



RECONNAISSANCE PROCEDURES FOR INITIAL VISIT TO STREAM MONITORING SITES

I. PURPOSE

To describe the methods used by the Minnesota Pollution Control Agency's (MPCA) Biological Monitoring Program to determine the location of stream monitoring sites for the purpose of assessing water quality and developing biological criteria.

II. SCOPE/LIMITATIONS

This procedure applies to all initial site visits for which an integrated assessment of water quality is to be conducted. An integrated assessment involves the collection of biological (fish and macroinvertebrate communities), physical habitat, and chemical information to assess stream condition. Reconnaissance procedures must be implemented before any sampling can be conducted.

III. GENERAL INFORMATION

Sites may be selected for assessment for a number of reasons including: 1) sites randomly selected for condition monitoring as part of the Environmental Monitoring and Assessment Program (EMAP), 2) sites selected for the development and calibration of biological criteria, and 3) sites selected to evaluate a suspected source of pollution. Although the reasons for monitoring a particular site vary, the reconnaissance procedures described in this document apply to all monitoring sites unless otherwise noted.

IV. REQUIREMENTS

- A. Qualifications of crew leaders: The crew leader must be a professional aquatic biologist with a minimum of a Bachelor of Science degree in aquatic biology or closely related specialization. Field crew leaders should also possess excellent map reading skills and a demonstrated proficiency in the use of a GPS (Global Positioning System) receiver and orienteering compass.
- B. Qualifications of field technicians/student interns: A field technician/student intern must have at least one year of college education and coursework in environmental and/or biological science.
- C. General qualifications: All personnel conducting this procedure must have the ability to perform rigorous physical activity. It is often necessary to wade through streams and/or wetlands, canoe, or hike for long distances to reach a sampling site.

V. RESPONSIBILITIES

- A. Field crew leader: Implement the procedures outlined in the action steps and ensure that the data generated meets the standards and objectives of the Biological Monitoring Program.
- B. Technicians/interns: Implement the procedures outlined in the action steps, including maintenance and stocking of equipment, data collection and recording.

VI. QUALITY ASSURANCE AND QUALITY CONTROL

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. Calibration and maintenance of equipment will be conducted according to the guidelines specified in the manufacturer's manuals.

In addition to adhering to the specific requirements of this protocol and any supplementary site specific procedures, the minimum QA/QC requirements for this activity are as follows:

- A. Control of deviations: Deviation shall be sufficiently documented to allow repetition of the activity as performed.
- B. QC samples: Quality control samples are not required for this procedure.
- C. Verification: The field crew leader will conduct periodic reviews of field personnel to ensure that technical personnel are following procedures in accordance with this SOP.

VII. TRAINING

- A. All inexperienced personnel will receive instruction from a trainer designated by the program manager. Major revisions in this protocol require that all personnel be re-trained in the revised protocol by an authorized trainer.
- B. The field crew leader will provide instruction in the field and administer a field test to ensure personnel can execute this procedure.

VIII. ACTION STEPS

- A. Equipment List: Verify that all necessary items are present before commencement of this procedure (Table 1).
- B. Method: Depending on the type of site being sampled (random, biocriteria development, etc.); reconnaissance activities may begin with the collection of preliminary information in the office or take place entirely in the field.

- 1) Latitude and longitude coordinates (x-site) are provided by EPA, Corvallis for all randomly selected condition monitoring sites (EMAP). A stream information sheet is supplied for each site which contains locational information and a stream trace, making it possible to determine the approximate location of the site on a USGS 7.5" topographic map and the state DeLorme atlas. Record the site location on the topographic map and make a copy of the appropriate section. Also record the location on the state atlas to aid in vehicular navigation to the site.

It is often advantageous to begin landowner determination prior to site reconnaissance. County Platte maps, courthouse records, and the internet can be used to determine ownership and provide contact information for landowners. If a site is accessible only via private land, it is essential to obtain access permission from the landowner before visiting the site. Under no circumstances should field personnel knowingly trespass on private property to access a sampling site. For each site an information packet is compiled containing the **Stream Verification Form** (see below), the stream information sheet provided by EPA, the topographic map copy, and any additional maps that may be useful (Platte map, aerial photos, land use coverage, etc.)

Consult the state atlas, topographic map, Platte map, aerial photos, etc. to navigate as close as possible to the site by vehicle. Navigate from the vehicle to the target location (x-site), as identified on the EMAP stream information sheet, utilizing available maps, a compass, and a GPS receiver (consult GPS manual for operating instructions). In remote areas, it is recommended that a GPS waypoint be taken at the vehicle to aid in returning from the site. Considerable effort should be expended to identify and record an access route that minimizes access problems for sampling crews returning at a later date.

- 2) For targeted sites (i.e. latitude and longitude are unknown prior to initial site reconnaissance) it is up to the investigator to determine what, if any, preliminary information should be obtained before field reconnaissance activities are conducted. It is often beneficial to gather information about the stream and its watershed (e.g. reference condition, above or below point sources, and watershed land use) to help achieve the monitoring objectives. Prior to field reconnaissance activities there may be many candidate sites considered for sampling, however, completion of the **Stream Verification Form** is necessary only for those sites that meet the monitoring objectives and are determined *sampleable*.

While selection of the sampling reach and determination of the x-site are at the discretion of the principal investigator, it is important to consider local influences that may affect the fish or macroinvertebrate community. Unless your objective is to evaluate a specific local influence, an effort should be made to avoid sampling within 1 mile of a lake, dam, or stream confluence that is three or more stream orders larger. Establishing sampling reaches under bridges, through culverts, or within their associated scour holes should also be avoided.

For all sites the station length is 35 times the mean stream width, which is based on the distance necessary to capture a representative and repeatable sample of the fish community (following: Lyons, J. 1992. The length of stream to sample with a towed electrofishing unit when fish species richness is estimated. North American Journal of Fisheries Management. 16:241-256.). This approach provides progressively longer stations with increasing stream size.

The information obtained during initial site reconnaissance is recorded on the **Stream Verification Form**. A copy is attached and guidelines for filling out this data sheet are described in the following pages.

C. Stream Verification Form

This form provides locational, stream status, and reach length information. The form is completed after location or determination of the x-site. For sites in which a predetermined latitude and longitude is not provided, it will be necessary for the investigator to determine the x-site. Record the following information in the space provided:

C.1. Stream Documentation

- 1) *Field Number* – A seven-digit code that uniquely identifies the station. The first two digits identify the year of sampling, the second two identify the major river basin, and the last three are numerically assigned in sequential order (example 02UM001). Assign the station an appropriate field number. For EMAP sites the last three digits should correspond to the sequential number provided by EPA for each site.
- 2) *Date* – The date initial site reconnaissance is conducted in month/day/year format (MM/DD/YY).
- 3) *Stream Name* – The name of the stream as shown on the most recent USGS 7.5" topographic map. Include all parts of the name (i.e. "North Branch", "Creek", "River", "Ditch", etc.).
- 4) *Project* – The purpose behind sampling of the site (i.e. "Phase I", "TMDL", "EMAP", etc.).
- 5) *Crew* – The personnel who conducted the reconnaissance procedures.
- 6) *Invasive Presence* – The invasive species that are known to be present in the area, based on DNR map coverage. Species specific measures to prevent spreading invasives between sites should be taken.
- 7) *GPS File Name* – The unique identifier of a rover file assigned by the GPS unit. When the x-site is located, a GPS file is taken to document the location. The unit will assign an eight-digit code consisting of a file prefix, date stamp, and time stamp that uniquely identifies the file. Consult the GPS user's manual for additional guidance on GPS operation.
- 8) *GPS Date* – The date that the final GPS file is taken in month/day/year format (MM/DD/YY).
- 9) *GPS Time* – The time of day (24-hour clock) that the GPS file is taken.
- 10) *Latitude* – The angular distance north or south of the equator. Record the latitude of the x-site as displayed on the GPS receiver in degrees, minutes, seconds format.
- 11) *Longitude* – The angular distance east or west of the prime meridian. Record the longitude of the x-site as displayed on the GPS receiver in degrees, minutes, seconds format.

- 12) *Type of GPS Fix* – The position mode (3D or 2D) of the GPS file recording. The default and recommended position mode is 3D. The option you choose affects the number of satellites needed to calculate a position. The 3D mode requires more satellites and thus, is considered more accurate. A file should be recorded in 2D only when a 3D position is unattainable.
- 13) *Logger Serial Number* – The serial number of the temperature logger if one is placed at the site.
- 14) *Temp Logger Latitude* – Record the latitude of the temperature logger placement as displayed on the GPS receiver in degrees, minutes, seconds format.
- 15) *Temp Logger Longitude* – Record the longitude of the temperature logger placement as displayed on the GPS receiver in degrees, minutes, seconds format.
- 16) *Coldwater Stream* – A site is considered a coldwater stream if the reach is on a DNR designated trout stream. This box should be checked to indicate that a temperature logger should be placed at the site.
- 17) *Logger Description* – If a temperature logging device is placed at the site, describe in detail the location of the logger.

C.2. **Stream Status:** A determination of the stations sampleability. Determine if the station is *sampleable* or *non-sampleable* for biological monitoring; check the box that best describes the status of the station.

- 1) *Sampleable* – A site is considered *sampleable* if it has a defined stream channel and at least 50% of the sampling reach contains water. All targeted sites (i.e. non-random) should be regarded as *sampleable*. Indicate if the stream is perennial or intermittent in nature.

Perennial: A stream that flows continuously throughout the year.

Intermittent: Flow of water is not continual at the site but the stream channel is defined and greater than 50% of the sampling reach contains water.

Other: If a site is determined to be *sampleable* for a reason other than one of those described above, note and explain in the comments.

- 2) *Non-Sampleable* – For EMAP sites there are circumstances that would cause field personnel to reject a site for assessment. Reasons for declaring a site *non-sampleable* include:

No Channel or Waterbody Present: Examination of the x-site revealed no waterbody or stream channel.

Impounded: The stream is submerged under a lake or pond due to man-made or natural (e.g. beaver dam) impoundments. An impounded site can be declared *sampleable* if it maintains a defined channel and more than half of the reach can be effectively sampled for fish.

Wetland: The site contains water but does not have a definable stream channel. In cases in which riparian wetland vegetation surrounds a defined stream channel, classify the site as *sampleable* and restrict sampling to the defined channel.

Insufficient Flow: A discernible stream channel is present but less than half of the sampling reach contains water. If the channel is completely dry, note in comments.

Access Permission Denied: The field crew is denied permission to access the site by the landowner.

Inaccessible: The site cannot be sampled safely or effectively because it is not possible to access the site with the necessary sampling gear or the nature of the stream makes it unsafe to sample (e.g. rapids or waterfalls).

Other: If a site is determined to be *non-sampleable* for a reason other than one of those described above, note and explain in the comments.

- 3) *Gear Type* – Determine the type of electrofishing gear that will most effectively sample the fish community given the width, depth, and accessibility of the stream, and check the appropriate box. The MPCA's Biological Monitoring Program utilizes four electrofishing gear types. General guidelines for determining the appropriate gear type are as follows:

Backpack: Generally used in small, wadeable streams (typically < 8 m MSW and < 50 mi² drainage area).

Stream-shocker: Used in larger, wadeable streams and rivers (typically > 8 m MSW and 50-500 mi² drainage area). The stream-shocker is a towable unit that can effectively sample larger streams because it has additional power capabilities and employs two anodes, thus increasing the electrified zone. When stream-shocker access is too difficult or the site is a wide, shallow riffle it may be necessary to sample larger streams utilizing two backpack electrofishers simultaneously.

Mini-boom: Used in non-wadeable streams and rivers that are either too small or that do not afford the access necessary to utilize a boom-shocker. The mini-boom electrofisher is a jon-boat that is light enough to be portaged, yet provides a stable work platform.

Boom-shocker: Used in large rivers with available boat ramps.

- 4) *Comments* – Record any additional information about the station in the space provided, such as the reason the site is unsampleable or comments about gear type.

- C.3. **Stream Reach Determination:** To obtain the reach length multiply the mean stream width (MSW) by 35, round to the nearest meter. Divide by 2 to determine the distance to proceed upstream and downstream from the x-site. The x-site will serve as the mid-point of the sampling reach. The minimum and maximum reach length is 150 m and 500 m, respectively.

Mark the reach with flagging at the x-site, downstream end, and upstream end of the station. It is important that the flagging be visible from as great a distance as possible. It is preferable to tie the flagging on nearby vegetation as high as possible to ensure that high water conditions do not wash it away. Write on the flagging in permanent marker which reach boundary is being marked.

For EMAP sites there are some circumstances that would require “sliding” the stream reach around features we do not wish to sample across. Do not advance upstream into a lower order stream or downstream into a higher order stream when laying out the stream reach. Similarly, do not proceed if you encounter a lake, impoundment, or wetland while establishing the reach. If such a confluence is reached, note the distance and flag the confluence as the reach end. Compensate for the loss of reach length by moving (“sliding”) the other end of the reach an equivalent distance away from the x-site. Do not slide the reach to avoid man-made features such as bridges, culverts, rip-rap, or channelization. If more than 50% of the original reach cannot be sampled, the station is *non-sampleable*.

- 1) *Mean Stream Width* – The average stream width (m) used to determine the reach length of the sampling site. Determine the MSW by measuring with a tape measure the wetted width of the stream channel at the x-site and a minimum of three other representative cross sections, such as a riffle, run, and pool. Average the measurements and record to the nearest half-meter. If initial site reconnaissance is conducted during high water conditions, it may be necessary to “adjust” the MSW downward to account for the narrower stream widths that would be encountered while sampling. To the degree possible, the reach length should be 35 times the normal summer base flow MSW.
- 2) *Upstream Length* – The length, measured to the nearest half meter, of the upstream portion of the sampling reach. From the x-site, measure the appropriate distance upstream with a tape measure, avoid rounding off bends or diverging too far from the stream channel.

- 3) *Downstream Length* – The length, measured to the nearest half meter, of the downstream portion of the sampling reach. From the x-site, measure the appropriate distance downstream with a tape measure, avoid rounding off bends or diverging too far from the stream channel.
 - 4) *Total Length* – The length (m) of the sampling reach. To obtain, add the upstream and downstream lengths.
 - 5) *Length Accuracy* – Record the accuracy of the total reach length. If the reach was measured in the stream or in the immediate riparian zone and incorporates all bends, the reach length is accurate. If the stream reach was measured away from the immediate riparian zone and does not incorporate all bends, the reach length is not accurate, and the stream should be remeasured during sampling.
- C.4. Directions to Stream Site: Provide a comprehensive description of your access route to guide sampling crews returning at a later date. Include county, Atlas page, driving instructions, where to park and access, major landmarks, trail info, etc. It is critical that the reconnaissance crew does a thorough job identifying and documenting the easiest access route to the site in order to minimize the difficulty experienced by the sampling crews.
- C.5. Landowner Information: Provide pertinent landowner information including landowner name and phone number, and the address if the landowner is interested in a fish list, or if providing the address will make the site easier to find. Include the County Plat page number
- C.6. Flagging Information: Record information about flagging placement. Flags should be placed at the downstream, mid-point, and upstream sections of the reach in an area that will be visible throughout the summer. Mark the flags with the appropriate section of the reach. Describe in detail the location of the flagging tape including what side of the bank the flagging is on, what the flagging is tied to, etc.

Table 1. Equipment List – This table identifies all equipment needed in order to implement the initial site reconnaissance procedure as described.

Stream information sheet – for location of x-site, provided by EPA (needed only for EMAP sites)

1:24,000 USGS topographical maps – for navigation to and from the sampling site

County Platte maps – for determining land ownership

Aerial photographs – for navigation to and from the sampling site

DeLorme atlas – for vehicular navigation to and from the sampling site

Stream Verification Form – for recording initial site reconnaissance information

Measuring tape (m) – for measuring distances

GPS receiver – to locate and document sampling location

Compass – for navigation to and from the sampling site

Flagging – to mark the boundaries of the sampling reach

Pencil – for filling out forms

Permanent marker – to label flagging

Clipboard – to store forms/maps and record data

Waders – because it may be necessary to enter the stream during site reconnaissance

Cellular telephone – to contact landowners, to communicate between field crews, and for safety

STREAM VERIFICATION FORM**MPCA** (Revised Feb 2009)

STREAM DOCUMENTATION				
Field Number:		Date of Visit (mm/dd/yy):		
Stream Name:		Project:		
Crew:		Invasive Presence:		
GPS File Name		GPS Date	GPS Time	
Coordinates	Latitude	Longitude	Type of GPS	
Field GPS:	_____.	_____.	<input type="checkbox"/> 2D <input type="checkbox"/> 3D	
Logger Serial #	Temp Logger Latitude	Temp Logger Longitude	Coldwater	
	_____.	_____.	<input type="checkbox"/>	
<u>Logger Description:</u>				
STREAM STATUS				
<u>Sampleable</u>		<u>Non-Sampleable (no sample taken)</u>		
<input type="checkbox"/> Perennial – (flowing water / defined channel) <input type="checkbox"/> Intermittent – (dry spots along reach) <input type="checkbox"/> Other (explain in comments)		<input type="checkbox"/> No Channel or Waterbody Present <input type="checkbox"/> Impounded (underneath lake/pond) <input type="checkbox"/> Impounded (beaver dam) <input type="checkbox"/> Wetland (no definable channel) <input type="checkbox"/> Insufficient Flow (<50% of reach has water) <input type="checkbox"/> Access Permission Denied <input type="checkbox"/> Inaccessible (unable to sample) <input type="checkbox"/> Other (explain in comments)		
<u>Gear Type</u>				
<input type="checkbox"/> Backpack <input type="checkbox"/> Stream Shocker <input type="checkbox"/> Mini-boom <input type="checkbox"/> Boom Shocker				
<u>Comments:</u>				
STREAM REACH DETERMINATION				
Mean Stream Width (m)	Upstream Length (m)	Downstream Length (m)	Total Length (m)	Length Accuracy
				<input type="checkbox"/> Yes <input type="checkbox"/> No, remeasure
DIRECTIONS TO STREAM SITE				
LANDOWNER INFORMATION				
FLAGGING INFORMATION				