

Chapter 3

Visual Survey

- Level 1 Volunteer Water Quality Monitoring Training Notebook -

The purpose of the visual survey is to determine if there are observable problems on the stream and to characterize the environment through which the stream flows. The visual survey will help pinpoint any areas that may be the sources of water quality problems and increase familiarity with the overall condition of the stream. This information will also be helpful should you decide to map your watershed.

Since water quality is very dependent on the local conditions of the stream, the visual survey should be completed in the immediate vicinity of the monitoring site that will be used for sampling. Remember, your site is a 300-foot-long section of stream. The site location chosen should be considered permanent to allow you to develop several years of data at the same location. This allows us to track physical changes in the stream over time. Visual survey data for a monitoring site should be conducted twice per year, once with the foliage present (early autumn before the leaves fall) and once with the foliage absent (early spring before leaves emerge). You should sample the macroinvertebrates *before* conducting your visual survey.

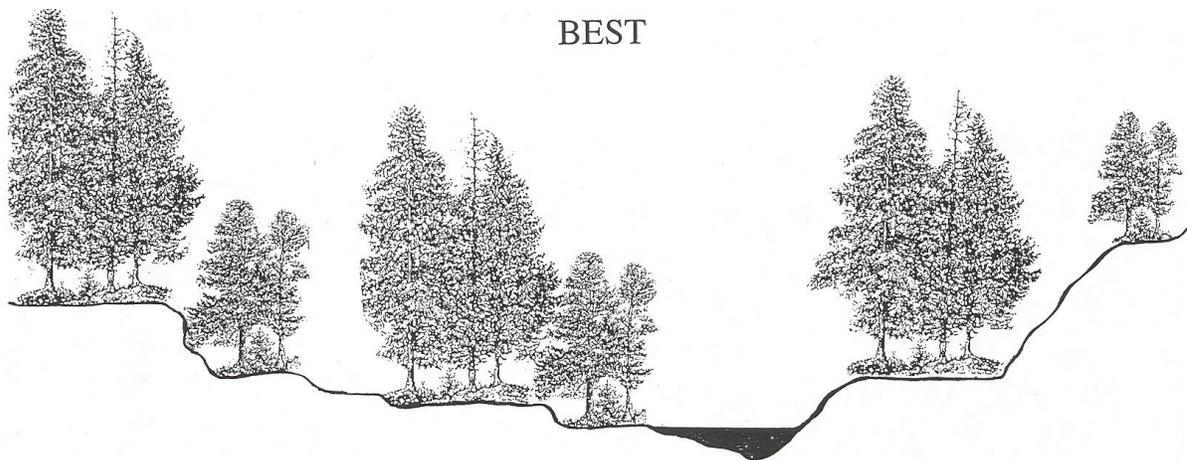
In order to conduct your visual survey, you will use the *Visual Stream Survey Data Sheet* provided in this notebook or in your packet (feel free to make copies!) as well as on the Stream Team website (www.mostreamteam.org). The data sheet serves as a report form on which to write down the information (data) you collect. The back side of the data sheet provides instructions on how to collect the data and can be a very handy reminder when you need clarification while in the field. Please be sure to fill out as many of the survey items on the data sheet as you can before sending it into the Program. The information requested in the top portion of the sheets is especially important. This applies to any of the data sheets Stream Team volunteers may use – Visual Survey, Macroinvertebrates, Water Chemistry, Site Selection and Stream Discharge.

If you have questions or concerns about filling in any of the requested pieces of information, please feel free to contact us. You can reach us using the contact information provided in the *Appendix*.

Before we provide specific direction on how to fill out the *Visual Stream Survey Data Sheet*, let's review how the use of the land surrounding streams can impact water quality. As you can see in the following figures, as changes are made in land use, there is a direct impact on the stream. Removal of riparian vegetation and streambank erosion will greatly impact the water quality. The removal of riparian vegetation allows nutrients that would normally be filtered to run off into the stream.

Urban land use has the most devastating effect on streams. Many times, buildings are built right in the floodplain. When this happens, there can be quite a bit of damage during storm events. This causes people to try other costly and drastic measures to control the water flow, such as channelization, levees, etc. Another impact of urban land use is the run off of chemicals such as herbicides, pesticides and road salt into the stream. For a more complete review of the impacts of urban development, be sure to review the *Urban Stormwater and Sedimentation* chapter in the Introductory Level Notebook.

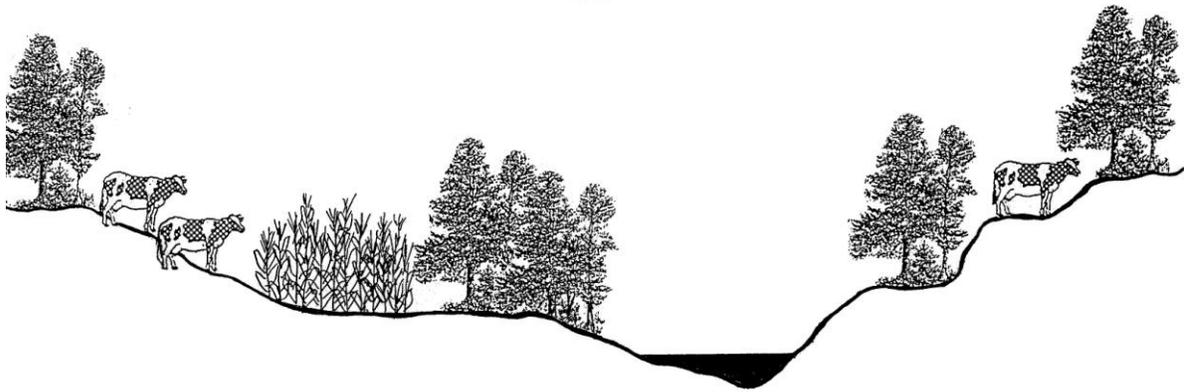
LAND-USE IMPACT ON WATER QUALITY



Unimpacted

- Land use has not negatively impacted water quality.
- Floodplain has a stair-step appearance due to normal high water events.
- The riparian corridor is naturally vegetated and filters water before it enters the stream. Roots also provide stability to the streambanks.
- Gently sloping banks
- Streambed is narrow with varying water depths.

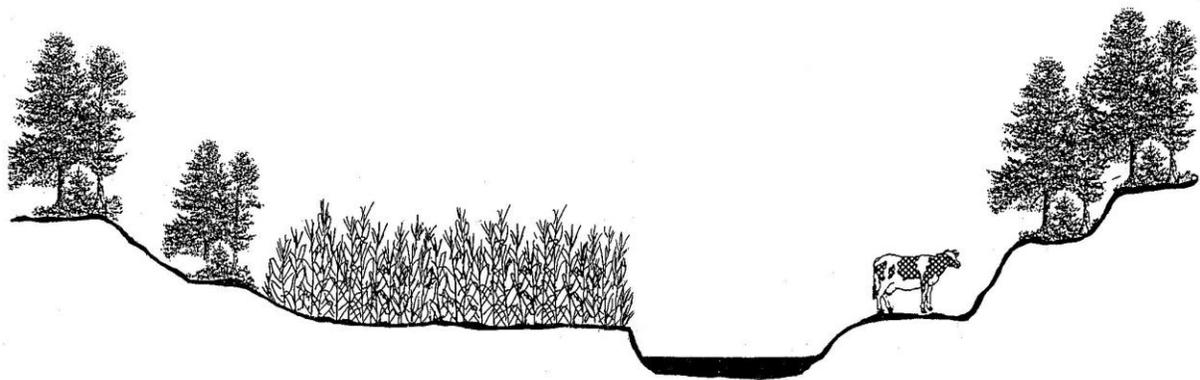
THE GOOD



Upland and Floodplain Land Use

- Land use in the floodplain has been changed and the possibility of nutrient (N & P) and sediment loading is increased by crop management practices and animal production activities.
- A vegetated riparian corridor mediates these threats to some extent through these means:
 - Preventing erosion
 - Taking up excess nutrients
- Streambank moderately changed but still has a gentle slope.
- Streambed remains unaltered.

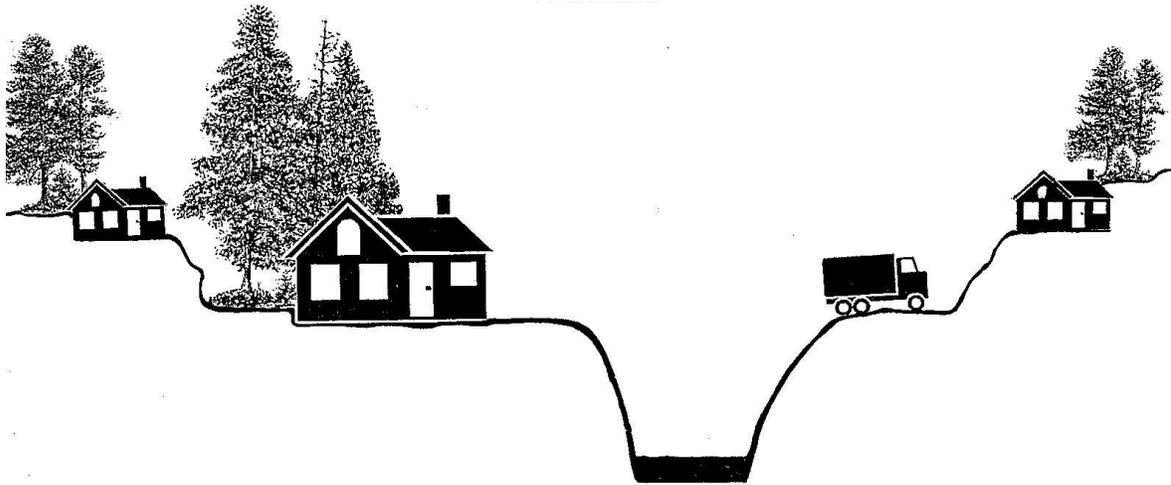
THE BAD



Floodplain Land Use

- Permanent, natural vegetation in the riparian corridor is absent, along with its stabilizing and filtering benefits. Nutrients and sediment directly enter the stream.
- Floodplain contains activities that have a higher dollar value and could be lost during flood event.
- Streambanks become steeper due to erosion, and they are vulnerable to severe erosion because there are no roots to stabilize banks.
- Streambed is wider, shallower and more uniform due to sediment filling in the stream.

THE UGLY



Urban Land Use

- Floodplain land use contains valuable development that will be threatened by flood events.
- The riparian corridor is no longer vegetated.
- Streambanks are very steep and very prone to erosion.
- Streambed is downcut and uniform like a trench.

VISUAL STREAM SURVEY DATA SHEET

NOTE: If you intend to do a visual survey and sample macroinvertebrates the same day, *sample macroinvertebrates first!* This will ensure that you don't accidentally dislodge or lose invertebrates while conducting your Visual Survey. You will want to account for these during your biomonitoring.

As mentioned earlier, it is especially important to provide the information requested in the top portion of your data sheet to ensure your data can be used.

- **Site Number.** Remember to number sites using the chronological order and send in a map if you are monitoring a new site for the first time.
- **Stream and County.** List the name of the stream as it appears on your map (e.g., a USGS topographic map) and the county in which the monitoring site is located.

- **Site Description.** Consider your site description to equate to driving directions. *Always use the same verbal description each time you monitor the site. If you change your site description, we may think you are not at the same site you have monitored before. Consistency helps us know where you are.*
- **Date.** Include day, month and year.
- **Time.** Please use military time.
- **Trained Data Submitter's Stream Team Number.** If you don't remember this is something we can easily find for you. However, if you are on more than one team, please tell us which team you are representing at the time you are monitoring.
- **Trained Data Submitter.** This is the name of the person who attended the Level 1 Volunteer Water Quality Monitoring workshop or higher level of and to whom these data will be assigned.
- **Trained Participants.** List names of others on your Team that are assisting the Trained Data Submitter on the day of data collection. Participants do not need to be trained as long as they are helping you.

NOTE: *Keep in mind that consistency is the key when assessing Numbers 1 through 10 on the Visual Stream Survey Data Sheet. Since these observations are highly subjective, the data provides more accurate trend information if you have the same person make these judgment calls at the same spot every time you survey a particular site.*

1. **FLOODPLAIN LAND USE.** The floodplain is the flattened portion of the stream valley susceptible to large floods. Report the dominant land uses in the floodplain along the 300-foot stretch of stream for this sampling site. Do not try to make this evaluation from the water's edge. Instead, walk far enough out into the floodplain to determine all land uses or pay particular attention when you are travelling to your site. It's likely to be easier to see the entire floodplain when the trees are bare.

Estimate percentages (%) of the various types of land uses listed. Adding percentages of land uses in the floodplain along both sides of the stream together should total to 100%.

- Industrial
- Commercial
- Residential
- Pasture/hayfields
- Row crops
- Woods
- Other (specify)

If the value is entered under “Other,” describe the land use (e.g., ball field, city park, etc.) and enter a percentage.

2. RIPARIAN COVER. The riparian zone is the area of land adjacent to the stream. For the purposes of this checklist, it is the area extending away from the top of each streambank for a distance of 100 feet into the floodplain. You will be looking at the 100-foot zone along the entire 300-foot sampling site, up and down the stream on both sides of the stream. Estimate the total percent of the area (combining both sides of the stream) that is covered by the list below. Again, the percentages should total to 100%.

- Trees
- Grasses or weeds
- Bare ground
- Parking lots or streets
- Buildings
- Other (specify)

3. STREAMBANK CONDITIONS. The streambank is defined as the area of land that rises from the streambed and reaches a crest. The crest is also the beginning of the riparian zone. Such crests are most noticeable when looking at the outside bend of a stream meander. If there is no marked change in elevation or obvious crest,

consider the bank to extend no further than 50 feet away from the edge of the streambed (then begin the riparian area measurement there). For your site's 300-foot stretch of stream, estimate the percent of the area between the top of the streambank (reference drawings on page 14 and 15) and the wetted portion (or adjacent gravel/sand bar) of the channel that is covered by the list below. Again, the percentages should total to 100%.

- Trees
- Grasses or weeds
- Bare Ground
- Bedrock
- Pavement or riprap
- Other (specify)

4. BED COMPOSITION OF RIFFLE. The streambed is the area where a natural stream of water runs, or may run, depending on precipitation. This is the area between the streambanks in which substrate is deposited or removed by the energy of moving water. The streambed may be dry during certain times of the year, especially in the upper stream reaches.

If the monitoring site you choose does not contain a riffle, please check the box in "4. *Bed composition of riffle,*" so we know you didn't have a riffle and that the percentages of bed composition you enter here describes a habitat other than a riffle.

Estimate the percent of streambed within the riffle that is covered by the following sized sediments:

- Silt or mud
- Sand
- Gravel
- Cobbles (2-10")
- Boulders (>10")
- Bedrock

Again, percentages should total to 100%.

- 5. PERCENT EMBEDDEDNESS OF COBBLE SUBSTRATE.** This calculates embeddedness in the streambed. *Embeddedness* refers to how much of the surface area of large stones in the streambed is surrounded by finer sediment. If you plan to do both macroinvertebrate sampling and a visual survey at a site in the same day, we recommend you do your macroinvertebrate sampling before you measure embeddedness.

Not all streams will have cobble-size stones, so check the box, “Cobble substrate not present at site,” if the site you monitor has none. If cobble is present, pick up 5 random cobble-sized rocks from the riffle. Write on your data sheet the percent (%) embeddedness of each rock and then determine the average embeddedness of the cobble substrate in your stream by adding the five percentages up and dividing the total by five (see the diagram illustrating different degrees of embeddedness). Be sure to measure the portion of the rock that’s been stuck down in the substrate, not what’s been exposed to flowing water! This can often be seen by the lack of algal growth and/or black oxidation line on the embedded portion of the rock.

- 6. SIGNS OF HUMAN USE.** Examples include pull-offs or dirt roads for cars, footpaths, food and drink containers, picnic areas, campfires or fishing equipment.
- 7. ALGAE.** First estimate the percent of the stream bottom covered by visible algae. Second, of the total algal cover observed, calculate what percent is which of two kinds:
- Close-growing
 - Filamentous (strands over 2 inches in length)

The range of substrate covered by some type of algae could be anywhere from 0 to 100% where you are making your observations. Of that area covered, what percentage is close-growing and what is filamentous? Example: algae of some form cover 30% of the substrate in the spot you’re observing, so enter “30%”. Eighty percent of the algae present is close-growing, so 7(a) is 80%. So for 7(b), you would enter the remaining 20% (to equal 100%) as filamentous algae.

- 8. WATER COLOR.** When you look at the water in the stream it can appear to be the color of the stream bottom, which can be misleading. To avoid this, put some water in a clear plastic container in order to check its true color. This section could include the terms “clear,” “brown,” “green,” “milky,” “oily sheen”.
- 9. WATER ODOR.** If any odor is present, please describe the odor. Make this observation from the same container you used to determine water color. Otherwise you might smell the odors originating from the surrounding land rather than from the water itself. You should use one of the following terms to describe the odor, “no perceptible odor,” “organic,” “fishy,” “musty,” “rotten egg,” “petroleum,” “chemical,” or “sewage”.
- 10. WEATHER CONDITIONS.** Describe the cloud cover. Examples: “clear,” “partly cloudy,” “cloudy,” or “precipitation”.
- 11. COMMENTS.** This section may include the presence of drainpipes, ditches and other water conveyances. Add any other observations you think might be important or of interest. *Please mention here if your survey observations at this site have changed drastically since the last time.* If you let us know in the *Comments* that something has drastically changed since you last sampled, we will know we need to pull your last data submission and compare.
- 12. FISH PRESENT.** As always, be sure to mark the “Fish Present” box at the bottom of the data sheet if you see fish. It is not necessary to tell us how many fish or how large they were, or what type of fish they happen to be.

VISUAL STREAM SURVEY DATA SHEET

Please check the box next to the "Site #" *if this is a new site and please be sure to attach a map.*

Site # 1 Stream Hillers Creek County Callaway
 Site Description 200 yds east of Jct. Hwy J & Hwy BB
 Date 2/15/10 Time (24-hr., military time) 0930 Trained Data Submitter's Stream Team Number 3184
 Trained Data Submitter (person assuming responsibility for these data) Chris Riggert Water Temp. (°C) 8
 Rainfall (inches in last 7 days) 1.0 Trained Participants Suzy Higgins, Kat Lackman

<p>*1. Floodplain land use industrial <u> </u>% commercial <u> </u>% residential <u> </u>% pasture/hayfields <u>10</u>% row crops <u>20</u>% woods <u>40</u>% other (specify) <u>Conservation Land</u> <u>30</u>%</p>
<p>*2. Riparian cover trees <u>40</u>% grasses or weeds <u>40</u>% bare ground <u>10</u>% parking lots/streets <u>10</u>% buildings <u> </u>% other (specify) <u> </u>%</p>
<p>*3. Streambank conditions trees <u>30</u>% grasses or weeds <u>65</u>% bare ground <u>5</u>% bedrock <u> </u>% pavement/riprap <u> </u>% other (specify) <u> </u>%</p>
<p>*4. Bed composition or riffle (or, if alternative habitat, check box <input type="checkbox"/>) silt or mud <u>80</u>% sand <u>10</u>% gravel <u>10</u>% cobble (2-10") <u> </u>% boulder (>10") <u> </u>% bedrock <u> </u>%</p>
<p>5. Percent embeddedness of cobble substrate = <u> </u> + <u> </u> + <u> </u> + <u> </u> + <u> </u> = <u> </u> / 5 = <u> </u>% <input checked="" type="checkbox"/> Cobble substrate not present at site</p>
<p>6. Signs of human use <u>Trails for hunting and hiking. Pile of old lumber</u></p>
<p>7. Algae What percent of stream bottom is covered by visible algae? <u>20</u>% Of the algae observed what percentage is: (a) close-growing <u>95</u>% + (b) filamentous (strands over 2' long) <u>5</u>% = 100% (The sum of 7a and 7b should equal 100%)</p>
<p>8. Water Color (describe) <u>Light tan</u></p>
<p>9. Water Odor (describe) <u>Earthy</u></p>
<p>10. Weather Conditions (cloud cover) <u>Clear</u></p>
<p>11. Comments <u>Tree seedlings have been planted on the west bank extending 100 yards.</u></p>
<p>12. Fish Present (Please mark) Yes <input checked="" type="checkbox"/> or <input type="checkbox"/> No</p>

***Items 1 thru 4 must total 100%**

<p>PLEASE KEEP A COPY AND SEND ORIGINAL DATA TO: Susan Higgins Water Protection Program Department of Natural Resources P.O. Box 176 Jefferson City, MO 65102-0176</p>	 <p>Water Quality Volunteer</p>
<p>Volunteer Monitoring - 06/10</p>	

VISUAL STREAM SURVEY SHEET INSTRUCTIONS

The purpose of the visual survey is to determine if there are any obvious water pollution problems on the stream and to characterize the riparian environment through which the stream flows. If thoroughly done, the watershed map should provide good guidance on which segment of your stream should be concentrated on in your visual survey. This data sheet has been developed to help you collect information during the visual survey of your 300-foot monitoring site. You are encouraged to fill out all of the data sheet items and any additional notes you feel help describe the stream and riparian corridor.

Data Sheet Items

Site Number. You must designate this number. It becomes very important if you choose to monitor more than one site. Number your sites as you chronologically choose them.

Stream and County. List the name of the stream as it appears on your map (e.g., a USGS topographic map). Locating your site on a map also ensures you record the appropriate county.

Site Description. This refers to a verbal description. Verbally describe where you are on the stream using street or highway names, bridges, approximate distances from landmarks, etc. Please be consistent and use the same verbal description for the same site (e.g., 100 feet upstream of Hwy. P bridge).

Date and Time. Please use military time (e.g., 2:00 p.m. is 1400, or 2:45 p.m. is 1445).

Trained Data Submitter. List the name of the person assuming responsibility for these data.

Water Temperature. 0° - 34° C *is within the normal range*

Be sure to read water temperature while the thermometer is submerged and shaded.

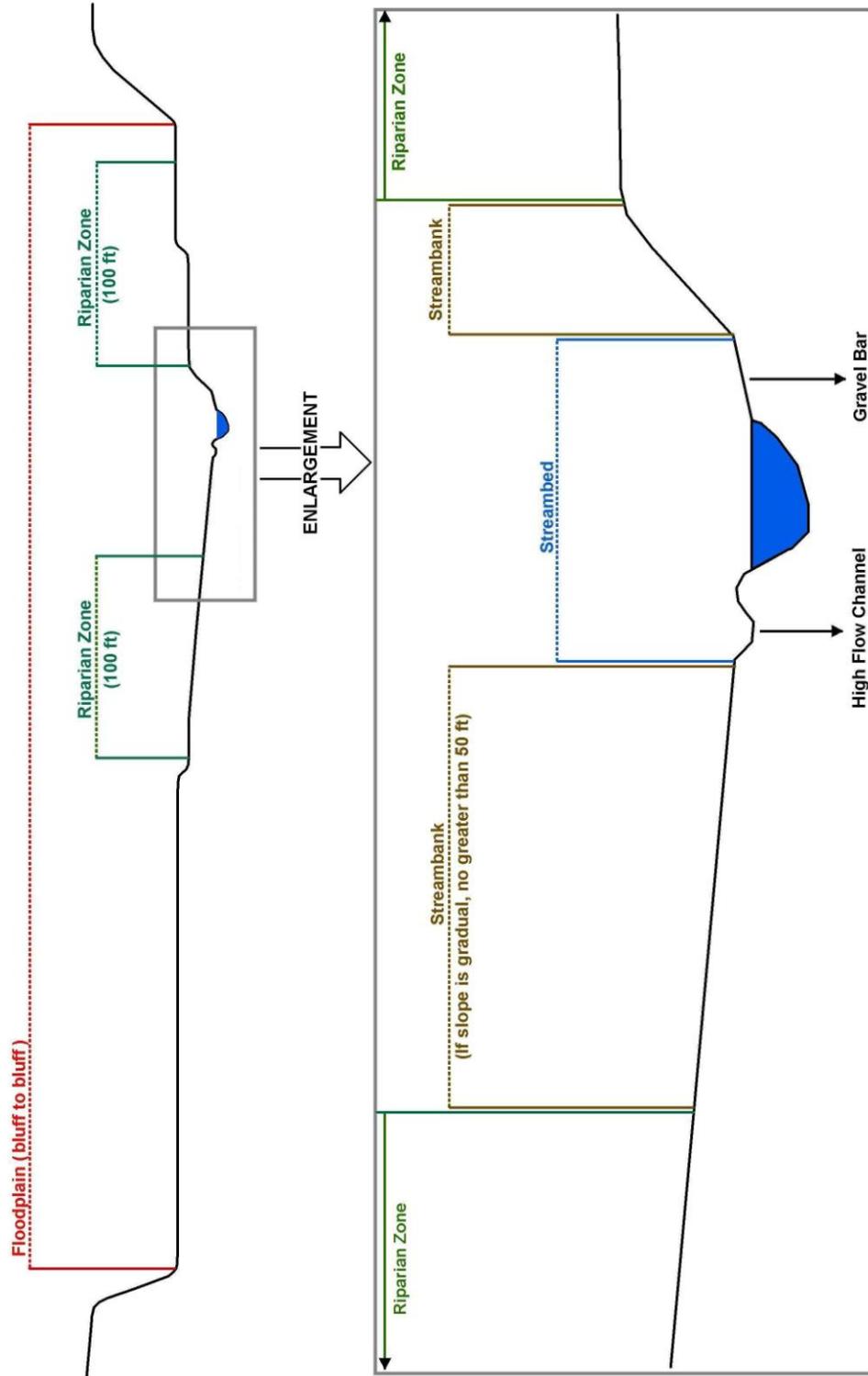
Trained Data Submitter's Stream Team Number. Enter your Stream Team number.

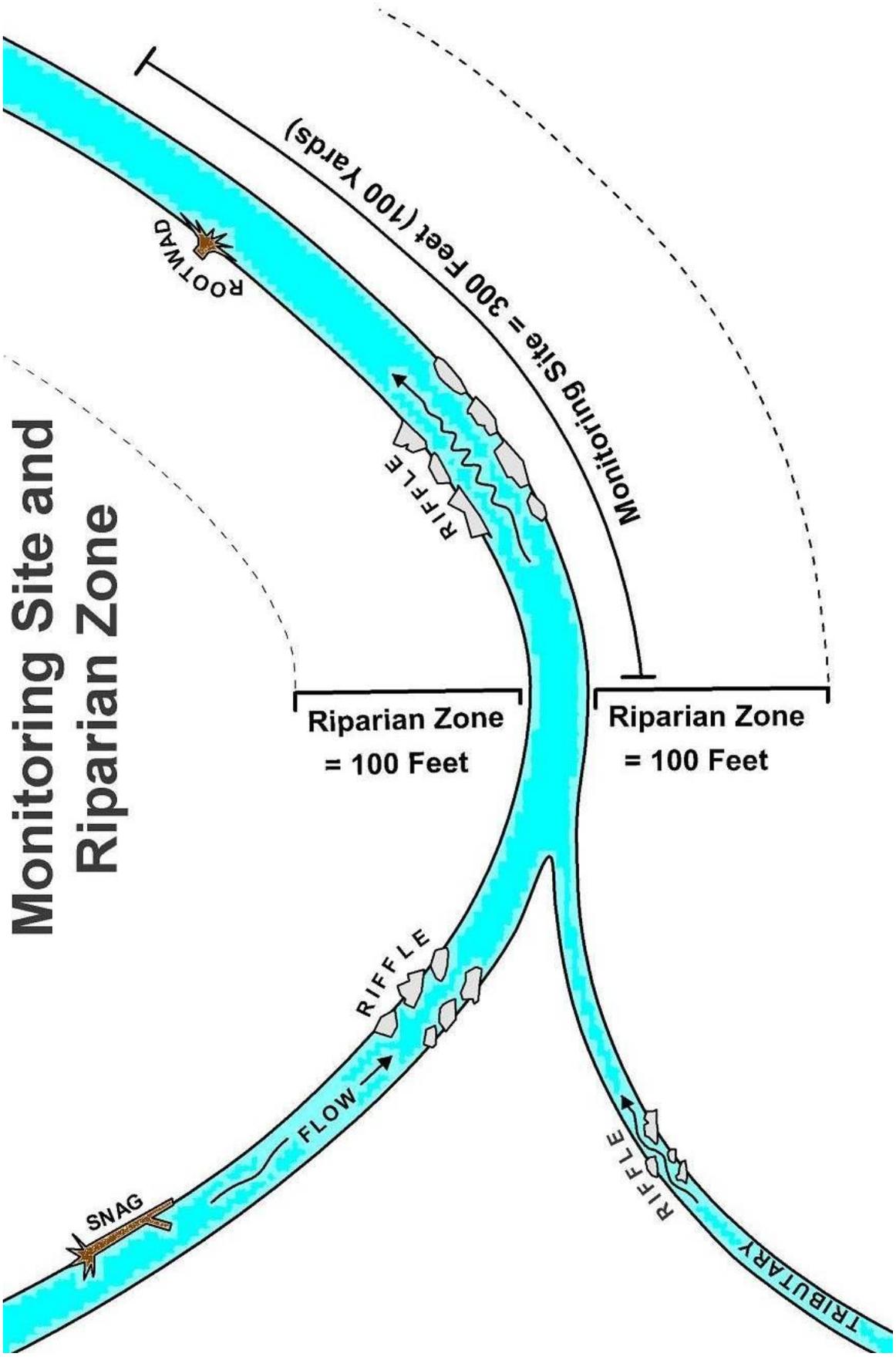
Rainfall. Enter the amount of rainfall received in inches in the past 7 days

Trained Participants. List the names of other volunteers trained at VWQM classes.

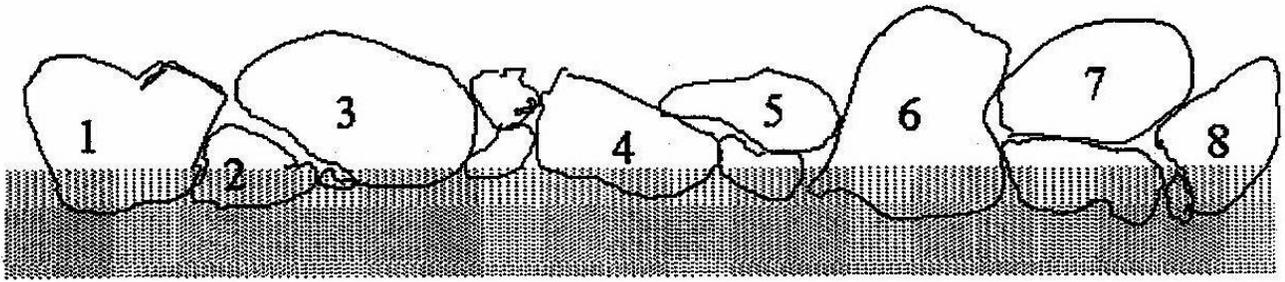
- 1. Flood Plain Use.** List the dominant land uses adjoining the stream. Bluff to bluff, estimate the percentage.
- 2. Riparian Cover.** For the purposes of this data sheet, the riparian zone is the area extending back from the top of each streambank for a distance of 100 feet. Estimate the percentage of this area that is covered by the various categories listed.
- 3. Streambank Conditions.** The streambank is the area of the land that rises from the streambed and reaches a crest. Such crests are more noticeable when looking at the outside bend of a stream meander. Estimate the percentage of the area of the streambank that is covered by the categories listed.
- 4. Bed Composition of Riffle.** A riffle is an area of shallow, rapid flowing water within a stream. If at least one of your habitats sampled is a riffle, estimate the percentage of streambed within the riffle that is covered by the various sized sediments listed. If you do not have a riffle, check the box and describe alternative habitat substrate.
- 5. Percent Embeddedness of Cobble Substrate.** Estimate the percentage (0-100%) of the surface area of the cobble substrate embedded in the sediment or sand. Randomly pick up five rocks between 2"-10" in size from the riffle and estimate the percentage each rock is embedded. Sum the 5 percentages and divide by 5. If cobble is not present, then place a check in the box. Be sure not to choose rocks from areas where you will be sampling macroinvertebrates.
- 6. Signs of Human Use.** This is the area along the stream (e.g., pull-offs or dirt roads for cars, footpaths, food and drink containers, campfires, fishing equipment, etc...).
- 7. Algae.** Estimate the percentage of the stream bottom covered by visible algae. Of the total algal cover, what percent is: (a) close-growing? (b) filamentous? Remember that (a) + (b) should total 100%.
- 8. Water Color.** Collect a sample of water using a clear plastic container and describe the water's color (e.g., clear, brown, green, milky, oily sheen, etc...).
- 9. Water Odor.** Take a whiff from your plastic container. If any odor is present, please describe (e.g., sewage odor, chemical odor, petroleum odor, rotten egg odor, musty odor, organic odor, no perceptible odor, etc...).
- 10. Weather Conditions.** Please describe the cloud cover (e.g., sunny, partly cloudy, etc...).
- 11. Comments.** List anything else not covered on the data sheet such as pipes, drainage ditches, and any changes in conditions since the last survey.
- 12. Fish Present.** Mark "Yes" or "No"

Visual Survey

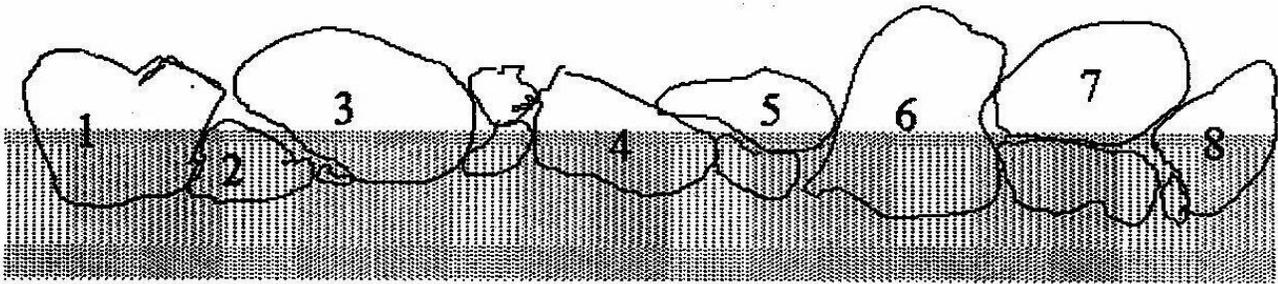




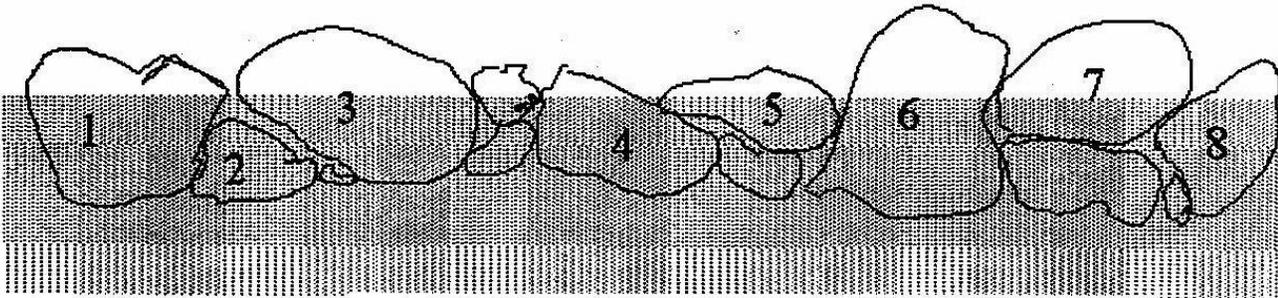
Monitoring Site and Riparian Zone



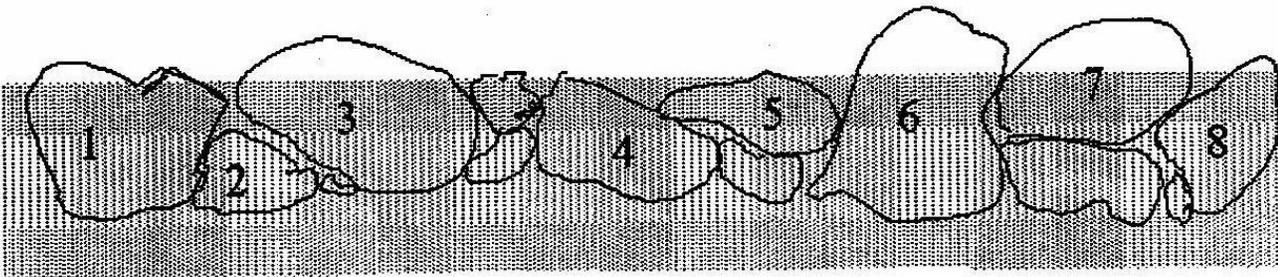
0 - 25% Embeddedness



25 - 50% Embeddedness



50 - 75% Embeddedness



75% - 100% Embeddedness