

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 monitoring for a number of reasons including: 1) sites selected for condition monitoring as part of Intensive Watershed Monitoring (IWM), 2) sites randomly selected as part of the Environmental Monitoring and Assessment Program (EMAP), 3) sites selected for the development and calibration of biological criteria, and 4) sites selected for stressor identification. 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 the EPA's Environmental Monitoring and Assessment Program (EMAP) for all randomly selected condition monitoring sites. 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 Plat maps, courthouse records, and county websites on the internet can be used to determine ownership and provide contact information for landowners. GIS mapping programs on individual county websites are the most accurate tool with recently updated ownerships. 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, Plat 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 (mid-point of the sampling reach) 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 downstream, X-midpoint and upstream station coordinates are established. For sites in which a predetermined latitude and longitude is not provided, it will be necessary for the investigator to determine the station location. Record the following information in the space provided:

C.1. Stream Documentation

- 1) *Field Num* – A seven-digit code that uniquely identifies the station. The first two digits identify the year the station was established, 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) *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.).
- 3) *Project* – The purpose behind sampling of the site (i.e. "IWM", "Class7", "stressor ID", etc.).
- 4) *Watershed* – The name of the 8 Digit HUC that the site is located in.
- 5) *Visit Date* – The date initial site reconnaissance is conducted in month/day/year format (MM/DD/YY).
- 6) *DNR Office* – The DNR area office whose jurisdiction the site is located within.
- 7) *Crew* – The personnel who conducted the reconnaissance procedures.
- 8) *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 invasive species between sites should be taken.
- 9) *GPS File Name US, DS, X* – The unique identifier of a waypoint file assigned by the GPS unit. When the upstream (US), downstream (DS), and mid-point (X) locations are determined, GPS files are taken to document the locations. Waypoint averaging should be utilized with a minimum of 100 waypoints collected, if possible the GPS coordinates should be taken mid-channel at these locations. The appropriate GPS file naming convention for the upstream location is the field number of the sampling site followed by the suffix US (i.e. 13UM001US). The appropriate GPS file naming convention for the downstream location is the field number of the sampling site followed by the suffix DS (i.e. 13UM001DS). The appropriate GPS file naming convention for the mid-point (X) location is the field number of the sampling site followed by the suffix X (i.e. 13UM001X). Consult the GPS user's manual for additional guidance on GPS operation.
- 10) *GPS Date US, DS, X* – The date that each GPS file is taken in month/day/year format (MM/DD/YY).

- 11) *GPS Time US, DS, X* – The time of day (24-hour clock) that each GPS file is taken.
 - 12) *Lat: US, DS, X* – The angular distance north or south of the equator. Record the latitude of US, DS, and X as displayed on the GPS receiver in decimal degrees format with a map datum type of WGS84.
 - 13) *Long: US, DS, X* – The angular distance east or west of the prime meridian. Record the longitude of US, DS, and X locations as displayed on the GPS receiver in decimal degrees format with a map datum type of WGS84.
 - 14) *Unit* – Record which biological monitoring unit the station is located within.
 - 15) *IWM/SID Lead* – Record the staff member who is the IWM Biological Monitoring lead for the station, if the station is a stressor ID project then record the name of the stressor ID staff who requested that station location.
- 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.
 Note – sampling stations selected as part of separate monitoring projects may have different protocol regarding their sampling status. For example, a stream that is intermittent at the time of sampling may be *sampleable* following EMAP protocol but generally is considered *non-sampleable* following other project protocol including Intensive Watershed Monitoring (IWM).
- 1) *Habitat* – Check this box to indicate if a quantitative habitat assessment should be conducted during the sampling visit to the site.
 - 2) *TL* – Check this box to indicate if a temperature logger should be placed at the site.
 - 3) *Recon Result* – A Sampleable or Non-Sampleable checkbox to determine if the site is or is not sampleable.
 - 4) *Recon Result Reason* – Sites where a representative sample can be taken are considered sampleable. Reasons for declaring a site *sampleable* include:

Perennial: A stream that flows continuously throughout the year. It is often difficult to distinguish between small, headwater perennial streams and intermittent streams (a stream which carries water a considerable portion of the time, but which ceases to flow occasionally during very dry periods). For this reason any stream that contains flowing water throughout the stream channel at the time of sampling and did not go dry at any point in the year prior to sampling - should be considered a perennial, *sampleable* stream.

Intermittent (EMAP only): 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 (Explain in Comments): If a site is determined to be *sampleable* for a reason other than one of those described above, note and explain in the comments.

- 5) *Non-Sampleable Reason* – Circumstances where a representative sample of stream biological communities may not be taken at a site. 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: Project specific, for most monitoring projects including IWM defined as: portions of the stream channel are dry, and/or emergent vegetation throughout the stream channel, and/or stream flow is considerably lower than normal summer base flow. For EMAP sampling stations defined as: 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).

- 5) *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:

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

BPx2: Used in larger streams that don’t allow for efficient sampling with stream-shocker, usually wide shallow riffles with numerous large boulders, using this method both units are used simultaneously.

SS (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.

BP/SS: Used in situations where conditions at recon visit did not allow for easy determination of gear type needed, although conditions do indicate it would be best sampled by BP or SS depending on flow variability.

MB (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.

SS/MB: Used in situations where conditions at recon visit did not allow for easy determination of gear type needed, although conditions do indicate it would be best sampled by SS or MB depending on flow variability.

BS (Boom-shocker): Used in large rivers with available boat access.

- 7) *Desktop Channel Condition* – Indicates if the channel appeared to be Natural or Channelized using Aerial imagery, etc. during the desktop review process.
- 8) *Recon Channel Condition* – Indicate if the channel is Natural or Channelized during the initial site visit.
- 9) *Desktop Recon Comments* – Record any desktop recon information about the station in the space provided, such as the possible access locations or physical obstacles seen on aerials.

- 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 which permit “sliding” the stream reach in order to meet the minimum sampling distance ($\geq 50\%$ of the reach is sampleable). 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. As long as $\geq 50\%$ of the reach is sampleable, the station is considered sufficient and target for EMAP purposes. If establishment of the minimum reach length is prohibited due to the occurrence of the confluence, you may compensate for the loss of reach length by moving (“sliding”) the x-site up to a maximum of 28 m in order to obtain the minimum reach length. Do not slide the reach to avoid man-made features such as bridges, culverts, rip-rap, or channelization. If $\geq 50\%$ of the reach cannot be sampled, the station is *non-sampleable*.

- 1) *Est. DA* – The estimated drainage area using the preliminary station coordinates of the subwatershed’s polygon using GIS methods.
 - 2) *County* – The county which the station falls within.
 - 3) *Mean Stream Width (m)* – 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.
 - 4) *Upstream Length (m)* – 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.
 - 5) *Downstream Length (m)* – 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.
 - 6) *Total Length (m)* – The length of the sampling reach. To obtain, add the upstream and downstream lengths, should correspond to the MSW.
 - 7) *Length Accuracy* – Record the accuracy of the total reach length by checking the Yes/No box. 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 should be re-measured prior to sampling.
- C.4. Location/Access: Provide a comprehensive description of your access route to guide sampling crews returning at a later date. Use the top line for naming the nearby road crossing and describing location of the station pertaining to that road crossing (Upstream or Downstream), also include the distance in miles to the nearest town. In the larger box below include 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 for the upstream and downstream landowners including name, address, and phone number. Also include the County Plat name and section number. If the landowner is interested in a fish list record, providing the address will make the site easier to find.
- 1) *US* – Record pertinent information for the landowner upstream of the road crossing including name, address, phone number, nearby relatives (if available) and which landowner granted permission including who at that household gave permission. Also include Township name and section number for the area immediately upstream of the road crossing for a point of reference. Add landowner specific requests involving access to this box as well.

- 2) *DS* – Record pertinent information for the landowner downstream of the road crossing including name, address, phone number, nearby relatives(if available) and which landowner granted permission including who at that household gave permission. Also include Township name and section number for the area immediately downstream of the road crossing for a point of reference. Add landowner specific requests involving access to this box as well.
 - 3) *Fish List Request (Name)* – Record landowner(s) name that requested fish list.
 - 4) *Fish List Given* – Check this box if fish list was given to the landowner immediately following sampling visit.
- 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..
- C.7. Tape Down Location/Description: Record information about tape down location. This should include what the reference mark was(e.g. blue arrow, blue arrow with line), upstream or downstream of road crossing, where on culvert or bridge deck the reference mark was made, and which culvert if multiple culverts exists.

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

Unit: IWM/SID Lead:

MPCA

STREAM DOCUMENTATION Sample Year 2013

FieldNum:		Stream Name:	
Project:		Watershed:	
Visit Date (mm/dd/yy):		DNR Office:	
Crew:		Invasive Presence:	

GPS		X		UP		Down	
File_Name:		File_Name:		File_Name:		File_Name:	
Date:	Lat:	Date:	Lat:	Date:	Lat:	Date:	Lat:
Time:	Long:	Time:	Long:	Time:	Long:	Time:	Long:

STREAM STATUS

Habitat	TL	Recon Result Reason	<input type="button" value="Clear ReconResReason"/>	<input type="button" value="Clear Gear Type"/>	<input type="button" value="Clear DesktopChan"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Non-sampleable: Access permission denied <input type="checkbox"/> Non-sampleable: Impounded <input type="checkbox"/> Non-sampleable: Inaccessible <input type="checkbox"/> Non-sampleable: Insufficient flow <input type="checkbox"/> Non-sampleable: No channel or water body present <input type="checkbox"/> Non-sampleable: Wetland <input type="checkbox"/> Sampleable: Intermittent (EMAP only) <input type="checkbox"/> Sampleable: Other (explain in comments) <input type="checkbox"/> Sampleable: Perennial		Gear Type <input type="checkbox"/> BP <input type="checkbox"/> BP/SS <input type="checkbox"/> BPx2 <input type="checkbox"/> BS <input type="checkbox"/> MB <input type="checkbox"/> SS <input type="checkbox"/> SS/MB	Desktop Channel Condition <input type="checkbox"/> NA <input type="checkbox"/> OC <input type="button" value="Clear Recon Chan"/> Recon Channel Condition <input type="checkbox"/> NA <input type="checkbox"/> OC
TL Serial Number		<input type="button" value="Clear Recon Result"/> Recon Result <input type="checkbox"/> Sampleable <input type="checkbox"/> Non-Sampleable			
DesktopRecon Comments:					

STREAM REACH DETERMINATION

Est. DA:	Mean Stream Width (m)	Upstream Length (m)	Downstream Length (m)	Total Length (m)	Length Accuracy
County:					<input type="checkbox"/> Yes <input type="checkbox"/> No, remeasure
					<input type="button" value="Clear Length Accuracy"/>

LOCATION/ACCESS

LANDOWNER INFORMATION Fish List Given

Fish List Request: (Name)	
US	
DS	

FLAGGING INFORMATION

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