



Clinton River Watershed Council Adopt A Stream Standard Operating Procedures

Adopt-A-Stream Program

Safety in the River

General Safety

1. Do not monitor alone. A minimum of three team members is recommended per monitoring session. There is safety in numbers.
2. Do not monitor if there has been significant rainfall during the three days prior to your scheduled monitoring day. Water levels and speed of flow are often unpredictable and unsafe after rainfalls due to stormwater. **Never attempt to monitor in water that is deeper than three feet or water that is too deep or swift to allow a volunteer to comfortably stand in it and follow monitoring procedures.** If you are unsure whether water levels are safe or not, contact CRWC (248-601-0606) prior to monitoring.
3. If the water appears to be severely polluted (a strong smell of sewage or chemicals, unusual colors, lots of dead fish, oil sheen), **do not monitor chemical or macroinvertebrates.** Report any spills to the Department of Environmental Quality at 800-292-4706 or the county pollution hotline for your site:
 - a. Macomb County - (586) 772-3425
 - b. Oakland County - (248) 858-0931
 - c. Wayne County- (888) 223-2363
4. Always keep your hands away from your eyes and mouth when monitoring. Always wash your hands (and any other body parts that come in contact with the water) thoroughly with soap and water after monitoring. Never eat after monitoring without first washing your hands.
5. Glass may be hidden in the bottom of the stream or along the stream banks. Watch out for it!
6. Before monitoring, ask if any of your monitoring team members are allergic to any type of insects or spiders. If so, make sure you know where they keep any antidotes or medicines that will subdue or stop an allergic reaction. If a volunteer gets an insect/spider bite and has a history of allergic reactions or the bite swells up to unusual size, has severe redness, or the volunteer is having trouble breathing, seek medical attention immediately. In the event of an emergency, CRWC has asked volunteers to provide CRWC with allergy/medication information and emergency contact phone numbers. Call CRWC for this information once you have sought medical attention.
7. Ticks are prevalent in grassy and wooded areas. It is recommended that volunteers wear light colored clothing and long pants that can be tucked into socks. It is important that volunteers check their bodies for ticks. If you do find an embedded tick, do not pull it out. Seek advice from a medical professional on proper tick removal.
8. CRWC recommends that volunteers entering the water at a monitoring site wear waders. Waders will help keep your body warm while in cool or cold water and can help reduce contact with waters that may or may not contain unknown pathogens.

Wader Safety

Excerpt from "Gone Fishin'" by L. Gordon Stetser, Jr.; *Michigan Out of Doors*, June 1992

1. Plan your route. Look ahead for exits, should you have difficulty, and "read" the water for spots to avoid, such as drop-offs, sunken logs, and tricky currents. Backtracking is often dangerous or impossible once you've committed to a tough situation.
2. Cross currents at right angles or slightly downstream. Move slowly, keeping the foot on the upstream side in the lead and pointed forward. Your rear, or anchor, foot should point downstream and be at right angles to your lead foot. Move the lead foot forward about half a step, feeling for a solid hold. Next, move the anchor foot forward the same distance – you should shuffle across so that your anchor foot never passes the lead. This way, both feet are always able to lend support. If you must turn around, do so toward upstream.
3. If, despite your precautions, you take a spill, don't panic. Your waders, even full of water, weigh less than on land and the water inside the waders doesn't add a single ounce as long as you're in the water! Further, the common fear that air trapped in your waders will raise your feet higher than your head and force your face underwater is simply unfounded.

Waders do make kicking useless. If the current is gentle, bend your knees and use the side or breast stroke to safety. In a swifter current, lie on your back, bend your knees, and point your feet downstream so your feet, not your head, bounce off the rocks. Sculling with your hands will help direct you to the nearest shallow area, which, of course, you had noted before. *Don't* waste precious energy in the vertical position going for the bottom. Without the ability to read, this position is virtually impossible to maintain and leads quickly to exhaustion – the major cause of many drownings. And remember, concentrate on getting out of the water and *don't worry about* saving your gear!

If you chose, you may wear a lifejacket when in or near the water.

Adopt-A-Stream Monitoring Procedures: Getting Started

1. Make sure there is a copy of the *CRWC Adopt-a-Stream Volunteer Monitoring In Progress sign* on the front dash of each volunteer's vehicle.
2. Using the tape measure in your kit measure a representative reach (100 ft in length) of the river/stream/drain for monitoring. Measure by walking the bank to minimize your impact on the invertebrates in the water. If the monitoring site is next to a road (road crossing), then the monitoring should be made upstream from the road crossing (Monitor the water body before it flows under a road/bridge). If the access point to your site is not a road crossing, then monitoring can take place in either direction. If possible, do not monitor directly adjacent to the road/bridge; move upstream as much as 25 ft if possible (not possible at all sites).

If you do not have access to a 100 ft reach at your site, monitor the longest reach possible and note the approximate length of your reach in the **Additional Comments** section of your data form.

3. Set up your team's "work station" (i.e. chairs, tarp, table, etc. for identifying macros) in a location that is safe from oncoming traffic, and far enough from the water's edge that volunteers and equipment won't accidentally fall into the water.
4. Assign team roles (*Individuals may fill more than one role (suggested roles are listed below)*).
 - a. Team Coordinator: The person in this role has been pre-selected by the volunteer and CRWC. This individual has responsibility for the safety of the monitoring team, assignment of team roles, proper completion of monitoring protocols and data forms and identification of macroinvertebrates. This includes coaching of team members as necessary on how to complete monitoring tasks/roles. It is required that the Team Coordinator reviews all information on data forms and signs in appropriate space at the bottom of each page on data forms. This individual is also responsible for completing the 'Count' and 'Code' columns on the macroinvertebrate charts.
 - b. Equipment Coordinator: This person will inventory equipment upon arrival, keep track of equipment while monitoring, ensure equipment is clean upon storage, and complete a second inventory prior to departure to make sure all equipment is present and functional. This person will report any missing or damaged items to the Team Coordinator prior to departure from the monitoring site.
 - c. Quality Assurance Coordinator: This person will help ensure data quality by helping the team follow proper protocols. This person will read the step-by-step monitoring instructions (and refer to informational sheets as needed) out loud, while other team members perform the monitoring tasks/assessments. This individual is responsible for writing all information on the data forms except for the macroinvertebrate chart (this will be filled out by the Identifier and the Team Coordinator).
 - d. Identifier: This should be the "Macro ID" certified Team Coordinator or a volunteer designated by the Team Coordinator who is also "Macro ID" certified for the current year (will be noted on the team coordinator's team list for the current season). This individual

- will identify and count organisms found at the site, complete the macroinvertebrate data sheet and collect and preserve 1 specimen of each of the 24 groups identified in separate labeled vials. If the Team Coordinator has another “Macro ID” certified team member to identify and count the organisms, he/she should verify that forms are being completed properly and “spot check” macro identification for team members that are serving as “Identifier” for the first or second time.
- e. Collector: This is a trained team member who will collect samples with the net from all of the different habitats in the stream/river/drain.
 - f. Collecting Assistant: This person will help the collector by kicking the stream bottom (and scrubbing rocks as needed/able) at various habitats in the water body. This person will also help by passing equipment on shore as needed.
 - g. Pickers: These individuals are responsible for picking out macroinvertebrates from the samples collected and placing them in ice cube trays for the Identifier to count and identify. To be successful a Picker needs to look very carefully through the debris for small creatures clinging to leaves and rocks and to be as unbiased as possible in selecting creatures of different types and sizes from the sample.
5. Inventory your equipment. A *Kit Equipment List* is provided in the Monitoring Equipment Kit (inside clipboard).
 6. Complete the **Team and Site Location** sections of your data form. CRWC will provide your team coordinator with the **Site Location** information in advance of the monitoring season. The latitude and longitude information can be found in the storage area in the clipboard.
 7. Complete the **Weather** section of your data form.
 - a. Check the box that best represents the current weather (sunny, partly cloudy, etc.).
 - b. Measure air temperature. To do this, hang the thermometer from a tree branch (if your site is mostly shady) or hold it in the air in a representative location along the banks of your site for at least 3 three minutes, then read and record the temperature.
 8. Complete the **Storm Event Data** section of your data form.
 - a. Write down the number of days since the last rainfall (or snowfall).
 - b. Write down the estimated amount of rain/snow (in inches). If you are unsure of the amount of precipitation, check your local tv station, newspaper or weather.com.
 - c. A storm event occurs when water runoff from a significant weather event, such as a major rainstorm or fast snowmelt, causes an increase in river flow. Note that high water flow conditions that are not related to storm events can exist (particularly in the spring). Also, rainstorms can occur that result in no increase in stream flow and therefore there is no storm event.

Check the appropriate description of event conditions exhibited **in the stream**. Event conditions are increased river flow above what would be considered typical or normal for the stream for the time of year. The team needs to determine this based on the following:

- 1 Their knowledge of recent weather conditions (how much rain)

- 2 Visual stream observations(look for event related conditions such as a rising or recently elevated water level, water running off the land into the stream, fast stream water velocity, increased water turbidity, and increase in the amount of debris being carried by the stream, etc)
- 3 The team's best guess of knowledge of what is typical flow for that stream, for that season.

NONE- No event conditions are evident. Stream flow conditions exist that are typical for the season of the year. Note that it is possible to have "high" flow conditions that are not due to a recent storm event.

LIGHT- Stream exhibits increased turbidity from normal and/or the water level of the stream (stage height) is somewhat elevated above what would be considered typical for the season of the year.

MODERATE- Stream stage height is elevated substantially above typical flow conditions for the stream for that time of year.

HEAVY- Bank full or flooding conditions exist.

9. Have team members planning to enter the water put on waders. Team members are encouraged to share the waders with each other so that everyone who wishes to enter the water will have a chance to complete part of the "in stream" procedures. Only those collecting data or macroinvertebrates should be in the water.
10. Complete the **macroinvertebrate collection** and then **physical/habitat monitoring**. This order will minimize the impact that your team might have on results by limiting your access to the water during the monitoring process.
11. Once your team has completed the data forms, the team coordinator should take them home with him/her. He/she should also take one of the self-addressed, stamped envelopes provided in the kit. **The team coordinator should return the completed paper data form to CRWC when dropping off the monitoring kit.**
12. After monitoring, examine kit contents and make sure everything is accounted for and nothing has been damaged. If anything is missing or damaged, report the missing/damaged item to CRWC as soon as possible.
13. The monitoring kit should be returned to its location as soon as possible. If possible, please rinse the waders and allow them to dry overnight before putting them back in the storage bin.

Physical/Habitat Monitoring Procedures

All data to be completed for a 100 ft reach (area of water body approximately 25 ft upstream of road crossing/bridge to approximately 125 ft further upstream) facing upstream. Shorter reaches (due to access or safety concerns) should be noted on data form (include approximate length of reach monitored).

I. BACKGROUND INFORMATION

For each of the items below, check the category that is most representative of what you observe in your reach.

Water Temperature

Submerge the DIGITAL thermometer in a representative location within your reach, placing it inside a container. The thermometer and the container should be held horizontally in the stream, with the mouth of the container facing upstream. Hold both underwater for one minute keeping them level at the point between the stream's surface and bottom.

Remove the container from the stream, keep the thermometer bulb in the water-filled container, and read the water temperature as quickly as possible.

Record the results on you data form. Be sure to record Celsius.

TROUBLESHOOTING USING THE THERMOMETER

There is a **Celsius/Fahrenheit temperature conversion button** on the back of the thermometer. Please press this button to change display to **degrees Celsius** if it is displaying degrees Fahrenheit. There is also a Max/Min button. If your thermometer doesn't seem to work properly, press the Max/Min button until there the letters "max" or "min" no longer appear. If the digital thermometer isn't working, use the standard thermometer. Be sure to keep the bulb in the water when reading the temperature.

Water Color/Odor

Examine the water in the reach for color and odor. The most common color options are provided. Check the color that is most similar to that of the water in your reach. To the extent possible, try to describe any unusual odors. (e.g. fishy, sulfur, etc.)

Stream Width

Stream width is the distance from the water's edge on one side to the water's edge on the other side. Check the box that best represents the average stream width in feet. Make this observation using best judgment of the distance. This can be done by pacing off the distance (counting the number of steps taken) on the road crossing from one edge of the stream to the other. There is no need to measure the distance with a tape measure or similar device, however, it is best to have previously paced off distances of 10, 25 and 50 feet so that the number of strides is known to these category endpoints.

Stream Depth

Check the box on your data form that best represents the average reach depth in feet. If the water is turbid and the depth cannot be determined, check “Unknown”. This observation is for the average depth of the stream that is consistently observed. In other words, if the stream is mostly shallow, but is 5ft deep in the channel, the >3ft category should be circled. However, if the stream is generally shallow (<1ft), but has a pool that is 3ft deep, circle the <1ft category since a pool is not representative of the average depth of <1ft observed over most of the stream. Remember that water often looks shallower than it is.

Stream Flow Type

Check the category that best represents *general flow volume in the stream*. Note that in this case, “average” flow refers to the annual average flow. For example, if a river flow is reduced in the summer, due to dry and hot conditions, check “L” because it is below average, even though low flow may be typical for that stream in the summer.

Dry = No standing or flowing water, sediments may be wet.

Stagnant = Water present but not flowing, can be shallow or deep.

L (low) = Flowing water present, but volume would be considered to be below average for the stream.

M (medium) = Water flow is in average range for the stream.

H (high) = Water flow is above average for the stream.

***NOTE:** Look for signs of high water marks to help you determine if the stream flow is high, average or low. Stream Flow Type is something you will learn over time as you monitor your site over multiple seasons. CRWC has a sense of stream flow levels based on visits and USGS stream gauge data for a number of sites in the Clinton River Watershed.*

II. PHYSICAL APPEARANCE

Check the stream/river/drain upstream, for as far as can be seen from the road stream crossing, for the presence of any of the following characteristics. If a category type (e.g. aquatic plants) is not present in the stream, do not record anything. If a category type can be seen, in any amount, check “present”. If a category type is present in a large portion of the water body, check “abundant”.

For the items below, check those that are present or abundant in your site reach.

Aquatic Plants

This category refers to aquatic vascular plants—plants with a vascular system that typically includes roots, stems and/or leaves. This includes duckweed, as it is a floating vascular plant. Aquatic Plants have roots and can be submerged under, floating on, or extending out above the water. Examples include pondweed (submerged under), water lilies (floating on) and cattails (extending above). While aquatic plants in the stream can serve as an excellent food source for aquatic organisms, excessive plant growth may indicate excessive amounts of nutrients.

Floating Algae

Floating algae has no root structure and no structure to hold it to the stream bottom. The presence of suspended algae (single celled organisms that may or may not form colonies) or floating algae mats/bundles should be recorded here. This includes algae mats/bundles, whether floating on the surface, suspended in the water column, or present at the bottom.

Filamentous Algae

Filamentous Algae has no roots. However it is made up of long stringy or “ropy” strands that may or may not be attached to other objects in the waterbody.

Bacterial Sheens/Slime

Bacterial sheens occur as oily appearing coatings on the water surface, often with a silverish cast to them. The sheen can be distinguished from petroleum products because they break into distinct platelets when poked with a stick or are physically disturbed, whereas petroleum products remain viscous (sticks together).

Bacterial slimes are bacterial growths that are visible as a slimy-appearing coating on stream or lake bottoms. They can be various colors, including black and orange.

Turbidity

Water appears cloudy—it is not transparent. Turbidity is caused by suspended particles such as silt, sand, algae, or fine organic matter. Turbid water is opaque to varying degrees, preventing the observer from seeing very far into it. Note that water can have a color to it that is not turbidity, such as the brown transparent water often associated with swampy areas.

Oil Sheen

An oily sheen is a layer or coating on the water surface caused by petroleum products. Oil sheens typically have a multi-colored or rainbow appearance.

Foam

Check “present” or “abundant” only if you find unnatural foam.

Natural foam often looks like soap suds on the water surface and can be white, grayish or brownish. Natural foam is produced when water with dissolved organic material (i.e decomposing leaves) has extra oxygen in it. Natural foam (i.e. bubbles) is typically produced in streams when water flows through rocks or rapids or past surface obstructions such as logs, sticks and rocks. Foam can range from a few bubbles to mats several feet high.

Unnatural foam usually comes from a soap product. Natural foam can be distinguished from soap suds by rubbing it between ones fingers. If the suds disintegrate and leave only wet fingers or a gritty residue, the foam is natural. If the suds feel slippery and soapy, the foam is unnatural.

Trash

Use this category to record the presence of general litter, such as paper, bottles, cans, etc., either in the waterbody or along the riparian banks or in the trees and branches above the stream (indicator or high water mark). Such accumulations often suggest how high the water level can rise during storm events or spring runoff. Use some reasonable discretion when completing this category. A single piece of gum wrapper on one bank would not be sufficient cause for checking “present”.

If you can safely remove the trash, bags have been provided in the kit and you are welcome to remove of and dispose of litter properly. Be sure to use gloves.

III. SUBSTRATE COMPOSITION

Substrate composition is “what the bottom of the river/stream/drain is made of”. It is a critical factor in determining what aquatic macroinvertebrates will be present. In general, good quality substrates (from an aquatic habitat perspective) contain a large amount of coarse material—such as gravels and cobbles—with a minimal amount of fine particles (silt, sand, muck).

Estimate the relative abundance of various substrate types (listed on the data form) in the stream reach. Round off to the nearest 10% increment. For example, do not record 25%, use either 20% or 30%. The composition estimate should include the entire area of the stream/river/drain bottom that is visible in the reach. Sometimes it is not possible to determine the substrate type all the way across a river because it is too deep or the water is turbid. In these cases, assign the appropriate percentage amount to the “unknown” category. The total percentage should add up to 100%,

Sand-feels “gritty” to the touch. Individual grains can usually be seen with the eye.

Silt/Detritus/Muck-very fine substance. Smooth to the touch. Can be the result of decomposing plant matter or simply very fine “rock” particles.

Artificial/Human made-Examples include concrete piers, sheet piling or rock riprap (that portion of shoreline erosion protection structures that extends below the water surface is considered substrate).

IV. EMBEDDEDNESS

Embeddedness is the degree to which rocks and snags are covered or sunken into silt, sand, or mud in the stream/river bottom. Embeddedness is a result of large-scale sediment movement and deposition and is a parameter typically evaluated in the riffles and runs of high-gradient streams. The more the substrate (river/stream bottom) is embedded the less its surface area is exposed to water and available as habitat by macroinvertebrates.

Check the category that best describes the bottom of your water body. Using your best judgment, indicate the extent to which the gravel, cobble, or boulders are embedded. If no rocks are visible, dig down a few inches to see if the natural streambed is rocky. Your water body may be naturally sandy or clay-based so no rocks will be present. Indicate if there are no rocks present.

Four embeddedness readings should be taken; two downstream and two upstream. Begin in the downstream area. If your site has riffles, this is where you should take your readings. Make one observation in the riffle (or other midpoint of water body as measured from stream bank to stream bank) and one observation in an area to the left of the midpoint, when looking downstream. Observe the tops and the sides of all rocks greater than three inches across within an approximately two foot

squared area. Gently pick up several rocks, one at a time, from the observation area and watch for “plumes” of sediment to rise into the water column as you move the rocks. Record the average embeddedness value for the four observations.

V. RIVER MORPHOLOGY

For the items below, check those that are present or abundant in your site reach.

Riffles

Riffles are areas of naturally occurring, short, relatively shallow, zones of fast moving water followed by a pool. The water surface is visibly broken (often by small standing waves) and the river bottom is normally made up of gravel, rubble and/or boulders. Riffles are not normally visible at high water and may be difficult to identify in large rivers.

Present - A riffle can be positively identified.
Abundant - A series of riffles and pools are visible.

Pools

Pools are areas of relatively deep, slow moving water. The key word here is “relatively”. Water depth sufficient to classify an area as a pool can vary from around 8 inches in small streams, to several feet in wadable streams, to tens of feet in large rivers. Pools are often located on the outside bend of a river channel and downstream of a riffle zone or obstruction. The water surface of a pool is relatively flat and unbroken. The presence of pools in large rivers may be difficult to identify because of an increase in relative scale, and an often limited ability to see to the bottom of deep or turbid stream reaches.

Present - At least one pool can be identified.
Abundant - A series of pools in a riffle pool sequence are visible.

Highest Water Mark

The highest water mark is the maximum height to which the stream water level rises at the site, (during a typical year, not a 50 or 100 year flood) as determined by visible evidence. This level is typically reached during floods or high flow conditions. The highest water mark is determined as the distance in feet above the present water level at the site. If you can’t visibly determine how far the stream rises at the site, check the “?” on the form. The highest water mark may be visible as discoloration on bridge pilings or abutments, stream debris (trash, leaves, weeds) left along the stream banks or in tree/shrub branches, ice scour marks on trees or stream banks, or muddy residues left in floodplains or on streamside vegetation.

VI. CHANNEL

The channel condition, for the purposes of this assessment, is classified as Natural, Recovering, or Maintained.

NATURAL STREAM- A natural stream has not been altered from its defined pattern, dimension and profile by artificial means, which includes straightening and widening. It is not

necessarily stable, however. The stream has a non-uniform cross section with distinct pool and riffle sequences, although in large rivers these sequences may be difficult to identify. Mild to extreme meanders are often visible. The banks are vegetated and there are no signs of spoil piles or dikes along sides. The stream is not channeled or artificially controlled.



RECOVERING- A recovering stream is one that has been straightened or otherwise controlled, and is evolving back to a stable pattern, dimension and profile. The stream channel is relatively straight, or is overly wide with a channel within the wider channel. Meanders may be beginning to form as evidenced by bank erosion and pool formation. Pools and riffles should be forming but may be sparse. Point bars may be forming. Vegetation may be sparse or very young. Defined dikes or spoil piles along the stream bank can be identified.



MAINTAINED- A maintained stream channel is one that is actively controlled through dredging, widening, straightening, or the formation of dikes along the stream channel. The stream channel is straight, wide and shallow at low flow, and has a uniform cross section. Bank vegetation is typically sparse or very young. Pools and riffles are not existent or very sparse.



VII. STREAM CROSS SECTION SKETCH

Draw a rough cross section of the stream profile. This should be just a general approximation. Do not spend more than a few seconds on this.

VIII. INSTREAM COVER

For the items below, check those that are present in your site reach.

In-stream cover generally refers to habitat cover that is available to fish to: (1) protect them from predators, or (2) avoid certain-stream conditions such as fast flow or direct sunlight. Check all the in-stream cover types on the data form that are present in the stream reach.

Types of cover include the following:

Undercut Banks

Undercut Banks are areas along the edges of the stream/river/drain where water has “carved out” the sediment from the banks and water now flows below the upper edge of the bank. Roots from trees, shrubs and grasses that are close to the water’s edge are often visible and the top of the bank along the water’s edge “juts farther out” into the stream than the bank along the water’s edge.

Overhanging Vegetation

Overhanging vegetation includes trees, shrubs and grasses (land-based vegetation) that reach out over the water body.

Deep Pools

Deep pools are depressions or “holes” in the bottom of the stream where the water is substantially deeper than the average water depth of the stream. They are typically more than twice the average depth of the reach.

Boulders

Boulders are stones that are greater than 10 inches across (diameter).

Aquatic Plants

This category refers to aquatic vascular plants—plants with a vascular system that typically includes roots, stems and/or leaves. This includes duckweed, as it is a floating vascular plant. Aquatic Plants have roots and can be submerged under, floating on, or extending out above the water. Examples include pondweed (submerged under), water lilies (floating on) and cattails (extending above).

Logs or Woody Debris

Logs and woody debris (small or large branches, leaves, roots or trunks) in the stream or along the water’s edge can slow or divert water to provide important habitat for fish and aquatic macroinvertebrates. Excessive amounts of debris or logs can cause localized flooding.

Check the category “logs or woody debris” and note in the “Additional Comments” if log jams or dams (created by logs, beavers or humans) are present (also note general size of log jams).

IX. STREAM CORRIDOR

Check the category that is most representative of your water body reach for each criteria listed below.

Riparian Vegetative Width

The riparian vegetative width is the width of the streamside natural vegetation (plant) area along the stream/river/drain banks.

The width is measured from the edge of the water body to the far side of the section of natural vegetation. Natural vegetation including trees, shrubs, old fields, wetlands, or planted vegetative buffer strips (often used in agricultural areas and stormwater runoff control). Agricultural crop land and lawns are **not** considered natural vegetation for the purposes of this question.

Check the appropriate distance (ft) that represents the **average** width of the vegetation zone for each side of the water body. **Left and right banks are determined from the perspective of facing downstream.**

Bank Erosion

Bank erosion occurs when soils are removed from the banks of the water body. Bank erosion may occur as a result of natural flow conditions, or may be caused by human activities.

Determine the severity of erosion that has taken place and check the appropriate category. Record the most severe examples of erosion observed on either bank within your site reach.

- 0 - Banks appear stable; no evidence of erosion. These banks are most likely well vegetated or structurally stabilized, and have no evidence of exposed tree roots or leaning trees due to eroded soil. They are not being altered by water flows, livestock access, or recreational access.
- L - Low evidence of erosion. Stream banks are stable but are being lightly altered. Less than 10% of the stream bank is receiving any kind of stress. Less than 10% of the bank is sloughing, broken down, or actively eroding.
- M - Moderate evidence of erosion. At least 75% of the stream bank is in stable condition. 10%-25% of the stream bank is sloughing, broken down, or actively eroding.
- H - High evidence of erosion. Less than 75% of the stream bank is in stable condition. Over 25% of the stream bank is sloughing, broken down, or actively eroding. Stream bank sidewalls may have been scraped by machinery or scouring flows. Banks may be slumped; banks may be severely undercut. Tree roots may be exposed or fallen/leaning trees may be present.

Streamside Land Cover

Check the dominant type of plant cover that exists at the stream bank “edge” (within the first 20 feet or so of the water’s edge) along the site reach.

- Bare - Bare ground. No, or almost no, streamside vegetation.
- Non-woody Plants - Grasses, wildflowers, ferns, sedges
- Shrubs - Shrubs and small trees; woody vegetation less than 15 feet high.

Trees - Woody plants 15 feet or taller

Stream Canopy

The stream canopy cover is the amount of leafy vegetation that extends out over a stream (at any height) and shades the water from direct sunlight. Canopy cover helps keep the water cool, increasing the oxygen levels in the water and providing healthy habitat conditions organisms. Estimate the percent of the water body reach shaded by vegetation (when trees are fully-leaved) and check the option on the data form that best represents this estimate.

X. ADJACENT LAND USE

When looking along your site reach and UPSTREAM, check the bank (left or right) where the specific land use is found. Check the appropriate left or right stream bank designation for the following land uses that are adjacent to the stream. If the land use is not present, check “none”.

Wetland

A Wetland may have standing water part or all of the year, “hydric” or wetland soils and vegetation that is common to wetlands. Riparian (river) wetlands, marshes, swamps, fens, vernal pools, and bogs are examples of wetlands. Be cautious about indicating areas of land unnaturally flooded by stormwater.

Shrub or Old Field

Meadow or field that has not been recently cultivated or grazed. Often represented by tall grasses and shrubs.

Forest

An area of land covered primarily by trees; includes small woodlots. May be a natural forest or a forest planted by people.

Pasture

A field that is showing signs of being recently or actively grazed by livestock (vegetation is cropped close to the ground).

Crop Residue

An area of land that has been recently used to grow crops. Remnants of corn stalks, grains, or other vegetable crops can be seen. An agricultural crop residue remains, after harvest which covers 30% or more of the field surface.

Rowcrop

Agricultural cropland planted in rows and cultivated.

Residential Lawn, Park

An expanse of maintained grass, often found in residential lawns and parks.

Impervious Surfaces

Land surfaces that prevent water from entering the soil/ground. Impervious surfaces include rooftops, sidewalks, cement, parking lots, pavement and compacted fields or lawns.

Disturbed Ground- *soil has been disturbed (plowed, cleared, bulldozed, excavated) for construction or agriculture. Vegetation is not present but may be present nearby.*

Bare Ground

No vegetation is present, but it is not disturbed ground. Includes areas of high foot traffic.

XI. POTENTIAL SOURCES OF WATER CONCERNS

Look at the way land is used near your site. Which of these land uses might be a potential source of pollution for your stream/river/drain? Think about how pollution might travel from each land use source to the water then rank each source on the severity of impact it might have on water quality at your site. Use your best judgment; remember this is designed to provide general information on land use over time. Note any changes in land use since the prior monitoring season in the “Additional Comments” section.

None=no impact/not present, S=slight, M=moderate, H=high

Potential Source	Description
Crop Related Sources	... there is a reasonably clear pathway for pollutants to enter the water body from the farmed area.
Grazing Related Sources	... there is clear evidence that grazing of animals near or in the water body has resulted in the degradation of stream banks or stream beds, increased sediment in the water body, nutrient enrichment , and/or potential bacterial contamination (animal wastes).
Intensive Animal Feeding Operation	... there is a reasonably clear pathway for pollutants to enter the water body from either runoff from the operation or land application of animal manure.
Transportation Runoff (i.e. highways, bridges)	...there is clear evidence that transportation infrastructure is creating increased flow, runoff of pollutants, or erosion areas in or adjacent to the water body.
Channelization	... there is clear evidence that the natural river channel has been straightened to facilitate drainage.
Dredging	... there is clear evidence that a water body has been recently dredged (bottom dug out). Evidence might include: spoil piles on side of water body, disturbed bottom, disturbed banks.
Removal of Streamside Vegetation	... there is clear evidence that vegetation along the water body has been recently removed (within the last few years).
Bank & Shoreline Erosion/Changes/Destruction	... there is clear evidence that the banks or shoreline of a water body have been modified through either through human activities or natural erosion processes.
Human Regulation of Water Flow	... there is reasonably clear evidence that flow modifications in the watershed have created unstable flows resulting in stream bank erosion
Upstream Impoundment (i.e. dam, lake level control structure)	... there is reasonably clear evidence that an upstream impoundment has contributed to impacts on downstream sites. Impacts may be: nuisance algae, increased temperatures, stream bank erosion from unstable flows.
Construction: Highway/Road/Bridge	... there is clear evidence that on-going or recent construction of transportation infrastructure is contributing pollutants to the water body.
Construction: Land Development	... there is clear evidence that on going or recent land development is contributing pollutants to the water body.
Urban Runoff (incl. residential runoff, geese/ nuisance wildlife)	... there is a reasonably clear pathway for pollutants to enter the water body from an urban/residential area. Possible pathways: gully erosion, pipe/storm sewer discharge, wind erosion, runoff from lawns or impervious surfaces.
Land Disposal	... there is a reasonably clear pathway for pollutants to enter the water body from an area where waste materials (trash, seepage, hazardous waste, etc.) have been either land applied or dumped. Possible pathways: gully erosion, pipe discharge, wind erosion, or direct runoff.
On-site Wastewater Systems	... there is reasonably clear evidence of nutrient enrichment and/or sewage odor or waste is present, and there is reason to believe the area is unsewered.
Forestry	...there is a reasonably clear pathway for pollutants to enter the water body from the forest management area. Possible pathways: logging to the edge of the water body, gully erosion, pumped drainage, erosion from logging roads, wind erosion.
Mining	... there is a reasonably clear pathway for pollutants to enter the water body from

	the mined area. Possible pathways: gully erosion, pumped drainage, runoff from mine tailings, wind erosion.
Recreation/Tourism (General)	... you are unable to clearly identify the recreational source as related to a golf course, or recreational boating activity. Foot traffic causing erosion would fall into this category.
Potential Source	Description
-Golf Courses	... there is a reasonably clear pathway for pollutants to enter the water body from the golf course area. Possible pathways: overland runoff, gully erosion off course, wind erosion.
-Marinas/Recreational Boating: boat access via water	... if you can reasonably determine that releases of pollutants to a water body such as seepage of oil/gasoline are due to recreational boating activities.
-Marinas/Recreational Boating: bank erosion	... you can reasonably determine that stream bank erosion is due to wake from recreational boating activities.
Debris in Water	... debris in the water either is discharging a potential pollutant, or is causing in stream impacts due to modifications of flow. Possible examples: Leaking barrel, Refrigerator, Tires, etc. This does not include general litter (e.g. paper products).
Industry Source	... there is reasonably clear evidence that an upstream industrial point source has contributed pollutants.
Municipal Source	... there is reasonably clear evidence that an upstream municipal (city, governmental) point source has contributed pollutants.
Natural Sources (i.e. log jams)	... there is reasonably clear evidence that natural sources are contributing pollutants. Possible examples: stream bank erosion, pollen, foam, etc.
Source(s) Unknown _____ _____	... if you see an impact but are unable to clearly identify any likely sources.

XII. ADDITIONAL COMMENTS

Write any other pertinent observations that were made during the survey. These may include the presence of wildlife in or along the stream, people using the stream for recreation (boating, swimming, fishing), or some unusual event or observation. Indicate whether observations are made upstream or downstream of the road crossing.

Digital pictures of your site and the adjacent upstream and downstream sections or land uses are welcome. Please provide them to CRWC on CD (medium or high quality images preferred).

XIII. SITE SKETCH

A site sketch should be made of the study site each time the stream habitat is assessed. Draw a bird's eye view of the study site. Include enough detail that someone unfamiliar with the site could easily find the site on their own using only the site sketch. It is important to include a north arrow, the direction of water flow, and notable stream, upland, and location features in the sketch. An example site sketch with suggested legend can be found in the storage area of the clip board in each kit.

Benthic Macroinvertebrate Monitoring Procedures

- 1) Survey a 100 foot stream stretch. If it is at a road crossing, sample upstream of the road.
- 2) Because macroinvertebrates have adapted to survive in a variety of stream conditions, all habitats need to be sampled. Macroinvertebrate samples should be collected using nets supplied by the CRWC. Habitats to be sampled include:

Most Diverse Habitat	Riffles
	Leaf packs
⇕	Tree roots, snags, and submerged logs
	Undercut banks, overhanging vegetation
	Submerged and Emergent Vegetation (aquatic plants)
Least Diverse Habitat	Sediments

- 3) The sampling effort should be sufficient to ensure that all types of benthic macroinvertebrate habitats are sampled in the site reach. **This should take about 30 minutes of total sampling time. If you have multiple types of habitat, spend equal amounts of time collecting from each habitat type.**
- 4) Determine a plan of attack for collection sites based upon the above habitat chart.
- 5) Enter the ‘Start time’ above the Macroinvertebrate Data chart on the data forms when macroinvertebrate sampling begins.
- 6) **Start at the downstream-most point, and work upstream** so you always work into undisturbed water. Habitat and substrate types from which macroinvertebrates were collected (or collections were attempted) should be recorded on the data form. The Quality Assurance Coordinator is responsible to fill out the data sheet.
- 7) To make collection easier, the samples from multiple habitats may be collected in the same net load. For example, a sample from an undercut bank can be held in the net while overhanging vegetation is sampled, then organisms collected from both habitats can be dumped into a collection bucket at the same time. **Do what is easiest for you, but be very careful not to loose your samples.**
- 8) The composite sample (all samples five-gallon bucket) should be divided into several sub samples (by pouring into various white pans) to make location of macros easier and quicker. Organisms should be removed from the white pans by the “pickers” and placed in “like groups” in plastic sorting trays.
- 9) Once organisms have been placed in sorting trays, the team’s “identifier” will use the identification keys provided to identify the organisms found, record information on data forms

and place labeled samples in sample jars. **THE IDENTIFIER MUST BE A TRAINED AAS MEMBER WHO IS “MACRO CERTIFIED”.**

STEPS TO IDENTIFYING MACROS

- a) Obtain the bag of macroinvertebrate vials from the monitoring kit (*gallon Ziploc bag with 25 vials*).
 - b) Take the first macro from the sort trays.
 - c) Identify the organism.
 - d) Write a “tick mark” in the appropriate tally column of the macro data form (ie. If your first macro is a water penny, write a “tick mark” in the tally column for “water penny”.
 - e) Place the macro in the vial with the corresponding label. **(Be sure to close the lids tightly.) NOTE: Do not allow alcohol from inside the vial to spill out onto the side of the vial, your hands or the ground.**
 - f) Repeat until you run out of macros.
- 10) Once macroinvertebrate identification is complete and the samples have been placed in separate vials with identification labels, return the bag of vials to the monitoring kit.
- 11) Once the identifier has identified all collected organisms, the Team Coordinator should count the tally marks for each organism type and write the total “count” in the ‘Count’ column.
- 12) The relative abundance of each group of organisms found at the site should also be recorded on the data form (Rare=1-10, Common= 11 or more). For each organism type in the corresponding ‘Code’ column the Team Coordinator should mark an R or a C. If the number of organism type found was 10 or less an R should be entered in the ‘code’ column. If the number of organism type found was 11 or more then a C should be entered. At the bottom of the ‘Code’ column count the number of R’s and the number of C’s that were recorded in that ‘Code’ column)**THIS IS NOT A MEASURE OF TALLY MARKS OR THE TOTAL AMOUNT FROM THE ‘COUNT’ COLUMN.** *The total stream quality score will be calculated along with other metrics once data has been entered into the monitoring database. Example:*

ORGANISM	Tally	COUNT	CODE
Beetle adults	II	2	R
Blackfly larvae	IIII, IIII IIII, IIII	16	C
Caddisfly	IIII, III	8	R
Mayfly	IIII, IIII,IIII	15	C
Gilled Snails		0	
# of R			2
# of C			2

- 13) During the macroinvertebrate survey, volunteers should take note of any fish or wildlife (frogs, turtles, ducks, etc.) that may be visible in/near the stream and document these observations on the “Additional comments” section of the data form.

Note: The preservative in the sample collection jars is rubbing alcohol (Rubbing alcohol is flammable). Do not allow alcohol to spill out of vials onto the outside of the vial, your hands or the ground.

Crayfish, **live** clams, and **live** snails should be **counted and released**.
Empty shells should not be counted. DO NOT COLLECT FISH.
Take photos if you would like CRWC to verify identification.

Riffles

1. When selecting a riffle, select the fastest (white water present, larger rocks) and slowest (no white water, smaller gravel sized rocks) moving areas of the riffle to take your samples in an attempt to find different types of organisms. Organisms collected from both these sites will constitute one riffle sample.
2. With the net opening facing upstream, place the bottom of the net flush on the stream bottom immediately downstream from the riffle. Position the handle perpendicular to the stream flow.
3. While the first volunteer ("collector") holds the net, the second ("collecting assistant") picks up large rocks (2 inch or greater diameter) within a 1 foot by 1 foot area directly in front of the net opening and gently rubs them in the net opening to remove any clinging organisms. Be sure to hold the rocks under water in front of the net. Gently place the cleaned rocks outside the sampling area. (Usually takes less than one minute.)

Note: If the water level is too deep or sharp objects don't allow the "collecting assistant" to safely/easily pick up rocks from the stream/river/drain bottom, then the "collecting assistant" should spend two minutes kicking the 1ft square area directly in front of the net. Use a kicking/shuffling motion with your feet to dislodge rocks. You're trying to shake organisms off rocks and kick up organisms that are hiding under the rocks. Kick down approximately two inches while moving toward the net.

4. When all the stones (or as many as possible) are removed from the sample area, the "collecting assistant" stands approximately one foot upstream of the net opening and kicks the stream bed vigorously to dislodge any remaining organisms into the net.
5. Kick down approximately 2 inches (approximately one minute) while moving toward the net.
6. When done kicking, the "collector" sweeps the net in an upward fashion to collect the organisms. Return all the rocks to their 1st square area.

Note: If the net is relatively empty after sampling at the first station, steps 8 - 11 may be skipped and the net emptied (according to steps 8 - 11) only as necessary.

7. Carry the net to the shoreline. Have team members on the shore assist with rinsing/dumping.

8. Before emptying the collected material into the sample bucket/pan, have the “collection assistant” pour stream water through the net and its contents until the water runs clear. This is particularly important in streams with sediment problems and in pools. This should help reduce the murkiness of the water which can make finding and sorting macros difficult.

9. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net’s contents into the tray. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.

10. Remove any clinging organisms and place them directly into the sampling bucket/pan.

11. Turn the net inside out and rinse it with water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.

12. Collect a total of three riffle samples by repeating steps 1 - 11.

Leaf Pack

1. Look for leaves that are about four to six months old. These old leaf packs are dark brown and slightly decomposed. Slimy leaves are an indication that they are decaying. Only a handful of leaves is necessary for sampling.
2. With the net opening facing upstream, place the bottom of the net flush on the stream bottom immediately downstream from the leaf pack. Position the handle perpendicular to the stream flow.
3. Have the “collection assistant” gently shake the leaf pack in the water to release some of the organisms, then quickly scoop up the net, capturing both organisms and the leaf pack in the net.

Note: If the net is relatively empty after sampling at the first station, steps 5 - 8 may be skipped and the net emptied (according to steps 5 - 10) only as necessary.

4. Before emptying the collected material into the sample bucket/pan, have the “collection assistant” pour water through the net and its contents until the water runs clear. This is particularly important in streams with sediment problems and in pools. This should help reduce the murkiness of the water which can make finding and sorting macros difficult.
5. Carry the net to the shoreline.
6. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net’s contents into the tray.
7. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.

8. Remove any clinging organisms and place them directly into the sampling bucket/pan.
9. Turn the net inside out and rinse it with stream water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.
10. Collect a total of three leaf pack samples by repeating steps 1 - 10.
11. If using a smaller pan, dump the sample into the five-gallon bucket.

Tree Roots, Snags, and Submerged Logs

Snags are accumulations of debris caught or “snagged” by logs or boulders lodged in the stream current. Caddisflies, stoneflies, riffle beetles, and midges commonly inhabit these areas.

1. Select an area on the tree roots, snag, or submerged logs which is approximately 3 feet by 3 feet in size.
2. Scrape the surface of the tree roots, logs, or other debris with the net while on the downstream side of the snag. You can also disturb such surfaces by scraping them with your foot or large stick, or by pulling off some of the bark to get at the organisms hiding underneath. In all cases, be sure that the net is positioned downstream from the snag, so that dislodged material floats into the net.
3. You may remove a log from the water to better sample from it, but be sure to replace it when you are done.

Note: If the net is relatively empty after sampling at the first station, steps 5 - 8 may be skipped and the net emptied (according to steps 5 - 10) only as necessary.

4. Before emptying the collected material into the sample bucket/pan, have the “collection assistant” pour water through the net and its contents until the water runs clear. This is particularly important in streams with sediment problems and in pools. This should help reduce the murkiness of the water which can make finding and sorting macros difficult.
5. Carry the net to the shoreline.
6. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net’s contents into the tray.
7. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.
8. Remove any clinging organisms and place them directly into the sampling bucket/pan.

9. Turn the net inside out and rinse it with stream water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.
10. Collect a total of three tree root samples by repeating steps 1 - 10.
11. If using a smaller pan, dump the sample into the five-gallon bucket.

Undercut Bank and Overhanging Vegetation

Undercut banks are areas where moving water has cut out vertical or nearly vertical banks, just below the surface of the water. In such areas you will find overhanging vegetation and submerged root mats that harbor dragonflies, damselflies, and crayfish. .

1. Place the net below the surface under the overhanging vegetation.
2. Move the net in a bottom - up motion, jabbing at the bank five times in a row to loosen organisms. For overhanging vegetation, put the net under the bank edge at the base of the plants and shake the vegetation using your yet, trying to shake off the animals clinging to the plants.

Note: If the net is relatively empty after sampling at the first station, steps 3 - 6 may be skipped and the net emptied (according to steps 3 - 8) only as necessary.

3. Before emptying the collected material into the sample bucket/pan, have the “collection assistant” pour water through the net and its contents until the water runs clear. This is particularly important in streams with sediment problems and in pools. This should help reduce the murkiness of the water which can make finding and sorting macros difficult.
4. Carry the net to the shoreline.
5. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net’s contents into the tray.
6. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.
7. Remove any clinging organisms and place them directly into the sampling bucket/pan.
8. Turn the net inside out and rinse it with stream water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.
9. Collect a total of three undercut bank samples by repeating steps 1 - 8.

10. If using a smaller pan, dump the sample into the five-gallon bucket.

Submerged and Emergent Vegetation (Aquatic Plants)

1. Keep the net opening pointed upstream and move the net through the vegetation trying to shake the plants and catch any animals.

Note: If the net is relatively empty after sampling at the first station, steps 3 - 6 may be skipped and the net emptied (according to steps 3 - 8) only as necessary.

2. Use your hands to agitate the vegetation and dislodge the animals into the net.
3. Before emptying the collected material into the sample bucket/pan, have the “collection assistant” pour water through the net and its contents until the water runs clear. This is particularly important in streams with sediment problems and in pools. This should help reduce the murkiness of the water which can make finding and sorting macros difficult.
4. Carry the net to the shoreline.
5. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net’s contents into the tray.
6. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.
7. Remove any clinging organisms and place them directly into the sampling bucket/pan.
8. Turn the net inside out and rinse it with stream water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.
9. Collect a total of three submergent or emergent vegetation samples by repeating steps 1 - 8.
10. If using a smaller pan, dump the sample into the five-gallon bucket.

Sediments

Areas of mostly sand and / or mud can usually be found on the edges of the stream, where water flows more slowly.

1. A collector stands downstream of the sediment area with the dip net resting on the bottom. A collection assistant disturbs the sediment to a depth of about two inches as he or she approaches the net.

2. The collector sweeps the net upward to collect the organisms as the collection assistant approaches.
3. **Keeping the opening of the net at least an inch or two above the surface of the water, wash out the sediment from the net by gently moving the net back and forth in the water of the stream. THIS IS VERY IMPORTANT FOR KEEPING SEDIMENT OUT OF THE SAMPLE BUCKET.**

Note: If the net is relatively empty after sampling at the first station, steps 4 - 8 may be skipped and the net emptied (according to steps 4 - 8) only as necessary.

4. Carry the net to the shoreline.
5. One volunteer should hold the sampling bucket/pan, while a second volunteer empties the net's contents into the tray. **TRY NOT TO ADD SEDIMENT TO COLLECTION BUCKET.**
6. Using the squirt bottle filled with stream water, rinse the inside of the net into the bucket/pan to collect all the organisms.
7. Remove any clinging organisms and place them directly into the sampling bucket/pan.
8. Turn the net inside out and rinse it with stream water, letting the water run through the net into the sample bucket/pan to dislodge any aquatic macroinvertebrates that are still attached to the net. Remove any remaining macros using forceps and place them in the sample bucket/pan.
9. Collect a total of three sediment samples by repeating steps 1 - 8.
10. If using a smaller pan, dump the sample into the five-gallon bucket.

Clean Up

1. **Rinse all nets, pans, WADERS and other equipment VERY well before leaving** the site to avoid transporting animals or plants between monitoring locations (invasive species are often spread by not rinsing equipment, fishing gear, boats, etc.). Dispose of identified invasive species in the trash.
2. Have the team coordinator double check that the data form has been completed and that all habitats have been sampled.