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Water Use in Vermont:
An Activities Guide for Teachers

U.S. Department of the Interior
U.S. Geological Survey

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Water Use in Vermont:
An Activities Guide for Teachers

by Debra H. Foster, Tatianna N. Batorfalvy, and Laura Medalie

U.S. Department of the Interior
U.S. Geological Survey

To obtain additional copies of this guidebook, watershed maps, or information on water resources in New Hampshire or Vermont, contact:

Outreach Coordinator
USGS
New Hampshire/Vermont District
361 Commerce Way
Pembroke, NH 03275

E-mail: dhfoster@usgs.gov
Phone (603) 226-7837 FAX (603) 226-7894

Web site: **http://vt.water.usgs.gov**

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INTRODUCTION

Water-use data are collected and compiled every 5 years by the U.S. Geological Survey (USGS), in cooperation with the State of Vermont Agency of Natural Resources. This activities guide was created to bring this information to educators of upper elementary and middle school students throughout the State. The activities in this guide book encourage the development of skills that are recommended by the Vermont Department of Education Framework of Standards.

How to Use this Guidebook

The following pages and the accompanying map poster were developed by the USGS to teach students in Vermont about the watershed they live in, how watershed boundaries are determined, and how water is used in the 16 largest watersheds in the state. The watershed map on the poster shows topographic relief and major rivers and lakes. Watersheds are named for the major river draining each watershed. The town map included on the poster shows town boundaries, watershed boundaries, and major rivers and lakes. Using both maps, tables 1and 2, and activities 1-4, students will learn about water use in their town and State. The page *"Helpful Hints for Educators"* contains suggestions and answers for each activity.

Several of the activities included in this guide book are designed for educators to use in a classroom setting where more time can be spent on water-use questions and discussions. Some of the activities are suggested as general guidelines to provide the flexibility often needed in classrooms. These activities can be used to supplement an existing water resources curriculum and are not meant to be inclusive on the topic of water use. The data are from USGS Water-Resources Investigations Report 97-4178, titled "Estimated Water Withdrawals and Use in Vermont, 1995.

As a supplement to this guide book, the USGS poster titled *"Water: The Resource that gets Used and Used for Everything"* would be useful to illustrate the various water uses. The colorful poster is drawn with cartoon-like characters and can be used with the graphics in Activity 2 to illustrate the six water-use categories. Ordering instructions for this poster can be found in the section *"U.S. Geological Survey Educational Resources."*

Skills Used by Students

Students will be working in the areas of *7.1* Scientific Method and *7.2* Scientific Investigations of the Vermont Department of Education Framework of Standards. Skills students will use include

Reading
Map reading
Table reading
Group Discussions
Use of technology
Problem Solving
Independent project
Data Collection
Graphing/models

Mission of the U.S. Geological Survey

As the Nation's largest water, earth, and biological science, and civilian mapping agency, the U.S. Geological Survey works in cooperation with more than 2,000 organizations across the country to provide reliable, impartial, scientific information to resource managers, planners, and other customers. This information is gathered in every state by USGS scientists to minimize the loss of life and property from natural disasters, contribute to the sound conservation, economic, and physical development of the nation's natural resources, and enhance the quality of life by monitoring water, biological, energy, and mineral resources.

Acknowledgments

The authors greatly appreciate the technical and educational reviews of this book and map by Marilee Horn, Water-Use Specialist, USGS; Tim Sullivan, Teacher, Kimball Elementary School, Concord, N.H; Laura Barone, Middle School Science Teacher, Portsmouth Jr. High School, Portsmouth, N.H., John Girard, Science Teacher, Marion Cross School, Norwich, Vt. and Hervey Scudder, Northeast Center for Social Issue Studies in Vermont.The authors thank Ann Marie Squillacci, Craig Johnston, and Anita Cotton, USGS, for graphics assistance.

WATER USE

About 70 percent of the Earth's surface is covered by water. Water also exists in the air as water vapor and in the ground as soil moisture. Thanks to the water cycle, our planet's water supply is constantly moving from one place to another and from one form to another. Surface water is water naturally open to the atmosphere. Ground water is fresh water found beneath the Earth's surface, usually in aquifers. Water flows from the aquifers to the surface through wells and springs. In 1995, the Nation used about 321 billion gallons per day of surface water and about 77 billion gallons per day of ground water.

Water is supplied to users in two ways–by public water suppliers or by self supply. Public water suppliers provide water to users by withdrawing water from one of several reservoirs, lakes, streams, or wells and delivering it through a network of pipes. The source of water for many large public water suppliers is surface water, such as Lake Champlain. Water users who do not receive water from a public water supplier are said to be self supplied. Most places that are self supplied withdraw ground water from wells.

The USGS divides water users into six major categories for consistent data analysis--**domestic**, **commercial**, **industrial**, **thermoelectric power**, **mining**, and **agriculture**. Hydroelectric power and other instream uses, such as recreation and transportation, are considered a different kind of water use because the water remains in the stream as it is used and, therefore, is not discussed in this guide. Activities 1-4 relate only to users who withdraw water from surface and ground-water resources. Class discussions and further research on other uses could easily be added to the discussion on water use.

Water-use data were collected for each of the 6 categories for 16 large watersheds in Vermont. Many of these watersheds extend into the surrounding states of New Hampshire, New York, Massachusetts, and Canada, although the segments in these other states are not shown on the poster found at the end of this guidebook. The water-use data provided in table 2 only apply to the parts of the watersheds that are in Vermont.

In 1995, Vermont's total water use was **570 million gallons per day**. Water users from the categories **thermoelectric power**, **commercial**, **domestic**, and **industrial** used the most water. The watershed with the most water use is the *Upper Connecticut-Mascoma River Basin* because the nuclear power facility along the Connecticut River, which generates electricity, continuously uses water for cooling. The watershed with the second most water use is the *Winooski River Basin.* This basin has the largest domestic use because the largest number of people reside in this watershed (see table 1). To determine the amount of water use accounted for by category in each watershed, use table 2. Note the correlation between population (table 1) and domestic use (table 2).

PURPOSE OF WATER-USE DATA

Reliable data on water use provide an important tool for town and state managers and water suppliers to help maintain water supplies that meet the needs of all water users. Water resource managers use past and present data on climate, streamflow, ground-water levels, and population to estimate future water needs. The USGS has published a national summary on water use by state every 5 years since 1950. For copies of these summaries contact the USGS by calling **1-888-ASK-USGS**.

WATER-USE DEFINITIONS

Ground Water: fresh water found beneath the Earth's surface, usually in aquifers. Water flows from the aquifers to the surface through wells and springs.

Hydroelectric power: electricity produced by turbine generators driven by falling water, usually over dams.

Million gallons per day (Mgal/d): rate at which a volume of water is used. One Mgal/d is equal to a flow of 1.55 cubic feet per second.

Public supply: water withdrawn by public and private suppliers of water that is delivered to domestic, commercial, industrial, and other

users through a network of pipes.

Runoff: precipitation that runs off the land into streams, ponds, lakes and reservoirs. Runoff can carry pollutants from air and land into these receiving waters.

Self supply: water withdrawn from wells, rivers, or lakes by households and other users.

Surface water: water naturally open to the atmosphere; includes rivers, lakes, reservoirs, ponds, and streams.

Water cycle: The constant circulation of water from sea to the atmosphere by evaporation, to land as precipitation, and back to the sea.

Watershed: an area of land from which all rainfall and (or) snow melt flows downhill from high elevations to low elevations into a common body of water such as a stream, lake, wetland, estuary, or ocean. Ridges of high ground generally form the boundaries between watersheds. At these boundaries or **watershed divides**, rain falling on one side flows into one watershed, while rain falling on the other side of the boundary flows into the adjacent watershed. In this booklet, **drainage basin** and **basin** are both synonymous with watershed.

WATER-USE CATEGORIES:

Agriculture - water used for irrigation to grow crops and for watering of livestock, such as cows, pigs, sheep, poultry, and horses.

Domestic - water used for household purposes, including water used indoors for drinking, preparing food, flushing toilets, washing clothes, and bathing, and outdoors for watering lawns and washing cars.

Commercial - water used by hotels, restaurants, office buildings, hospitals, schools, and similar facilities and for snow making at ski areas.

Industrial - water used in fabricating, processing, washing, and cooling industrial materials. Examples of industries are food, steel, chemical, paper, and petroleum refining.

Mining - water used in removing, sorting, and washing material from the earth, such as marble, granite, and sand and gravel.

Other -Part of public supplied water that is not measured, including meter errors, leaks, and water used for fire fighting and town parks or swimming pools.

Thermoelectric power - water used in the process of generating electricity from fossil or nuclear fuel. Thermoelectric power plants use uranium or burn coal and oil to produce steam to power turbines that produce electricity.

SELECTED WATER-RESOURCES REFERENCES

Durney, Mike, ed., 1996, Project WET Curriculum and Activity Guide: Bozeman, Mont. and Houston, Tex., The Watercourse and Council for Environmental Education, 516 p.

Koffman, S.C., 1994, Water matters, water resources teacher's guide: National Science Teachers Association, v. 1, 31 p., three educational posters and reference list.

Medalie, Laura, 1997, Estimated water withdrawals and use in New Hampshire, 1995: U.S. Geological Survey Water-Resources Investigations Report 97-4177, 18 p.

_____ 1997, Estimated water withdrawals and use in Vermont, 1995: U.S. Geological Survey Water-Resources Investigations Report 97-4178, 18 p.

New England Interstate Water Pollution Control Commission, 1998, That Magnificent Ground Water Connection: A resource book for Grades K-6, 7-12: U.S. Environmental Protection Agency, May.

Solley, W.B., Pierce, R.R., and Perlman, H.A., 1998, Estimated use of water in the United States in 1995: U.S. Geological Survey Circular 1200, 71 p.

U.S. Environmental Protection Agency, 1997, Water on tap, A consumer's guide to the Nation's drinking water: EPA 815-K-97-002, 22 p.

U.S. GEOLOGICAL SURVEY EDUCATIONAL RESOURCES:

GEO CENTER

The ***GEO CENTER*** (Geoscience Education Outreach Center) was established in 1991 with Educational Initiative Funding from the U.S. Department of the Interior and is a part of the U.S. Geological Survey Library. *GEO CENTER* serves as a special resource area for USGS personnel and teachers involved in earth science instruction for grades K-12.

The ***CENTER's*** collection contains more than a thousand earth science books, videos, software programs, lesson plans, science fair suggestions, hands-on materials and activity kits. In addition, users have access to the wide range of research material available through the Library and Cartographic Information Center. This would include more advanced educational materials, maps, and the use of other related databases.

GEO CENTER materials may be borrowed directly by schools and USGS personnel. Others may borrow items through their school or public libraries using the Interlibrary Loan System. For further information contact the **Library's Reference Desk (703) 648-4302**.

U.S. Geological Survey Library
National Center, MS 950
Reston, VA 20192

POSTERS

Water Posters:

The front side of the following posters has a colorful cartoon graphic depicting the topic of the poster. The back sides of the posters contain educational activities, definitions, and interpretive questions concerning the poster topic. The educational materials on the back of the poster determine the appropriate grade level and the posters can be joined to create a wall mural. Black-and-white posters are available but do not have activities printed on the back side and are used as coloring exercises for children in grades K-5. These posters are available from the USGS by calling **1-888-ASK-USGS or by writing to**

USGS Information Services
Box 25286
Denver, CO 80225
Fax: 303-202-4693

- *Water: The Resource that gets used and used and used for everything!:* U.S. Geological Survey, 96-0461 (grade school), 96-0462 (middle school), 96-0460 (black and white version)
- *Watersheds: Where we live:* U.S. Geological Survey, 96-0479 (grade school), 96-0480 (middle school), 96-0478 (black and white version)
- *Water Quality: Potential sources of pollution:* U.S. Geological Survey, 96-0469 (grade school), 96-0470 (middle school)

Water Jeopardy Game

To order a copy of the game (while supplies last), contact the USGS office in Nebraska:

Kathy Wilson
U.S. Geological Survey
Room 406 Federal Building
100 Centennial Mall North
Lincoln, NE 68508

Phone: **(402) 437-5663**
http://www-ne.cr.usgs.gov/jeopardy/intro.html (to view the game)

or

The Groundwater Foundation
P.O. Box 22558
Lincoln, Nebraska 68542-2558

Toll-free Phone: **1-800-858-4844**
Telephone: **(402) 434-2740**
Fax: **(402) 434-2742**
E-mail: **info@groundwater.org**

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

OTHER WATER-RESOURCES EDUCATIONAL MATERIAL

☛ **National Science Teachers Association**--The following water-resource educational material is available at cost by contacting:

NSTA Publications and Sales
1840 Wilson Boulevard
Arlington, VA 22201-3000
(800) 722-NSTA

web site: **http://www.nsta.org**

Water Matters: Water Resources Teachers Guide, volumes 1, 2, and 3, National Science Teachers Association. Includes booklets and all nine of the USGS water series posters. These volumes can be ordered separately or as a set.

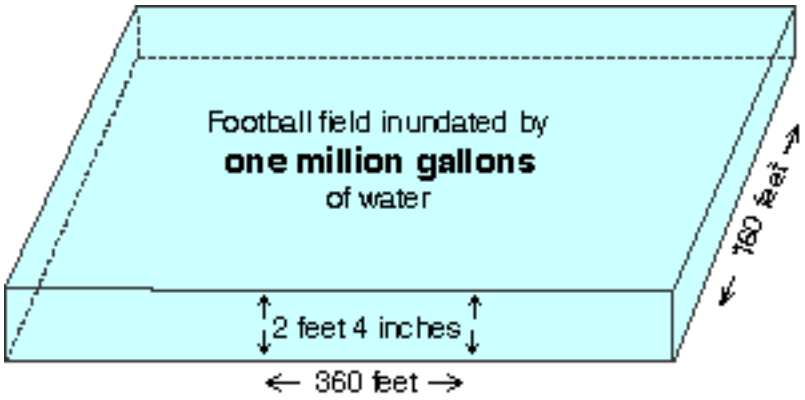
☛ Vermont Project WET (Water Education for Teachers)

Project WET is an interdisciplinary water education program for kindergarten through 12th grade students designed to facilitate and promote awareness, appreciation, knowledge and stewardship of Vermont's water resources. Project WET is available to formal and non formal educators only through workshops conducted by Vermont's Project WET coordinator and trained facilitators.

web site: **http://www.anr.state.vt.us/dec/waterq/infoeduc/wet.htm**

HOW MUCH WATER IS A MILLION GALLONS?

A football field is 360 feet long and 160 feet wide. If it was filled with ***1 million gallons*** of water (or any liquid, for that matter), the field would be covered with water about 2 feet 4 inches deep. For another example, Lake Champlain is Vermont's largest lake shared with New York and the Province of Quebec) and the sixth largest lake in the country. On an average day of the year, Lake Champlain contains about ***6,800,000 million gallons*** (6,800,000,000,000 gallons) of water.



This means that it would take almost **7 million** football-field blocks shown above to fill the lake with water. That amount of water would cover the entire state of Vermont almost 3 ½ feet deep.

Table 1. Population by Watersheds in Vermont,1995

Watershed	Number of People
Upper Connecticut River	**4,500**
Passumpsic River	**21,000**
Waits River	**15,300**
Upper Connecticut-Mascoma River	**34,600**
White River	**28,500**
Black-Ottauquechee	**20,500**
West River	**20,200**
Middle Connecticut River	**2,100**
Deerfield River	**7,800**
St. Francois River	**20,400**
Lake George	**20,300**
Otter Creek	**76,700**
Winooski River	**150,000**
Lamoille River	**102,500**
Missisquoi River	**28,500**
Hudson-Hoosic River	**31,900**
Total Population	**584,800**

Table 2. Water Use by Category in Major Watersheds in Vermont in 1995

[The "other" column represents the difference between public supply withdrawals and deliveries to domestic, commercial, and industrial users. Negative numbers represent leaks or losses of water]

	Water-Use Category, In Million Gallons per Day							
Watershed Name	**Domestic**	**Commercial**	**Industrial**	**Thermo-electric Power**	**Mining**	**Agriculture**	**Other**	**Total water use in watershed, in million gallons per day[1]**
Upper Connecticut River	0.3	0	1.5	0.5	0.1	0.1	0.2	2.7
Passumpsic River	1.6	1.8	0.1	0	0	0.3	1.1	4.9
Waits River	1.1	0.3	0.5	0	0.1	0.2	-0.1	2.1
Upper Connecticut-Mascoma River	2.7	1.1	2.3	450	0.3	0.2	0	460
White River	2.1	3.3	0.2	0	0	0.4	-0.1	5.9
Black-Ottauquechee River	1.6	1.3	0.1	0	0	0.3	0.9	4.2
West River	1.5	1.4	0.2	0	0	0.6	-0.1	3.6
Middle Connecticut River	0.1	0	0	0	0	0	0	0.1
Deerfield River	0.5	1.3	0	0	0	0.2	-0.1	1.9
St. Francois River	1.6	0.2	0	0	0.2	0.7	0.7	3.4
Lake George	1.5	0.3	0	0	0	0.5	0	2.3
Otter Creek	5.9	5.3	4.7	0	0.9	1.6	1.1	20
Winooski River	12	4.5	5.3	0.4	0.6	1.2	3.6	27
Lamoille River	7.9	8.6	0.9	0	0.4	1.3	-2.8	16
Missisquoi River	2.1	0.9	0.8	0	0.2	1.3	0.1	5.4
Hudson-Hoosic River	2.5	2.7	0.5	0	0.3	0.3	1.1	7.4
Total water use in Vermont (in million gallons per day)	**45**	**33**	**17**	**450**	**3.1**	**9.2**	**5.6**	**570**

[1] The total values in this column have been rounded off due to uncertainties with reporting large numbers and, therefore, may differ slightly from the actual sum of each row.

Helpful Hints for Educators

The following suggestions and answers will be useful for Activities 1-4.

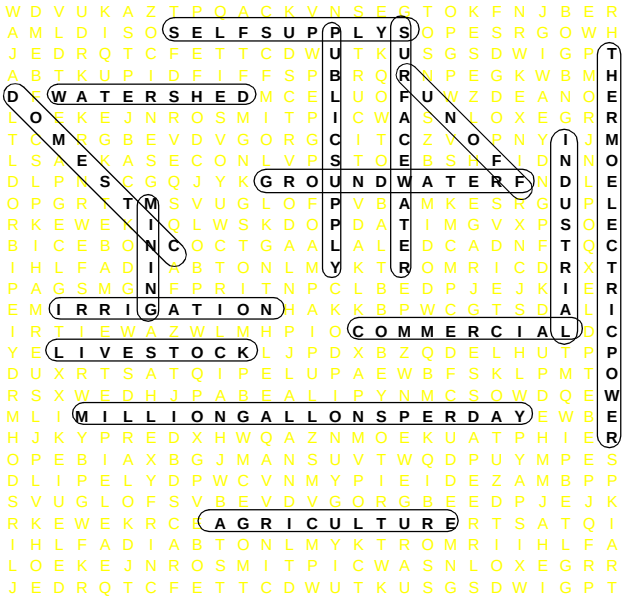
Activity 1. *"Identify your Watershed"* Laminate the surface of the map poster so that students can draw arrows to show paths of runoff and drainage patterns in their watershed. Be sure to use washable markers. The students also could use pre-cut arrows that are attached by double-sided tape to show pathways on the map.
Activity 1 can be used with a three-dimensional watershed model that students or educators build from rocks and paper-mâché (M. Durney, 1996). Waterproof the surface by painting it with latex paint. Rain can be simulated by spraying blue water over the surface. The model shows how rain runs off the land surface from high to low elevations on different sides of a ridge. Students can then locate a watershed boundary along a ridge. The watershed model should be made with mountains and valleys to best illustrate drainage patterns. USGS poster "Watersheds-Where We Live" also would be a useful resource to accompany this activity. *Challenge questions-Pathways in your watershed.* **Answer to no. 11**.- Erosion of land surface forms valleys and ridges and water flows downhill along paths of least resistance. **Answer to the "Extra Project"** question on page 12 can be found on the USGS web page: **http://nh.water.usgs.gov/current projects/Dye tracer study of New Hampshire Rivers**.

Activity 2. *"Water-Use Categories Word Match"* Water-use category definitions are included in the first part of this guide book. **Answers:** Commercial-**E**; Domestic-**F**; Industrial-**B**; Agriculture-**C**; Mining-**A**; Thermoelectric Power-**D**

Activity 3. *"Water use in Vermont in 1995"*

- Copy water-use category symbols from Activity 2, cut out, and paste onto oak tag for use in Activity 3. For question 6, students place within the boundaries of the appropriate watershed the picture of the water-use category that uses the most water in Vermont and (or) they can place all the water-use category symbols in each watershed. Use table 2 to determine amounts of water use in different parts of the state.
- Discuss ways students can reduce the amount of water their family uses every day. The USGS poster *"Water: The Resource That gets Used and Used and Used"* (grade school level) includes a fun activity for estimating the amount of water used for daily activities. The chart included in the activity is from that poster. Answers will vary with each student.
- **Activity 3 answers:***1.* 570 Mgal/d; *4.* Upper Connecticut-Mascoma River; *5.* thermoelectric power,450 Mgal/d; *6a.* Otter Creek, 1.6 Mgal/d; *b.* Upper Connecticut-Mascoma, 450 Mgal/d; *c.* Winooski, 12 Mgal/d; *d.* Lamoille, 8.6 Mgal/d; *e.* Winooski, 5.3 Mgal/d; *f.* Otter Creek, 0.9 Mgal/d.
- Visit the USGS Water Science for Schools web site for interactive exercises on water use: **http://water.usgs.gov/droplet**
- To practice graphing skills, students can plot water-use values for each watershed as graphs called **histograms**. Values are taken from Table 2. A key showing how the histograms should be drawn is provided on page 10. The graphs give a picture of water use for each watershed and could be used for discussion and placed next to the appropriate watershed on the map poster. These graphs can be produced using a spreadsheet computer software that generates graphs or they can be drawn by hand on graph paper. Notice that the scale for amount of water used will vary from watershed to watershed because of the large volume of water used by some categories but not others. Graphs can all remain about the same size by using different scales for the left axis of the graph as shown in the histograms.

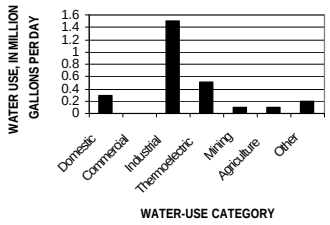
Activity 4. '*Water-Use Word Search"* **answers**.



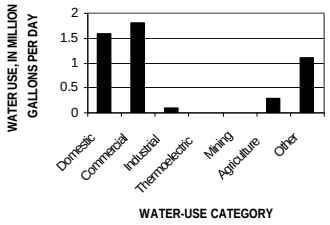
Helpful Hints for Educators

Activity 3-Bar graphs or **histograms** showing water use by category in each of the watersheds in Vermont. Refer to table 2 for water use data used to create these graphs. Negative numbers are not used in these bar graphs.

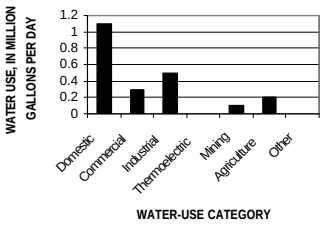
Upper Connecticut River



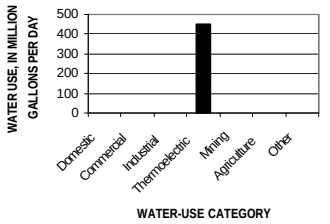
Passumpsic River



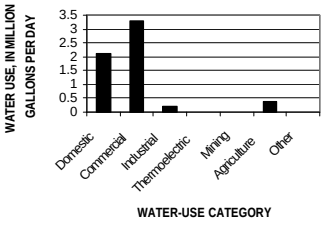
Waits River



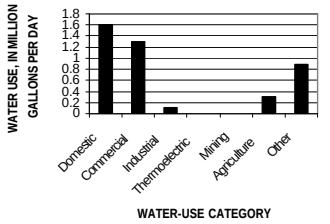
Upper Connecticut-Mascoma River



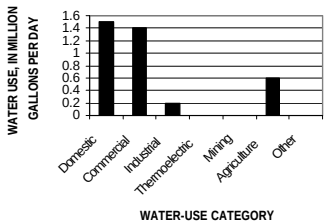
White River



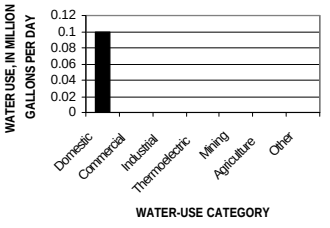
Black-Ottauquechee River



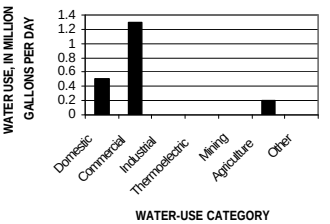
West River



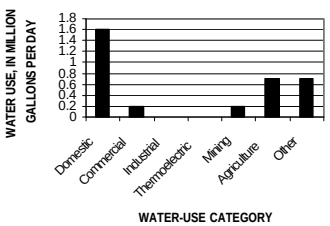
Middle Connecticut River



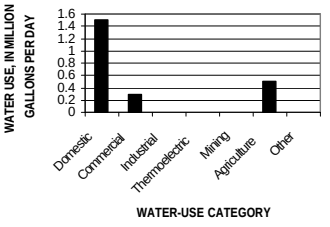
Deerfield River



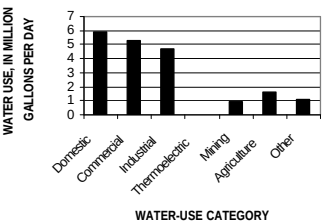
St. Francois River



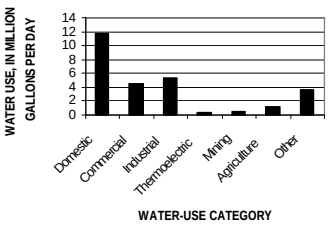
Lake George River



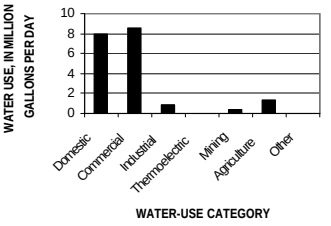
Otter Creek River



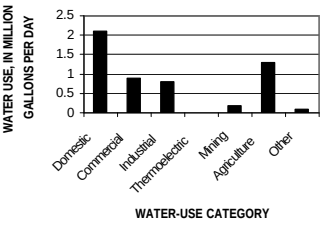
Winooski River



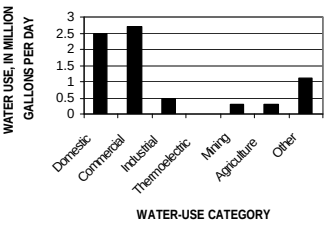
Lamoille River



Missisquoi River



Hudson-Hoosic River



Name:

Activity 1. Identify Your Watershed

<u>Goal of Activity</u>: To identify the (1) watershed you live in, (2) source of water used at home, and (3) pathway of surface runoff in your watershed. Look at the watershed maps of your state to answer the following questions.

1. In what town do you reside?

2. Locate your town on the town map.

3. Locate your watershed on the town map. With your finger, trace the watershed boundaries.

4. What is the name of the watershed in which you live? (Look at the watershed map.)

5. What is a watershed?

6. Is your town contained entirely within one watershed? If no, what is the name of the other watershed in your town?

7. Is there a town near yours that is in more than one watershed? Identify this town on the map and write the town name here.

8. Do watershed boundaries follow political boundaries such as town lines? Why or why not?

9. What is the source of your drinking water at home? (Circle the source)

Private Well River Spring Public water supplier (reservoir, town well)

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Name:

Activity 1. Identify Your Watershed

Challenge Questions: Pathway of Water in Your Watershed: Water flows from high elevations to low elevations. In a stream or river, water flows from upstream to downstream.

10. What path do you think water follows in your watershed? With your finger, trace the pathway of water draining from the high elevations in your watershed. (Use the large map on the poster and place an arrow on the map to show the direction water flows.)

11. What patterns do the rivers and streams create in your watershed? Sketch the pattern of drainage. Explain what causes these patterns?

12. If gasoline spilled into the river upstream from your town, what path do you think the gasoline would take based on your knowledge of river pathways in your watershed? Refer to the watershed map before writing your explanation here.

Extra Project:

Investigate methods used to identify, track, and monitor river pollution and describe a method that scientists would use to determine how long it would take a pollutant in a river to travel downstream to the next town.

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Activity 2. Water-Use Categories Word Match

Directions: Match the definitions in the right column with the water-use categories in the left column. Place the corresponding letter of the water-use category definition on the line to the left of the category.

____ Commercial

____ Domestic

____ Industrial

____ Agriculture

____ Mining

____ Thermoelectric Power

Definitions

A. water used in removing, washing, and sorting earth materials such as marble, granite, and sand and gravel

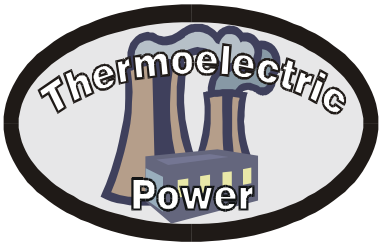
B. water used in fabricating, processing, washing, and cooling industrial materials

C. water provided to cows, pigs, sheep, poultry, and horses and to grow crops

D. water used in the process of generating power from fossil fuel or nuclear sources

E. water used by hotels, restaurants, office buildings, hospitals, and schools

F. water used for bathing, cooking, drinking, and other household purposes



Name:

Activity 3. Water Use in Vermont in 1995

Goal of the activity: To identify how water is used in major watersheds of Vermont.
Directions: Use the watershed map of your state and Table 2 to answer the following questions:

1. What was the **total amount of water** used in Vermont in 1995?_____

2. In your watershed, what **water-use category** accounts for the largest amount of water?_____
3. In your watershed, how many **millions of gallons per day** are accounted for by this category?_____

4. In which watershed is the largest amount of water used by a water-use category (**Hint:** look in the "**Total Water Use**" column)_____
5. Identify in the next line which **water-use category** it is and the total millions of gallons per day used by this category?
   Water-use Category_____
   Total millions of gallons per day_____

6. For each category, identify the watershed that accounts for the largest amount of water used and write down that amount of water. Follow the example for agriculture
   a. Agriculture **Otter Creek, 1.6 Mgal/d** d. Commercial _____
   b. Thermoelectric power_____ e. Industry _____
   c. Domestic_____ f. Mining _____

7. Investigate why the **water-use category** that used the most water per day in your State uses all that water.

8. Using the following chart, estimate how much water you use in your home on a typical day in June.

Estimated amounts of water used for daily living

Daily Activity	Amount of water used	Your total	Daily Activity	Amount of water used	Your total	Weekly Activity	Amount of water used	Your total
Drinking requirement (8 glasses per day)	3/4 gallon (3 liters)		Washing hands (leave water on for 1 minute	5 gallons (20 liters)		Washing car for 5 minutes	26 gallons (100 liters)	
Flushing toilet (per flush)	5 gallons (20 liters)		Showering (5-minutes)	26 gallons (100 liters)		Watering lawn (1 inch over 108 square feet)	66 gallons (250 liters)	
Brushing teeth (leave water on for 2 minutes	10.5 gallons (40 liters)		Washing clothes per load	32 gallons (120 liters)				
Washing dishes	26 gallons (100 liters)							

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Activity 4. Water-Use Word Search

Directions: Find and circle the 15 hidden words in the letter grid. The words can appear in any direction-horizontally, vertically, and diagonally. Two or more words do not have spaces between them in the puzzle.

AGRICULTURE	**LIVESTOCK**	**SELF SUPPLY**
COMMERCIAL	**MILLION GALLONS PER DAY**	**SURFACE WATER**
DOMESTIC	**MINING**	**IRRIGATION**
THERMOELECTRIC POWER	**GROUND WATER**	**PUBLIC SUPPLY**
WATERSHED	**INDUSTRIAL**	**RUNOFF**

W D V U K A Z T P Q A C K V N S E G T O K F N J B E R
A M L D I S O S E L F S U P P L Y S O P E S R G O W H
J E D R Q T C F E T T C D W U T K U S G S D W I G P T
A B T K U P I D F I F F S P B R Q R N P E G K W B M H
D F W A T E R S H E D M C E L U O F U W Z D E A N O E
L O E K E J N R O S M I T P I C W A S N L O X E G R R
T C M R G B E V D V G O R G C I T C Z V O P N Y I J M
L S A E K A S E C O N L V P S T O E B S H F I D N N O
D L P N S C G Q J Y K G R O U N D W A T E R F N D L E
O P G R T T M S V U G L O F P V B A M K E S R G U P L
R K E W E K I Q L W S K D O P D A T I M G V X P S O E
B I C E B O N C O C T G A A L A L E D C A D N F T Q C
I H L F A D I A B T O N L M Y K T R O M R I C D R X T
P A G S M G N F P R I T N P C L B E D P J E J K I E R
E M I R R I G A T I O N H A K K B P W C G T S D A L I
I R T I E W A Z W L M H P I O C O M M E R C I A L D C
Y E L I V E S T O C K L J P D X B Z Q D E L H U T P P
D U X R T S A T Q I P E L U P A E W B F S K L P M T O
R S X W E D H J P A B E A L I P Y N M C S O W D Q E W
M L I M I L L I O N G A L L O N S P E R D A Y E W B E
H J K Y P R E D X H W Q A Z N M O E K U A T P H I E R
O P E B I A X B G J M A N S U V T W Q D P U Y M P E S
D L I P E L Y D P W C V N M Y P I E I D E Z A M B P P
S V U G L O F S V B E V D V G O R G B E E D P J E J K
R K E W E K R C E A G R I C U L T U R E R T S A T Q I
I H L F A D I A B T O N L M Y K T R O M R I I H L F A
L O E K E J N R O S M I T P I C W A S N L O X E G R R
J E D R Q T C F E T T C D W U T K U S G S D W I G P T

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Useful USGS Web Sites

For information on water, geology, biology, and maps for the Nation and individual states:

http://www.usgs.gov

USGS web sites on water resources in New Hampshire and Vermont:

http://nh.water.usgs.gov

http://vt.water.usgs.gov

Free science lesson plans from the USGS:

http://www.usgs.gov/education

For information on many aspects of water, along with water cycle pictures, water data, maps, and an interactive center where you can give opinions and test your water knowledge:

http://water.usgs.gov/droplet

This web site also provides a basic description of the Water Cycle. Left click on "**Earth's Waters**", then left click on "**The Water Cycle.**" For a copy of the following picture, scroll down to the bottom of the "Water Cycle" page and click on "**View our large graphic showing the water cycle"**