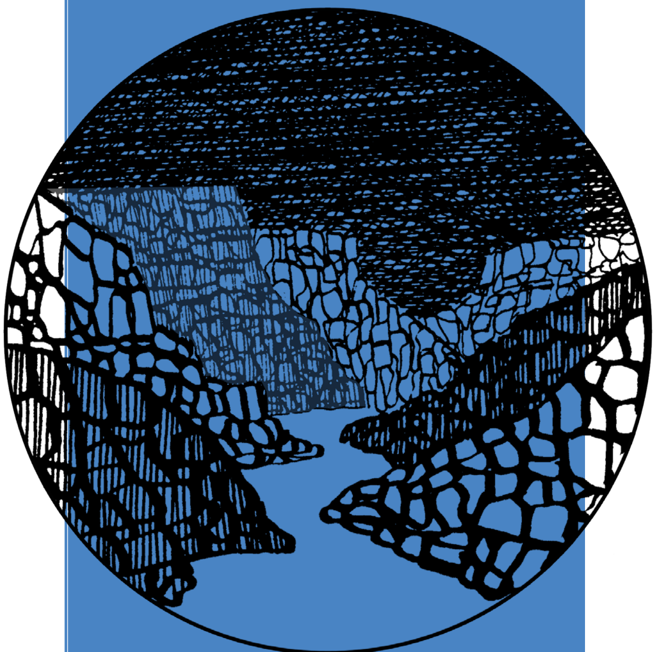

Statistics for Action Water Quality Guide: Read Before You Drink

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Acknowledgments

Based on the full version
Water Quality: Read Before You Drink

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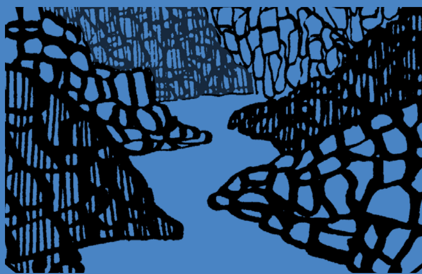


Statistics for Action Water Quality Guide:

Read Before You Drink

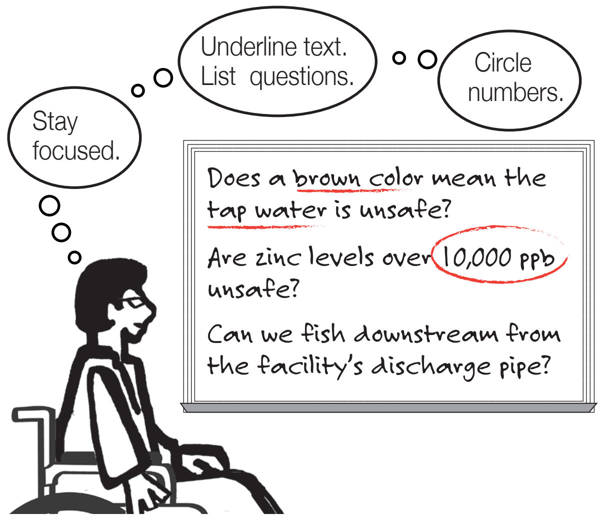
Introduction to this Guide

What's Here

This guide focuses on how residents play a role in monitoring water quality. It offers an overview of the reasoning that shapes monitoring. The suggestions provided may or may not fit your situation. Use the guide as a jumping off point to consider your steps and strategies.

You can learn:

1) What steps are part of the testing process.
2) What to figure out before you start pushing for testing.
3) How to handle the results—how to decode lab results and consultants' reports that are full of unfamiliar terms.
4) How to communicate results without losing your audience.



Going Solo?

This guide tells the story of a community facing contamination from a junkyard. Following the story and examining their data will give you ideas for how to tackle the test data you receive.

Got a Group?

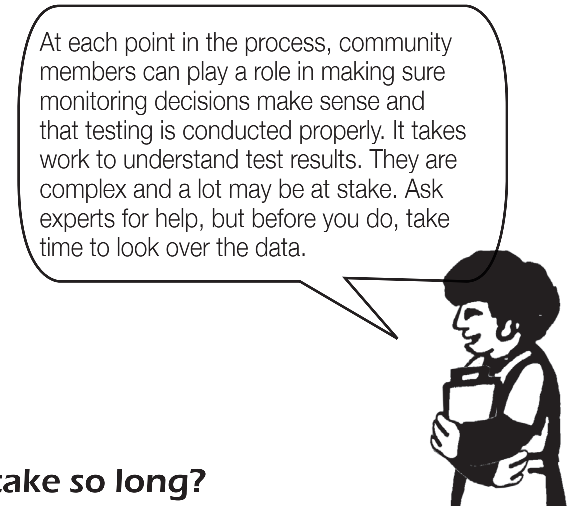
Statistics for Action has activity ideas and resources for groups to use. These are meant to make it easier to use the data from reports. The goal is for everyone in the group to feel more confident reviewing and talking about test results.

Visit the SfA website to view the activities marked with:
sfa.terc.edu/materials/activities.html
Try the activities to deepen understanding and help with planning.

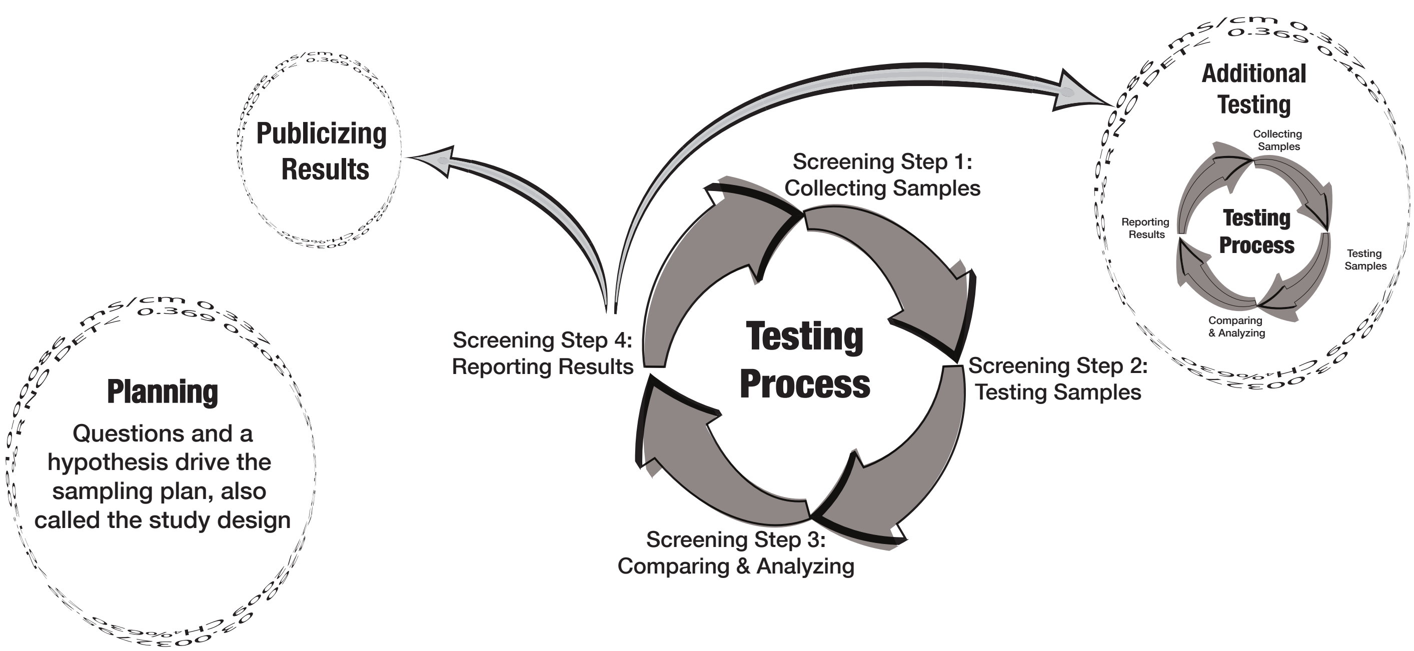
Note: If your main interest is in collecting your own samples, look in the appendix for resources on testing.

Introduction to Testing

There are many ways to restore and protect water and to prevent health problems. Before a community can make progress in this direction, it needs a baseline to determine the current status. Sampling and testing the water, also called water quality monitoring, are key parts of the process.



Why does it take so long?



Testing may or may not lead to a clean-up and if it does, testing will be ongoing. Testing happens before, during, and after the clean-up process. Every test yields data that describe conditions in the environment.

Terms You May Run Across

Concentration

The strength of a chemical in a liquid. For example, the amount of flouride in a liter of water.

Contaminant

Chemical solvents, metals, and neurotoxins used for insect control that can make water unsafe for humans and animals exposed to it.

Detection Limit

The lowest weight at which an instrument is no longer accurate. Think of a bathroom scale weighing a feather.

Discharge Monitoring Reports/Permits

The paperwork that lists the amounts of contaminants a business or facility is allowed to send out into the air or water in an amount of time, and the paperwork that shows the actual amounts emitted.

Environmental Protection Agency (EPA)

EPA is a federal agency with regional offices that sets and enforces regulations for contaminants in water.

Maximum Contaminant Level (MCL)

The highest level of a chemical or element legally allowed in drinking water.

Maximum Contaminant Level Goal (MCLG)

A health goal that should keep people safe from any negative health effect. MCLGs are not legally enforceable.

Microgram (μg)

1,000 times smaller than a milligram, a million times smaller than a gram. Even at an amount measured in micrograms per kilogram, some contaminants are toxic.

Milligram (mg)

1,000 times smaller than a gram, which is about the weight of a packet of sweetener or a little less than a paperclip.

Parameter

Something one can measure and describe about water quality, like temperature or contamination levels.

Part per billion (ppb)

A measure of contaminants in water. The same as micrograms per liter.

Part per million (ppm)

Another way to express milligrams per liter or per kilogram in water.

Plume

Pollution that is spreading from a spill or release.

Reference Dose (RfD)

The highest amount of a substance that you can consume (or otherwise take in) that won't cause you harm throughout your lifetime (estimated to be 70 years). Also known as Tolerable Daily Intake (TDI).

Sediment

The bottom of a lake, pond, or river. Some contaminants float away, but some sink and persist in the sediment.

Recovery site

The place downstream from run-off where the pollution is likely to be much less concentrated and natural processes have broken down pollutants allowing a river to naturally recover.

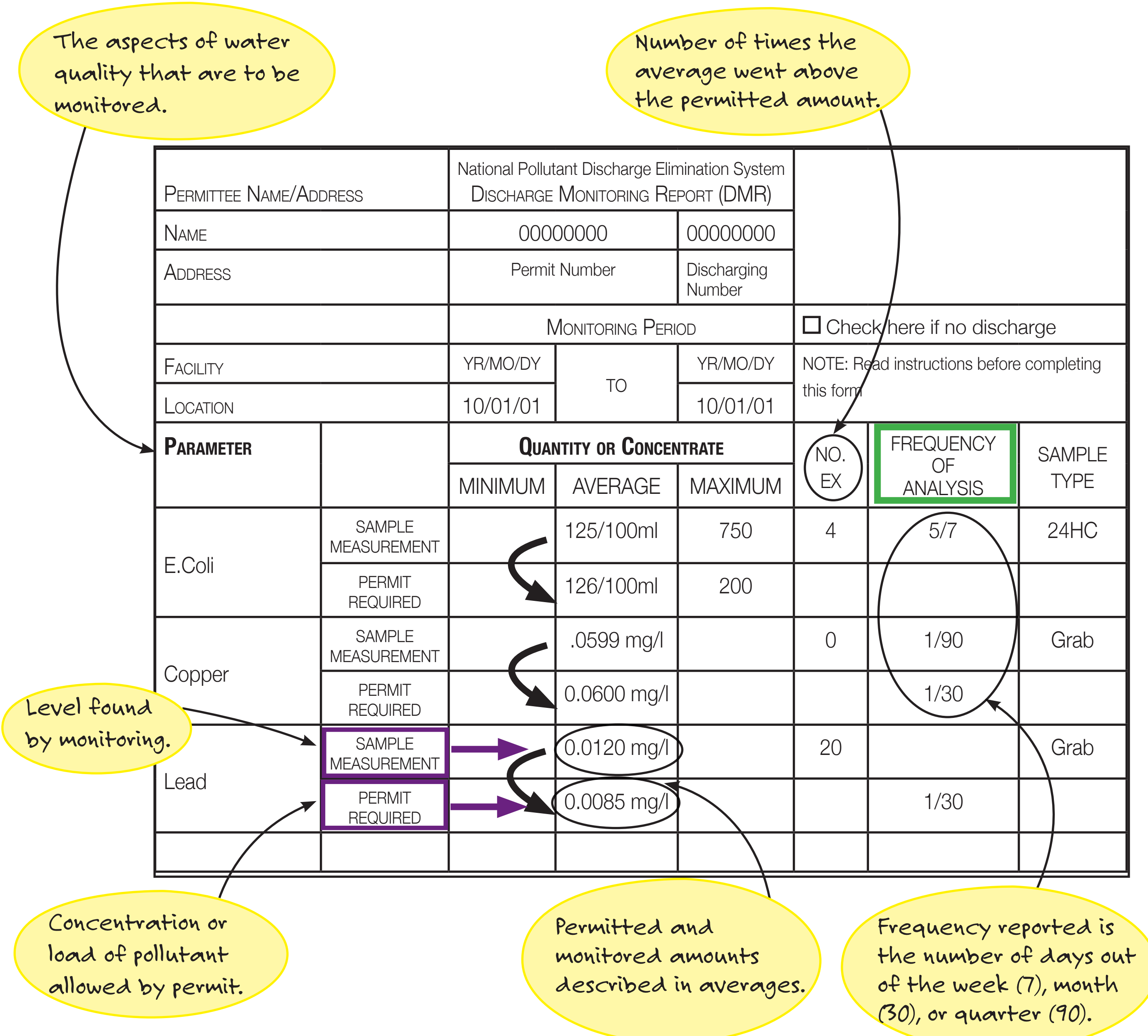
Screening Quick Reference Table (SQuiRT) Threshold Effect Level (TEL)

SQuiRTs are a set of screening levels that are set in relationship to harm to organisms living in water bodies and sediment. The TEL is a level above which chemical concentration has an effect on aquatic life. See: response.restoration.noaa.gov/environmental-restoration/environmental-assessment-tools/

Got a Group?

Use fact sheets from *Common Units* and *Limits and Levels* to get a better grasp of these units.

Sneak Preview: What you might see



Permittee Name/Address	National Pollutant Discharge Elimination System Discharge Monitoring Report (DMR)						
Name	00000000		00000000				
Address	Permit Number		Discharging Number				
	Monitoring Period				☐ Check here if no discharge		
Facility	YR/MO/DY	TO	YR/MO/DY		NOTE: Read instructions before completing this form		
Location	10/01/01		10/01/01				

Parameter		**Quantity or Concentrate**			No. Ex	Frequency of Analysis	Sample Type
		Minimum	Average	Maximum			
E.Coli	Sample Measurement		125/100ml	750	4	5/7	24HC
	Permit Required		126/100ml	200			
Copper	Sample Measurement		.0599 mg/l		0	1/90	Grab
	Permit Required		0.0600 mg/l			1/30	
Lead	Sample Measurement		0.0120 mg/l		20		Grab
	Permit Required		0.0085 mg/l			1/30	

Discharge monitoring for reports are a useful tool, comparing the quantities of chemicals approved for release with the quantities emitted. They are a way to track how often the amounts are exceeded.

Compare the sample measurements to the permitted amounts above. Is the average above the permitted amount for E. coli, copper, or lead?

Check how often copper was monitored. Was it more or less often than the permit required?

Expressing Concerns

In a small Vermont town, a neighborhood grew up around a junkyard. Parents and their kids now live next to this junkyard with its large drums and old cars, and a pile of thousands of tires. Neighbors could smell fumes when the owner burned trash. They could see that the pond bordering the junkyard had discolored water. They started to wonder.

As neighbors talked, they formed hypotheses.

> *Fluids from drums or old cars on the junkyard property could be getting into water and soil and making drinking water wells unsafe.*

> *Chemicals from the junkyard could be making the pond unsafe for wildlife.*

Community members had questions like:

> *Are levels of contaminants higher near the junkyard than they are downstream?*

> *Are levels of contaminants in the groundwater higher than state limits?*

> *Do test results show levels of contamination that could affect the health of residents who have well water?*

Junkyard neighbors pushed for testing. Keep reading to find out more about what neighbors learned. In some situations like this one, there are no discharge permits or discharge monitoring reports. But community members can still take steps to learn more about potential contamination.

Talk to others

Explain what water monitoring will and will not do.

Water testing CAN help you:

- ✓ Determine if human or animal health problems are linked to polluted water
- ✓ Make certain the water is safe for swimming
- ✓ Document baseline water quality
- ✓ Assess whether a particular business has polluted the water
- ✓ Assess whether or not the runoff from human activities is polluting the water beyond legal limits
- ✓ Enable you to compare contamination levels to published standards
- ✓ Design a cleanup plan appropriate to the extent of contamination

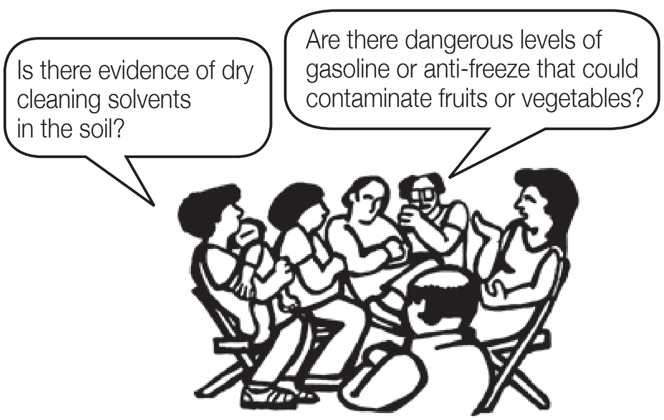
Water testing will NOT directly:

- × Tell you who will get sick
- × Result in money for health care or clean-up
- × Indicate if a lawsuit is a good idea

Planning

It may take time for officials to begin testing. They may wait until they have identified Potentially Responsible Parties. Meanwhile, community members can form their own hypotheses. They can create pressure for testing and clean-up by talking about the purpose of testing. Sometimes it helps to show the need by collecting water samples, getting them analyzed, and announcing the results. Before testing:

- Learn what a watershed is and find out the boundaries of your watershed.
- Talk to your neighbors. Make a contact list of interested people and their concerns.
- Speak to local non-profit groups to find out how they are working on these or related issues.
- Get advice from an environmental justice organization, like those listed at: sfa.terc.edu/data/assistance.html



Get involved

Begin watershed and/or site characterization.

Start by taking an inventory. Note unusual sights, signs or smells, such as plants growing in some areas but dying in others, sweet or astringent (sharp) smells, color changes in the water or fish die offs.

Create a community log. Include photos. Use Google Maps (maps.google.com) or IMRivers (www.imrivers.com) to document your photos and findings online.

Track ownership. If you see (or find) areas that appear contaminated, determine who owns the nearby properties that may be the source of pollution. In many situations, owners are legally responsible for contamination on their property, whether or not they caused it. Town offices keep records of land ownership.

Examine discharge permits and discharge monitoring reports. Anyone who discharges anything into a water body must obtain a permit under the Clean Water Act, called an NPDES permit (NPDES stands for the National Pollution Discharge Elimination System). Find out as much information about the owners' activities as possible. For example: What pesticide and other chemicals were used on the site? This information will help you narrow the scope of testing.

Community Member Checklist

- [ ] Pool information. Host a community meeting. Post a map large enough that participants can mark threats such as pipes draining into a river, pesticides used near waterways, or gas stations with a history of polluting. Also mark spots where kids swim, people fish, and so on.
- [ ] List health concerns. If people say the water is making them sick, start a list of the health problems like getting a rash. Include symptoms and syndromes like numbness and birth defects.
- [ ] Research suspected contaminants to find out if the health concerns match the known health effects for contaminants used in your area. (See Appendix, p. 20 for researching health effects.)

Planning (*cont'd)*

Before you test a drop of water, you (or others) should know what you are testing for and how it will happen. A monitoring design plan should be in place to answer the following questions:

- Why the monitoring is being done and what question(s) it is intended to answer.
- What will be monitored.
- Where the sampling will be done.
- When the samples will be taken.
- How the sampling and analysis will be done.
- What quality assurance and quality control procedures will be employed.
- Who will do the sampling and analysis.
- What the Data Quality Objectives are.

Formulate your hypothesis and key questions

Based on the information you have, formulate the most likely explanation for the problem. A sample hypothesis:

Bacteria from a nearby farm are seeping into the pond causing swimmers to get sick.

Next list specific questions that once answered will help you determine if your hypothesis is correct or not. So, you might ask:

Are bacteria levels in the pond at or above levels known to cause problems for swimmers?

How do bacteria levels upstream from the farm compare to bacteria levels just downstream?

What are the bacteria levels in and around the swimming hole?

The questions will guide the plan. For example, if you decide to focus on bacteria levels above and below the farm, that determines:

(1) the parameter that you want to monitor (in this case, bacteria levels. See p. 10 for more on parameters) and

(2) where you will monitor (in this case, at least above and directly below the farm).

TABLE 8
SUMMARY OF METALS RESULTS
SURFACE WATER SAMPLES
MILTON, VERMONT

SAMPLE LOCATION / SAMPLE NUMBER	SW-02 R01-081020GL-0047	SW-03 R01-081020GL-0048	SW-04 R01-081020GL-0049	Vermont Water Quality PHHCWO *
PARAMETER				
Aluminum	ND	2,900	11,000	NL
Arsenic	ND	ND	**23**	0.02
Barium	21	140	270	NL
Calcium	26,000	39,000	45,000	NL
Chromium	ND	ND	23	---
Copper	ND	45	150	---
Iron	220	53,000	120,000	---
Lead	ND	53	180	---
Magnesium	6,200	5,400	7,800	NL
Manganese	230	3,100	3,500	NL
Nickel	ND	ND	31	610
Vanadium	ND	ND	18	NL
Zinc	ND	130	450	---
Mercury	ND **	ND **	**0.22**	0.14

The junkyard owner stored lead acid batteries and old cars on site. Community members wanted testing to tell them:

Are levels of metals higher near the junkyard than they are downstream?
Are levels of lead and other metals higher than Vermont Water Quality Standards?

The study design called for collecting samples from the water in nearby Hobbs Pond and testing them for heavy metals.

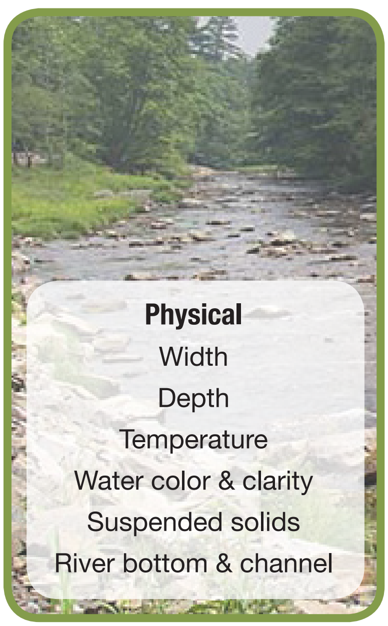
What are you testing for?

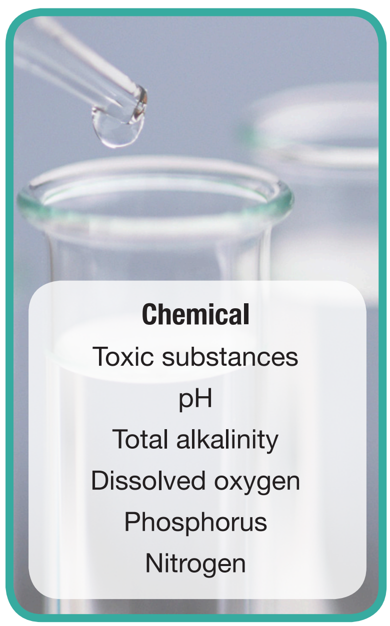
If your research is unable to pinpoint specific toxic chemicals for which you want to monitor, there are screening tests that can be done for broad suites or groups of the more commonly found toxic chemicals. Then, once you've identified the chemicals that are present, you can always pay for much more refined tests for those individual chemicals.

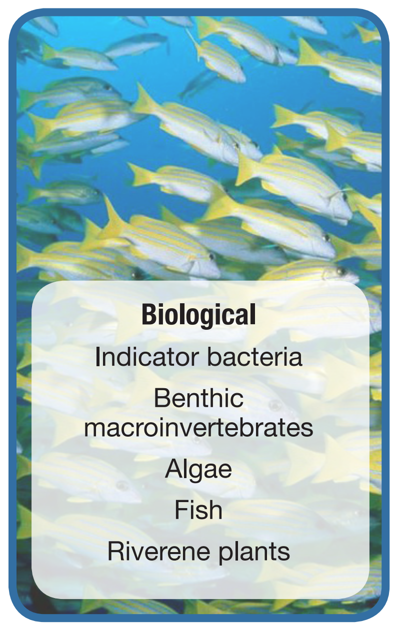
Most commonly occurring chemicals tend to fall into one of the following classes:

1. Contaminants such as heavy metals—lead, mercury, and chromium, arsenic and nitrites from storm water runoff or industrial releases.
2. Chemical contaminants including,
   • VOCs (Volatile Organic Compounds) from gas stations, dry cleaners, urban storm water runoff, and septic systems.

   • Pesticides, including insecticides and herbicides, which may come from a variety of sources such as storm water runoff, lawncare, or agriculture.
3. Disinfectants and their by-products, such as chlorine, chloramine, and trihalomethanes used to treat waste water or drinking water.
4. Radionucleides, by-products of nuclear weapons manufacturers, and medical facilities that use radioactive materials.







There are over 80,000 industrial chemicals in production. The EPA specifies water quality guidelines for about 90 of them. Each one can be expensive to detect. Narrow the list to the likely chemicals that are released in your watershed. There are a variety of means to determine this, including:

1. NPDES permits. See Chapters 1 and 6 in the extended version of this guide at sfa.terc.edu/materials/guides.html
2. The Toxics Release Inventory (TRI), available online at through the US EPA at epa.gov/tri/tridata/index.htm
3. Local fire departments, which receive reports of hazardous chemical inventories from local facilities, as mandated by the Emergency Planning and Community Right to Know Act (EPCRA).

Screening Step 1: Collecting Samples

Community members told EPA and state officials their concerns: that drums used to store chemicals might be leaking into the soil and into the pond, that the pond had an oily sheen, and that fluids from car engines might be seeping into the ground water and affecting their wells for drinking water. Consultants came and collected five kinds of samples related to water: groundwater on and off the junkyard, water samples from wells neighboring the junkyard; they took samples of fish tissue, surface water, and sediment from the pond. All samples were sent to the lab.

Community Member Checklist

- ☐ If you are collecting the samples, get advice from the lab and some training ahead of time.
- ☐ If you are a bystander with the opportunity to give input into sample collection:
  - Make sure samples are taken from all areas that might be contaminated.
  - Make sure samples will allow for comparisons.

Collecting samples of surface water has some rules of thumb.

For surface water …

Take samples in three places: (1) just upstream from the suspected source, (2) just downstream form the source, and (3) further downstream at a "recovery" site where the pollutant is likely to be diluted. This approach is called *bracketing*.

Make sure samples are taken from areas where children or wildlife (especially a protected species) could come into contact with contaminated water.

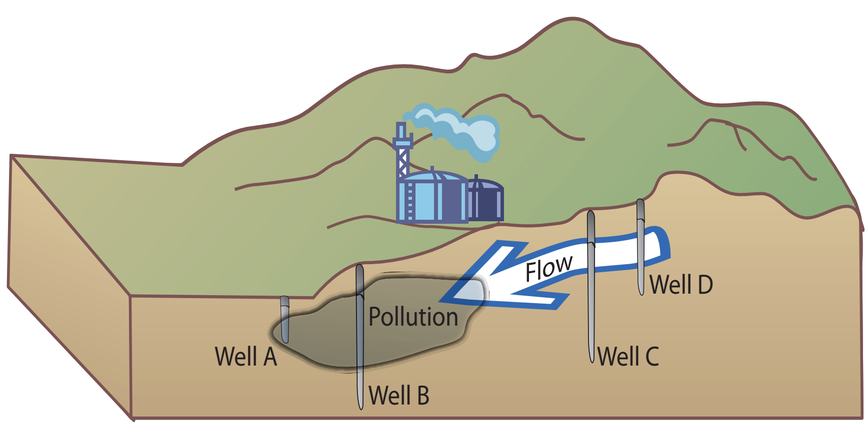
For groundwater sampling …

Ask from what depths samples will be taken. Deep samples will tell you more about the groundwater and risks to drinking wells. Closer to the surface, samples will tell you more about the risks from contact with skin or accidental swallowing.

Choosing locations for groundwater testing is complicated. Hydrogeologists should take into account a site's soil types, topography, nearby pumps that could affect groundwater flow, streams and springs, and other variables—to predict where to collect samples. They decide on the location and depth of monitoring sites. The idea is to locate groundwater monitoring wells to pick up the main groundwater flow.

Testing on a steep grade

Wells C and D are uphill, so they are the baseline or control. Wells A and B are downstream, so they could catch pollution in theory, but a sample from the bottom of Well B will miss the plume. The well is too deep.



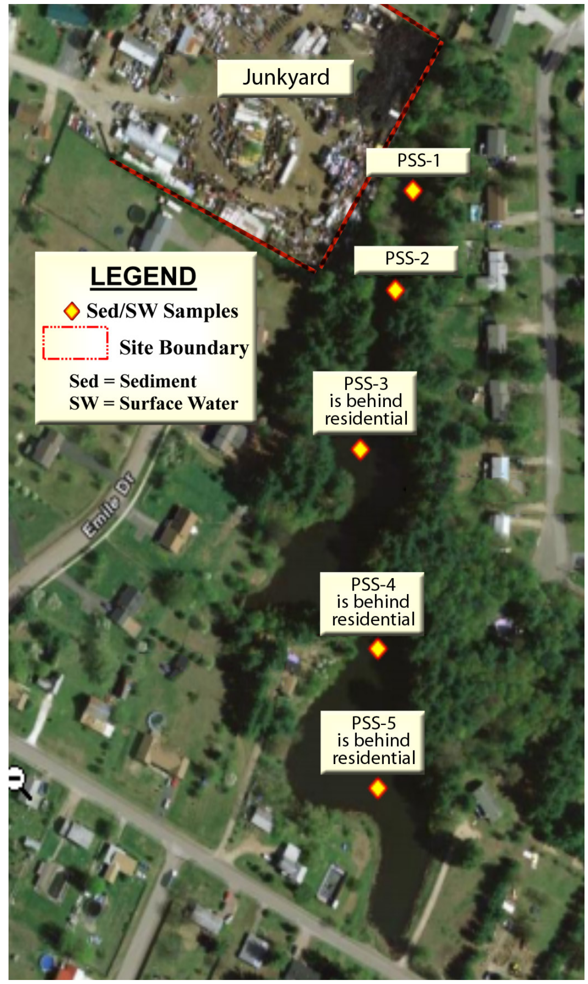
After the fact …

Check the map. If you were not involved before samples are collected, it is still worth checking the sampling locations. With the report, you should find a site map. Note where sample locations are marked. If spots were missed, you may need to make a case for more testing.

Samples MUST have a chain of custody that shows where the samples were at all times, who had access to them, and if proper care was taken to preserve them.

During screening, samples are collected. It's impossible to test ALL the water ALL the time. Sampling water is like sipping coffee. You don't need to drink the whole pot to know if the flavor is too strong or too bitter. On the other hand, the basic rule of thumb: the more samples over time that are taken, the more certain you can be.

Testing the sediment at a river bottom, testing tissue from fish, and looking at the animal life in the ecosystem are other ways to gather data about water quality.



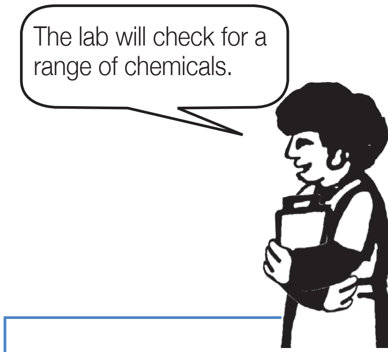
Five sediment samples were collected from Hobbs Pond. The pond is spring fed and forms at one edge of the junkyard. The water from the pond runs into a stream that leads to the Winooski River.

Community Member Checklist

- [ ] Check the map.
- [ ] Note where the samples were taken.
- [ ] If spots were missed, you may want to make a case for more testing.

Screening Step 2: Testing the Samples

You may have to sit tight until the report comes back. While waiting, you can learn about the contaminants you suspect are present. Consult the appendix for ideas on where to research health effects.



Residence	Sample dates		Maximum Contaminant Level (MCL)
	3/8/2007	5/9/2007	
RCRA 8 Metals			
Total Arsenic	**0.026**	**0.038**	0.01
Total Barium	ND<0.020	ND<0.020	2
Total Cadmium	ND<0.002	ND<0.002	0.005
Total Chromium	ND<0.020	ND<0.020	0.1
Total Lead	ND<0.001	ND<0.001	
Total Mercury	ND<0.001	ND<0.001	0.002
Total Selenium	ND<0.002	ND<0.002	0.05
Total Silver	ND<0.020	ND<0.020	0.1

NOTES:
All values reported in µg/L, unless otherwise indicated.
EPA Method 6010 and 7470 used for laboratoy analysis for metals.
ND<X — Not Detected (Detection Limit).
Values above or equal to VHA/MCL (Vermont Dept. of Health Drinking Water Guidance, 12/2005) are shaded.
Values above the laboratory detection limit are in bold.

The National Recommended Water Quality Criteria for Priority Pollutants lists chronic exposure to arsenic in freshwater at 69µg/L. Arsenic is categorized as a human carcinogen. The homeowners will want future tests for arsenic levels. They may request testing for lead and cadmium because they suspect these contaminants are on the junkyard site.

Going Solo? Got a Group?

Find the fact sheet called *Detection Limits* in the SfA resource *Limits and Levels.*

Use a digital scale and guess the scale's detection limits. What amounts are too big or too small to be detected?

Community Member Checklist

- ☐ When you have access to the results, check to see if suspected contaminants appear in bold. Are any contaminants listed as "ND"?
- ☐ Look for the "detection limit" to find out if the instruments were sensitive enough to detect potentially harmful concentrations of contamination.
- ☐ If the results say ND, but you are convinced that a certain chemical is present, plan how you will ask for tests to be done again with more sensitive equipment.

Screening Step 3: Comparing and Analyzing

To make sense of the test results, make comparisons. Test results can be compared to screening levels. Screening test results are like an early warning system. You want a smoke detector to go off with a tiny amount of smoke, not when a big fire is already burning. The test results may look high by comparison. Pay attention, but do not panic. Take care to make other comparisons too.

1. Compare results from around the location. Are downstream levels higher than upstream?
2. Compare results to state or tribal Water Quality Standards, and/or to EPA drinking water standards like Maximum Contaminant Levels (MCLs) or surface water standards like the NOAA's SQuiRT TEL. Find both at sfa.terc.edu/data/public.html
4. Compare sampling data to flow data (see p. 15.)
5. Assess Toxicity. If you are wondering how toxicity is determined, toxicologists have some (imperfect) answers. (See below.)

Toxicity for lab rats

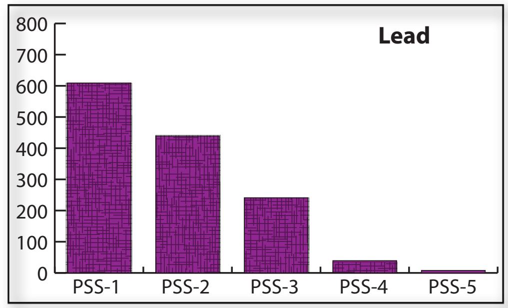
Chemical	LD50 (mg/kg)
Sugar	29,700
Salt	3,000
Caffeine	192
Nicotine	50
Arsenic	13
Dioxin	0.02

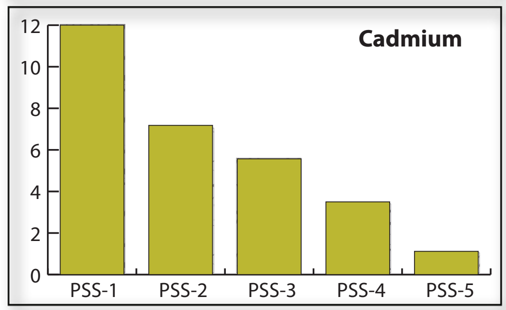
The table above shows how much salt it took to kill 50% of the rats in a lab test. Compare that to the amount of dioxin it took to kill 50% of the rats.

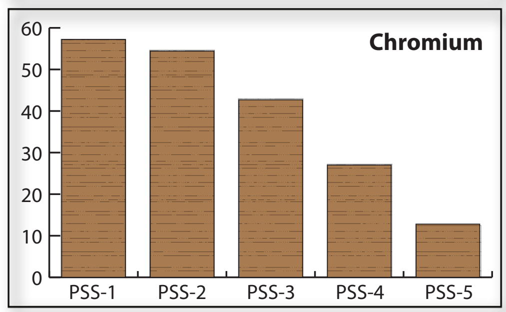
The LD50 is the "lethal dose," of the chemical that kills 50% of the lab animals exposed to it.

Most people want to know about much lower levels of toxicity: the smallest amount that can cause harm, not the amount that can kill. The Reference Dose (RfD) is used to compare the relative toxicity of different chemical compounds. To set a RfD, toxicologists look at the smallest dose that affects lab animals. Then they set the RfD 100 to 1,000 times smaller, in hopes that will make it safe for humans. RfDs are the basis for establishing drinking water quality criteria.

Sediment samples were taken at numerous points along Hobbs Pond (see map, p. 12). The community group graphed the test results. As they did so, they could see a pattern with the results of testing for heavy metals.

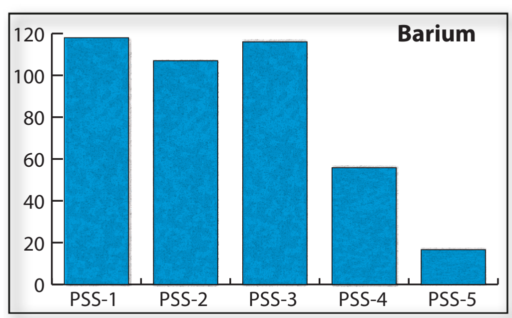






In the case of lead, cadmium, and chromium, there was a clear trend: higher levels near the junkyard and lower levels further away.

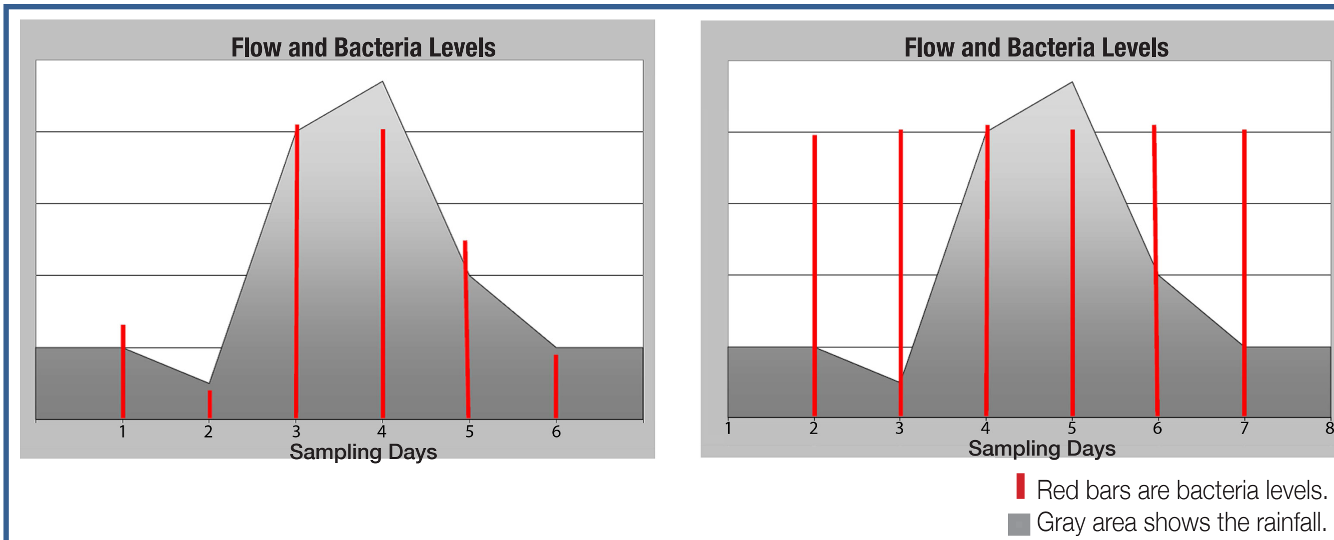
Barium did not follow the pattern.



Comparing in these ways are just some ideas. You could also compare test results to:

- Test results of the same spots under different conditions (after a rainy season or before and after a farm owner uses pesticides).
- New, stricter standards that are not currently in effect, but are scheduled to take effect in the future.
- Standards for a different category of water use, for example, the standards that a river meets when it is approved for fishing or swimming.

If you have data from samples taken before, during, and after rain, compare your monitoring data to flow data. Flow data are available online from the U.S.tates Geological Survey (usgs.gov) or call the National Weather Service and ask for precipitation data for the days before you sampled.



Look for a pattern. If levels of contaminants rise and fall with the water levels, the problem could be runoff from a farm or sewer system serving homes and businesses. If the contamination levels stay the same day after day, you're likely dealing with a point source of pollution such as a pipe from a factory.

The community members noticed that there was a clear trend of higher pollutant levels near the junkyard and lower levels further away, with the exception of one sampling location. The community group questioned that one sample, and the EPA admitted a mix-up at the lab was possible.

Make a graph to contrast levels in one sample compared to another.

Got a Group?

The Summary vs. The Lab is a warm-up to reviewing the results you have. Look for all kinds of mistakes and see what you can catch.

Compare to Standards gives a group another way to compare results easily, so everyone can participate and see the worst contamination.

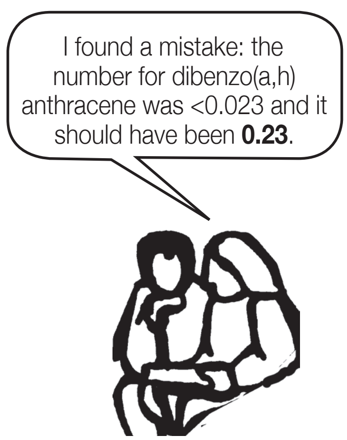
Community Member Checklist

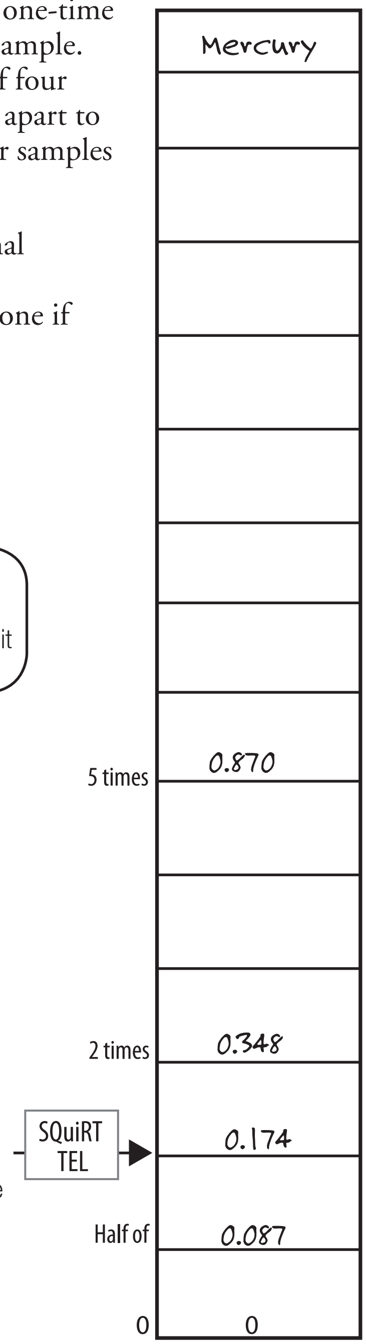
- ☐ Look over results.
- ☐ Analyze the data by comparing the results in different ways. Keep your goal in mind: are you trying to uncover a problem source or prove a health hazard? Are you pressing for a clean-up, revoking a permit, or changing how a facility manages its operations?
- ☐ Choose the approach that makes sense given your goal. Remember, screening levels have no legal weight. No court case will be won, or clean up triggered, based on one round of screening test results.

Keep in mind that you will want to compare like units. If you compare milligrams to micrograms, you will be off by an enormous amount, 1000 times off! Milligrams are 1,000 times larger than micrograms. However, you can compare ppm to mg/L and ppb to µg/L in water.

Compare like sample types. For example, comparing a one-time sample to a one-time sample. Compare an average of four samples taken 8 hours apart to another average of four samples taken 8 hours apart.

Pay attention to decimal points. These are not decorations. Ask someone if you are a little unsure.





Choose one contaminant. Fill in the SQuiRT TEL (see p. 5 for definition) to show the level at which living things in the water will be harmed by mercury. Before adding your test results, fill in some multiples for comparison. See p. 17 for the next step.

Screening Step 4: Reporting Results

Environmental professionals handling sampling will write up the results and send a report to the property owner. The report should include a map, the scope of the work, and lists of any test results over state limits. Compare the report to the EPA's guidelines.

If you have the results reviewed by experts, they will check the numbers as well as the information on the testing procedures to make sure everything was done properly and the results are believable.

SQuiRT Level for Mercury

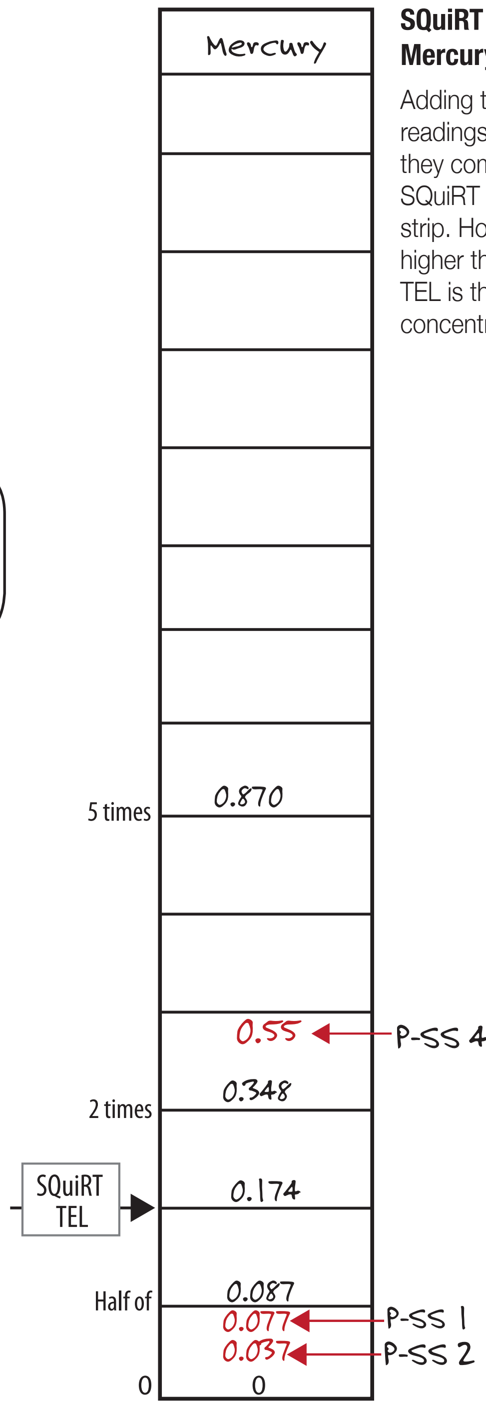
Adding the mercury readings shows how they compare to the SQuiRT TEL. Check the strip. How many times higher than the SQuiRT TEL is the mercury concentration at P-SS 4?

Levels of mercury look pretty small especially as you move away from the junkyard. We should concentrate on metals in larger amounts.

Whoa. We should confirm that. I've heard mercury is toxic even in tiny amounts. Let's compare...

1	2	3	4	5	6	7
.077	.037	ND	.55	ND	ND	ND

Mercury levels in pond sediment at 7 locations.
Quick Screening levels of threshold effects in freshwater.
Mercury SQuiRT level is 0.174 .Results are in mg/kg.



Community Member Checklist

- ☐ Make sure the report is complete and comprehensive. Review the results and identify and questions or concerns.
- ☐ Meet to plan a response.
- ☐ Publicize the results.

Additional Testing

Additional testing sets the stage for a clean-up plan or a plan to reduce discharges.

If, at this point, contamination is at a level of concern, environmental consultants have to do a risk assessment, figuring out who could be exposed to contaminants and in what ways. Risk assessors will be determining:

Concentration: Effects are generally stronger when there are high levels of the contaminant.

Frequency of exposure: Effects are stronger when the contamination is in a place people or animals visit often.

Length of exposure: Effects are generally stronger as people or animals spend longer periods in contact with the contaminated water.

Type of exposure: Swallowing often has a stronger effect than skin contact.

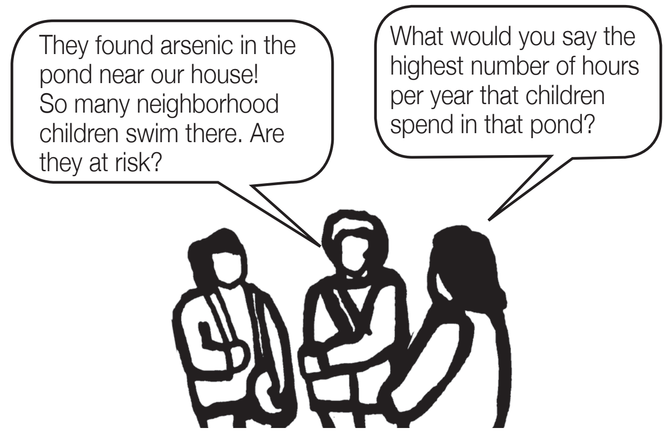
Bioaccumulation: Some contaminants build up in the body over time; others the body flushes out.

Age and body size: Some contaminants can have a stronger effect on elderly people whose bodies do not process toxins quickly. Children are often at higher risk. Their bodies are still developing and contaminants can affect development.

Going Solo? Got a Group?

Pieces of the Risk Puzzle gives a short overview of the risk factors listed above. For each, there are other SfA activities and data to help you explore more deeply.

In a second round of testing near the junkyard, the pattern was confirmed, helping make more evident the source of the pollution. Plotting the test results onto a map was critical in demonstrating that there was a likely mix-up and that further testing was needed.



Community Member Checklist

- [ ] Find out if federal laws or state regulations are being broken.
- [ ] Look into the Resource Conservation and Recovery Act (RCRA), the Clean Water Act, and Safe Drinking Water Act as possible ways for your community group to protect local waters.
- [ ] Start your own monitoring or volunteer with a local watershed group so you have a more complete picture of conditions over time.

Publicizing the Results

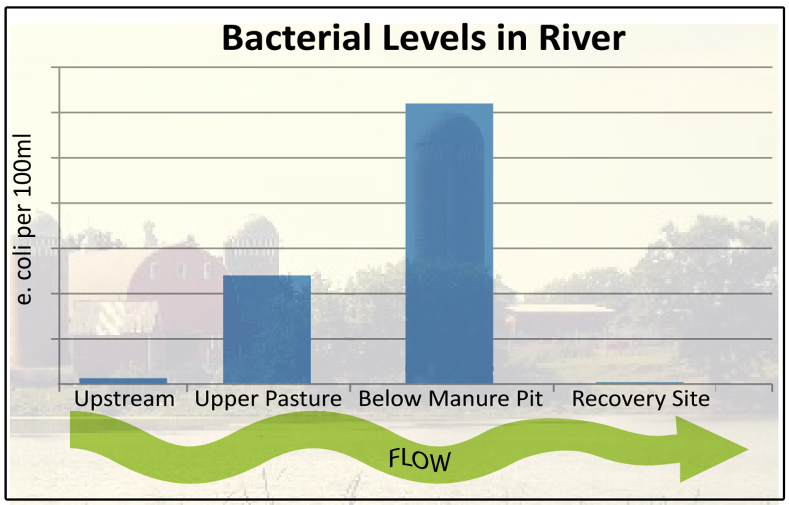
Consider your options

Once your group or its consultant has analyzed your data, plan how to let others know what testing found. Most people will not be interested in the raw data. If you want to interest your neighbors, the media and political leaders, you have to pick through the raw numbers and make the data come to life.

Consider the following two ways to show data on the number of e.coli bacteria colonies that were found in a sample of 100ml of water at each of the sites along a river bordering a farm.

Milton CLEAN members wanted everyone to know that Hobbs Pond could pose a danger to human health. One mother asked the EPA to send a letter to neighbors explaining the dangers. She felt that the information should come from an official source. Meanwhile group members waited for the outcome of a court case against the owner of the junkyard.

Site	E.Coli/100ml
1	20
2	**2700**
3	**3100**
4	750
5	1200
6	65



Which one helps people understand quickly? How could you make the results even more compelling?

Community Member Checklist

- ☐ Play with the numbers and say them in many ways.
- ☐ Make a graph or find a visual to go with the numbers.
- ☐ Make an analogy to help people relate to the very large or small amounts.
- ☐ Keep it real. Don't risk your credibility with a claim you can't back up.
- ☐ Relate the data to health concerns. Use *Toxic As...* for ideas.

Got a Group?

Use the activities and strategy sheets in *Communicating with Numbers* for ideas about expressing numbers creatively in words and images.

Practice explaining your message in 2 minutes or less.

Appendix—List of Helpful Resources

- **2009 Edition of the Drinking Water Standards and Health Advisories. EPA 822-R-09-011**
  epa.gov/nscep
- **Cancer Downstream: A Citizen's Guide to Investigating Pollution/Health Connections**
  rivernetwork.org/resource-library/cancer-downstream
  This step by step action guide helps community groups investigate and understand the potential impact of environmental contamination on community health.
- **A Citizen's Guide to Risk Assessments and Public Health Assessments at Contaminated Sites**
  http://www.atsdr.cdc.gov/publications.html
  A guide to how a community goes about cleaning up sites that are contaminated.
- **Clean Water Act Owner's Manual, The (2nd Edition) –** rivernetwork.org/learn-about-clean-water-act
  The new edition of this comprehensive manual for people who want to clean up their rivers, streams and watersheds gives advice about how to use the Clean Water Act to solve real-world problems, and contains expanded information on antidegradation, stormwater permits, TMDLs and more.
- **EPA Integrated Risk Information Sheet (IRIS) –** epa.gov/iris/subst
  You can search here for any pollutant/chemical compound and will receive information on its toxicity, including how dangerous it is for humans.
- **EPA Chemical References Index –** epa.gov/enviro/html/emci/chemref
  The EPA's list of chemicals, their properties, and what their effects on human health are.
- **National Recommended Water Quality Criteria**
  water.epa.gov/scitech/swguidance/standards/criteria/current
- **NIOSH Pocket Guide to Chemical Hazards –** cdc.gov/niosh/npg
  Put out by the National Institute for Occupational Safety and Health. A very good quick reference guides to the toxicological properties of the most common chemicals. Better organized than the EPA's own list.
- **NVLAP Directory of Accredited Laboratories –** nist.gov/nvlap
  The NVLAP Directory of Accredited Laboratories is fully searchable by testing and calibration scopes of accreditation or by an index of accreditation program/state labs.
- **EPA New England Regional Laboratory Reports and Documents**
  epa.gov/region1/lab/reportsdocuments.html
  EPA most recently published documents and reports on environmental health issues in New England.
- **Testing the Waters –** rivernetwork.org
  This manual, designed to meet the needs of community groups and high school teachers, answers the questions of what, when, where and how to monitor a river for water quality.