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# Unit I. Introduction

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This section provides an overview of the *Utah Stream Team* program. You'll also find information on how to use the manual and a short description of each of the units and sections within.

## Sections

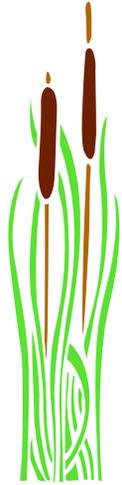
1. Introduction to the *Utah Stream Team*
2. What's in the Manual



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# I-1. Introduction to the *Utah Stream Team*

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## Why do we care about water quality monitoring?

WATER is one of the most abundant and important substances on Earth. Water comprises over 70% of the Earth's surface and 50 to 80% of every living organism's weight – it truly connects all living things. Each of us – student, bird, farmer, plant – depends on the same global water-centered system. Within this system our lives depend on the small volume of fresh water.

Fresh, clean, drinkable water constitutes only one half of one percent of all the Earth's water (if you filled a bucket with 100 liters of water, 98 liters would be saltwater, 2 liters would be fresh, and only 60 milliliters of that fresh supply would be drinkable). We depend on our streams and rivers to deliver much of this drinking water, as well as provide for irrigation for agriculture, recreation and other uses. Many animals and plants could not live without clean river water.

Humans are the only species with the ability to manage water resources. With this ability comes an important *responsibility* to understand and protect streams and rivers. A vital tool for such action is WATER QUALITY MONITORING.

In Utah there are more than 16,450 miles of streams and rivers. As of 1996 only 40% of those miles had been monitored. The water quality monitoring effort needs our help.

## What is water quality monitoring?

Did you ever wonder how we get information on the conditions of our streams? How do we determine if a water body is healthy enough to provide drinking water, recreation, irrigation and still support fish and other wildlife? Water quality monitoring provides the answers in the form of scientific data.

## We collect the scientific data from several sources.

The *Utah Stream Team* manual will help you sample the

following water quality properties. You may choose to incorporate all of them into your program or just one or two.

*Physical properties* affect the environments that aquatic plants and animals live in. They include:

- turbidity – sediment and other material carried in the water
- temperature – the heat energy of the water
- stream flow – the amount and speed of the water
- stream shape – the structure of the channel banks and bottom

*Chemical properties* influence how healthy the water is for aquatic plants and animals and for humans. They include:

- pH - the acidity or alkalinity of the water
- dissolved oxygen – oxygen in the water that supports aquatic life
- nutrients (phosphorus, nitrogen) – food for aquatic plants

*Biological properties* determine the types and amounts of life in and around the stream. They include:

- the riparian zone – the area alongside the stream provides food and shelter for life in the stream and on land
- macroinvertebrates – aquatic bugs are an important link in the food chain

**The information that we collect helps us:**

- determine the overall health of our stream,
- understand our streams and their role in the watershed,
- identify specific water quality problems,
- and, most importantly, take wise action to improve or protect the water quality of our stream.

## **Why are students and teachers getting involved in the monitoring effort?**

Through the hands-on experience of water quality monitoring, students further their understanding of water resources in the State. Just as important, they grow and learn from the experience. Water quality monitoring is also a powerful educational tool. Use this program to meet Utah State Core Curriculum Objectives, teach in an interdisciplinary manner, provide meaningful content and activities, expose students to new learning environments and much more. The learning outcomes are even more exciting.

**Through the *Utah Stream Team* program students will:**

- understand the relevancy of their studies,
- gain confidence in their ability to positively influence their local environment,
- learn the importance and rewards of serving their community,
- develop skills to become better decision makers,
- realize that learning is FUN!

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*“The educational benefits of monitoring spread out in circles to a wider and wider community, beginning with the student volunteers and then extending to friends, neighbors, businesses, elected officials...”*

- Volunteer Monitor, 1994

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## How do we monitor water quality?

### We investigate in the classroom.

Students need to understand “why” they are monitoring. We can help them see the relevancy of their investigations by presenting “big picture” concepts, such as The Water Cycle and Watersheds. Within these large concepts students can then identify areas of interest, such as Aquatic Life, to pursue. They can even design their own monitoring program to address their interests.

The classroom also provides a great place to prepare for field exercises. Practicing data collection procedures (e.g., sampling the acidity of household substances) and reviewing safe and ethical monitoring techniques are important for success in the field.

After we return from the field we reflect on our findings as well as our collection techniques. Classes are encouraged to present and share their data via the internet.

### We study water across the curriculum.

The *Utah Stream Team* facilitates the study of water in all major discipline areas. Computer graphing, creative writing and public decision-making are just a few of the areas students can explore through the program.

### We get wet!

At the stream site, students collect scientific data. They may conduct a variety of chemical tests, collect and identify aquatic bugs, measure the stream shape and flow and much more.

The structure of the monitoring exercises depends on the individual goals and resources of the group. Some groups may opt to take only a few measurements; some may run every test. Some groups may visit their site only once during the year while others may visit once a month.

### We develop community projects.

Many groups choose to take action based on what they’ve learned. For example, if a group discovers significant bank erosion, they may return to the site to work with a specialist to revegetate and stabilize the banks. Some groups take the opportunity to educate others in their community about water quality. They may present their findings to the city council or start a community water education program. *Utah Stream Team* emphasizes action based on unbiased scientific information.

## Thanks for being involved!

The *Utah Stream Team* is glad you’ve decided to join the water quality monitoring effort. Before you is an exciting opportunity to make a difference – for your streams, your students and your community.



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## I-2. What's in the Manual

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The *Utah Stream Team* (UST) is a flexible educational tool able to meet a wide range of instructional goals and settings. An earth science class may spend 2 weeks investigating water quality and work through the manual from start to finish. A social studies class may simply want to look at Water Laws for a day and use only that section.

This manual also accommodates educators with a wide range of experience and knowledge levels. Those familiar with water quality monitoring may wish to skip over some sections. Less experienced teachers may actually desire more information (if so, consult the “resources for further investigation”). To decide which units will be most helpful for you take a few minutes to familiarize yourself with the manual.

### Unit I: Introduction

**Section 1. Introduction** - an overview of Water Quality Monitoring and the UST program.

**Section 2. What's in the Manual**

### Unit II: Designing Your Program

Every class and teacher operates in a unique environment. Read through the sections of this unit in sequence to design a water education and monitoring program that meets your individual needs.

**Section 1. Utah Science Core Curriculum**

**Connections** – correlations between UST activities and the Utah 5<sup>th</sup> - 8<sup>th</sup> Grade Core Curriculum for Science are identified (UST content is adaptable for grades 5 through 12).

**Section 2. Suggested Instructional Strategies** – teaching philosophy and strategies.

**Section 3. Interdisciplinary Study** – cross-curricular connections.

### Unit III: Field Prep

This unit will help you to plan and organize field activities. Be sure to consult this section well in advance of your field day.

**Section 1. In the Field** – answer your questions about *where, what, when* and *how* to sample.

**Section 2. Organizing Your Group** – facilitate efficient field exercises.

**Section 3. Field Behavior** – learn to sample in an ethical manner.

#### *Check it out ...*

Let these icons be your guide.



Here's an exciting monitoring idea.



Find out how things work here in Utah.



Don't forget about this.



Here's a fun way you can help protect your local stream.



Whoa. Don't miss this important information.

**Section 4. Sampling Safely** – reduce unnecessary risk for students and volunteers.

**Section 5. Before You Go** – obtain permission, connect with other monitoring groups and natural resource specialists, and develop community support.

**Section 6. The Utah Stream Team Monitoring Kit** – lists equipment, materials and information on borrowing a free kit.

## Unit IV: Field Investigation

This unit guides you through a water quality monitoring investigation of your local stream.

### Section 1. General Stream Survey

- Weather
- Surrounding land use
- Water appearance and smell

### Section 2. Physical Properties

- Stream flow
- Stream shape

### Section 3. Chemical Properties

- pH
- Dissolved oxygen
- Nutrients (nitrate, ammonia, phosphorus)

### Section 4. Biological Properties

- Macroinvertebrates
- The Riparian Zone

**Each of the physical, chemical and biological properties sections contains:**

- key terms – these bolded, underlined terms are defined in the Glossary
- background information
- overhead masters
- information to help interpret your findings
- resources for further investigation
- directions and data sheets for field monitoring [section VII-8 compiles them into one area for easy access]

## Unit V: Post-Field Activities

**Section 1. Illustrating Your Data** – chart and graph your data.

**Section 2. Reflecting on Your Data** – interpret your data and data collection techniques.

**Section 3. Stewardship** – act on your findings and making a difference.

## Unit VI: Utah Water Information

These sections provide the “big picture” that will help students understand *why* they are monitoring.

**Section 1. Water Cycle** – describes universal processes.

**Section 2. Watersheds** – describes regional processes.

**Section 3. Water Pollution**–examines the types, sources and effects of water pollution.

**Section 4. Water Laws**—discusses legal aspects concerning water quality.

## **Unit VII: Appendices**

**Section 1. Feedback** – help improve the UST program for students and teachers.

**Section 2. Contacts and Resources** – investigate further and find monitoring assistance.

**Section 3. Utah Science Core Curriculum Matrix** – identify which sections of the manual will help you address a specific Standard or Objective.

**Section 4. A Note to Volunteers** – one-page overview of the UST program for volunteers, media and other interested parties.

**Section 5. Sampling Directions and Data Sheets** – a compilation of field sheets.

**Section 6. Overhead Masters** – instructional aids (remember, figures with an arrow can be found in this appendix).

**Section 7. Funding Your Monitoring Program** – find additional support for your program.

**Section 8. Purchasing Supplies** – prices and ordering information for monitoring equipment and supplies.

**Section 9. Making Your Own Monitoring Equipment** – easy-to-follow instructions for useful instruments.

**Section 10. Monitoring in the Classroom**—options for groups without access to a waterbody and groups looking to extend their field monitoring program.

**Section 11. Conversion Chart** – convert monitoring units.

**Section 12. Glossary** – all key terms (bolded) are defined here.

**Section 13. Index**