Bingham, S. N., C. C. Young, J. L. Haack-Gaynor , L. W. Morrison, and G. A. Rowell. 2016. Wetland monitoring protocol for Cuyahoga Valley National Park: Narrative. Natural Resource Report NPS/HTLN/NRR—2016/ 1336. National Park Service, Fort Collins, Colorado.

Standard Operating Procedure 3: Field Delineation of Wetlands

Version 1.00 (12/27/2016)

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

Contents

Figures and Tables

Standard Operating Procedure 3: Field Delineation of Wetlands

Authoritative Guidance and Standards

This protocol requires that the observer is a Certified Wetland Delineator and able to delineate wetlands in accordance with jurisdictional standards that the U.S. Army Corps of Engineers (USACE) has established. The authoritative guidance for this purpose is outlined in 1) USACE Wetland Delineation Manual (Environmental Laboratory 1987, Sections III, IV, and V) and 2) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0 (Environmental Laboratory 2012). This second publication contains information specific to the Northcentral and Northeast Regions of the United States and supercedes the 1987 manual where discrepancies exist. Cuyahoga Valley National Park (CUVA) is included in the area that the regional supplement covers. Wetland delineations completed at CUVA as part of this protocol are completed without the use of official sample plots in most cases. The visual indicators of wetland vegetation, wetland hydrology, and hydric soils (as specified in the manual), however, are always verified in the field during a delineation. Sample plots are used in problematic areas.

Most CUVA wetlands are discrete and will have well-defined boundaries. Some floodplain wetlands (generally along the Cuyahoga River and larger tributaries), however, are extensive systems with poorly defined boundaries. Contiguous wetlands within the same hydrogeomorphic (HGM) class are delineated together (Mack 2001). Changes in HGM class can be identified in the field "…where the volume, flow, source or, velocity of water moving through the wetland changes significantly" (Mack 2001; see "Field Identification of Hydrogeomorphic Classes"). This is often the case where slope wetlands intergrade with riverine wetlands at the base of the valley walls (Figure 3.1).

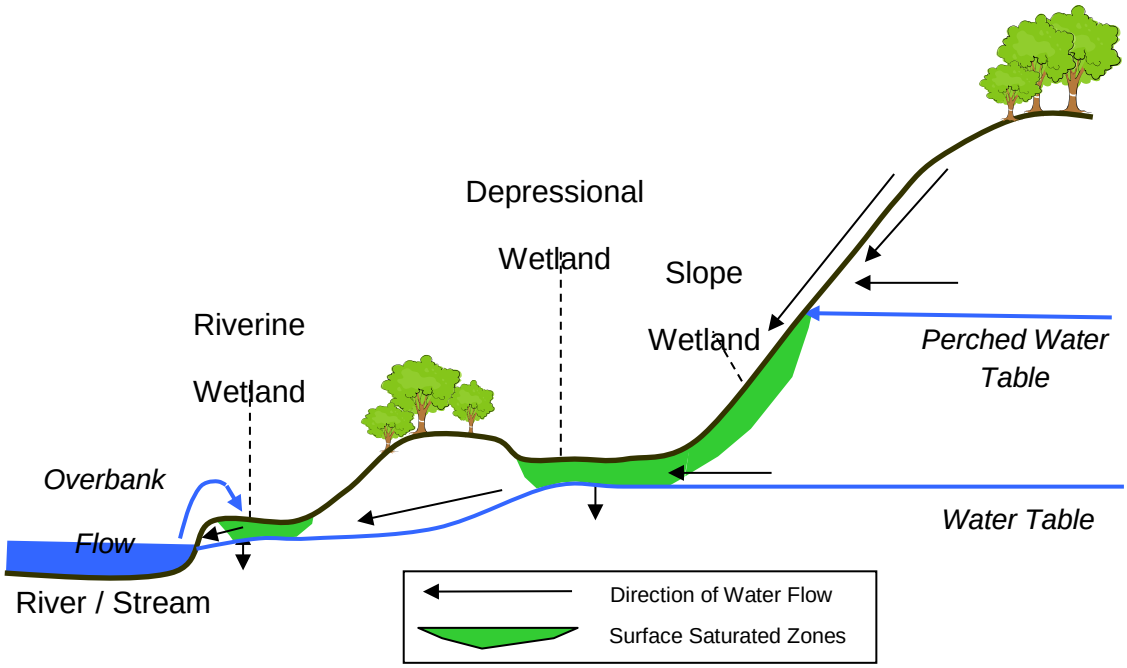

Figure 3.1. Cross-sectional view of dominant wetland hydrogeomorphic classes (depressional, riverine, slope) in Cuyahoga Valley National Park.

Navigation to Target Wetland

See SOP 2.

Delineation Procedure without Sample Plots

Intensively Assessed Wetlands

1. The wetland scientist uses visual wetland indicators (see field identification sections below) to locate and mark the boundary with pin flags for temporary visual reference. In some cases, the boundary is unclear and sample plots may be used to better define the boundary (see Delineation Procedure with Sample Plots).
    a. Flags are generally placed at bends in the wetland to accurately capture its shape.
    b. For sections without bends, flags are spaced out every 10 to 20 meters depending on visibility.
    c. Flags are labeled with "NPS" if they are to be left in the field for extended periods.
    d. For complex boundaries, flags should be labeled in numerical order.
2. A GPS unit is used to record the location of each pin flag (see SOP 4).
3. After the positions are captured, pin flags are removed.

Rapidly Assessed Wetlands

The method described for intensively-assessed wetlands is also used for rapidly-assessed wetlands with the exception that flags are not used and boundary determinations are made while a polygon feature is being recorded.

1. The goal is to provide an approximate estimation of the wetland boundary to calculate wetland size in ORAM metric 1, wetland size.
2. A polygon feature is used (see SOP 4) to walk around the edge of the wetland, noting hydrological features, modifications or disturbances, invasive species, and changes in habitat type or development.

3. Decisions regarding the exact boundary are made using visual wetland indicators (see *Field Identification* sections below) while walking the line and without the use of pin flags.

A GPS point feature, identifying the Wetland ID is taken before leaving the wetland.

Visual Indicators

Field Identification of Hydrophytic Vegetation

See technical guidance in the USACE Wetland Delineation Manual (pp. 16-19) and in the Regional Supplement (pp. 15-30).

1. Wetland vegetation indicator values are assigned to all species in the plot using values for Region 1 (Northcentral and Northeast Region) on the national wetland plant list.
    a. Obligate wetland plants (OBL) – Almost always a hydrophyte; rarely in uplands.
    b. Facultative wetland plants (FACW) – Usually is a hydrophyte; but occasionally occurs in uplands.
    c. Facultative plants (FAC) – Commonly occurs as either a hydrophyte or non-hydrophte.
    d. Facultative upland plants (FACU) – Occasionally is a hydrophyte; but usually occurs in wetlands.
    e. Obligate upland plants (UPL) – Rarely is a hydrophyte; almost always in uplands.
2. *Note*: Annual updates are now made to the wetland indicator list to update nomenclatural changes and any adjustments to ratings of plant species. These are posted at the Corps website: http://rsgisias.crrel.usace.army.mil/NWPL/index.html. Lists for the U.S., a region, or a state can be viewed and downloaded here.
3. Tests for hydrophytic vegetation may proceed through four stages to determine if the criteria is met as follows:
    a. Rapid Test: All dominant species across all strata (using 50/20 rule) are rated OBL or FACW, or a combination of these two categories, based on a visual assessment.
    b. Dominance Test: More than 50 percent of the dominant plant species across all strata (using 50/20 rule) are rated OBL, FACW, or FAC.
    c. Prevalence Index: The prevalence index is 3.0 or less (using a weighted-average wetland indicator status of all plant species in the sampling plot, where OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5)
    d. Morphological Adaptations Test: Species with morphological adaptations maybe reassigned FAC status and the Dominance Test or Prevalence test is recalculated based on the new value.
4. In most situations, if the hydrophytic vegetation (OBL, FACW, FAC) dominates the site (>50% cover) then the area represented by the plot would meet criteria for hydrophytic vegetation.

Field Identification of Hydric Soils

Soil profiles are completed within the upper 20 inches of the ground surface to document the presence or absence of hydric soil conditions in the sample plot. Use a moist Munsell® chart (Gretag/Macbeth 2000) for the soil color analysis in natural light. Examine soil colors immediately within 5 to 30 minutes of sample collection, as ferrous iron can oxidize rapidly (Environmental Laboratory 2012). If the soil is too saturated, it may be difficult to see redox features. Moist soil is recommended. See technical guidance in the USACE

Wetland Delineation Manual (pps 26-34) and in the Regional Supplement (pps 32-75). The manual provides the contents in Table 3.1 as the most common wetland soil indicators in the region.

Table 3.1. Minimum thickness requirements for common wetland soil indicators in the Northcentral and Northeast Region of the United States.

Indicator	*Thickness Requirement*
S5 – Sandy Redox	4 in. (10 cm) thick starting within 6 in. (15 cm) of the soil surface
S7 – Dark Surface	4 in. (10 cm) thick starting within 6 in. (15 cm) of the soil surface
F1 – Loamy Mucky Mineral	4 in. (10 cm) thick starting within 6 in. (15 cm) of the soil surface
F3 – Depleted Matrix	6 in. (15 cm) thick starting within 10 in. (25 cm) of the soil surface
F6 – Redox Dark Surface	4 in. (10 cm) thick entirely within the upper 12 in. (30 cm)
F7 – Depleted Dark Surface	4 in. (10 cm) thick entirely within the upper 12 in. (30 cm)

Field Identification of Hydrological Conditions

Indicators of wetland hydrology are examined in the vicinity of a sample plot to confirm that "…hydrophytic vegetation and hydric soils are not relicts from a past hydrologic regime" (Environmental Laboratory 2012), which may be the case in many floodplain terraces throughout the valley. If a primary indicator is not present, two or more secondary indicators are required to conclude that wetland hydrology is present.

- Primary Hydrological Indicators
    - Only need one present
    - Includes: surface water, high water table, soil saturation
    - All intensive survey sites have water monitoring wells (SOP 7) that can be used to confirm the presence of surface water or a high water table.
- Secondary Hydrological Indicators
    - Need two or more in combination
    - Includes: water stained leaves, water marks, sediments or drift deposits, oxidized roots
    - See full list in the Regional Supplement (pps 76-113)

Recording the Location of Delineated Wetlands

A Global Positioning System (GPS) is used to record wetland boundaries. This section provides only an overview of GPS operation for this purpose. Workers may need to study the Yuma 2 Operations Manual to skillfully operate the unit. The Heartland Network Operational Plan for GPS also covers GPS use in greater detail.

GPS Set-Up

Apply the following standard NPS settings to the Trimble GPS unit at each use:

1. System: UTM
2. Datum: NAD 1983 (conus) CORS96
3. Zone 17N (for CUVA)

4. Altitude Measure: Height Above Ellipsoid (HAE)
5. Units: Meters
6. Antenna Height: The antenna, whether internal or external, should be set to reflect the height of the observer. Measure the distance from the bottom of the antenna to the ground with a meter tape.
7. PDOP: Should be 6.0 (or less to ensure location accuracy)
8. GPS Correction: None or use Uncorrected
9. Satellite Elevation: Minimum of 15 degrees.

Collecting Field Data

File Naming

1. Wetland monitoring rover files begin with the park code (CUVA), an acronym that describes the type of activity (wells, VIBI, ORAM, etc), and the date of data collection (e.g.: cuva_delineation_042509) without spaces.
2. New files are created for each day of field work.
3. In a field notebook, record the name, date, and time of each file collected.

Data Dictionary

The generic data dictionary option allows for the collection of point, line, and polygon features. If desired, GPS users can create a customized data dictionary to name feature types and require a specific level of detail to describe the attributes of each feature recorded.

Capturing GPS Data

To capture location data, scroll to the desired feature type, press *Create***,** then fill out the requested information. Positions are generally recorded with 4 or more satellites in range and a maximum PDOP (relates to satellite geometry) of 6, but settings are adjustable.

Point Features

1. Use a point feature to collect location data at features such as wetland boundaries (boundary flag), centroids, groundwater wells, survey plot boundaries, and rare plants.
2. To record point features, collect a minimum of 50 satellite positions for each point using a 1-second interval.
3. Hold the antenna still over the rebar or marker being collected while the positions are being acquired.
4. The data dictionary can be populated while collecting the positions.

Line and Polygon Features

1. Use a line feature to collect linear features such as headwater streams and roads. Point features should be recorded at the beginning and end of each line feature.
2. Polygons are used in combination with point features to delineate wetland boundaries.
3. Set the GPS to record positions at a 5 second interval for line and polygon features.
4. To define any curve or change in direction, record a minimum of 3 positions.
5. Unlike points, multiple positions at one location are generally not wanted. Use *Pause* when entering requested values / information, walking around an object that the observer is not trying to record and if satellite configuration is low.

6. Press *Pause* again when ready to resume data collection. The GPS should be positioned in the correct location when restarting.

Post-Processing

See Heartland Network Operational Plan for GPS

References

Environmental Laboratory. 1987. *Corps of Engineers wetlands delineation manual*. Technical Report Y-87-1. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station. (*http://el.erdc.usace.army.mil/wetlands/-pdfs/wlman87.pdf*)

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Gretag/Macbeth. 2000. Munsell® color. New Windsor, NY.

Heartland Network Operational Plan. Continuously updated internal document.