Unit V. Post-Field Activities

Many groups feel that stream monitoring is the climax of their water quality monitoring program. However, many more exciting and important opportunities lay ahead. Students will want to take a look at their data to find out how their stream is doing or to design further investigations. They will also want to share what they have learned with others (e.g. community members, fellow students) and to act on their findings to make a difference for their stream. This unit will help to make your monitoring program complete.

Sections

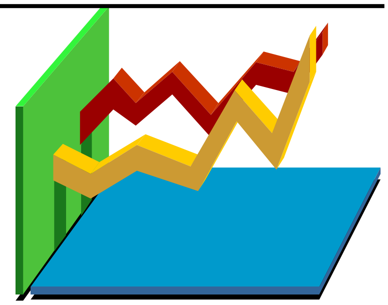
1. Illustrating Your Data
2. Reflecting On Your Data
3. Stewardship

southwestern willow

V-1. Illustrating Your Data

Key Terms

bar graph	mean
dependent variable	line graph
independent variable	spreadsheet



It can be challenging to interpret your data in raw form. The data will appear even more confusing to those who were not involved in its collection. Both your group and outside audiences will better understand the meaning of your data if it is presented in graphical form (it will be much more interesting to look at, too). This section will help you to chart and graph data. The next section, "Reflecting on Your Data," will help you to interpret it.

To decide which form(s) of data illustration best suits your purpose asks yourself the following questions. Suggested chart and graph types are provided.

How do you summarize your data?

The first step in illustrating data is to organize it. You may want to first enter data by hand onto a ledger or graph paper and then transfer the information to a computer **spreadsheet** program (Excel, Lotus 1-2-3, Quattro Pro). Computer spreadsheet programs will help you to summarize and analyze the data. They will also allow you to create charts and graphs directly from the spreadsheet.

Rocky Creek Water Quality Monitoring Data (1999-2000)

	9/20/99		3/14/00		5/20/00		7/17/00	
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
Temperature (°C)	9.0	9.5	5.0	5.2	13.5	14.0	19.8	20.5
Turbidity (NTU)	8	9	35	40	50	55	15	20
DO (mg/liter)	9.0	9.0	10.0	10.5	8.5	8.0	7.0	6.5
Nitrate (mg/liter)	.100	.200	.150	.400	.200	.450	.150	.180
Phos. (mg/liter)	.030	.040	.200	.300	.150	.200	.050	.070
pH	7.5	7.5	7.0	7.0	7.5	7.5	8.0	8.0
EPT Value	15	8	9	6	10	6	14	9
Flow (cfs)	25	30	50	60	75	85	30	35

Table V-1. Example of a spreadsheet with monitoring at 2 sites and 5 dates.

What's the first step in presenting our data?

After organizing your data, summarize it in table form. You might want to include the maximum and minimum values (which establish your range of values), and the **mean** – the average value. Make notations on your chart, if necessary, to help you to interpret your data later on. A table may be the final form for your data. It is also a useful step when creating a graph. Table V-2 below summarizes data for various water quality parameters.

Summary – Rocky Creek Water Quality Data			
parameter	average	minimum (date)	maximum (date)
temperature (°C)	11.8	5.0 (3/14/00)	19.8 (7/17/00)
turbidity (NTU)	27	8 (9/20/99)	50 (5/20/00)
dissolved oxygen* (mg/liter)	8.6	7.0 (7/17/00)	10.0 (3/14/00)
nitrate (mg/liter)	0.150	0.100 (9/20/99)	0.200 (5/20/00)
phosphate (mg/liter)	0.100	0.03 (9/20/99)	0.20 (3/14/00)
pH**	7.5	7.0 (3/14/00)	8.0 (7/17/00)
EPT value	12	9 (3/14/00)	15 (9/20/99)
Flow (cfs)	45	25 (9/20/99)	75 (5/20/00)
NOTES: * samples taken from riffle area ** tests conducted with pH strips			

Table V-2. Summary table of data shown on table V-1.

How do you want to represent your data?

There are many ways to present your data, but the two most common are pie charts and two-dimensional graphs.

Do you want to look at percentages of a whole?

A **pie chart,** such as Figure V-1, compares parts of a whole. The proportion of each part is represented by a "piece of the pie," with the pie equaling 100% of the total values of the data set. Pie charts are widely used because they are simple and easily understood.

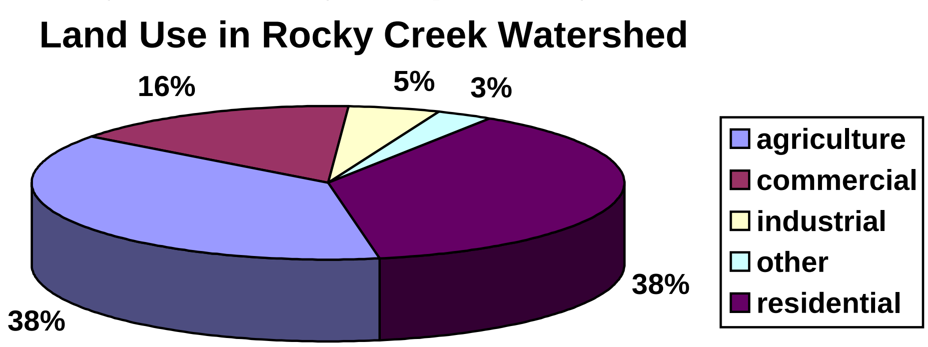


Figure V-1. Example of a pie chart to show percent of land use in an area.

Do you want to see how values change over time or distance?

Two-dimensional graphs (**line graphs** and **bar graphs**) show how values change over time or from one site to another. These graphs have an x-axis and a y-axis. The x-axis represents the **independent variable -** a constant, such as time and date, that is not influenced by other factors. The y-axis, the **dependent variable**, changes in response to other factors. An example of a dependent variable is water temperature.

In Figure V-2 below, the line graph shows how the temperature of Porcupine River fluctuates over the course of a year. The bar graph in Figure V-3 compares pH levels from site to site. Continuity of data is an important difference between line and bar graphs. Line graphs assume data points are connected to each other – they show a continuous trend. Bar graphs are used when data points are not connected.

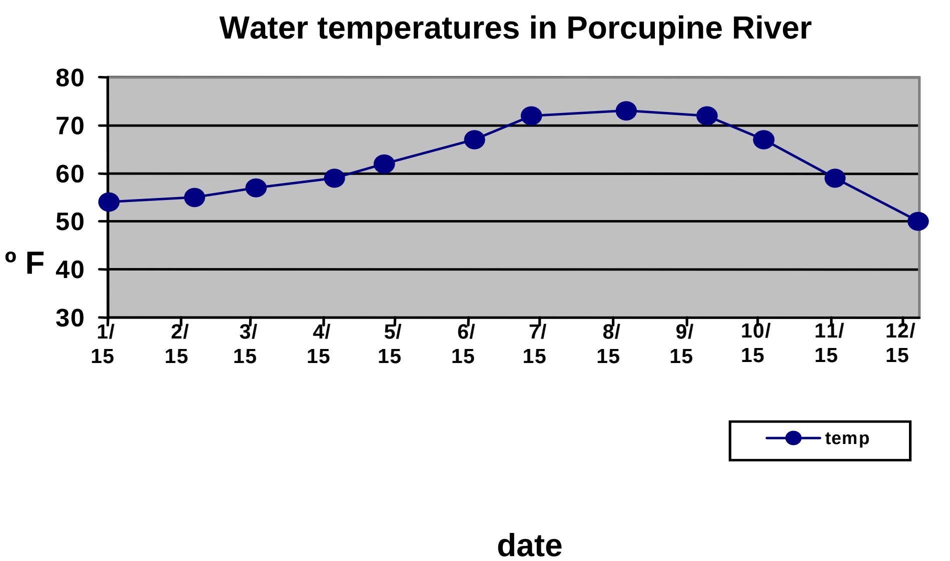


Figure V-2. Example of a line graph showing water temperatures over time.

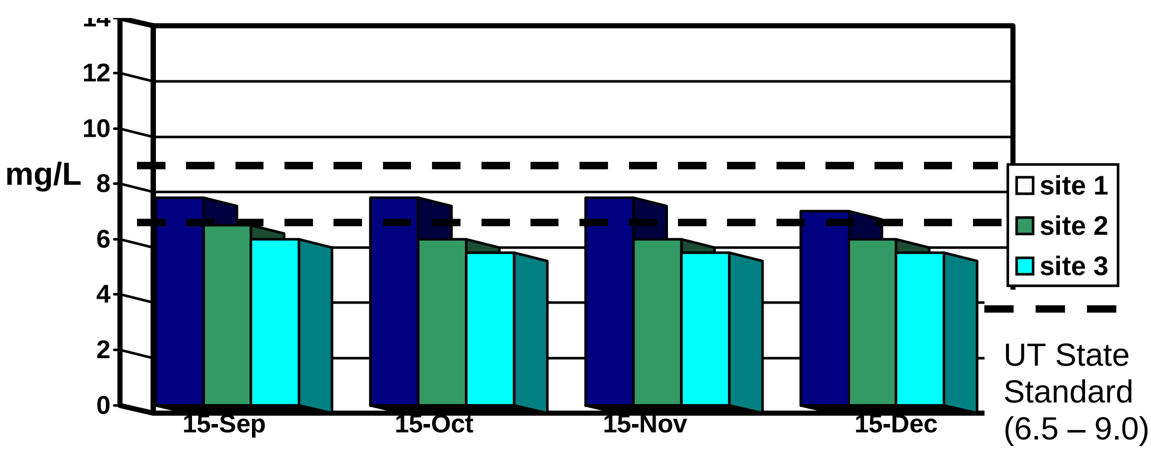


Figure V-3. Example if a bar graph showing pH levels over time at different sites.

NOTES:

- This is a good way to illustrate water quality upstream (site 1), downstream (site 2), and far downstream (site 3) of a suspected pollution source.
- Include the **Utah State Standard** on your graph to help you interpret water quality. See "Water Laws" for information on Utah's Water Quality Standards.

Do you want to look at relationships between parameters?

You can place the values for two or more parameters on the same graph to investigate a possible relationship. For example, the graph that follows, Figure V-4, contains values for both dissolved oxygen and temperature. We see that a rise in temperature coincides with a drop in dissolved oxygen concentration. Graphically illustrating these relationships will help you interpret your data later. Notice that this graph has two y-axes – one for temperature and one for dissolved oxygen. The x-axis – time – is the independent variable for both.

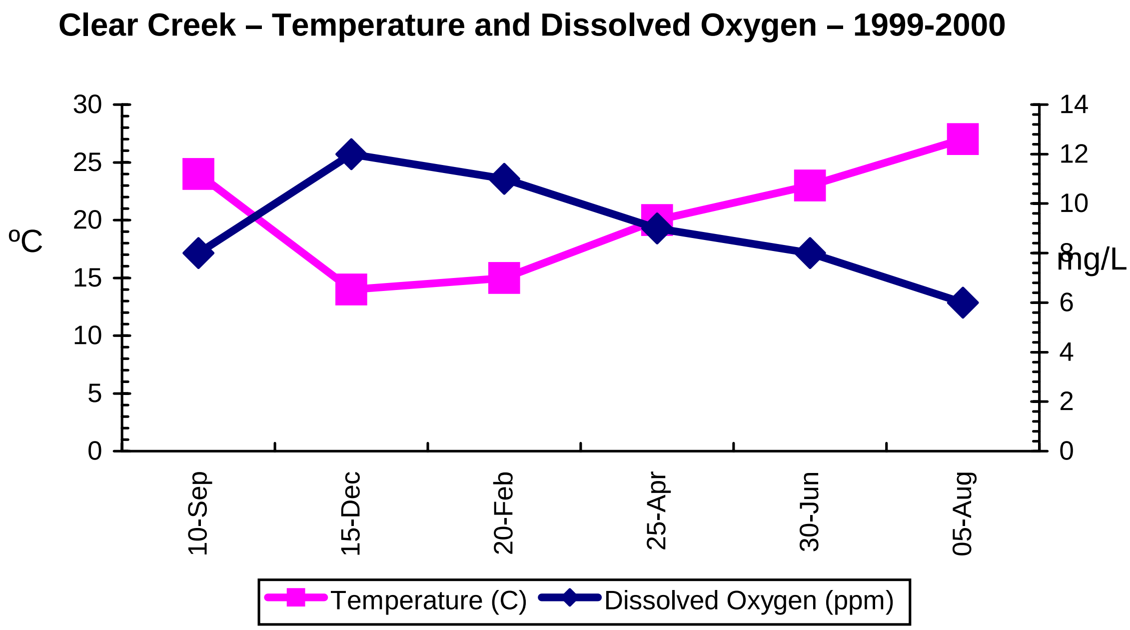


Figure V-4. Example of a line graph showing 2 parameters.

More tips on graphing

- Make sure your graph has a title and legend and that all units are labeled.
- The data points should be proportional to the actual values so the meaning of the graph is not distorted.
- Keep the graph simple. Limit the number of variables.
- Notations can help others better understand your graph.

Resources for further investigation

Streamkeepers Field Guide: Watershed Inventory and Stream Monitoring Methods. This manual addresses most major aspects of a classroom and field monitoring program including graphing and presenting data. Manual is adaptable for use by students ages 12-adult. Companion video also available. Contact: The Adopt-A-Stream Foundation at the Northwest Stream Center, 600-128th Street SE Everett, WA 98208-6353 (425)316-8592; Fax: 425-3381423; aasf@streamkeeper.org; www.streamkeepers.org

The Volunteer Monitor – This bi-annual publication by the Environmental Protection Agency (EPA) offers information and ideas for volunteer water quality monitors of all backgrounds, including school groups. The Spring 1995 issue specifically addresses the topic of "Illustrating Your Data." You will find articles such "Using Graphs to Tell Your Story," "Beyond Reports: Packaging Data Creatively," and "Using Data in the Classroom." You can obtain this free publication by mail or via the EPA's web site. Contact: Elanor Ely, Editor, 1318 Masonic Avenue, San Francisco, CA, 94117; (415) 255-8409. www.epa.gov/OWOW/volunteer/vm_index.html

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V-2. Reflecting on Your Data

Key Terms
accuracy comparability outlier representativeness
cause correlation precision

So, does your stream have good water quality? Why or why not? Can you make a judgment at this point? This chapter will help you to analyze your water quality data and answer these questions. First, take a look at how well your group collected data. Then, investigate a series of graphs that illustrate common water quality data sets. The insight provided will help you interpret your own data.

Reflecting on the data collection process

Natural systems, such as streams, are inherently variable; their water quality changes due to climate, temperature, stream flow, and many other factors. Variability exists in our data collection procedures, as well. Each of us measures and interprets differently. Our differing ability to judge colors, distances and amounts affects the quality of data we collect. For example, we use a **color comparator** (color wheel) to determine the concentration of nitrogen in the water. One of us may judge the color differently than another and therefore determine a different nitrate concentration. Or, perhaps the equipment was faulty or used incorrectly. These differences can lead to variability in monitoring results.

Remember, mistakes make excellent learning opportunities.

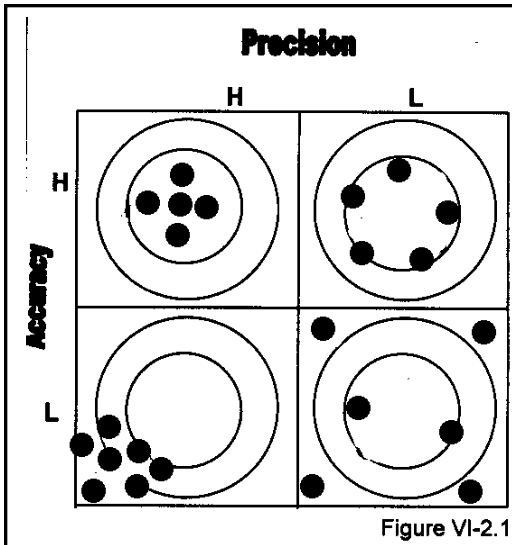
Measures of **precision**, **accuracy**, **representativeness** and **comparability** help us evaluate sources of variability and error, and thereby increase confidence in our data. No matter what standard of quality we set for our data, students should understand these measures. Their underlying principles apply to all scientific investigations and even everyday inquiries.

Precision

Precision – the closeness of measurements to each other – tells us how consistent our sampling procedures are. If data points are spread across a graph in a shotgun pattern, we can consider our sampling procedures to have a low degree of precision.

Accuracy

Accuracy tells us how much confidence we can have in our data. The smaller the difference between our measurement (e.g., nitrate concentration) and its "true" value the more accuracy we have. Data collected by the Division of Water Quality can serve as a comparison to help you determine accuracy.



Adapted from: Volunteer Monitor's Guide to Quality Assurance Project Plans

Figure V-5 A comparison of precision and accuracy. Top left corner shows data with high precision and high accuracy, bottom right shows data with low precision and low accuracy.

Representativeness

If you sampled only a small stretch of pristine headwaters in an otherwise highly polluted stream, then your measurements had a low degree of *representativeness* – how well measurements depict the true characteristics of the stream. Sampling at multiple sites or throughout the year are two ways to increase representativeness.

Comparability

Our water quality data gain real value when we can establish long-term trends or are able to compare different sites (upstream to downstream) on a stream to another. The degree to which we can compare data between dates, sites and other studies is called *comparability*. Consistent sampling techniques are needed to reach a high degree of comparability.

Cause vs. Correlation

Students of all ages tend to mistake **cause** with **correlation**. For example, if students are told that no fish live in a local cold-water stream, they may be quick to infer that the cold temperatures are to blame, without knowing anything else about the stream. Further, students, especially those of middle school age, are very quick to prove cause from only one event. This owes mainly to students' over-eagerness to fit information to their preconceived notions. This occurs even when there is insufficient information or when other, contradictory information exists. To counteract this, discuss the tendency, and the difference between the terms *cause* and *correlation*. Also, address misconceptions as they arise (e.g., all water quality problems are caused by man). Then, design ways for students to investigate for themselves those misconceptions (e.g., have them monitor changes in a pristine stream)

Reflecting on your water quality data

Here are some important points to remember about analyzing water quality monitoring data.

1. To interpret the value for a measurement, such as pH, we need to compare it to the **Utah State Standard**. The Utah Division of Water Quality determines a State Standard for many water quality parameters. State Standards can be found in the "Water Pollution" section and in the background information for each sampling parameter in Unit IV.

2. The "Background Information" supplied for each parameter in Section IV will also help you to investigate possible reasons (natural and human) for poor water quality.

3. If you find a potential water quality problem, re-sample to ensure that you properly collected the data. Then, consult with a local water quality expert (see the "Resources" appendix for contact information) to see if your data compares favorably with theirs. Always check your data against other sources before sharing your results.

What's the right answer?

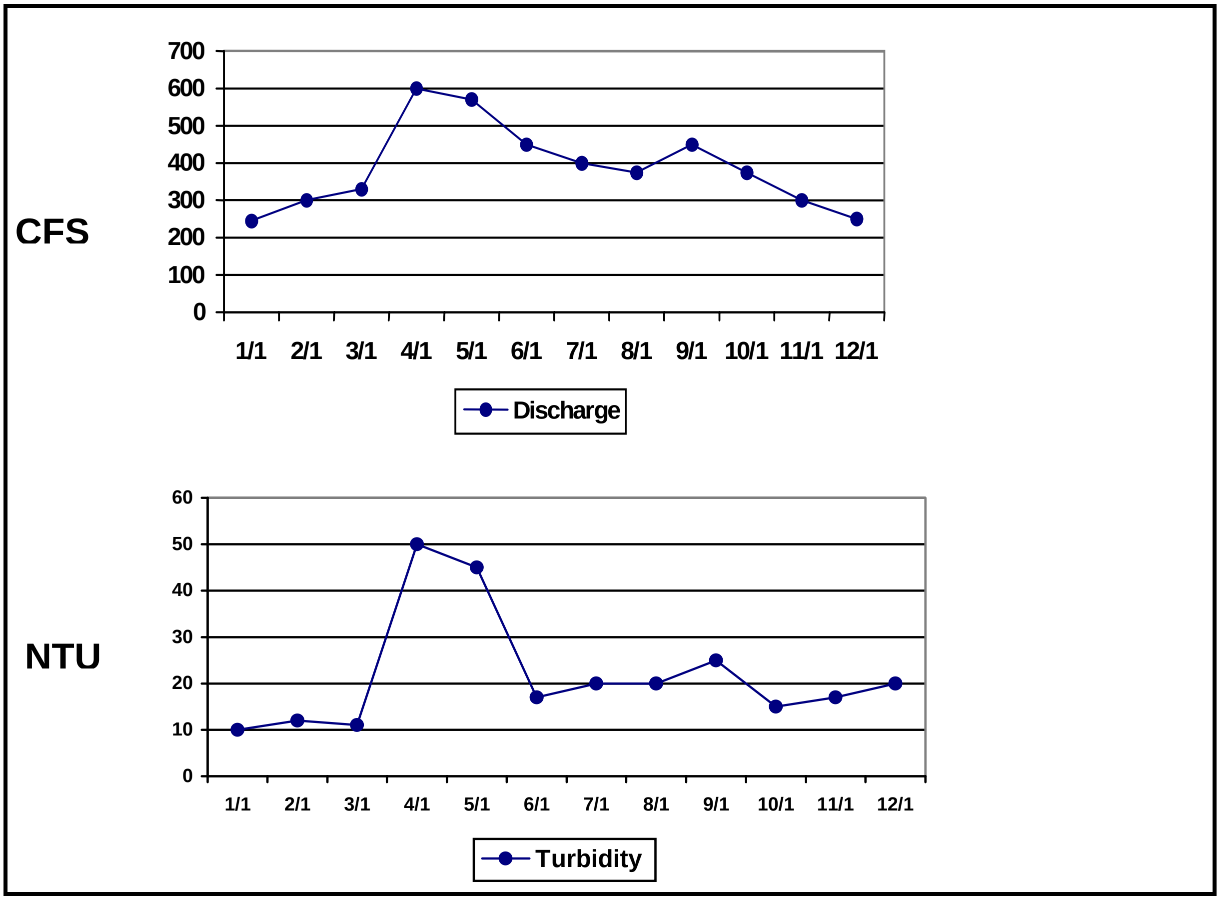
There are often several different ways to make sense out of a set of data. However, studies show that few middle-school students seriously consider alternative explanations. To address this, have teams of students separately develop explanations for a water quality graph and then share. Challenge each team to develop multiple explanations for a graph. Students will increase their understanding of the complex nature of science.

Sample Data Graphs

The following series of graphs represent common results from water quality monitoring. Share these graphs with students (you may want to make them into overheads).

Have students examine the data and propose hypotheses or ask questions about what they are observing. Compare their observations and questions with the conclusions listed below each graph. Note: Graph Sets 1 and 2 (Figures V-6 and V-7) are to be examined in pairs.

Figure V-6 Graph set 1. Example of flow and turbidity data.



What makes sense?

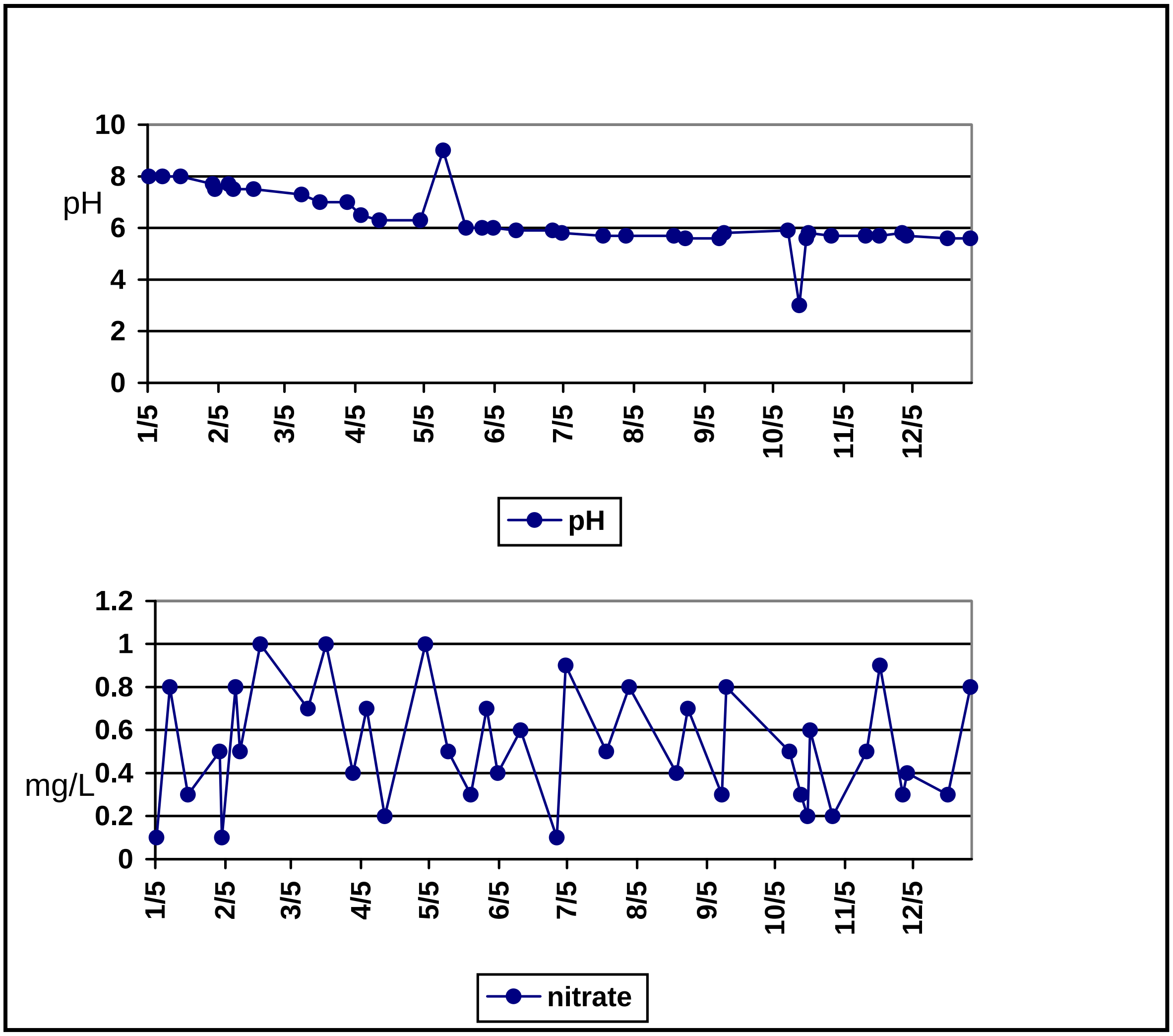
1. Both the turbidity and discharge values follow a seasonal trend; they rise during the spring snow melt period and relax over time. Since the small spike in September occurred on both graphs it is probably due to a real event, such as a rainy period or dam release, not human error.
2. Turbidity increases with an increase in discharge and decreases with a decrease in discharge.

What requires further investigation?

1. Discharge increased almost 100% in April. At the same time, turbidity increased 400%.
2. During January and February, when discharge was low, turbidity was 10-12 NTU's. Discharge returned to its low level in November and December. Turbidity did not (it measured 18-20 NTU's).

- These two outcomes may be due to increased erosion in the stream channel or watershed over the course of the year. They could also be due to sampling error or unusually low turbidity levels at the beginning of the year. Continue to sample and establish a trend. Assess any changes in **macroinvertebrate** populations to see if possible turbidity increases are affecting aquatic life.

Figure V-7 Graph set 2. Example of pH and nitrate data.



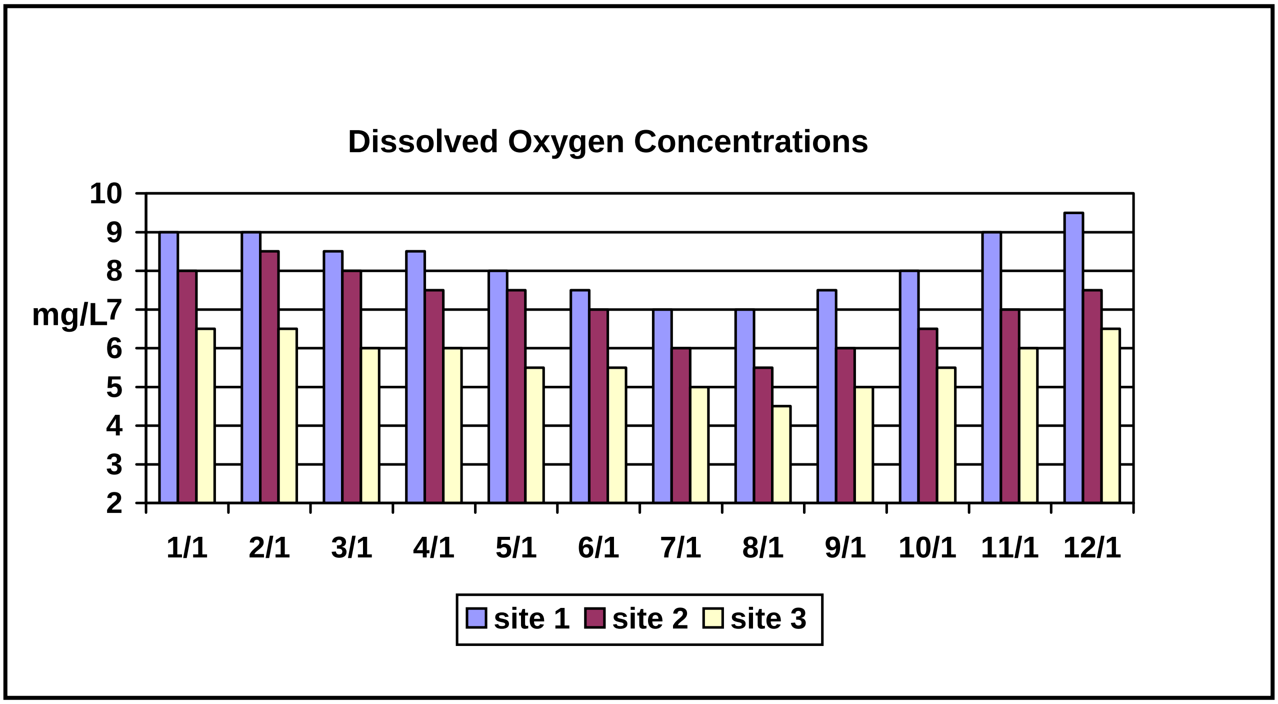
What makes sense?

1. With the exception of two points the pH data points are very *precise*.
2. pH drops during then spring snow melt period as expected.
3. The nitrate data points all fall within acceptable limits (more than "4 mg/L" is considered a pollution indicator).

What requires further investigation?

1. Nitrate data has a very low degree of *precision* – the data points are scattered all over the graph. Sampling error is the likely cause.
2. Two points on the pH graph are **outliers** – they do not fit within the range of the rest of the data. Sampling error is a possible cause. Since there is an abundance of precise data points for pH, we can confidently discard these two outliers.
3. pH drops steadily over the course of the year; from 8 to 6 (6 is below the Utah State Standard for most beneficial use designations). This is worthy of attention. The abundance and precise nature of the data points suggest sampling error is not a factor. Contact a water quality specialist to investigate further.

Figure V-8 Graph 3. Example of Dissolved Oxygen Data



What makes sense?

1. Dissolved oxygen concentration follows a predictable seasonal trend – higher during cold months and lower during warm months.
2. The smooth trend tells us that our data collection techniques were precise.

What requires further investigation?

1. We commonly take measurements above, at and below a site to determine the amount of pollution coming from that site. In this graph we see DO concentrations falling as we move downstream (from site 1 to site 3). We might be quick to assume that pollutants (probably nutrients) are entering around site 2 and 3 and causing DO levels to drop. However, as you read above, correlation does not prove causation. Without comparing nutrient data from the same sites we cannot say that nutrients are the cause. We should also look at changes in gradient and increases in water temperature from industrial output, channel alterations or lack of riparian shading. Interpreting data without considering other relevant data can lead to errors.

An important final note on data interpretation

The *Utah Stream Team* does not promote particular viewpoints for students or the larger community to adopt. Instead, it presents sound information and asks students to judge for themselves. Take this same approach when interpreting your data. Make sure students are confronted with a balance of information, materials and personal perspectives. Help students recognize and discuss their personal biases so they do not misinterpret a water quality situation.

Resources for further investigation

"The Volunteer Monitor: The National Newsletter of Volunteer Water Quality Monitoring." Volume 7, No. 1, Spring 1995. This bi-annual EPA publication addresses almost every aspect of water quality monitoring, including those specific to school and youth groups. This volume, available on the internet, focuses on Managing and Interpreting Your Data. www.epa.gov/volunteer/spring95/index.html

Streamkeepers Field Guide: Watershed Inventory and Stream Monitoring Methods – This manual addresses most major aspects of a classroom and field monitoring program including data interpretation. The manual is adaptable for use by students ages 12-adult. A companion video is also available. Contact: Adopt-A-Stream Foundation, 600-128th St SE, Everett, WA 98208, (425)316-8592; www.streamkeepers.org

Volunteer Stream Monitoring: A Methods Manual – This free manual from the Environmental Protection Agency provides background information, sampling directions and data sheets for monitoring stream water quality. You will also find a handy section on Graphing and Interpreting Your Data. For a free copy of the manual, contact Alice Mayio at USEPA (4503F), 401 M St. SW, Washington, DC 20460; 202/260-7018; mayio.alice@epamail.epa.gov. Also available on the web: www.epa.gov/owow/monitoring/vol.html.

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V-3. Stewardship

"Never doubt that a small group of concerned citizens can make a difference. Indeed, it's the only thing that ever has."
- Margaret Mead

What is stewardship?

Stewardship of our streams and water resources implies taking *active* care of them; being involved in the effort to improve or protect their health. Learning about, monitoring and reflecting on our stream's water quality are important steps to take. However, if we fail to act on what we've found, then we have lost an opportunity to benefit the streams we care so much about. Stewardship is the final and perhaps most important component of the *Utah Stream Team* program.

The *Utah Stream Team* does not promote particular viewpoints for students or the larger community to adopt. Instead, it presents sound information and asks students to judge for themselves. When a class is determining whether action should be taken on an issue, the teacher should provide students with balanced information, materials and personal perspectives. Students should recognize and discuss their personal biases and make sure action taken does not reflect those biases.

Why is stewardship important?

Students want to turn their monitoring efforts into action. They want to make a meaningful contribution and know that they are important members of their community. By doing so, they grow personally, socially and intellectually. Studies show that providing students with opportunities to apply citizenship action skills affects their motivation, sense of personal responsibility and their likelihood of participating in future environmentally responsible behavior.

How do we create a plan for stewardship?

The steps of a basic action plan are described below. Allow students to make important decisions at each stage. Work with a natural resource specialist to ensure that you are taking the proper course of action.

Stewardship projects provide students excellent opportunities to:
- practice interpersonal and communication skills (both oral and written)
- cooperate as a group
- develop leadership abilities
- understand conflict management

1. Evaluate a need for action

Help students determine whether their active involvement is needed in a particular situation. List the social and ecological consequences of action or inaction. Then, list the advantages and disadvantages of involving students in the situation. Include an honest assessment of the group's strengths, resources and commitment.

2. Choose a stewardship project

Make a list of possibilities for a stewardship project. Your final choice should reflect student interests (and possibly the input of a specialist). The next section, "What types of action can we take?" provides specific ideas.

3. Research your project

Help your students investigate their choice of action. What information should they know to make it successful? For example, if students choose to plant trees along the streambank, they should know what types of trees to plant, how to plant them, and what functions they will serve for the stream and riparian area. A natural resource specialist can be a valuable asset for this.

> **Do we act on our monitoring data?**
> There are rewards and challenges to basing your stewardship project on your water quality monitoring results. Students will see a direct outcome of their efforts and better understand that science is a tool for affecting their world. However, most groups find it difficult to collect enough quality data to base action on. Regardless of the quality of your data you should consult a local water quality specialist before deciding on a course of action. This person can check your findings against agency-collected data and make sure your stewardship project is appropriate. Arrange to have the specialist come to your school and work out a plan with your students.

4. Create your plan

The steps below will help you consider important logistical aspects of a stewardship project.
1. Define the problem. For example, a lack of riparian vegetation along our stream is contributing to degraded water quality.
2. Describe the goal of your project and your strategy to accomplish this goal. For instance: we will increase woody vegetation along our study area by planting willows.
3. List the specific objectives that support your overall goal. These should be realistic and measurable. For example: we will plant 100 willow saplings.
4. List the start and end dates of project.
5. Describe the tasks that are necessary to meet each objective. You may want to do this on a timeline. List the names of students responsible for each task and supplies needed. The "Give Water a Hand – Youth Action Guide" provides a handy chart for organizing these duties (see "Resources for further investigation" at the end of this section).
6. List possible sources for supplies, information, money and other necessities.
7. Generate ideas for how to publicize your project.

5. Put your plan into action

Follow the steps of your completed implementation plan. Keep careful records of each step along the way (who completed each task and when). Photographs and videotape will help document and publicize your efforts. Periodically review your goals, objectives and timeline to make sure you're on track.

6. Reflect on your stewardship project

After you've completed your stewardship project, celebrate the fact that you took action! Then, help your group reflect on individual and group efforts as well as the success of the project as a whole.

- Did you meet all of your goals and objectives?
- What did you do well as individuals and as a group?

- Was your action effective?
- Why might it be difficult to determine the effectiveness of your action? Consider the scale of the issue, the time needed to see improvement, and human and natural influences that will continue to affect the situation.

Use this opportunity to discuss concepts of empowerment and community service with your group. Through the *Utah Stream Team*, program students should have developed an understanding of the broad consequences of their actions and their responsibility for those consequences. This "Stewardship" component empowers students to act on that responsibility. Students should know they have the ability and knowledge to make a difference for their stream and community.

Think about it.
"Research on experiential education programs clearly shows that the key to helping youth learn from service projects is thoughtful reflection during and after the experience. Through structured reflection, youth make sense of what they have seen and done. Then, as they continue on the same or new service projects, they test their ideas about how to get things done. They learn how to learn."

- North American Association for Experiential Education – Environmental Education: Guidelines for Excellence.

What types of action can we take?

Water-focused stewardship projects can encompass all major disciplines, target a wide range of audiences, happen in many different places, and occur through many different mediums. The information that follows will help you choose from the many alternatives.

Education – These projects focus on teaching others about water quality or water-related issues. They provide great opportunities for working in other disciplines. You can write and perform a play, song or poem; design posters or works of art; create a water education pamphlet and hand it out to the community; or, put on a slide show. Here are some other ideas.

- Hold a workshop for family members or school staff on dangerous household cleaning chemicals and water-friendly alternatives, such as baking soda and vinegar. For information, contact: Water Environment Federation, 601 Wythe St, Alexandria, VA, 22314.
- Make posters informing the community of where they can recycle their used oil. For information, contact: Water Environment Federation, 601 Wythe St, Alexandria, VA, 22314.

Who is going to listen?
Stewardship projects can target one or more of the following:

- your school
- a community organization
- your city or county commission
- private land owners
- store owners and shoppers
- fairs and festivals
- resource management agencies
- news media
- your home/family
- your neighborhood
- any individual or group that has a stake in quality water – everyone!

Persuasion – These projects try to convince people to take positive action. You can create posters, brochures, or a video; organize a debate (invite land users, civil servants, water quality experts, biologists and others); write letters to your local government or newspaper; or, give a presentation to your County Commission. Here are some other ideas.

• Stencil water-friendly messages on neighborhood storm drains. The Earthwater Stencils program provides 10 different stencils, each with a picture of an aquatic animal and messages such as "Dump no waste, drains to river." Their web page offers step-by-step instructions on how to conduct a storm drain stenciling project Contact: Earthwater Stencils, 4425 140th Ave SW, Rochester, WA 98579-9703; www.earthwater-stencils.com.

Economics – These projects encourage consumers to shop for products that have less impact on water quality. You can set up an informational display in front of a grocery store or hardware store or inform folks through newspaper or radio. Here are some other ideas.

• Sell environmentally-safe products, such as organically-grown vegetables from the school garden. Inform folks that all proceeds will go to support water quality programs. Contact: your local County Extension Agent for information on organic gardening.

Restoration – A restoration project aims to physically improve your stream. This may include picking up litter, reinforcing eroded stream banks, planting riparian vegetation and building bird houses. Restoration projects away from the steam, such as vegetating bare upland slopes and enriching upland soils, may also improve water quality. Always include restoration experts in your project. Here are some other ideas.

• **Xeriscape** (plant native, drought-tolerant vegetation) the grounds around your school or home. For information, contact the Natural Resource Conservation Service (NRCS), Utah State Office, 125 South State Street, Salt Lake City, Utah 84138, PO Box 11350, Salt Lake City, UT 84147-0350, (801) 524-4550, fax: 801-524-4403, www.nrcs.usda.gov

> How can we help?
>
> When we think of improving our stream's water quality we often think of doing it directly through a stream-side restoration project. However, there are many influences far from the stream that can affect its water quality, such as household chemical use, personal water use, and littering. We can do a lot of good for our stream by addressing these community-wide issues as well.

Politics – Your group may want to change a regulation or take up some other form of political action. You can speak at a public hearing, present your issue to a government official, start a letter writing campaign, circulate petitions and fliers, and write letters to the newspaper. Here are some other ideas.

• Your group can campaign for a community- or state-wide water quality issue. For help organizing a campaign effort, refer to The Kid's Guide to Social Action (see "Resources for further investigation" below).

What else should we know about stewardship?

• Students should know that their stewardship project, by itself, will probably not solve the water quality challenges of their stream. But, it will make a difference. Real change does not occur all at once, but instead through small, continual steps – each one an essential part of the larger effort.

• Through the Stewardship portion of the *Utah Stream Team* program, students should learn about people of different ages, races, genders, cultures, education and income levels who have helped make their world a better place by taking action.

- Consider partnering with a community organization for your stewardship program. Established organizations can provide funding, logistical support and human resources. These groups may also help assure that your stewardship project is carried on into the future, increasing its effectiveness. Some groups you might consider working with: Utah Farm Bureau, Sierra Club, Trout Unlimited, Audubon Society, Utah Association of Conservation Districts, Izaak Walton League and many others. Your Chamber of Commerce has a directory of such organizations in your area.

Resources for further investigation

50 Simple Things Kids Can Do To Save The Earth – This book provides 50 practical, easy-to-accomplish activities kids, and kids of all ages, can do to protect and improve the environment. You'll find lots of ideas specific to water quality. Contact: The Earth Works Group, Andrews & McMeel, Kansas City, MO, 1990.

Give Water a Hand – This youth action program promotes good water management practices at home and in the community. You'll find a comprehensive plan for leading students through a water education and service program. Their "Action Guide" and "Leader Guidebook" can be downloaded from their web site for free. Contact: University of Wisconsin – Extension, College of Agriculture and Life Science, Madison, WI, 53706, (800) WATER20. http://www.uwex.edu/erc/down.htm

The Kid's Guide to Social Action, by Barbara Lewis, 1991. This book will show you how to get your project noticed and to get results. It includes step-by-step guidance for writing letters and press releases, making speeches, campaigning, lobbying, and other kinds of community action for kids 10 and up. 185 pages. $17.95. Order from Free Spirit Publishing, 400 First Ave. North, Ste. 616, Minneapolis, MN 55401; (800) 735-7323.

The Volunteer Monitor – The Spring, 1999 issue of the EPA's biannual national newsletter for volunteer water quality monitoring focuses on restoration. Find technical information, project ideas, contacts and more. This publication is designed for all areas of volunteer monitoring, including school groups. You can obtain this free publication by mail or via the EPA's web site. Contact: Elanor Ely, Editor, 1318 Masonic Avenue, San Francisco, CA, 94117; (415) 255-8409. www.epa.gov/OWOW/volunteer/vm_index.html

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