

FIELD PROCEDURE: GRAB SAMPLING FOR LAB ANALYSIS (BACTERIA, NITRATES, ETC.)

(**NOTE:** The regular stream teams do not perform this procedure. A special Grab Sample Team collects a large number of these samples in a single day, in what's known as a "site tour" in the Clallam County Water Resources database.)

EQUIPMENT NEEDED:

- Streamkeepers Fecal/Nitrate Sample Tracking Sheets—one per team per day
- Clipboard, pencils
- Directions to collection sites
- Sterile bottles, enough for each team's collection, plus replicates, plus a few more
- Watch to tell time
- Latex gloves
- Streamkeepers business cards
- Waterproof marking pen
- Thermometer
- Salinity meter—*optional* (see below)
- Sampling wand to attach bottles to
- Large cooler to keep in car
- Portable cooler to carry to sites
- Gel ice packs or ice (preferably crushed or shaved) to maintain temperatures below 39°F/4°C

SPECIAL EQUIPMENT FOR NITRATE SAMPLES:

- Clallam County IOCS Reports for Nitrates—enough for each team's collection, plus replicates, plus a few more
- Sterile bottles, enough for each team's collection, plus replicates, plus a few more
- Nitrate test strips—one per site
- Rubber bands
- Ziplock bags

WHY GRAB SAMPLES?

Many types of water analysis are exclusively or optimally performed in a laboratory. This protocol describes sampling for bacteria and nitrate analysis, but similar procedures can be used for many other types of analysis.

WHY SAMPLE FOR BACTERIA & NITRATES?

Microorganisms and nitrates are naturally present in streams, but humans can change both the quantity and nature of these inputs in a way that upsets nature's balance:

- Pathogenic (disease-causing) microorganisms that humans or domestic animals introduce to water—including varieties of bacteria, viruses, and protozoans—can cause diseases in humans and animals alike, including salmonella, hepatitis, and giardia.
- Undisturbed streams generally contain less than 1 mg/L of nitrate-nitrogen (the part of the nitrate ion consisting of elemental nitrogen). Levels above 10 mg/L have been connected with Blue Baby Syndrome, reduced livestock vitality, and "brown blood disease" in fish.
- Excessive inputs of nitrates (through fertilizers, livestock, or leaking septic tanks) to water can lead to eutrophication--a massive build-up and die-off of vegetative matter that takes up the available dissolved oxygen in the water and suffocates fish and the macroinvertebrates they depend on. Nitrate loading can be particularly devastating to nearshore marine areas.

When elevated levels of pathogens or nitrates are present, water quality is at risk.

One way to test for the presence of human-introduced pathogenic microorganisms is to focus on fecal coliform bacteria, which primarily live in the digestive systems of warm-blooded animals, aiding digestion. These bacteria, though not pathogenic themselves, are good indicators of human or animal waste contamination, which often carries other more harmful organisms that are harder to test for. Hence, Washington State water quality standards use fecal coliforms as the indicator of potential pathogenic conditions in streams.

GRAB SAMPLING

However, since some forms of fecal coliform bacteria do not have an animal origin, laboratories can also test for strains that are primarily traceable to animals--Escherichia coli (E. Coli) or enterococcus--to confirm animal contamination.

Neither bacteria nor nitrates can be accurately measured in the field. Hence, the Streamkeepers protocol is to:

- have regular Stream Teams screen all reaches for nitrates on a quarterly basis with test strips (which, though neither accurate nor precise, can alert to potential "red flag" situations), and to
- have a separate Grab Sample Team take samples for laboratory bacteriological testing (total fecal coliforms and/or E. Coli presence) near the mouth of every monitored stream, also on a quarterly basis.

If either nitrate test strips or bacterial samples indicate a problem, the Grab Sample Team may be asked to do further sampling for bacteria or nitrates.

WHERE TO SAMPLE:

Quarterly samples for bacteria will generally be taken on each stream that Streamkeepers monitor, at a site near the mouth. In the case of an identified problem or special-project request, additional sites may be sampled.

WHEN TO SAMPLE:

Time of year:

- Routine bacterial samples will be taken quarterly during the following times:
 - January
 - April or May
 - August 1 – September 15
 - October 5 – 31

The Grab Sample Team will decide on what day to sample, taking into consideration the factors listed below. ANY proposed sampling date must be confirmed two weeks in advance with the processing laboratory (usually the Clallam County Environmental Health Lab, 360-417-2334. NOTE: The lab does not take samples

on Fridays.) **Notify Streamkeepers staff** when you have scheduled a sampling date, and arrange to pick up the equipment.

- Non-routine bacterial and nitrate samples will be scheduled ad hoc in conjunction with Streamkeepers staff.

Time of day: Ordinarily, fecal samples must be delivered by 2 p.m. and within 6 hours of the first sample, but some projects may differ; nitrate samples may be stored for 48 hours at 4°C. If you're running late, don't decide to skip your final sites before calling the lab manager at 417-2334, and trying to make special arrangements. This is often possible.

Avoiding tidal interference: What you should be testing is the freshwater runoff of the stream, not what might surge in on a high tide. To avoid tidal interference:

- The Grab Sample team should check the tide tables before planning their collection day. Tide chart can be found in current phone book or online at www.dairiki.org/tides/daily.php/ang
- Samples taken near the mouths of streams should be taken on an outgoing tide. In general, you can sample ½ hour after mean high tide, defined as the point halfway between the high-low tide and low-high tide for the day.
- If a salinity meter is available, take it along and sample salinity. Note the reading on the tracking sheet.
- Be sure that the water is flowing downstream when you sample. If the tide has turned and you notice upsurge effects, note that on the tracking sheet and plan your next sample day to avoid such situations!
- Sites that are well above the stream mouth should have no problem with tidal interference.

FIELD REPLICATES:

Our quality control plan requires that at one sampling point out of every ten (or portion thereof), a second sample be collected for a replicate test. Field replicates give an indication of how much variability there is in the equip-

ment, sampling techniques, and environment.

To perform and record field replicates:

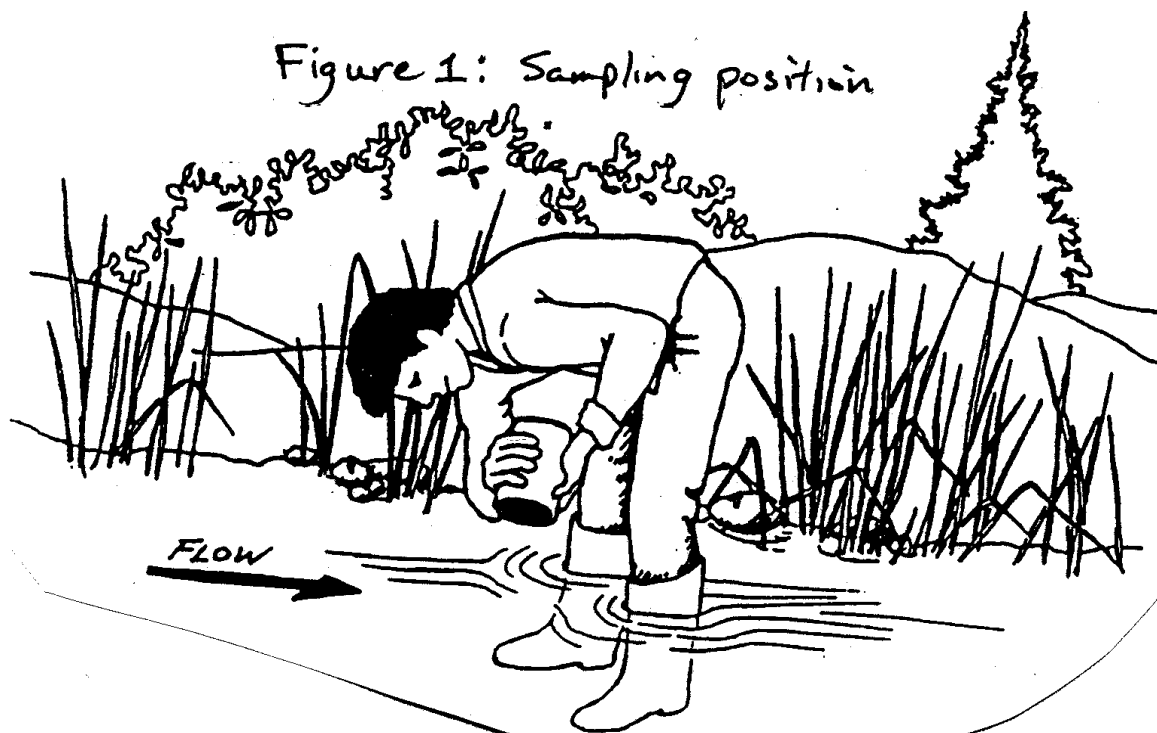
- Streamkeepers staff or the team leader will determine how many replicate samples need to be collected, select sites for replicates, and then notify team members where they'll need to collect replicates.
- At the replicate site(s), the team will grab a second sample, as soon as possible after the first, and in the same spot.
- On the Streamkeepers Sample Tracking Sheet, write "FR" in the "Field Rep?" column on the line for the replicate sample (see sample field sheet at the end of this section).

FIELD PROCEDURE:

For safety purposes, at least two people must go out together to collect grab samples.

- 1) Fill the car cooler with ice or ice packs. Keep the thermometer in a place where it will be near the outside temperature.
- 2) Take the portable cooler with you to each site, with enough ice to chill the sample(s) until you get them back to the car cooler.

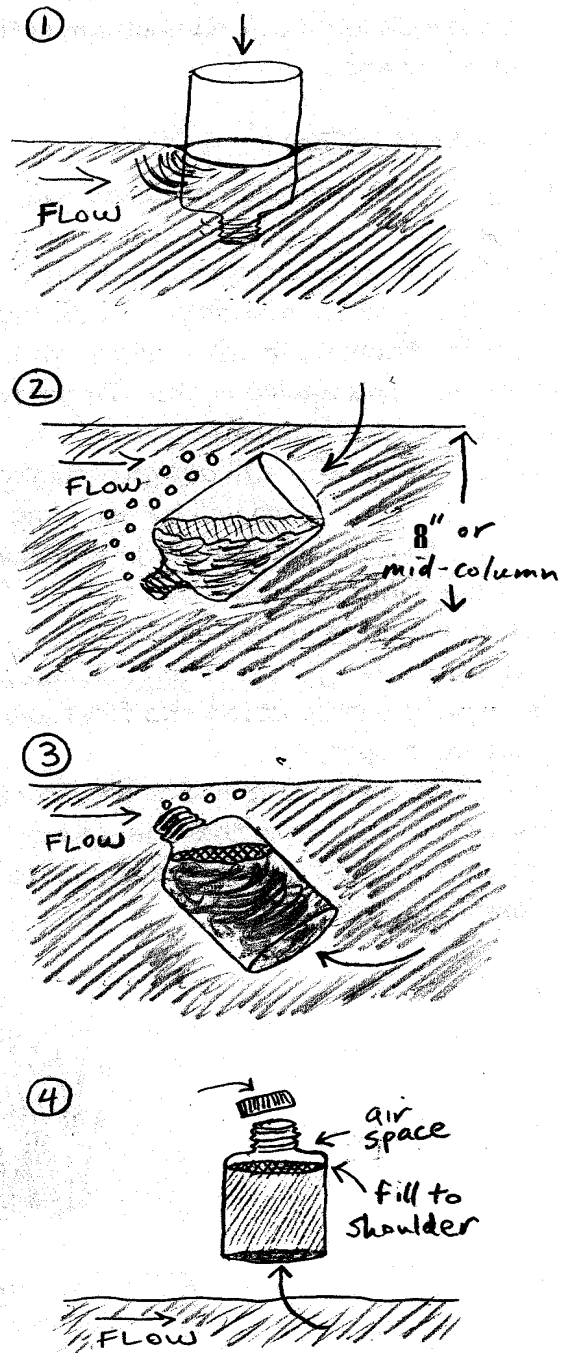
- 3) When first arriving at the site, hang the thermometer in a shady spot.
- 4) **Collecting the sample:** Gloves are optional but preferred, and you can use the sampling wand to avoid having to wade in the stream. Here is the procedure if you can find water that is at least 6" deep:
 - a) Enter the stream downstream of where you plan to sample, to avoid contaminating the sample from your boots or stirred-up sediment. Sample at a point within the regular monitoring reach where the stream is flowing, well mixed, and preferably at least 6" deep. (If there is no such place, you may go outside the reach, but note your location on the tracking sheet.) Get as far away from the banks as you can. Choose a spot that appears undisturbed and has little or no sediment stirred up in the water, if possible. (See Figure 1; however, note that ***it is preferable to use a sampling wand***, as this stirs up the bottom far less than walking in the creek.)



GRAB SAMPLING

- b) Uncap the bottle, holding the bottle near the bottom and the cap near the top edge. Do not let anything touch the inside of the cap. Do not set the cap down. Do not rinse the bottle or cap. If the bottle becomes contaminated (e.g., if you touch the threads or hit it on the stream bottom), discard it.
- c) If you're in water $>6''$ deep, hold the bottle near its base and plunge it below the water surface with the opening pointing downward. Collect the sample 8-12" below the surface, or midway between the bottom and the surface if the water is shallower. Turn the bottle underwater into the current and away from you. In slow-moving stream reaches, push the bottle underneath the surface and away from you in an upstream direction. Take the bottle out of the water when it is filled up to the shoulder, 2/3 of the way full is also acceptable. (Figure 2, #4.)
- If the bottle comes out with the water level below the shoulder, pour out the water and try again.
 - If the bottle comes out full quickly flick the bottle until the water level decreases to the shoulder. If more than a few seconds have passed, cap and shake the bottle before flicking.
- d) If the water is $<6''$ deep, you have a couple of options:
- Sample in shallow, fast-moving water, preferably at a point where the water is forced between a couple of larger rocks. Hold the bottle facing upstream so as to catch the moving water in it. Avoid hitting the bottom.
 - If there is a drop-off somewhere, as from a cascade or culvert, you can sample from this drop-off so long as the bottle touches nothing but the falling water.
- 5) Recap the bottle carefully, without touching the inside.

Figure 2: Collection procedure when bottle can be submerged



- 6) If there is no number on the bottle, mark it with the site name. If there is a number, simply record that number on the data sheet.
- 7) Put the bottle in the cooler.
- 8) If this is a site where you are to take a **replicate**, repeat the sampling procedure. If you're marking the bottle, include a circled "FR" after the site name.

- 9) At your first sampling site, fill out the headers on the Tracking Sheet (see example at end of section). The "Sampler in Charge" is the person ultimately responsible for the data at those sites on that day. Be sure to include all initials.
- 10) At each site, enter on the tracking sheet:
- The bottle number, if there is one.
 - The site name; if you do not know its name, describe it well enough that its location is clear.
 - "FR" if the sample is a field replicate (see discussion above).
 - The time of sampling.
 - Sample collector's initials.
 - The air temperature: make sure the thermometer is still in the shade, hold it by the upper end, and record to the nearest °C. (*Remember to take the thermometer back with you!*)
 - Any noteworthy remarks—e.g., a flock of ducks on the water, abundant leaf litter, strange debris, high turbidity, unusual smells—or problems sampling.
- 11) If you are taking a **nitrate sample** at this site, follow a similar sampling procedure:
- Write "Y" in the "Nitrate sample?" column on the tracking sheet.
 - If available, use a Hach test strip to test the nitrate level, and enter the reading to the nearest mg/L.
- Fill out a Clallam County IOCS Report for Nitrates, following the example below. No need to write on the bottle.
 - Fold the report sheet and wrap it around the bottle with a rubber band. Put the bottle and sheet in a ziplock bag and store them in the cooler.
 - Take a **replicate** nitrate sample at each fecal replicate site.
- 12) Transfer sample bottles to the car cooler.
- 13) When finished sampling, bring all samples and forms directly to the laboratory. On your data sheet, enter the time that you turned the samples in, and have someone from the laboratory initial the time that they've received the samples. Have the lab make a copy of your data sheet(s), give them the originals, and bring the copies, along with the equipment, back to the Streamkeepers office. Don't forget to turn in a Volunteer Hours sheet for your team.
- 14) The lab will process the samples and submit results to Streamkeepers staff, who will enter the information into the Clallam County Water Resources database and then issue a report. Fecal coliform colonies will be counted using the membrane filtration or "mFC" method; nitrate samples will be tested for nitrate-nitrogen concentration using the nitrate ion electrode method; and other indicators may be tested as well, using Standard Methods for Examination of Water & Wastewater (20th edition).

INORGANIC CHEMICALS (IOCS) REPORT FOR NITRATES

FILL IN ONLY THESE BLANKS IN THE TOP SECTION →

(indicate here if "REPLICATE")

| | | | |
|--|---|-------------------------------------|--|
| System ID No.: | System Name: <u>Peabody Creek Reach #1</u> | | |
| Lab/Sample No.: | Date Collected/Time: <u>8/23/99 11:12am</u> | DOH Source No.: | |
| Multiple Source Nos.: | Sample Type: <u>Raw Stream</u> | Sample Purpose: | |
| Date Received/Time: | Date Reported: | Supervisor: | |
| | Date Analyzed: | Analyst: | |
| County: | Group: A B Other | | |
| Sample Location: | | | |
| Send Report To: <u>DCD / Streamkeepers</u> | | Bill To: <u>DCD / Streamkeepers</u> | |

