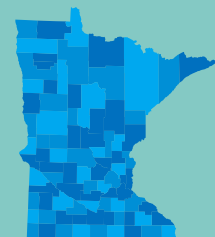


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# Wetland monitoring standard operating procedures

Procedure for evaluating Minnesota Wetland Condition Assessment sample sites



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# 1. Purpose and scope

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To describe the methods used by the Minnesota Pollution Control Agency (MPCA) Biological Monitoring Program to evaluate and establish [Minnesota Wetland Condition Assessment \(MWCA\)](#) Sample Sites.

This procedure applies to all potential MWCA Sample Sites and is largely adapted from the [National Wetland Condition Assessment \(NWCA\) Site Evaluation Guidelines](#) and [Chapter 3 \(Establishing the Assessment Area\) of the NWCA Field Operations Manual](#). Site evaluation for all other MPCA wetland monitoring Sample Sites is provided in a separate procedure (Procedure for evaluation wetland biological monitoring sample sites).

There are two primary components to MWCA site evaluation: desktop evaluation consisting of basic information gathering done prior to making a field visit and field evaluation which applies to all initial Sample Site visits. Both desktop and field evaluation procedures must be implemented prior to conducting any MWCA sampling.

## 2. General information

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The MWCA is a probabilistic wetland condition survey that is repeated on a five year basis to track the overall status and trends of wetland quality in Minnesota. It is done in conjunction and cooperation with the U.S. Environmental Protection Agency's (EPA) [National Wetland Condition Assessment \(NWCA\)](#).

The MWCA target population is defined as all wetlands with < 1 m depth of surface water that are not actively being cultivated—representing virtually all wetlands in Minnesota.

Probabilistic natural resource surveys require a sample frame that represents the target population (i.e., wetland map) from which to draw the random sampling locations. The MWCA relies on [DNR status and trends](#) wetland Geographic Information System (GIS) data as the sample frame.

MWCA sampling and reporting does not occur at the individual wetland scale as individual wetland bodies are often difficult to define. Alternatively, random POINT locations are selected from the sample frame and standardized Sample Sites (synonymous with National Wetland Condition Assessment [NWCA] Assessment Areas or AAs) are established around the POINTS that define the scale of data collection. The EPA provides the random MWCA sample draw, which is integrated with the NWCA draw. To maintain the integrity of the survey design, POINTS must be evaluated in the order generated by the random draw (e.g., replace rejected POINTS from the overdraw of POINTS in the design order).

The total target number of MWCA sites is 150, with 50 allocated to each major ecoregion (Mixed Wood Shield, Mixed Wood Plains, and Temperate Prairies). Half of the total target number are re-visit sites (i.e., sites sampled in the previous MWCA iteration) and half are new sites. In addition, approximately 15-20% of the total sites are the Minnesota allocation of the NWCA draw.

## 3. Requirements and responsibilities

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### 3.1 General qualifications

All personnel conducting wetland site evaluation must have the ability to perform rigorous physical activity in an outdoor setting. It is often necessary to hike for long distances through rugged terrain to

reach a sampling site. Walking and wading through wetlands for prolonged periods is required to perform field evaluation and ultimately any wetland monitoring.

### 3.2 Field crew leader

The field crew leader must be a professional aquatic biologist with a strong working knowledge of Minnesota's wetlands with a minimum of a Bachelor of Science degree. Field crew leaders should also possess excellent map reading and orienteering skills and a demonstrated proficiency with both compass and Global Positioning System (GPS). The field crew leader is responsible for implementing the action steps of the procedure and ensuring that the data generated meets the standards and objectives of the MPCA.

### 3.3 Field technicians/student workers

Field technicians/student workers must have at least one year of college education and coursework in environmental, natural resource, and/or biological science and an interest in becoming a natural resource professional. Field technicians/student workers are responsible for implementing the action steps of the procedure — including data recording and the maintenance, stocking, and storage of sampling equipment.

## 4. Training

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All inexperienced personnel will receive instruction from a trainer designated by the unit supervisor. Major revisions of this protocol require that all personnel that apply this procedure be re-trained by experienced personnel. Field crew leaders will provide additional instruction to the field technicians/student workers and will be responsible for assessing their performance throughout the field season.

## 5. Desktop evaluation

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The primary purpose of desktop evaluation is to gather or derive as much required basic information as possible prior to making a field visit.

All information generated during desktop evaluation is recorded in MWCA site tracking tables and GIS geospatial coverages.

### 5.1 Evaluate the POINT

The POINT is the location defined by the coordinates generated by the MWCA random draw.

In the designated MWCA ArcMap project, locate and zoom to the POINT that is to be evaluated. Use the following sources to evaluate whether the POINT occurs on target wetland:

- Aerial photography
- Wetland sample frame coverage
- National Wetlands Inventory
- DNR [MnTOPO elevation viewer](#)
- NRCS [Web Soil Survey](#), or in-house SSURGO GIS coverage

If these sources provide evidence that the POINT is (or may be) located on target wetland, continue to Section 5.2

If these sources provide conclusive evidence that the POINT does not occur on target wetland, do the following:

- Evaluate the immediate area near the POINT for the presence of target wetland. A POINT can be shifted to target wetland up to 60 m from the original location.
- If there is evidence that target wetland may be present within 60 m of the original location, shift the POINT to target wetland. The POINT should be placed in the target wetland as near to the original location as possible. Record that the POINT has been shifted in the tracking table and continue to Section 5.2.
- If there is *conclusive* evidence that no target wetland is present within a 60 m radius of the original point, reject the POINT. Record the non-sampleable category (i.e., reason the POINT was rejected; Table 1) in the site tracking table and begin evaluating the next POINT from the sample draw.

**Table 1. Non-sampleable categories for rejected MWCA POINTS.**

Non-Sampleable Category	Description
Temporarily Non-Sampleable	Site typically is target wetland and can typically be accessed, but there is a temporary reason a crew could not do so during the visit (e.g., high water)
Access Permission Denied	Permission is not granted by the landowner to sample the location
Physically Inaccessible	Location could not be safely accessed and sampled in a single day
Map Error	Map indicates target wetland but no actual target wetland located at (or within 60 m) of the Point
Active Crop Production	Location is being used for active crop production during the index period
Inundated by Water > 1 m	Water > 1 m in depth covers ≥ 90% of the area within 60 m of the Point
Industrial/Agricultural/Aquacultural Purpose	Location is being used to treat wastewater or strictly for another industrial/agricultural/aquacultural purpose
Sampleable Area Too Small	Target wetland area is < 0.1 hectares (ha) or < 20 m in width

A POINT can only be rejected at this step of desktop evaluation if there is *conclusive* evidence that the POINT is not located on or cannot be shifted to target wetland. If there is uncertainty, a field evaluation visit will be necessary to make the final determination.

A POINT can also be rejected on the basis that it is Physically Inaccessible (Table 1). To maintain the integrity of the probabilistic design, however, every effort must be made to sample the POINT if possible. For the purposes of the MWCA, a POINT is defined as Physically Inaccessible if accessing a POINT constitutes a legitimate safety concern for the field crew or cannot be safely accessed and sampled, with field crews returning to the vehicle within a single day. The majority of POINTS will be accessed from vehicles on foot, however, the MPCA can also access POINTS via canoe, boat, specialized transport provided by local natural resource managers (e.g., amphibious ATV, airboat), or helicopter (if a safe landing zone is present within two miles of the POINT).

Accessing POINTS by these various methods needs to be considered during desktop evaluation. If there is *conclusive* evidence that the POINT cannot be accessed after considering all possible modes of transport, reject the POINT and record Physically Inaccessible (Table 1) as the non-sampleable category in the site tracking table.

## 5.2 Establish an initial Sample Site

The Sample Site is the area that represents the POINT and defines the scale of MWCA data collection. All MWCA field sampling occurs in the Sample Site.

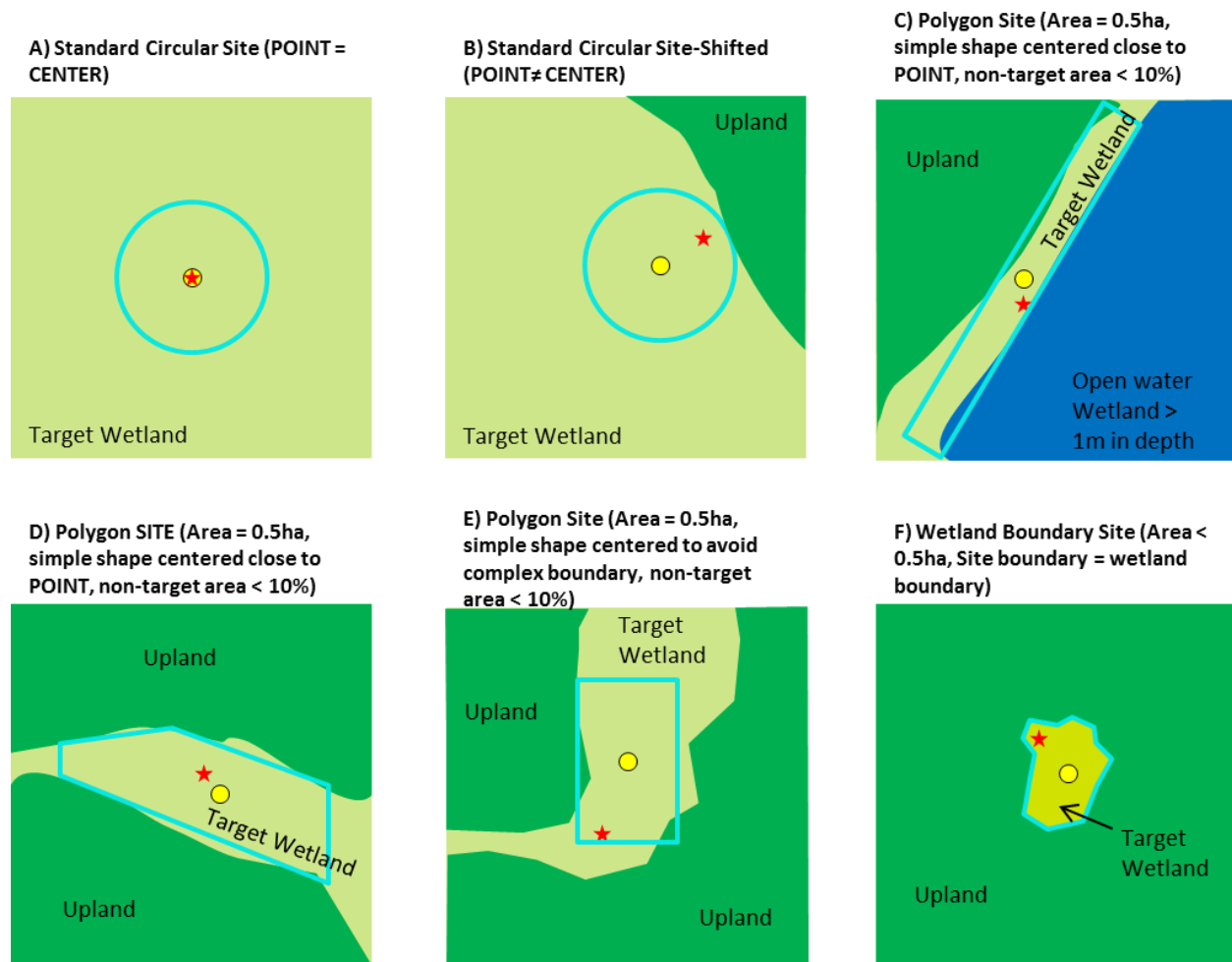
Requirements for establishing MWCA Sample Sites are as follows:

- Sample Site boundary must include the POINT
- A standard size of 0.5 hectares (ha) when possible (can be to a minimum size of 0.1 ha for small wetlands)
- Contains < 10% non-target wetland area (e.g., upland, cultivated wetland, open water wetland/deep marsh > 1 m in depth)
- Does not cross a hydrogeomorphic (HGM) boundary or does not cross entering tributaries if alongside a stream or river (see [Chapter 3 of the Field Operations Manual \(Establishing the Assessment Area\)](#) for further guidance)

There are four MWCA Study Site types that are employed depending on the size and shape of the target wetland the POINT is located in (Figure 1):

- **Standard Circular Site (Figure 1A):** A circular plot with 0.5 ha area and a 40 m radius (80 m diameter) centered on the POINT. The Standard Circular Site is the default MWCA Sampling Site and is used when the location of the POINT is  $\geq 40$  m distant from a non-target category in any direction or the non-target area within boundary is < 10%.
- **Standard Circular Site-Shifted (Figure 1B):** A circular plot with 0.5 ha area and a 40 m radius (80 m diameter) used when the location of the POINT is < 40 m distant from a non-target category in one or more directions but target wetland extends  $\geq 40$  m in the other directions. The POINT is not the CENTER.
- **Polygon Site (Figure 1C-E):** A Polygon Site is used in situations where circular Site's that encompass the POINT will not fit within the target wetland present. Polygon Sites have the following attributes:
  - The polygon boundary must include the POINT
  - An area equal to 0.5 ha
  - The CENTER of the polygon is located as close to the POINT as possible
  - The polygon contains < 10% non-target wetland area
  - Is the most simple shape possible given the target wetland area present (e.g., it is preferred to include some non-target area within the polygon using a simple shape as opposed to following jagged natural boundaries)
- **Wetland Boundary Site (Figure 1F):** A Wetland Boundary Site is employed when the target wetland area present is smaller than 0.5 ha, but is at least 0.1 ha. In addition, the wetland area must have  $\geq 20$  m of width. In this case the Sample Site boundary coincides with the target wetland boundary and the entire area of the wetland will be sampled.

**Figure 1. Example MWCA Sample Sites (A-F): Target wetland = light green, POINT = red star, CENTER = yellow circle, Site boundary = light blue.**



A designated GIS coverage of initial MWCA Sample Sites that can be edited during this stage of desktop evaluation will first be created. Re-visit Sample Sites will have the same layout as established in the previous MWCA iteration. The default initial layout for new potential sites will be the Standard Circular Site layout, derived in ArcMap. New Site layouts need to be reviewed during desktop evaluation according to the random draw order and the target number of new Sites ( $n = 75$ ). Site layouts should be edited according to the above guidelines as needed. The goal is to have the most appropriate initial Sample Site layout established prior to conducting field evaluation in order to minimize effort in the field.

To establish an initial Sample Site for a POINT, first locate and zoom to the POINT that is to be evaluated in the designated ArcMap project. Evaluate the target wetland in the vicinity of the POINT using the sources described in Section 5.1 and determine if a MWCA Sample Site can be established (i.e., target wetland in the vicinity of the POINT is  $> 0.1$  ha and/or target wetland width is  $\geq 20$  m wide for linear wetland features).

- If none of the four Sample Site layouts can be established (in order of preference above) due to target wetland size or width, reject the POINT. Record “Sampleable Area Too Small” as the non-sampleable category (Table 1) in the tracking table and delete the initial Site from the GIS coverage.



- If a Sample Site layout can be established, evaluate the target wetland area for the most appropriate site type according to the above descriptions. Make any necessary geospatial edits to the initial Site GIS coverage including updating site identifiers in the coverage table when necessary (e.g., delete the Standard Circular Site derived for a new point and replace with a Polygon Site). Update the desktop Site layout field in the tracking table with the appropriate layout type.

Repeat this process for all base and necessary overdraw POINTS needed to reach the target sample number.

### 5.3 Assign MPCA wetland Sample Site ID and derive CENTER coordinates

All MWCA POINTS and Sites that have successfully passed through Sections 5.1 and 5.2 need to be assigned a MPCA wetland Site ID in the designated tracking table and GIS spatial coverages. Re-visit sites will already have been assigned a MPCA Site Name from the previous MWCA iteration. New sites will require new Site IDs.

The MPCA Site ID is a 9-character unique identifier used in the MPCA wetland database and is assigned for MWCA sites based on the following convention:

- 2-digit year that the site was first established (e.g., 2016 = 16)
- 4-letter county abbreviation (e.g., Washington = WASH)
- 3-digit number that corresponds to the EPA design sort number for the POINT

For example, a new POINT that is being evaluated for the 2016 MWCA iteration, located in Washington County, with the EPA design sort number of 187 will have the following Site Name: 16WASH187.

Assign MPCA Site IDs to all new Sites in the tracking table. This will be used to update Site IDs in all the geospatial coverages.

Next, the Site CENTER coordinates need to be derived. For Standard Circular Sites, the POINT and the CENTER will occur in the same location (Figure 1A). For all other Site layouts, the POINT and CENTER will have different locations (Figure 1B-1F). There are geospatial coverages for each. Deriving CENTER coordinates consists of calculating the centroids of all of the initial Sites (established in Section 5.2) in ArcMap and creating a new geospatial coverage.

Ultimately, two sets of GPS points and the Site boundary polygons will be uploaded into the field GPS units of crew leaders for field evaluation and sampling. The sets of points will have a different naming convention so that crew leaders will be able to effectively access the points on the GPS units (Figure 2):

- POINT: Record name = unique EPA POINT identifier from the design file
- CENTER: Record name = MPCA Site ID
- Polygon site boundaries: Record name = MPCA Site ID

**Figure 2. Example MWCA GPS points. POINT = red star, CENTER = yellow circle, Site boundary = light blue. Note the different naming conventions of the POINT and CENTER. For the Standard Circular Site (upper-left), the POINT and CENTER coordinates are equal. The Standard Circular Site-Shifted (upper-right) clearly illustrates the difference between the POINT and the CENTER.**



## 5.4 Determine land ownership and obtain permission from landowners

Under no circumstances should field personnel knowingly trespass on private property to access or sample a wetland monitoring Sample Site. In addition, some types of public land require research permits to access and conduct scientific work (e.g., state parks, scientific natural areas, national wildlife refuges, etc). Therefore, it is imperative that the landowner information for all candidate monitoring Sample Sites and likely access routes are determined during desktop evaluation and that an effort to obtain access permission is made prior to making a field visit.

Landowners should be determined using the following sources (in priority):

- GIS parcel data through MnGEO 's GDRS
- County plat map books
- Contacting county tax assessor's offices

Once landowner information has been determined, access requests should be made to private landowners and managers of public lands that require permits. The most effective approach for public and organizational/corporate land managers is via email. For private individual landowners, the following sequence has been found to be an effective approach for obtaining access to randomly selected status and trends Sample Sites. This sequence can be adapted as needed. The goal is to get a "yes" or "no" answer, which can happen at any point in the sequence:

- Call during normal business hours. If no answer, leave a message.
- Call during the evening. If no answer, leave a message. Repeat this step if there is no return call after an appropriate length of time (minimum three days).
- Visit their home/place of business while conducting field evaluation/sampling other sites in the area.
- Leave a business card at the home/place of business or send a written request with a self-addressed stamped envelope, so that landowners can conveniently respond.
- If no response, the status of the site should be considered as "access permission denied".

Record all of the landowner information determined through desktop evaluation and the final permission status (if resolved) in the designated site tracking tables.

## 5.5 Create access and site maps

Two PDF file format maps should be created for all MWCA Sample Sites: a moderate scale access map that shows the likely route to the Sample Site from main roads and a small scale site map that provides details of the Sample Site itself. For re-visit Sites, only a new site map is typically required for each planned visit, unless there has been a change in landownership or a new access route is required.

Access maps should have the following elements (Figure 3):

- Zoomed to a scale that shows both the Sample Site and the appropriate road(s) that provide the best access to the Sample Site. This provides an appropriate view to show likely parking areas and the access route from the vehicle.
- The background should be recent vintage color aerial photography (e.g., MnGeo WMS service).
- Include the wetland Sample Site boundary, the POINT and CENTER locations.
- The map should be centered on the most likely foot access route between the parking area and the Sample Site.
- Include the most recent landowner parcel coverage (if available) with the labels for each parcel in view activated.
- Include any useful notes from the individual completing the desktop evaluation such as parking locations or specific information provided by the landowner.
- Access maps should have a scale bar in meters (for small-moderate scale maps) or miles (for larger scale maps) and be clearly labeled with the MPCA Site ID, a north arrow, and the MPCA logo (Figure 3).

**Figure 3. Example access map for a MWCA Site. The view includes roads and is centered on possible foot routes to the Site. Coverages include: Sample Site boundary (pink), POINT (pink triangle), CENTER (yellow point), ownership parcels (yellow line-work, landowner labels were de-activated for example). Appropriate labels included in the header.**



The separate site map provides greater detail of the Sample Site itself. It is needed for plant community mapping during vegetation sampling and noting any other specific aspects of the Sample Site while in the field (e.g., locations of specific impacts).

Site maps should have the following elements (Figure 4):

- Zoomed to a scale that shows the wetland Sample Site for the majority of the view.
- The background should be high resolution imagery that provides the greatest level of detail.
- Include the wetland Sample Site boundary, the POINT and CENTER locations.
- The view should be centered on the Study Site polygon.

Site maps should have a scale bar in meters and be clearly labeled with the Study Site ID, a north arrow, and the MPCA logo (Figure 4).

Both types of maps should be created in the designated ArcMap project and exported as a PDF file to the appropriate folders.

## 5.6 Prep site files, compile and upload GPS coordinates

Information derived during desktop evaluation needs to be transcribed onto site evaluation forms prior to engaging in field evaluation. This provides field crews with the information that they need to conduct a field evaluation and/or a sampling visit. Fill out the Site and Access Information sections on the form as completely as possible and add the form to the designated paper site file.

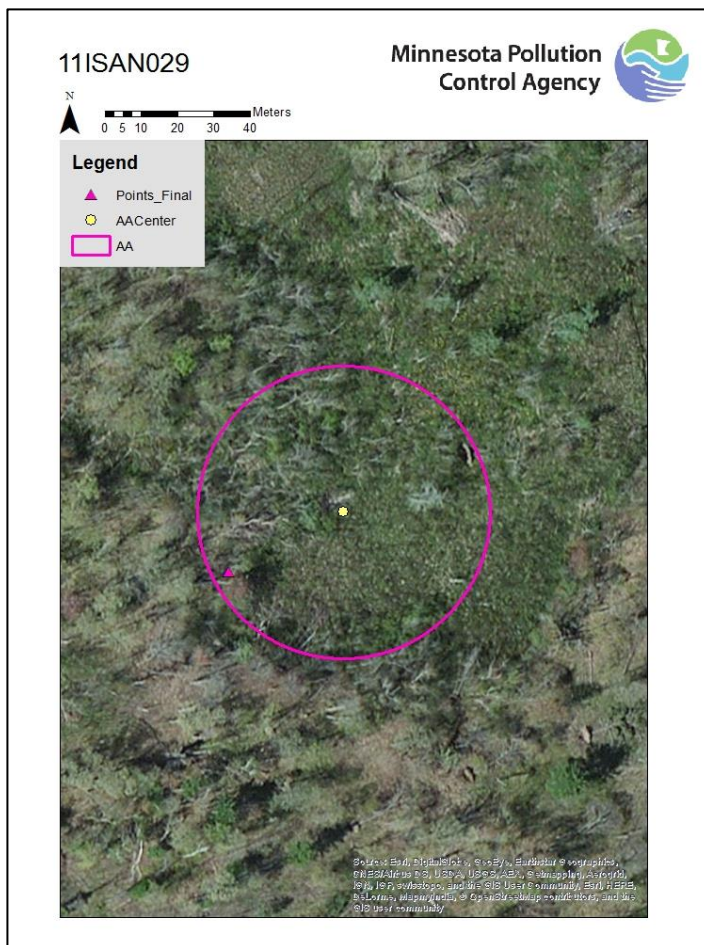
The access and site maps should also be printed in color and added to site files.

Upload the POINT, CENTER, Polygon boundary files to field and navigation GPS units. This can be done using the open source [DNR GPS application](#) or propriety software available with the GPS units.

## 6. Field evaluation

The primary objective of MWCA field evaluation is to determine whether the POINT and initial Sample Site layout are correct. In other words, is the POINT actually located on target wetland and can a MWCA Site layout actually be established? Field evaluation must be completed before any MWCA sampling begins. In most cases the POINT and initial Site layout will be correct and once verified through field evaluation, sampling can begin. There will, however, be cases where the desktop evaluation cannot

**Figure 4. Example site map for a MWCA Site. The background is high resolution ESRI Basemap World Imagery and map is centered on the Site. Coverages include: Sample Site boundary (pink), POINT (pink triangle), CENTER (yellow point). Appropriate labels included in the header.**



accurately provide correct information or a mistake has been made. When this occurs, any POINT shifting and/or reconfiguration of the Site needs to be completed in the field.

Prior to conducting field evaluation at MWCA Sample Sites, check that all necessary equipment to complete this procedure is present and in proper working condition (Table 2).

MWCA Sample Sites do not require a separate visit to conduct field evaluation. Field evaluation is the initial activity undertaken during a sampling visit.

**Table 2. Equipment list for wetland field evaluation organized by category.**

Driving Navigation	Field Navigation	Personal/Safety Equipment	Documentation	Wetland Determination Equipment
Navigation GPS (w/points loaded)	Field GPS (w/points loaded)	Cell phone	Site file	US ACE regional supplement
		Waders/knee boots	Site map	
DeLorme atlas	Access map	Rain gear	Site evaluation form	Region NWI List
	Compass	First aid kit	Digital camera	Soil color chart
		Drinking water	Clipboard	Tape measure
		Sunscreen/insect repellent	Pencils/markers	Soil auger

## 6.1 Resolve any outstanding access permission

Under no circumstances should field personnel knowingly trespass on private property to access or sample a wetland Sample Site. If the Sample Site access permission was not resolved during desktop evaluation (see Section 5.4), it needs to be obtained prior to visiting the Site. This typically involves making a visit to the landowner’s home or place of business to make an in-person access request. Any new information from the in-person request needs to be documented in the Access Information section of the site evaluation form and ultimately added to the site tracking table.

## 6.2 Clearly document site access route information

All Sample Sites should have as complete access route information as possible. Each site will be visited at least twice over consecutive MWCA iterations. Complete access information will be needed for the second visit. It also increases efficiency whereby the same information doesn’t need to be gathered multiple times.

All access route information should be documented. This may be done with written notes on the space provided in Access Information section of the site evaluation form or done by annotating the access map (Figure 5) or both. Clearly indicate the visit date on the access map. For sites that have previously been visited, record this information on the form if it hasn’t been already or make any updates if a parking/route change has been made.

## 6.3 Verify the POINT

The first step when arriving at a MWCA Site is to navigate to the exact location of the POINT. The GPS record name of the POINT is the EPA POINT identifier (Section 5.3). Once arriving at the POINT, take a photograph of the conditions at the POINT.

Evaluate the wetland conditions at the POINT and determine whether it meets the target wetland definition (all wetlands with < 1 m depth of surface water that are not actively being cultivated).

Standard wetland delineation approaches should be employed when assessing whether the POINTS meet the target wetland definition. For most cases there will be no doubt that the POINT is actually target wetland. If there is *any question* that the POINT is *not* target wetland employ the following determinations based on the [US Army Corps regional supplements to the wetland delineation manual](#) (these will be supplied during training):

- **Hydrophytic vegetation:** Perform an ad-hoc Prevalence Test of the immediate area around the POINT, using the current regional plant wetland indicator status. If the POINT clearly meets or fails the Prevalence Test, that is sufficient justification for verifying or rejecting a POINT. If the Prevalence Test is inconclusive, proceed to hydric soils.
- **Hydric soil:** Sample soils (preferably with a soil auger) and assess for hydric soil indicators. If one (or more) hydric soil indicators listed in the appropriate regional supplement is present, the POINT can be determined as target wetland. If no hydric soil indicators are present, the POINT is non-target and is rejected.

If the POINT is successfully verified as target wetland, mark the appropriate box in the MWCA site evaluation section of the form and proceed to Section 6.4.

If the POINT is not located on target wetland, record the specific indicators (e.g., prevalence test, hydric soils) used to determine how the conditions at the POINT failed in the Comments section of the form.

Next, search the immediate area for target wetland and determine whether it is possible to shift the POINT. The POINT can be shifted up to 60 m from the original location. The POINT should be shifted to the nearest target wetland where a valid MWCA Site layout can be established. Use the same approach as described above to make the determination.

If the POINT can be successfully shifted to target wetland within 60 m of the original location:

**Figure 5. Example annotated access map for a MWCA Site. Parking area, route to the site from the vehicle, and the visit date have been recorded.**



- Record the coordinates of the shifted POINT in the field GPS unit, naming the record with the EPA site identifier followed by an S (e.g., MNW16-123S) to indicate that the coordinates are for a shifted POINT.
- Take a photograph of the conditions at the shifted POINT location.
- Indicate that the POINT was relocated in the MWCA site evaluation section of the form by marking the appropriate box.
- Provide a brief narrative to further document the logistics and rationale of shifting the POINT in the Comments section of the form.
- Proceed to Section 6.5 to reconfigure the Site layout in the field (all shifted POINTS will require a reconfigured Site layout).

If no target wetland is present within 60 m of the original POINT location, the POINT is rejected. Indicate the appropriate non-sampleable category (Table 1) in the MWCA site evaluation section of the form. Field evaluation is complete.

## 6.4 Verify the Sample Site

Once the POINT has been verified in the original POINT location, the next step is to verify whether the initial Site layout established during desktop evaluation is appropriate. If not, then the Site layout must be shifted or reconfigured in the field to meet the requirements described in Section 5.2. All MWCA Sample Sites must be verified or appropriately reconfigured prior to sampling.

The requirements for establishing MWCA Sample Sites are:

- Sample Site boundary must include the POINT
- A standard size of 0.5 ha when possible (can be to a minimum size of 0.1 ha for small wetlands)
- Contains < 10% non-target wetland area (e.g., upland, cultivated wetland, open water wetland/deep marsh > 1 m in depth)
- Does not cross a hydrogeomorphic (HGM) boundary or does not cross entering tributaries if alongside a stream or river (see [Chapter 3 of the Field Operations Manual \(Establishing the Assessment Area\)](#) for further guidance)

MWCA Sites need to be configured according to the following types in priority based on the area of target wetland in the vicinity of the POINT (see Section 5.2 for MWCA Site layout specifications):

- Standard Circular Site
- Standard Circular Site-Shifted
- Polygon Site
- Wetland Boundary Site

For Standard Circular Sites it will often be obvious that sufficient target wetland is present to verify the initial Site layout established from desktop evaluation. These will not require further investigation to verify. When this is the case: mark that the initial Site layout is correct and the Standard Circular Site in the Site Establishment section of the Site Evaluation form. Proceed to sampling.

For all other MWCA Site types, or for Standard Circular Sites that may include or approach non-target area, further investigation is required to verify. Use the same determination approach described in Section 6.3 to evaluate for target wetland. Do the following when applicable to the situation:

- **For Standard Circular Sites that may include or approach non-target area:** Navigate to that portion/boundary of the Site. Assess the area for target wetland.

- If the non-target area is < 10% of the Site, the Standard Circular Site layout is valid. Mark that the initial Site layout is correct and the Standard Circular Site in the Site Establishment section of the Site Evaluation form. Proceed to sampling.
- If the non-target area is > 10% the Site needs to be reconfigured. Proceed to Section 6.5
- **For Standard Circular Site-Shifted (1):** Navigate to the area outside of the Site boundary that was interpreted as non-target (thus causing the initial Site shift). Confirm that that area is actually non-target.
  - If it is non-target, the Standard Circular Site-Shifted configuration is valid. Proceed to the next step.
  - If the area that is to be avoided is target wetland, the Site does not actually require shifting (or as much shifting) and needs to be reconfigured. Proceed to Section 6.5.
- **For Standard Circular Site-Shifted (2):** Next assess whether the shifting reduced the non-target area within the Site boundary to < 10%.
  - If the non-target area in the Site is < 10% the Site layout is valid. Mark that the initial Site layout is correct and the Standard Circular Site-Shifted in the Site Establishment section of the site evaluation form. Proceed to sampling.
  - If the non-target area in the Site continues to be > 10% the Site layout needs to be reconfigured. Proceed to Section 6.5.
- **For Polygon Sites:** The entire boundary needs to be assessed (i.e., walked) to verify. Navigate as close to the Site boundary as possible using the field GPS. Estimate the cumulative non-target area in the initial Polygon Site.
  - If the non-target area in the Site is < 10%, the Site layout is valid. Mark that the initial Site layout is correct and the Polygon Site in the Site Establishment section of the site evaluation form. Proceed to sampling.
  - If the non-target area in the Site is > 10%, the Site layout needs to be reconfigured. Proceed to Section 6.5.
- **For Wetland Boundary Sites:** The entire boundary needs to be assessed (i.e., walked) to verify.
  - If the Site boundary (more or less) corresponds to the actual wetland boundary, the Site layout is valid. Mark that the initial Site layout is correct and the Wetland Boundary Site in the Site Establishment section of the site evaluation form. Proceed to sampling.
  - If the Site boundary does not correspond to the actual target wetland boundary, the Site layout needs to be reconfigured. Proceed to Section 6.5.

## 6.5 Reconfiguring Sample Sites in the field

All shifted POINTS and rejected initial Site layouts require Site layout reconfiguration. Properly established MWCA Sample Sites are required before sampling begins. A Site must meet the requirements and be done in the prioritized order described in Section 5.2. Reconfiguring a Site in the field is often a time consuming process, which is why effort is first spent to establish accurate initial Site layouts during desktop evaluation (Section 5.2) and then performing verification of the initial Site layouts in the field (Section 6.4).

Again, the reconfigured Site layouts must meet the layout requirements according to the Site types in priority (Section 5.2). General considerations to reconfiguring a Site layout in the field include:

- Attempt to shift a circular Site first before using a Polygon or Boundary Site layout.



- If a Polygon Site is needed, try to keep the shapes as simple as possible. It will be easier to approximate the 0.5 ha required area. For example, it is much easier to establish a rectangle (or a shape approaching rectangular) with the correct area in the field as opposed to a more complex shape. If this means that the resulting Polygon Site includes non-target area, it is acceptable as long as the non-target area is < 10% of the Site.
- Employ temporary GPS points and use the range finder and bearing from those temporary points to reconfigure Site layouts:
  - **For reconfiguring back to a Standard Circular Site:** In some cases initial Site shifting can be found to be unnecessary. When this occurs, the POINT equals the CENTER. Navigate to the POINT and proceed with sampling.
  - **For shifting a Standard Circular Site:** Take a temporary GPS point at the boundary of the non-target area that the Site is being shifted away from. Load that temporary GPS point on the field GPS unit. Walk in the direction the Site needs to be shifted to. When the range finder from the temporary GPS point reaches 40 m, this should be the new CENTER for the reconfigured Standard Circular Site-Shifted.
  - **For Polygon Sites:** Approximate the shape, side lengths, and vertex locations with the aid of the site map. Use the comments section of the form and basic geometry to approximate the area. Move to the approximate location of a vertex. Record a GPS point at the vertex. Load that temporary GPS point on the field GPS unit. Use the bearing and range from that point to approximate the distance needed for the next vertex (i.e., the next vertex should be approximately xx m from the temp point along a bearing of xxx°). Do this for all vertices, making modifications as needed. An Area Track in the field GPS unit can also be used to calculate the approximate area of a Polygon Site. Note: the Area Track has to be initiated at the first vertex.
  - **For a Wetland Boundary Site:** Use an Area Track in the field GPS unit to approximate the area. Note: the Area Track has to be initiated when you start walking the boundary of the wetland basin. Wetland Boundary Sites should range in size from 0.1-0.5 ha. If the attempted Wetland Boundary Site layout clearly exceeds 0.5 ha, a Polygon Site layout is more appropriate.
- All reconfigured MWCA sites will require establishing new CENTER coordinates:
  - **For Standard Circular-Shifted Sites:** The above procedure will locate you at the new CENTER. Record a waypoint naming the record with the MPCA Site Name followed by an S (e.g., 16RAMS123S) to indicate that the coordinates are for a shifted CENTER.
  - **CENTERS for Polygon and Wetland Boundary Sites:** These will have to be approximated in the field. A CENTER is required for taking site pictures. Use the GPS and site map to navigate to the approximate center. Record a waypoint naming the record with the MPCA Site Name followed by an S (e.g., 16RAMS123S) to indicate that the coordinates are for a shifted CENTER. The actual CENTER of the Polygon or Wetland Boundary Site will be derived using GIS following field sampling.

For all Site layout reconfiguration completed in the field, the site map should be fully annotated to show all changes from the initial Site layout. Draw the reconfigured Site. Indicate non-target areas that were avoided. Clearly label any shifted POINTS, new CENTERS, and vertices. Record the rationale used for the layout reconfiguration in the comments section of the site evaluation form. Finally, record the Site layout used on the site evaluation form.

If a Site layout is successfully reconfigured during field evaluation, indicate the layout type on the form. MWCA field site evaluation is complete. Proceed to sampling

If a Site layout cannot be reconfigured during field evaluation (should only be due to small target wetland size/narrow width) record “Sampleable area too small to establish Site” as the non-sampleable category on the form. The POINT is rejected and MWCA field evaluation is complete.

## 7. Data security

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The following action steps must be taken after MWCA site evaluation has been completed:

- **File completed site evaluation forms:** Remove completed forms from the clipboard, dry them (if necessary) and securely file them in their designated site files. Complete this step on a daily basis during field evaluation/sampling visits.
- **Download data:** Download any and all new coordinate data from the field GPS and all digital photographs. Save them using appropriate file naming conventions in designated file directories. Delete data on field GPS units and cameras to avoid making duplicate copies from downloading the same files multiple times during the field season. Complete this step on a weekly basis.
- **Update site tracking tables and GIS coverages:** Site evaluation results need to be entered on the designated Sample Site tracking database tables and GIS geospatial coverages on a weekly basis.

## 8. Quality assurance/quality control

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Compliance with this procedure will be maintained through annual internal reviews. Technical personnel will conduct periodic self-checks by comparing their results with other trained personnel.