Information Paper 2.3.1
Assembling a Field Manual for Water Quality Monitoring

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1.0 Intent and Scope

The purpose of this Information Paper (IP) is to supply advice on preparing a field manual that will help monitors working in the field. It can also serve as a training manual for your monitoring program.

2.0 Content of the Field Kit

There are four basic components that need to be developed before implementing citizen monitoring program. These are a monitoring plan, quality assurance project plan, database and a field manual. Each citizen monitor does not need to be an expert on the above components nor should they be expected to read a collection of Standard Operating Procedures (SOP) in order be a valued volunteer. They only need to be properly instructed, evaluated for quality control assurances, and given clear guidance when questions arise.

The idea behind a field manual is to allow field monitors to "go by the book", have answers to questions that might arise and obtain good data/samples. The manual should provide clear instruction on where to sample (maps, site descriptions…), how take a water sample (grab sample basics, using a pole sampler…), how to operate sampling equipment, field safety, completed data sheet for reference, glossary of data sheet terms, vegetation guide or any thing else that will help field monitors do their best work.

The field manual should be simple, thorough and compact. Some monitoring programs simply use water-proof paper and include the manual on a clipboard with the days data sheets ready to go. Other groups have a small booklet and some us a small ringed binder so that updates can be easily included. Obviously it would be beneficial to review field manuals produced by other citizen monitors conducting similar programs.

This checklist and examples present possible items for field manual.

- Introduction to the project.
  Make this as specific as possible and include the program's goals.

- Basic hydrology and ecology of the area being worked in.
  This can be a short general geographical and historical description of the watershed or waterbody.

- Background information on Citizen Monitoring.
  This can be a broad explanation please refer to the Clean Water Team (www.swrcb.ca.gov/nps/volunteer.html), other citizen monitoring projects and The Volunteer Monitor www.epa.gov/owow/volunteer/vm_index.html).

- Organizational Expectations
  What to expect as a citizen monitor.
  Which days and times will monitoring be done?
  How much time is expected of me?
  Will I receive training?

  What is expected of a citizen monitor.
  Monitors are expected to attend all training events.
  Monitors are expected to provide their own transportation

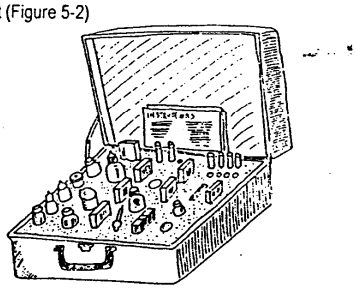
- Descriptions of the parameters to be measured and why they are being measured.
  You may refer to the Clean Water Team's Fact Sheets

- How to take a field sample.
  Collecting a water sample:
  Most samples will be collected on foot in shallow flows. If you are wading the individual samples should face upstream, this minimizes contamination of the samples from the samplers presence. The container should enter the water opening down to minimize collection of material from the surface area. Unless preservative has been added to the bottle it should be rinsed three times by filling and emptying the bottle. A new sample must be taken for each test that is run. All split samples and samples for bacteria testing will be collected in pre labled sample bottles and immediately be put on ice.
  Collecting a water sample for bacteria:
  Before collectiong any other samples put on a pair of latex gloves, grab a sterile sample bottle for bacteria collection from the field kit and using the marker provided in the kit write the site name , date , time, and sample number on the bottle. Position yourself so you can easily reach the water, remove the seal on the bottle neck and remove the cap from the bottle. Submerge the bottle in the water opening down and tilt the opening up and fill the bottle to the neck. Put the cap on the bottle and place in the cooler on ice. Examples from Orange County Channel Keeper's Handbook

- Field kit inventory.

Water Chemistry Team Equipment Checklist:

Water Chemistry Stream Team Field Kit (Figure 5-2)
Tape measure (50 feet)
String line
Stadia rod
Float (orange peel)
Calculator
Stopwatch
6 wooden stakes two foot
First aid kit
Hammer
Roll of white waterproof tape
Small ice chest



Example from Heal the Bay, The Malibu Creek Watershed Stream Team Field Guide

- Instructions on how to use each piece of field equipment including trouble shooting information, how to change batteries and any needed calibration information (such as elevation for an oxygen meter).

4. Water Temperature

Pull from the test kit the following items that you will need:
1 Plastic-encased thermometer CODE 1066
1 Sample Container

Water Temperature Sampling Procedure
1. At the selected stream sample location, in an area of the stream that is fast flowing but does not have turbulence or white water and is at least 6-8" deep, lower the sample container with the cap tightly secured, facing upstream.
2. With the bottle submerged, uncap the container and allow the bottle to fill.
3. Replace the cap with the bottle still submerged.
4. Return to the streambank to a shady location, if possible, and place the thermometer in the bottle for approximately two minutes, or when reading remains steady.
5. Without removing the thermometer from sample container, record the reading on the field sheet in the appropriate column.

6. pH Testing

Pull from the test kit the following items that you will need:

QTY	CONTENTS	CODE
1	pH Testr 2 meter (Figure 5-9)	
1	Open-mouth plastic beaker	0944

pH Testing Procedure
1. Turn the Testr on by pressing the ON/OFF button.
2. Take a water sample using the same procedure as in "Temperature."
3. Pour a portion of the water sample into the open toped plastic beaker code (0944).
4. Dip 1/2" to 1" of the electrode into the beaker (0944) that contains the water sample, and stir once. Let the reading stabilize.
5. Note the pH and record it on the field sheet.
6. Pour the sample back into stream, and take a new sample with the same container.
7. Repeat steps 1-6.
8. Turn off the electrode by pressing the ON/OFF button.
9. Rinse the electrode with deionized water or tap water.
10. Keep a small piece of sponge or towel moistened with clean tap water (not deionized) in the cap to keep the electrode from drying out.

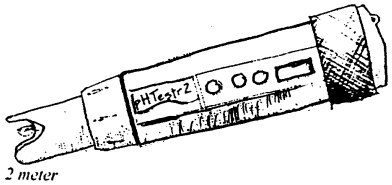


Figure 5-9: pH Testr 2 meter

Examples from Heal the Bay, The Malibu Creek Watershed Stream Team Field Guide

- Field sheets (data sheets) with examples of correctly filled out forms and a glossary of terms defined.

  For some examples refer to the Clean Water Team's Model QAPP and Compendium Glossary.

- Sample site location information.

  This can be made exclusively for specific teams monitoring a given site.

Information can be provided as and include the following: maps, written directions, site description, GPS coordinates, pictures. Additionally it could contain information on where to pick up supplies and/or where drop off samples.

- Field instructions for stream flow, benthic macro invertebrate field collection or stream/shore/dock walk protocols.

Procedures for determining stream flow:

Pick a 20-foot long section of the stream that is straight and of uniform width. Water should be flowing evenly within this section without turbulence, obstacles or other disturbances. This section of the stream should be shallow enough for you to safely wade across and conduct the stream flow test.

1. To measure the cross sectional area of a stream, place a stake at the wetted edge on each streambank.

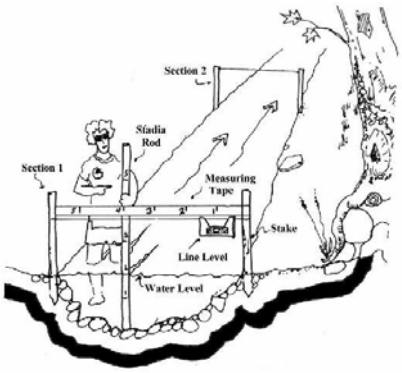
2. Tie a string line to both stakes running across the stream, use the line level in the field kit to insure the string line is level.

3. Attach the loose end of the tape measure to one of the stakes using the spring clamp in the field kit, while one of your teammates holds the other end of the tape measure on the opposite streambank. The tape measure should be placed directly beside the level string line. Note: This location will be the starting line for the stream flow velocity trials.

4. Have one person take the stadia rod to measure the depth of the water at 1-foot intervals across the stream use the tape measure to establish these points. Always stand downstream of the tape line and stadia rod.

5. Continue to measure at 1-foot intervals until you reach the edge of the water on the opposite side of the stream bank. Call out the depth measurements at every 1-foot interval so it can be recorded on the Stream Flow Field Sheet. Please read the section on How to Read the Stadia Rod.

6. Add up the depths on the Stream Flow Field Sheet. This is the cross sectional area for that section of the stream.



Note: Leave the string line attached to the stakes running across the stream. You will use this as a marker for the velocity measurement.

7. Repeat this procedure 20 feet downstream from where the first cross section was measured. This is where the finishing line for your stream flow velocity trials will take place. Compute the cross sectional area for this section and record this on the Stream Flow Field Sheet.

8. Add the two cross sectional area figures together and divide by two to get an average cross sectional area. Record this information on the Stream Flow Field Sheet.

Now you are ready for the velocity float trial part of the stream flow test.

1. Measure the length of the stream where the velocity float trials are to be conducted and record this information on the Stream Flow Field Sheet. This distance should be 20 feet, from starting line to finish line.

2. One team member stands in the stream at the starting line with an orange peel. Another team member stands downstream at the finish line waiting to retrieve the orange peel as it crosses the finish line. A third team member is standing on the bank next to the finish line with a stopwatch and clipboard.

The team member at the starting line drops an orange peel and as it passes the starting line, yells, “go”. The person on the bank starts the stopwatch. When the orange peel passes the finish line the watch is stopped, the orange peel retrieved, and the time recorded on the Stream Flow Field Sheet.

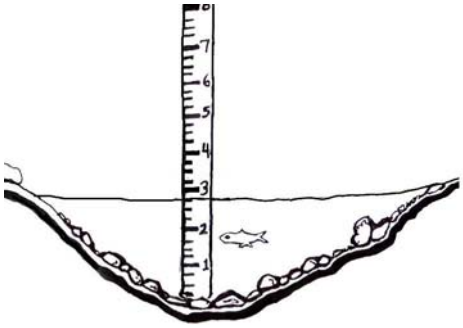
4. Repeat this test five times moving from the left to the right side of the stream along the starting line. Doing this will give you a more representative depiction of stream flow along that section of the stream. Record the results on the Stream Flow Field Sheet each time.

5. Add up the times for each of the velocity float trials and divide by the number of trials (5) to get an average velocity time. Record the results on the Stream Flow Field Sheet.

6. Use the Stream Flow Field Sheet to calculate surface velocity. Divide distance (20 feet) by average velocity time to get average surface velocity in feet per second. Next, multiply this result by the velocity correction factor of 0.8 to get average corrected velocity. The velocity correction factor has been added to adjust for the fact that water velocity at the surface is faster than water velocity closer to the bottom of a stream. Use this factor to get a more accurate stream flow calculation.

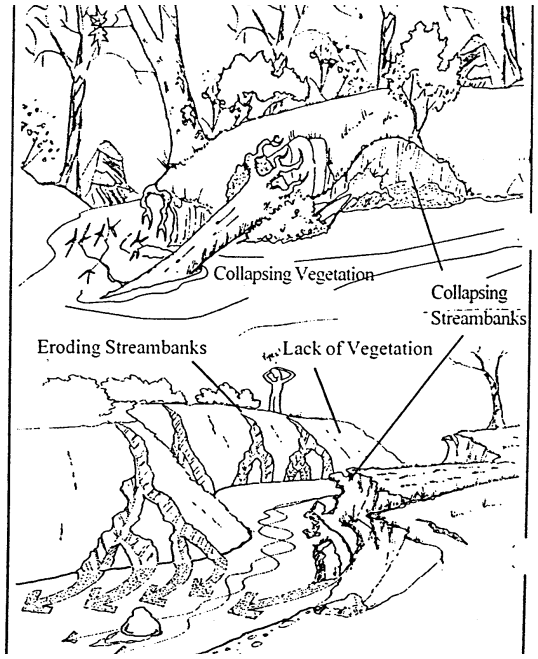
7. Finally, calculate stream flow by multiplying average correction velocity by average cross sectional area. Your result will in CFS (cubic feet per second). Record this number on the Stream Flow Field Sheet.

Reading the Stadia Rod
Hold the stadia rod plumb (straight up and down) and on the stream bottom. You are taking measurements at every foot along the horizontal tape measure that is stretched across the stream. The team is measuring at the four-foot mark on the tape measure. The stadia rod touches the top of the stream water at the two-foot mark. Record 2 foot on the Stream Flow Field Sheet in the box directly along side of the 4 foot horizontal box.



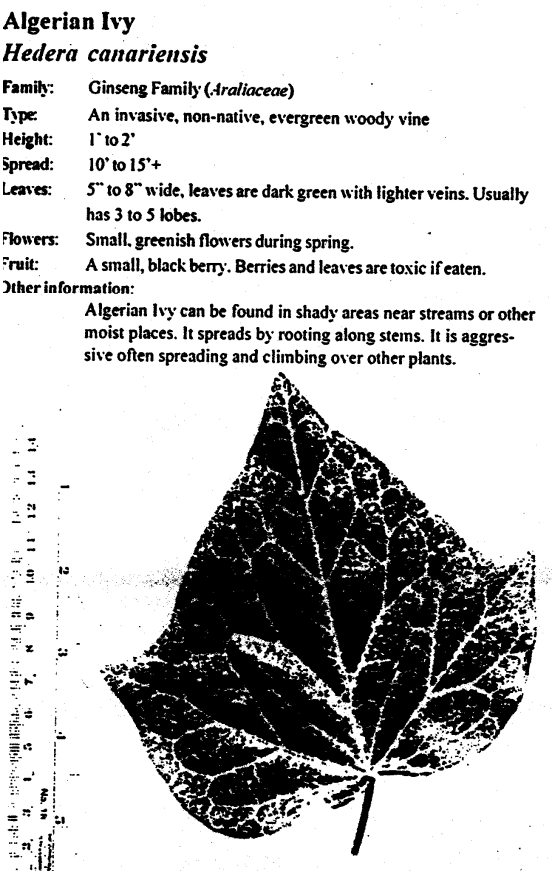
Field Sheets:
Record the results on the Stream Flow Field Sheet. A sample of the Stream Flow Field Sheet is provided on the following pages

- Sometimes tidal phases or water release information should be included
- Hydrologic and/ or habitat depictions and definitions.



Example from Heal the Bay, The Malibu Creek Watershed Stream Team Field Guide

- Wildlife and/or plant descriptions with pictures or drawings.



- List of references.

- Safety information.

  Volunteer citizen monitors are the most valued part of any program. Keep in mind the time and place monitoring will be conducted. This should cover all working condition aspects. Examples of some safety issues: water safety, trail safety, sun exposure, exposure to heat/cold, poisonous plants, venomous animals, biting insects, feral animals, livestock, homeless encampments, hypodermic needles, locations of nearest hospital, list of emergency phone numbers …

  The following are some basic common sense safety rules. At the site:

  < Always monitor with at least one partner. Teams of three or four people are best. Always let someone else know where you are, when you intend to return, and what to do if you don't come back at the appointed time.

  < Develop a safety plan. Find out the location and telephone number of the nearest telephone and write it down. Locate the nearest medical center and write down directions on how to get between the center and your site(s) so that you can direct emergency personnel. Have each member of the sampling team complete a medical form that includes emergency contacts, insurance information, and pertinent health information such as allergies, diabetes, epilepsy, etc.

  < Have a first aid kit handy. Know any important medical conditions of team members (e.g., heart conditions or allergic reactions to bee stings). It is best if at least one team member has first aid/CPR training.

- Listen to weather reports. Never go sampling if severe weather is predicted or if a storm occurs while at the site.

- Never wade in swift or high water. Do not monitor if the stream is at flood stage.

- If you drive, park in a safe location. Be sure your car doesn't pose a hazard to other drivers and that you don't block traffic.

- Put your wallet and keys in a safe place, such as a watertight bag you keep in a pouch strapped to your waist. Without proper precautions, wallet and keys might end up downstream.

- Never cross private property without the permission of the landowner. Better yet, sample only at public access points such as bridge or road crossings or public parks. Take along a card identifying you as a volunteer monitor.

- Confirm that you are at the proper site location by checking maps, site descriptions, or directions.

- Watch for irate dogs, farm animals, wildlife (particularly snakes), and insects such as ticks, hornets, and wasps. Know what to do if you get bitten or stung.

- Watch for poison ivy, poison oak, sumac, and other types of vegetation in your area that can cause rashes and irritation.

- Never drink the water in a stream. Assume it is unsafe to drink, and bring your own water from home. After monitoring, wash your hands with antibacterial soap.

- Do not monitor if the stream is posted as unsafe for body contact. If the water appears to be severely polluted, contact your program coordinator.

- Do not walk on unstable stream banks. Disturbing these banks can accelerate erosion and might prove dangerous if a bank collapses. Disturb streamside vegetation as little as possible.

- Be very careful when walking in the stream itself. Rocky-bottom streams can be very slippery and can contain deep pools; muddy-bottom streams might also prove treacherous in areas where mud, silt, or sand have accumulated in sink holes. If you must cross the stream, use a walking stick to steady yourself and to probe for deep water or muck. Your partner(s) should wait on dry land ready to assist you if you fall. Do not attempt to cross streams that are swift and above the knee in depth. Wear waders and rubber gloves in streams suspected of having significant pollution problems.

- If you are sampling from a bridge, be wary of passing traffic. Never lean over bridge rails unless you are firmly anchored to the ground or the bridge with good hand/foot holds.

- If at any time you feel uncomfortable about the condition of the stream or your surroundings, stop monitoring and leave the site at once. Your safety is more important than the data!

When using chemicals:

- Know your equipment, sampling instructions, and procedures before going out into the field. Prepare labels and clean equipment before you get started.

- Keep all equipment and chemicals away from small children. Many of the chemicals used in monitoring are poisonous. Tape the phone number of the local poison control center to your sampling kit.

- Avoid contact between chemical reagents and skin, eye, nose, and mouth. Never use your fingers to stopper a sample bottle (e.g., when you are shaking a solution). Wear safety goggles when performing any chemical test or handling preservatives.

- Know chemical cleanup and disposal procedures. Wipe up all spills when they occur. Return all unused chemicals to your program coordinator for safe disposal. Close all containers tightly after use. Do not switch caps.

  Know how to use and store chemicals. Do not expose chemicals or equipment to temperature extremes or long-term direct sunshine.

Examples from Orange County Channel Keeper's Handbook