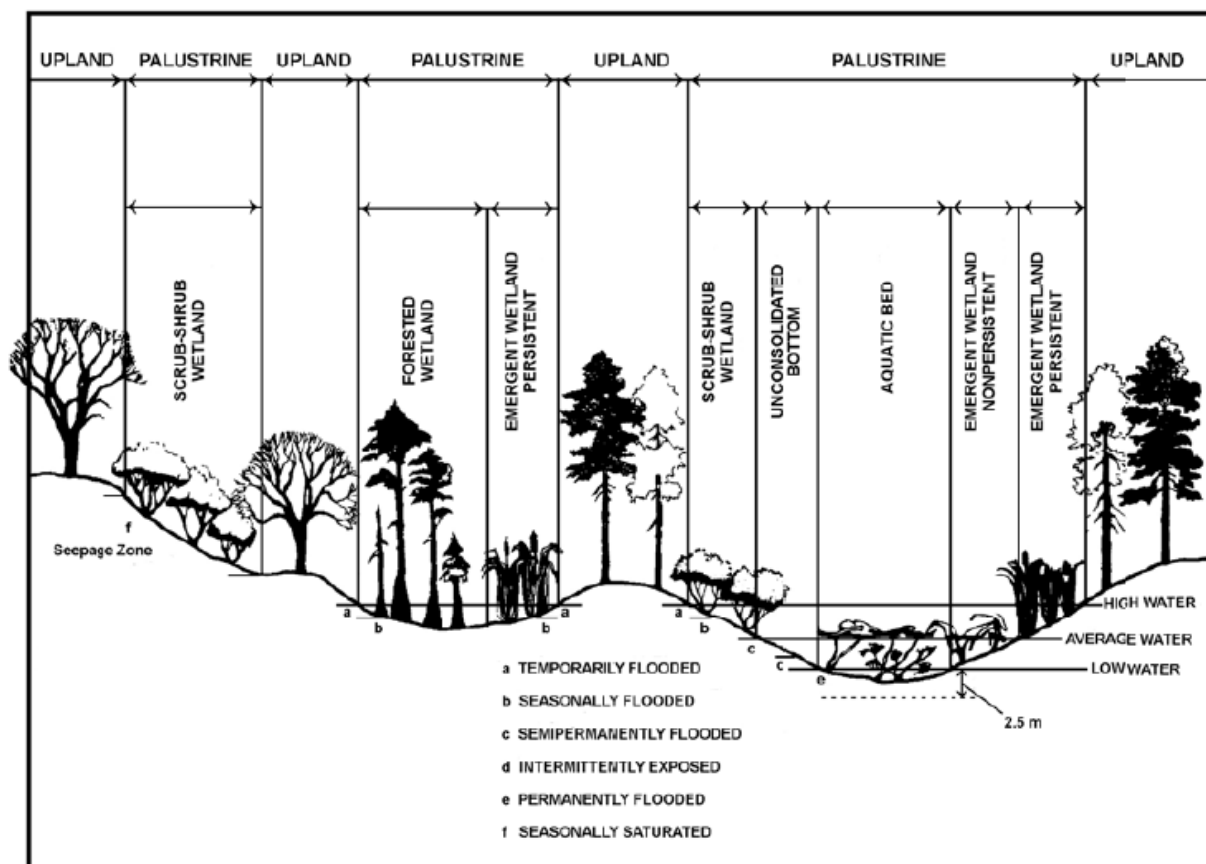
- a. Lucastrine (L) systems include wetlands and deepwater habitats with all the following characteristics:
  - i. Situated in a topographic depression or dammed river channel;
  - ii. Lacking trees, shrubs, persistent emergent, emergent mosses, or lichens with greater than 30 percent areal coverage, and;
  - iii. Total area exceeds 20 acres. Areas less than 20 acres may be included in the lacustrine system if an active wave formed or bedrock shoreline makes up all or part of the boundary, or if water is greater than 6.6 feet in the deepest part of the basin at low water.
  - iv. It is bounded by upland or by wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens.
- b. Palustrine (P) systems include all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Areas lacking such vegetation are also included if they have all of the following characteristics:
  - i. Area less than 20 acres;
  - ii. No active wave formed or bedrock shoreline;
  - iii. Water depth in deepest part of basin less than 8.2 feet at low water, and;



iv. Less than 0.5 ppt salinity due to ocean derived salts.

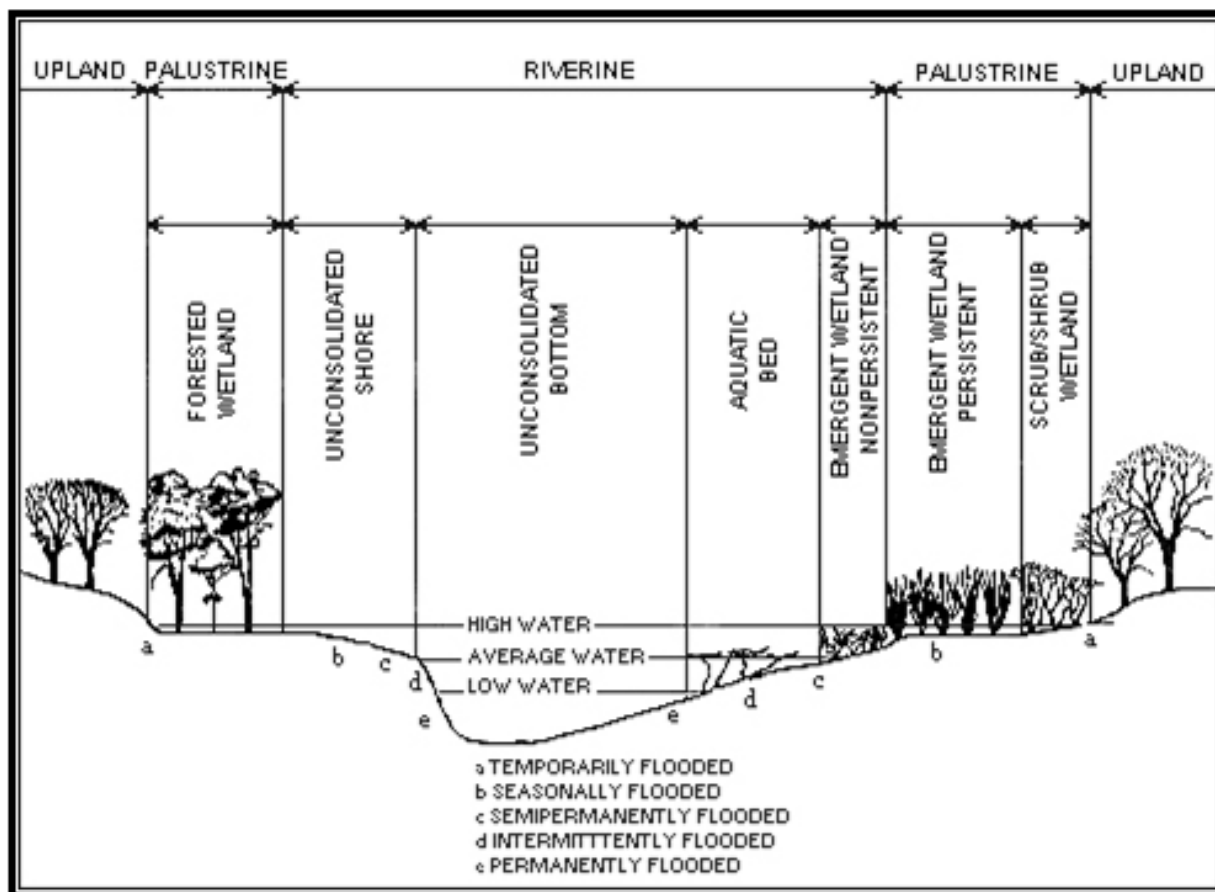
Palustrine systems may be situated at the edge of a lake or river or in river floodplain. It is bounded by upland or any of the other systems. It includes small, shallow, permanent or intermittent water bodies, i.e. ponds.

- c. Riverine (R) systems includes all wetland and deepwater habitats contained within a channel except wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens or habitats with water containing ocean derived salts. A channel is “an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water” (FGDC, p. 8). It is bounded on the landward side by upland, by the channel bank (including natural and man-made levees, or by wetlands dominated by trees, shrubs, persistent emergent, emergent mosses, or lichens.



**Figure 12. Distinguishing Features and Habitats of the Palustrine System**

Source: FGDC-STD-004-2013



**Figure 13. Distinguishing Features and Habitats of in the Riverine System**

Source: FGDC-STD-004-2013

3. The five subsystems relevant to Indiana are:
  - a. Intermittent (R4) - Flowing water present only part of the year. When water is not flowing, it may remain in isolated pools or surface water may be present.
  - b. Lower Perennial (R2) - Water velocity slow, but some water flows throughout the year. Gradient is low. The substrate consists of sand and mud. Oxygen deficits may occur.
  - c. Upper Perennial (R3) - Gradient high, water velocity fast. Water flows throughout the year. Substrate consists of rock, cobble, gravel, and sand. Dissolved oxygen content high.
  - d. Limnetic (L1) - Includes all deepwater habitats (greater than 8.2 feet deep below low water).
  - e. Littoral (L2) - Includes all wetland habitats in the lucastrine system from the shoreward boundary to a depth of 8.2 feet below low water.
  - f. Intermittent, lower perennial, and upper perennial are associated with riverine systems while limnetic and littoral are associated with lacustrine systems.



4. The systems and subsystems can be further defined by class. Class describes the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate.

- a. Aquatic Bed (AB) - Includes wetlands and deepwater habitats where plants that grow principally on or below the surface of the water (i.e., surface plants or submergents) are the uppermost life form layer with at least 30 percent areal coverage. The plant communities require surface water for optimum growth and reproduction.
- b. Emergent (EM) - Emergent plants, i.e., erect, rooted, herbaceous hydrophytes, excluding mosses and lichens, are the tallest life form with at least 30 percent areal cover. Vegetation is present for most of the growing season in most years and is usually dominated by perennial plants. The two subclasses are:
  - i. Persistent (1) - Areal coverage of persistent emergents exceeds that of non-persistent emergents. Persistent emergents are emergent hydrophytes whose stems and leaves are evident all year above the surface of the water, or above the soil surface if surface water is absent.
  - ii. Non-persistent (2) - Areal coverage of non-persistent emergents exceeds that of persistent emergents. Non-persistent emergents are emergent hydrophytes whose stems and leaves are evident above the water surface, or above the soil surface if surface water is absent, only during the growing season or shortly thereafter. During the dormant season, there is no obvious sign of emergent vegetation.
- c. Forested (FO) - Woody vegetation (trees) that are at least 20 feet tall are the dominant (30 percent or more areal coverage) life form. The common subclasses in Indiana are:
  - i. broad-leaved deciduous (1);
  - ii. needle-leaved deciduous (2), to include -
    - Taxodium distichum*, Southern cypress, found in SW Indiana
    - Larix laricina*, Tamarack, found in Northern Indiana, and;
  - iii. dead (5).
- d. Rock Bottom (RB) - All wetlands and deepwater habitats with substrates having an areal cover of stones, boulders, or bedrock cover 75 percent or greater and vegetative cover of <30%.
- e. Rocky Shore (RS) - Includes wetland habitats characterized by bedrock, stones, or boulders which singly or in combination have an areal cover of 76 percent or more and an areal coverage by vegetation of <30%.
- f. Scrub-Shrub (SS) - Includes woody plants <20 feet tall with 30 percent or more areal coverage. Includes shrubs, tree species under 20 feet, and woody plants stunted because of adverse environmental conditions. The common subclasses in Indiana are:
  - i. broad-leaved deciduous (1);
  - ii. needle-leaved deciduous (2), to include -
    - Taxodium distichum*, Southern cypress, found in SW Indiana
    - Larix laricina*, Tamarack, found in Northern Indiana, and;
  - iii. dead (5).
- g. Streambed (SB) - Includes all wetlands contained within the intermittent subsystem of the riverine system. Streambed subclasses include: bedrock, rubble, cobble-gravel, sand, mud,

organic, and vegetated.

- h. Unconsolidated Bottom (UB) - All wetlands and deepwater habitats with at least 25 percent cover of particles smaller than stones and a vegetative cover < 30%. They are characterized by the lack of large stable surfaces for plant and animal attachment.
- i. Unconsolidated Shore (US) - Includes all wetland habitats having three characteristics: (1) unconsolidated substrates with <75% areal cover of stones, boulders, or bedrock; (2) < 30% areal cover of vegetation other than pioneer plants; and (3) water regimes to include irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, seasonally flooded-saturated, temporarily flooded, or intermittently flooded. They are characterized by substrates lacking vegetation except for pioneer plants that become established during brief periods when growing conditions are favorable.

5. A site can be described further using modifiers for the water regime. A modifier is included to fully describe the habitat. The non-tidal water regime modifiers are:

- a. Temporarily flooded (A) - Surface water is present for brief periods (from a few days to a few weeks) during the growing season, but the water table usually lies well below the ground surface for most of the season.
- b. Saturated (B) - Substrate saturated to the surface for extended periods during the growing season but surface water seldom present.
- c. Seasonally flooded (C) - Surface water is present for extended periods (generally for more than a month) during the growing season, but is absent by the end of the season in most years. When surface water is absent, the depth to substrate saturation may vary considerably among sites and among years.
- d. Seasonally flooded/saturated (E) - Surface water is present for extended periods (generally for more than a month) during the growing season, but is absent by the end of the season in most years. When surface water is absent, the substrate typically remains saturated at or near the surface.
- e. Semipermanently flooded (F) - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.
- f. Intermittently exposed (G) - Water covers the substrate throughout the year except in years of extreme drought.
- g. Permanently flooded (H) - Water covers the substrate throughout the year in all years.
- h. Intermittently flooded (J) - The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity. Weeks, months, or even years may intervene between periods of inundation. Dominant plant communities will fluctuate with soil moisture.
- i. Artificially flooded (K) - The amount and duration of flooding are controlled by means of pumps or siphons in combination with dikes, berms or dams.

6. Special modifiers are also available:

- a. Beaver (b) - Created or modified by beaver activity.

- b. Partially drained/ditched (d) - Wetland has been altered hydrologically, but soil moisture can still support hydrophytes.
- c. Farmed (f) - Soil surface has been mechanically or physically altered for the production of crops, but where hydrophytes would become reestablished if the farming were discontinued.
- d. Diked/Impounded (h) - Barrier obstructs inflow (dike) or outflow (impoundment) of water.
- e. Artificial (r) - Substrate material emplaced by humans. Includes concrete-lined drainage ways.
- f. Spoil (s) - Wetlands where deposition of spoil material (excavated and emplaced by humans) forms the primary substrate type.
- g. Excavated (x) - Lies in a basin or channel excavated by humans.

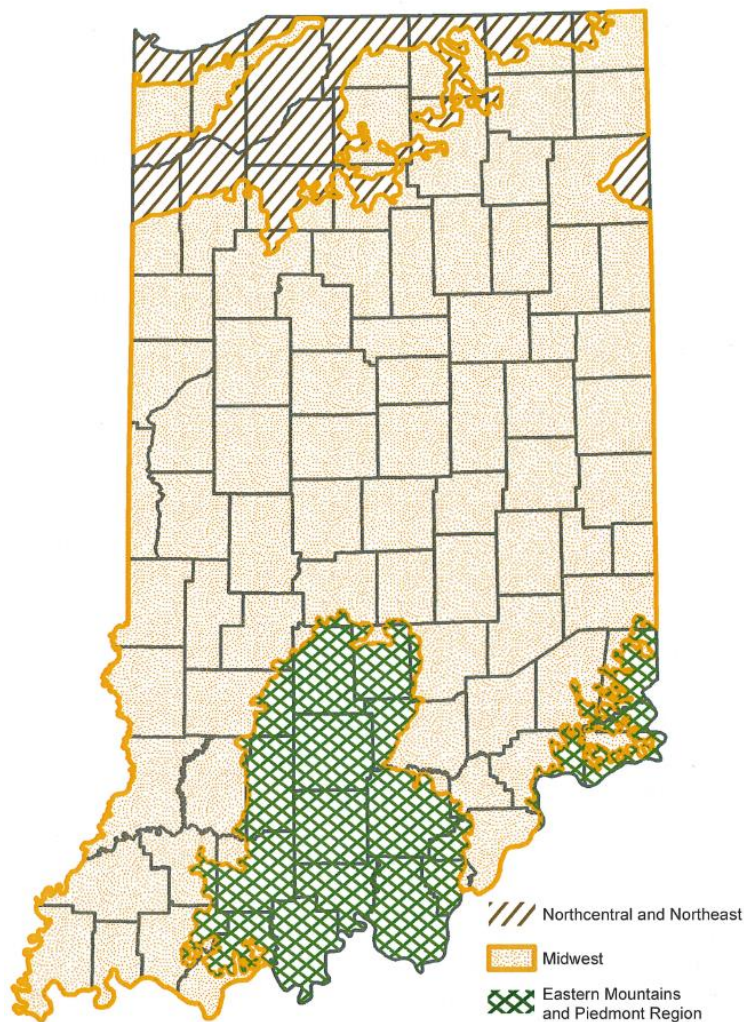
7. Labeling wetland and waterway features - The Wetlands and Deepwater Habitats Classification table should be used to classify features within the study area. The table is included in Appendix J. The feature should be identified down to the subclass, if appropriate, and include any modifier that is appropriate to the site. The designation on the NWI maps should be verified. Three examples are:

- a. PFO1A - Palustrine Forested Broad-Leaved Deciduous temporarily flooded
- b. R2UBH - River Lower Perennial Unconsolidated Bottom Permanently Flooded
- c. L1UBH - Lacustrine Limnetic Unconsolidated Bottom Permanently Flooded (Lake Michigan)

## IV. Conducting a Wetland Delineation

### A. Wetland Delineation Manual Regional Supplements

There are three USACE wetland delineation regions in Indiana - Midwest, Northcentral and Northeast, and Eastern Mountains and Piedmont. They have minor differences in approach and each has their own version of the USACE Wetland Determination Data Form. In addition, the wetland plants may have a different wetland indicator status. The appropriate regional supplement should be used as a reference when completing the data form and will take precedence over the Corps Manual. This chapter will use the Midwest Region form that covers most of the state. The regulatory agencies will not accept this form for projects located in other regions. Each regional supplement contains descriptions of the hydrophytic vegetation, hydric soil, and wetland hydrology indicators. They also include a discussion of difficult wetland situations, agricultural lands, problematic hydrophytic vegetation, problematic hydric soils, wetlands that periodically lack indicators of wetland hydrology, and wetland/non-wetland mosaics.



**Figure 14. Indiana Regional Supplement Boundaries.**

## B. Delineation of Wetland Boundaries

There are two methods for delineating wetland boundaries: for small areas ( $\leq 5$  ac) and for large ( $\geq 5$  ac) areas.

### For all areas -

**Step 1.** Locate the project area.

**Step 2.** Determine if the area is disturbed such that procedures for atypical situations must be used.

**Step 3.** Select a sampling approach (small or large area).

### For small areas -

**Step 4.** Identify and map the plant community types. Data points should be taken in all communities.

**Step 5.** Determine whether “normal environmental conditions” are present.

**Step 6.** Select a representative observation point in each plant community.

**Step 7.** Visually select dominant species from each stratum of the community.

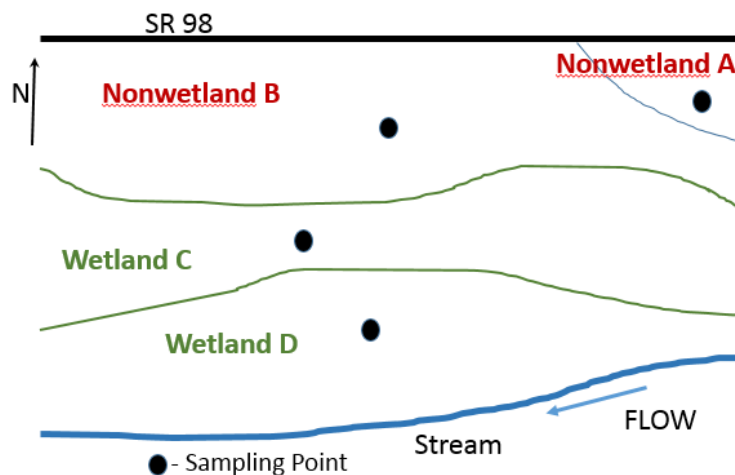
**Step 8.** Record the indicator status of each dominant species.

**Step 9.** Determine whether the vegetation is hydrophytic.

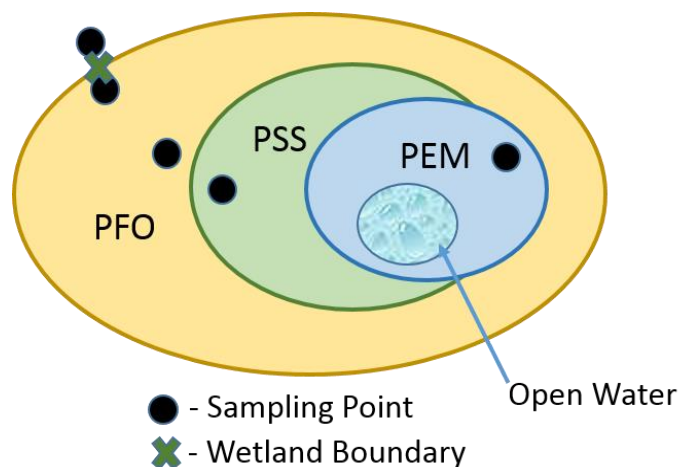
**Step 10.** Record indicators of wetland hydrology.

**Step 11.** Determine whether wetland hydrology is present.

**Step 12.** Determine whether the soil must be characterized. The soil is assumed to be hydric if: all dominant species are Obligate (OBL), or all dominants are OBL or Facultative wetland (FACW) and the wetland boundary is abrupt.



**Figure 15. Sampling method for small areas.**



**Figure 16. Sampling method for complex sites.**

**Step 13.** If needed, dig a soil pit.

**Step 14.** Record indicators of hydric soil.

**Step 15.** Determine whether the soil is hydric.

**Step 16.** Make the wetland determination in each plant community.

**Step 17.** Determine the wetland/nonwetland boundary. Confirm with an upland data point.  
Verify by walking the boundary and making minor adjustments based on soils and vegetation.

For large areas -

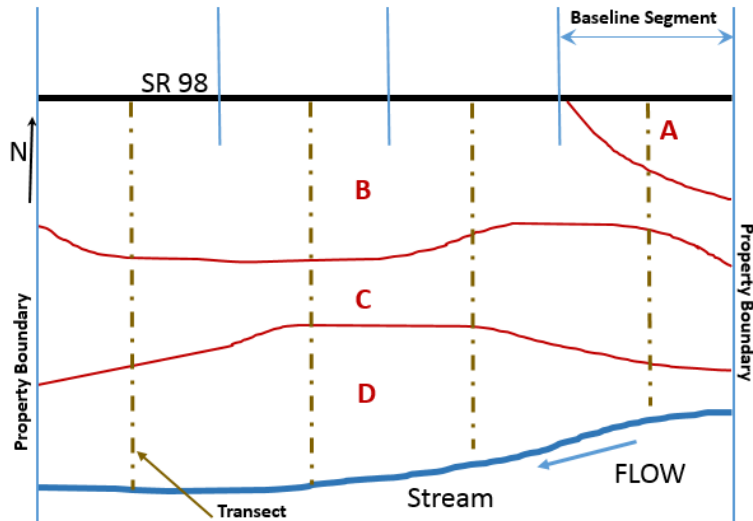
**Step 4.** Establish a baseline.

**Step 5.** Determine the number and position of transects. This table should be used to determine the minimum number of transects.

<u>Baseline Length (mi)</u>	<u>No. of Transects</u>
< 1.0	3
1.0 - 2.0	3 - 5
2.0 - 4.0	5 - 8
> 4.0	8 or more*

\* The interval between transects should not exceed 0.5 mile.

**Table 1. Minimum Number of Transects.**



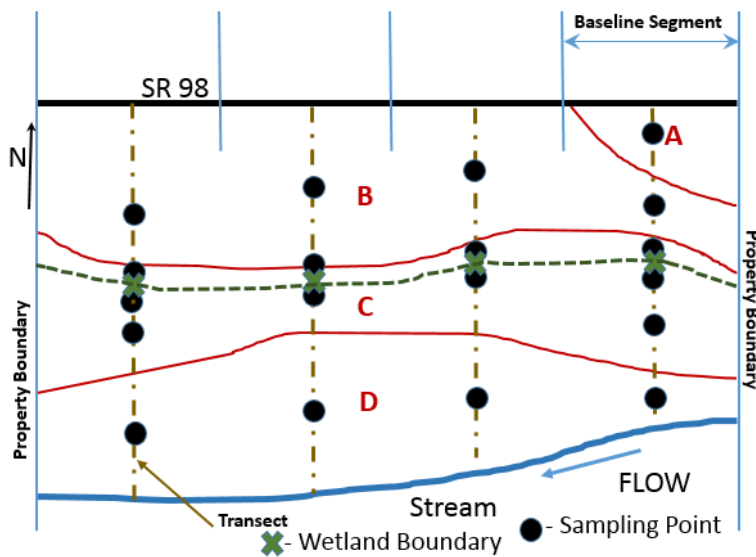
**Figure 17. Establishing Transects.**

**Step 6.** Sample points along the first transect:

- Determine whether “normal environmental conditions” are present.
- Establish an observation point in the first plant community.
- Characterize vegetation, soil, and hydrology and record on data sheet.
- Make the wetland determination for the point.
- Sample the remaining points in the transect.
- Determine wetland boundary between wetland and upland data points.

**Step 7.** Sample the remaining transects.

**Step 8.** Synthesize data and determine the wetland boundary between transects.



**Figure 18. Establishing the wetland boundary for a large area.**



## C. Completing Wetland Determination Data Forms

1. Wetland delineations must be based on the best available information, interpreted in the light of the investigator's training, experience, and professional judgement. The data forms are part of the minimal requirement for a report and must be filled out completely. For each wetland data point an upland data point is required to determine the wetland boundary. Use the current data form for the correct region.

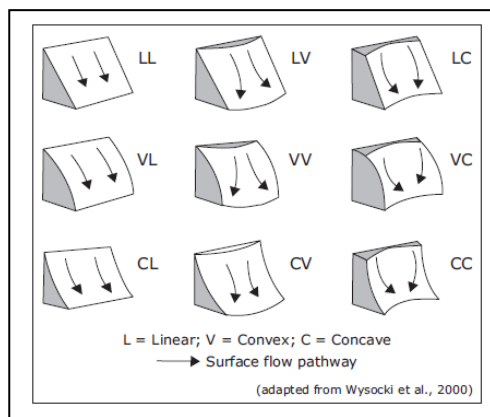
**WETLAND DETERMINATION DATA FORM - Midwest Region**

Project/Site: _____		City/County: _____	Sampling Date: _____
Applicant/Owner: _____		State: _____	Sampling Point: _____
Investigator(s): _____		Section, Township, Range: _____	
Landform (hillslope, terrace, etc.): _____		Local relief (concave, convex, none): _____	
Slope (%): _____	Lat: _____	Long: _____	Datum: _____
Soil Map Unit Name: _____		NWI Classification: _____	
Are climatic/hydrologic conditions of the site typical for this time of the year? Yes _____ No _____ (If no, explain in remarks)			
Are vegetation _____, soil _____, or hydrology _____ significantly disturbed?		Are "normal circumstances" present? Yes _____ No _____	
Are vegetation _____, soil _____, or hydrology _____ naturally problematic?		remarks.)	

**Figure 19. Wetland Determination Data Form Header.**

### 2. Data Form Header

- a. Project/Site - Include road type and number, DES number, and project type.
- b. Sampling Point - The points should be numbered logically and should be planned prior to going in the field. For example, for the first location, include a data form for Wetland (1A) and Upland (1B).
- c. Landform - hillslope, terrace, etc.
- d. Local relief - concave, convex, none
- e. Slope (%) - The ground surface inclination with respect to the horizontal plane made downslope.
- f. Typical climatic/hydrologic conditions - Having the distinctive qualities of a particular climatic or hydrologic condition.
- g. Significantly disturbed - Sufficiently great, important, or noteworthy disturbance.
- h. Naturally problematic - A situation that presents a problem or difficulty that exists in or is caused by nature.



**Figure 20. Concave and Convex Comparison.**

Source: USDA-NRCS Field Book



- i. Normal circumstances - Occurring naturally.

Alluvial cone, fan or flat		Axial stream	Berm	Blowout
Bluff	Bog	Brained stream	Collapse sinkhole	
Depression	End Moraine	Ephemeral stream	Erosion remnant	
Escarpment	Esker	Fen	Flat	Flatwoods
Flood Plain	Ground moraine	Hill	Hillslope	
Intermittent stream		Island	Kame	
Kame moraine or, terrace		Karst cone	Lake	
Lateral moraine	Levee	Marsh	Meander	Moraine
Natural levee	Overflow stream channel		Oxbow	Oxbow lake
Perennial stream	Pothole	Pothole lake	Ravine	
Recessional moraine		River	River valley	Saddle
Seep	Sinkhole	Slough	Stream	Stream terrace
Swale	Swallow hole			

**Figure 21. Landforms.**

Source: USDA-NRCS Field Book

### 3. Vegetation Assessment

a. Hydrophytic vegetation - Hydrophytic vegetation is the community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to exert a controlling influence on the plant species present. The community is dominated by species that can tolerate prolonged inundation or soil saturation.

b. Vegetation is divided into four stratum -

- i. Tree - woody plants 3” or more dbh, sampling radius - 30’
- ii. Sapling/shrub - woody plants less than 3” dbh, but greater than 3.2’ in height, sampling radius - 15’
- iii. Herb - all non-woody plants and/or woody plants less than 3.2’ in height, sampling radius - 5’
- iv. Woody Vine - all vines greater than 3.2’ in height, sampling radius - 30’

c. There are five wetland indicator status’ used to classify plants -

- i. Obligate (OBL) - obligate wetland plant (greater than 99 percent chance of occurring in a wetland)
- ii. Facultative wetland (FACW) - facultative wetland plant (67-99% chance of occurring in a wetland)

- iii. Facultative (FAC) - facultative plant (34-66%) chance of occurring in a wetland)
  - iv. Facultative upland (FACU) - facultative upland plant (1-33% change of occurring in a wetland)
  - v. Upland (UPL) - upland plant (less than 1 percent chance of occurring in a wetland)
- d. Absolute cover - An estimate of the prevalence of each species over the entire stratum in the sampling plot. The total absolute cover can exceed 100 percent within each stratum. It includes species overhanging the plot but rooted outside. The same species can be found within multiple stratum.
- e. If not using an electronic form, verify that the current scientific name and indicator status is used. Species should be listed from highest percent cover to the lowest.
- f. Apply the indicators in the sequence presented on the data form. Only one or two indicators (variations of the dominance test) may need to be evaluated in the majority of wetland determinations. Hydrophytic vegetation is present if any of the indicators is satisfied.
- g. There are three tests for determining the dominant species -
- i. Rapid Test - All dominant species across all strata are rated OBL or FACW based on visual sampling. It provides a quick confirmation in obvious cases where a site has hydrophytic vegetation.
  - ii. Dominance Test - More than 50 percent of the dominant species across all strata are rated OBL, FACW or FAC. The 50/20 rule is used to select the dominant species.
- 50/20 Rule
- Estimate % cover for each species and sum to get total cover.
  - Identify the species that sum to more than 50 percent of total cover and any individual species that accounts for 20 percent or more of total cover.
  - A species may be counted more than once if in more than one stratum.
- iii. Prevalence Index - The range is from 1.0 to 5.0. At least 80 percent of the total vegetation in the plot has to be accurately identified and have an assigned indicator status (including upland). It is passed if the index is 3.0 or less.

**VEGETATION -- Use scientific names of plants.**

Tree Stratum	(Plot size: _____)	Absolute % Cover	Dominant Species	Indicator Status	<b>Dominance Test Worksheet</b> Number of Dominant Species that are OBL, FACW, or FAC: _____ 0 (A) Total Number of Dominant Species Across all Strata: _____ 0 (B) Percent of Dominant Species that are OBL, FACW, or FAC: _____ 0.00% (A/B)
1					
2					
3					
4					
5					
		0	= Total Cover		<b>Prevalence Index Worksheet</b> Total % Cover of: OBL species _____ 0 x 1 = _____ 0 FACW species _____ 0 x 2 = _____ 0 FAC species _____ 0 x 3 = _____ 0 FACU species _____ 0 x 4 = _____ 0 UPL species _____ 0 x 5 = _____ 0 Column totals _____ 0 (A) _____ 0 (B) Prevalence Index = B/A = _____
<b>Sapling/Shrub stratum</b> (Plot size: _____)					
1					
2					
3					
4					
5					
		0	= Total Cover		<b>Hydrophytic Vegetation Indicators:</b> 1 - Rapid Test for Hydrophytic Vegetation 2 - Dominance Test is >50% 3 - Prevalence Index is ≤3.0 <sup>1</sup> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) _____  <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
<b>Herb stratum</b> (Plot size: _____)					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
		0	= Total Cover		<b>Hydrophytic vegetation present?</b> Yes _____ No _____
<b>Woody vine stratum</b> (Plot size: _____)					
1					
2					
		0	= Total Cover		

Remarks: (Include photo numbers here or on a separate sheet)

**Figure 22. Midwest region wetland determination data form vegetation section.**

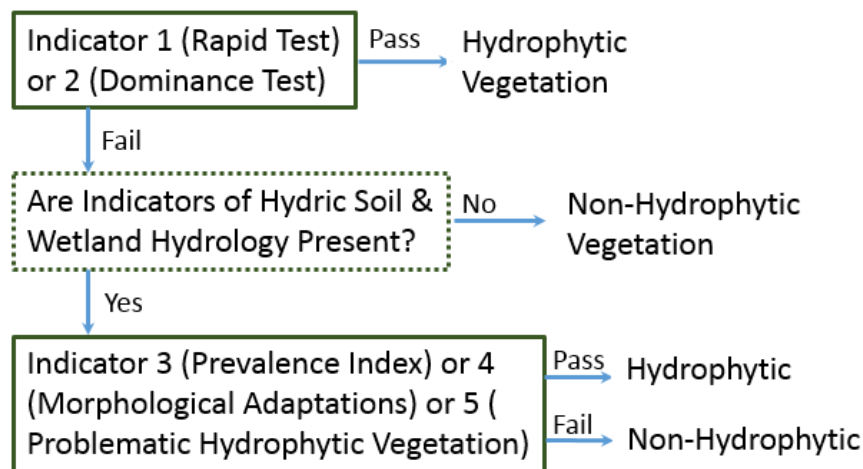
h. Morphological Adaptations - The plant community passes either the dominance test or the prevalence index after reconsideration of the indicator status of certain plant species that exhibit morphological adaptations for life in wetlands. Morphological adaptations may develop on FACU species when they occur in wetlands, indicating they are functioning as hydrophytes in that setting. Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

- i. More than 50 percent of the individuals of a FACU species must exhibit such adaptations.
- ii. Indicator status of qualifying species are labeled as FAC for this site.
- iii. Morphological adaptations include:
  - buttressed tree trunks,
  - multiple trunks,
  - pneumatophores (breathing roots),
  - adventitious roots,

- shallow roots,
- hypertrophied lenticels,
- aerenchyma (airy tissue found in the roots of plants for gas exchange),
- polymorphic leaves, and;
- floating leaves.

i. Problematic Hydrophytic Vegetation - Apply the procedure only where indicators of hydric soil and wetland hydrology are present, unless disturbed or problematic.

- Verify that at least one indicator of hydric soil and one primary or two secondary indicators of wetland hydrology are present.
- Verify that the area is in a landscape position that is likely to collect or concentrate water.
- Use either the specific problematic vegetation situation approaches or the general approaches to determine whether the vegetation is hydrophytic. Specific problematic vegetation situations include: temporal shifts in vegetation; riparian areas; areas affected by grazing; managed plant communities, and; areas affected by fires, floods, and other natural disturbances. General approaches to problematic hydric vegetation include: direct hydrologic observations; reference sites, and; review of technical literature. See the regional supplement for more detail.



**Figure 23. Applying vegetation indicators.**

j. Collecting Vegetation Data

- Sequence - herb, sapling/shrub and tree and woody vine strata. This order allows documentation of the herb stratum at the center of the vegetation plot before it gets trampled.
- Take photos of herb stratum prior to species identification and soil sampling.
- Use a tool to assist with measuring plot sizes if you're not accurate with your measurements. For example - 30 foot or more string, marked at 5, 15 and 30 foot intervals, with a large nail on end to secure at center point.

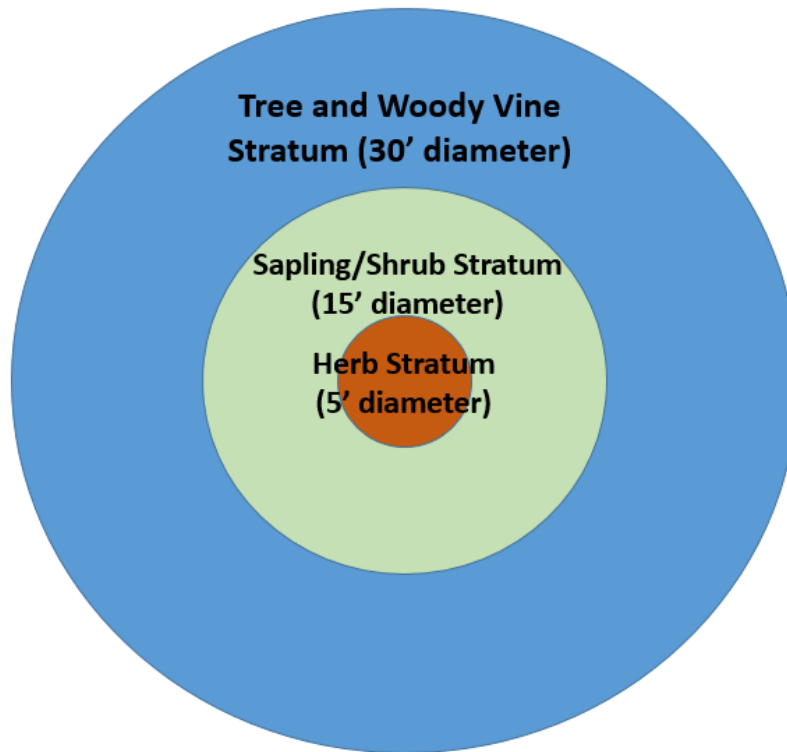


Figure 24. Vegetation strata.

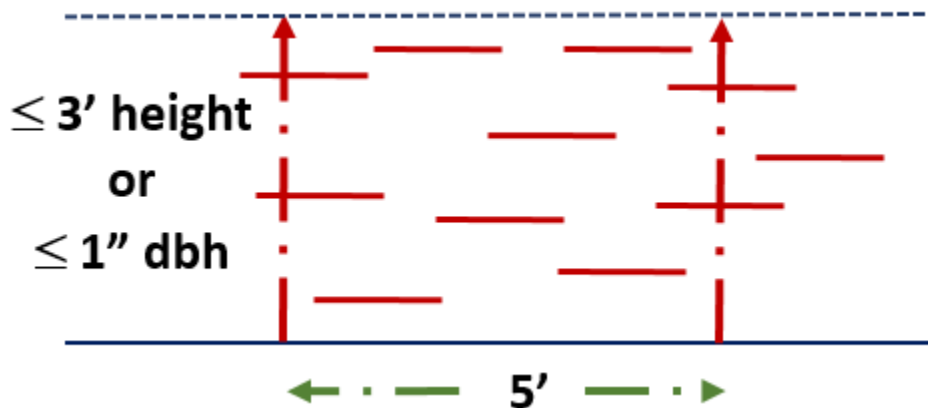
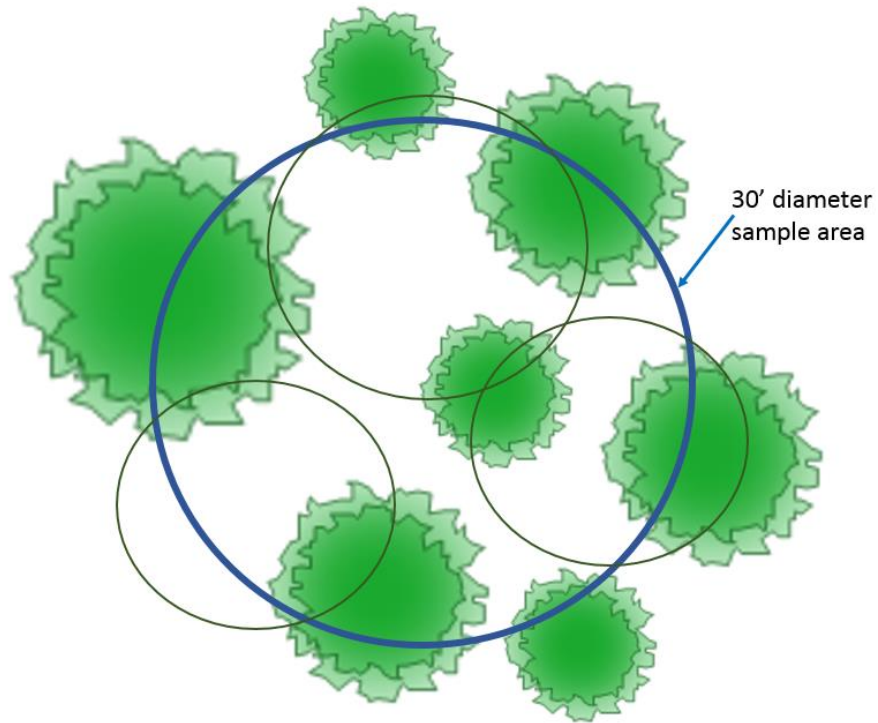
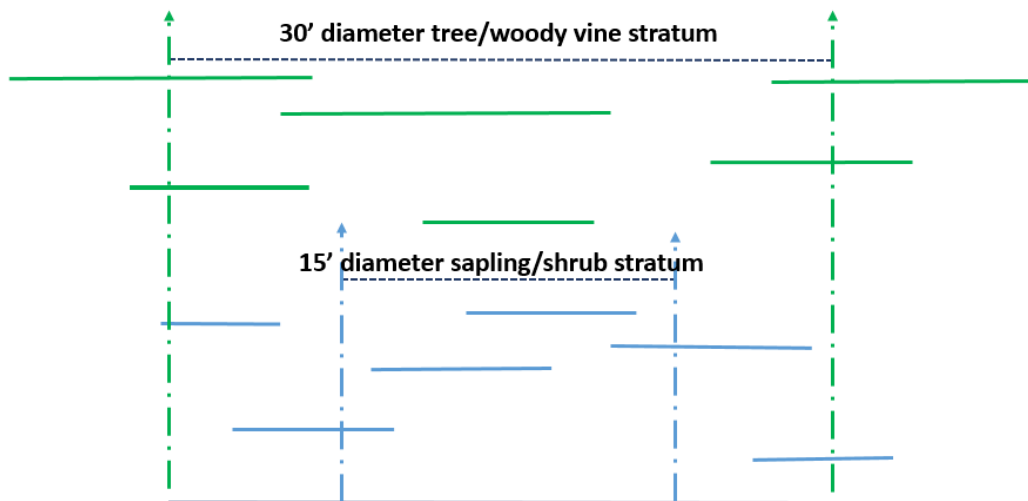


Figure 25. Side view of the herb stratum.

Note - Vines that are not twining should be included in the herb stratum.



**Figure 26. Overhead view of tree and woody vine stratum.**



**Figure 27. Side view of tree/woody vine and sapling/shrub strata.**

#### 4. Soil Assessment

- a. The following are procedures for obtaining a soil sample.
  - i. The sample point should be within the 5' herb stratum plot.
  - ii. The sample should be taken after collecting the herb stratum vegetation data.
  - iii. The final soil cut should be taken with a spade. The hole can be started with a shovel if this is easier. A soil probe can be used to determine the general location of a sample but should not be used to collect the data reported on the data sheet.
  - iv. Describe the soil to the depth needed to document the indicator or confirm the absence of indicators. This is generally from 18 to 20 inches.
  - v. The optimal conditions for obtaining a sample are natural light, clear sunny day, midday, light at right angles, and moist soil.
  - vi. Soil should be moist when evaluating color. The soil may need to dry to a moist state if too wet or require addition of water if too dry.
  - vii. Start below any fibric or hemric material. Remove any woody material larger than 2 cm that cannot be crushed or shredded when rubbed. Do not remove the organic surface layers. Start at the muck surface or mineral surface if muck is absent unless saturated organic material is > 8 inches thick.

- b. The next step is to document soil sample.
  - i. Complete soil section of data sheet.
  - ii. Photograph the sample area prior to disturbance and photograph the soil cut on the spade with a ruler prior to analysis.
  - iii. Evaluate for presence of layers (each a line in the profile).
  - iv. Note depth of each profile, starting from the top (zero).
  - v. Evaluate color for each layer to include matrix and redox using the Munsell® Soil Color Book.

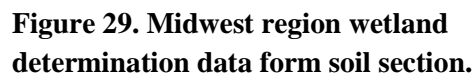


**Photo of Soil Sample**

- c. Terms
  - i. Degree of visual distinction between associated colors
    - Faint - evident only on close examination
    - Distinct - readily seen
    - Prominent - contrast strongly
  - ii. Abundance - Different indicators require different abundance thresholds. It is best to record an estimated percentage. See Figure 28.
  - iii. Location
    - Pore lining (PL) - coatings on the pore surface or impregnations of the matrix adjacent to the pore



- Figure 28. Percent (%) area coverage.**  
Source: USDA-NRCS Field Book, page 7-1

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d. Redoximorphic features includes redox concentrations (masses, pore linings and nodules and concretions), redox depletions (depleted matrix) and reduced matrix. Nodules and concretions are not considered to be redox concentrations unless indicated otherwise.

i. Redox concentrations are bodies of apparent accumulation of Fe/Mn oxides. They can be masses, pore linings (on ped faces and in root channels) and nodules and concretions.

ii. Masses are soft bodies that are frequently found in the soil matrix and will be variable in shape.

**Masses**



**Redox concentrations**

iii. Pore linings are coatings located on a pore surface. They can also be described as impregnations of the matrix adjacent to the pore.

**Pore linings**



- iv. Nodules and concretions are firm to extremely firm bodies that are often relict. Newer ones should be irregular in shape. They will have a diffuse boundary (halo or corona).

**Fe/Mn nodules  
washed from the soil**



- v. Redox depletions are bodies of low chroma where Fe/Mn oxides have been stripped out. They generally have a value of  $\geq 4$  and a chroma of  $\leq 2$ . They were formally called “gray mottles.”

**Redox depletions**



- vi. Depleted matrix has a dominant soil color of gray.

**Depleted matrix**



- vii. A reduced matrix soil has a high value and low chroma when undisturbed but will change color when exposed to air. Reduced Fe is present in the undisturbed soil and  $\text{Fe}^{2+}$  is oxidized to  $\text{Fe}^{3+}$  upon exposure.
- viii. For concentrations and depletions, describe the type, color, abundance, and location (i.e. along macropores or within matrix). For reduced matrix, describe the reduced matrix color, oxidized color, and time for the color change to occur.

- ix. Not all wet soils will develop redoximorphic features. Conditions that will impact development include low amounts of soluble organic carbon, high pH, cold temperatures, low amounts of Fe, and aerated ground water.
  - x. Soils in recently constructed wetlands will develop visible redox depletions within a couple years if saturation occurs during the growing season. Redox concentrations (pore linings) begin forming around aerated roots as soon as 7 days after flooding and may be visible after 30 days.
- e. Hydric soil indicators
- i. The regional supplements and *Field Indicators of Hydric Soils* should be used to verify the appropriate hydric soil indicators.
  - ii. The indicators that are more common in southern Indiana are A2, A3, A4, A11 and A12. The indicators that are not applicable to Indiana are A16, S7 and S3.
- f. Problematic hydric soils - Use the references to determine if problematic hydric soils are present. Examples of problematic hydric soils includes: shallow soils over limestone, fluvial sediments within floodplains, recently developed wetlands, seasonally ponded soils, or soils with high-chroma subsoils.

## 5. Hydrology Assessment

- a. Wetland hydrology is present if the area is inundated or saturated during the growing season at a frequency and duration sufficient to maintain vegetation and soil conditions characteristic of wetlands. The creation and maintenance of a wetland may vary based on climate, landforms, geology, soils and plant and animal adaptations. Geomorphic settings that accumulate or concentrate water include:
- i. concave surfaces (depressions or swales),
  - ii. drainage ways and floodplains,
  - iii. level or nearly level flats,
  - iv. toe slopes or areas of convergent slopes,
  - v. fringes of water bodies,
  - vi. areas with shallow restrictive layers, and
  - vii. discharge zones.
- Wetland hydrology indicators help ensure that soil and vegetation are not relicts of a past hydrologic regime. It is the least exact or more transitory of the three evaluation criteria.
- b. Wetland hydrology can be evaluated by observing the vegetation and soils. It reflects the medium- to long-term wetness history of the site. Hydrophytic vegetation and hydric soils are evidence of wetland hydrology if hydrology has not been altered.
- c. There are four wetland hydrology indicator groups -

A - observation of surface water or saturated soil



- B - evidence of recent inundation
- C - evidence of current or recent soil saturation
- D - evidence from other site conditions or data

Each indicator is categorized as “primary” or “secondary” by region. Only one primary indicator is required to indicate that wetland hydrology is present. It provides stand-alone evidence of current or recent saturation and may indicate long-lasting saturation. Two secondary indicators are required to indicate that wetland hydrology is present. Mark any indicator that is applicable.

d. The growing season date may be required to evaluate certain wetland hydrology indicators such as observations of surface water (A1), high water table (A2), or saturated soils (A3). It may also be required to monitor hydrology on a highly disturbed or problematic site.

e. See the Regional Supplements for information on the wetland hydrology indicators listed on the data form.

#### HYDROLOGY

Wetland Hydrology Indicators:			
Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)	
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Gauge or Well Data (D9) <input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> FAC-Neutral Test (D5)	
<b>Field Observations:</b> Surface water present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): <input style="width: 50px;" type="text"/> Water table present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): <input style="width: 50px;" type="text"/> Saturation present?    Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): <input style="width: 50px;" type="text"/> (includes capillary fringe)			<b>Wetland hydrology present?</b> <input style="width: 50px;" type="text"/>
Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:			
Remarks:			

**Figure 30. Midwest region wetland determination data form hydrology section.**

#### SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? <input style="width: 50px;" type="text"/> N Hydric soil present? <input style="width: 50px;" type="text"/> Wetland hydrology present? <input style="width: 50px;" type="text"/>	<b>Is the Sampled Area within a Wetland?</b> Yes <input style="width: 50px;" type="text"/> No <input style="width: 50px;" type="text"/>
Remarks: (Explain alternative procedures here or in a separate report.)	

**Figure 31. Midwest region wetland determination data form summary of findings section.**

## 6. Atypical Situations and Problem Areas

a. An atypical situation is an area in which indicators of one or more wetland factors have been removed or altered by some recent disturbance such as human activities. Human activities may include the removal of vegetation or soil, placement of fill, conversion to agriculture, channelization or drainage. Natural events may include a change in river course, beaver dams, and fires. The procedures in the Corps Manual focus on unauthorized activities. The procedures are different based on the factor that was disturbed. The discussion to support an atypical situation determination should include the following:

- i. Describe the alteration.
- ii. Describe the effects on vegetation, soils and hydrology. Examples - cleared or partially cleared, filled, excess water caused mortality, removal of selected species or layers, depth of fill, depth of plow zone, soil profile, soil compaction, and changes in the timing, frequency, or duration of inundation or soil saturation
- iii. Characterize the original vegetation and hydrology using historical resources such as aerial photography, site inspections, adjacent vegetation, reference site, NRCS records, etc. Characterize the original soils using soil surveys, characterization of excavated buried soils, and examination of adjacent areas.
- iv. Determine whether vegetation was hydrophytic, soils were hydric or if wetland hydrology was present.

### b. Man-Induced Wetlands

- i. A man-induced wetland is an area that has developed at least some characteristics of naturally occurring wetlands due to intentional or incidental human activities. Examples include irrigated wetlands, impoundment wetlands, and mitigation sites.
- ii. If indicators of hydrophytic vegetation and wetland hydrology are present, the soils can be assumed to be hydric.

### c. Difficult or Problem Area Wetlands

- i. A problem area wetland is one in which indicators may be periodically be lacking due to normal seasonal or annual variability. There are five problem area wetlands: agricultural lands, problematic hydrophytic vegetation, problematic hydric soils, hydrology periodically lacking, and wetland/non-wetland mosaics.
- ii. The wetland determination is made based on the best evidence available.