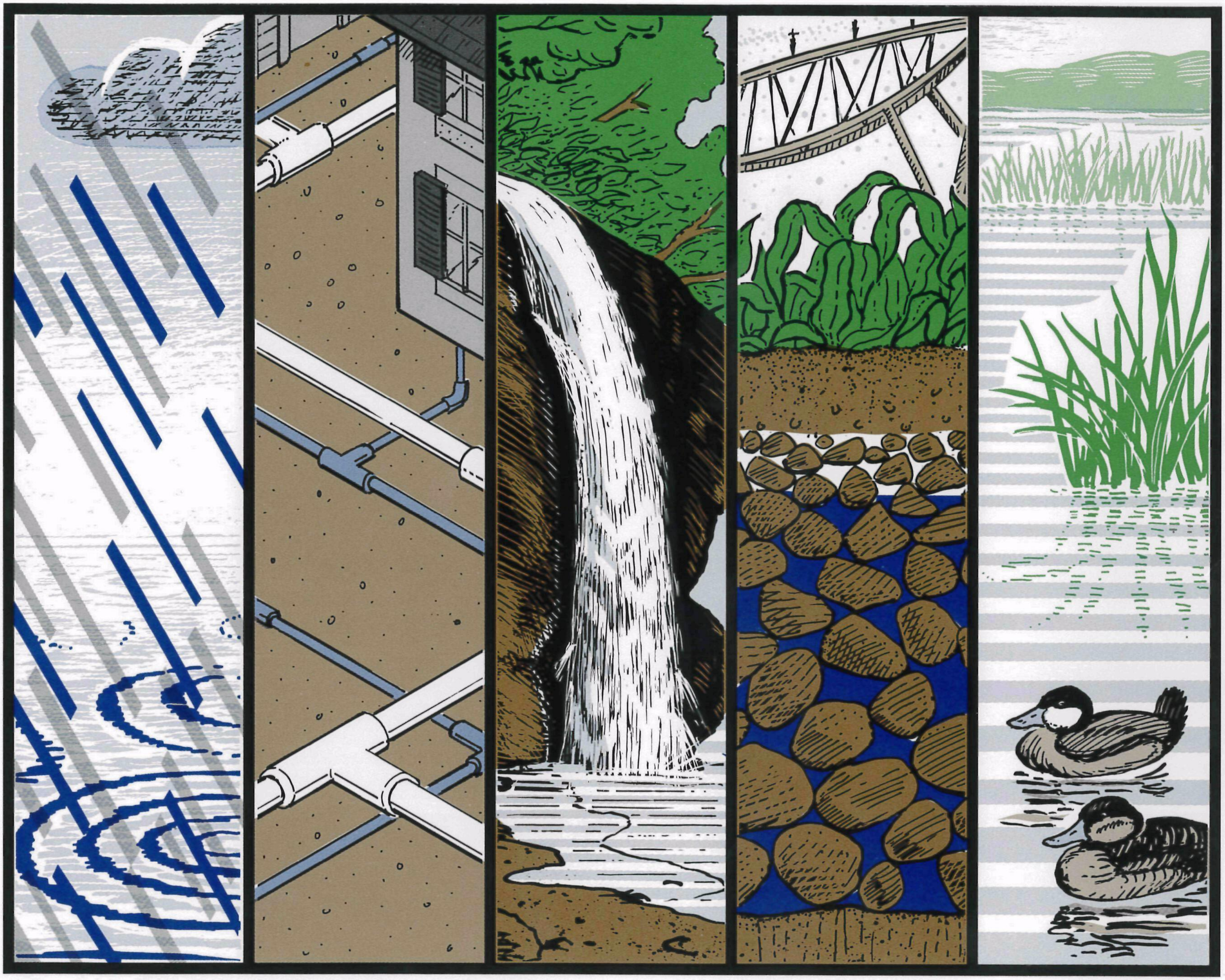

# THE WATER SOURCEBOOK

GRADES

**K-2**

ZB-1701

# WATER SOURCEBOOK

A Series of Classroom Activities for
Grades K-2

Produced for

LEGACY, INC.
Partners in Environmental Education

in cooperation with
U.S. Environmental Protection Agency

Prepared by

EDUCATION RESEARCH AND INSERVICE CENTER
University of North Alabama
Florence, Alabama

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For information about obtaining a copy of the Water Sourcebook.

a. The Georgia Water Wise Council, 1033 Franklin Road Suite 9-187, Marietta, GA 30067-8004 USA, 770/426-8936 Ext. 234 (phone), 770/426-9092 (fax), or web page: www.griffin.peachnet.edu/waterwise/wwc.htm
b. Legacy, Inc., P O Box 3813, Montgomery, AL 36109, 334/270-5921 (phone).
c. The Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314-1994 USA, 800-666-0206 (phone), 703-684-2492 (fax), or web page: www.wef.org.

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# ACKNOWLEDGMENTS

## Project Staff

Earl Gardner, Ed.D., Project Director
Education Research and Inservice Center and Center for Environmental and Science Education, University of North Alabama
Mary Lou Meadows, Ed.D., Project Director
Education Research and Inservice Center and Center for Environmental and Science Education, University of North Alabama
Charles Horn, Project Coordinator, Alabama Department of Environmental Management
Wayne Aronson, Project Coordinator, EPA
Paige Connell, Project Coordinator, Legacy, Inc.
Angie Fugo, Editor in Chief, EPA

## Classroom Teacher Activity Writing Team

Cheryl Badger - Florence City Schools, Florence, Alabama
Peggy Clay - Florence City Schools, Florence, Alabama
Beth Corum - Lauderdale County Schools, Florence, Alabama
Connie Gilley - Florence City Schools, Florence, Alabama
Judy Jester - Lawrence County Schools, Florence, Alabama
Karen Lawton - Florence City Schools, Florence, Alabama
Karen McCullough - Florence City Schools, Florence, Alabama
Donna Morgan - Riverhill School, Florence, Alabama
Cindy Taylor - Florence City Schools, Florence, Alabama
Gail Senn - Florence City Schools, Florence, Alabama
Judy Sharp - Florence City Schools, Florence, Alabama
Dihanne Westfield - Florence City Schools, Florence, Alabama
Kim Williams - Florence City Schools, Florence, Alabama

## Classroom Teacher Piloting Team

American Professional Development Corporation, Killen, Alabama - Team Leaders
Kim Browning - Cobb County Public Schools, Smyrna, Georgia
Violet Carlos - Greene County Schools, Greeneville, Tennessee
Terri Cohen - Cobb County Public Schools, Smyrna, Georgia
Mary Ann Connell - Greene County Schools, Greeneville, Tennessee
Loretta Couch - Greene County Schools, Greeneville, Tennessee
Kay Fleming - Colbert County Schools, Tuscumbia, Alabama
Susan Franks - Colbert County Schools, Tuscumbia, Alabama
Jan Gargis - Colbert County Schools, Leighton, Alabama
Mary Goldsmith - Cobb County Public Schools, Smyrna, Georgia
Susan Harkness - Russellville City Schools, Russellville, Alabama
Dianne Pace - Russellville City Schools, Russellville, Alabama

Rhonda Pounders - Russellville City Schools, Russellville, Alabama
Stacy Rank - Cobb County Public Schools, Smyrna, Georgia
Doug Ratledge - Greene County Schools, Greeneville, Tennessee
Jennifer Teague - Greene County Schools, Greeneville, Tennessee

## Graphics and Typing Team

Allyssa Michael, Illustrator, Florence, Alabama
Jeff and Paige Prozan - Illustrators, Huntsville, Alabama
Kathy Robbins, Editing, Typist, Florence, Alabama
Andrew Southerland, Illustrator, Florence, Alabama
Tammy Wynn, Team Leader and Typist, Florence, Alabama

## Design Layout Team

Kathy Robbins, Team Member - University of North Alabama
Tammy Wynn, Team Leader - University of North Alabama

## Technical Reviewers

Jim Adcock, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Wayne Aronson, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Cheryl Badger, Elementary Supervisor, Florence City Schools, Florence, Alabama
Kendy Behrends, Ed.D., Federal Programs Coordinator, Florence City Schools, Florence, Alabama
Steve Blackburn, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Wanda Boyd, Marine and Wetlands Section (6WQ-EM), US EPA, Region 6, Dallas, Texas
MaryJo Moubry Feuerbach, US EPA, Region 1, Boston, Massachusetts
Bob Freeman, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Dale Froneberger, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Angie Fugo, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Earl Gardner, Ed.D., Director, Education Research and Inservice Center and Center for Environmental and Science Education, University of North Alabama, Florence, Alabama
Frank Heatherly, Ed.D., Instructional Division, Alabama State Department of Education, Montgomery, Alabama
Ginny King, Instructional Technology Specialist, Technology Transfer, CSRA, RESA
Charles Horn, Chief, Water Division, Alabama Department of Environmental Management, Montgomery, Alabama
Walter Hunter, Water Management Division, US EPA, Region 4, Atlanta, Georgia
Patricia Hurley, Water Division, Alabama Department of Environmental Management, Montgomery, Alabama
Paul Johnson, Reynolds Metals Company, Listerhill, Alabama
Terry Logue, Ed.D., Assistant Professor, Earth Science, University of North Alabama, Florence, Alabama
Lorraine V. Loken, Manager, Public Education, Water Environmental Federation, Alexandria, Virginia
Fox McCarthy, Water Conservation Coordinator, Cobb County-Marietta Water Authority, Marietta, Georgia
Rose McGee, Ed.D., Classroom Teacher, Florence City Schools, Florence, Alabama
Mary Lou Meadows, Ed.D., Associate Professor of Early Childhood and Elementary Education, Middle Tennessee State University, Murfreesboro, Tennessee

Carol Ann Mudd, Cobb County Public Schools, Smyrna, Georgia
Richard D. Nawyn, Chief, Environmental Education and Public Outreach, US EPA, Region 4, Atlanta, Georgia
Jacquie Osborne, Ed.D., Director, Child Growth and Development Center, University of North Alabama, Florence, Alabama
David Pincumbe, Water Quality Specialist, US EPA, Region 1, Boston, Massachusetts
Pat Robinson, Vulcan Chemical Technologies, Inc., Orlando, Florida
Bob Young, Ed.D., Associate Professor, Early Childhood and Elementary Education Department, University of North Alabama, Florence, Alabama

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# INTRODUCTION

The value of clean, safe water for individuals, communities, businesses, and industries cannot be measured. Every living thing depends on water. The economy requires it. Water issues should be everyone's concern, but most people take water quality and availability for granted. After all, clean, safe water is available to most Americans every time they turn on the tap. Water issues do not become a concern until there is a crisis such as a drought or wastewater treatment plant failure. Educating citizens who must make critical water resource decisions in the midst of a crisis rarely results in positive change. Developing awareness, knowledge, and skills for sound water use decisions is very important for children, for they will soon be making water resource management decisions. Properly equipping them to do so is essential to protect water resources.

## WATER SOURCEBOOK PROGRAM

The Water Sourcebook educational program is directed specifically toward in-school population. The program will consist of the development of supplemental activity guides targeting kindergarten through high school. Water Sourcebooks will be developed for primary (K-2), elementary (3-5), middle (6-8), and secondary (9-12) levels. Materials developed in the program will be compatible with existing curriculum standards established by State Boards of Education throughout the United States and will teach concepts included in those standards by using water quality information as the content.

The Water Sourcebooks will each include five chapters-Introductionto Water, Drinking Water and Wastewater Treatment, Groundwater Resources, Surface Water, and Wetlands and Coastal Waters.

## DEVELOPMENT

The Water Sourcebooks are developed in 3 stages. First, classroom teachers are selected to write the activities with the assistance of education specialists. Teams of teachers are then given the task of developing and writing the activities for each of the five instructional chapters. The second step involves testing the activities in the classroom. Other teachers are selected to use the activities in their classrooms, and each activity is tested by at least three of them. The teachers involved in this unit are early childhood teachers from several states. From the evaluations provided by the testing teachers, revisions are made. Finally, technical reviews, editing, and illustrations are completed and the Water Sourcebook is published.

## ACTIVITY DESIGN

All of the activities include "hands-on" components and are designed to blend with existing curricula in the areas of general science, language arts, math, social studies, art, and, in some cases, reading or other areas. Each activity details (1) objectives, (2) subject(s), (3) time, (4) materials, (5) background information, (6) advance preparation, (7) procedure (including activity, follow-up, and extension), and (8) resources. A glossary section is included at the end of the guide to help teachers deal with concepts and words used in the text which may be unfamiliar.

## ORGANIZATION OF INDIVIDUAL ACTIVITIES

Each activity is organized in the same way, detailing objectives, materials needed, background information, and procedures. Following is a brief summary of what you should expect to find in each activity:

**OBJECTIVES:** Describes what the student should be able to do when the activity is completed.

**SUBJECT:** The general subject(s) to which the activity applies: Science, Mathematics, Social Studies, Language Arts, and so on.

**TIME:** The approximate number of minutes needed to complete the main exercise(s). More time may be needed for the follow-up and extension exercises. Some activities or follow-ups may require collecting data over several days/weeks, but will only need major time blocks at the beginning and end of the activity to explain, present information, and reach conclusions.

**MATERIALS:** List of materials needed to complete activity. Alternatives and optional materials are listed where appropriate. If the basic materials are not immediately available in your classroom, they can often be borrowed from other classes in the school, or local college or university science departments, local government agencies, or area businesses.

**BACKGROUND INFORMATION:** Background specific to the activity for the teacher's use. This material is suggested as a basis for teacher lecture and/or student discussion when the activity is introduced.

**ADVANCE PREPARATION:** Directions for the teacher to prepare materials in advance.

**PROCEDURE:** Complete directions to conduct the entire activity, including follow-up and extension ideas. Includes teacher sheets and student sheets.

**Setting the Stage:** Introduction of the main ideas of the activity to the students. This section may use student discussion questions/topics, sharing of pertinent background, a demonstration or activity, or a combination of these.

**Activity:** Step-by-step instructions on how to do the activity. This ends with questions to demonstrate that students understand what they have done.

**Follow-Up:** Conclusion of the activity by summarizing the information and drawing conclusions if applicable. May be used as evaluation of the stated objectives.

**EXTENSION:** Suggestions for extending the activity into other subject areas and/or suggestions for other related activities. This part of the activity is optional. Some may be used as ongoing projects, while others may be used as additional classroom work for advanced students or for extra credit.

**RESOURCES:** Reference materials used either in developing the activity or to provide additional information and addresses for ordering materials used in the activity.

These special notations appear within some activities:

**Note:** Further explanation about a procedure, used to clarify or reemphasize important directions.

**Optional:** Optional procedure or materials that may enhance part of the activity.

## ACTIVITY PREPARATION

Once you have decided on the activity(ies) you will be doing, check the materials list. You will need to take into account the number of students or student teams in your class(es). Many materials are readily available, but some may need to be borrowed or purchased ahead of time.

Prepare copies of all the needed student handouts and/or transparencies or other materials for your use. Each activity contains ready-made masters for these. These teacher and student sheets can be easily removed from the binder and replaced after photocopying. Some activities also contain suggestions to make a transparency for use with an overhead projector. Transparencies may be made by a thermofax, a photocopier, or by tracing.

If you plan to have the students do part of all of the extension suggestions, you will want to add additional materials to your list. You may also need to locate other sources of information or telephone numbers to complete the extension. Some extensions can be started simultaneously with the regular activity.

As you read through the activity, highlight any NOTE and decide whether you will do optional suggestions. Check the suggested time for completion of the activity and add time needed to do any extension activities. The time needed may vary from class to class. These activities have all been field tested in elementary school classrooms. However, you might want to do a trial run of the activity yourself to evaluate the time needed and areas where minor problems might occur. It is also a good idea to mark points in the text where natural breaks can be taken to divide the activity into class periods.

Further reading may be found in the list of resources at the conclusion of each activity. If these resources are not readily available, you may want to check other books on environmental concerns.

## PAGINATION

Each chapter is page-numbered separately and is designated with an appropriate chapter number. For example, the "Introduction" chapter begins with page 1-1, the "Drinking Water and Wastewater Treatment" chapter begins with 2-1, and so on.

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | | | x | | x | x | | x | x | x | |
| use measurements | | | x | | x | | x | x | | x | x | x | |
| make estimates and approximations | | x | | | x | | x | x | | | | | |
| formulate and solve problems | | | x | x | | | x | x | | | | | |
| probability and statistics | | | | | | | | | | | | | |
| charts and graphs | | x | x | | x | | x | x | | x | x | | |
| **SCIENCE** | | | | | | | | | | | | | |
| problem formulation | | | | | x | | x | x | | | | x | |
| formulation of hypothesis | | | x | | x | x | x | x | x | | | x | |
| gather information | x | | | | x | x | x | x | x | x | x | x | x |
| organize and analyze information | | | x | x | x | | x | x | | x | x | | x |
| interpret data | | | | | | | x | x | | | | | |
| draw conclusions | x | | x | x | x | x | x | x | | x | x | x | |
| observation and experimentation (experiment, demonstration) | | | x | | x | x | x | x | | x | x | x | x |
| **LANGUAGE ARTS** | | | | | | | | | | | | | |
| language (acquiring and using) | x | x | x | x | x | x | x | x | x | x | x | x | x |
| writing (mechanical, persuasive, creative, letters) | x | | x | | x | x | x | x | x | x | x | x | x |
| speaking and listening | x | x | x | x | x | x | x | x | x | x | x | x | x |
| reading and literature | x | x | | | x | x | x | x | x | | x | | |
| communication/presenting ideas | x | x | x | x | x | x | x | x | x | x | x | x | x |
| **SOCIAL STUDIES** | | | | | | | | | | | | | |
| map skills | | | | | | | | | | | | | |
| collecting/recording/categorizing data | | x | x | x | x | | x | x | x | x | x | x | x |
| comparing and contrasting | x | | | x | | x | x | x | x | x | x | | |
| inferences/generalizations | x | x | x | x | x | | x | x | x | | | | |
| social/human problems & decisionmaking | x | x | x | x | x | | | | | x | x | x | x |
| **RELATED ARTS** | | | | | | | | | | | | | |
| the arts (art, music, drama) | x | x | x | x | x | x | x | x | x | x | x | x | x |
| health | | | | | x | | | | | | | | |
| computer | | | | | | | | | | | | | |

# CORRELATION—CHAPTER 1

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|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | | | |
| use measurements | | | | | |
| make estimates and approximations | | | | | |
| formulate and solve problems | | | | | |
| probability and statistics | | | | | |
| charts and graphs | | | | | |
| **SCIENCE** | | | | | |
| problem formulation | | | | | |
| formulation of hypothesis | x | | | | x |
| gather information | x | x | x | x | x |
| organize and analyze information | x | | x | x | x |
| interpret data | | | | | |
| draw conclusions | x | | x | x | x |
| observation and experimentation (experiment, demonstration) | | | | | |
| **LANGUAGE ARTS** | | | | | |
| language (acquiring and using) | x | x | x | x | x |
| writing (mechanical, persuasive, creative, letters) | x | x | x | x | x |
| speaking and listening | x | x | x | x | x |
| reading and literature | | | | | |
| communication/presenting ideas | x | x | x | x | x |
| **SOCIAL STUDIES** | | | | | |
| map skills | x | | | | |
| collecting/recording/categorizing data | x | | | | |
| comparing and contrasting | x | x | x | | |
| inferences/generalizations | x | | | | |
| social/human problems & decisionmaking | x | | | | |
| **RELATED ARTS** | | | | | |
| the arts (art, music, drama) | x | x | x | x | x |
| health | | | | | |
| computer | | | | | |

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|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | x | | | | x | | |
| use measurements | x | | | | x | x | x |
| make estimates and approximations | x | | | | | | |
| formulate and solve problems | | | | | | | |
| probability and statistics | | | | | | | |
| charts and graphs | | | | | | | x |
| **SCIENCE** | | | | | | | |
| problem formulation | | | | | | | |
| formulation of hypothesis | | | | | x | x | x |
| gather information | x | x | x | | x | x | x |
| organize and analyze information | | x | x | | | | |
| interpret data | | | x | | | | |
| draw conclusions | x | x | | | x | x | x |
| observation and experimentation (experiment, demonstration) | | | | | x | | x |
| **LANGUAGE ARTS** | | | | | | | |
| language (acquiring and using) | x | x | x | x | x | x | x |
| writing (mechanical, persuasive, creative, letters) | x | x | x | x | x | x | x |
| speaking and listening | x | x | x | x | x | x | x |
| reading and literature | | | | | | | |
| communication/presenting ideas | x | x | x | x | x | x | x |
| **SOCIAL STUDIES** | | | | | | | |
| map skills | | | | | | | x |
| collecting/recording/categorizing data | x | x | | x | x | x | x |
| comparing and contrasting | | | | x | x | x | x |
| inferences/generalizations | | | | x | | | x |
| social/human problems & decisionmaking | | | | | x | | |
| **RELATED ARTS** | | | | | | | |
| the arts (art, music, drama) | x | x | | x | x | | |
| health | | | | | | | |
| computer | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MATHEMATICS | | | | | | | | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | X | | X | X | X | X | | | | X | X | | |
| use measurements | X | X | | | | X | | | X | X | X | | X |
| make estimates and approximations | | | X | X | | | X | | | | | | |
| formulate and solve problems | | | | | | | | X | | | | | |
| probability and statistics | | | | | | | X | | | | | | |
| charts and graphs | | | X | | | | | | | | | | |
| SCIENCE | | | | | | | | | | | | | |
| problem formulation | | | | | X | | | | | | X | | |
| formulation of hypothesis | | | | | X | X | X | | | | | | X |
| gather information | X | X | X | X | X | X | X | X | X | | | X | X |
| organize and analyze information | | | X | | X | | X | X | | X | | | X |
| interpret data | X | | | | | | | | | | | | |
| draw conclusions | X | X | X | X | X | X | X | X | X | X | X | X | X |
| observation and experimentation (experiment, demonstration) | X | X | | | | | | | X | X | X | | |
| LANGUAGE ARTS | | | | | | | | | | | | | |
| language (acquiring and using) | X | X | X | X | X | X | X | X | X | X | X | X | X |
| writing (mechanical, persuasive, creative, letters) | X | X | X | X | X | X | X | X | X | X | X | X | X |
| speaking and listening | X | X | X | X | X | X | X | X | X | X | X | X | X |
| reading and literature | | X | X | X | X | X | X | X | X | X | X | X | X |
| communication/presenting ideas | X | X | X | X | X | X | X | X | X | X | X | X | X |
| SOCIAL STUDIES | | | | | | | | | | | | | |
| map skills | | | | | | | | | | X | | | |
| collecting/recording/categorizing data | X | | X | | X | | | X | | X | | | X |
| comparing and contrasting | X | | X | | | X | X | | | | X | | X |
| inferences/generalizations | X | | | X | X | | | X | X | | | | |
| social/human problems & decisionmaking | X | X | X | X | X | X | | X | X | | X | | X |
| RELATED ARTS | | | | | | | | | | | | | |
| the arts (art, music, drama) | X | X | X | X | X | X | X | X | X | X | X | X | X |
| health | | | | | | | | | | | | | |
| computer | | | | | | | | | | | | | |

# CORRELATION—CHAPTER 3

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|---|---|---|---|
| **MATHEMATICS** | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | |
| use measurements | | | X |
| make estimates and approximations | | | |
| formulate and solve problems | | | |
| probability and statistics | | | |
| charts and graphs | | | |
| **SCIENCE** | | | |
| problem formulation | | | |
| formulation of hypothesis | X | | |
| gather information | X | | X |
| organize and analyze information | X | | X |
| interpret data | | | X |
| draw conclusions | | | X |
| observation and experimentation (experiment, demonstration) | | | X |
| **LANGUAGE ARTS** | | | |
| language (acquiring and using) | X | X | X |
| writing (mechanical, persuasive, creative, letters) | X | X | X |
| speaking and listening | X | X | X |
| reading and literature | X | X | |
| communication/presenting ideas | X | X | X |
| **SOCIAL STUDIES** | | | |
| map skills | | | |
| collecting/recording/categorizing data | X | X | X |
| comparing and contrasting | | | |
| inferences/generalizations | | | |
| social/human problems & decisionmaking | | | |
| **RELATED ARTS** | | | |
| the arts (art, music, drama) | | X | |
| health | | | |
| computer | | | |

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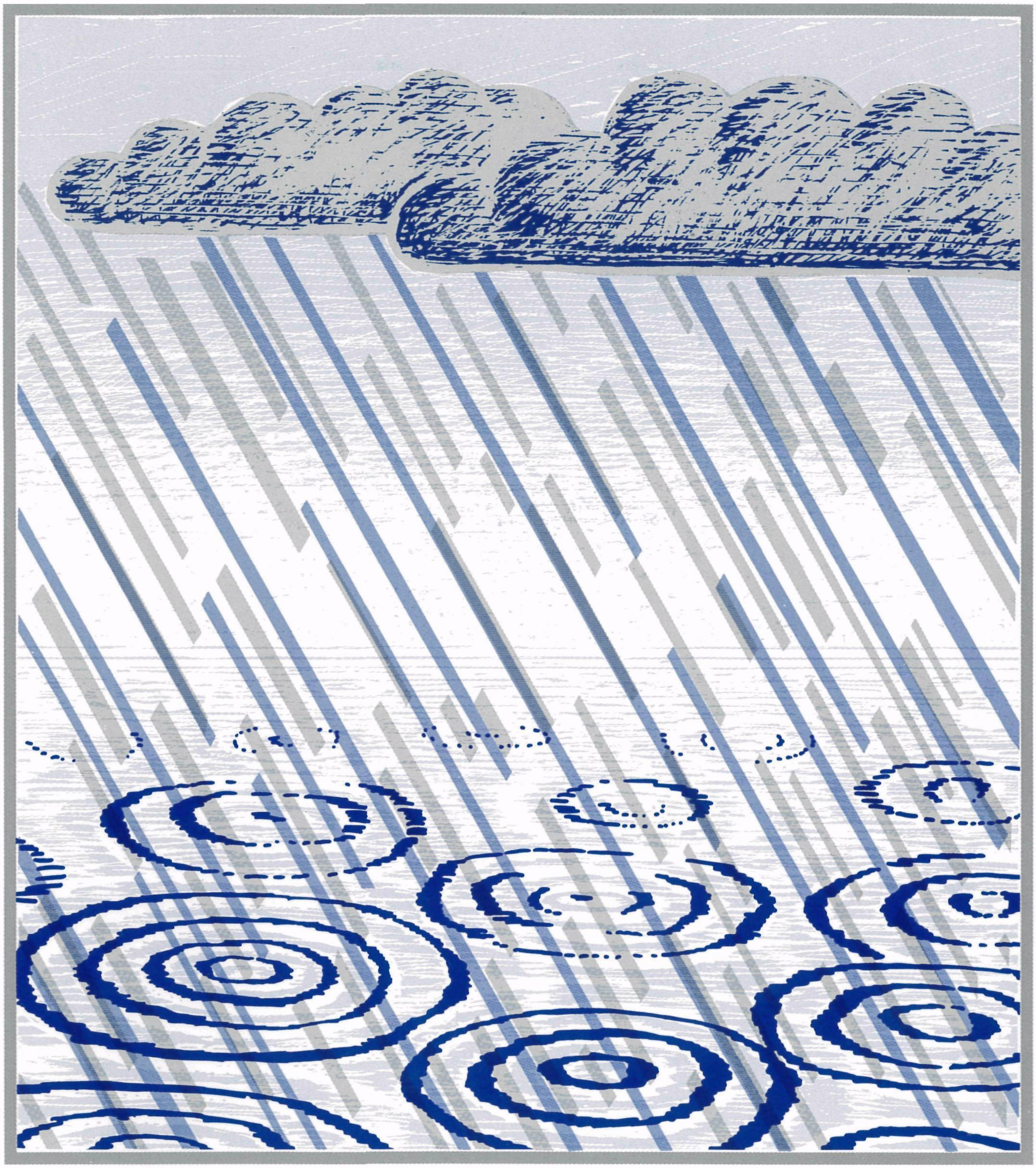
|---|---|---|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | | x | | | | | x | |
| use measurements | | x | | x | | | | | x | x |
| make estimates and approximations | | | | | | | | | | |
| formulate and solve problems | | | | | | | | | | |
| probability and statistics | | | | | | | | | | |
| charts and graphs | | x | | | | | | | | |
| **SCIENCE** | | | | | | | | | | |
| problem formulation | | | | | | | | | | |
| formulation of hypothesis | | | | | x | | | x | | |
| gather information | | x | x | x | x | | x | x | x | x |
| organize and analyze information | | | | | | x | x | x | x | |
| interpret data | | | x | | | | | | | |
| draw conclusions | | x | x | x | x | | | | | x |
| observation and experimentation (experiment, demonstration) | | | x | x | x | | x | x | | x |
| **LANGUAGE ARTS** | | | | | | | | | | |
| language (acquiring and using) | x | x | x | x | x | x | x | x | x | x |
| writing (mechanical, persuasive, creative, letters) | x | x | x | x | x | x | x | x | x | x |
| speaking and listening | x | x | x | x | x | x | x | x | x | x |
| reading and literature | x | x | | | | | | | | x |
| communication/presenting ideas | x | x | x | x | x | x | x | x | x | x |
| **SOCIAL STUDIES** | | | | | | | | | | |
| map skills | | | | | | | | | | |
| collecting/recording/categorizing data | | x | | x | x | x | | x | x | |
| comparing and contrasting | | x | | | | | x | | | |
| inferences/generalizations | | | | | | | | | | |
| social/human problems & decisionmaking | | | | | | | | x | x | |
| **RELATED ARTS** | | | | | | | | | | |
| the arts (art, music, drama) | x | x | x | x | | x | | x | x | x |
| health | | | | | | | | | | |
| computer | | | | | | | | | | |

# CORRELATION—CHAPTER 5

| | | It's Too Salty!; p. 5-1 | Salty or Fresh; p. 5-5 | What is a Wetland?; p. 5-11 | Exploring Wetlands; p.5-15 | Spongy Wetlands; p. 5-19 | Who Needs Wetlands?; p. 5-23 | Cranberry Bogs; p. 5-27 | Down By The Sea; p. 5-31 | Wetlands, Sweet . . .; p. 5-37 | A B C's of the Wetlands; p. 5-51 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | | | | x | x | | x | x | |
| use measurements | | | | | | x | x | | x | x | |
| make estimates and approximations | | | | | | | | | | | |
| formulate and solve problems | | | | | | | | | | | |
| probability and statistics | | | | | | | | | | | |
| charts and graphs | | | | | | | | | x | | |
| **SCIENCE** | | | | | | | | | | | |
| problem formulation | | | | | | | | | | | |
| formulation of hypothesis | | x | x | | | x | | | | | x |
| gather information | | x | x | x | x | x | x | x | x | x | x |
| organize and analyze information | | | x | x | x | x | x | | x | x | x |
| interpret data | | | | | | | | | | | |
| draw conclusions | | | x | x | | | x | x | x | | |
| observation and experimentation (experiment, demonstration) | | | | | x | x | x | x | x | | |
| **LANGUAGE ARTS** | | | | | | | | | | | |
| language (acquiring and using) | | x | x | x | x | x | x | x | x | x | x |
| writing (mechanical, persuasive, creative, letters) | | x | x | x | x | x | x | x | x | x | x |
| speaking and listening | | x | x | x | x | x | x | x | x | x | x |
| reading and literature | | | | | | | | | | | |
| communication/presenting ideas | | x | x | x | x | x | x | x | x | x | x |
| **SOCIAL STUDIES** | | | | | | | | | | | |
| map skills | | x | | | | | | x | | | |
| collecting/recording/categorizing data | | x | x | x | x | x | x | x | x | x | x |
| comparing and contrasting | | x | | | | | x | | x | x | |
| inferences/generalizations | | | | | | x | | | x | | |
| social/human problems & decisionmaking | | x | | | | | | | x | | |
| **RELATED ARTS** | | | | | | | | | | | |
| the arts (art, music, drama) | | x | | | | x | x | | | x | x |
| health | | | | | | | | | | | |
| computer | | | | | | | | | | | |

# CORRELATION—CHAPTER 5

| | "Bay" Watch: By . . .; p. 5-55 | Marie Debris; p. 5-65 | Oceans and Ponds; p. 5-71 | How Dry I Am, . . .; p. 5-79 | Get the Oil Out!; p. 5-83 | Sifting Through . . .; p. 5-85 |
|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | |
| basic computation (addition, subtraction, multiplication, and division) | | | | | | |
| use measurements | | | | | | X |
| make estimates and approximations | | | | | | X |
| formulate and solve problems | | | | | | |
| probability and statistics | | | | | | |
| charts and graphs | | | | | | |
| **SCIENCE** | | | | | | |
| problem formulation | | | | | | |
| formulation of hypothesis | X | | | | X | X |
| gather information | X | X | X | X | X | X |
| organize and analyze information | X | | X | X | X | X |
| interpret data | | | | | | |
| draw conclusions | X | | X | X | X | X |
| observation and experimentation (experiment, demonstration) | | | | | | |
| **LANGUAGE ARTS** | | | | | | |
| language (acquiring and using) | X | X | X | X | X | X |
| writing (mechanical, persuasive, creative, letters) | X | X | X | X | X | X |
| speaking and listening | X | X | X | X | X | X |
| reading and literature | | | | | | |
| communication/presenting ideas | X | X | X | X | X | X |
| **SOCIAL STUDIES** | | | | | | |
| map skills | X | | | | | |
| collecting/recording/categorizing data | X | | | | | X |
| comparing and contrasting | X | X | X | | | X |
| inferences/generalizations | X | | | | | |
| social/human problems & decisionmaking | X | | | | | X |
| **RELATED ARTS** | | | | | | |
| the arts (art, music, drama) | X | X | X | X | | X |
| health | | | | | | |
| computer | | | | | | |



THE WATER SOURCEBOOK

# INTRODUCTION TO WATER

# WATER, NOW AND THEN

K-2

## OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, ways people have depended on water during different periods of history.

**SUBJECTS:**
History, Art

**TIME:**
1 hour or two 30-minute periods

**MATERIALS:**
butcher paper
crayons
scissors
tape
4 pieces of white poster board

## BACKGROUND INFORMATION

Throughout history people have depended on water. More than two hundred years ago many people came to America to start new lives. They had to cross the ocean to get here. The trip took many weeks. They had to bring fresh water in barrels for drinking and washing while they were on the ship.

During the next 150 years, many of the new settlers moved farther and farther across America to find new places to live. When selecting a place to settle, one of the main considerations was a fresh water supply. Most of them chose land near rivers, lakes, and springs. They needed the water for drinking, growing crops, raising farm animals, washing, and cooking.

By 1900, in addition to using water for drinking, washing, and cooking, people also began using water to manufacture products. During this period of history, factories were built and many machines were invented. Water was used to make steel and paper; it was used to create steam and to cool products.

Today we use water in many ways. In our homes, we use water for drinking, cleaning, cooking, and flushing. Irrigating farms, golf courses, and our lawns requires a tremendous amount of water. Industries use water to manufacture metal, glass, and wood products. They use water in canned foods, soft drinks, and many other products. Water is used to produce electric power. We enjoy the beauty of nature's rivers, lakes, and oceans. We use the bodies of water for swimming, boating, and fishing. Water is also used by firefighters to save lives and property.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Share background information.

II. Activities

A. Divide the class into groups with 3 or 4 children in a group.

B. Give group assignments.

1. Each group will make a life size character by tracing around the body of one group member on butcher paper. Each group will research a different time period (1700's; 1800's; early 1900's and today) and use crayons to draw appropriate time period clothing on their character.

2. The other four (4) groups will also research the same time periods (see above) and design a poster showing the ways water was used during that time period.

C. Tape each character to the wall with the corresponding poster.

III. Follow-Up

A. Decorate invitations. Send them to other classes inviting the students to visit the display.

IV. Extension

A. Give each character (from above activity) a water related name.

Examples: Silas Stillwater
Walter Waverly
Sam Springer
Rhonda Rivers
Carol Creekmore
Whitney Wells, etc.

B. Produce a play depicting different time periods in history and the importance and uses of water in that time period.

## RESOURCE

World Book Encyclopedia, 1988, Vol 21, p. 116-118.

# EXTRA EXTRA, READ ALL ABOUT IT

K-2

## OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. Identify orally facts about water learned from this lesson.

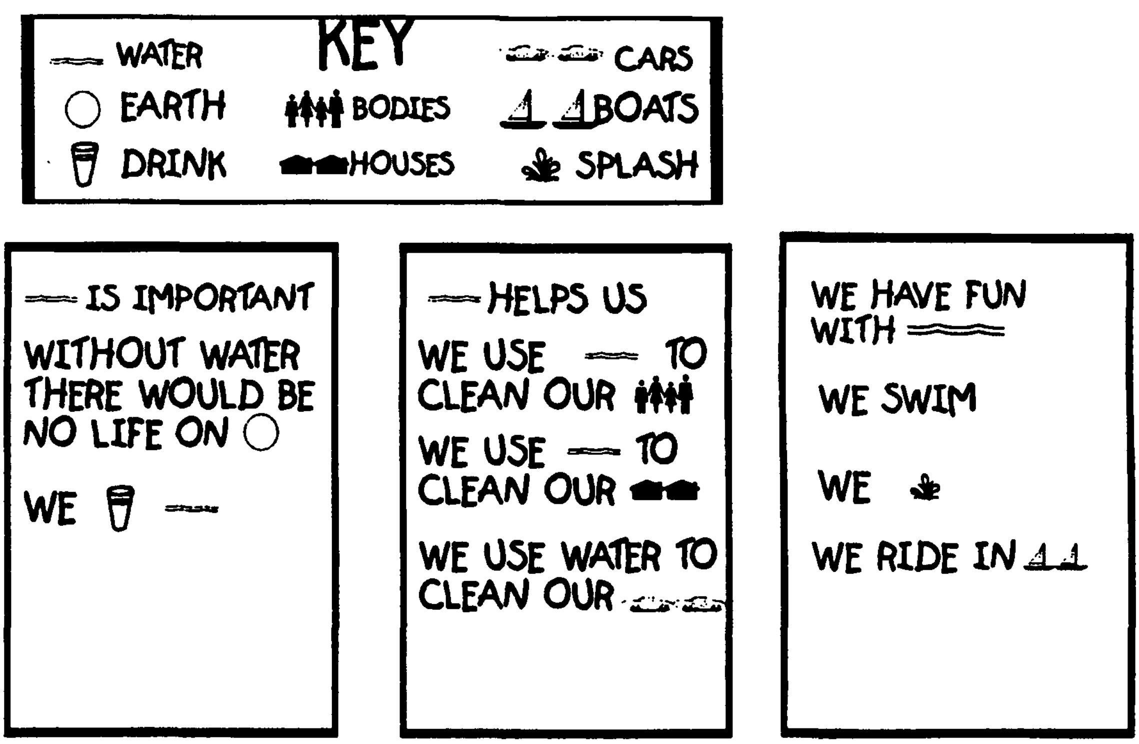
## BACKGROUND INFORMATION

Display background information on four sheets of chart paper as shown below:

**SUBJECTS:**
Language, Art

**TIME:**
30 minutes per day

**MATERIALS:**
single sheet of newspaper and 4 sheets of plain paper for each child for journals
markers
sponges, cut in the shape of water drops
blue paint
4 pieces of lined chart paper



## ADVANCE PREPARATION

A. Make Information Charts.

B. Gather materials.

## PROCEDURE

I. Setting the stage

A. Explain the key.

B. Read the Information Charts to the students, allowing them to say the "picture words."

II. Activities (This can be done individually or as a whole group activity creating a class book.)

A. Have the students cut and fold a piece of newspaper, creating a "book cover." Suggested size is 9" x 11" or larger.

B. On the (newspaper) front cover write a water related title such as:

"THE DRIP DROP JOURNAL"
"THE WATER BOOK"
"THE $H_2O$ BOOK"

C. Laminate the book covers (optional).

D. Over a period of several days, let the students add pages to their journals.

1. Give each student a piece of paper and let him/her write, "WATER IS WONDERFUL" (or some other water related phrase) in large letters. Let him/her sponge paint water drops around the words. This will be the first page of their water journal.

2. Write (or dictate) an original poem about water.

3. Glue water related newspaper or magazine articles to pages.

4. Draw or paint pictures about water.

III. Follow-Up

A. Let each child have an opportunity (over a period of days) to share one or more pages from his/her journal with the class. Discuss the information shared and add water facts to the "water chart," using pictures when appropriate.

B. Review the water chart facts each day.

## RESOURCE

Water, World Book Encyclopedia, 1988, Vol 21, p. 116-118.

Original Activity by Beth Corum, Lauderdale County Schools.

# WATER IS VERY SPECIAL

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Write or tell ways people use water for cleaning;
2. Write or tell ways people use water for eating or drinking; and
3. Write or tell ways people use water to have fun.

**SUBJECTS:**
Science, Art

**TIME:**
20-30 minutes

**MATERIALS:**
2 oz uncooked spaghetti
1 box macaroni and cheese
1 box jello
1 pack Kool-Aid
butcher paper
plate
glass

## BACKGROUND INFORMATION

Water is very important to all living things. Without water all plants, animals, and people would die. We use water for drinking and for preparing food. We use water for cleaning our bodies, our homes, our pets, and our cars. We use water to have fun when we go swimming and boating. Water is used EVERY DAY.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Sit on the floor with the children in a large semi-circle around the teacher. Show them a plate on which uncooked spaghetti noodles, dry jello powder, and macaroni noodles sprinkled with powdered cheese have been placed. In a clear drinking glass, empty a pack of Kool-Aid powder.

B. Point to the spaghetti and ask, "What is this?" (spaghetti). "Would you like to eat it?" "What does the spaghetti need to make it taste good?" (to be cooked).

C. Point to each of the other food items and ask the same questions.

D. On a dry erase or chalkboard, write:

**Spaghetti    Jello    Macaroni and Cheese    Kool-Aid**

E. Ask, "How does a person cook spaghetti?" After someone answers, write the word "water" under the word "spaghetti" on the board. "How does a person cook macaroni?" Write "water" under "macaroni." Ask the same question about jello and Kool-Aid and write "water" under each word on the board.

| Spaghetti | Jello | Macaroni and Cheese | Kool-Aid |
|---|---|---|---|
| water | water | water | water |

F. "Look at the board. What do you notice?" (We use water to prepare all four of the food items). "Is water important when we are preparing food?" "Is water important at other times?" Discuss.

G. Read the poem written by Beth Corum:

**WATER IS VERY SPECIAL**

Water is in drippy drops,
Water is in soapy mops,
WATER IS VERY SPECIAL.

Water fills swimming pools,
Water fills fishes schools,
WATER IS VERY SPECIAL.

Water makes spaghetti floppy,
Water makes puddles sloppy,
WATER IS VERY SPECIAL.

Water keeps us all alive,
It's necessary to survive,
WATER IS VERY SPECIAL.

Read the poem a second time. Have the children say together "Water is very special."

II. Activity

A. Write the poem in a single line across the top of a long piece of butcher paper. Let the children work in groups to create a mural which illustrates each line to the poem. (Under the words).

III. Follow-Up

A. As each child completes his portion of the mural, he should join the teacher and answer these questions:

"What is one way we use water for eating or drinking?"
"What is one way we use water for cleaning?"
"What is one way we use water to have fun?"

B. Graph the results by letting the child paint or color sections which represent his/her answers.

IV. Extension

A. Have the children sit at their tables with paint brushes and art paper. Pour some dry tempera paint onto a paper plate in the middle of the table (or give them individual paint sets). Tell them to paint a picture. Someone will point out that they need water in order to paint. Discuss. Add water. Paint pictures.

B. Have children keep track of how water is used to prepare their dinner. Could be done for one night or a week.

## RESOURCE

Water, World Book Encyclopedia, 1988, Vol 21, p. 116-118.

Original activity by Beth Corum, Lauderdale County Schools.

# BEING A HYDROLOGIST

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Tell the different ways water is used at school and at home; and

2. Give a verbal definition of the new terms hydrologist and hydrology.

**SUBJECTS:**
Science, Social Studies, Math

**TIME:**
30 minutes over 2 days

**MATERIALS:**
clipboards or hard writing surface for half of the students
pencils
3 pieces of 12" x 24" paper
marker

## BACKGROUND INFORMATION

Water is absolutely essential for life as we know it.
All living things require water for survival. Water is one of our most precious resources and, because of its importance in our lives, we must learn to respect water for what it is. Therefore, the practice of water conservation is an important concept to teach young children. The first step in teaching young children how to conserve water is helping them become aware of where water is used and how much water is used in daily living.

This lesson will help children become aware of the many different ways we use water in our daily lives. Water is used for food production, power generation, transportation, recreation, heating, cooling, fire fighting, cooking, and bathing. At school and at home, water is used both indoors and outdoors. Cleaning, cooking, drinking, and toilet water account for most of the water used indoors. Outdoors we use water for watering lawns and gardens, and washing cars. Much more water is used at school than in the home because of the size of the location and the number of people in the school, but water can be conserved in both places.

Have each child play the role of a hydrologist. Hydrology has become an important science because of the need to understand our water system on earth and its usefulness in helping to solve our water problems before we feel the effects of a water shortage. Therefore, children can become familiar with the role of the hydrologist and how he/she finds solutions to our water problems.

<u>Terms</u>

**hydrologist**: a person that applies scientific knowledge and mathematical principles to solve water-related problems in society such as problems of quantity, quality, and availability.

**hydrology**: the study of water, its properties, distribution on Earth, and effects on the Earth's environment.

## ADVANCE PREPARATION

A. On three separate sheets of 12" x 24" paper, draw a large waterdrop and label as follows: **Waterdrop #1 - What we know about how we use water; Waterdrop #2 - What we would like to know about how we use water;** and **Waterdrop #3 - What we learned about how we use water.** Place them in a convenient location for writing.

B. Place paper on enough clipboards or hard writing surfaces with **List #1 WAYS WE USE WATER AT SCHOOL** and pencils for half the students. Divide the class into pairs.

C. Copy **List #2 - WAYS I USE WATER AT HOME** and **Letter to Parents** for all students. Staple together.

## PROCEDURE

I. Setting the stage

A. Place the pictures of the waterdrops in a location convenient for adding information dictated by the students.

B. Begin by asking students where they use water at school and writing down what they say on Waterdrop #1. Ask the students where they use water at home and write down what they say on Waterdrop #2. Compare the school list to the home list. Then ask students if there is anything they would like to know about how we use water. Write what they say on Waterdrop #3.

II. Activity

A. Pair students into groups giving each group a clipboard with a copy of List #1 WAYS WE USE WATER AT SCHOOL and a pencil for recording. Begin by explaining to students that they are all going to be hydrologists. Explain what hydrologists do and what hydrology is. Tour the school recording all the ways water is used at school. Return to the classroom and discuss and add any new ways that were discovered and add to Waterdrop #1.

B. Give each student a copy of List #2 - WAYS I USE WATER AT HOME attached to a copy of the Letter to Parents. Explain to the students that they are to complete the list at home in the same manner they completed the list at school. The list is to be returned on the day specified.

III. Follow-Up

A. On the day the students return List #2, discuss the different ways the students used water at home and add any new information to Waterdrop #1. At this time discuss whether any of the things they would like to know on Waterdrop #2 could be answered.

IV. Extensions

A. Have students draw pictures of the different ways water is used to raise animals, produce a garden, and cook a meal.

B. Have students keep a list of the different ways they use water from the time they get up in the morning until the time they go to bed. Have students discuss how life would be different if they did not have water to do these things.

## RESOURCES

Carroll, Jack. Water Conservation Checklist for the Home. Mississippi Cooperative Extension Service, Mississippi State University MS. 1989.

Owen, Oliver S. Natural Resource Conservation: An Ecological Approach. Macmillan Publishing Co., New York, 1985.

**Hydrologist________________**

# List #1-WAYS WE USE WATER AT SCHOOL

| | Tally how many | How many in all? |
|---|---|---|
| drinking fountains | | |
| toilets | | |
| sinks | | |
| dishwashers | | |
| ice cube makers | | |
| water heaters | | |
| washing machines | | |
| sprinkler system | | |
| outside fountains | | |
| outside water faucets | | |
| others | | |
| | | |
| | | |

**Hydrologist________________**

# List #2-WAYS I USE WATER AT HOME

| | Tally how many | How many in all? |
|---|---|---|
| sinks | | |
| toilets | | |
| bathtubs/showers | | |
| water heaters | | |
| dishwashers | | |
| ice cube makers | | |
| washing machines | | |
| steam iron | | |
| humidifiers | | |
| outside water faucets | | |
| pools | | |
| others | | |
| | | |
| | | |
| | | |
| | | |

Dear Parent,

We are studying the different ways in which we use water both at school and at home. Your child will be completing a checklist of the different ways he/she uses water around the home. Please assist your child in completing the attached form and help him/her to discover any other ways that may not be listed by adding them to the list. In order for us to complete our study your child must return the list by
Thank you for your assistance in our study of water conservation.

Sincerely,

# DRINK IT UP!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Illustrate that the human body needs a lot of water by graphing water consumption for a day;
2. Describe orally how the human body gets water;
3. Tell why the weight of an apple decreases over a period of time; and
4. Give an oral or written definition of dissolve.

**SUBJECTS:**
Science, Math, Health, Music

**TIME:**
30 minutes
Extension activity extends through a school day
Follow-up activity extends over several days

**MATERIALS:**
clear cup
Kool-Aid
container of water
4-6 apples, depending on number of children in class
2 pint jars
1 quart jar
1 clear pitcher
disposable 8 oz cup for each child
measuring cup
balance scale
unifix cubes or bear counters for weights

## BACKGROUND INFORMATION

Water is very important to us. All living things must have water to stay alive and healthy. We must take care of our bodies and give them plenty of water. The body gets its water from things that we eat and drink. The human body needs eight glasses of water a day. Seventy percent of a child's body is water.

Term

**dissolve:** to make a solution of, as by mixing with a liquid; blend with a liquid.

## ADVANCE PREPARATION

A. Gather materials.

B. Label a cup for each child with his/her name.

C. Cut the apples into fourths.

## PROCEDURE

I. Setting the stage

A. Have a clear 8 oz. cup of water in your hand and seven more 8 oz. cups in front of you.

B. Sing the song:

**CUP OF WATER**
(Original tune: I'm a Little Teapot)

Here's a cup of water
Clean and pure.
It is very good for me
I am sure.
Eight cups a day, feeds and cleans you up
So tip your cup and
Drink it up!

C. Drink the water in the clear cup at the end of the song.

D. Explain the background information to the students.

E. Tell the students that the following activity is going to show them that water is inside their bodies and that it gets there by eating and drinking.

II. Activities

A. With the students in a group, let them help prepare a clear pitcher of Kool-Aid. The students can pour cups of water into pint and quart containers according to the recipe on the Kool-Aid package. Ask the students how many cups make a pint? How many pints make a quart? How many cups make a quart? (Actually let them use the water to determine the answers.) Also, let the students measure the sugar.

B. Count the number of stirs it takes to dissolve the powdered Kool-Aid into the water. Explain dissolve.

C. Serve the Kool-Aid and apple wedges to the students.

D. After the snack, ask the students questions such as:

1. How much water did we use to make our Kool-Aid?

2. Where is the water now? (Inside you)

3. Did we put water in our bodies when we ate the apple?

4. How can we find out if the apple had water?

III. Follow-Up

A. Weigh an extra apple wedge on the balance scale. Place unifix cubes on opposite side of scale to balance. Let the students predict what will happen to the apple's weight, what the apple will look like, and how many cubes will be needed to equal the weight of the apple each day.

B. Let the apple dry for several days. Weigh and record the difference every few days. Discuss the results with the students. Also discuss the appearance of the apple. "Would people weigh more or less if they had no water in their bodies?"

IV. Extensions

A. To reinforce the concept of how much water a child's body needs daily, set eight disposable or non-breakable 8 oz. cups in the water play or science center for the students to fill.

B. Give each child an 8 oz. disposable cup labeled with his/her name. Have the students tally and graph, by stacking unifix cubes together, each time they drink a cup of water or liquid. At the end of the day, let the children compare the trains of unifix cubes by placing them side by side. Determine who drank more, less, or equal amounts.

## RESOURCE

Hone, Elizabeth and Geraldine Thompson, Water is Your Best Friend, California Department of Water Resources, p. 1.

# WHAT SHAPE IS WATER?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify orally a liquid and a solid;
2. Give an oral or written definition of a liquid and a solid;
3. Demonstrate, orally or in writing, the difference in liquids and solids; and
4. Give an oral or written definition of the terms: liquid, solid, vapor, and water.

**SUBJECTS:**
Science, Language Arts, Writing, Art

**TIME:**
45 minutes

**MATERIALS:**
clear plastic containers, various shapes
spaghetti
spoon
water
different liquids (3 per group)
ketchup, vinegar, milk, juice
solids (1 per group)
marshmallows, marbles, unifix cubes
tub or box (1 per group)
chart paper or blackboard
tag board for book
crayons or markers
food color
Shapes by Shel Silverstein

## BACKGROUND INFORMATION

Water is a substance that can be found in three forms: a liquid, a solid, and a vapor. Water can be found most often in its liquid form and becomes a solid when the temperature drops below freezing $32^{o}$ F or $0^{o}$ C. Water becomes a vapor when it escapes into the air. The more heat that is applied to water the faster it vaporizes. Water is in a constant cycle of changing from a liquid to a vapor because it is made up of millions of molecules that are in constant motion.

Water has no shape. In its liquid form it borrows the shape of the container it occupies. Simple experiments can help students become more aware of the properties of water as well as the importance of water in their lives.

Terms

**liquid**: a free flowing substance that borrows the shape of its container.

**solid**: a hard substance that keeps its own shape.

**vapor**: a substance in the form of a gas having no fixed shape.

**water**: a clear liquid, or gas made up of tiny molecules of two parts hydrogen and one part oxygen.

## ADVANCE PREPARATION

A. Collect all materials listed.

B. Preselect heterogeneous groups. There should be 3-5 students in each group, but can be done as a whole group activity with younger children.

C. Have the different liquids and containers divided into tubs or boxes for the number of groups.

D. Have the water droplets precut with the text written on them. List the different liquids and solids on the board or chart paper for the students to copy.

## PROCEDURE

I. Setting the stage

A. Read the poem *Shapes* by Shel Silverstein in A Light in the Attic. Discuss the poem. Discuss different shapes: square, circle, rectangle, triangle, cube, cylinder, and sphere. Discussion depends on your student' knowledge of shapes.

B. Have different objects available as examples of these shapes. Look around the room and have the students find objects in the room that are these shapes.

C. Ask students "What shape is water?"

II. Activities

A. Pour colored water and dry spaghetti into different clear plastic containers (pitchers, jars, cubes) to demonstrate the difference between a solid and a liquid. Have students pour the water and spaghetti into different containers until they decide that water takes the shape of its container and that water has no shape of its own.

B. Introduce the term "liquid." Discuss other substances that are liquids (milk,juice). In small groups let students experiment to see if all liquids have the same properties. Give each group three different shaped containers and three different liquids (milk, juice, pancake syrup, honey, cooking oil, etc.) and one solid object (marbles, marshmallows, unifix cubes). Let each group decide which items are liquid and which are solid. Have each group tell the class why the items they chose were liquid or solid.

C. Have students dictate a definition of a liquid and a solid. Record these responses on a blackboard or a large sheet of paper. After they have defined a liquid and a solid, make a permanent record of their definitions.

III. Follow-Up

A. Have students make their own big book in the shape of a raindrop to describe the different liquids they have learned. Use the text "_______________ is a liquid." "_______________ is not a liquid."
Students will fill in the blank and draw an illustration of the substance he/she is describing. Be sure to include a front cover, title page, and dedication page if more pages are needed for the book.

IV. Extension

A. Water Races. Have students save milk cartons. Put one hole with the same size nail in a side of the carton. Compare each carton and determine which one, when filled with water, will shoot the farthest stream. Tape each hole with masking tape. Fill the cartons with water. Line five cartons on a table with a tub below or outside on a step. Have students pull off their tape at the same time. Determine which stream went the farthest. Repeat with other students to determine the farthest stream. Discuss why the carton won the race. Let students make another attempt the following day. See if any student determines that water has weight and the more weight the longer the stream. Other considerations for discussion and experimentation:

1. Does the volume of water determine the pressure?

2. Does the depth of the container make a difference?

3. What size of hole is most efficient?

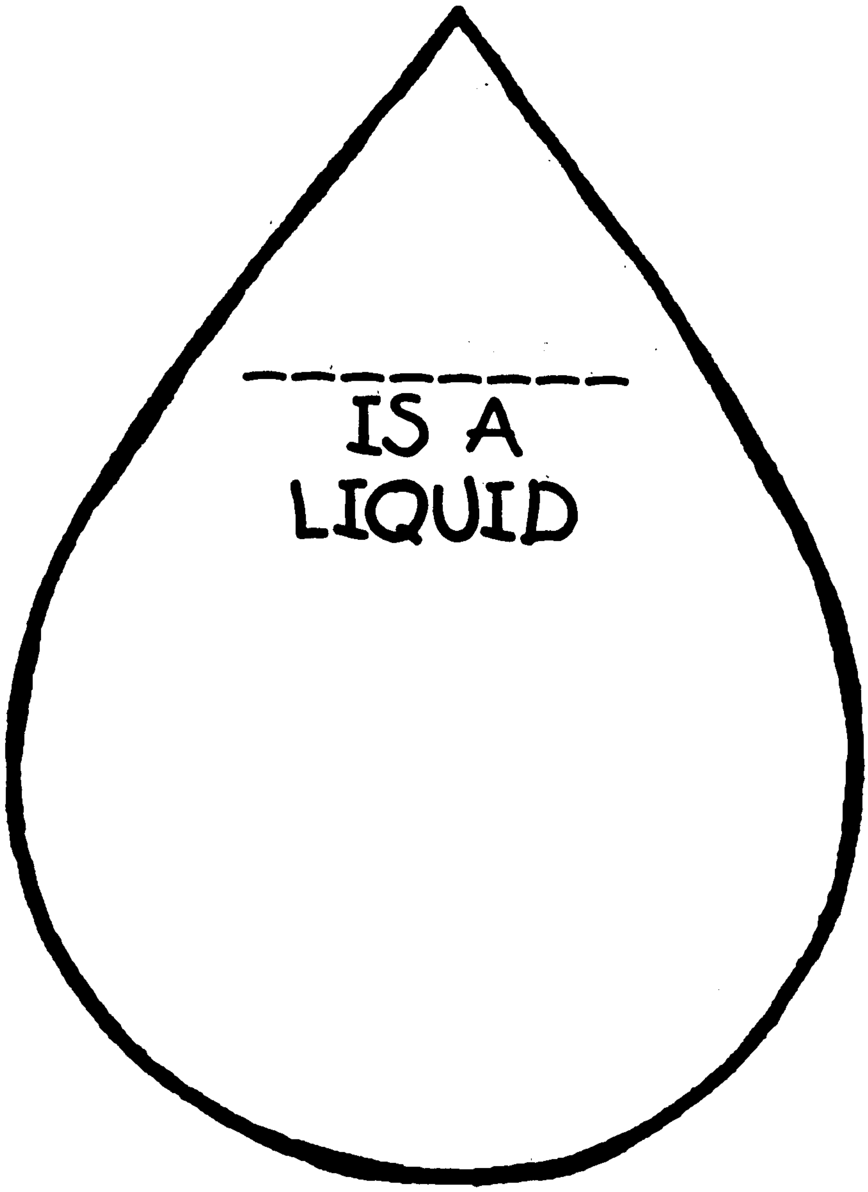
4. Where appears to be the best location for the hole and why?

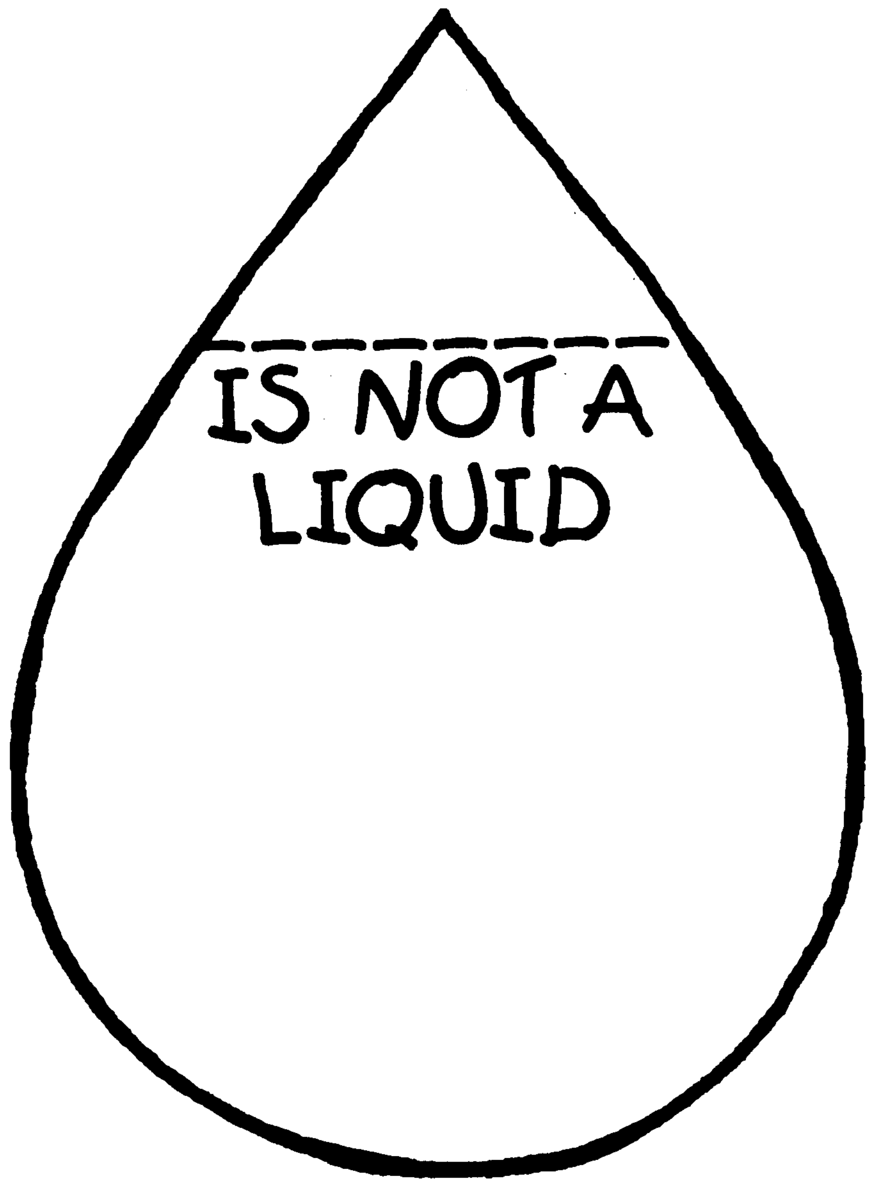
## RESOURCES

Broekel, Ray, Experiments with Water, Childrens Press, Chicago, IL, 1988.

Goldin, Augusta, The Shape of Water, Doubleday & Company, New York, 1979.

Silverstein, Shel, *Shapes*, A Light in the Attic, Harper & Row, New York, 1981.


________ IS A LIQUID


________
IS NOT A
LIQUID

# THE WATER FREEZE

K-2

**SUBJECTS:**
Science, Math, Music, Art

**TIME:**
45 minutes on 2 different days

**MATERIALS:**
*The Freeze* by Greg and Steve on the album Musical Moves or fast beat music
poster board or tag board
ice cube in dish
ice cube poster
small clear cup with water
ice cube predictors (included)
freezer thermometer
egg timer
science chart (included)
large freezer bags, tray
salt, sugar, sand, sawdust, charcoal
large tub
block of ice in bucket
red, yellow, blue food coloring or tempera paint
small zip-loc bags

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Predict, orally or by writing, the time it takes for water to freeze and sequence the predictions;

2. Predict, orally or by writing, whether water expands upon freezing and develop a classroom hypothesis;

3. Form water creations and develop their own experiments with their creations; and

4. Give an oral or written definition of new terms: expand, evaporate, freeze, melt, solid, and sublimate.

## BACKGROUND INFORMATION

Water freezes when its temperature falls below 32° F (0°C). When water freezes it takes the shape of the container it occupies. As a solid, the molecules in water slow down and expand. When water expands it becomes lighter and floats. The water will keep the same solid shape until it melts, the temperature rises above freezing, or it evaporates into water vapor.

Terms

**expand:** to take up more space.

**evaporate:** to change from a liquid to a vapor.

**freeze:** to harden into ice or into a solid body; to change from the liquid to the solid state by loss of heat.

**melt:** to change from a solid to a liquid usually through the process of heating.

**solid**: a hard substance that keeps its own shape.

**sublimate**: to change from a solid to a vapor.

## ADVANCE PREPARATION

A. Collect all materials listed.

B. Cut out an ice cube shape from a large piece of tag board or poster board. (See Figure 3.) Label it with "What we know," "What we would like to know," and "What we learned about frozen water" leaving space to write the students' responses.

C. For the first experiment, fill a clear plastic cup with water and mark the level of the water with tape or a permanent marker. Copy and cut out the ice cube predictors (see Figure 1) and choose a place to sequence the students' predictions. Copy "The Water Freeze Log"(see Figure 2) for each student to record the times and temperatures or have one classroom log.

D. Make a generic science chart. You may use this for other activities with predictions. (See diagram). For younger students it is good to give them only two choices (Yes, the ice will expand; No, the ice will not expand.) Allow first graders three choices (the ice will expand, the ice will shrink, and there will be no change). For second grade, use three and allow them to make up a fourth choice. This poster may be laminated for changing the hypothesis and choices to fit different experiments.

E. Freeze a block of ice a day before using. Mix the materials for the ice caves. (See IV. Extension.)

## PROCEDURE

I. Setting the stage

A. Play the song *The Freeze* by Greg and Steve on the album Musical Moves or play fast beat music and instruct the students to move with the beat of the music. When the music stops they must stop moving. Instruct them to "freeze" and not move a muscle. Play the game several times using the word "freeze."

B. Students may want to express how they felt during their "freeze." Have them explain some of their experiences in playing the game.

C. Discuss ice with the students while they examine an ice cube. Write on chart paper or on poster board shaped like an ice cube "What we know about frozen water," "What we'd like to know about frozen water," and "What we learned about frozen water." List things the students discuss and place them under the appropriate title leaving the last title blank until the end of the lesson.

II. Activities

A. Pour water into a small clear plastic cup until it is half full and take the temperature of the water marking the level with a permanent marker.

B. Have the students predict how long it will take the water to freeze. Let them write their predictions on an ice cube predictor. Anything they predict from minutes to days to years is acceptable. (No names on the predictors eliminates any competition or blame and helps students realize estimating, even if wrong, is okay.) Help students sequence their predictions from the shortest time to the longest time placing them in a convenient area for later referral.

C. Put a thermometer in a cup of water and place both in a freezer. Using an egg timer, check the cup every 15 minutes keeping a log of the time and temperature. When a thin layer of ice forms on the top of the water, discuss how long it took and the temperature at freezing. (It will take approximately 45 minutes to one hour for the water to begin to freeze.) Discuss which guesses were more and less than the time of actual freezing.

D. Place the cup back in the freezer and continue to freeze completely to note the final level of the ice. On your generic science chart, have the students predict if they think one level of the water will change. On one side write "Yes" and on the other side write "No." Develop a statement or hypothesis using the students' predictions. (Yes, the level of the water will change when all of the water is frozen.) Check the level of the water at the end of the day and discuss the results.

E. Discuss what was learned and record on the ice cube chart "What we learned about frozen water."

III. Follow-Up

A. Have students choose non-glass containers in the room. Tell some students to fill their containers completely, placing lids on them, and tell others to partially fill their containers. Place the water-filled containers in the freezer in plastic bags or on a tray to catch any overflow and leave them overnight.

B. The next day, remove the containers from the freezer and observe them. Discuss what happened to the water in the various containers. Note how some water overflowed as it froze. Create a class definition of the word "expand."

C. Have students create their own experiments with their new creation.

1. Some students may want to determine their creation's melting time.

2. Take some creations from the containers to show that the solid ice has taken the shape of the container and place them in a bigger container to show that the solid can keep its shape.

3. If any creations are similar in size, break up one and leave the other one whole to determine which melts faster.

4. Place salt, sugar, sand, sawdust, or charcoal on different creations to observe the effects on the ice.

IV. Extension

A. Ice Caves.

1. Freeze a large block of ice in a bucket or other large container. Remove the ice from its container and place in a bigger tub.

2. Mix the following ingredients in a small zip-loc bag:

   1/4 cup warm water
   food coloring or powdered tempera paint
   1/2 cup salt (ice cream salt works best)

3. Make three bags using the primary colors and seal the bags closed. Cut a small hole in one of the bottom corners of the bag. Pour water over the block of ice to make it slick.

4. Allow students to squirt small amounts of the mixture onto the block of ice. Watch how the ice develops small colorful caves. Discuss the different colors the primary colors made in the ice.

5. Rinse with a cup of water to start the procedure over.

6. Discuss why salt is used to melt ice on roads in the winter.

## RESOURCES

Arnold, Caroline, Bodies of Water, Franklin Watts, New York, NY, 1985.

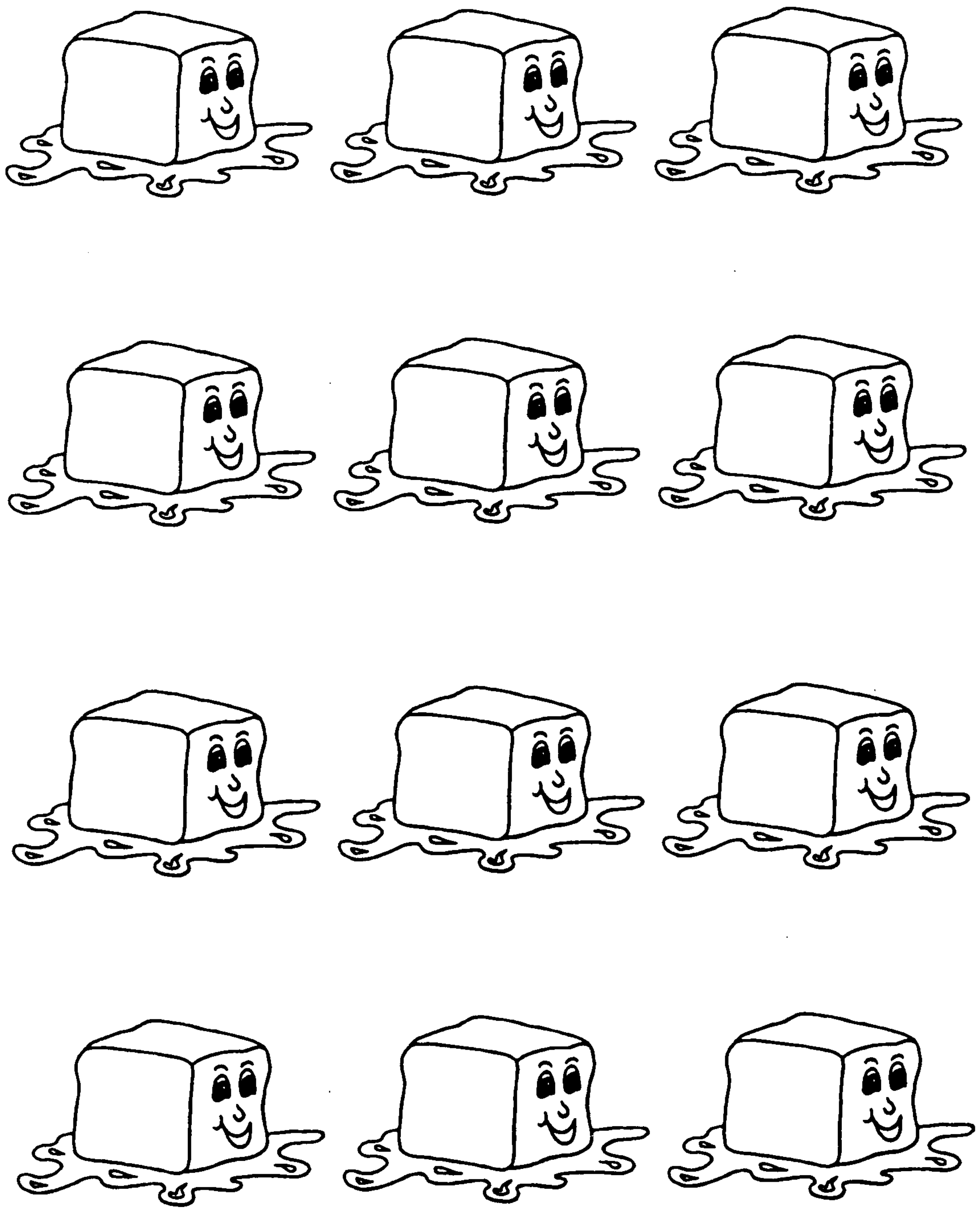
Broekel, Ray, Experiments With Water, Childrens Press, Chicago, IL, 1988.

Goldin, Augusta, The Shape of Water, Doubleday & Company, New York, NY, 1979.

Nichols, Wendy and Kim Nichols, Wonder Science, Learning Expo Publishing, Los Altos, CA, 1990.

# Figure 1

# ICE CUBE PREDICTORS



# The Water Freeze Log

Time started:_______ Temperature:_______________

| | | | | |
|---|---|---|---|---|
| Time | | | | |
| Temp. | | | | |

Name: ________________________________________

Figure 2

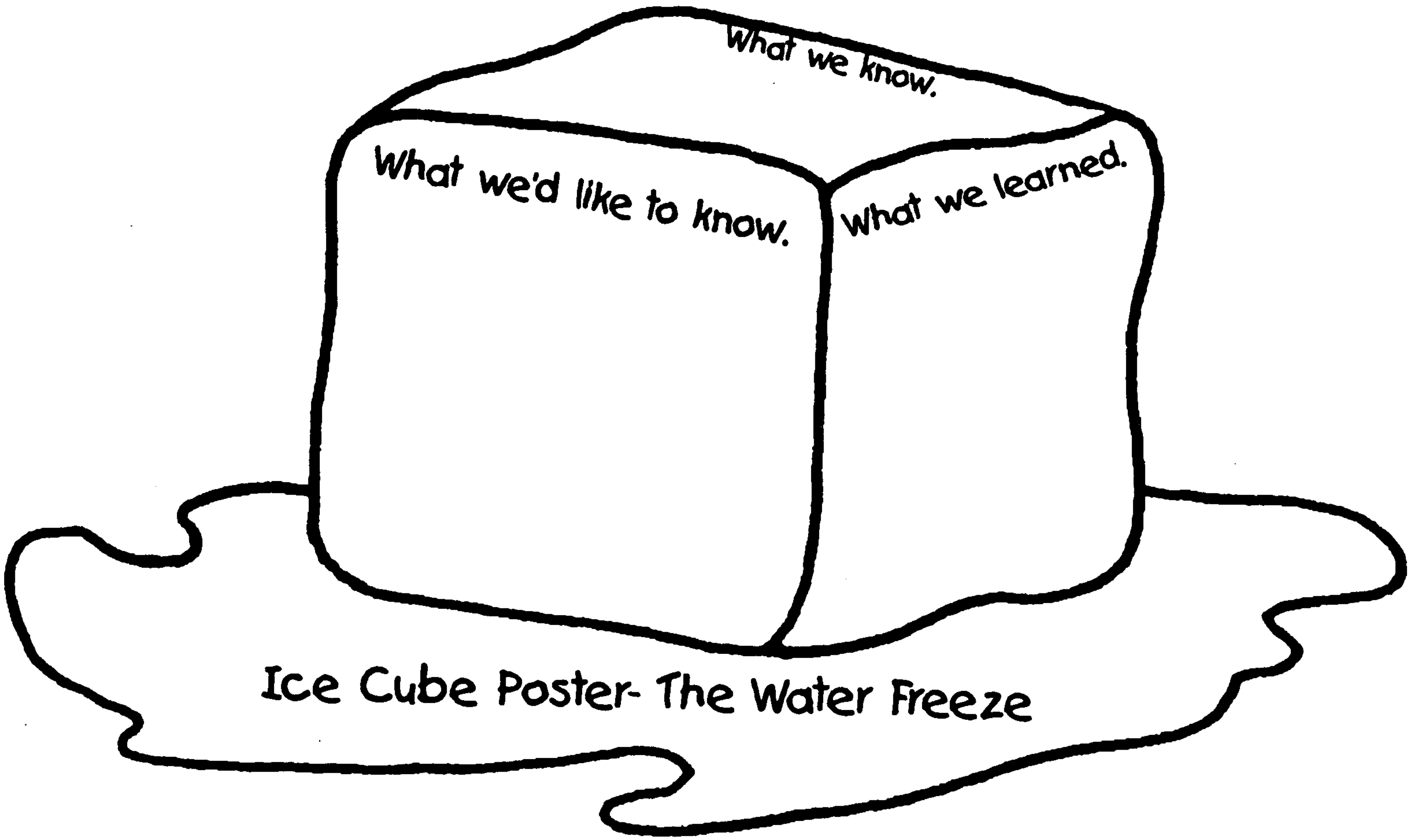

What we know.
What we'd like to know.
What we learned.
Ice Cube Poster- The Water Freeze

Figure 3

# LET'S WEIGH SNOW

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Demonstrate or tell how to measure and weigh snow;

2. Demonstrate or explain that snow is a solid form of water; and

3. Give an oral or written definition of precipitation.

**SUBJECTS:**
Science, Math, Art, Language Arts

**TIME:**
45 minutes

**MATERIALS:**
measuring cups
balance scales
teddy bear counters or substitute counters
stopwatch/timer/clock
recording sheet
snow or crushed ice (1 cup for each child)
The Snowy Day by Ezra Jack Keats
winter hats (assortment)

## BACKGROUND INFORMATION

Snow crystals are formed when water freezes inside the clouds. When these crystals join together, snowflakes are formed. When the flakes become heavy enough they will fall.

Term

**precipitation:** forms of condensed water vapor that are heavy enough to fall to Earth (rain, sleet, snow).

## ADVANCE PREPARATION

A. Collect materials.

Note: If snow is not available, use crushed ice.

## PROCEDURE

I. Setting the stage

A. Introduce this lesson with a bag filled with hats that would be appropriate to wear in snowy weather. Read The Snowy Day by Ezra Jack Keats. Discuss what happened to Peter's Snowball when he came indoors. Discuss solid and liquid forms of water in this story.

B. Sing the song:

**WINTER WEATHER**
(Tune: Are You Sleeping?)

Winter weather, winter weather
See it snow.
See it snow.

The flakes come down and cover the ground.
They fall from the sky without making a sound.
We love snow.
We love snow.

II. Activities

A. Collect one cup of snow and bring indoors. Use shaved ice if snow is unavailable.

B. Set timer and follow directions given on student activity sheet (included).

III. Follow-Up

A. Watch the video The Snowman.

1. Take the pictorial version of The Snowman and create text to go with the pictures. Record the text and paper clip to the original book. Put the book in the listening library.

B. Make Snowflake Snowmen.

1. To make snow mix 1 cup of water and 2 cups of Ivory soap flakes. Add more water if needed. Mold the mixture into 3 balls for each child. Have the students roll and stack their balls onto a piece of cardboard. Create a face on the snowman. Let it dry for a couple of days.

IV. Extensions

A. Marshmallow Snowman. Give each child two marshmallows. Secure together with toothpicks. Make a face and buttons with minature chocolate chips. Push tiny twigs or toothpicks in to make arms. Tie a scarf, handmade out of scrap fabric, onto the snowman. Snowman will "melt" in your mouth.

B. Snow Creme. Put one cup of clean snow in a bowl. Pour 1/2 cup of Eagle brand milk over snow. Serve a little snow creme to each student.

## RESOURCES

Briggs, Raymond, The Snowman, (book and video), Clarion.

Burton, Virginia Lee, Katy and the Big Snow, Houghton Mifflin.

Crowell, Branley Franklyn, Snow is Falling, 1986.

Gibbons, Gail, Weather Words and What They Mean, Holiday, 1990.

Keats, Ezra Jack, The Snowy Day, Viking, 1962.

Shecter, Ben, When Will the Snow Trees Grow?, Harper Collins, 1993.

Name:____________________

1. My snow weighs the same as _____ teddy bear counters.

Draw a picture of the collected snow.

2. It took _____ minutes and _____ seconds for the snow to melt.

Draw a picture of the melted snow.

3. One cup of snow equals _____ cups of water.

4. How did it change?

5. Is snow a liquid, solid, or gas?

Weigh the snow (water) after it melts. Before weighing, predict whether it would weigh the same, more, or less than the collected snow.

# NOW YOU SEE IT, NOW YOU DON'T

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. List, orally or by writing, substances which dissolve in water;

2. Classify, orally or by writing, substances into categories "will dissolve" and "will not dissolve" in water; and

3. Give an oral or written definition of dissolve and liquid.

**SUBJECT:**
Science

**TIME:**
30 minutes

**MATERIALS:**
styrofoam egg carton
clear plastic cups
muffin pan or ice cube tray filled 3/4 full of water for each child
craft sticks or plastic spoons for each child
newspapers to cover tables
dry materials: salt, sugar, sand, fine gravel, corn meal, flour, seeds
cooking oil
jar with lid
Kool-Aid
sugar
spoon
pitcher
measuring cup
cup for each child
container of water
chart paper

## BACKGROUND INFORMATION

Water is a liquid. There are substances that will blend or mix into water, and there are substances that will not mix or blend into water. A solution forms when one substance dissolves in another substance. When a substance dissolves, it breaks down into molecules. These molecules mix with the molecules of the other substance. A mixture in which particles of a substance are scattered in another substance but not dissolved is called a suspension. An oil-and-vinegar dressing is a suspension. Orange juice that has not been strained is another type of suspension.

Two hydrogen atoms join with an oxygen atom to form a new substance, water. A mixture is made of materials that are mixed, not joined chemically. You use many mixtures every day.

Terms

**dissolve:** to make a solution of, as by mixing with a liquid; blend with a liquid.

**liquid:** a free flowing substance that borrows the shape of its container.

## ADVANCE PREPARATION

A. Cut lids off of the styrofoam egg cartons.

B. Fill egg cartons or similar container sections 3/4 full of water.

C. Put newspaper on tables.

D. Add dry ingredients to containers (4 containers for each material). Place on tables.

## PROCEDURE

I. Setting the stage

A. In a whole group have students watch as you make a pitcher of Kool-Aid. Name the ingredients as you add them. Give each child a cup of Kool-Aid. Ask the children questions such as: "Where is the sugar?" "Where is the powdered Kool-Aid?" "Can you feel them?" "Can you see them?" "Is it still there?" "Can you taste them?" Listen to answers and give correct responses as needed.

B. Explain the concept "dissolve" to the students.

C. Tell the students that they are going to add different materials to water. Ask them to predict which materials will dissolve in water.

II. Activities

A. Divide students into groups of four.

B. Tell students to put a spoonful of salt in one section of their container. Stir it with the craft stick or plastic spoon. Ask questions such as: "Can you see the salt?" "Can you feel it?" "Where is it?"

C. Have the students try all of the other dry ingredients.

D. Discuss the results.

III. Follow-Up

A. Let the containers set for a while. Recheck and discuss the results.

B. Classify items as "Dissolves in Water" and "Does Not Dissolve in Water." Record on chart paper.

IV. Extension

A. As a whole group activity, fill a clear jar half-full of water and add some oil and food coloring. Put the lid on tight and shake the container of water and oil. Discuss the results. Let the container set for a while. Recheck and discuss the results.

## RESOURCES

Cohen, Michael Dr., et al, Discover Science, Scott, Foresman and Company, Glenview, IL, 1989, p. 147-149.

Walpole, Brendan, 175 Science Experiments to Amuse and Amaze Your Friends, Random House, New York, NY, 1988, p. 40.

# HOW BUOYANT!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the effect of fresh water and salt water on the buoyancy of objects;
2. Record in writing or tell the effect of fresh water and salt water on the buoyancy of objects;
3. Compare and contrast, orally or in writing, the effect of fresh water and salt water on the buoyancy of objects; and
4. Give an oral or written definition of buoyancy.

## BACKGROUND INFORMATION

Because salt water is heavier than fresh water, objects float more readily in it. Salt water supports more weight and allows things to float more easily than fresh water.

(Note: In this experiment it will take a little more than 1 tablespoon of salt per cup of water to make the egg and carrot float. To make the potato float, it will take 1 1/2-2 tablespoons of salt per cup of water.)

Term

**buoyancy**: the ability of water to support weight and the degree to which it can support that weight.

**SUBJECTS:**
Science, Art, Music, Language Arts

**TIME:**
40 minutes

**MATERIALS:**
fresh water/salt water
recording sheet #1, 1 per child (included)
swimming figure, (sheet #2)1 swimmer per child (included)
crayons for each child
2 clear 1-1 1/2 quart wide-mouth containers
water
salt
tablespoon for measuring
teaspoon for stirring
small wood block
large marble (or stone of that size)
egg
small potato
2"-3" piece of carrot
small label with word "fresh water"
small label with word "salt water"
song "I Went for a Swim" (included)
recording sheet #3 for extension activity (optional, included)
additional sink/float objects for extension activity (optional)

## ADVANCE PREPARATION

A. Gather materials listed above.

B. Make copies of Recording Sheet #1 and swimmer (Sheet #2.)

C. Put 3-4 cups of water in each of the two clear containers. Add one tablespoon of salt to one container.

D. Make copies of Recording Sheet #3 for extension activity (included, optional).

E. Gather additional objects to test for buoyancy in extension activity (optional).

## PROCEDURE

I. Setting the stage

A. Have the students color the water on Recording Sheet #1. Color and cut out the swimmer (Sheet #2).

B. Determine experience background of students.

1. "Do you go swimming?" "Do you wear life jackets or use flotation devices?" "Can anyone float or swim without using any of these devices?"

2. "Where do you swim?" (Hopefully, someone will have been swimming in both fresh water and salt water.) "Did you notice a difference in the ease of swimming?" "The taste of the water?"

C. Explain that today we are going to see how well some things float in water.

II. Activity

A. Show the students the two clear containers with water in them. Add salt to one container. Explain that the class is going to observe what happens when various objects are placed in each container. If the object sinks, it will be put in one pile. If it floats, it will be put in another pile.

1. Drop an object in container 1 (fresh). What did it do?

2. Drop the same object in container 2 (salt). What did it do?

3. Does it go in the sink or float pile?

4. Continue the same procedure with all five objects.

B. If some students discovered that it was easier to float objects in salt water, discuss the reason for this. If not, tell the students that the next experiment will try to make the egg float by adding more salt to one of the containers of water.

1. Place the egg in container 2.

2. Add salt, one tablespoon at a time, stirring after each spoonful. Count how many spoons of salt it takes to make the egg float.

3. When the egg finally floats, explain to the class that adding more salt made the water heavier and therefore, it can support more weight.

4. Put remaining objects in the salt water, one at a time, to determine if they now float. Sort them into sink and float piles. Remind the students that the salt water is more buoyant so it can give more support to objects in the water. That is why the egg and carrot now float, but did not in the fresh water.

5. Ask students if it might be possible to make the potato float by adding more salt. Add two more tablespoons of salt to container 2. Stir well. Put the potato in the salt water. Does it float now? (It should.) Why? (Adding more salt increases the buoyancy of the potato.)

6. Add the marble or stone to container 2. What happened? (It sank.) Ask students if adding more salt might make the marble float? Add more salt and stir well. Did the marble float? (No.) Explain that some things will not float because they are too heavy for the salt water to support.

C. Put the "fresh water" label on container 1 and the "salt water" label on container 2. Test the objects in each container again as the students record the results. Explain that it is very important for a scientist to draw or record exactly what he/she sees so that others will know exactly what happened.

1. Put the egg in container 1 (fresh water). What happened? (It sank.) Demonstrate drawing an egg at the bottom of the fresh water on the recording sheet. Direct students to do the same.

2. Put the egg in container 2 (salt water). What happened? (It floated.) Demonstrate drawing an egg at the surface of the salt water. Direct students to do the same. Why did the egg float in the salt water? (The egg is more buoyant in salt water.)

3. Repeat this procedure for the remaining four objects.

D. Discuss the results of this experiment.

1. Which objects floated in fresh water?

2. Which objects floated in salt water?

3. Why did more objects float in the salt water?

4. Were there any objects that did not float in salt water? Why?

E. Explain that we have recorded the results of this experiment. Do all of our recordings have the same answers? (Yes.) Why? (We all saw the same thing and recorded the same conclusion.)

III. Follow-Up

A. Remind students of the earlier discussion about swimming. Is it easier to float in a swimming pool or the ocean? (Ocean.) Why? (Objects are more buoyant in salt water.)

1. Direct students to look at their Recording Sheet #1 and explain. Pretend the fresh water side is a swimming pool. How high would you float? Place a swimmer at the level you think he/she would float.

2. Pretend the salt water is the ocean. Place a swimmer where he/she should be. Did you place him/her slightly higher in the water? Why?

B. Sing song "I Went for a Swim" (included). Have students place swimmer on correct water at appropriate level in the water. Gently move the swimmer in a swimming motion.

1. Where else could people swim? (Accept any reasonable answer.) Is it fresh or salt water? Place swimmer in correct water and at correct level. Sing the song again.

2. Direct the students to set the papers aside and go to the circle area. Tell the students to pretend they are in a lake. Is a lake fresh water or salt water? Would people float easily or need more energy to swim? Have students act out the words to the song as you sing it again. (Sing the ocean verse as well for the students to contrast motions.)

3. Ask students where else people could swim? Sing song again inserting their words in the song.

4. Discuss the importance of water safety wherever people swim.

IV. Extensions

A. Place the salt water and fresh water containers in the science center. Let students experiment on their own. They may use the objects used in the class demonstration or use additional objects gathered by the teacher. (Caution students to wash their hands when they are finished with this activity. It is painful to rub salty water in an eye.)

B. Place Recording Sheet #3 in the science center so students can record their observations. (Students can use invented spelling to fill in the blank.)

C. New inquiries may arise:

1. Did anyone notice salt crystals left behind when water drops evaporated?

2. Did the salt water have a corrosive effect on any of the objects? Investigate rust. Place two tin cans in each tub of water to see which one rusts first or more.

3. Did the fresh water appear to become more buoyant as objects were move back and forth between the two containers? Why?

## RESOURCE

Orii, Eiji and Masako Orii, Science Experiments With Water, Gareth Stevens Children's Books, Milwaukee, 1989.

# I WENT FOR A SWIM

(Tune: My Bonnie Lies Over the Ocean)

I went for a swim in the lake.
Lake swimming is fun for me.
In the lake I float low in the water.
The lake has fresh water, you see.

Swimming takes more energy.
I float low in the water you see, you see.
Swimming takes more energy.
I float low in the water you see, you see.

I went for a swim in the ocean.
Ocean swimming is fun for me.
In the ocean I float high in water.
The ocean is salty you see.

Swimming, easily;
I float high in the water you see, you see.
Swimming, easily;
The ocean is salty you see, you see.

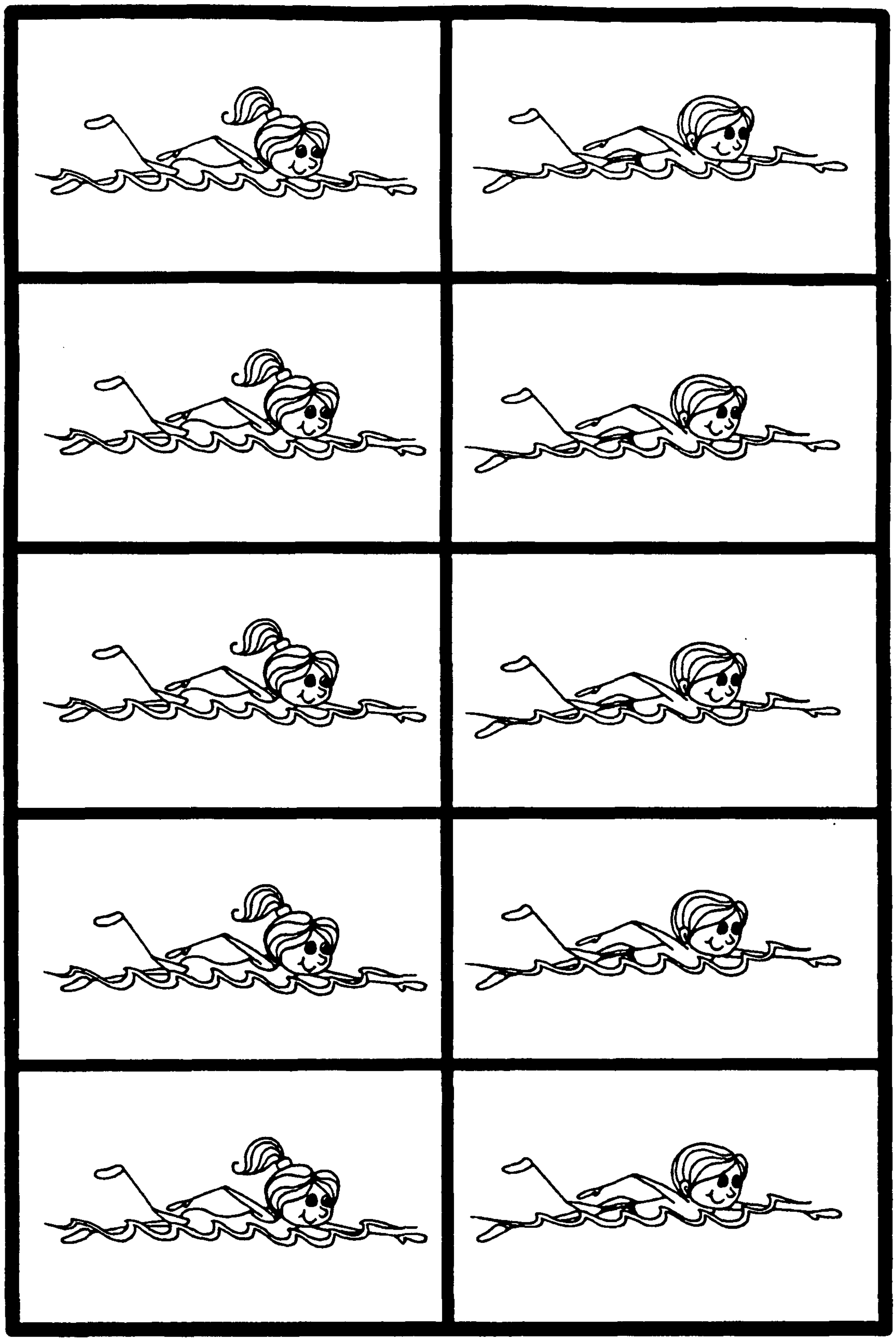
(Note: In the first verse, you can substitute the word "lake" with pool, river, pond. The word "ocean" can be substituted with other salt water bodies and still work well.)

Recording Sheet #1

A __________ IN
FRESH WATER

A __________ IN
SALT WATER

# Recording Sheet #2



Recording Sheet #3

| FRESH WATER | SALT WATER |
|---|---|

# GREAT BALLS O' WATER!

K-2

**SUBJECTS:**
Science, Math, Art, Writing

**TIME:**
1 hour

**MATERIALS:**
straws
water droppers
bowl
flour
wax paper
pepper
food coloring (red, blue, green, or yellow)
water
toothpicks
liquid detergent
Water by Brenda Walpole or similar book suitable for K-3
Great Balls O' Water record sheet (one per student)
needle

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Define, orally or in writing, the physical characteristics of water (cohesion and surface tension);
2. Demonstrate that water likes to "hold together" to form drops of water (as in rain);
3. Demonstrate the effects of liquid soap on water tension; and
4. Give an oral or written definition of the terms cohesion and surface tension.

## BACKGROUND INFORMATION

Solids have definite shapes, but liquids usually take the shape of the container that holds them. The basic property that makes the water behave as it does is often neglected. Learning about the attraction of molecules to each other (cohesion and surface tension) can help the students have a much better understanding of water. The molecules on the surfaces of water drops are so strongly attracted to each other that they will move to "hold together" and form one large drop (cohesion). If you put a few drops of water on a flat surface, they will spread out at first, but will not continue to spread until flat. The surface of the water is said to have "tension." With water in any amount larger than a drop, the cohesion pulls on the molecules on the surface. This force pulls the molecules in from the sides and down. This causes the surface of the water to form a "film" or "skin." This helps in making raindrops in the atmosphere and in the way water is able to travel through rocks and soil. However, when a raindrop falls from the sky, it flattens (doesn't stay round) because air is pushing against the drop of water as it falls. In addition, this film/skin that holds the water together is so tight that the surface of the water can even "hold up" some objects that shouldn't be able to "float" (because they are heavier than the water).

Terms

**cohesion**: the force by which the molecules of a substance are held together.

**surface tension**: a property of liquids in which the exposed surface tends to contract to the smallest possible area, as in the formation of a meniscus; caused by unequal molecular cohesive forces near the surface.

## ADVANCE PREPARATION

A. Assemble materials.

B. Add several drops of red food coloring to one cup of water. Add several drops of blue food coloring to one cup of water.

## PROCEDURE

I. Setting the stage

A. Ask the students to describe a drop of water. Ask the following questions and record all answers:

1. What shape is a water drop?

2. What happens when one drop of water gets close to or touches another drop of water?

3. What shape is a raindrop? Why?

B. Read the book Water by Brenda Walpole or a similar book suitable for K-2.

II. Activities

A. Activity I

1. Allow the students to explore and practice using a water dropper. If water droppers are not available, use straws. If straws are used, practice picking up water with the straw and letting it go, one drop at a time. (Straws may be used as a water dropper by folding over the top of the straw 1/2" to 1" then pinching the folded part as you would a water dropper.)

2. Put some flour on a square of wax paper. Blow gently at the flour through a straw. What happens to the flour? Did it stick together or did it scatter into small bits?

3. Have the students follow along as you read the record sheet together. Set a purpose for the experiment, "What can we learn about water by working with water drops?"

4. Follow the directions on the record sheet. Check off each step as it is completed.

5. Ask questions listed in "A" again. Compare answers after the experiment to the answers before the experiment.

B. Activity II

1. Fill a bowl with water.

2. Sprinkle some pepper onto the water. It should be floating on top of the water. Draw a picture to show how it looks.

3. Insert a toothpick into the water. The surface tension does not break.

4. Have students dip a toothpick into some liquid detergent.

5. Have them insert the soapy toothpick into the middle of the bowl of water. Describe what happened. (The pepper scattered to the edges of the bowl because the surface of the water was broken. Surface tension is like a "skin" or "film" on the water.)

6. Draw a picture to show how the bowl looks after the soapy toothpick is inserted into it.

C. Activity III

1. Fill a bowl with water.

2. Push the needle halfway into the bowl of water. The water "film" or "skin" seems to be higher on the sides of the needle.

3. Remove the needle and carefully float the needle on the water. Why does the needle float? The tension or "skin/film" of the water causes the needle to float.

III. Follow-Up

A. Review the steps of the record sheet. Discuss the answers.

B. Have a "water-drop race." Have each student select a friend.

1. Put down some wax paper in front of each pair of students.

2. Each student should put one drop of colored water on the wax paper.

3. Instruct students to blow the drop across the paper with a straw.

4. Determine whose drop crosses the wax paper first.

IV. Extensions

A. Repeat the "water-drop race" activity using tempera paint instead of colored water (Follow-Up B).

B. Repeat the "water-drop race" activity using soapy water drops. Could you have a race?

C. Art: "Splash Art"

   1. Mix water with food coloring: one bowl of red, one bowl of blue, and one bowl of yellow.

   2. Hold the droppers or straws high above some paper.

   3. Drop drops of two different colors of water on the same paper.

D. Repeat "Splash Art" using a variety of liquids. Did the different liquids splash the same way? Which one made the smaller splashes? Larger splashes?

E. Repeat "Splash Art" from different heights. How are the splashes from different heights?

F. Investigate how the insect "water strider" stays on top of the water. (The surface tension of the water is strong enough to support the weight of the insect.)

G. Visit a pond. Look very carefully at the surface of the water. Use a nature book to see how many different insects you can count skimming across the pond's surface.

H. Ask students to search and find an occurrence of cohesion and surface tension at home. List and bring to school. (Example: water beading on a waxed car.)

## RESOURCES


3-2-1 Classroom Contact—"Water Cycle: Go With the Flow", (Video).

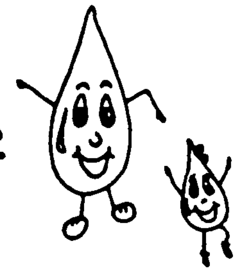
Markle, Sandra, A Rainy Day, Orchard, 1993.

Van Rose, Susana, Eyewitness Science: Earth, Dorling Kindersley, 1994.

Walpole, Brenda, Water, Garrett Educational, 1990.

Watson, Philip, Science Club: Liquid Magic, Walker Books Ltd., 1982.

# Great Balls O' Water



Materials: food coloring, dixie cups, toothpick, waxpaper eyedropper

1. Add a few drops of food coloring to your cup of water. Use the eyedropper. Put 5 large drops of colored water onto the waxpaper. Draw how the drops look.

2. Use the toothpick. Pull one drop on the paper and make it touch another drop. Draw what you observe.

3. Using the toothpick, pull the other drops so that they touch the large drop. Draw what the water looks like now.

4. Using the toothpick try to pull a drop out of the big drop. Draw what the big drop looks like as you are pulling on it.

Do drops of water stay apart or do they try to stick together?

# UP, UP AND AWAY!

K-2

**SUBJECTS:**
Science, Math, Music

**TIME:**
1 day and 30 minutes to measure and record

**MATERIALS:**
containers with various size openings (milk jugs, bowls, quart jars) one container for every 4 students
recording sheet
a graduated cylinder for exact measurement
measuring cups, either metric or standard
ruler (one for each group)

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Record, orally or in writing, that changes in evaporation depend on the size of the container's opening;
2. Use a ruler to measure the size of the opening and the amount of water; and
3. Give an oral or written definition of evaporation.

## BACKGROUND INFORMATION

The molecules of liquid water are always in motion. Molecules with sufficient energy that escape the water's surface and go into the atmosphere are said to evaporate. At ordinary temperature, evaporation is slow because fewer molecules have enough energy to escape the liquid's surface. As water molecules absorb heat energy, the molecules speed up. Then more molecules have sufficient energy to escape the water's surface. With increasing temperatures the evaporation rate increases. When water evaporates, it enters the atmosphere in the form of water vapor.

Term

**evaporation**: process in which the heat energy of the sun causes the water on the Earth's surface to change into a vapor.

## ADVANCE PREPARATION

A. Part of this activity should be done in the morning, so the containers can be exposed to a full day of sunlight. Then the other half should be done toward the end of the school day.

B. Have the materials on a table accessible by the students.

## PROCEDURE

I. Setting the stage

A. Read the story Listen to the Rain by Bill Martin, Jr. Ask the students, "Where do the rain puddles go?"

II. Activities

A. Divide the class into groups of four Let each group choose its container, and get a ruler, measuring cup, and recording sheet.

1. Using a graduated cylinder, decide on the amount of water to be used for the experiment. Let the students determine the amount of water their containers will hold and, as a class, decide on a common amount. Have students fill their containers. Record this amount.

2. Using the ruler, have students measure the dimensions of their opening. If it is round, introduce the concept of diameter. Let them record this on their recording sheets.

3. Have each group find a sunny place to put their container. Have them check on their container periodically during the day to make sure it is not in the shade.

4. After several hours, have students collect their containers and bring them inside. Carefully, let them pour out the water and measure it in the graduated cylinder. Have students report and record the amount of water remaining.

III. Follow-Up

A. Begin a discussion on the effect that the size of the opening had on the amount of water which evaporated. Have students record the final amount.

1. How long did it take the water to disappear?

2. Keep a weather graph of the weather each day. Does the water evaporate more on a sunny or cloudy day?

3. Draw a line down the chalk board. Wet each side with a wet sponge. Fan one side of the board and let the other side dry naturally. Which side dries first? Why?

IV. Extensions

A. Find a puddle or make a puddle. Using a ball of yarn, outline the puddle. Cut and tie the ends together. Secure the yarn to the area by sticking hairpins into the ground. Ask, "What do you think will happen?" Come back the next day. Is the water still there? Where did the water go? Write your ideas in your journal.

B. Using the data collected make a large class graph of the amount of water remaining in the containers.

C. Make subtraction problems using the initial amount of water and the remaining amount.

D. "Magic Wand" Math Review. Use a Q-tip dipped in water as "Magic Wand." Squeeze the excess water out of the "Magic Wand." Write math number sentence (8 + 6, 3 x 4, 18 - 9) on chalkboard. Call on a student to answer question before the number sentence disappears. Ask "What happened to the number sentence?" "Where did the water go?"

## RESOURCE

Namowitz, Samuel N. and Nancy E. Spaulding, Earth Science, p. 437, D. C. Heath and Company, Lexington, MA, Toronto, 1985.

# EVAPORATION RECORDING SHEET

Group Members:

____________________ ____________________

____________________ ____________________

1. This is how our container looks:

2. We put __________ water in our container.

3. The opening of our container is shaped like this:

4. The dimensions are __________.

5. At the end of a sunny day, we had __________ water left in our container.

6. Does the size of the opening have an effect on the amount of water evaporated?

_______________________________________________

_______________________________________________

# WATER GOES UP AND DOWN

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Demonstrate, through role play, the steps of the water cycle; and
2. Give an oral or written definition of evaporation, vapor, and the water cycle.

**SUBJECTS:**
Science, Language Arts, Music

**TIME:**
30-40 minutes

**MATERIALS:**
chart paper

## BACKGROUND INFORMATION

When it rains, the rainwater runs down drains or into rivers, streams, lakes, or oceans. Some of the rainwater makes puddles on sidewalks or on the ground. Some of the water soaks into the ground to become ground water. After the rain stops, the sun warms the water, turning some of it into tiny, invisible drops of water called vapor. The vapor rises into the sky, condenses back to water, and joins other water droplets to form clouds. When the water droplets are heavy enough they fall to the Earth as rain, snow, ice, or hail. Then the process repeats itself. We call this continuous movement of water "the water cycle."

Terms

**evaporation**: process in which the heat energy of the sun causes the water on the Earth's surface to change into a vapor.

**vapor**: a substance in the form of a gas having no fixed shape.

**water cycle**: continuous movement of water from the oceans and fresh water sources to the air and land and then back to the oceans.

## PROCEDURE

I. Setting the stage

A. Share background information about the water cycle.

B. Sing the song:

**WATER GOES UP AND DOWN**
(Tune: The Farmer in the Dell)

Water goes up and down
Water goes up and down
High Low is how it goes
Water goes up and down.

First it falls down
First it falls down
High Low is how it goes
First it falls down.

Then it makes a stream
Then it makes a stream
High Low is how it goes
Then it makes a stream.

The stream joins a river
The stream joins a river
High Low is how it goes
The stream joins a river.

The river joins the ocean
The river joins the ocean
High Low is how it goes
The river joins the ocean.

The sun warms the water
The sun warms the water
High Low is how it goes
The sun warms the water.

The water turns to vapor
The water turns to vapor
High Low is how it goes
The water turns to vapor

The vapor forms a cloud
The vapor forms a cloud
High Low is how it goes
The vapor forms a cloud.

The rain falls again
The rain falls again
High Low is how it goes
The rain falls again.

Water goes up and down
Water goes up and down
High Low is how it goes
Water goes up and down.

**Original song by Beth Corum**

II. Activity

A. Divide the children into groups and place them in the role play positions:

1. Have a few children stand on a low table. They will be "the raindrops."

2. Have a few children stand side by side holding hands. They will be "the river."

3. Have several children stand together in a group. They will be "the ocean." Of this group, choose a few children who will become "vapor" at the appropriate time.

4. Choose one child to be "the sun."

B. Read the narration slowly, allowing time and providing direction for role playing.

Narration (to be read by the teacher)

"One day a gray cloud formed in the sky. Thunder could be heard."
(All children make thunder sound)

"Raindrops started to fall."
(One by one the children on the table "fall" to the floor.)

"The raindrops joined together to form a stream."
(These children hold hands and start walking slowly, winding around the room.)

"The stream flowed into a river."
("Stream children" join hands with "river children.")

"The river flowed into the ocean."
("River" joins "ocean.")

"Some of the water got so warm it turned into vapor and rose into the air."
(Designated "vapor children" carefully climb onto the table.)

"The vapor got cold and joined together to form a cloud."
(Children on the table move close together.)

"Raindrops started to fall."
(One by one the children on the table "fall" to the floor.)

III. Follow-Up

A. Ask the students to tell you the steps of the water cycle.

1. List their responses on chart paper.

2. Let the students work in pairs, illustrating the steps of the water cycle. (Each pair illustrates one step.)

B. As the class sings "Water Goes Up and Down" let one student point to the corresponding step on the chart paper.

IV. Extensions

A. Fill three jars half-full of water. Mark the water line on each by placing a rubber band around each jar.

1. Place one jar on a sunny windowsill.
Place one jar inside a cabinet or closet.
Put lid on the third jar and sit it on a shelf.

2. Observe the jars over a period of time. Discuss.

B. Paint with water on a sidewalk on a sunny day. Discuss evaporation.

C. Sing the song:

**WATER CYCLE SONG**
(To the tune of "Clementine")

Evaporation, condensation, precipitation on my mind.
This is the water cycle and it happens all the time.

MOTIONS:

Students form a circle, squatting. When they sing evaporation they should rise, slowly. For condensation they hold hands together, and for precipitation they squat down to original position.

## RESOURCES

Bittinger, Gayle, Learning and Caring About Our World, Warren Publishing House, Inc., Everett, Washington, 1990.

Mayes, Susan, What Makes it Rain?, Usborne Publishing, 1989.

# RAIN, RAIN GO AWAY

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, how water moves in a never ending circle or cycle; from sky to Earth, over and over again;

2. Name and explain, orally or in writing, the steps in the water cycle; and

3. Give an oral or written definition of the new terms: condense, evaporate, gas, hail, liquid, sleet, snow, solid, and water.

**SUBJECTS:**
Science, Music, Math, Geography, Language Arts, Art

**TIME:**
25 minutes

**MATERIALS:**
tea kettle or sauce pan
1/4 filled with water
hot plate
aluminum pie pan
ice cubes
large zip-loc baggie
water
globe

## BACKGROUND INFORMATION

Water falls from the sky to the Earth in different forms; rain, snow, sleet, and hail. Some of the water soaks into the ground and becomes ground water. The rest flows into streams, lakes, rivers, and oceans. The sun's heat changes some of the water to a gas called water vapor. This process is called evaporation. The water vapor rises into the sky and forms a cloud. Clouds are made of trillions of water droplets. The droplets are tiny and light enough to float. When the clouds get very cold, the water droplets freeze and get so heavy they can't float anymore. They fall out of the cloud and melt on the way down to Earth. They fall as rain. If the air is too cold on the way down, the drops of water will fall frozen as snow or sleet.

Terms

**condense**: water vapor that changes into a liquid.

**evaporate**: to convert or change into a vapor.

**gas**: substance having no fixed shape.

**hail**: precipitation in the form of hard pellets of ice or hard snow.

**liquid**: a free flowing substance that borrows the shape of its container.

**sleet**: precipitation consisting of generally transparent frozen or partially frozen raindrops.

**snow**: solid precipitation in the form of white or translucent ice crystals of various shapes originating in the upper atmosphere as frozen particles of water vapor.

**solid**: a hard substance that keeps its own shape.

**water**: a clear liquid, solid, or gas made up of tiny molecules of two parts hydrogen and one part oxygen.

## ADVANCE PREPARATION

A. Gather information.

## PROCEDURE

I. Setting the stage

A. Sing the song:

**HERE COMES THE RAIN by Amy Pochodaj**
(To the tune: The Green Grass Grows All Around)

| | |
|---|---|
| Here comes the rain— | (Echo.) |
| The wettest rain. | (Echo.) |
| The heaviest rain. | (Echo.) |
| That you ever did see. | (Echo.) |

And the water keeps going all around, all around.
And the water keeps going all around.

And from that rain
There is a puddle—
The biggest puddle
That you ever did see.
Puddle from the rain.
And the water keeps going all around, all around.
And the water keeps going all around.

Here comes the sun
To dry the puddle—
The hottest sun
That you ever did see.
Sun dries the puddle, puddle from the rain.
And the water keeps going all around. . . .

Now forms the cloud
Up in the sky—

The biggest cloud
That you ever did see.
Cloud from the puddle, when the sun dries the puddle, puddle from the rain.
And the water keeps going all around. . . .

Here comes the rain—
The wettest rain.
The heaviest rain
That you ever did see.
Rain from the cloud, cloud from the puddle, when the sun dries the puddle, puddle from the rain.
And the water keeps going all around. . . .

Used with permission of Amy Pochodaj, Humpty Dumpty Day Care, Ypsilanti, MI.

II. Activity

A. Place ice cubes in the tea kettle or sauce pan. Discuss that ice is water in the solid form.

B. Heat the ice. Observe and discuss the change from a solid to a liquid. Discuss with the students that the liquid takes the shape of the container. The solid form, ice, did not.

C. Boil the water until it changes into water vapor. A cloud will form just beyond the spout of the kettle or above the sauce pan. The clear area nearest the spout or pan is steam or water vapor.

D. Hold the aluminum pie pan that is filled with ice cubes in the cloud area.

E. Ask the students to watch beneath the pie pan and comment on what is happening. It is raining!

F. Ask the students the question: "What happened when the warm water vapor touched the cold pan?" (The water vapor was cooled and condensed into water drops that got heavy and fell.)

III. Follow-Up

A. Place 1/2 cup of water in the bottom of a zip-loc baggie. Make sure no water gets on the sides of the bag. Tell the students that this is a pretend puddle that will help us know what happens to the water in a real puddle.

B. Tape the bag that is zipped tight to a sunny window.

C. Watch the bag for several hours. Let the students feel the water through the bag. What does it feel like? (Warm)

D. Tiny drops of water will form on the sides of the bag. Condensation has occurred. Tell the students that clouds are made of tiny water drops.

E. Hold a bag of ice against the top of the bag. Tell the children that the ice will do the same thing as cool air high in the sky. More condensation will occur. Some drops will get heavy and fall like rain as the students watch.

F. Within the plastic bag you can continue the rain cycle for as long as you like.

G. When you are finished with the experiment, open the bag. Ask the students to predict what they think will happen to the water. Mark the water level on the bag with a permanent marker each day. Record the water level until the water is gone. Discuss the graph on the bag with the children. Ask: "What makes more water evaporate some days and not others?" (temperature) Discuss.

IV. Extensions

A. Read What Makes It Rain by Keith Brandt. Give the students pre-cut raindrops. Ask the students to use their imaginations and write and illustrate on their raindrops what they were and where they had been before they were a raindrop.

B. Watch and listen to a televised weather broadcast. Using a globe or map, point out places where it is raining. Discuss the fact that it does not rain everywhere at the same time.

C. Read the story Rain Talk by Mary Serfozo. Using a water table or dish pan and a variety of objects such as strainers, funnels, slit spoons, plastic medicine droppers, and watering cans, let the children rain on various objects such as tin cans, wood blocks, plastic butter tubs, or milk cartons. Let the children describe the "rain talk" or different sounds they hear.

D. Rain Collage. Have the students create a rain scene by gluing confetti or paper hole punch-outs on paper. Let the students cut from magazines things that benefit from rain and glue them on paper. Examples: animals, people, plants, etc.

## RESOURCES

Pochodaj, Amy, Here Comes the Rain, Humpty Dumpty Day Care Center, 1212 Washtenaw, Ypsilanti,MI, 48197.

The Education Center, The Mailbox, Pre-K, April/May, 1995.

Victor, Edward, Science For the Elementary School, Macmillan Publishing Company, 1980, p. 385.

# RAIN, RAIN GO AWAY, PART II

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Construct a water cycle wheel;
2. Name the three major components of the water cycle; and
3. Give an oral or written definition of the terms: condensation, evaporation, precipitation, and transpiration.

**SUBJECT:**
Science

**TIME:**
25 minutes

**MATERIALS:**
water cycle poster
activity sheets (water cycle wheel #1 and #2)
water cycle song on chart paper
paper plate
scissors
brad
crayons

## BACKGROUND INFORMATION

Nearly 70% of the Earth's surface is covered with water. The Earth never gets more water added to it. The same water keeps circulating and recirculating through the water cycle.

Terms

**atmosphere**: envelope of gases surrounding the Earth.

**condensation**: process by which vapor changes back into a liquid.

**evaporation**: process in which the heat energy of the sun causes the water on the Earth's surface to change into a vapor.

**precipitation**: forms of condensed water vapor that are heavy enough to fall to Earth; rain, sleet, snow.

**transpiration**: process in which water absorbed by the root systems of plants moves up through the plants, passes pores (stomata) in their leaves or other parts, and then evaporates into the atmosphere as water vapor; the passage of water vapor from a living body through a membrane.

## ADVANCE PREPARATION

A. Display a water cycle poster.

B. Print the Water Cycle Song on chart paper.

**THE WATER CYCLE SONG**
(Tune: Are You Sleeping?)

Clouds have drops,
Clouds have drops,
That fall to the ground,
That fall to the ground.
Some drops fall in lakes and streams,
Others land on you and me.
Drip, Drop, Drip,
Drip, Drop, Drip.

Then the drops evaporate,
Then the drops evaporate,
And travel to the sky,
And travel to the sky.

There the drops will condensate,
Stick together with a mate,
And down they fall again,
Again, again, again.

C. You may wish to pre-cut or trace the squares onto the paper plates.

## PROCEDURE

I. Setting the stage

A. Display a poster of the water cycle. Introduce the Water Cycle Song.

II. Activities

A. Have students construct a water cycle wheel.

1. Use a large paper plate and trace the squares on it. Cut these out. See the pattern.

2. Color the raindrops blue.

3. Draw land and sea on the bottom of the plate.

4. Draw clouds and sun in the upper left, draw rain clouds in the upper right.

III. Follow-Up

A. Construct a classroom terrarium to illustrate a miniature water cycle.

1. In the bottom of a fish bowl or aquarium (any size), lay 1 1/2 inch of gravel, followed by soil.

2. Place a variety of plants in the aquarium, water slightly, cover with plate glass, and place in a warm place. If the cover fits tightly, students should observe that no additional water needs to be added. Point out that water has evaporated from the soil, transpired from the plants, condensed, and returned to the soil.

B. Read the story Looks Like Spilt Milk by Charles Shaw. Give each student a sheet of blue construction paper. Have students tear white construction paper into various shapes to represent clouds.

C. Read the story Cloudy With a Chance of Meatballs by Judi Barrett. Give each student a paper plate to divide into sixths. Have them cut out pictures of food from magazines to correspond with the food pyramid.

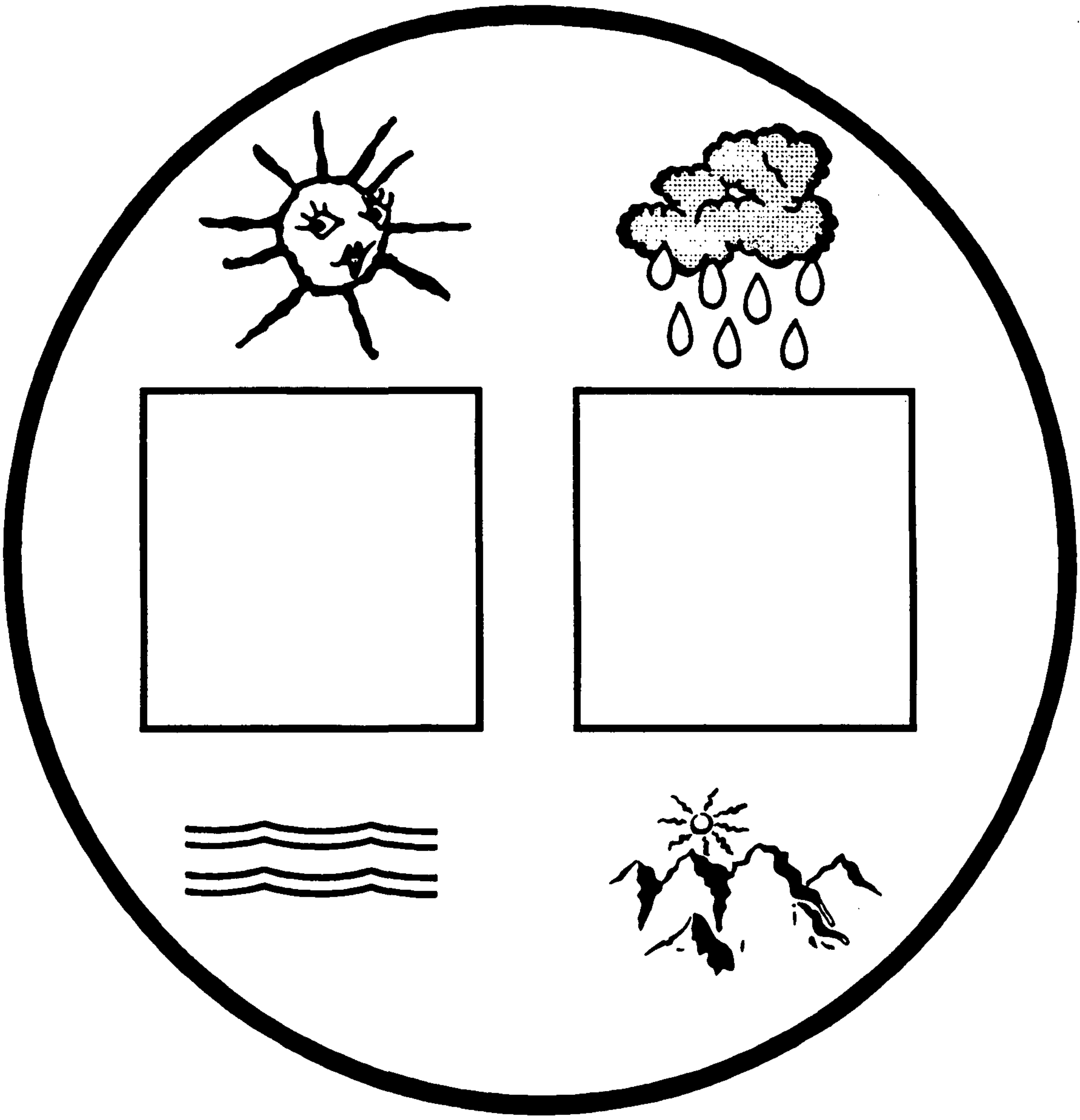
## RESOURCES

Barrett, Judi, Cloudy With a Chance of Meatballs, Atheneum Publishers, 1987.

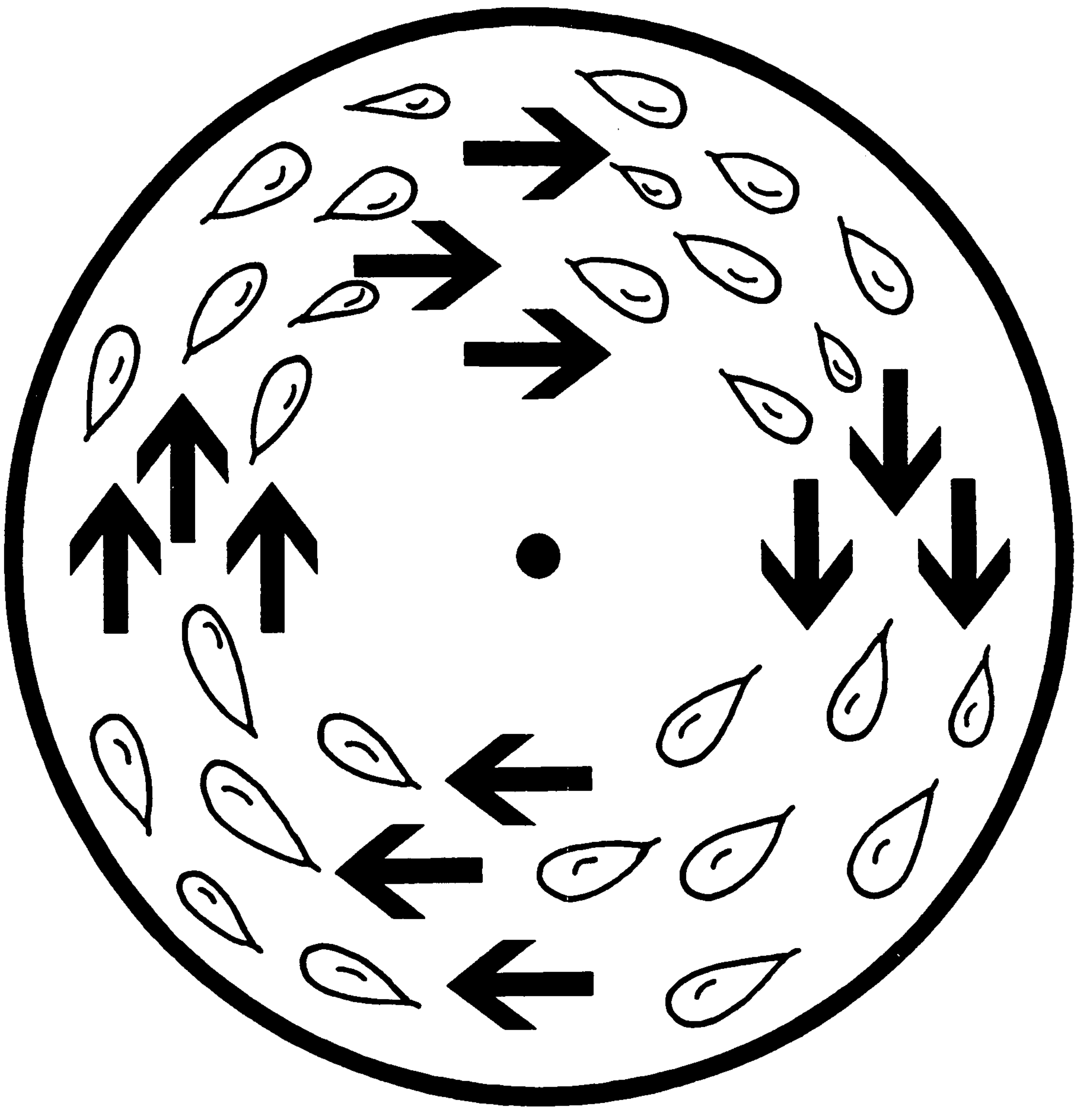
Polacco, Patricia, Thundercakes, Putnam Publishers.

Shaw, Charles, It Looks Like Spilt Milk, Harper Collins.

# WATER CYCLE WHEEL
# PATTERN 1



# WATER CYCLE WHEEL
# PATTERN 2



# DRIP AND DROP'S ADVENTURE

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Name or in writing, at least three ways to conserve water;
2. Construct a "Big Book"; and
3. Give an oral or written definition of what it means to conserve.

**SUBJECTS:**
Science, Health, Language Arts

**TIME:**
15 minutes

**MATERIALS:**
puppet
puppet play "Drip and Drop's Adventure" (included)

## BACKGROUND INFORMATION

People use water in numerous ways such as bathing, washing clothes, drinking, cooking, washing cars, washing dishes, cleaning, watering plants, watering yards, flushing the toilet, and many more. People, businesses, factories, and farms use millions of gallons of water each day. People have to pay for clean, safe water. There is a limited amount of clean, safe water because water in nature may no longer be safe enough to use. At times, there is a shortage of usable water due to a shortage of rain, overuse of water by people, or pollution.

Term:

**conserve**: save, protect, keep; to use a resource wisely and efficiently.

## ADVANCE PREPARATION

A. Make puppet (Figure 1).

B. Make copies of book cover "Ways I Will Save Water" (included).

## PROCEDURE

I. Setting the stage

A. Read or tell the first narrator's part of "Drip and Drop's Adventure."

II. Activity

A. Perform the puppet play "Drip and Drop's Adventure."

III. Follow-Up

A. Ask the students questions such as:

1. Can you name ways that Drip and Drop helped Johnny save water?

2. Can you think of other ways to save and conserve water.

IV. Extensions

A. Let students make their own little book, "Ways I Will Save Water." Allow the students who cannot write to draw pictures or dictate their story to an older student.

B. Have the class construct a "Big Book."

1. Divide the students into groups of two or three.

2. As a whole group decide on a different water conservation idea for each group.

3. Pass out large sheets of paper and markers to each group.

4. Instruct each small group to make an illustrated page for their water conservation idea.

5. Take dictation from groups that need your assistance.

6. Allow each group to share their page with the whole group.

7. When the pages are complete, punch holes and bind with a book binder, rings, or yarn.

## RESOURCE

Taking Care of the Earth, A Golden Book, New York, Western Publishing Company, Inc.

## DRIP AND DROP'S ADVENTURE

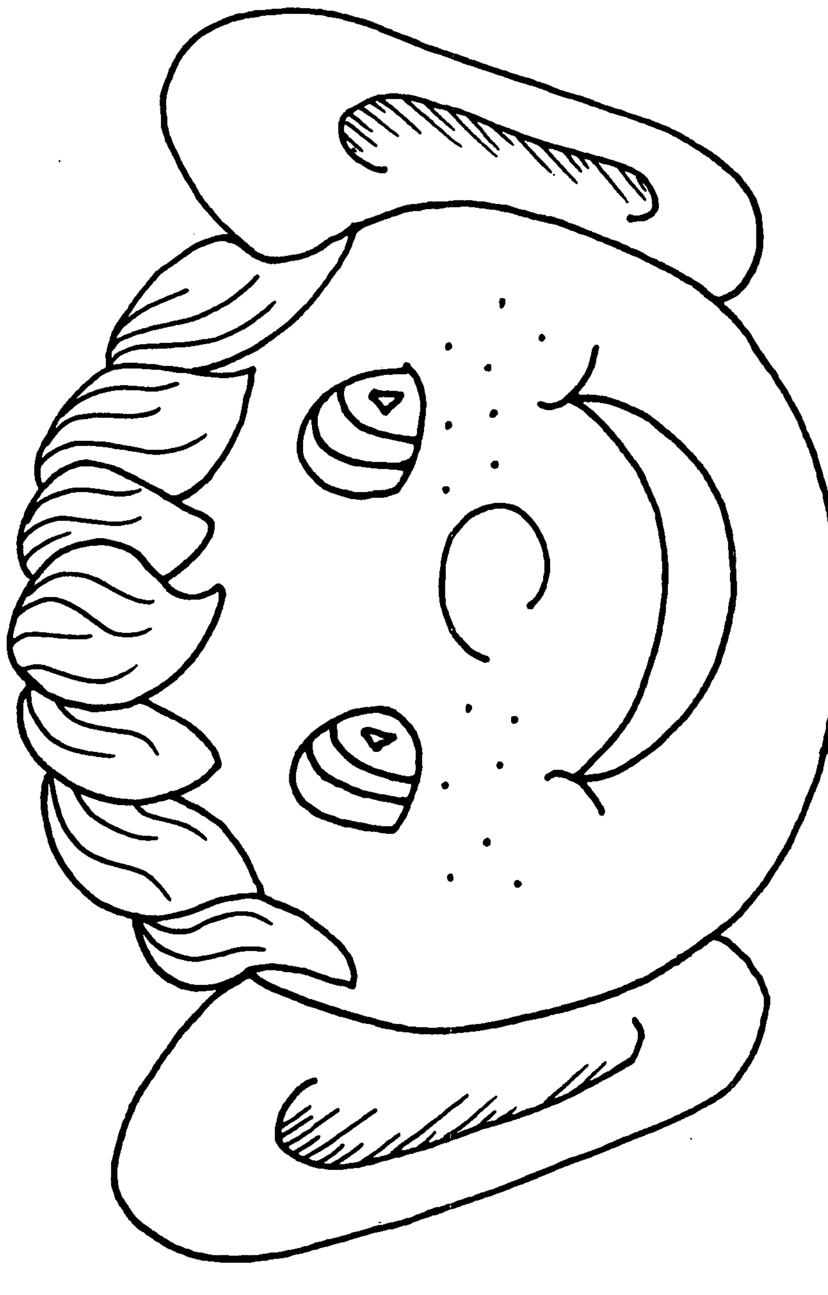
(Original story by Cindy Taylor)

| | |
|---|---|
| Narrator: | One day when Johnny was drying after his bath, he didn't dry behind his ear very good and left 2 drops of water behind his ear. He didn't know they were there. |
| Drop: | Hey Drip! |
| Drip: | What Drop? |
| Drop: | Johnny's towel didn't get us. |
| Drip: | Yea! We'll get to go everywhere Johnny goes and see things. |
| Drop: | What fun! |
| Drip: | I wonder where we're going? |
| Drop: | Looks like Johnny's going to brush his teeth. |
| Drip: | Oh no! Look Johnny's left the water running while he's brushing his teeth! |
| Drop: | Yea! Look at our little buddies going down the drain. |
| Drip: | Johnny turn the water off while you brush. You're wasting gallons of us! |
| Johnny: | Who said that? |
| Drip: | Shhhh! Don't tell him, he might wipe us away. |
| Drop: | Hey Johnny, you need to put a plastic soda bottle filled with water in your toilet tank. The bottle takes up space and saves us, I mean saves water. |
| Johnny: | OK I will, but I wish I knew who was whispering in my ear. |
| Drip: | I wonder where we are going now Drop? |
| Drop: | We're in the kitchen, and Drip look at the water dripping out of the faucet. It won't cut off. |
| Drip: | I see. |
| Drop: | There goes our friends down the drain. What a waste! |
| Drip: | Johnny, please tell your mom to get the leaky faucet fixed. |
| Johnny: | I don't know who said that, but OK. Mom, you need to get the faucet fixed. It's leaking and wasting water! |
| Drop: | Now what's Johnny up to? |
| Drip: | He's getting a drink and it's water. |
| Drop: | He's a smart kid. Water is good for his body. |
| Drip: | Oh, he didn't drink all of it and he's going to pour the rest down the drain! |

| | |
|---|---|
| Drop: | Stop! STOP! Johnny, save that water. Put it in the refrigerator for later, or water your mom's plants with it. Please don't waste it! |
| Johnny: | OK! Someone or something sure is watching out for water. I'll save it for later. |
| Johnny: | Mom, I'm going to the park to play. |
| Drip: | Oh good! We're going to the park! |
| Drop: | Drip, look at those people have a picnic. Doesn't that look like fun! |
| Drip: | But look, they're throwing their trash in our friend lake. |
| Drop: | Johnny help us! Tell those people to please throw their trash in the can. |
| Johnny: | Hey folks, please put your trash in the trash can. I still don't know who's whispering in my ear, but they sure do care about water! |
| Drip: | It's raining Drop. |
| Drop: | I love seeing so many of our friends all at one time. |
| Drip: | Me too! |
| Drop: | Look at all that rainwater. It's watering the Earth and making things grow. |
| Drip: | Johnny, why don't you collect some of the rainwater. It sure would be good for your aquarium. You could water the house plants with it or your family could use it to wash their hair. It makes hair soft and shiny. |
| Johnny: | OK, I will. I'll catch a big bucket full and use it for all those things. |
| Drip and Drop: | Good-bye Johnny. We sure have enjoyed our adventure with you today, but we're about gone! Thanks for all you've done to save our friend Water! |
| Johnny: | I've learned a lot today about conserving and taking care of water. |
| Narrator: | Drip and Drop have evaporated into the air but not before they taught Johnny some valuable ways to take care of and to conserve water. Don't worry boys and girls, Drip and Drop are not gone forever. They will return again. They will always be spreading the word of saving and taking care of water over and over again. |

PUPPET

A. Xerox, color, cut out, and attach to a tongue depressor.
B. Add blue construction paper raindrops to back of ear. Use glitter for a sparkling effect or for a special effect add blue teardrop shaped gems.



1-82

DRIP AND DROP
PUBLICATIONS

# WAYS I WILL SAVE WATER

AUTHORED
AND
ILLUSTRATED
BY

I WILL______________

1

I WILL______________

6

I WILL______________ 5

I WILL______________ 2

I WILL_______________ 3

I WILL_______________ 4

# WATER WORKS FOR EVERYONE

K-2

**SUBJECTS:**
Math, Art, Music, Social Studies

**TIME:**
30-40 minutes

**MATERIALS:**
occupation strips (included)
butcher paper
tape

## OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writig, at least one occupation for which water is important.

## BACKGROUND INFORMATION

People have many different kinds of jobs. Some jobs help keep people safe. Some jobs provide people with food or other things. Some jobs take care of people who are sick or hurt. Some jobs help people in other ways.

There are many different things that help people do their jobs better. Some jobs require special equipment or clothing. Almost every job uses WATER in one way or the other.

## ADVANCE PREPARATION

A. Draw the attached blank graph on butcher paper.

B. Cut apart the occupation strips and conceal them in a box or bag.

## PROCEDURE

I. Setting the stage

A. Share the background information with the students.

II. Activity

A. Let each child pull an occupation strip from the box or bag and read it aloud. Ask "How is water used in this job?" After class discussion, let the student tape the strip to the graph in the appropriate column. Let each student have a turn.

B. Discuss the completed graph:

Column 1 shows the jobs in which water is extremely important.
Let's count the jobs in Column 1 together - 1, 2, . . . "
Repeat with Columns 2, 3, and 4.
Continue the discussion until someone observes that there are no jobs in Column 4.

C. Sing the song:

**WATER WORKS FOR EVERYONE by Beth Corum**
(Tune: BINGO)

Every job that people do
Sometimes uses water
W - A - T - E - R
W - A - T - E - R
W - A - T - E - R
Water works for everyone ! !

III. Follow-Up

A. Let each student tell the teacher one occupation for which water is important. The teacher will write the response on an "occupation badge" and let the student decorate it.

IV. Extension

A. Write a class letter to your local fire station, explaining your recent study of water. Include bumper stickers which the students have made and ask the fire fighters to display them on their fire trucks.

Possible bumper sticker:

| |
|---|
| **Water is important to fire fighters.** |
| **Water is important to EVERYONE** |

B. Have the students write a sentence or tell about why water is important to the occupation tney choose. Draw a picture at the bottom of the paper to illustrate the chosen occupation.

## GRAPH TO BE PLACED ON BUTCHER PAPER

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Water is extremely important in this job** | **Water is important in this job** | **Water is sometimes used in this job** | **Water is seldom used in this job** |

| |
|---|
| SECRETARY |
| LIFEGUARD |
| WHALE TRAINER |
| CONST. WORKER |
| PAINTER |
| HOUSEKEEPER |
| FOOTBALL COACH |
| FARMER |
| SOLDIER |
| ZOO KEEPER |
| WEATHER MAN |
| HAIR STYLIST |

| |
|---|
| POLICEMAN |
| FIREFIGHTER |
| TEACHER |
| FISHERMAN |
| PREACHER |
| BUS DRIVER |
| COOK |
| WAITRESS |
| DOCTOR |
| DENTIST |
| VETERINARIAN |
| LAWYER |

# DO YOU KNOW MY JOB?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, water related careers;
2. Identify water-related careers based on job descriptions; and
3. Give an oral or written definition of career, related, and water.

**SUBJECTS:**
Science, Social Studies

**TIME:**
1 hour or 2 separate days, 30 minutes each

**MATERIALS:**
career picture cards, blackline masters
career description cards, blackline masters
2 transparencies

## BACKGROUND INFORMATION

Water-related careers offer a variety of job opportunities ranging from those requiring simple on-the-job training to those requiring an advanced degree. Young students need to be aware of water-related careers and become familiar with the tasks performed.

Terms

**career**: a chosen pursuit or life's work; a job or profession one is trained to do.

**related**: having a connection; going together.

**water**: a clear liquid, solid, or gas made up of tiny molecules of two parts hydrogen and one part oxygen.

## ADVANCE PREPARATION

A. Duplicate blackline masters.

B. Make a transparency of each blackline master.

C. Locate book The Divers or another book that presents a water-related career.

## PROCEDURE

I. Setting the stage

   A. Discuss the definition of water-related.

   B. Read The Divers. Ask how a diver's career is water-related.

   C. Have students help make a list of careers they know of that are water-related.

II. Activities

   A. Use transparencies of the blackline masters to introduce the water-related career game.

      Career Picture Cards
      Career Job Descriptions

      1. Cut the transparencies apart (bold lines) so that pictures can be matched with job descriptions.

   B. After naming each of the careers depicted on the career picture cards, place the cards on the overhead.

      1. Read different job description cards and call on students to identify the matching picture card.

III. Follow-Up

   A. Pass out blackline masters (picture and job description cards) and have the students cut the cards apart.

      The cards can be used as follows:

      1. Matching - match job description cards to the correct career picture cards.

      2. Concentration - for this game students will work in groups of 2-3 and use one set of cards. Place all cards face down. Each student (in turn) turns over two cards trying to match a job description with the correct picture card. If a match is made, the student keeps the cards and gets another turn. If no match is made, the play moves to the next student.

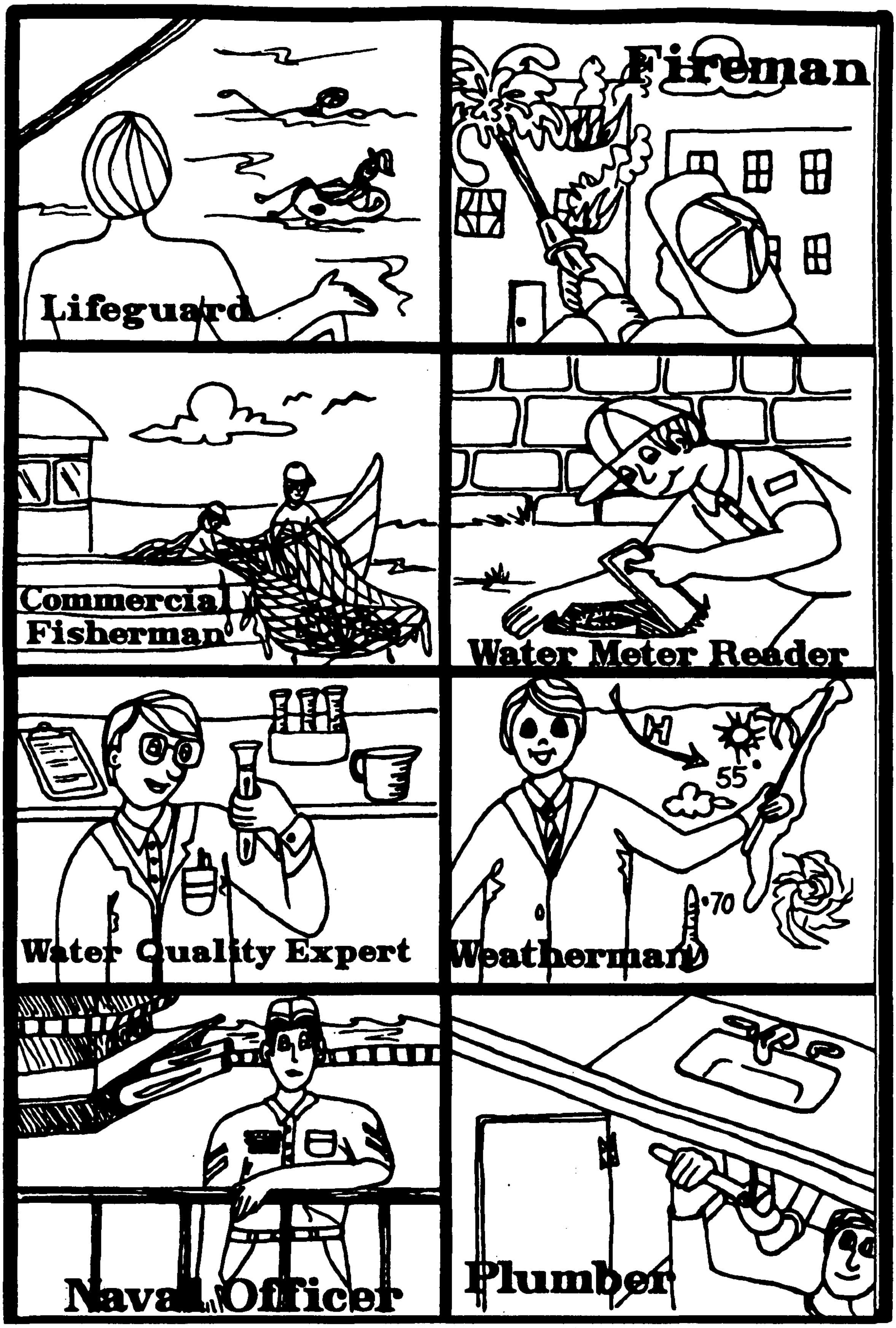
IV. Extensions

   A. Students may select a water-related career and make a poster illustrating the job responsibilities.

   B. Invite speakers who have water-related careers to talk with the class.

## RESOURCE

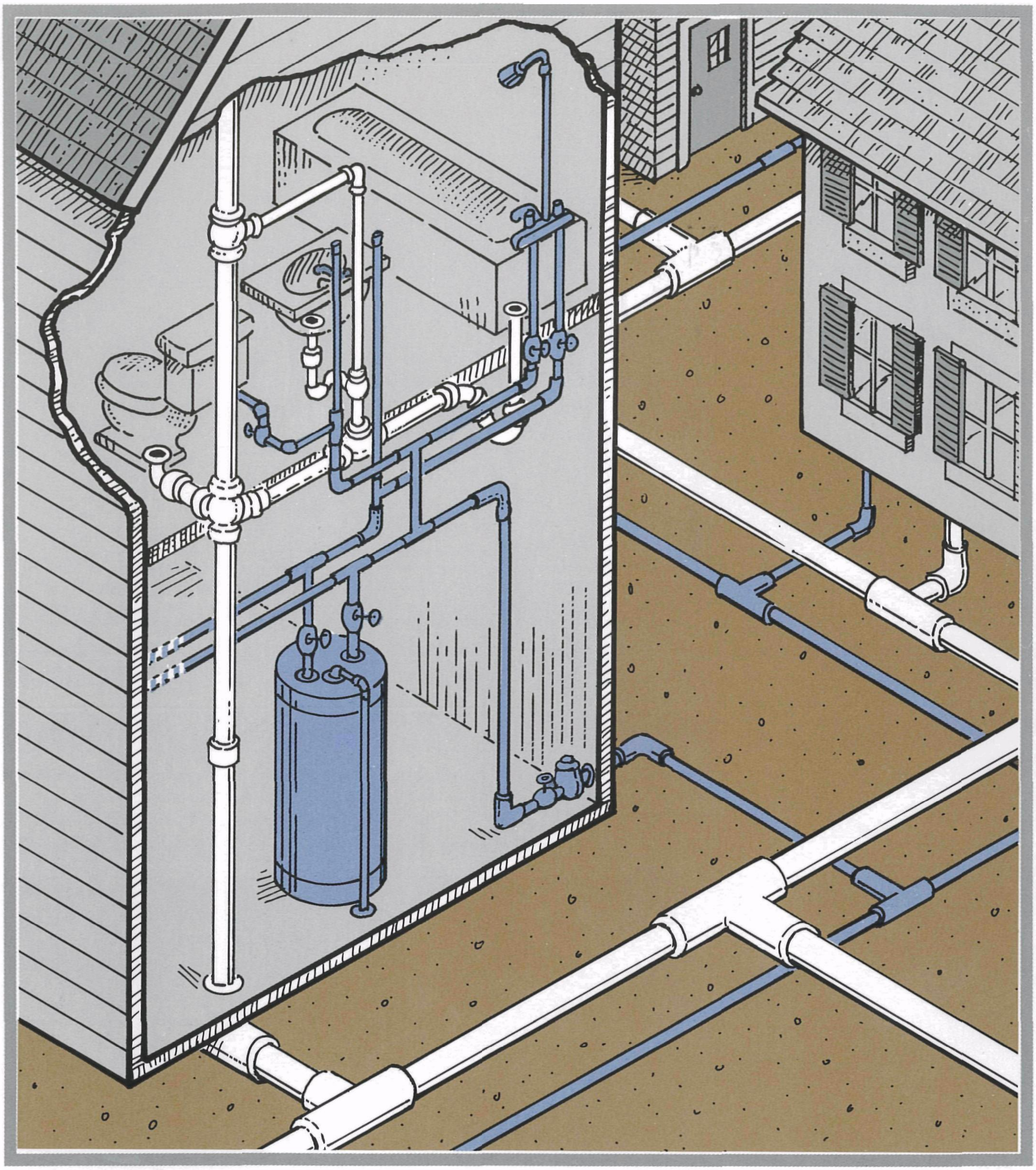
Midjas, Bente, The Divers, The Wright Group, 1993.


Lifeguard
Fireman
Commercial Fisherman
Water Meter Reader
Water Quality Expert
Weatherman
55°
70
Naval Officer
Plumber

| | |
|---|---|
| 1. I help to protect your country. I am in the armed services. What is my career? | 2. I catch fish and bring them to market. What is my career? |
| 3. I prevent, tend to, and control fires. What is my career? | 4. I forecast weather. What is my career? |
| 5. I find out how much water your family uses. What is my career? | 6. I repair your pipes and make sure your toilet, faucets, and showers are working. What is my career? |
| 7. I watch while you swim to make sure you are safe. What is my career? | 8. I test your water to make sure it is clean and safe to drink. What is my career? |

## ANSWER KEY

1. NAVAL OFFICER
2. COMMERCIAL FISHERMAN
3. FIREMAN
4. WEATHERMAN
5. WATER METER READER
6. PLUMBER
7. LIFEGUARD
8. WATER QUALITY EXPERT





THE **WATER** SOURCEBOOK

# DRINKING AND WASTEWATER TREATMENT

# PLANTS NEED TO DRINK TOO!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Predict, orally or in writing, what will happen to a plant that receives no water; and
2. Demonstrate, orally or in writing, an understanding that plants need water by drawing a picture of a plant that has received adequate water and one that has not.

**SUBJECTS:**
Science, Math, Creative Dramatics, Language Arts

**TIME:**
15 minutes (observations last several days)

**MATERIALS:**
celery
container for celery
balance scale, caloric scale, or postage scale
red food coloring
3 small potted plants
plastic bag that will cover one of the potted plants

## BACKGROUND INFORMATION

A plant is a living thing. All living things need water to survive and grow. Plants use water to help make their food. They also use dissolved minerals in water to make new plant parts and to grow.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Show the students a stalk of celery. Ask the students if they have ever eaten celery. Ask questions such as "Do you think it has water in it?" "Do you think it needs water to grow and stay alive?" Share the background information with the students. Explain to them that the activity they are going to do will demonstrate that all plants have a tube system that carries water to all their parts and that all plants contain water.

II. Activities

A. Put one stalk of celery in a container of water colored with red food coloring. Place the container with the celery in the science center to observe. Also place an observation and recording booklet in the science center for the students to record their observations.

B. The next day, in a group discussion, show the students the stalk of celery. The students will be able to clearly see the tubes that carry water up the stalk of the celery. Explain to them that plants have a tube system in which water travels carrying dissolved food from the soil to all of the plant's parts.

III. Follow-Up

A. As a group, weigh the celery on a scale. Record the weight and date. Place the celery on a paper towel in the science center for several days for the students to observe. As a group, weigh the celery every other day for 2 weeks and record the difference. Discuss the weight difference with the students. Ask them why there is a weight difference. Tell them that the water is drying up or evaporating. Have the students describe the appearance of the celery. Ask them why it looks the way it does.

B. Dramatize the action play:

**THE FARMER PLANTS THE CORN**
(Tune: The Farmer in the Dell)
Original words by Cindy Taylor

*(Action: Children are in circle on their knees. A child goes around and gently pushes the body down {the seeds}.)*
The farmer plants the corn.
The farmer plants the corn.
Hi Ho the dario
The farmer plants the corn.

*(Action: A child goes around the circle using hand motions to sprinkle rain on children {the seeds}.)*
Down comes the rain.
Down comes the rain.
Hi Ho the dario
Down comes the rain.

*(Action: A child goes around the circle making a circular sun motion over the children {the seeds}.)*
Out comes the sun.
Out comes the sun.
Hi Ho the dario
Out comes the sun.

*(Action: All children slowly stand up.)*
The corn begins to grow.
The corn begins to grow.
Hi Ho the dario
The corn begins to grow.

*(Action: The children raise hands up and sway.)*
The corn grows strong and tall.

The corn grows strong and tall.
Hi Ho the dario
The corn grows strong and tall.

*(Action: The children stop swaying and look sad.)*
It doesn't rain for days.
It doesn't rain for days.
Hi Ho the dario
It doesn't rain for days.

*(Action: The children slowly go down to the ground.)*
The corn begins to wilt.
The corn begins to wilt.
Hi Ho the dario
The corn begins to wilt.

*(Action: A child goes around the circle using hand motions to sprinkle rain on wilted corn.)*
Down comes the rain.
Down comes the rain.
Hi Ho the dario
Down comes the rain.

*(Action: The children stand tall with hands raised. Add a great big smile!)*
The corn grows strong and tall.
The corn grows strong and tall.
Hi Ho the dario
The corn grows strong and tall.

IV. Extensions

A. Cover a potted plant with a plastic bag. Secure the plastic tightly around the pot with a rubber band or tape. Place the plant in a sunny spot. Observe the plant Water drops will form inside the sealed bag. Ask the children questions such as "Where did the water come from?" (the plant and the soil) "What does this show us?" (plants have water)

B. In a group, discuss the process of condensation. Show the students two healthy potted plants. Tell the students that both plants have had plenty of water. We are going to see what happens when we stop watering one of the plants. Let the students decide which plant will get water and which one will not. Make labels for the plants "Water" and "No Water." Attach them to the appropriate plants. Have students draw pictures of the two plants.

C. Place the plants in the science center to observe. Designate a botanist to care for the plant that gets water. Discuss the appearance of both plants every few days.

## RESOURCE

Water is Your Best Friend, California Department of Water Resources, 1,4,5.

# HUNG UP ON WATER CONSERVATION

K-2

**SUBJECTS:**
Science, Art

**TIME:**
1 hour 15 minutes total
(3 activities: 40 minutes, 30 minutes, and 5 minutes)

**MATERIALS:**
2 paper plates per student
green, brown, and blue tempera paint
stapler
student sheet (included)
water drop pattern (included)
chart paper
1 wire clothes hanger per student
1 quart-size (or larger) resealable plastic bag per student
5 gallon jug

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, at least two ways people waste water;

2. Identify, orally or in writing, at least two ways people conserve water; and

3. Give an oral or written definition of conserve.

## BACKGROUND INFORMATION

There is a lot of water in the world, but only a small part of it can be used for drinking, cooking or cleaning. The rest of the world's water is either salt water (oceans), frozen (icecaps), or polluted. Since we have a limited supply of water we must use our water wisely and not waste it.

### Water Conservation Facts

1. A household can save up to 20,000 gallons of water each year by fixing leaky faucets.

2. A leaky faucet puts 3-5 gallons of water down the drain every minute.

3. More than five gallons of water is wasted if the tap water is running while brushing teeth.

4. Only 1/2 gallon of water is used if the toothbrush is just wetted and rinsed. Savings: Up to 4 1/2 gallons each time teeth are brushed. Fill five gallon jugs with water to demonstrate how much water is wasted.

5. Washing dishes with the tap running can use an average of 30 gallons of water.

6. Washing dishes (by hand): Fill basin, wash the dishes; empty basin; fill basin; rinse dishes; use about five gallons of water. Savings: 25 gallons each time dishes are washed.

7. Washing a car at home, using a hose, uses up to 150 gallons of water.

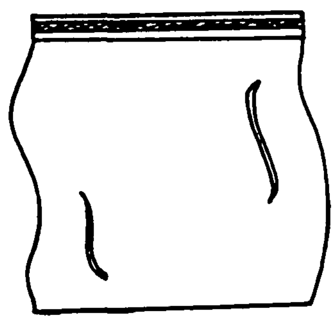
8. Washing a car: Washing it at a self-service car wash, uses 5-10 gallons. Using a sponge and a bucket, uses 15 gallons. Savings in each case: Over 100 gallons of water.

Term

**conserve**: save, protect, keep; to use a resource wisely and efficiently.

## ADVANCE PREPARATION

A. Cut through the zippered corners of each resealable plastic bag.



## PROCEDURE

I. Setting the stage

A. Share the background information.

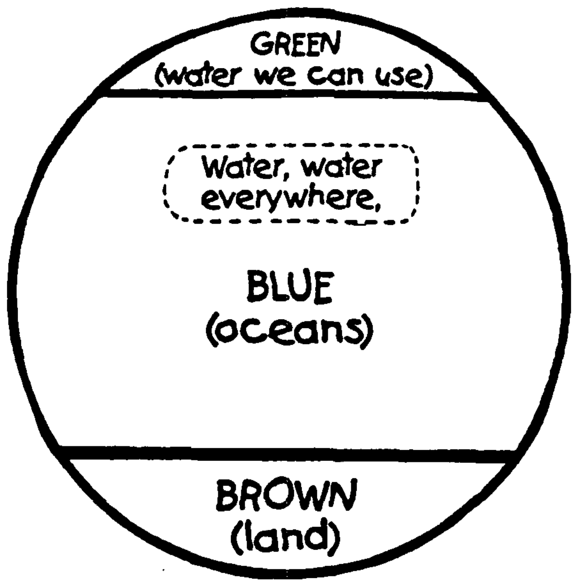
B. Let each student tell one way people waste water and/or one way people conserve water. Write their responses on chart paper:

| PEOPLE WASTE WATER WHEN THEY: | PEOPLE CONSERVE WATER WHEN THEY: |
|---|---|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |

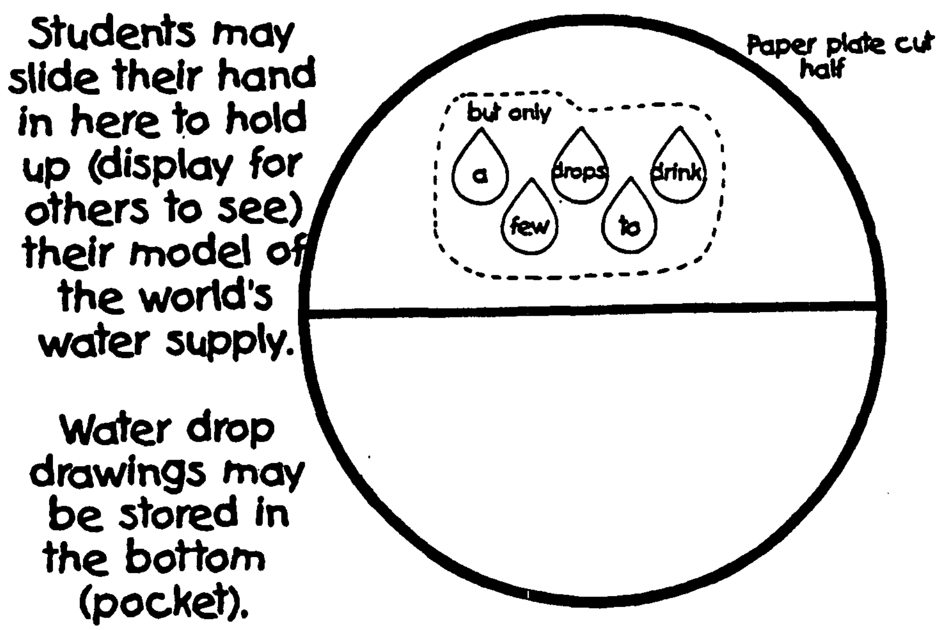
II. Activities

A. The students will make paper plate representations of the world's water supply.

1. Have the students paint a paper plate according to your instructions:




2. When the paint is dry, cut another paper plate in half and staple both halves to the back of the painted plate:



3. Give each student a copy of Student Sheet A. Have him/her cut on the dotted lines and glue:

| | |
|---|---|
| "WATER, WATER EVERYWHERE" | to the painted part of the paper plate project |
| "BUT ONLY A FEW DROPS TO DRINK" | to the back (top half) of the paper project |

B. Students will draw pictures of examples of water being wasted and conserved.

1. Review the chart lists (see Setting the stage).

2. Give each student two large water drop shapes (Student Sheet B) and these instructions, "On one water drop shape, draw a picture of a way people waste water. On the other water drop, draw a picture of a way people conserve water. When you're finished, cut them out and store them in the pocket on the back of your paper plate project."

III. Follow-Up

A. Copy Student Sheet B for each student. Have each student make an additional water drop drawing and place it in one of the prepared resealable plastic bags. Snap the bag to the bottom of a wire clothes hanger. Display on a bulletin board.

IV. Extension

A. Give each student approximately two cups of water in a plastic container, another shallow plastic container, a teaspoon, and some salt. Say, "Let's pretend this water represents all the water in the world. When I say 'Go', dip the water with your spoon quickly but carefully into the other container. 'Go'." Play a waterrelated song for one minute. Say, "Stop." "Sprinkle the salt into the large container. Let's pretend this water represents all the ocean water. Look at the water you dipped out. Let's pretend this represents the water we have to drink and use. Which one is more? Do we have a lot of water to use? Do we need to conserve water? How could we use this fresh water instead of pouring it down the drain?" (Follow one or more of the suggestions). "Could we use the salt water for anything?" Discuss.

## RESOURCE

Brownlee, Sharon, "Living With Our Legacy", U.S. News and World Report, April 23, 1990.

Student Sheet A

Water, water everywhere,

but only

a

few

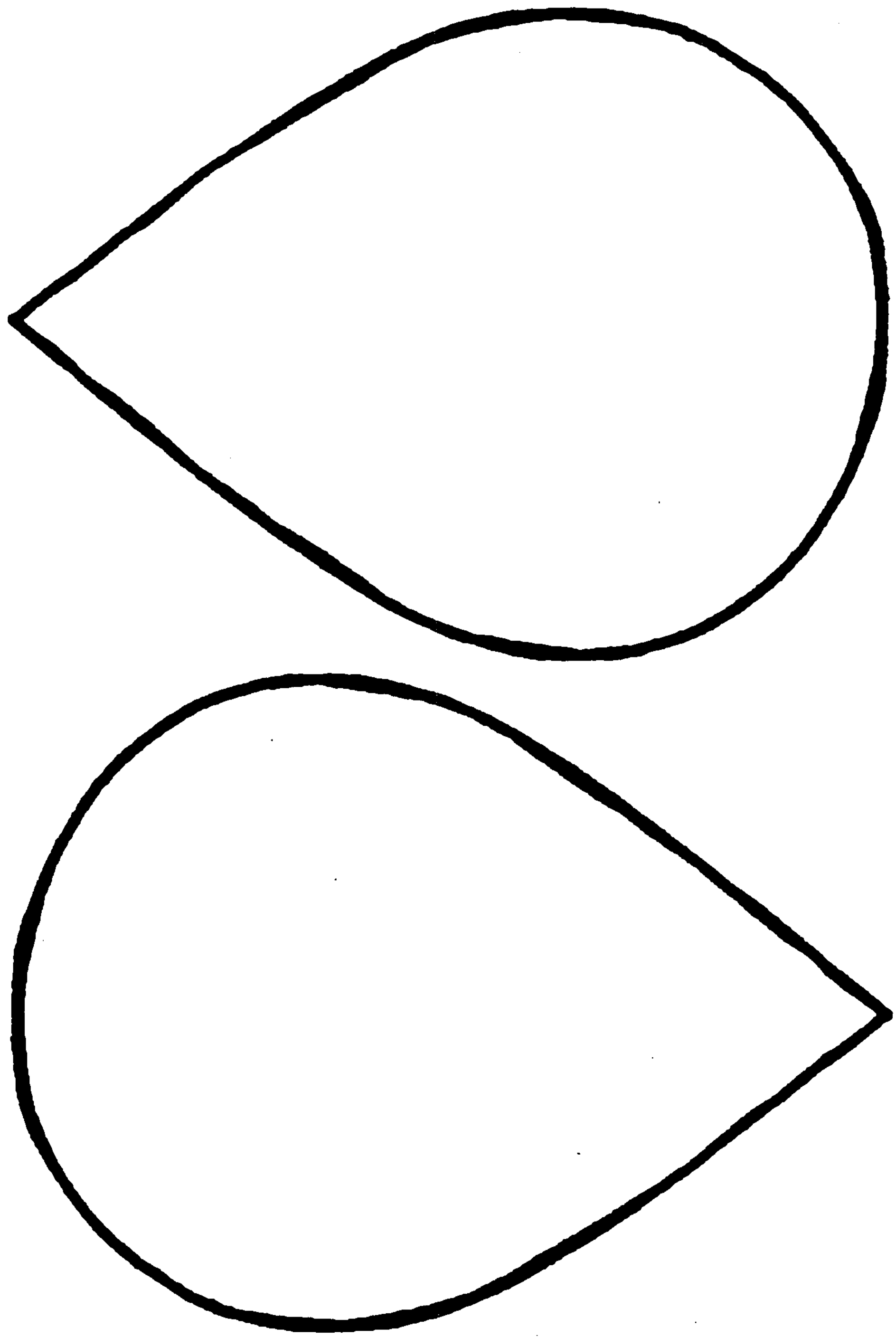
drops

to

drink.

## Student Sheet B

# Water drop pattern for activity B-2



# CONSERVE EVERY DROP!

K-2

## OBJECTIVES

At the end of this lesson, the students shall do the following:

1. Describe, orally or in writing, uses of water in the school;
2. Make a list of water conservation practices; and
3. Give an oral or written definition of conserve.

**SUBJECTS:**
Science, Language Arts

**TIME:**
45 minutes

**MATERIALS:**
2 poster boards or chalkboard
markers
blue construction paper
white paper

## BACKGROUND INFORMATION

Water is a liquid we need in order to live. People, plants, and animals cannot live without water. There are three basic ways to conserve water.

1. Economize: Become aware of the amount of water you use and try to find ways to conserve.
2. Repair any leaks that waste water.
3. Reuse water when possible.

Term

**conserve**: save, protect, keep; to use a resource wisely and efficiently.

## ADVANCE PREPARATION

A. Make raindrop-shaped books for each student.

## PROCEDURE

I. Setting the stage

A. Chant the attached Water Walk poem.

B. Take your class on a water walk through the school. Find examples of good water conservation and water misuse.

C. Teacher records student's responses.

II. Activities

A. Brainstorm with the class to make two class posters: one with water conservation and the other on water waste. Make a web of each with recorded responses from the water walk.

III. Follow-Up

A. Make Rain Drop Conservation Books. Let students look at the class web and make book shaped like a rain drop (pattern included). Each student should illustrate four ideas to conserve water.

B. Have the students select an address from the following list. These organizations will send booklets about ways students can help to save the environment. Include the student's name, complete address, and two first-class stamps.

Adopt-a-Stream
P. O. Box 5558
Everett, WA 98201

Alliance for Environmental Education
211 Wilson Blvd
Arlington, VA 22201

American Forestry Association
P. O. Box 2000
Washington, D.C. 20036

Center for Marine Conservation
1725 DeSalles St, N.W., Suite 500
Washington D.C. 20036

Environmental Defense Fund
257 Park Avenue, South
New York, NY 10010

Friends of the Earth
218 D Street, S.E.
Washington, D.C. 20003

The International Crane Foundation
E-11376 Shady Lane Road
Baraboo, WI 53913

National Audubon Society
915 Third Avenue
New York, NY 10022

National Geographic Society
Educational Services
17th & M Streets, N.W.
Washington, D.C. 20036

National Recycling Coalition
1101 30th St, N.W., Suite 305
Washington, D.C. 20007

National Wildlife Federation
1412 16th St. N.W.
Washington, D.C. 20036

Renew America
1400 16th St N.W., Suite 710
Washington, D.C. 20036

Sierra Club
730 Polk Street
San Francisco, CA 94109

Whale Adoption Project
P. O. Box 388
North Falmouth, MA 02556-0388

IV. Extension

A. For a homework assignment have each student use the student activity page "Every Drop Counts" (included) and go for a water walk at home. Illustrate good water conservation and water misuse in the home.

## RESOURCE

Southwest Florida Water Management District, 2379 Broad St, Brooksville, FL 34609-6899.

# WATER WALK ACTIVITY

**Look for the following examples of water use or misuse:**

We're going on a water walk,
What will we see?
Head out on the sidewalk,
Just follow me!

(drinking fountain, hoses, raindrops, drips, and runoff)

We're going on a water walk,
What will we see?
Head out to the lunchroom
Just follow me!

(sinks and faucets, coffee pot, pitchers, ice machine)

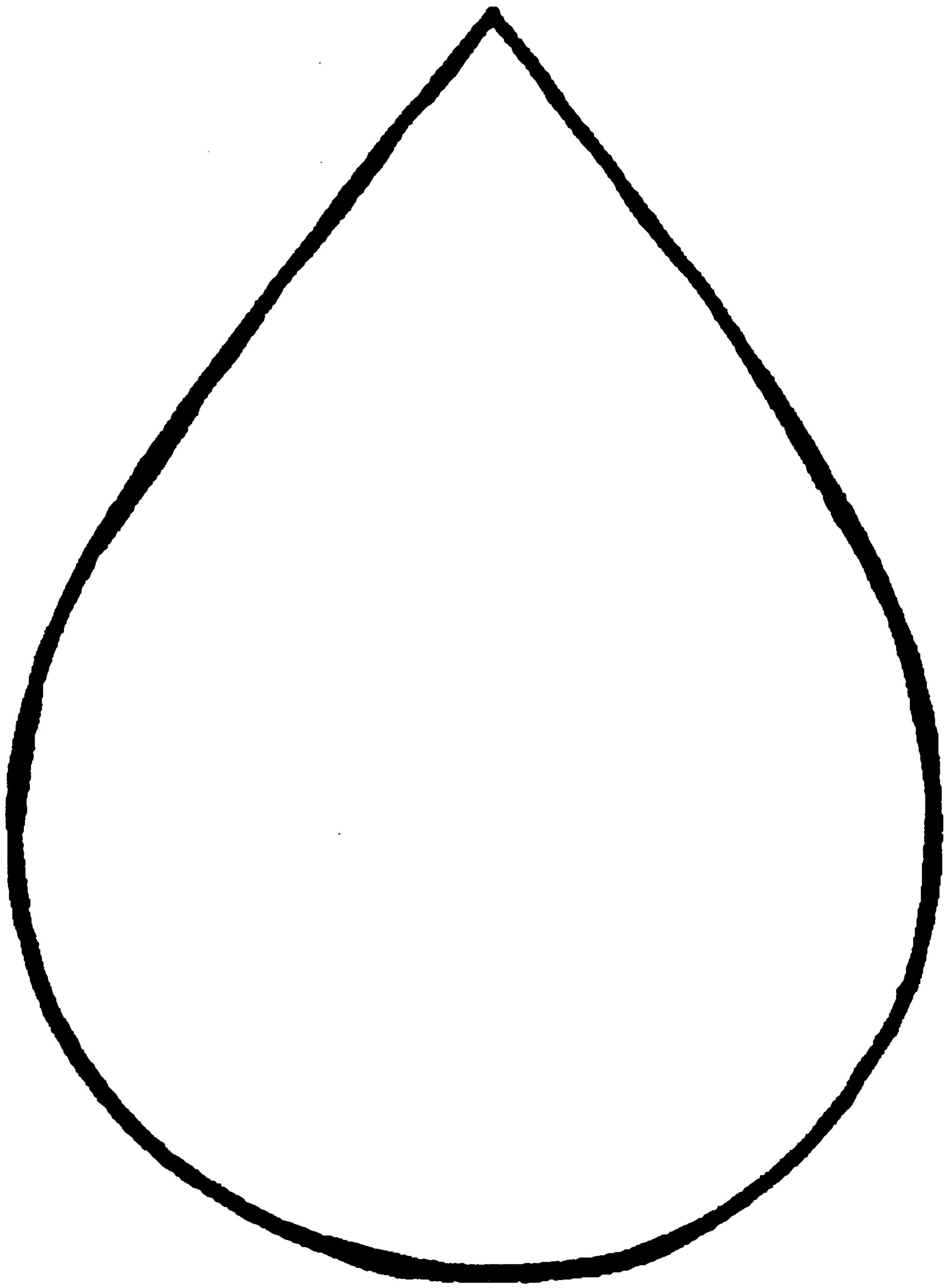
We're going on a water walk,
What will we see?
Head to the playground,
Just follow me!

(puddle, retention pond, dark clouds, hose, spigot, sprinklers, dew)

We're going on a water walk,
What will we see?
Head to the classroom
Just follow me!

(aquarium, toilet & sink, paint trays, sweat, a/c units, and lunch boxes)

# Pattern for Raindrop Conservation Books



# EVERY DROP COUNTS

Take a water walk at home. Record your finding below.

| Good use of water in my | Bad use of water in my |
| --- | --- |
| | |

# WATERVILLE, U.S.A.

K-2

## OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. List, orally or in writing, at least three neighborhood jobs which relate to water.

**SUBJECT:**
Art

**TIME:**
1 hour

**MATERIALS:**
butcher paper
pencils
crayons
empty cardboard toilet tissue rolls (at least one per student)
miscellaneous art materials:
- markers
- tissue paper
- glue
- yarn
- lace
- material scraps

## BACKGROUND INFORMATION

Every city and town has lots of jobs which are related to water. There are obvious jobs like waste treatment workers and less obvious jobs like soft drink plant workers or firemen.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Brainstorm ideas with the class to come up with a list of places (buildings and businesses) which are found in most towns and cities. Beside each business or building list people that have water-related jobs.

II. Activities

A. Divide your class into four groups. Give each group a long piece of butcher paper. Tell them to draw a street down the middle (lengthwise) of the paper. Side streets may be drawn if so desired. Tell them to draw houses, buildings, and businesses to create a neighborhood.

B. For each corresponding water-related building, make a puppet using toilet tissue rolls and miscellaneous art materials. Examples:

House - plumber
Restaurant - dishwasher
Fire Station - fire fighter
Car Wash - employee
Coca Cola Plant -factory worker
Pool - lifeguard

III. Follow-Up

A. For each puppet a student makes ask, "How is water used in this person's job?" Write the response on an index card or small piece of paper. Place the card inside the toilet tissue roll puppet.

B. Let each student show his/her puppet and tell how the puppet's occupation relates to water.

C. Use an acrostic for each profession that illustrates how they use water.

Example:
D - rinking
O - perations
C - leaning instruments
T - rips by ship
O - cean vacations
R - iver boating

IV. Extensions

A. Laminate the butcher paper play mats. Allow the students to play with the puppets on the mats.

B. Write play skills for the puppets and/or create other puppets.

## RESOURCE

DeBruin, Jerry, Young Scientists Explore The World of Water, Good Apple, Inc., Carthage, IL, 1985.

# FILL IT UP: WATER STORAGE TANKS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Discuss the purpose of water storage tank in water systems;
2. Conduct an experiment with water pressure and gravity flow; and
3. Create a water quality logo to be used on water tanks.

**SUBJECTS:**
Science, Language Arts, Art

**TIME:**
45 minutes

**MATERIALS:**
coffee can
3 rulers
nail (large)
hammer
water pitcher
dish pan
crayons or markers
posterboard

## BACKGROUND INFORMATION

Almost all public water systems use water tanks for storage. Water is usually supplied by wells or a surface water treatment plant and pumped into the network of pipes carrying water to customers, called the distribution system. Storage tanks are present in the distribution systems of water systems to hold water for use by customers. Water use can be supplied by storage tanks and as these tanks become partially empty, pumps from the water source turn on to provide water. Water not used by the customers is available to refill the storage tanks. Therefore the water changes out in the tanks almost daily and stays fresh. The height of the tanks and, thus, the level of water in the tank provides pressure to move the water through pipes to customers and provides the pressure needed at each household. Ground tanks are more economical to construct than elevated tanks but must be located on a high hill to provide the elevation to provide pressure. For each 2.3 feet of elevation, one pound of pressure is available and thus a tank 120 feet tall when full can provide 52 pounds pressure (120/2.3 = 52 psig) which is sufficient to operate a dishwasher or allow a good shower.

Standpipes are tall tanks capable of holding more water than an elevated tank of the same diameter. When the level of water is low in a standpipe, the pressure is low and thus the water level must remain high. The water in the bottom is available for emergencies such as fire fighting.

Elevated and standpipe water tanks are made of welded steel while ground tanks can be constructed of steel or concrete. Steel tanks can rust and must be protected by special paint systems. In the past, red lead paint was used as a primer paint and, as the coating wore off, the lead paint could contaminate the water inside the tank. Today, no lead paint is allowed and special precautions are taken when the outside paint is sand-blasted off to prevent the lead paint chips from contaminating air or food in the area.

## ADVANCE PREPARATION

A. Contact the local water utility manager to find out the location and types of water tanks in your area.

B. Take photographs of these tanks.

## PROCEDURE

I. Setting the stage

A. Look at the photographs of the local water tanks. Find their locations on a city map.

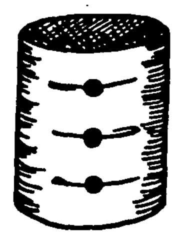
B. Share the background information.

C. Classify the local water tanks as elevated, ground, or standpipe.

II. Activities

A. Experiment to demonstrate water pressure and gravity flow.

1. Make three holes in the coffee can and plug them with paper plugs that can be easily removed. Fill the can with water.



2. Have students hold a ruler out beside each hole. Simultaneously remove the plugs and allow the water to spray into the dish pan. Measure the greatest projection from each hole.

3. Compare the measurements and hypothesize about why this happened.

4. Run a second test to check your results. How is this knowledge important to designers of water tanks?

B. Create a design and a logo for the sides of a water tank. The message should convey an environmental message. Choose any of the water tank designs. These could be made poster board size and used as a hall display.

III. Follow-Up

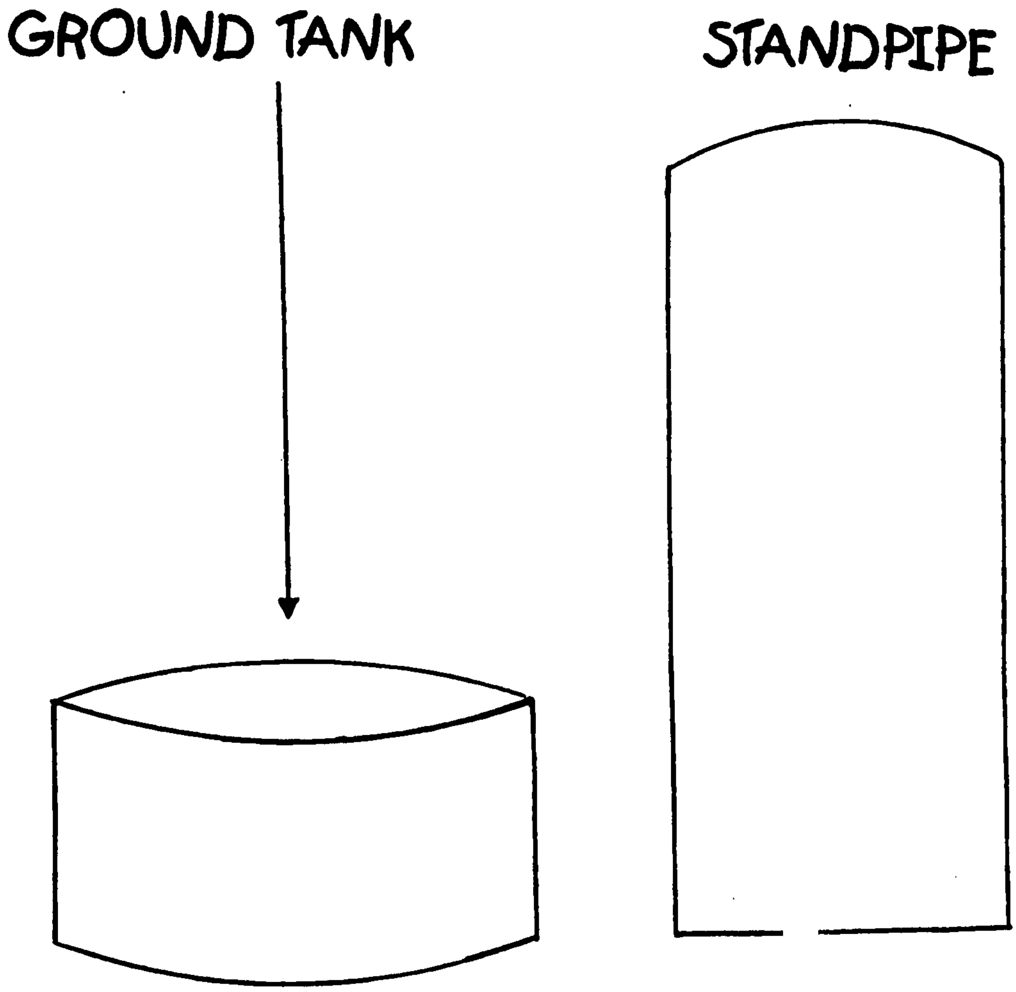
A. Invite the local water utility manager to your classroom to talk about local water tanks. Ask questions about how they are cleaned and how long the water is stored.

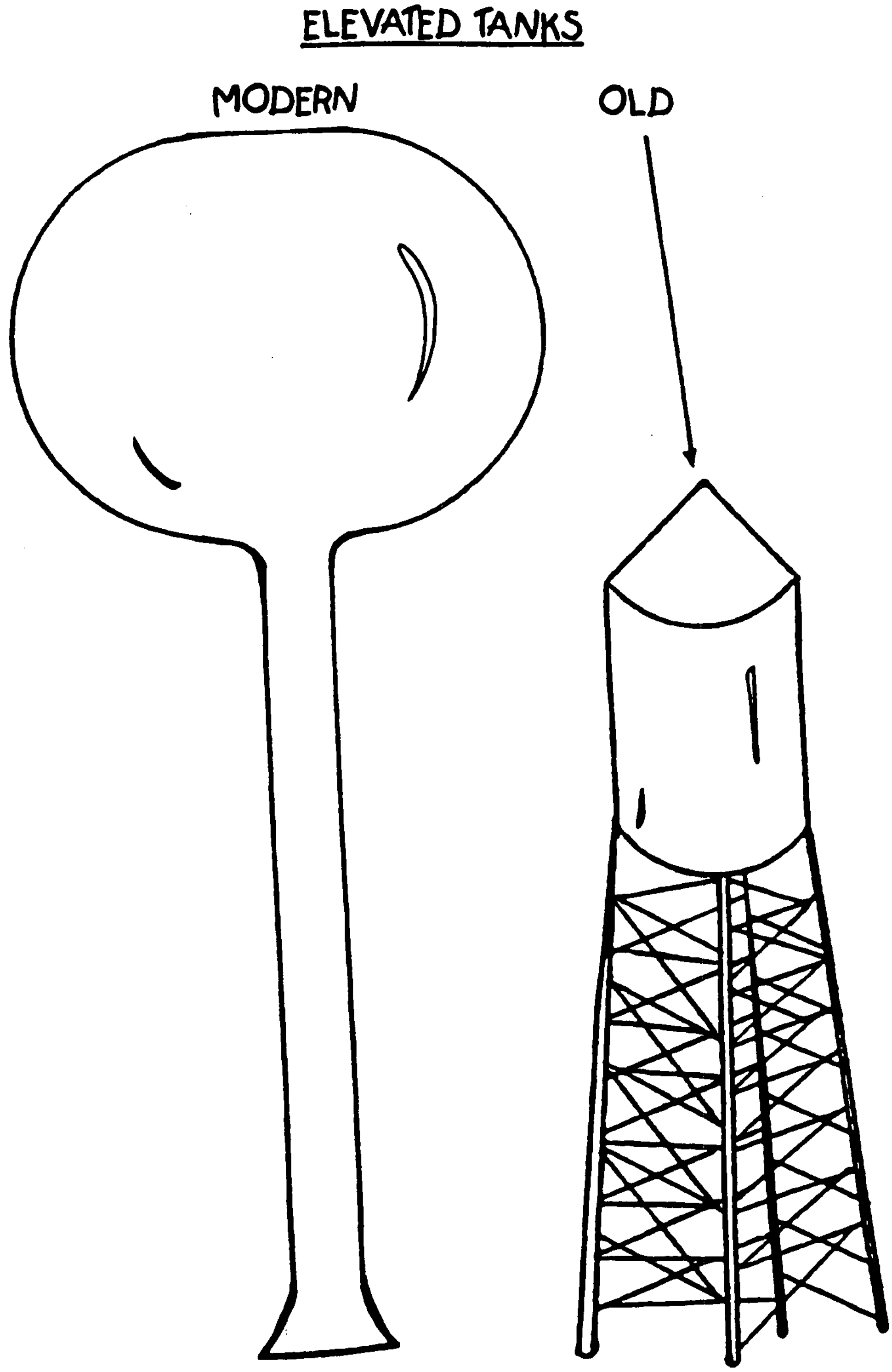
IV. Extension

A. Investigate how large water tanks are used to train astronauts for working in weightlessness.

## RESOURCE

Waste Not!, Eco Amigos Issue 2,, National Resource Division of International Paper, Palatine, IL, 1995.


GROUND TANK
STANDPIPE


ELEVATED TANKS
MODERN
OLD

# WHAT IS A SEPTIC TANK?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, the septic tank as a method of wastewater treatment;
2. Tell or write how a septic tank works;
3. Name, orally or in writing, the basic parts of a septic tank; and
4. Give an oral or written definition of the new terms: drain field, effluent, sludge, and septic tank.

**SUBJECTS:**
Science, Math

**TIME:**
1 hour

**MATERIALS:**
1 plastic or aluminum container (6-8 inches deep)
potting soil
gravel
1/2 gallon paper milk carton, labeled "House"
1 quart paper milk carton, labeled "Septic Tank"
plastic straws
clay
chart paper
cup or container for water
blackline master for "How a Septic Tank Works"
tack or small nail

## BACKGROUND INFORMATION

Septic tanks are used to treat sewage in many rural areas that are not served by public sewers.

A septic tank is a large container usually made of concrete. The tank is buried underground at individual buildings.

Sewage flows through pipes that connect the septic tank to the building. The solids in the sewage sink towards the bottom of the tank where anaerobic bacteria break them down into carbon dioxide, methane, and water. The undigested residue (sludge) stays on the bottom of the tank. The effluent from the septic tank containing the remaining liquid waste, flows through a piping network to a drainfield. Here, perforated pipes surrounded by gravel slowly release the wastewater into the soil where bacteria finish the treatment process.

Soil bacteria continue to destroy the remaining organic material in the effluent.

Solids (sludge) that remain at the bottom of the septic tank must be periodically pumped out and taken to a sewage treatment plant.

Terms

**drain field:** the part of a septic system where the wastewater is released into the soil for absorption and filtration.

**effluent**: treated wastewater, flowing from a lagoon, tank, treatment process, or treatment plant released to the environment.

**sludge**: solid material that isn't broken down by bacterial digestion which settles to the bottom of septic tanks or wastewater treatment plants; it must be pumped out and disposed of in landfills, application to land, or by incineration.

**septic tank**: a tank, commonly buried, to which all of the wastewaters from the home should flow and in which, primary digestion of the organic matter occurs by anaerobic bacteria; the main part of a septic system where scum and solids accumulate; derived from "sepsis" meaning "putrid decay" or "decay without oxygen."

**wastewater**: water that has been used for domestic or industrial purposes.

## ADVANCE PREPARATION

A. Find a picture of a septic tank.

B. Construct a septic tank model. (See diagram.)

1. Fill an aluminum roasting pan or a large plastic storage container 1/2 full of potting soil.
2. House - Place a 1/2 gallon milk carton cut to a height of approximately six inches at one end of the container. Make a hole 2 inches from the base of the carton and insert a drinking straw. Seal the connection with clay or tape to prevent leakage.
3. Septic Tank - Cut a quart-sized milk carton to a height of three inches. On two opposite sides of the carton make a hole 2 inches from the base of the carton. Connect one hole to the straw that is attached to the house.
4. Make field lines as follows:
   a. Punch a large hole in one straw.
   b. Insert another straw horizontally through the hole and seal each end with clay.
   c. Punch a large hole near the end of this straw. Insert a straw in each hole. Seal the open ends with clay.
   d. Using a tack or small nail, punch holes in each straw to allow drainage.
   e. Connect the field lines to the septic tank by inserting the middle straw into the hole in the quart carton.
   f. Test the system by pouring water into the house and checking for leaks as the water moves through the system. Use clay and or tape to seal any leaks.

g. Put a fine layer of gravel over the soil in the end of the container that represents the drain field.

h. Place the model in the container.

## PROCEDURE

I. Setting the stage

A. Ask students to think of places wastewater can be found at school.

1. Make a list on chart paper.

2. Show students some drain pipes in school (under sinks).

3. Explain that wastewater must be treated to make it safe before it is discharged into the environment.

B. Show the students a picture of a septic tank.

1. Ask students:

a. What do you think this is?

b. What is it used for? Explain that it is a septic tank used to treat wastewater.

2. Tell students they are going to learn how a septic tank works.

II. Activities

A. Display the septic tank model and give the students time to examine it.

B. Explain each part of the model.

1. House - Wastewater leaves through a pipe which is connected to the septic tank.

2. Septic Tank - Explain how solids (sludge) sink to the bottom and that liquids will flow into the field lines.

3. Field Lines - Field lines are placed on a bed of gravel. The wastewater seeps out of the holes in the field lines and passes through the gravel into the soil. Bacteria in the septic tank and in the soil destroy harmful organic material.

C. Demonstrate how the septic tank works by pouring water into the house and letting students observe as the water moves through the system.

III. Follow-Up

A. Give the students a copy of the blackline master, "How a Septic Tank Works."

1. Have the students label the parts of the septic tank system.

2. Use a blue crayon to color the path of wastewater movement through the system.

3. Use a brown crayon to illustrate sludge that settles in the septic tank.

B. Divide students into pairs. Ask each student to use the blackline master to tell his/her partner what happens to wastewater in a septic tank system.

IV. Extensions

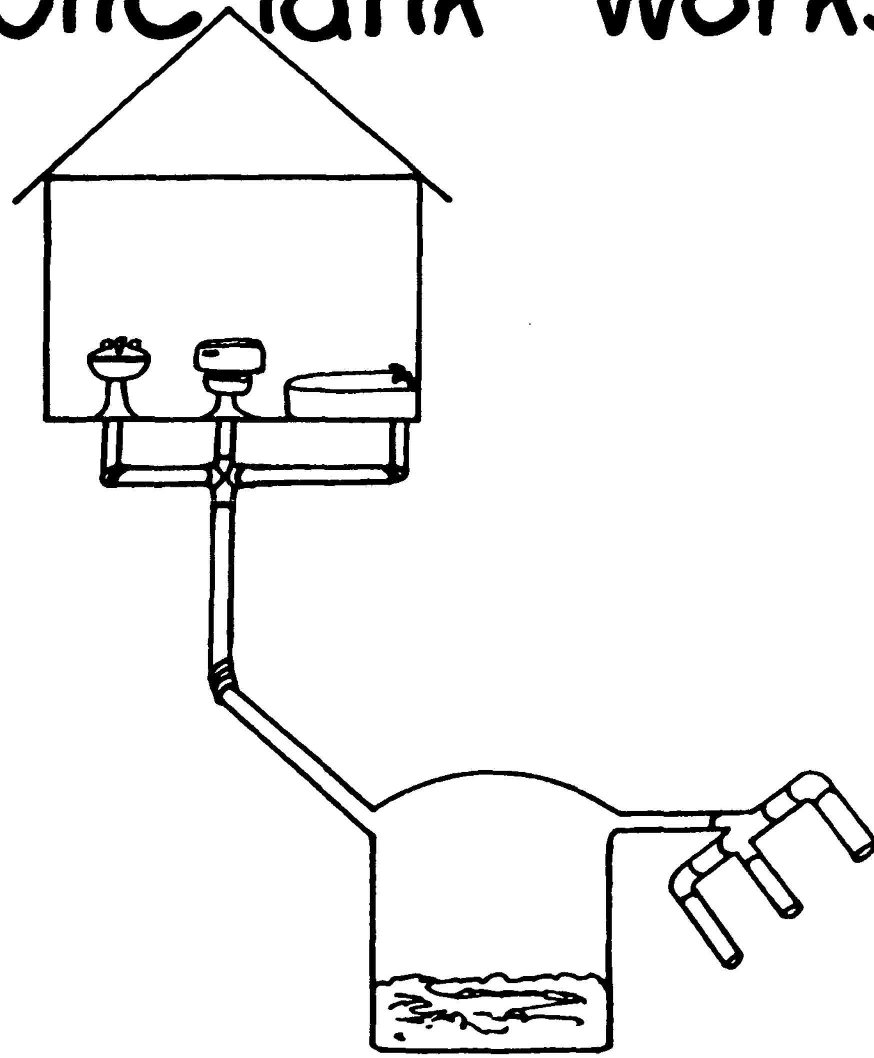
A. If possible, visit a site where a septic tank is being installed.

B. Ask each student to find out if his/her house has a septic tank for treating wastewater. Graph the results of the survey.

## RESOURCE

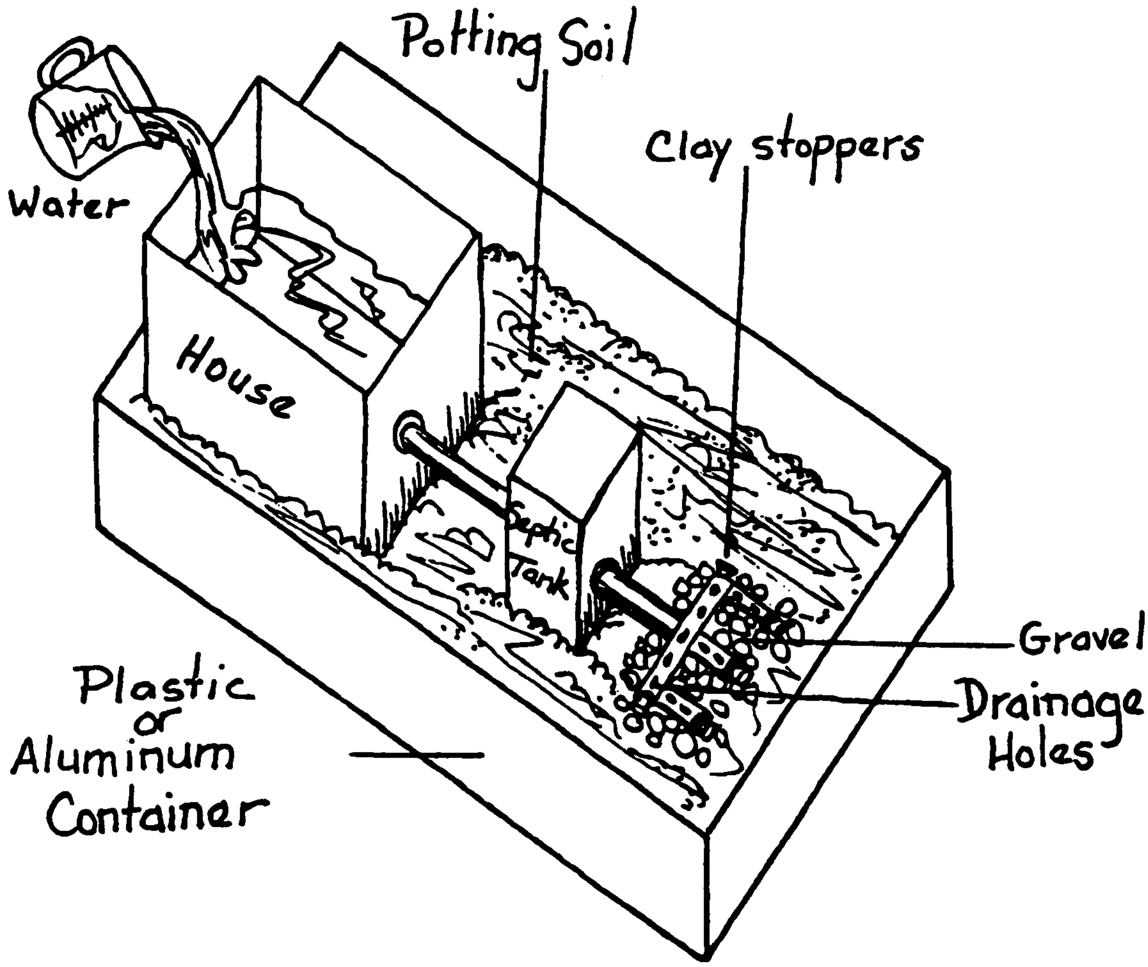
Biddulph, Fred and Biddulph, Jeanne, Getting Rid of Waste Water, Wright Group.

# How A Septic Tank Works



1. Label the following;
   drainage pipes
   sludge
   septic tank
   field lines
2. Color the flow of waste water blue. Color the sludge brown.

Diagram


Potting Soil
Clay stoppers
Water
House
Septic Tank
Gravel
Drainage Holes
Plastic or Aluminum Container

# SO MUCH WATER, SO LITTLE TO DRINK

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Discuss water concepts;
2. Observe, record, and compare, orally or in writing, the amount of the Earth's surface covered by land and by water;
3. Observe, record, and compare, orally or in writing, the amount of fresh water vs. salt water;
4. Give an oral or written definition of the new terms: fresh water, salt water, and surface.

## BACKGROUND INFORMATION

All living things on this planet are dependent on water for survival. In fact, every living organism is composed of more than 60 % water. Water is necessary for the production of food and maintenance of life. It is also used to produce energy, manufacture goods, transport goods, and provide recreational opportunities.

Because water covers 71% of the Earth's surface, it is often thought of as an endless resource. The fact is that 97% of the Earth's water is the salt water of the oceans. Only 3% of the Earth's water is fresh water and about two-thirds of that is frozen in glaciers, ice caps, and snow. Of the remaining 1%, half is in aquifers beneath the Earth's surface.

Terms

**fresh water:** inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or ground water.

**SUBJECTS:**
Science, Geography, Math, Language Arts

**TIME:**
3 or 4 30-minute sessions

**MATERIALS:**
2 pieces of butcher paper
1 egg
1 apple
standard globe
"balloon" or pillow" globe
2 colored labeling dots
12-3" squares of green construction paper
12-3" squares of blue construction paper
half sheet of copier paper per child
1 sheet graphing paper per child
1 blue crayon per child
1 green crayon per child
3 sheets 12"x18" green construction paper
7 sheets 12"x18" blue construction paper
1 student booklet per child "So Much Water, So Little to Drink"
United States map
state map
1/2 cup salt water solution
1 Q-tip per child
100 1-inch cubes, all same color
1 or more pkgs. small self-stick removable notes
magazines with pictures of outdoor scenes and/or water usage (optional)
calendars with pictures of outdoor scenes (optional)
2 extra pieces butcher paper

**salt water**: water that has a high level of dissolved salts (oceans, seas).

**surface**: the outside layer of an object or organism.

## ADVANCE PREPARATION

A. Gather materials listed above.

B. Prepare charts:

| We Know | We Learned |
|---|---|
| | |

C. Cut twelve 3-inch squares each of blue and green construction paper.

D. For the "Globe Toss" tally activity, cut sheets of copier paper in half (4 1/4" x 5 1/2"); one sheet per student.

E. For the "Globe Toss" graphing activity, copy one graphing sheet per student (included).

F. Copy student books "So Much Water, So Little to Drink" (included).

G. Prepare salt solution by mixing 1/2 teaspoon salt with 1/2 cup water.

H. Prepare classification charts for extension activities "Land/Water" and "Fresh Water/Salt Water" (optional).

## PROCEDURE

I. Setting the stage

A. Ask the students to tell what they know about water. Record their responses on prepared butcher paper titled "We Know."

B. Develop an understanding of the term "surface" as being the outside layer of something. Ask, "What is on the surface of:

an egg? (shell)
an apple? (skin or peel)
a person? (skin or hair)"

II. Activities

A. Show the students a globe. Explain they they will examine how much of the Earth's surface is covered by land and by water.

1. Students will identify land masses and water masses on the globe.

2. Rotate the globe slowly and ask students if they see more land or more water.

3. Using an inflated globe or stuffed cloth globe, play "Toss the Globe."

a. Select two students to be "Globe Tossers." Put a colored sticker on each student's right thumbnail.

b. The remainder of the class will record whether the "Tosser's" right thumb is on land or water as he/she catches the globe. The globe will be tossed a total of ten times. Choose the recording technique that best complements the math skill of your class:

1) Divide the class into two teams. One team will record each time a catcher's thumb touches land by placing a 3" green square in their recording area. The other team will record each time the thumb touches water by placing a 3" blue square in their recording area.

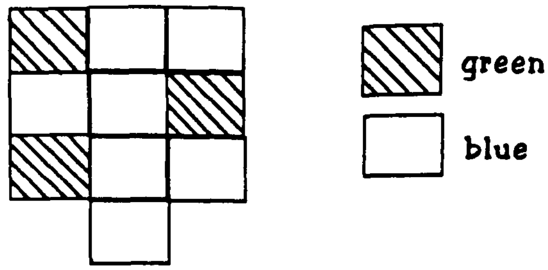
2) Each student will make a tally mark on his/her own paper using a green crayon to represent land and a blue crayon to represent water. At the end of ten throws, each student compares the green and blue tally marks. At the end of ten throws, compare results.

3) Each student will record his/her observations on the attached graph sheet. At the end of ten throws, compare results.

c. Students will discuss the results of their recordings. (The results of this activity could be different than the actual percentages of land and water. This can be discussed after the next section of this lesson. At a later time you may want to repeat the "Globe Toss" and compare results of each trial.)

B. Tell the students that you will use colored paper to better see how the amount of land and water compare.

1. Using 3" squares, place seven blue and three green squares as shown:




   a. Tell students to imagine that these papers represent the whole Earth and that it has been cut into equal pieces. Count the total number of pieces (ten).

   b. Imagine that all the water could be moved to one side and all the land to the other. (Separate the water and the land.) Ask students to describe the comparison.

   c. Count the land pieces, vocalizing the results. "Three of the ten parts are land."

   d. Count the water squares. Vocalize the results. "Seven of the ten parts are water."

   e. Move the 3" squares aside but still in full view of the students.

2. Using 12" x 18" pieces of construction paper, place three green pieces beside each other and seven blue pieces beside each other. Ask students to describe the contrast they see now.

C. Give each student a copy of the student book, "So Much Water, So Little to Drink."

   1. Read the text on page 1. Draw and color the earth.

   2. Read the text on page 2. Using blue and green crayons, color the appropriate number of spaces to represent land and water.

D. Review what was learned about the proportion of land to water on the Earth's surface in the lesson. Locate bodies of water on the globe. Encourage students to look for bodies of water other than the oceans. Is it easy to see these smaller bodies?

E. Using a large map of the United States, locate bodies of water. Identify these bodies as lakes or rivers. Compare bodies of water within your state to those located in other states. How does your state compare?

F. Examine a state map. How do bodies of water on your state map compare in size to those found within your state on the U.S. Map? Locate the body of water closest to where you live. Discuss the size of the body of water in real life compared to its size on the map.

G. Introduce the terms "fresh water" and "salt water."

   1. Ask, "Has anyone gone swimming in an ocean? Did any of the water get in your mouth? How did it taste?"

2. Give each student a Q-tip. (Caution the students to hold one end of the Q-tip but not to touch the other end since everyone is sharing the same solution and will be putting the Q-tip in their mouth). Have students dip their Q-tip into a container of "ocean" (salt) water. Taste it. Would this be good to drink? Explain that ocean water is salt water and cannot be used for drinking unless the salt is removed.

3. Explain that our drinking water comes from lakes, rivers, creeks, or bodies of water under the Earth's surface. It has relatively no salt and is called "fresh water."

H. Show the students a container in which you have placed 100 one inch cubes, all the same color.

1. Tell them to imagine that you have emptied all the water from the entire Earth (oceans, lakes, rivers, ponds, and swimming pools from the surface, and pockets of water under the surface). You have all the water from the whole Earth in this container. You have divided it into equal pieces as we did with the land and water yesterday.

2. Have the class count the cubes. (100)

3. Let individual children estimate how much of the total "water" is fresh vs salt by separating the cubes into two piles.

4. After students have made their guesses, move three cubes away from the other 97. Identify the three cubes as drinkable fresh water and the 97 as undrinkable salt water. Have students verbalize that 97 out of every 100 parts of water is salt water and that three parts of every 100 is fresh water.

I. Point to the three "fresh water" cubes. Explain that these three cubes represent fresh water, but not all of it is drinkable.

I. Set two cubes aside and identify them as fresh water but undrinkable. Ask children what happens to water when it gets very cold. (It freezes). Locate areas on the globe that are very cold. What happens to the water in these areas? (It freezes).

2. Point to the one remaining cube. Out of all the water on the Earth, only this much is fresh water that is drinkable.

3. Verbalize the quantities of total water, salt water, frozen fresh water, and drinkable fresh water.

J. Complete the final pages in the student book, "So Much Water, So Little to Drink." Color the correct number of squares on the graph of each page. Students may also draw a graphic to illustrate undrinkable water, drinkable water, and icebergs.

III. Follow-Up

A. Record student responses on "We Learned" chart.

B. Have students read "So Much Water, So Little to Drink" to classmates, older students, and parents.

C. Have students make a class big book of "So Much Water, So Little to Drink."

IV. Extensions

A. Place 1 1/2" x 2" self-stick removable notes near the maps. Students can draw a glass with a happy face for drinkable water or glass with an "X" through it for undrinkable water on the sticky notes. These notes can then be placed on appropriate bodies of water on the maps.

B. Prepare a wall display by cutting pictures of a variety of activities and environments out of magazines. Categorize the pictures by placing them under the label "Land" or "Water."

C. Cut a variety of water scenes, usage, and sources out of magazines and old calendars. Place them on a chart with labels of "Fresh Water" and "Salt Water."

## RESOURCES

Keinath, Thomas M., World Book Encyclopedia, Vol 22.

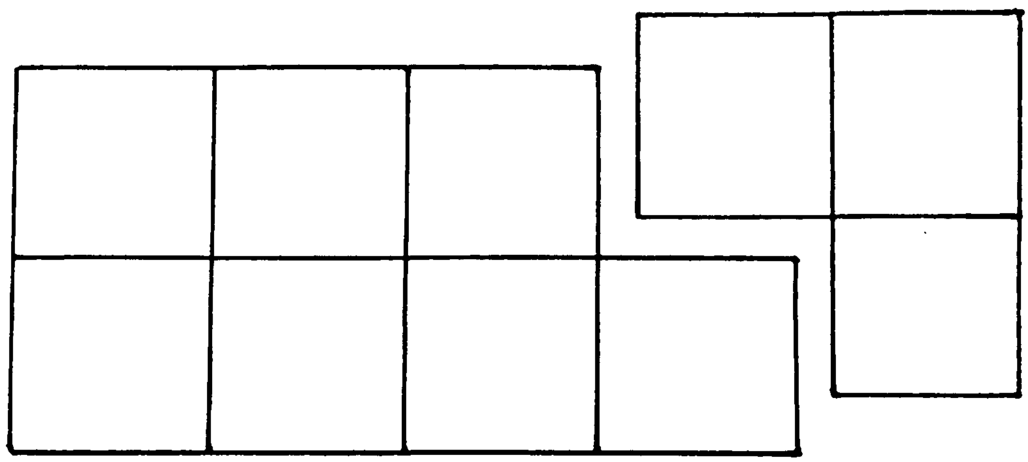
Tejada, Susan Mondshein, Geo-Whiz!, National Geographic Society, 1988.

Toss the Globe activity was taken from a workshop at Kilby School, University of North Alabama, sponsored by the Alabama Geographic Alliance.

# So Much Water, So Little to Drink

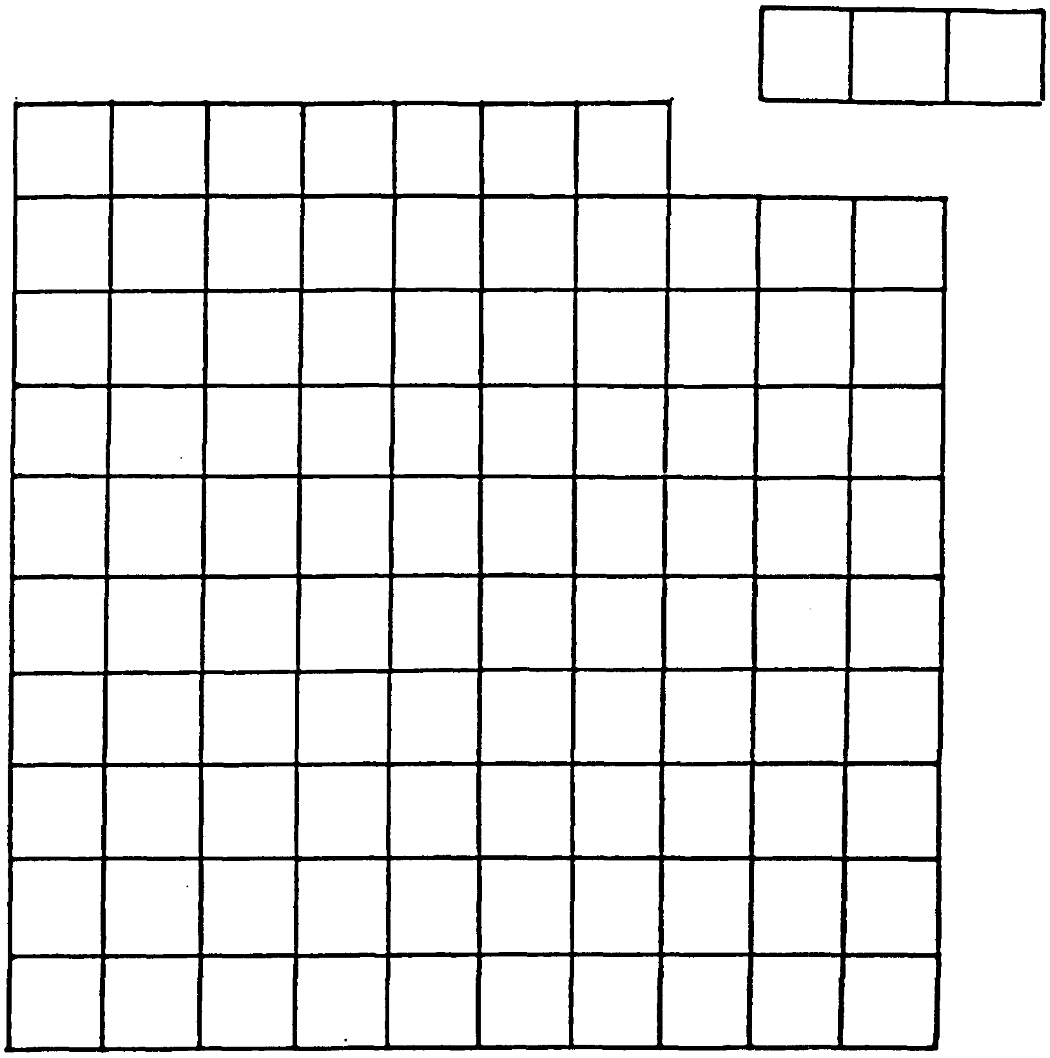
by

# 2

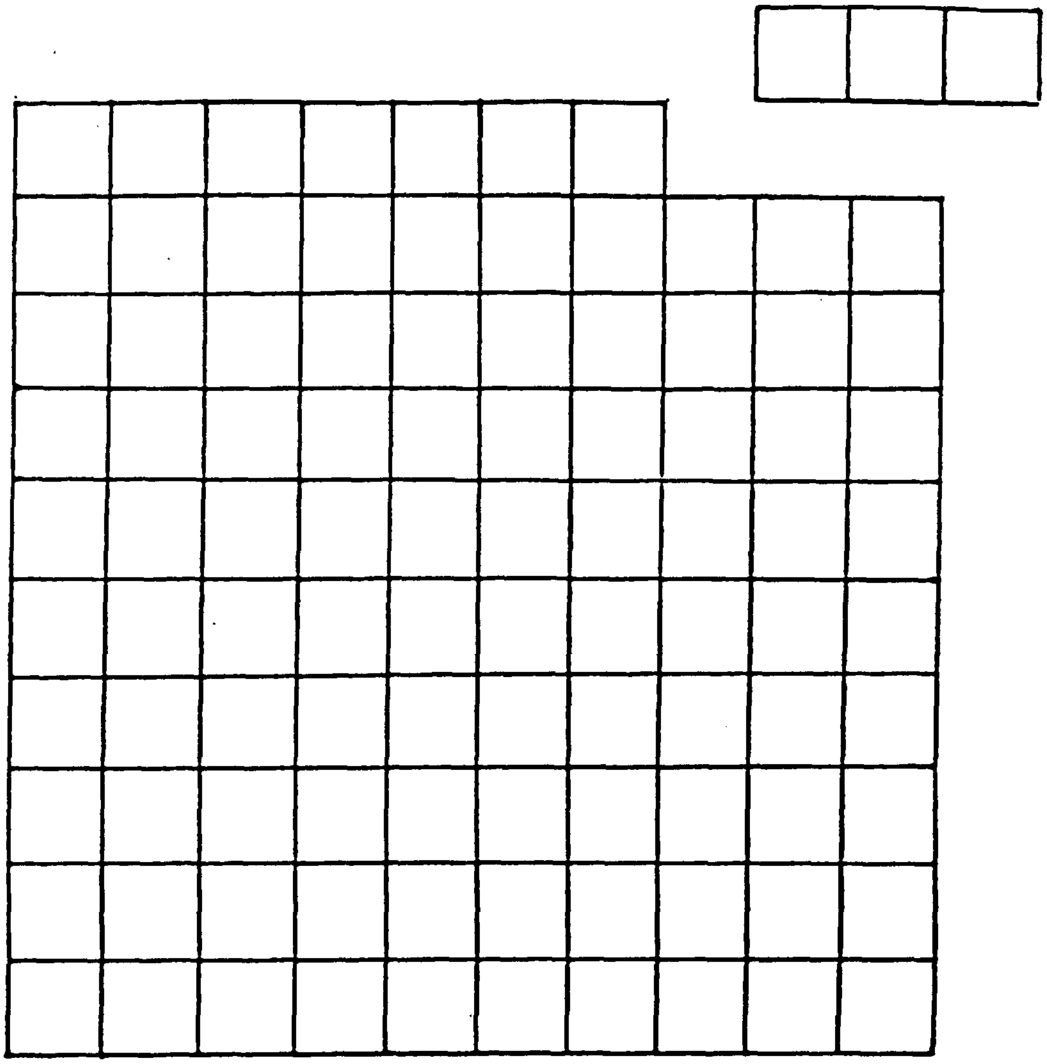


Three out of ten parts of the surface is land. Seven out of ten of the surface is water.

3

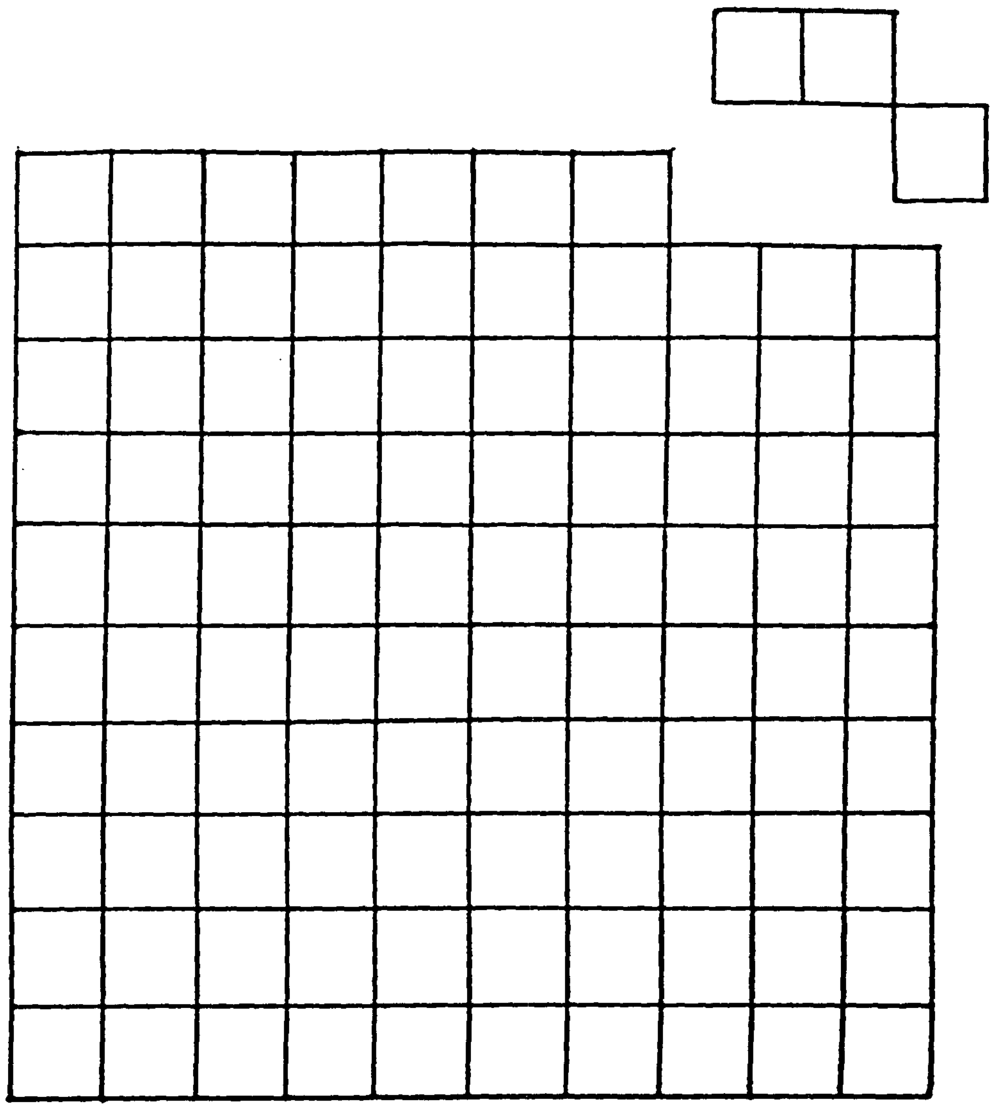


Most of our water is salty water - 97 out of 100 parts. We cannot drink salty water.



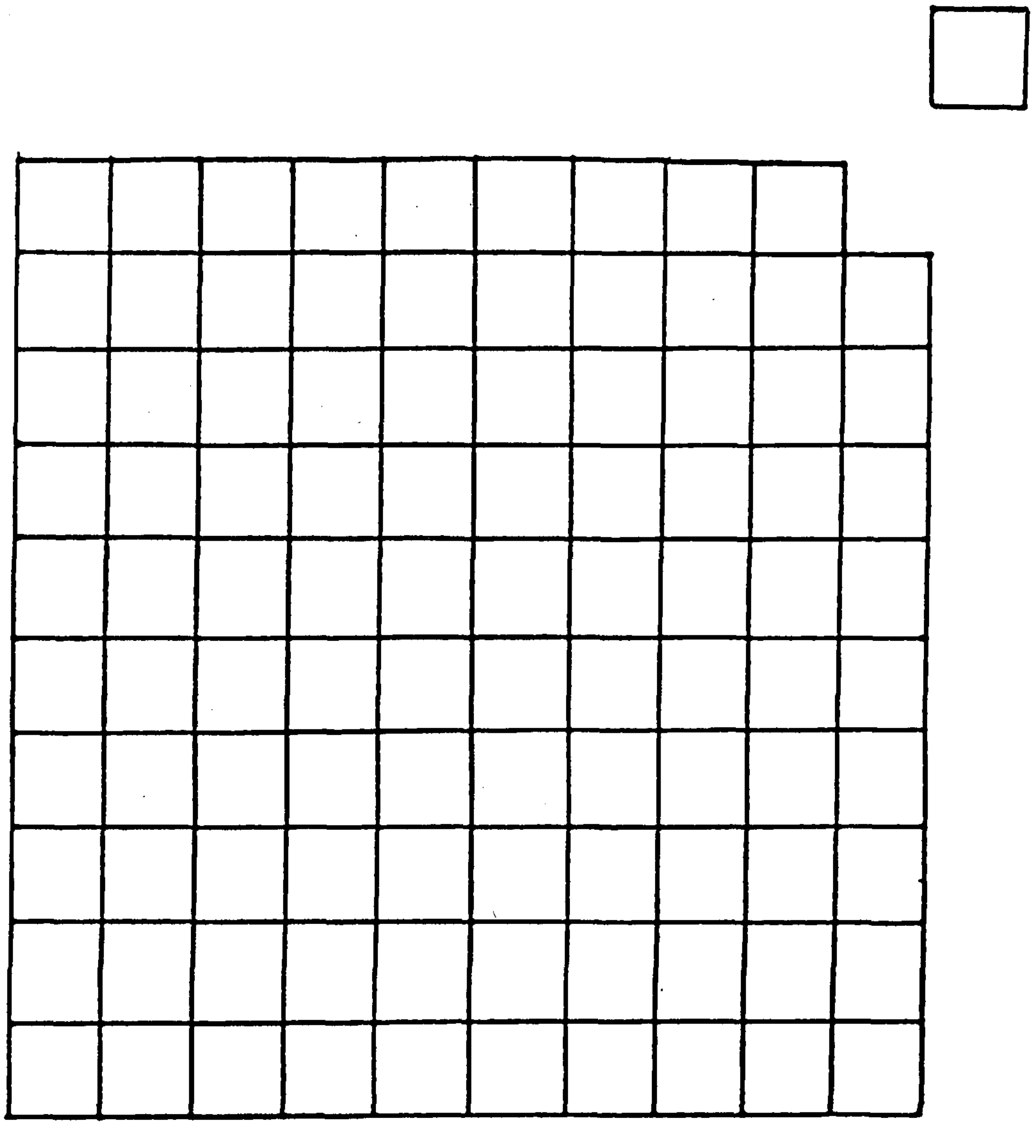
Very little water is fresh water - 3 out of 100 parts. We can drink fresh water.

# 5

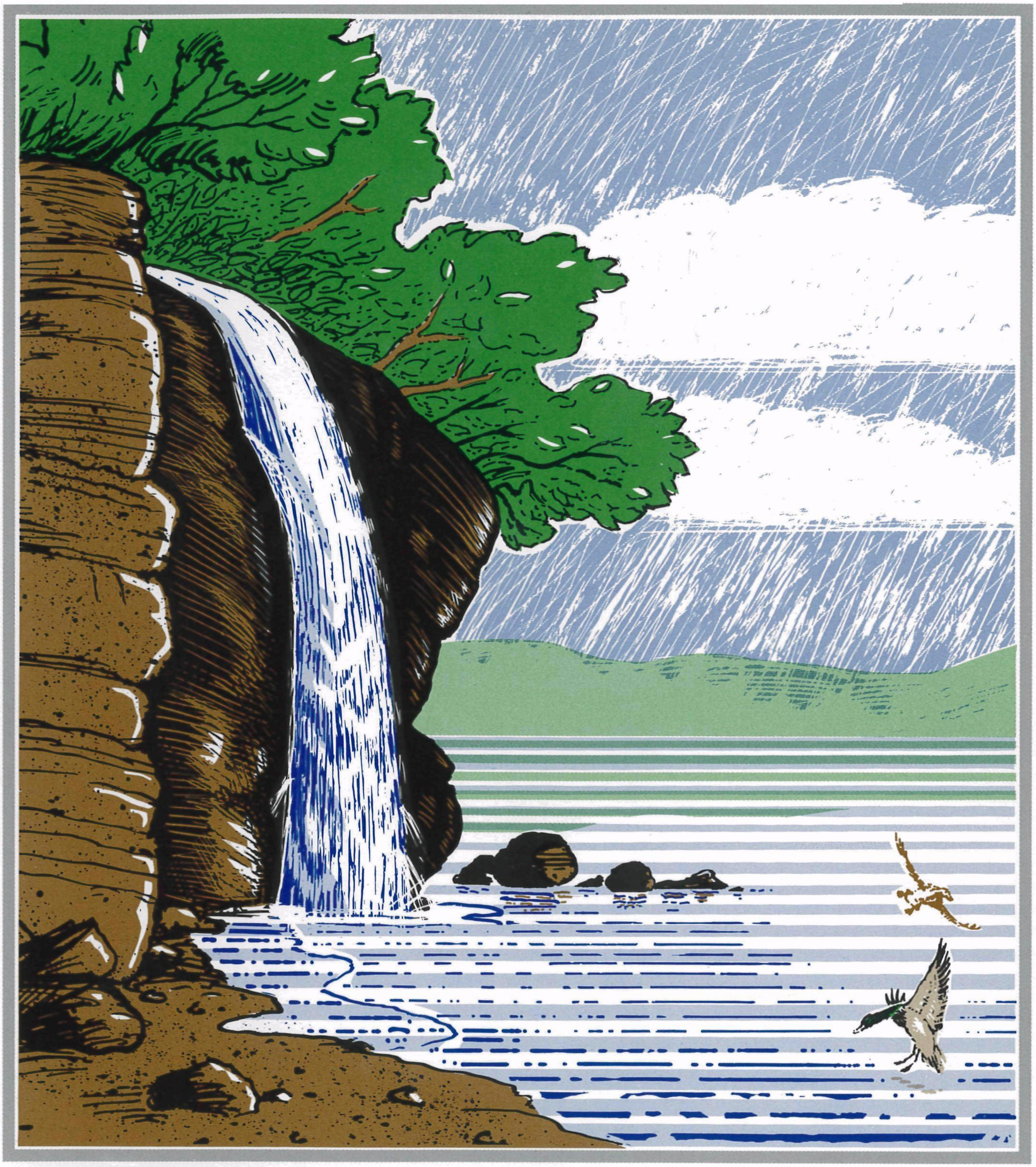


Most fresh water is frozen in icebergs. We cannot drink ice.

6



We can drink 1 out of 100 parts of all the Earth's water !



THE WATER SOURCEBOOK

# SURFACE WATER

# ICE IS N"ICE"!!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Observe and describe, orally or in writing, the different forms of water on the surface of the Earth;
2. Measure to find the approximate size of an iceberg using a familiar standard (cm ruler);
3. Estimate, orally or in writing, and measure the amount of ice that floats above the surface of the water and below the surface of the water;
4. Give an oral or written definition of the terms: air, clouds, float, freeze, gas, iceberg, liquid, snow, solid, and water.

**SUBJECTS:**
Science, Math, Language Arts, Social Studies, Music

**TIME:**
1 hour

**MATERIALS:**
1 cm ruler per student
1 pencil per student
1 picture of iceberg per student
1 irregular-shaped block of ice (prepared 1 or 2 days in advance) - gallon size freezer bag for the iceberg
Enough cool water to fill an aquarium 2/3 full
clear aquarium
strips of white paper 25 cm x 1/2 cm (optional)
scissors
water
2 quart-size resealable plastic bags
Icebergs by Jane Elliott
overhead projector
water color markers
transparency

## BACKGROUND INFORMATION

Concept: About three-fourths of the Earth's surface is covered with water. About one-tenth of the Earth's surface is covered with solid water or ice. Most of the water on the Earth is a liquid. Some places on the Earth are very cold. The water in these cold places is always frozen. We call water that is frozen either "ice" or "snow." Ice floats on water because it weighs less than water.

The Earth is a unique planet in the solar system because it is the only one on which large amounts of water exist in the liquid form. Without this water, life as we know it could not exist on the earth. It is estimated that about 10% of the Earth's surface is covered with ice. It is estimated that if the earth were a "smooth ball," and if all the ice in the polar caps were to melt, the entire earth would be covered by a layer of water more than 3 km deep.

When ice from the polar regions pushes out into the oceans, large chunks break off to form icebergs. About 9/10 of an iceberg is submerged. For every cubic meter of ice above the water, there are about 9 cubic meters of submerged ice. An iceberg (or an ice cube) floats because ice is less dense than water.

Terms

Write/introduce the following terms on individual "snowflake" cutouts to make a "snowstorm" of vocabulary words on board.

| | | | |
|---|---|---|---|
| Water | Freeze | Air | Gas |
| Snow | Float | Liquid | Solid |
| Iceberg | Clouds | | |

## ADVANCE PREPARATION

A. Gather materials from list.

B. Freeze some water in a gallon-sized plastic bag to produce an irregular-shaped ice block.

C. Make transparency of word web.

## PROCEDURE

I. Setting the stage

A. Write the word "ice" on the word web (use overhead) with water color marker. Brainstorm words that begin with the word "ice." Ex: iceberg, ice cube, ice cream, ice storm, ice cap, ice age, etc. Put on the word web after defining or describing each.

B. Read a book about icebergs such as: Icebergs by Jane Elliott.

II. Activities

A. Show a picture of an iceberg. Have children name the kinds of matter they see.
Solids - ice; snow Liquids - oceans; clouds

B. Show a picture of an iceberg. Have children estimate how tall the iceberg is. List estimates on chart on board.

C. Show a picture of an iceberg. Have children use a cm ruler to measure the height of one of the people exploring the iceberg. Compare that person's height with the height of the iceberg from water level to the highest point. (How many "people" tall is the iceberg?) Record on picture. (May want to do as a whole group activity with Kindergarten).

*If you have no cm rulers or children are too young, use strips of paper (25 cm x 1/2 cm) and have children mark the paper at intervals that are one person high. Count the intervals to see how many "people" tall this iceberg is.

D. Put cool water and the irregular-shaped ice block into aquarium. Children compare the floating ice with the iceberg in the picture.

E. Measure to see how much of the ice block is above/below the water's surface. Use a ruler to do this. Record on "Iceberg Recording Sheet."

III. Follow-Up

A. Make subtraction facts to find the difference of each child's estimate (in Activity B) with the actual height of the iceberg.

Example: Johnny 6 people tall
Tom - <u>4</u> people tall
2 people tall (difference)

Compare using terms "more","less","equal to." Write comparison statements.

Example: <u>Johnny</u> <u>Tom</u>
6 people tall > 4 people tall

IV. Extensions

A. Fill a quart-sized plastic bag with a pint of water and freeze overnight. Remove the bag the next day. Discuss what happened to the water. Fill another quartsized plastic bag with a pint of water. Children hold the two bags and compare the weight of the ice vs the weight of the water. (Ice feels lighter. It is less dense and that is why it floats on water.)

B. Float an ice cube in a glass of water. Observe to see if more of the ice cube is above the surface of the water or below the surface of the water in the glass.

C. Use globe to locate areas with lots of ice/icebergs (polar caps). Use books from resources as references.

D. Sing the song, "Frozen Water" (see attached sheet).

## RESOURCES

Cowcher, Helen, <u>Antarctica</u>, New York: Scholastic, Inc., 1990.

Elliott, Jane, <u>Icebergs</u>, The Wright Group: Applecross Ltd. (Publisher), 1994.

Williams, Geoffrey, <u>Antarctica: The Last Frontier</u>, Los Angeles: Price Stern Sloan, 1992.

## Frozen Water

(Sung to the tune of "Frere Jacques")

### First Verse

When water freezes,
When water freezes,
It weighs less,
It weighs less.

It looks like it would sink and drop,
But it floats and bobs up on the top,

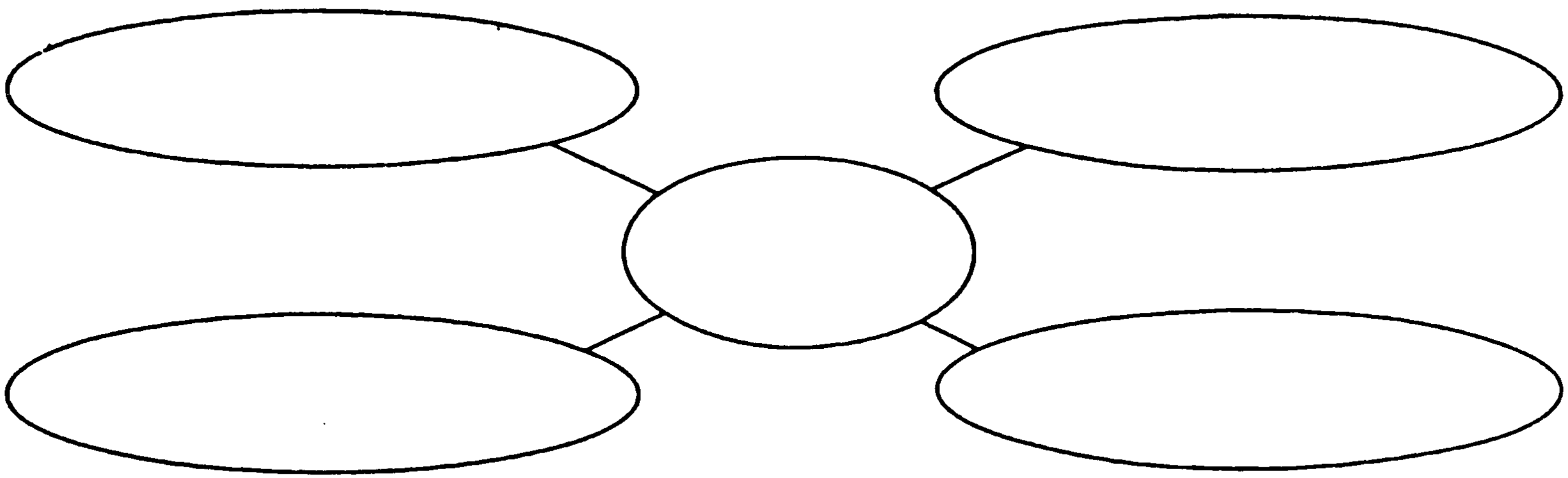
Of the water,
Of the water.

### Second Verse

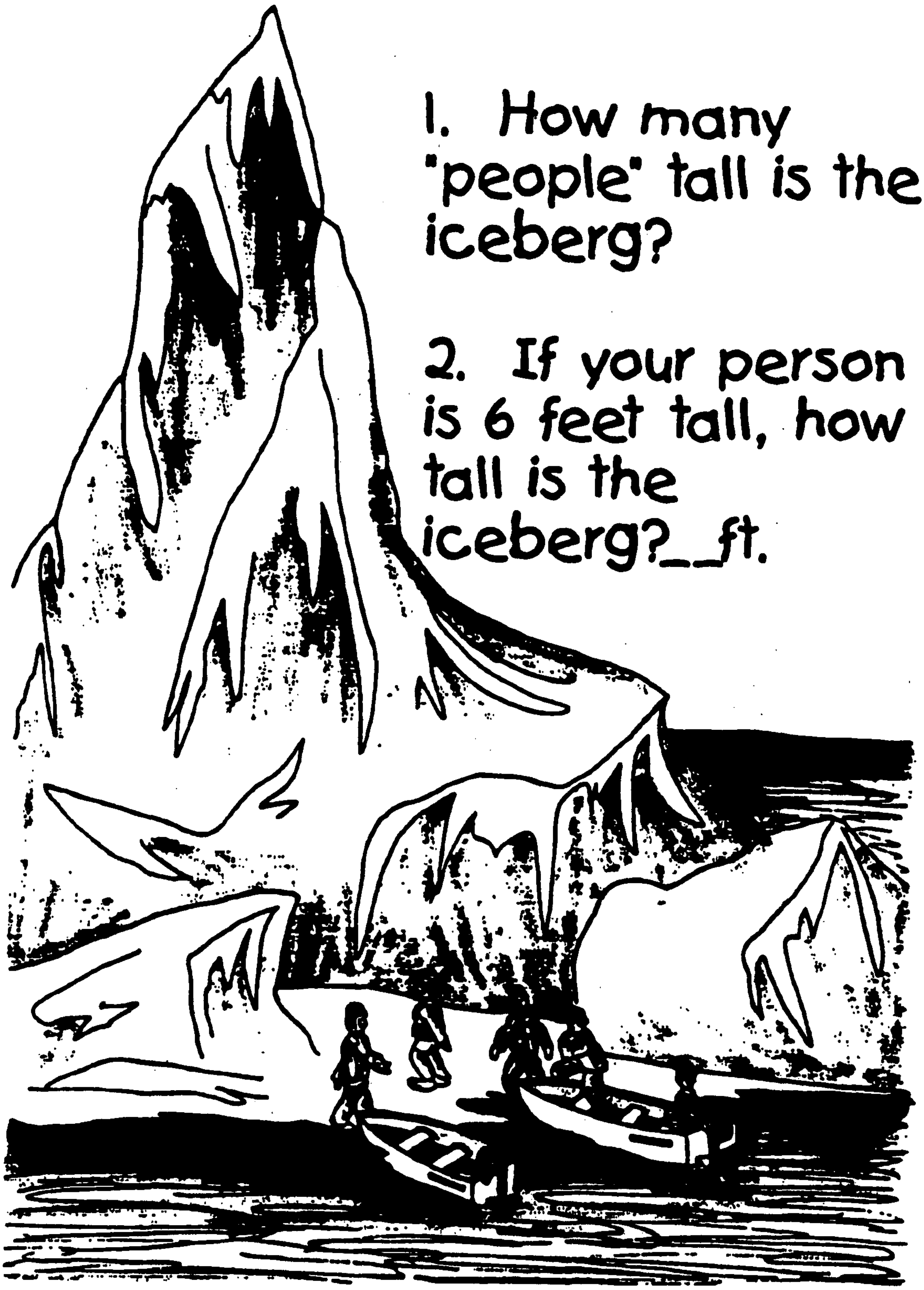
When water freezes,
When water freezes,
It's less dense,
It's less dense.

It looks like it would sink and drop,
But it floats and bobs up on the top,
Of the water,
Of the water.

# WORD WEB



These people from Greenland are exploring an iceberg that broke from a glacier.



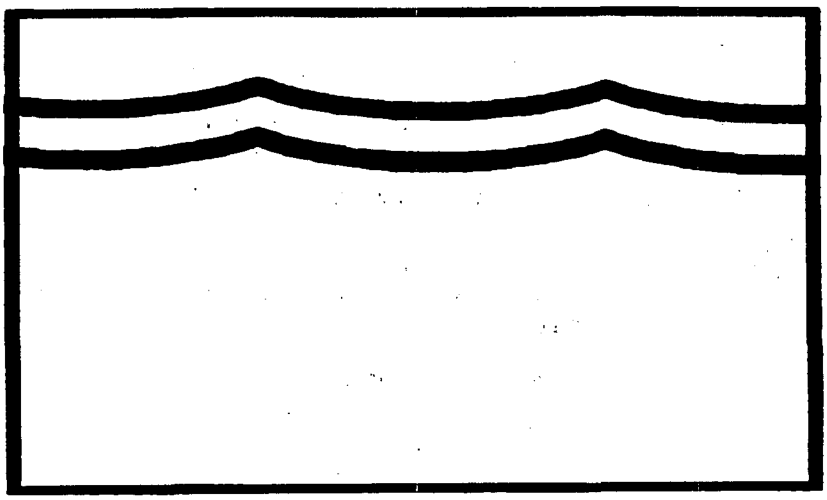
1. How many "people" tall is the iceberg?

2. If your person is 6 feet tall, how tall is the iceberg?__ft.

# "ICEBERG" RECORDING SHEET

NAME________________

This is how the aquarium filled with water looks:



1. Draw a picture of the "iceberg" after it has been placed into the aquarium.
2. How much of the "iceberg" is above the water's surface?__cm
3. How much of the "iceberg" is below the water's surface?__cm

# FLOATING CRITTERS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Create an insect which will float and repel water;
2. Revise their creations, if necessary;
3. Write or give an oral description of their insect including the number of legs and major body parts; and
4. Give an oral or written definition of insect.

**SUBJECTS:**
Science, Language Arts

**TIME:**
1 hour

**MATERIALS:**
assorted materials which will sink or float:
- pieces of polystyrene foam
- soft drink bottles/cans
- straws
- pipe cleaners
- plastic containers (margarine tubs)
- sponges
- wooden pieces
- fabric
- wiggle eyes

adhesives:
- glue
- tape
- staples
- hot glue (optional)

small pool filled with water (a large aquarium would work well, too)

## BACKGROUND INFORMATION

Many insects live on the water's surface, as well as above or below the water. These insects have special adaptations to help them float and resist water. An insect has six legs and three major body parts: the head, the thorax, and the abdomen.

Term

**Insect:** animal having six legs and three major body parts.

## ADVANCE PREPARATION

A. Have all materials freely available to students. It is very important to allow students to make mistakes. The teacher should be a facilitator, giving materials when necessary.

## PROCEDURE

I. Setting the stage

A. Review the characteristics of an insect (three body parts and six legs.)

B. Look at pictures of water striders or other animals which dwell primarily on the water's surface.

C. Discuss their importance in their habitat, and their role in the food chain.

II. Activities

A. Explain to students that they have 30 minutes to create an insect which will float. At the end of 30 minutes, have students put the insects in the water to test them.

B. Allow students any or all materials; try not to guide or intervene except to help with insect characteristics.

C. Make students aware of time restraints.

III. Follow-Up

A. After 30 minutes, go outside and test students' insects. The ones whose insects sink may make adjustments and retest their insects.

B. Have students write a description of their insects and illustrate.

IV. Extensions

A. Language - Have students name their fictitious insects and write about them. Include what they eat, where they live, and their predators.

B. Math - Practice counting by two's by counting the pairs of legs on the insects.

# THE WATER WINDOW

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. List, orally or in writing, at least three ways water can be conserved;
2. State, orally or in writing, the amount of water most Americans use daily; and
3. State, orally or in writing, the amount of water used by industry and agriculture.

**SUBJECTS:**
Language Arts, Science, Math, Art

**TIME:**
30-40 minutes for two days

**MATERIALS:**
1 plastic gallon jug
150 copies of jug pattern
a piece of yarn long enough to form the largest possible circle on the classroom floor
a piece of yarn - 45" long
1 copy of "My Water Window" poem/art project per student

## BACKGROUND INFORMATION

On the average, every American uses about 150 gallons of water each day. Of that amount, only about 1/2 gallon is used for drinking. Some of this water is used for cleaning, watering plants and animals, and for recreation.

The demand for so much water sometimes causes water shortages. Everyone can help by conserving water. There are many ways to do this:

* Turn the water off while brushing teeth.
* Only wash full loads of clothes.
* Take showers instead of baths.
* Make needed repairs (fix drips!).
* Water outdoor plants and lawns in the early morning hours.
* Use a bucket and sponge to wash cars.
* Place a plastic bottle filled with water in the toilet tank.
* Use dishwashers instead of washing by hand.

Everyone should do his/her part to conserve the earth's precious supply of water.

## ADVANCE PREPARATION

A. Gather the materials.

B. Fill the plastic jug with water, put a top on it and conceal inside a grocery sack.

C. Roll the long piece of yarn around a pencil.

D. Conceal the short piece of yarn in your pocket.

## PROCEDURE

I. Setting the stage

A. Write "267,000,000" or the most current population figure on the chalkboard. Ask, "What is this number?" Say the number and have the children repeat it. Say, "That is the number of people who live in the United States of America. Every day almost every one of those people uses 150 gallons of water. This is <u>one</u> gallon of water." Show the gallon jug of water. "Do you think you drink that much water during one day? No, most people don't. But we do drink some water, so I'm going to write, 'We drink it' on this picture of a gallon jug. Let's think of some other ways people use water. (Remind students that factories/ industries use lots of water in making the things they use.) Each time we do, I'll write it on one of these jug pictures. How many jug pictures do you think I have? 150 Why do you think I have 150?" (That represents the amount of water most Americans use each day.) Continue listing ways people use water as long as interest is high. Spread the pages around the room to emphasize the amount of 150 gallons. Do as a whole group activity.

Optional - Punch holes in the gallon jug pages. Let the children illustrate the pages. Place them in a loose leaf notebook and continue (through the year) adding ways people use water until all 150 pages are complete.

II. Activity

A. Read "My Water Window" poem.

B. While the students watch, unroll the long piece of yarn as you walk around the room and say, "I'm going to make a circle with this yarn that represents all the water we have in the whole world." Finish the circle, then ask, "Do you think we have a lot of water in the world?"

"Now I am going to make another circle with this piece of yarn which will represent the amount of water we can actually use." Pull the 45" piece of yarn from your pocket and form a small circle in the middle of the large circle. Ask, "Do you think we have a lot of water to <u>use</u>?"

C. Ask students why we cannot use the rest of the water. If they cannot answer, help them understand the types of water that are "usable" (fresh, available, nonpolluted sources) versus those that are "unusable" (saltwater, fresh water locked in ice caps, and polluted water).

D. Read the poem again.

E. Show one of the window shutter pages. Read the poem again, pointing to each word. Encourage them to "read" with you.

F. Give directions:

"Inside the window shutters, the paper looks like a window. The tiny square in the corner represents the amount of water we can use. Color the square blue. Color the frame brown. On the rest of the window draw pictures of fish (and other sea creatures), boats, people swimming and other examples of water being used." The pages should be copied back-to-back so that when the shutters are folded and opened the frame is revealed.

III. Follow-Up

A. Arrange for one older student (per child) to accompany each of your students to different classrooms in the school to share their "Water Windows." The older child can read the poem and the younger child can show the "Water Windows."

IV. Extension

A. Let each child take home a "Water Conservation Family Contract" for the family to complete and sign as a homework assignment.

## RESOURCE

"Clear Water Foundation Calendar", Clear Water Foundation, 444 N Capitol Street NW, Suite 330, Washington, D. C. 20001.

When I look through my
Water Window...

I see river water for fishing,
I see lake water for fun.
I see ocean water for
surfing,
We've got water by the ton!

But when I look a little
closer
For the part that we can
use,
I see we've only got a little;
If I waste it- we ALL lose!

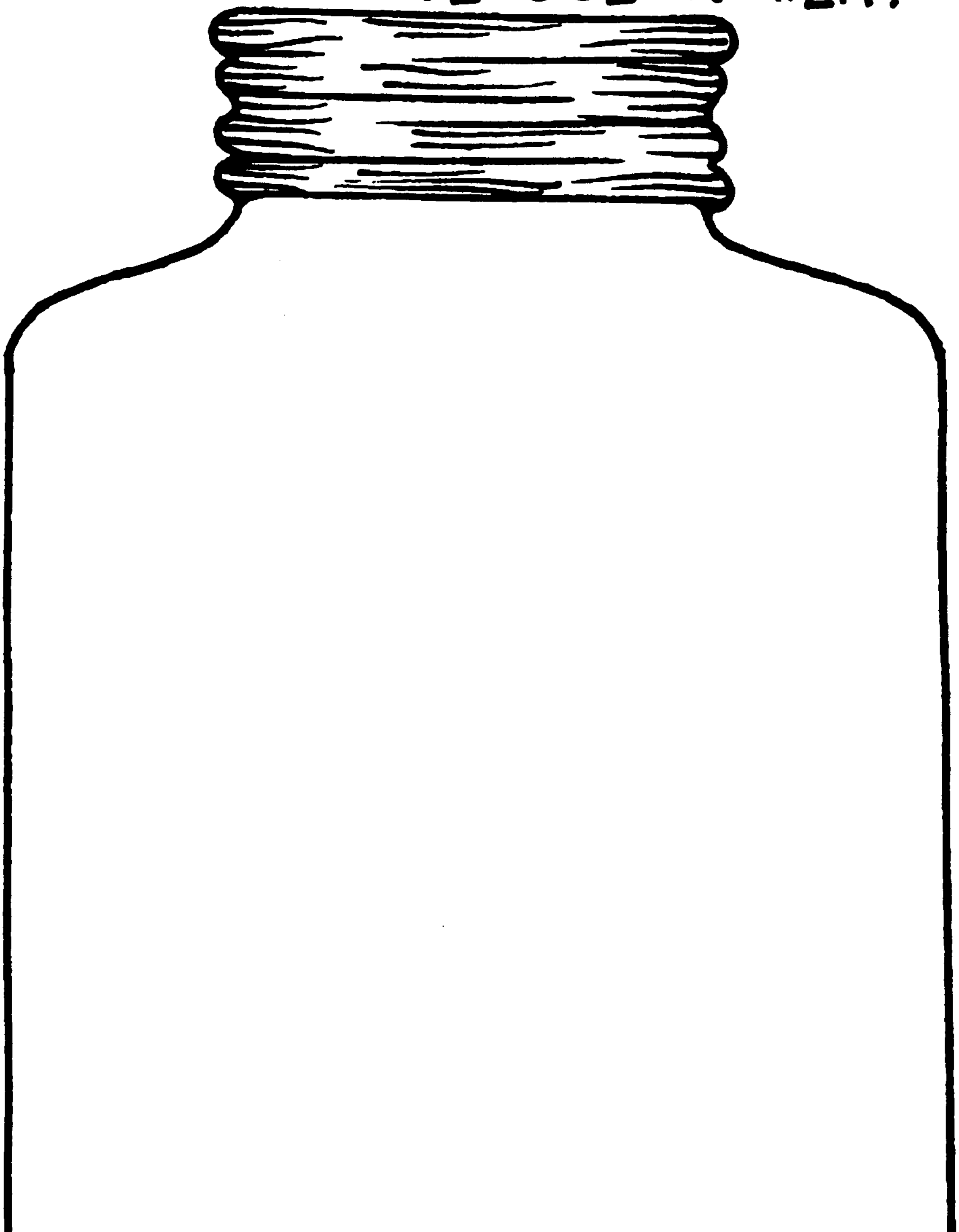
Beth Corum

# Water Conservation Family Contract

We, the __________ family realize that our Earth's water supply is limited. We will do our part to conserve water in the following ways:

Each family member sign:

# HOW DO WE USE WATER?



through my
WINDOW

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When I look
WATER

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I see ocean
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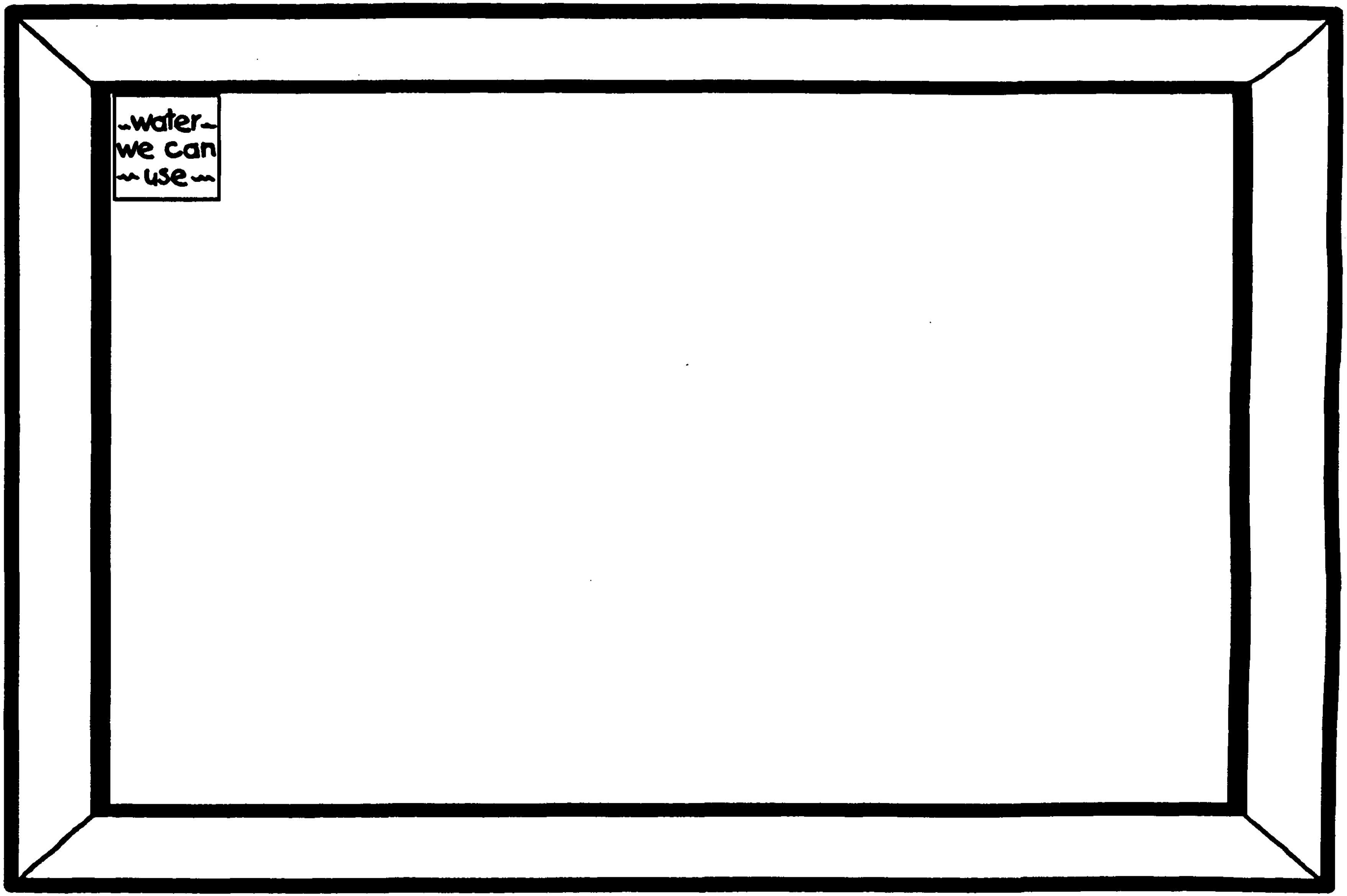
If I waste it-

3-17


water
we can
use

# COUGHING CATFISH

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Illustrate a poem about the story;
2. Sequence, orally or in writing, a poem about the story;
3. Add paper catfish and write an equation; and
4. Give an oral or written definition of new terms: freshwater, freshwater degradation, and water pollution.

**SUBJECTS:**
Language Arts, Math, Social Studies

**TIME:**
45 minutes

**MATERIALS:**
poster board
3' fishing pole or 3/4" dowel rod
yarn or string
magnet
paper clips
sentence strips
lunch sacks
crayons
scissors

## BACKGROUND INFORMATION

Lakes and ponds are important natural resources and, if managed properly, can be a renewable resource. They are home to many different plants and animals both in the water and along their banks. These plants and animals are as essential to ecology as freshwater is to the human race.

The United States has the highest freshwater usage in the world (over 340 billion gallons a day) for industry, agriculture, and domestic uses. In 1990, the EPA estimated that industry illegally dumped 7 million gallons of oil, 90,000 pounds of mercury, and 2,000 pounds of PCBs into the Great Lakes, which hold 1/5 of the world's surface freshwater supply. Many bodies of water in the United States are polluted to the extent that authorities have limited public consumption from them.

Both pollution and drought can cause freshwater degradation, leaving lakes and ponds without the ability to replenish themselves, killing fish and other aquatic life, and inhibiting plant growth. Degradation can cause abnormal algae growth which uses up the much needed oxygen in the water and eventually kills plants and animals. Even if pollution was completely stopped today, it would take decades to centuries for lakes and ponds to cleanse themselves back to normal levels for plants and animals to survive and replenish themselves.

Terms

**freshwater:** inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or groundwater.

**freshwater degradation** : freshwater that is either polluted or used up faster than it can replenish itself.

**water pollution:** water that has been made unclean for aquatic life and plants by dumping in foreign objects or liquids from human activities or natural processes.

## ADVANCE PREPARATION

A. Make poster of poem, "Solution to the Pollution." Copy pictures from the story to help students with context clues.

B. Write each line of the poem on long strips of paper.

C. Make a fishing pole with yarn attached to one end of a dowel or stick and a magnet tied to the other end. Copy, color, and cut out the catfish page and place paper clips on one end of each card.

## PROCEDURE

I. Setting the stage

A. Before reading the story, The Berenstain Bears and The Coughing Catfish by Stan and Jan Berenstain, discuss the front cover of the book with the students to determine prior knowledge about pollution. Ask what they think the bears are doing and what they think the story is going to be about. After reading the story, discuss with the students what the problem was and what the bears did about it. Ask them what they would do with their garbage. Encourage them to make up a clever saying like "Don't throw it, Bag-It!"

II. Activities

A. Copy the poem on poster board and display. Read the poem to the students pointing to each word as it is read. Reread the poem in an echo. After reading a line have the students echo it back.

## Solution to the Pollution
## by Donna Morgan

Brother Bear and Sister Bear went fishing one day,
And caught a coughing fish that wanted to say,
*"There's no mistake in Grizzly Lake,*
*We need a solution to the pollution."*

Now Brother Bear and Sister Bear had to agree.
That other folks in fishing boats had to see,
*"There's no mistake in Grizzly Lake,*
*We need a solution to the pollution."*

Other folks in fishing boats would have to pay
for throwing their pollution in the lake that way.
*"There's no mistake in Grizzly Lake,*
*We need a solution to the pollution."*

Brother Bear and Sister Bear were proud to be
A part of all the clean-up and felt victory.
*"There's no mistake in Grizzly Lake,*
*They found a solution to the pollution."*

B. Write each line of the poem on a strip of paper. Have different students illustrate one line each and match their illustration to the correct sentence. Have the class discuss the poem and place the poem in the correct sequence in a pocket chart or on a bulletin board along with their illustrations.

III. Follow-Up

A. Play Catch the Coughing Catfish. Using the fishing pole and the Catfish Cards, have the students fish over a puppet theater or into a large tub or even into a blue circle of construction paper to represent water. The student continues to catch fish until he catches the boot. Once the boot is caught the student stops and sorts his/her coughing catfish and regular fish then counts each one. Next, have the student complete a math sentence or equation on the "Coughing Catfish Math" page. After throwing their catch back into the water, students may continue to fish until all of the equations have been completed on the math page.

Different variations of the game can be played to accommodate the various math levels of students. Write numerals on each fish and have the student add or subtract the numbers on the fish caught and record the equation on the "Coughing Catfish Math" sheet. The fish can also be used for reinforcing number or color words.

IV. Extensions

A. Students will make a "Bag-It" game (or call it whatever the students discuss after reading the above story). Give each student a small lunch sack, preferably white, for easy coloring or a blue sack to represent water. Have the students color lake animals and plants on the outside of the sack. Give each student a copy of the "Bag-It" game cards to color and cut out. Discuss with the students which of the items are pollutants and which are helpful to lakes and ponds. Help students to sort the pieces by putting all the pollutants inside the sack and saying "Bag it!" Place all the other items on the outside of the sack and discuss how they help lakes or ponds.

B. Pair students up to play the "Bag-It" game. Have students place game cards face down. Each student draws a card and places it in the appropriate spot. If it is a pollutant it goes in the sack and the student says, "Bag It!" If it is helpful to lakes and ponds it is placed outside of the sack. Students may count how many pollutants they bagged as opposed to those placed in the lake.

C. Have students make posters to go along with the saying, "Don't throw it. Bag it!" and display around the school

## RESOURCES

Berenstain, Stan and Jan, The Berenstain Bears and The Coughing Catfish, Random House, Inc., New York, 1987.

Hoff, Mary and Rodgers, Mary M., Our Endangered Planet Rivers and Lakes, Lerner Publications Company, Minneapolis, 1991.

Saign, Geoffrey, Green Essentials: What You Need to Know about the Environment, Mercury House, San Francisco, 1994.

Stidworthy, John, Ponds and Streams, Troll Associates, New Jersey, 1990.

Name ______________________

# Coughing Catfish Math

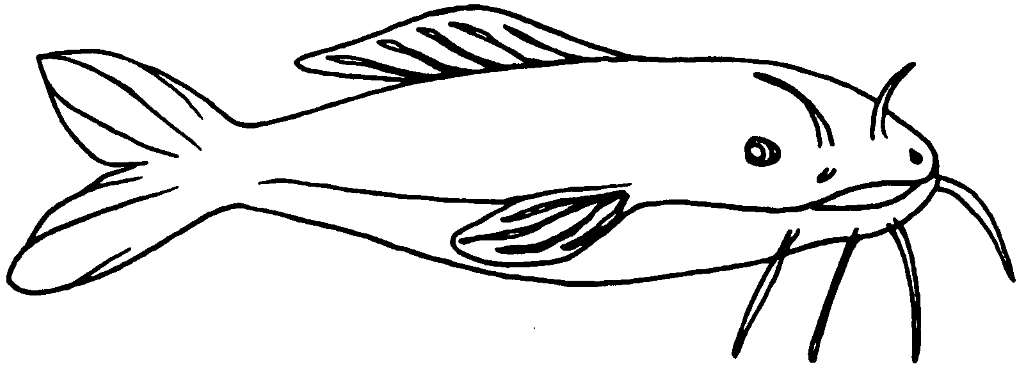
______ + ______ = ________

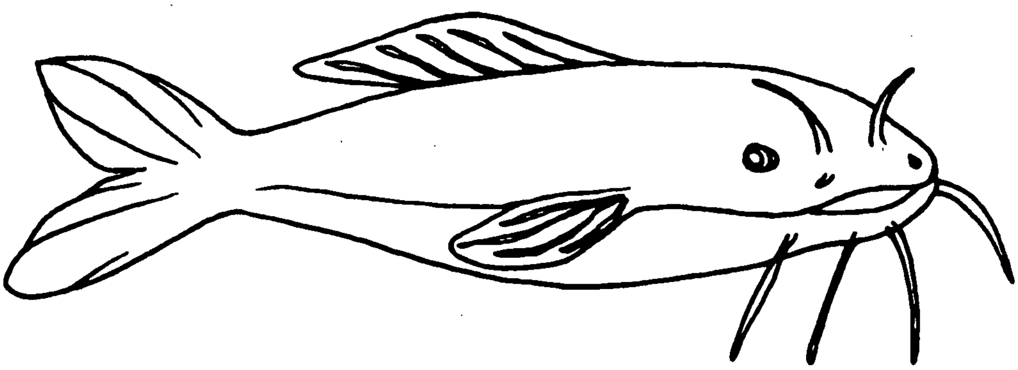
______ + ______ = ________

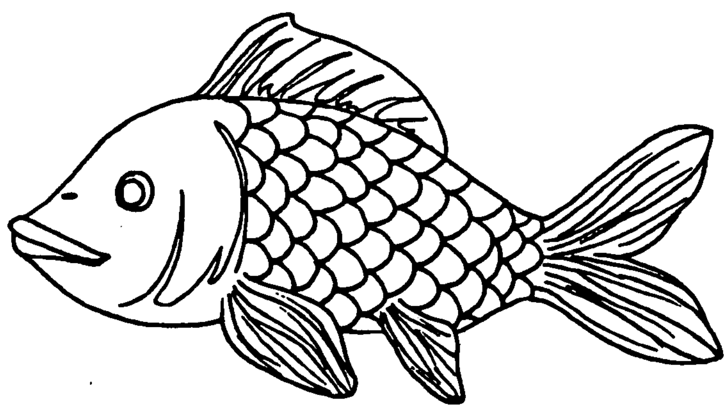
______ + ______ = ________

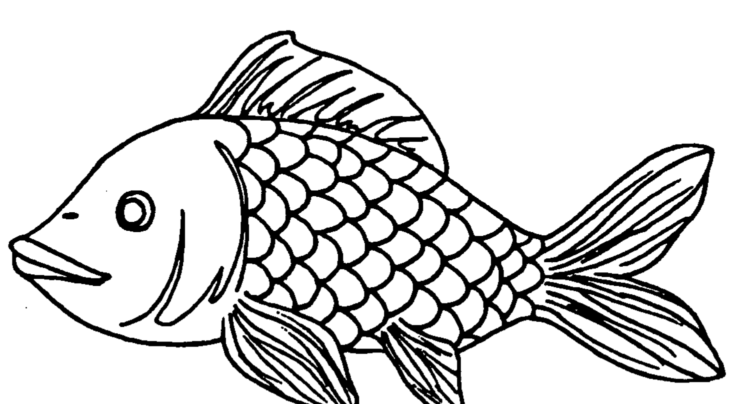
______ + ______ = ________

# FISH CARDS (COPY 5)





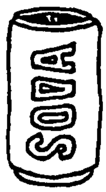




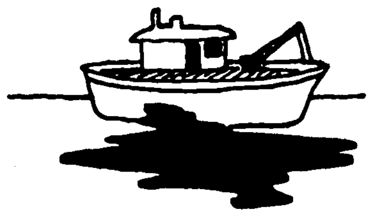
# BOOT CARD (COPY ONE)

# "Bag It" Cards

drink can



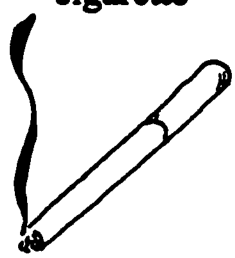

oil from a boat



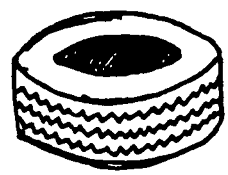
old boot

plastic bottle

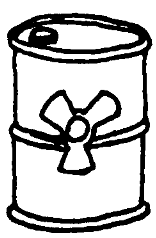
cigarette



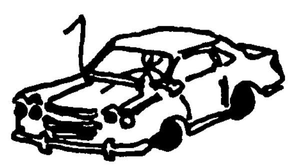
rubber tire



chemicals



old car

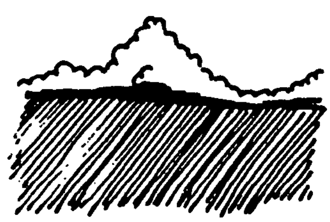


paper

fish food


plants

rain



# HAPPY THE FISH

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Illustrate or tell ways that the actions of people affect fish;
2. Simulate or talk about the addition of pollutants to water;
3. Order numerals 1-13; and
4. Give an oral or written definition of new terms: chemicals, cooling pond, and pollutant.

**SUBJECTS:**
Science, Whole Language, Math, Art

**TIME:**
Advance prep (day 1) 20-30 min
Activity (day 2) 30-40 min
Follow-up (day 3) 20-30 min
(This activity should be spread over 3 days to allow drying time.)

**MATERIALS:**
Happy the Fish (story)
sentence strips
pictures of Happy the Fish
15 sheets of white 12 x 18 construction paper
blue, brown, red and green tempera paint
wide, clear shipping tape (may use regular width transparent tape)
hole punch
2 or 3 large metal rings (may use yarn)

## BACKGROUND INFORMATION

Water has the amazing ability to clean itself. If waste materials are put into a river, they often sink to the bottom or mix with so much water that they cause no real problems— unless we dump too much waste material or even small amounts of dangerous material. Then it is a problem for people and for the plants and animals that live in the water.

When factories pour hot water into rivers, it is not healthy for the plants and animals that live there. Some fish need cool water and cannot live in warm water.

Terms

**chemicals:** substances which are used in factories, farms, and homes for a variety of purposes such as cleaning, painting, killing pests, and maintaining vehicles.

**cooling pond:** a pond where hot water from factories and power plants is stored until it is the same temperature as nearby bodies of water.

**pollutant:** any substance suspended or dissolved in water that builds up in sufficient quantity to impair water quality.

## ADVANCE PREPARATION

A. Prepare the pages of the big book.

1. Cut the sentence strips apart.

2. Glue the #1 sentence strip to the bottom of one of the pieces of large, white construction paper turned lengthwise.

3. Do the same for sentence strips #2 - #13 (one sentence strip per page).

4. Copy the fish picture page for each child.

B. Prepare the fish pictures.

1. Have students color and cut out the pictures of Happy the Fish.

2. Have students sort and stack the fish pictures according to facial expressions. (3 stacks)

## PROCEDURE

I. Setting the stage

Share background information and definitions of terms.

II. Activities

A. Read the story of Happy the Fish, encouraging the students to make facial expressions to match how they think the fish feels throughout the story.

B. Make the pages for a class big book.

1. Distribute the prepared big book pages to the students. Since there are 13 pages, some of the students should work together.

2. Let the students illustrate the pages.

3. The students who illustrate pages which need a picture of a fish should go to the sorted pictures, select the appropriate fish, and glue it to the illustration according to the text. (For example: the student who has page 2 will glue a smiling fish to the bottom of the illustration because page 2 says, "Happy loved to swim...Happy swam low....")

4. Let one or more students design the book cover on one of the large pieces of construction paper.

5. Let one or more students make the last page by writing: "This is the end of our little fish tale!"

6. Make a paint wash by diluting tempera paint with water. Let the students brush the paint wash over their
pictures.

    pages 1-5 - blue paint wash
    pages 6-7 - brown paint wash
    pages 8-9 - red paint wash
    pages 10-11 - green paint wash
    pages 12-13 - blue paint wash
    book cover and last page - blue paint wash

III. Follow-Up

A. Assemble the book.

1. When the pages are dry, spread them in random order on the floor.

2. Lead the class in counting aloud 1-13.

3. Choose a student to write the numerals 1-13 on the chalkboard.

4. Let the other students put the pages in order and number them.

B. Bind the book.

1. Reinforce the left edge of each page with wide, clear shipping tape. Punch holes in each page along the left edge (either 2 or 3 holes).

2. Attach the pages by threading metal rings through the holes.

C. Read the class big book.

IV. Extension

Give each student small amounts of blue and brown playdough or clay. Say, "Let's pretend the blue is river water and the brown is a chemical. Mix the two together." Allow time for them to do this. Ask, "When people put chemicals in water, do you think it would be easy to get them back out?" "Can you get the brown playdough back out?" Discuss.

## RESOURCE

"Water Pollution Fact Sheet", <u>Water Sourcebook: Grades 3-5.</u>

1

Once there was a little fish named Happy.
He was happy because he lived in a cool, clean river.

2

Happy loved to play and swim in the clean water.
Happy swam low - splishy, splashy.

3

Happy swam high - splishy, splashy.

4

Happy was comfortable in the cool water.

Happy relaxed low - flitty, floaty.

5

Happy relaxed high - flitty, floaty.

6

Then one day someone put chemicals in the river.

The chemicals made Happy sick.

7

Happy didn't feel like splishing or splashing.

8

Then hot water is poured in the river from a factory. The hot water made Happy uncomfortable.

9

Happy didn't feel like flitting or floating.

10

Then the people said, "We should be nice to the fish. We should keep the water clean." They stopped putting chemicals in the water. Happy felt a little better.

11

Then the factory workers said, "We should be nice to the fish. We should keep the water cool."

They built cooling ponds to cool the hot water.

12

Happy felt much better.

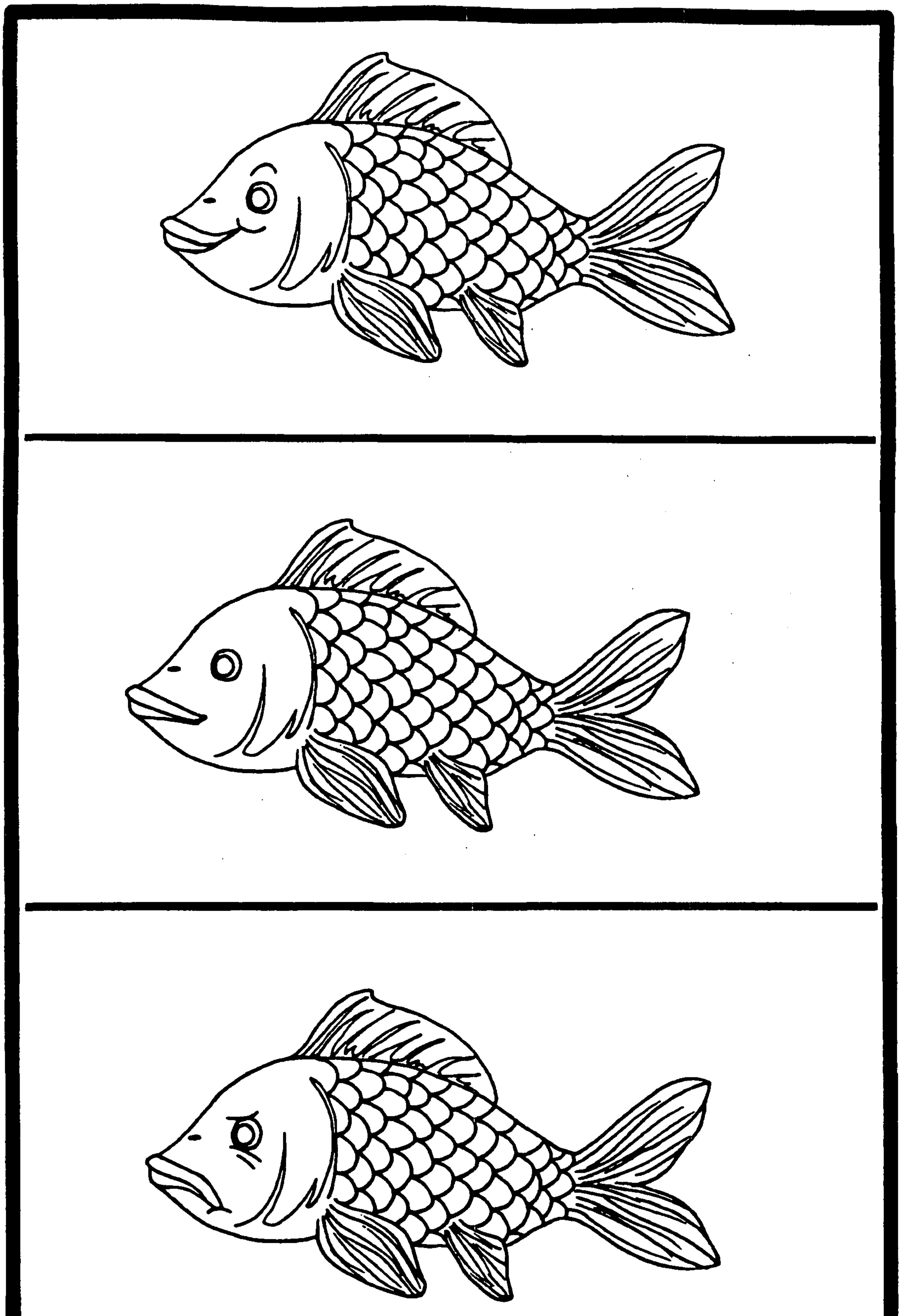
Once again Happy swam low -

Splishy splashy, Splishy splashly.

13

Once again Happy swam high -

Splishy
splashy,
SPLISHY
SPLASHY!



# HOW WATER FLOWS: SURFACE RUNOFF

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Observe and orally explain that water flows downhill;

2. Observe and orally explain surface water absorption and runoff; and

3. Give an oral or written definition of new terms: absorb, flow, and runoff.

**SUBJECTS:**
Science, Art, Math

**TIME:**
30 minutes

**MATERIALS:**
tin pan
sand
button
measuring cup
water
food coloring
droppers
water
various materials for absorption experiment
Rain Rain Rivers by Uri Shulevitz

## BACKGROUND INFORMATION

When rain or snow does not evaporate, soak into the ground, or freeze into ice glaciers, it runs into streams, rivers, or the ocean. The rain water is known as surface runoff. The following factors affect the amount of surface runoff:

1) type of soil (Some soils absorb more water than others.)

2) conditions of the soil (Dry soil absorbs more than wet soil.)

3) the slope of the land

4) the number of plants in the soil (If there are more plants, then there are more roots absorbing water and less runoff.)

Terms

**absorb:** soak up.

**flow:** move smoothly.

**runoff:** water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a waterbody; may pick up and carry a variety of pollutants.

## ADVANCE PREPARATION

Gather materials.

## PROCEDURE

I. Setting the stage

Read Rain Rain Rivers by Uri Shulevitz.

II. Activities

A. Use wet sand to shape a small hill on a pan.

B. Place a button or other small object at the final destination of the water according to the class prediction.

C. Slowly pour one cup of water from a measuring cup on to the top of the hill.

D. Observe the water flow.

E. Record class observation.

III. Follow-Up

Science/Art - Use modeling clay to shape a hill. Let children add details such as models of trees, boats, people, etc. Display projects and title them. Have children pour water over the model and discuss runoff and its effects on the model.

IV. Extensions

A. Make rain at the easel!

B. Mix paint and water (half and half).

C. Have children dip a brush in the paint and observe the paint running down the paper making different designs. Repeat using various textures of paper or fabrics, discussing differences in paint absorption and design. Display children's art work.

Materials: paint, brushes, water, paper, easel

## RESOURCES

Shulevitz, Uri, Rain, Rain Rivers.

Van Rose, Susan, Earth: Eyewitness Science, New York, New York: Dorling Kindersley, 1994.

# SETTLING IN - SEDIMENTATION

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Mix sand with water and record or tell what they observed with sedimentation or settling;

2. Predict, record, or tell the effect of shaking on the particles; and

3. Give an oral or written definition of the new term: sediment.

**SUBJECTS:**
Science, Language

**TIME:**
1 hour

**MATERIALS:**
1 baby food jar for each child
sand
water
recording sheet
soil (optional)
tablespoons
stopwatch

## BACKGROUND INFORMATION

Sediment is one of our most destructive water pollutants. America's water is polluted by more than one billion tons of sediment annually. Every year, Americans lose millions of dollars because of sediment pollution.

Sediment is caused by erosion, which is the gradual wearing down and carrying away of the earth's materials. Soil erosion occurs when soil is moved from one place to another by natural means. Wind blows soil, and moving water washes soil away. Normally, soil erosion occurs slowly over a very long time because trees and grasses hold the soil in place. Erosion can also occur naturally from forest and prairie fires, hurricanes, or tornadoes which strip the land of its protective vegetation cover. Nonpoint source erosion by people can also cause soil erosion to happen much more quickly than normal by allowing over grazing by farm animals, and by digging and building on steep slopes, cutting down trees, and plowing the land for crops. The rapid soil erosion that results from such activities can be very harmful to the environment.

Erosion by water often starts when rain strikes bare soil. Large amounts of rain washing down a sloping area pick up loose soil and carry it away. Harmful pollutants and nutrients can be washed away with the soil during the runoff event. Substandard agricultural and other land practices can cause fields and their topsoil to be washed away. Besides making the water less attractive to swim in and drink, the soil kills fish and other organisms living in the water.

<u>Term</u>

**sediment:** eroded soil material, often suspended in water, that consists mainly of particles derived from rocks, soil, and inorganic materials.

## ADVANCE PREPARATION

Fill the baby food jars about 2/3 full of water, and place one on each student's desk.

## PROCEDURE

I. Setting the stage

   A. On the recording sheet, have students draw a picture of the water and sand as they think they will look when both are in the jar.

II. Activities

   A. Have students add 1 tablespoon of sand to the water in their jars and then draw a picture of their observations.

   B. Have students draw a picture of how they think the sand and water will look when they shake their jars.

   C. Have students shake the jar and draw what they see. Immediately begin the stopwatch. Have students guess how long it will take for the sand to settle.

   D. Have each student raise his/her hand when all of the sand has settled. Write the settling times on the board.

   E. Have students record their hypotheses about what the water will look like when potting soil is first added, and then after it has been shaken.

   F. Have students shake their jars and then record their observations.

   G. Again, start the stopwatch and take students' predictions for potting soil settling. Students should watch their jars and raise their hands when it settles. Record these times on the board.

III. Follow-up

   A. Working in pairs, have students write or discuss their ideas about why one kind of material settled more quickly than the other.

   B. Point out that what occurred in the jar is similar to what happens in a natural body of water. The shaking is similar to the rivers or streams flowing and moving particles from place to place. The particles that settle out at the bottom are called sediment.

IV. Extension

   A. Conduct a tour around the schoolyard looking for signs of erosion. In an urban setting, look for such things as cracked and pitted sidewalks, rounded pebbles used for decorative stone and rivulets carved in dirt by water flowing along street gutters or down slopes on schoolyard.

1. Construct a chart with names of areas of erosion. Brainstorm possible solutions.

2. Write a letter to the principal explaining what you have been studying, along with the area noted on your tour and possible solutions. Ask permission to enlist help from parents and community to correct problem areas.

3. Set up a work session with students and parents to follow through with solutions designed by the class.

## RESOURCE

Video: 3-2-1 Classroom Contact. Children's Television Workshop, "Erosion: Earth vs Change".

Name--------

# SAND- after shaking

prediction

actual

Time needed for settling:---------

# SOIL- after shaking

prediction

actual

Time needed for settling:-----------

Which took longer to settle?----------

# THE TRIP OF DRIP

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. List, orally or in writing, and illustrate materials that should not be found in water;
2. Sing a song about "Water is in Our Hands"; and
3. Give an oral or written definition of erosion, pollution, and sediment.

**SUBJECTS:**
Science, Music, Language Arts, Math

**TIME:**
30 minutes

**MATERIALS:**
puppet show "The Trip of Drip"
puppets
sponge
thread
clear container of water
dark syrup (small amount)
dirt or potting soil
green and red food coloring
pebbles
rectangular shaped sponge
piece of grass sod the size of a sponge
grass seeds
ruler
watering can with spray head
needle
thread

## BACKGROUND INFORMATION

There are many sources that cause water pollution. Some of the sources are easy to spot or find. They are called point sources. Manufacturing plants and factories are examples of point sources. Other sources of pollution are not as easy to locate. They are called nonpoint sources. Some examples of nonpoint source pollution are sediment from land erosion, human and animal wastes, and chemicals that have been washed from fields or lawns. People are the underlying cause of pollution. People must keep pollutants out of the water. Water is the most important substance for life on earth. The earth gets no new supply of water. The water we have now is what the Earth has always had so we must work together to take care of water. The care of water is in our hands!

Terms

**erosion:** the wearing away of the Earth's surface by running water, wind, ice, or other geological agents; processes, (weathering, dissolution, abrasion, corrosion, and transporation) by which material is removed from the Earth's surface.

**pollution:** an unwanted change in air, water or soil (usually through the introduction of pollutants or contaminants) that can affect the health and survival of humans or other organisms.

**sediment:** eroded soil material (often suspended in water that consists mainly of particles from rocks, soil, and inorganic materials).

## ADVANCE PREPARATION

A. Prepare all of the puppets to be used in the puppet show. Puppet patterns are included at the end of this activity.

B. Gather all materials.

C. Copy student's little book, "Rivers, Lakes, and Oceans Should Definitely Not Have ________________." The book was developed by Pat Butler, Weeden School, Florence, Alabama.

## PROCEDURE

I. Setting the stage

A. Share background information.

B. Show the children "Drip" the puppet. Tell them that Drip is going on a trip that is going to get pretty rough. The students will have an opportunity to help Drip.

II. Activities

A. Perform the puppet show, "The Trip of Drip".

### The Trip of Drip

Original by Cindy Taylor

| | |
|---|---|
| Drip Puppet #1 | Boys and girls, I have been around and around for a long time. Once a dinosaur drank me. I have been raindrops. I have been snowflakes, I have helped make electricity for you. I have traveled across the world many many times. Sometimes I was on earth traveling in a stream, lake, river, or ocean. Sometimes I have a bird's-eye view of the world from a cloud being pushed along by the wind. |
| Snow Flake Puppet #2 | Today I am a solid snowflake on top of a big mountain. I feel the warm sun changing me into a liquid water drop. |
| Drip Puppet #3 | Now as a free flowing liquid I'm trickling down the mountain. Whoooo this is fun! |
| Small Stream Puppet #4 | My water drop buddies and I are grouping together forming a small stream. I see several other streams joining our stream. Hello and welcome! |

River Puppet
#5 — Now we all are a river. What a journey we will take. Rivers run through small towns and big cities.

River with Fish
#6 — Oh look at all the fish swimming in the river we've formed. They love this fresh clean water. They are having so much fun. And look at those people having a picnic beside our river.

Greasy Drip
#7 — What's this slippery stuff getting around me? Oh I see, that man is dumping oil in our river. It's the old oil from his car!

It makes me want to boil
When I see someone not recycling oil
It makes the fish have no more fun
For what the people have done.
Please don't be so mean
Always keep the water clean!

Farmland
River Puppet
#8 — Now we're running through rich farmland. Oh look at the cows grazing in the pasture. There's one cow getting a drink of water from our river.

Moo moo move over cow
Make sure you put your manure
in your own pasture.
Please don't be so mean
Always keep the water clean!
They know the solution
People must stop pollution.

Greasy Drip
#9 — Boys and girls, please do all you can to protect water. Pass the word to others.

It ought to be in the Constitution,
Everyone should stop pollution.
We have to work together
That's the only solution!

We have to work together, together, together,
We have to work together to keep water clean.
The water is my water; the water is your water,
We have to work together to keep water clean!

III. Follow-Up

A. Give the children a copy of the little book "Rivers, Lakes, and Oceans Should

Definitely Not Have ____________________." Have the children fill in the blanks with their own ideas. Have students dictate when necessary.

B. Sing the song "Water Is In Our Hands"

**Water Is In Our Hands**
(Tune: He's Got the Whole World in His Hands)

1. We've got the lakes and the streams in our hands
   We've got the lakes and the streams in our hands
   We've got the lakes and the streams in our hands
   We've got the care of water in our hands.

2. We've got the rivers and the oceans in our hands
   We've got the rivers and the oceans in our hands
   We've got the rivers and the oceans in our hands
   We've got the care of water in our hands.

3. We've got all kinds of fish in our hands
   We've got all kinds of fish in our hands
   We've got all kinds of fish in our hands
   We've got the care of water in our hands.

4. We've got all the sea life in our hands
   We've got all the sea life in our hands
   We've got all the sea life in our hands
   We've got the care of water in our hands.

5. We've got all living things in our hands
   We've got all living things in our hands
   We've got all living things in our hands
   We've got the care of water in our hands.

6. We've got to stop the pollution and the waste
   We've got to stop the pollution and the waste
   We've got to stop the pollution and the waste
   We've got the care of water in our hands.

IV. Extensions

A. Cut a small raindrop shape out of a sponge. (The raindrop shape sponge is the puppet "Drip.") Sew a piece of thread to Drip to pull him out of the water.

B. In a clear container of water add Drip. Discuss how happy Drip is in the clean, clear, cool water. If you prefer, use a gallon size resealable plastic bag instead of the clear container. If you use the baggie, there is no need to sew thread on the sponge-shaped drop of water.

C. Add pollutants to the water one at a time. After each pollutant is added, let the children discuss Drip's condition and how he might feel, if he were real. Pollutant examples:

1. Dirt and pebbles for sediment
2. Red and green food coloring for chemicals
3. Dark syrup for oil
4. Small chunks of dirt for manure

Erosion Experiment:

A. Place potting soil or dirt on a rectangular-shaped sponge. (The sponge represents land.)

B. Hold the sponge over a container of water. The container of water represents a body of water such as a lake, river, stream, or ocean. Blow the sponge (representing the wind).

C. Using a watering can, pour "rain" on the sponge. Some of the dirt will go into the water. This demonstrates wind and water erosion. Define erosion - "the movement of soil from one place to another by water and wind." Shake the rest of the lose soil from the sponge.

D. Place a piece of grass sod on the sponge. The sod needs to be the size of the sponge. Sprinkle "rain" on the grass sod. The dirt on the sod will stay on the sponge. If sod is not available, skip this step of the activity and go to step E.

E. Add a small amount of soil or dirt to the sponge and cover entire sponge with grass seed.

F. Have the person designated as the "botanist" keep the sponge damp. Keep the sponge in the science center, preferably near sunlight.

G. Observe the sponge daily. Discuss what the grass seeds need to grow (sun, water, air).

H. As the grass begins to grow, have the children measure its height.

I. After the grass is thick, blow on the soil, then pour "rain" on the sponge, using the watering can. Note that the soil stays on the sponge.

Contrast erosion in the previous demonstrations with erosion in this demonstration. Explain the importance of crops and other plants in preventing wind and water erosion.

## RESOURCES

Bains, Rae, Wonders of Rivers, Troll Associates, 1982.

Schmidlkofer, Regina, Educational Specialist, Tennessee Valley Authority, Muscle Shoals, Alabama, 205/386-3550.

Rivers, lakes, and oceans should definitely not have

_________________________.

# Rivers, Lakes, and Oceans

by

3-49

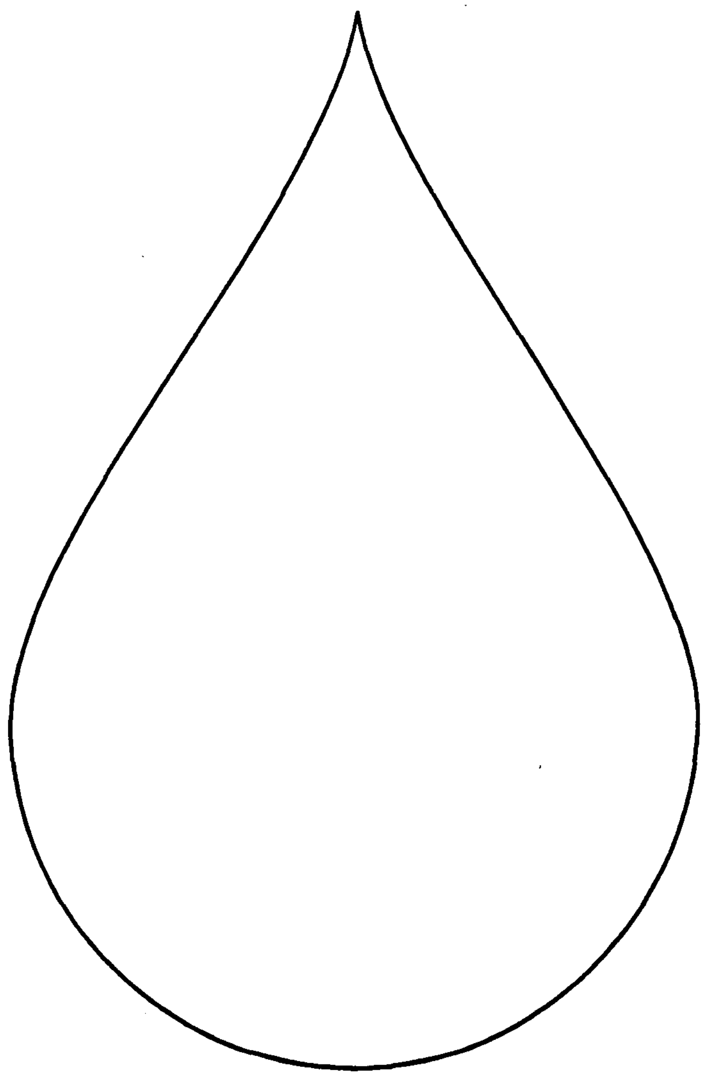
Rivers, lakes, and oceans should definitely not have

________________________.

Rivers, lakes, and oceans should definitely not have

________________________.

# DRIP PUPPET PATTERN
## Make 2



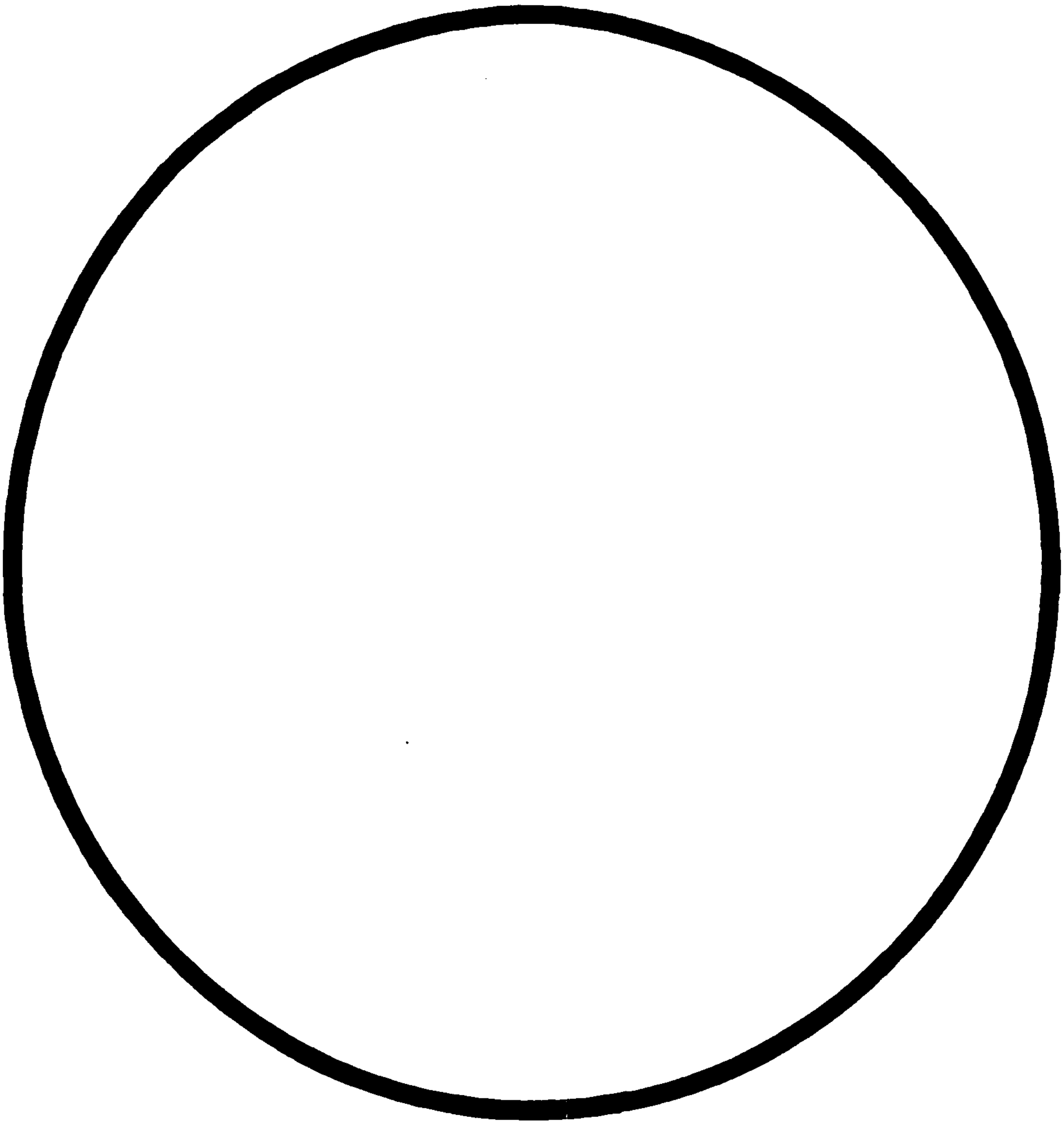
Drip Puppet #1 and #3
Make one puppet
for use as puppet #1 and #3

Glue blue plastic wrap
on white poster board pattern
Cut out, add wiggly eyes

Greasy Drip Puppet #7 and #9
Make one puppet for use as
puppet #7 and #9

Glue black plastic on
white poster board pattern
Cut out, add wiggly eyes

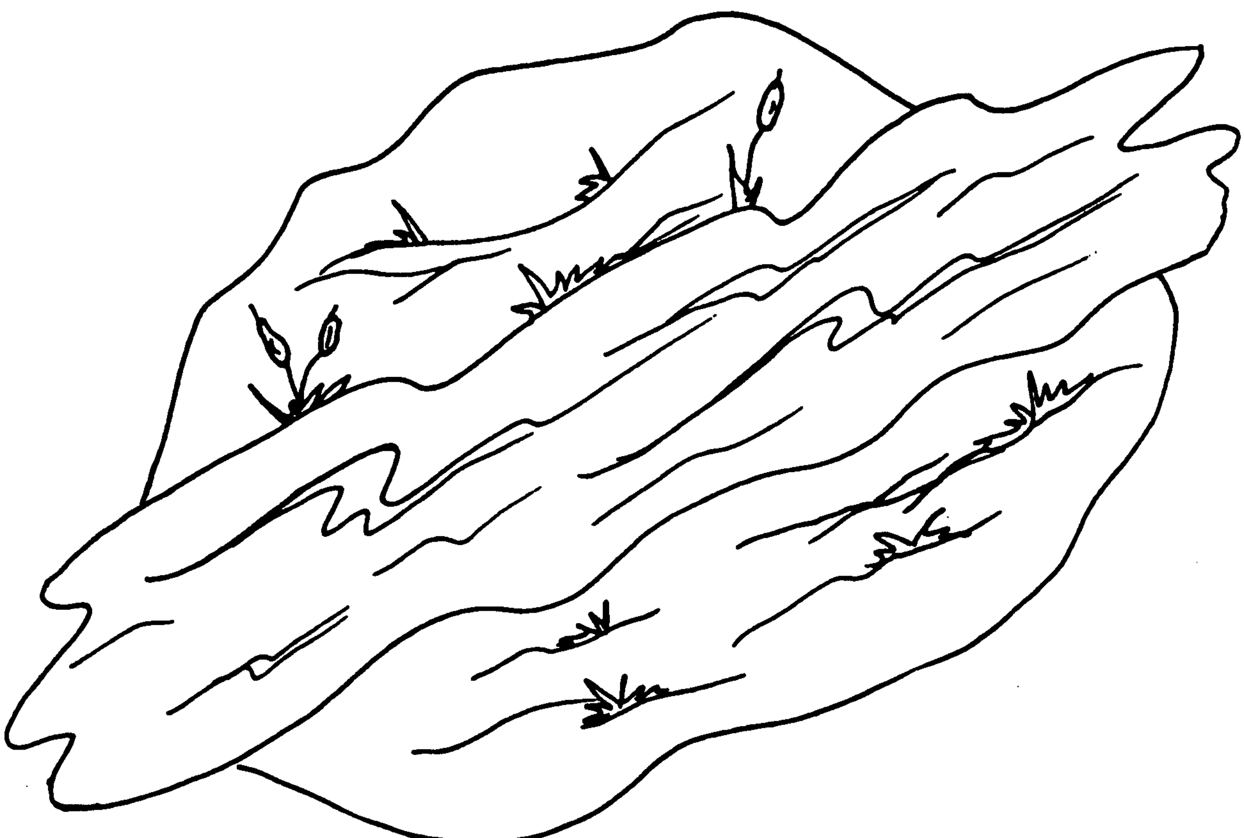
# SNOWFLAKE PUPPET #2



**Directions**

1. Cut out circle pattern
2. Fold it in half
3. Next fold it in thirds
4. Cut circular end off so the side will be straight
5. Cut small triangles and other designs on all sides of the pie-shaped piece

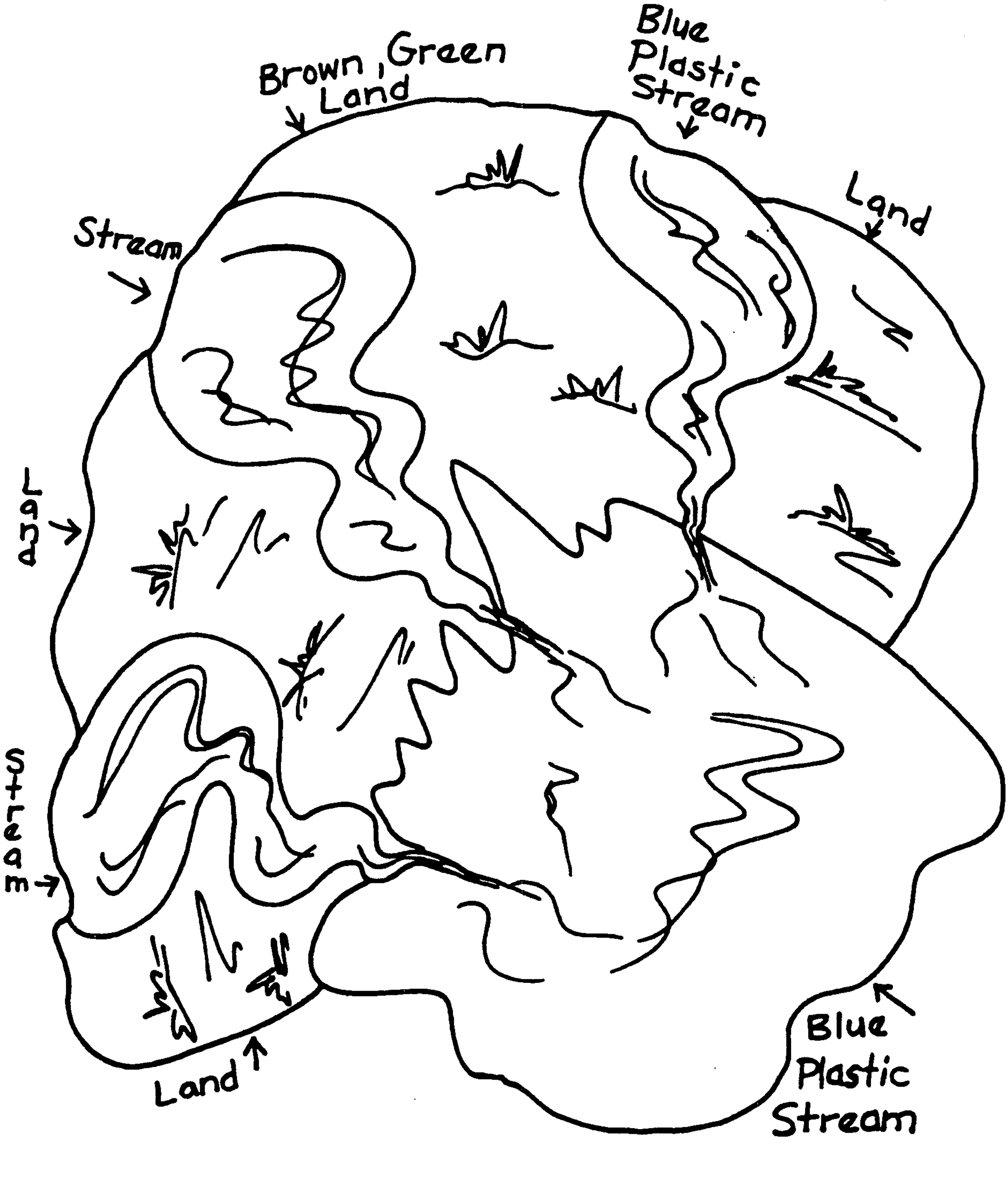
# Small Stream Puppet #4



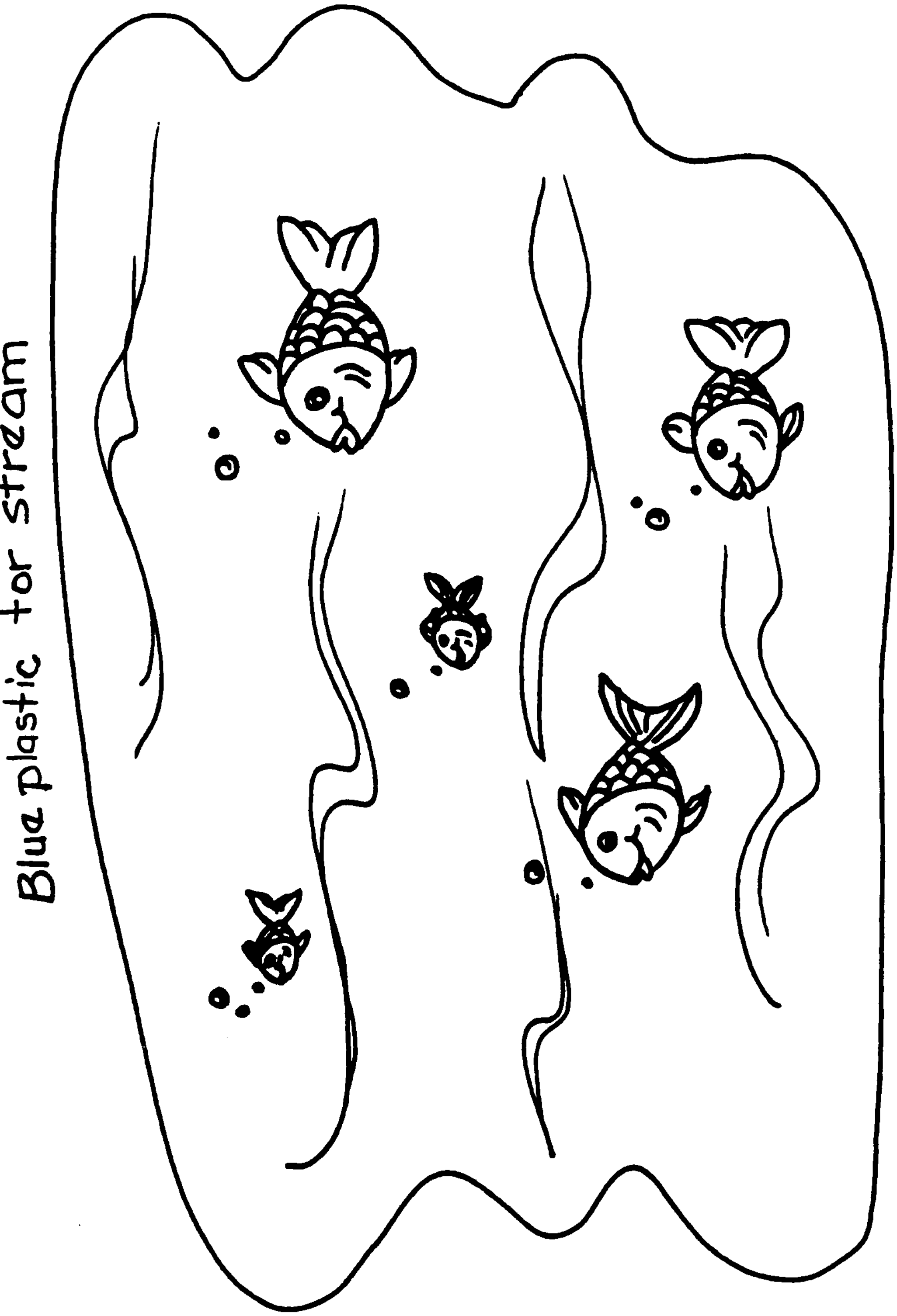
Color Brown
and green land

Blue plastic stream

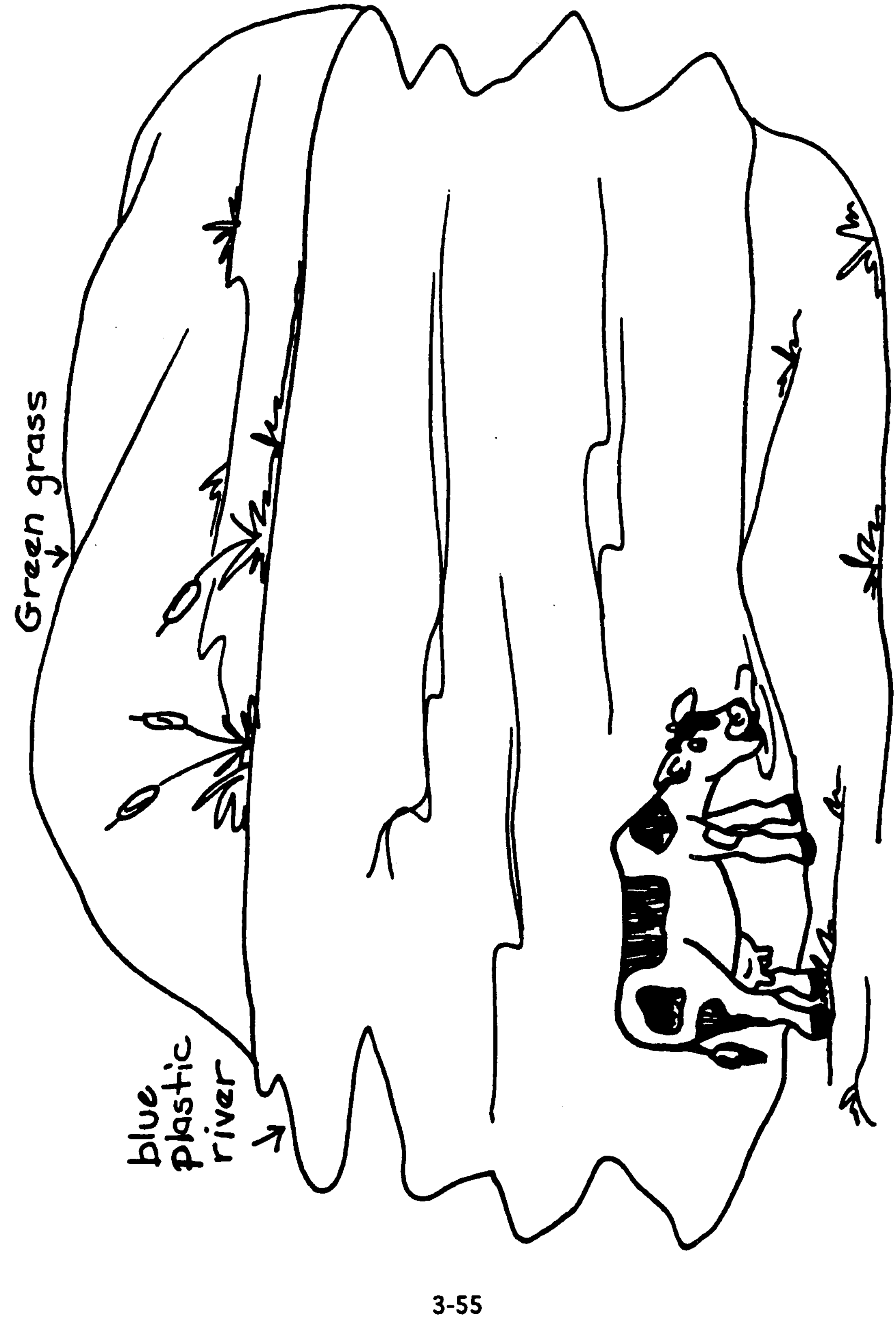
# River Puppet #5



# River with Fish #6



# Farmland River Puppet #8



# THE LITTLE GOLD FISH

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Act out a play about water pollution;
2. Make props and costumes in small groups;
3. Create and act out their own version of a play incorporating their solution to the problem of pollution; and
4. Give an oral or written definition or water pollution.

**SUBJECTS:**
Art, Dramatic Play, Social Studies

**TIME:**
45 minutes for one day or divide over a two day period

**MATERIALS:**
paper and markers for props and costumes

## BACKGROUND INFORMATION

Creative dramatics help young children use movement, mime, and dialogue to answer important questions or solve dramatic problems. Through reenactment of a story about water pollution, and through moving and make believe, children can begin to understand and remember the facts about pollutants in water and how to help solve the problems. In addition, because creative dramatics is a group effort, children learn to work together and to solve the problem collaboratively. By making up their own versions, they learn important problem solving and critical thinking skills.

Term

**water pollution:** water that has been made unclean for aquatic life and plants by dumping in foreign objects or liquids from human activities or natural processes.

## ADVANCE PREPARATION

A. Prepare a space to perform the play.

B. Pre-select small groups to perform the play together.

C. Pre-read the play.

## The Little Gold Fish

by Donna Morgan

Adapted from the classic children's story, "The Little Red Hen"

Once there were four friends - a beaver, a snake, a duck, and a little gold fish. The little gold fish had three baby fish. One day the little gold fish and her three baby fish were swimming in a shallow pond, and she found some aluminum cans, polystyrene foam cups, and plastic rings. She went to her three friends and asked, "Who will help me pick up the trash to make our pond beautiful?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will pick up the trash from the bottom of the pond," said the little gold fish. And they did.

Then the little gold fish asked her three friends, "Who will help me recycle all this trash to conserve our beautiful pond?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will recycle the trash," said the little gold fish. And they did.

By and by the little gold fish asked her three friends, "Who will help me write laws about littering in our pond and help to stop the pollution?"

"Not I," groaned the beaver.

"Not I," hissed the snake"

"Not I," quacked the duck.

"Then my children and I will write the laws about littering our pond," said the little gold fish. And they did.

Next the little gold fish asked her friends, "Who will help me make posters and bumper stickers to let the people know about pollution in our pond?"

"Not I," groaned the beaver.

"Not I," hissed the snake.

"Not I," quacked the duck.

"Then my children and I will make posters and bumper stickers to let the people know not to pollute our pond," said the little gold fish. And they did.

Then the little gold fish called to her friends, "Who will swim and play in the beautiful pond?"

"I will," groaned the beaver.

"I will," hissed the snake.

"I will," quacked the duck.

"Oh, no," said the little gold fish. "My children and I will swim in the pond by ourselves." And they did.

## PROCEDURE

I. Setting the stage

A. Read the story, The Little Gold Fish, adapted from the classic children's story, "The Little Red Hen," and discuss the lesson to be learned by the animals and what lesson we can learn from the story. If your students are not familiar with the story, "The Little Red Hen," read it first. Then, discuss how the two stories are alike and different (drawing a Venn diagram on the board might be helpful). Guide the discussion to help the students understand the story and relate it to their own lives. Call attention to the events in the story, how lazy friends might act, how the little gold fish might feel doing all the tasks by herself with her children, and how the friends might feel when they are left out in the end. Pose questions of the different actions having children exaggerate body parts to show the action.

II. Activities

A. Narrate the story as a small group of children act it out using student-made props and costumes (guiding the activity as the children dictate the action).

B. Divide students into small groups for the different characters in the story. If there are extra children, have them make up characters or roles for them. The groups will make up their own version of the play along with their own costumes and props. And of course, what the children invent is always right. After the students have had sufficient time to invent their play, have them act it out for the other groups. Compare the different ways the groups did the play.

C. Students may want to polish their plays to perform later for parents or the school. This may be over a couple of days. Emphasize to the students how these plays deliver a message about water pollution.

III. Follow-Up

A. Have the students make up a different version of the play with all the characters helping the little gold fish to clean up the pond, recycle the trash, write the laws, and make the posters and bumper stickers. Ask the students to decide how the play might end if everyone cooperated.

B. Make bumper stickers with a recycle-type message.

IV. Extension

A. Have one group write a new version of the play, The Little Gold Fish, while another group makes the costumes and props, and another group becomes the characters. This could be a complete production with sound effects, a narrator, and a director.

## RESOURCES

Barton, Byron, "The Little Red Hen," Harper Collins Publishers, New York, 1993.

Berenstain, Stan and Jan. The Berenstain Bears Don't Pollute Anymore, Random House, Inc., New York, 1991.

# MUDPUPPY POND

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the amount and distribution of water on the Earth in fresh water and sea water;

2. Identify, orally or in writing, causes of water pollution;

3. Describe and evaluate, orally or in writing, the effects of different kinds of land use on wetland habitats; and

4. Give an oral or written definition of new terms: habitat, lake, pollution, pond, river, runoff, urban stormwater runoff, and watershed.

**SUBJECTS:**
Science, Language Arts, Art, Music

**TIME:**
1 hour preparation time
50 minutes

**MATERIALS:**
12-14" x 22" poster board
glue
plastic frog
1 gallon jar
tablespoon
cold tap water
36" x 24" cardboard box or refrigerator box
1 heavy duty 33 gallon trash bag
sand
aluminum foil
2-4 index cards
popsicle sticks
7 small paper cups or baby food jars
soil
small rocks or gravel
brown sugar ("fertilizer")
pancake syrup or molasses ("oil")
salt
punched paper dots ("litter")
detergent (no phosphate type)
warm tap water
red food coloring ("sewage")
green food coloring ("toxic waste")
yellow food coloring ("animal waste")
wood ashes from fireplace

## BACKGROUND INFORMATION

For years people believed that materials dumped int water supplies would decompose or be diluted to th point that they were virtually harmless. It has been show that unlimited and unmonitored dumping of wastes ca be very harmful to water supplies. The vast quantities c industrial, animal, and human wastes produced must firs be treated, either physically or chemically, before the are allowed to re-enter lakes, streams, rivers, and ocean; Bodies of water cannot clean themselves as fast as peopl pollute them—so people must try to keep out pollutant of water.

Frogs are an indicator species because they are amon the first animals to be affected by habitat destructio and environmental pollution. The disappearance of frog from any habitat signals a coming ecological crisis. B recognizing the importance of saving frogs and acting t stop environmental contamination, we can save othe species including ourselves.

Terms

**habitat:** the place or type of site where a plant or animal naturally or normally lives and grows.

**lake:** a standing body of water which undergoes thermal stratification and turnover by mixing.

**pollution:** an unwanted change in air, water, or soil (usually through the introduction of pollutants or contaminants) that can affect the health and survival of humans and other organisms.

**pond:** a still body of water smaller than a lake where mixing of nutrients and water occurs primarily through the action of wind (as opposed to turnover).

**river:** a large body of flowing water that receives water from other streams and/or rivers.

**runoff:** water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a waterbody; may pick up and carry a variety of pollutants.

**urban stormwater runoff:** road salt, soil, lawn and garden chemicals, and pet wastes travel via streets and storm drains to nearby rivers, lakes, and ponds.

**watershed:** land area from which water drains to a particular surface waterbody.

## ADVANCE PREPARATION

A. To set up Verde Frog's habitat, cut sides of cardboard box leaving a depth of 8 inches. Slit the heavy duty garbage bag down one side and across the bottom. Line the cardboard box with the plastic bag. Place about 4-5 inches of sand in box forming a watershed area, river, creek, and pond. Line the waterways with aluminum foil to hold water in these areas.

B. Place a plastic frog in pond.

C. Number the baby food jars 1-9. Place soil in jar 1. Label it No. 1 - SOIL. Put 1/4 to 1/2 cup of water and 4-5 drops of yellow food coloring in jar 2. Label it No. 2 - ANIMAL WASTE. Put 1/4 cup brown sugar in jar 3. Label it No. 3 - FERTILIZER AND PESTICIDES. Put 1/4 cup molasses or syrup in jar 4. Label it No. 4 - OIL. Place paper punched dots in jar 5. Label it No. 5 - TRASH. Put 1/4 cup salt in jar 6. Label it No. 6 - SALT. Put 1/2 cup of warm water and a squirt of dishwashing detergent into jar 7. Label it No. 7 - FACTORY WASTE. Set out red and green food coloring. Label the red "sewage" and the green "toxic waste". Put 1/4 to 1/2 cup ashes in jar 8. Label it No. 8 - ASHES. Fill jar 9 with small rocks and cover with vinegar. Label it No. 9 - ROCKS.

D. Make big book from suggested pages in activity.

E. Make student copies of Verde (Spanish for green) Frog student activity page.

Adapted with permission from the *Fred the Fish* activity in *Water, Stones, & Fossil Bones*, edited by Karen K. Lind. Copyright 1991 by the National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000.

## PROCEDURE

I. Setting the stage

A. If all of the Earth's water fit in a gallon jug, available fresh water would equal just over a tablespoon. About 97 percent of the planet's water is seawater; another two percent is locked in icecaps and glaciers. Vast reserves of fresh water underlie the Earth's surface, but much of it is too deep to tap economically. Help students understand the notion by modeling the gallon jug of water and a tablespoon of water.

B. Tell the students that water pollution has become one of the most serious environmental problems facing the United States as well as countries around the world. Industry, government, cities, and towns have spent billions of dollars on research and treatment plants to try to reduce water pollution. Three chief sources of water pollution are: industrial (factory) wastes, municipal (city), wastes (sewage), and agricultural (farm) chemicals and wastes. Oil spills are another source of pollution. This activity will help students realize how water is polluted and the effects of pollution on animals.

II. Activities

A. Ask students to identify pollution and ways in which water becomes polluted. Use a semantic map or word web to organize the students' ideas.

B. Make word labels - watershed, pond, creek, frog habitat - using index cards and popsicle sticks. Ponds and freshwater wetlands are known as standing water habitats. Many species of animals live in these areas of freshwater. Habitats are areas where animals find food, water, and shelter necessary for their daily living and reproduction. Ponds and wetlands are some of the best places for frogs and amphibians to live. Place labels at appropriate places in the box of sand.

C. Invite the students to see what happened to Verde Frog's habitat as pollution begins to invade Mudpuppy Pond. Pass out the activity jars, food coloring, and Verde Frog student activity page.

D. Read the big book story, The Disappearance of Mudpuppy Pond - a story about the destruction of Verde Frog's habitat at Mudpuppy Pond. Pause after each page for students to add "pollution" to the frog's habitat. Every student should write down a different describing word each time they are asked the question, "How does Verde Frog feel?"

E. After the "pollution" has been added to the habitat, discuss the appearance of the frog and his habitat. Record the describing words on a master list.

III. Follow-Up

A. Go back to the semantic map organizer and with a different color marker, identify more ways water can be polluted.

B. Follow-up this activity with "The Big Clean-Up."

IV. Extensions

A. Divide the class into up to 11 groups. Write a class comic strip about Verde Frog's predicament. Assign a different pollution activity to each group. As groups place their pages on the wall, have students sequence the stages of polluting Mudpuppy Pond.

B. After the discussion, have the students form a circle (symbolic of the water cycle), and sing the following song about Verde Frog.

**SONG**
**Sing to the tune of "Froggie Went a-Courtin".**

Froggie was a floatin' in Mudpuppy Pond, uh-huh, uh-huh.
Froggie was a floatin' in Mudpuppy Pond, uh-huh, uh-huh.
His long sticky tongue helped him catch his prey;
Slurping his worm and a croakin' all day, un-huh, uh-huh.

Pollution threatened to end his life, uh-huh, uh-huh.
Pollution threatened to end his life, uh-huh, uh-huh.
Contaminatin' all his food;
And destroyin' his home, oh how rude! Uh-huh, uh-huh.

Soon Froggie wasn't feeling very well, uh-huh, uh-huh.
Soon Froggie wasn't feeling very well, uh-huh, uh-huh.
Eroded soil filled his pond;
He lost his home since the water's gone, uh-huh, uh-huh.

Be careful not to pollute the water, uh-huh, uh-huh.
Be careful not to pollute the water, uh-huh, uh-huh
Help our world and dispose your waste;
Put it in its proper place, uh-huh, uh-huh.

## RESOURCES

Lind, Karen K. Water, Stones, and Fossil Bones, Council for Elementary Science International and National Science Teachers Association, Washington, D.C., 1991.

Polluted, United States Environmental Protection Agency, Office of Water, Washington, D.C.

Ranger Rick's Nature Scope. Let's Hear It For Herps! National Wildlife Federation, Washington, D.C., pp. 19-35, 1987.

Water-The Power, Promise, and Turmoil of North American's Fresh Water. National Geographic Special Edition (1993), Vol. 184, No. 5.

Poster - Water-Precious Resource can be obtained from the National Geographic Society, 1745 Seventeenth Street, NW, Washington, DC, 20013-7138. Poster includes a map of the United States and surface water, groundwater, sources of water pollution, hazards of irrigation maps, and facts about water use.

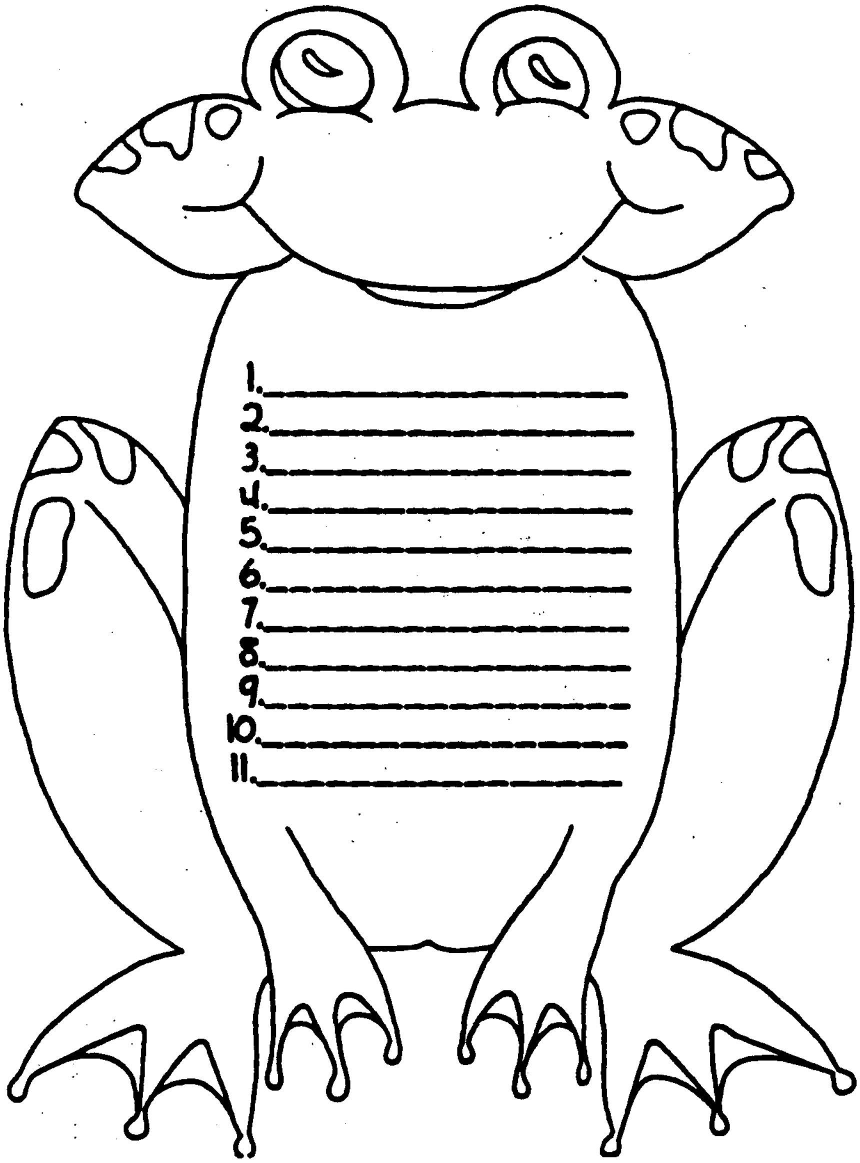
Poster - Water Quality and others can be obtained from the U.S. Geological Survey by writing to the following address:

U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO 80225. In your letter, please identify the poster title and grade level.

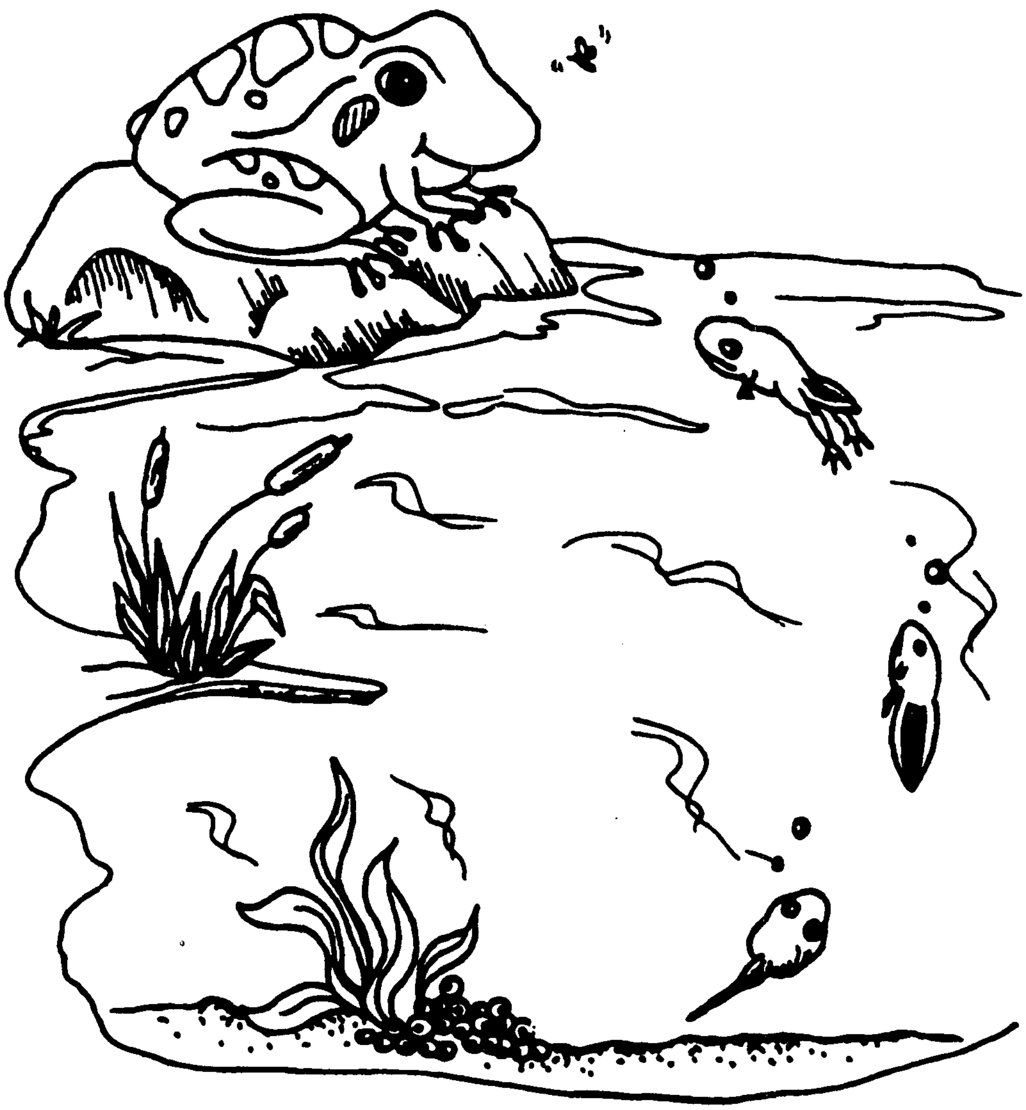
Videos - National Geographic Programs and Products
Great Lakes, Fragile Seas, general, 59 min., 1991.

Water: A Precious Resource, general, 23 min., 1980.

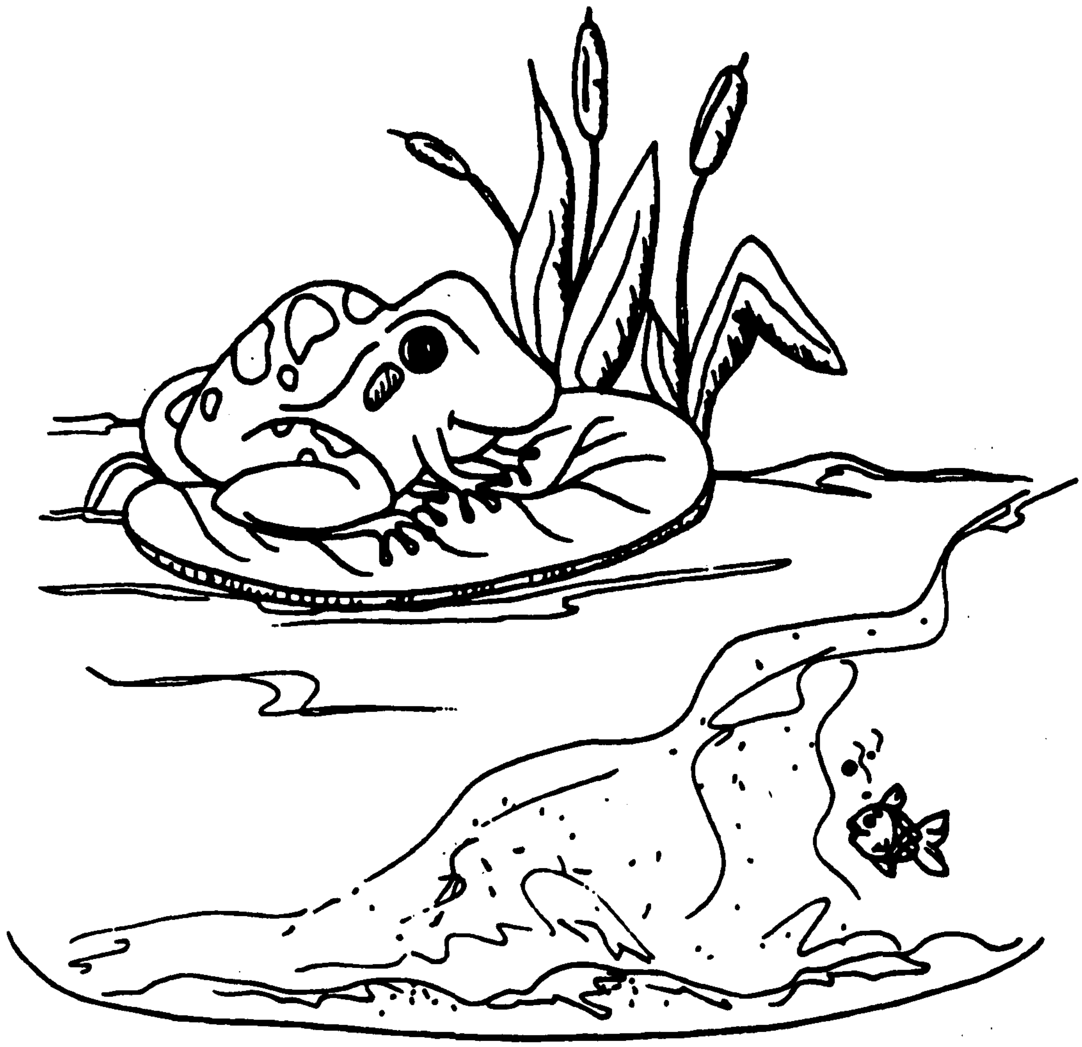
# HOW IS VERDE FROG?




**Directions: Write down a different describing word each time you are asked the question, " How does Verde Frog feel? "**



In the spring, Verde Frog began his life at Mudpuppy Pond. Like all amphibians, he went through several changes or metamorphoses before he became a frog. The unpolluted waters of Mudpuppy Pond helped him grow from an egg, to a tadpole, and finally to an adult frog. Verde loved to hop and swim in Mudpuppy Pond. Slurping bugs and worms with his long sticky tongue was the best part of the day. Life was good. Until . . .



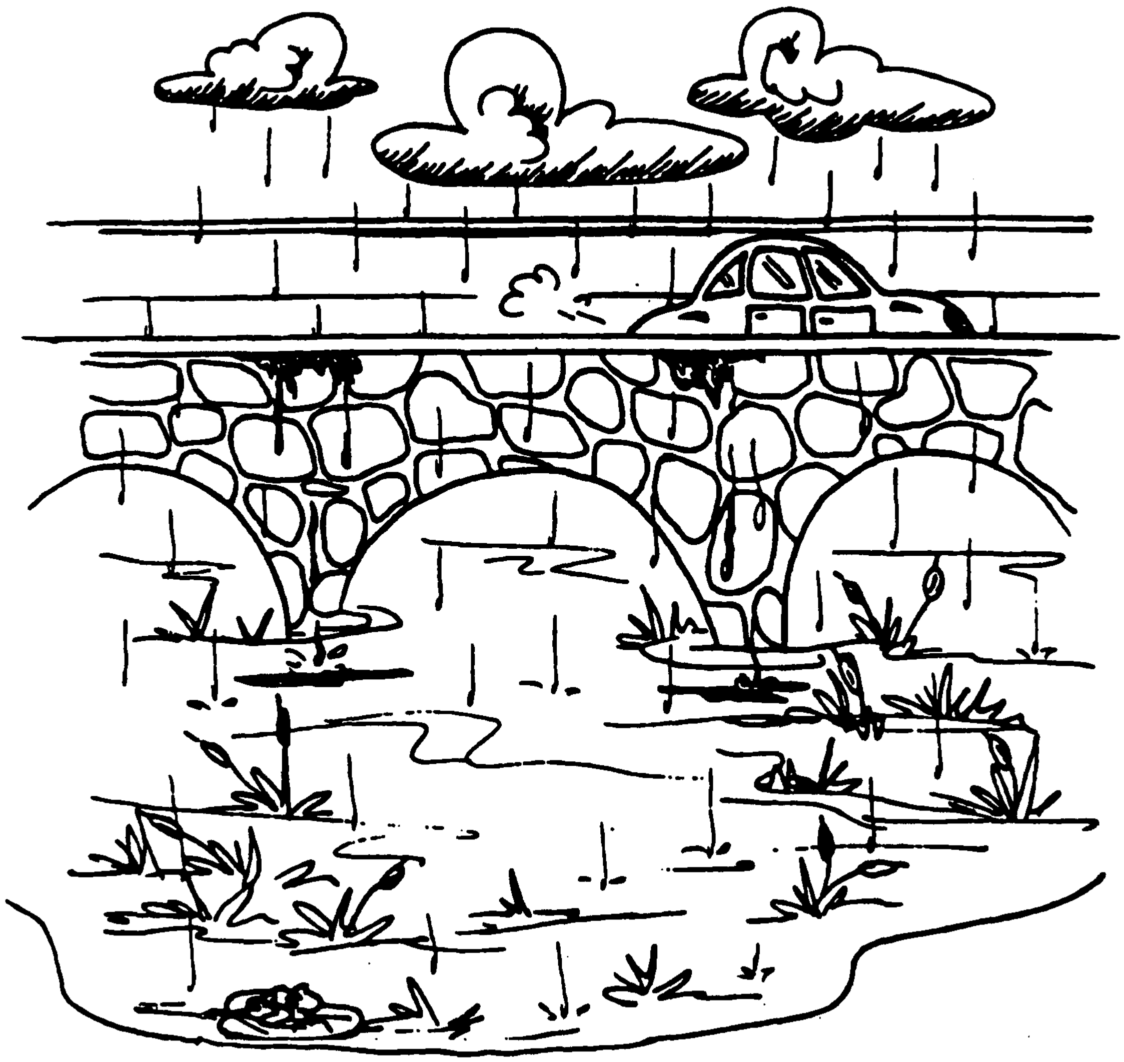
People became careless. They did not think about all the *species* of animals that lived in Mudpuppy Pond and the creek upstream from it. Water, the most abundant liquid on the earth, provides a variety of valuable habitats or homes for wildlife. Verde's habitat began to change.

Mr. Farmer freshly plowed his field near the creek. It begins to rain and some soil erodes into the creek near Mudpuppy Pond. Large amounts of sediment are beginning to fill in the creek and pond. (Pour contents of jar 1 into the creek near Mudpuppy Pond.) How does Verde frog feel?

The cows are grazing on the green grass next to the creek. Sometimes they wade out into the creek to get a drink of water or to cool off on a hot summer day. The animal waste washes into the pond. (Pour the contents of jar 2 into Mudpuppy Pond.) How does Verde Frog feel?

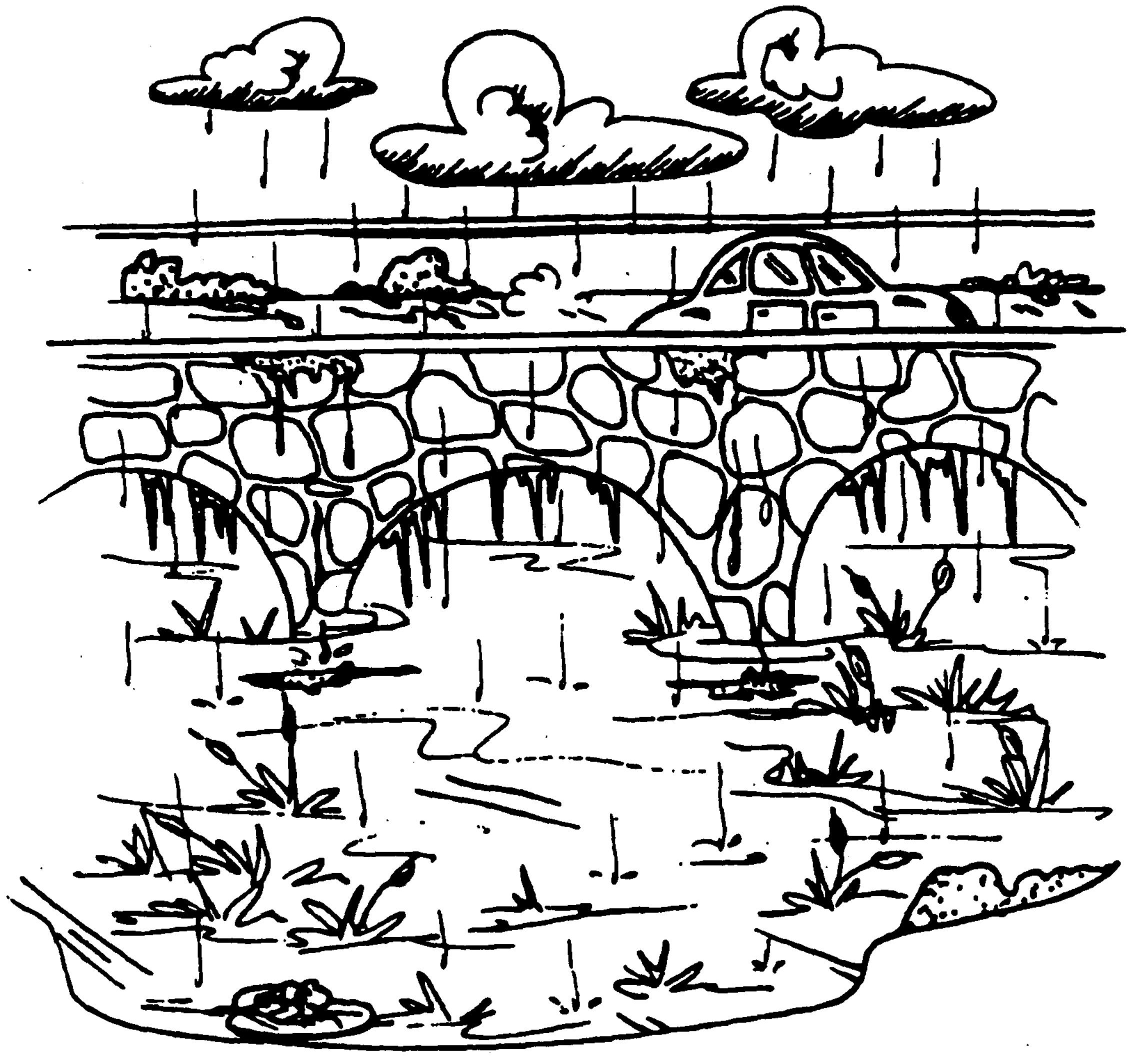
4

Many houses are built near the pond. Fertiliser and pesticides used on the lawns and gardens wash into the pond after a heavy thunderstorm. The fertiliser makes the plants in the pond grow very fast and thick. Mudpuppy Pond can't support all those plants. They begin to die and are starting to rot. Their decomposition (rotting) is using up some of the oxygen Verde's food sources need to live. (Pour contents of jar 3 into Mudpuppy Pond.) How does Verde Frog feel?

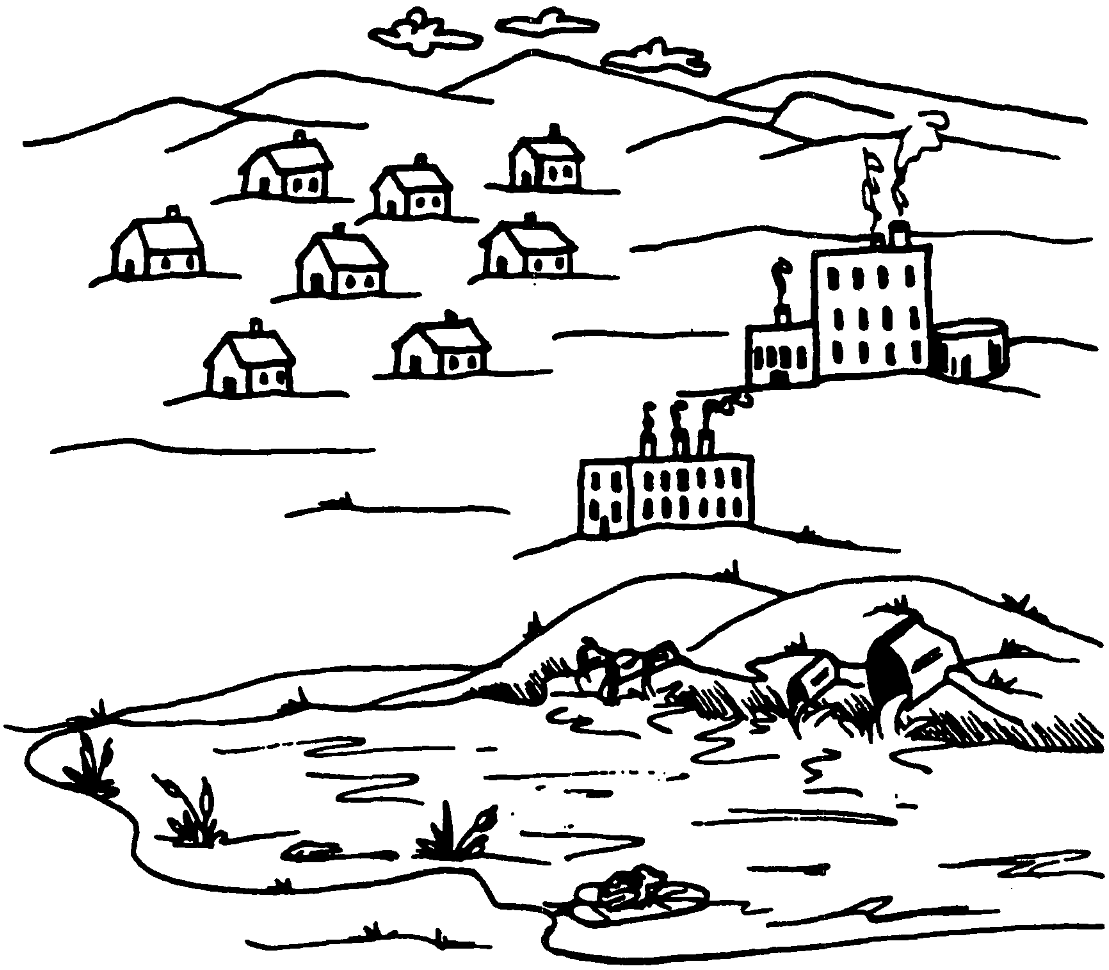


A beautiful park was built on the other side of the creek near Mudpuppy Pond. A bridge was built over the creek so people could travel back and forth. Some cars traveling across the bridge are leaking oil. The rain is washing the oil into the creek. (Pour contents of jar 4 into the creek.) How does Verde Frog feel?


People visit the park often. They play games and picnic near the water. Some people don't throw their trash into the garbage cans provided by the Parks and Recreation Department. The wind is blowing paper into the creek and pond. (Pour the contents of jar 5 into the pond and creek.) How does Verde Frog feel?

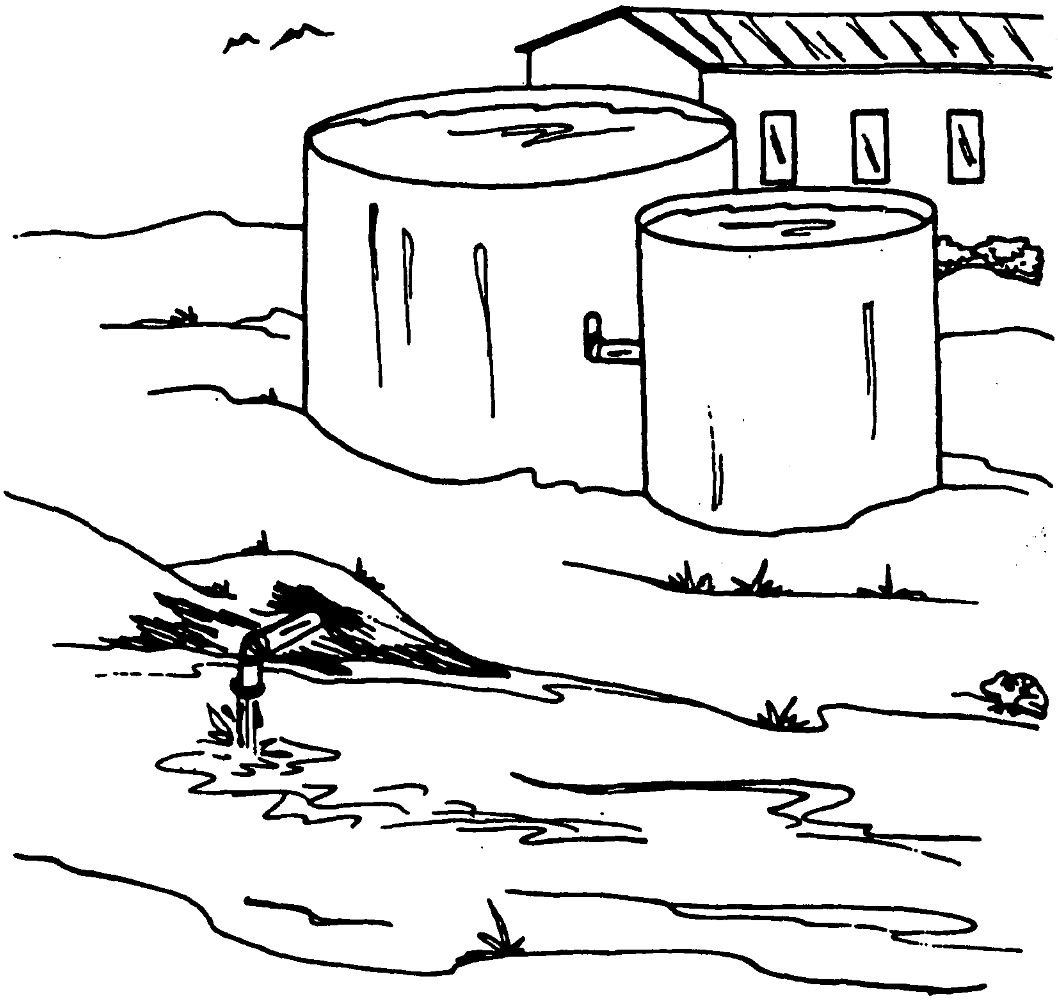


Last winter, when the temperature was below freezing, it started to rain. Ice formed on the bridge and roads around the town. County trucks spread salt on the road and bridge to prevent accidents. The rain washed salty slush into the creek and pond. (Pour contents of jar 6 into the creek.) How does Verde Frog feel?

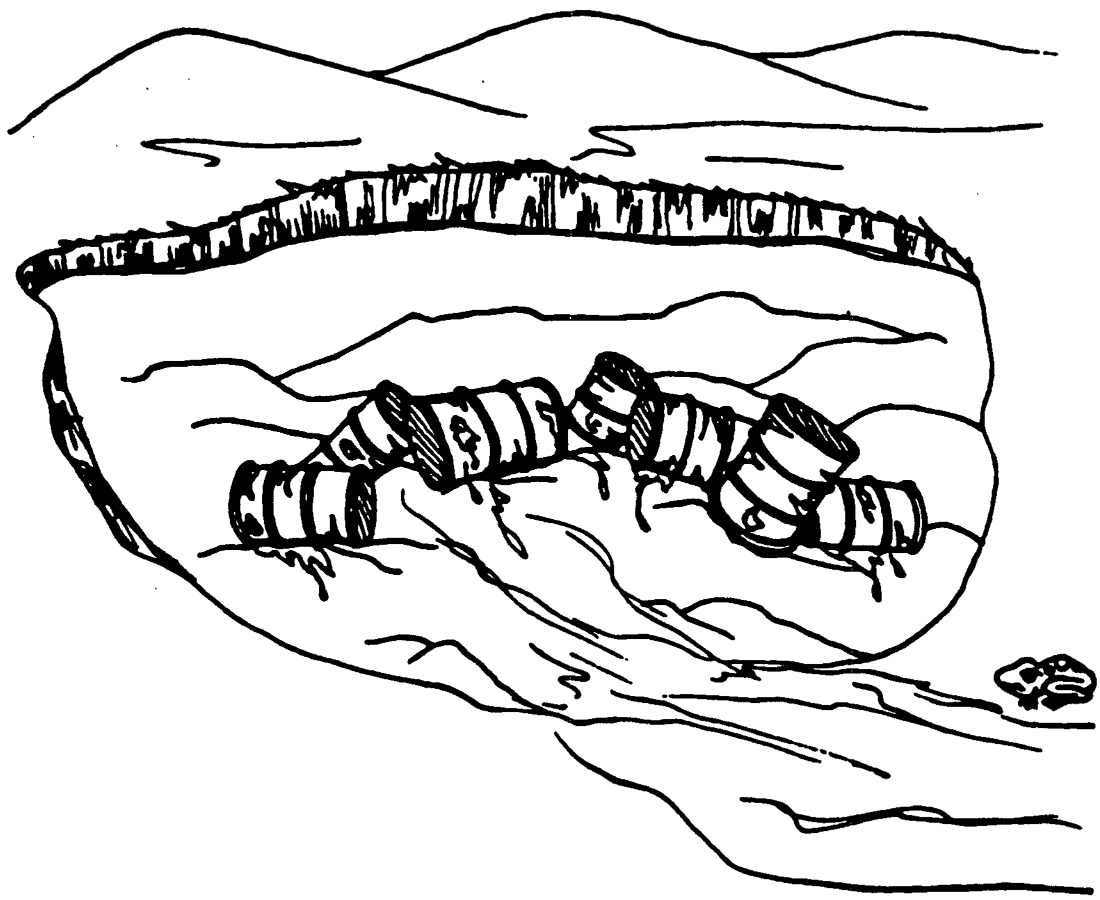


The town began to grow and several factories were built near the creek upstream from Mudpuppy Pond. Although laws limit the amount of pollution the factories are allowed to dump into the water, the factory owners don't always obey the laws. (Pour contents of jar 7 into Mudpuppy Pond.) How does Verde Frog feel?

9

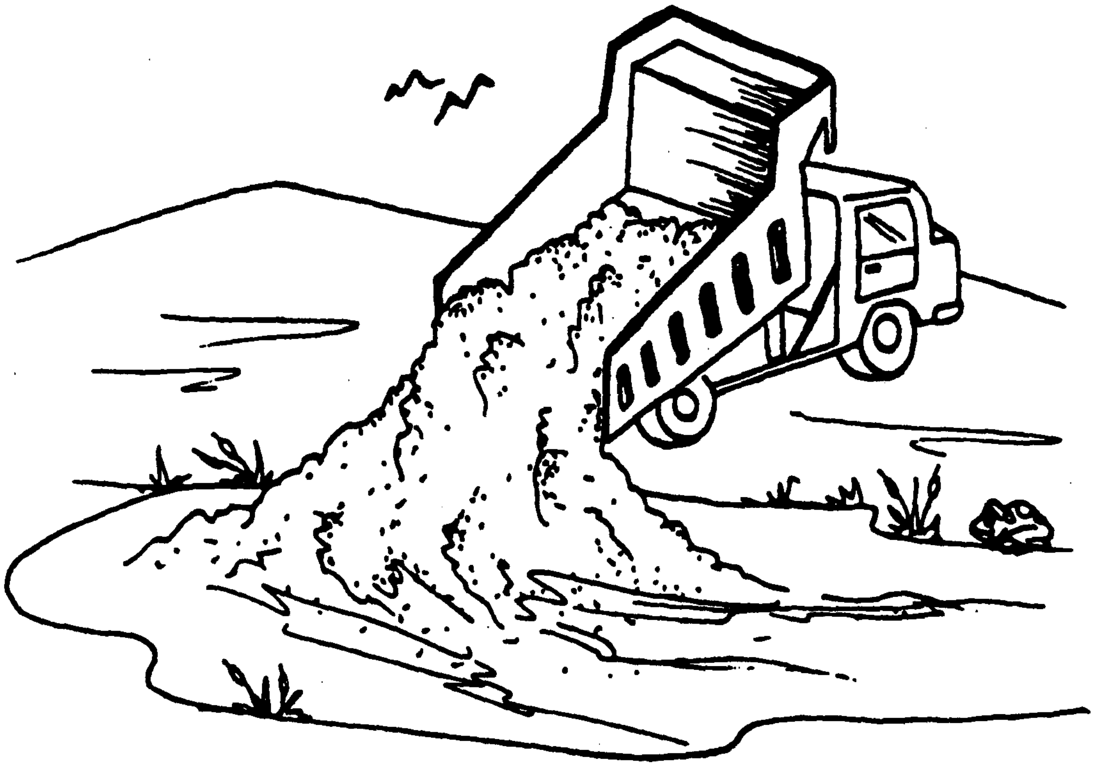


The town's wastewater treatment plant is located on the river upstream from Mudpuppy Pond. Sometimes people in the town pour hazardous waste such as floor polish, oven cleaner, furniture polish, spot remover, car wax, and pool chemicals down the sink drain instead of carrying them to a hazardous waste center for disposal. A part of the plant has broken down and untreated wastewater flows into the river. (Squirt two drops of red food coloring into the river.) How does Verde Frog feel?

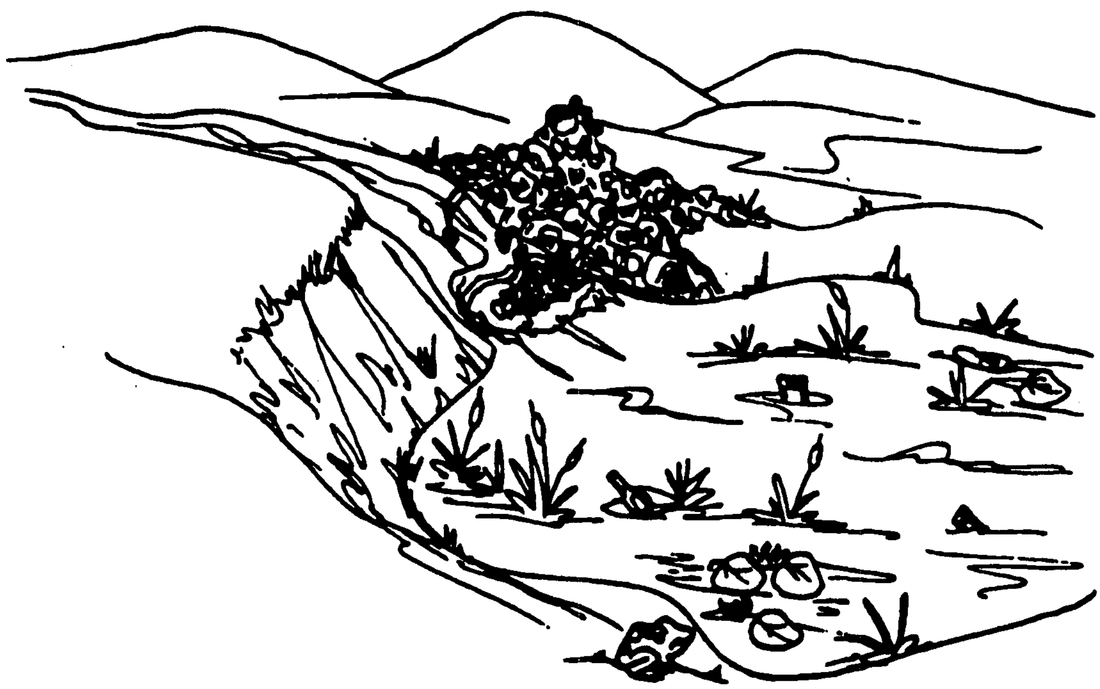


A hazardous waste landfill was built to store dangerous materials. The town's people knew how important it was to prevent them from getting into surface water and groundwater. Over time, the barrels become rusty and toxic chemicals start leaking onto the ground. The rain washes these chemicals into Mudpuppy Pond. (Squirt one drop of green food coloring into Mudpuppy Pond for every barrel that is leaking.) How does Verde Frog feel?

11



The growing town needed more electricity than the neighboring town's power plant could supply. The town built a coal-burning power plant close to Mudpuppy Pond. The pollution laws and rules aren't as strict as they should be, so the plant dumps the ashes left from burning coal into the pond. The ashes have a lot of metals in them. Mercury is one of those metals that is harmful to the wildlife living at Mudpuppy Pond. (Pour contents of jar 8 into Mudpuppy Pond.) How does Verde Frog feel?



Local residents discovered a mineral on a hill near Mudpuppy Pond. Mining is started to remove the mineral. The owners dump the rocks removed from the hill near the pond. As the rock pile grows, some of them fall into the pond. The rocks are filling in the place where the creek runs into Mudpuppy Pond. Fresh water cannot flow in. Soon, the water becomes smelly. (Pour contents of jar 9 into the creek where it runs into the pond.) How does Verde Frog feel?

Mudpuppy Pond has changed. People forgot that every living thing has a purpose and exists so that other living things can continue to live. The pollution in the lake has upset the balance in Verde's environment. How can we help Mudpuppy Pond become healthy again?

# CERTIFICATE

for
being a
FRIEND
of the
EARTH

Name Date

# CAN YOUR DAM HOLD WATER?

K-2

## OBJECTIVES

At the end of this lesson, the students will be able to do the following:

1. Construct a dam in a milk carton using selected materials;
2. List, orally or in writing, facts about why dams are important; and
3. Give an oral or written definition of dam.

**SUBJECTS:**
Language Arts, Science, Social Studies

**TIME:**
20 minutes for a 2-day period

**MATERIALS:**
32 oz. juice box
pitcher for water
waterproof paint
caulking
utility knife
green sponge
materials for beaver dam
(see Advance Preparation)
materials for dam construction
(see Advance Preparation)
1-pint milk cartons for each student

## BACKGROUND INFORMATION

A dam is a barrier across a water source to stop the flow of water. People use dams to store water for irrigation, town or city water supplies, to produce electricity for homes and industries, and for recreational purposes on the lakes and reservoirs created by dams. Dams also control flooding and can regulate the water flow for fish and wildlife in streams below the dams. Just as a beaver builds a dam for special purposes, such as shelter and protection against enemies, human-made dams are also built for special purposes. Unlike the beaver dam, which is made of sticks, stones, and mud, human-made dams are made of many different materials and vary in size according to the water source and need.

There are two main types of human-made dams: masonry dams and embankment dams. A masonry dam is built using concrete, stone, and other human-made materials. An embankment dam is constructed of compacted natural materials such as rocks, gravel, sand, silt, and clay. Some dams are built to support the entire weight of the force of the oncoming water and others are constructed in an arch curved outward toward the flow of the water to transfer the force of the flow to outside walls. To design a dam, builders must collect information about the location and the surrounding area. They must understand the purposes of the dam and reroute the water source while building the dam.

Term

**dam:** human-made or animal-made barrier across a steam or river that holds and regulates flow of water.

## ADVANCE PREPARATION

A. To demonstrate how a dam blocks water and forms a pool or lake, construct a stream using a half gallon juice carton or waxed cardboard box. Cut top and bottom off, then cut the corner of two sides from end to end. Push the two sides down exposing the inside of the milk carton forming a "V" shape in the middle of the other two sides. The end of the milk carton will make an "M" shape. Tape the cut ends to a piece of cardboard 14" x 14". Paint the model with waterproof green paint with a small blue stream in the "V" of the box. Glue small pieces of sponge to represent trees. Raise one end slightly to create a downward motion of the stream.

B. Gather the materials for the beaver dam. Find small twigs, sticks, and rocks. If real mud is not available, use modeling clay moistened with a small amount of water.

C. Collect 1-pint milk cartons and cut the tops and one side off for each of the students for constructing a dam at the open end.

D. Provide a box of materials for building a dam. Put in such things as twigs, sticks, rocks, shells, clay, glue, pipe cleaners, tissue paper, plastic paper, wood pieces, crayons, pencils, buttons, small blocks, small plastic lids, pieces of cloth, tape, yarn, string, etc.

E. Have pictures available of different types of dams both human-made and beaver made. Have books about dams and beavers available for the students.

## PROCEDURE

I. Setting the stage

A. Read the story, "A Beaver's Dam Home." While reading the story, use twigs, small sticks, rocks, and mud to build a dam in the "model stream" (see Advance Preparation) as the beaver does in the story. Pour water to form a small pool. Then, discuss with the students why beavers build a dam.

II. Activities

A. Discuss with the students why dams are important to people. List students' suggestions on the board or chart paper. Then discuss and list other reasons as discussed in the "Background Information." Discuss different kinds of dams made from human-made and natural materials. Ask the students to suggest other materials that the beavers could have used to build their dam.

B. Give each student a milk carton that has been prepared with the top and one side cut off. Instruct students to construct a barrier or dam that will hold water in the milk carton. Supply a few materials in a box and let them discover different things to use from around the room. Have them test their dams until the water will stay in the milk carton for at least five minutes. If their dam does not hold water, let them try again. Students may work on their dams for short periods of time over a couple of days.

III. Follow-Up

A. After the students have had a sufficient amount of time to build their dams, bring the students together to discuss their ideas about building a dam. Have them discuss the problems and successes encountered when building their dams. If time allows, have students modify their dams using the knowledge gained.

IV. Extensions

A. Beside a water table filled with sand (or using a sand box), set a bucket of water on a platform and put a flexible tube from the bucket to the water table. Use the tube as a siphon letting the water run slowly into the table to form a small stream. Have a small group of students construct a dam to make a small lake.

## RESOURCES

Kala, Sybille and Klaus, The Beaver Family Book, Neugebauer Press, Austria, 1987.

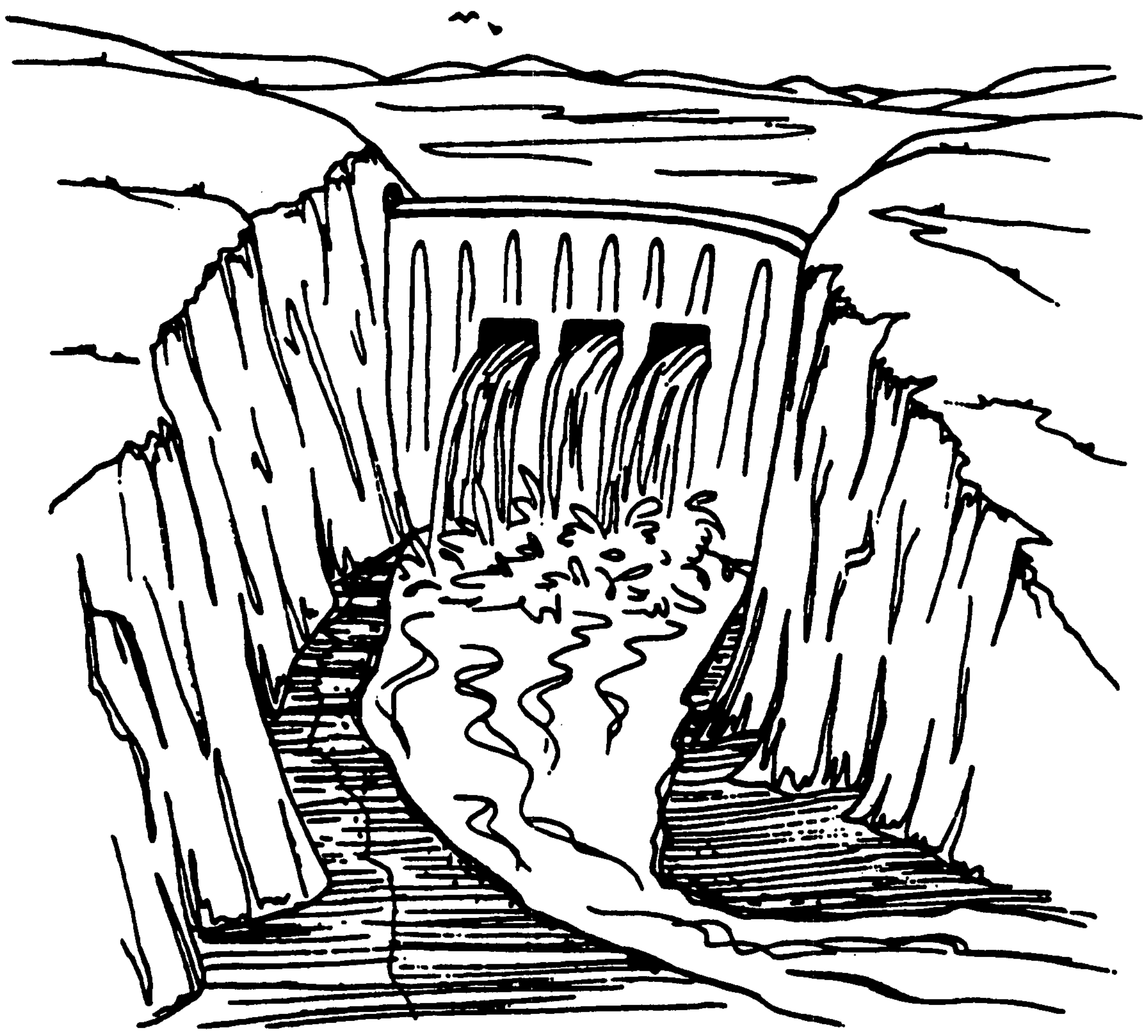
The World Book Encyclopedia, World Book, Inc., Volume D5, 1995.

Stidworthy, John, Ponds and Streams, Eagle Books, Limited, New Jersey, 1990.

## A Beaver's Dam Home

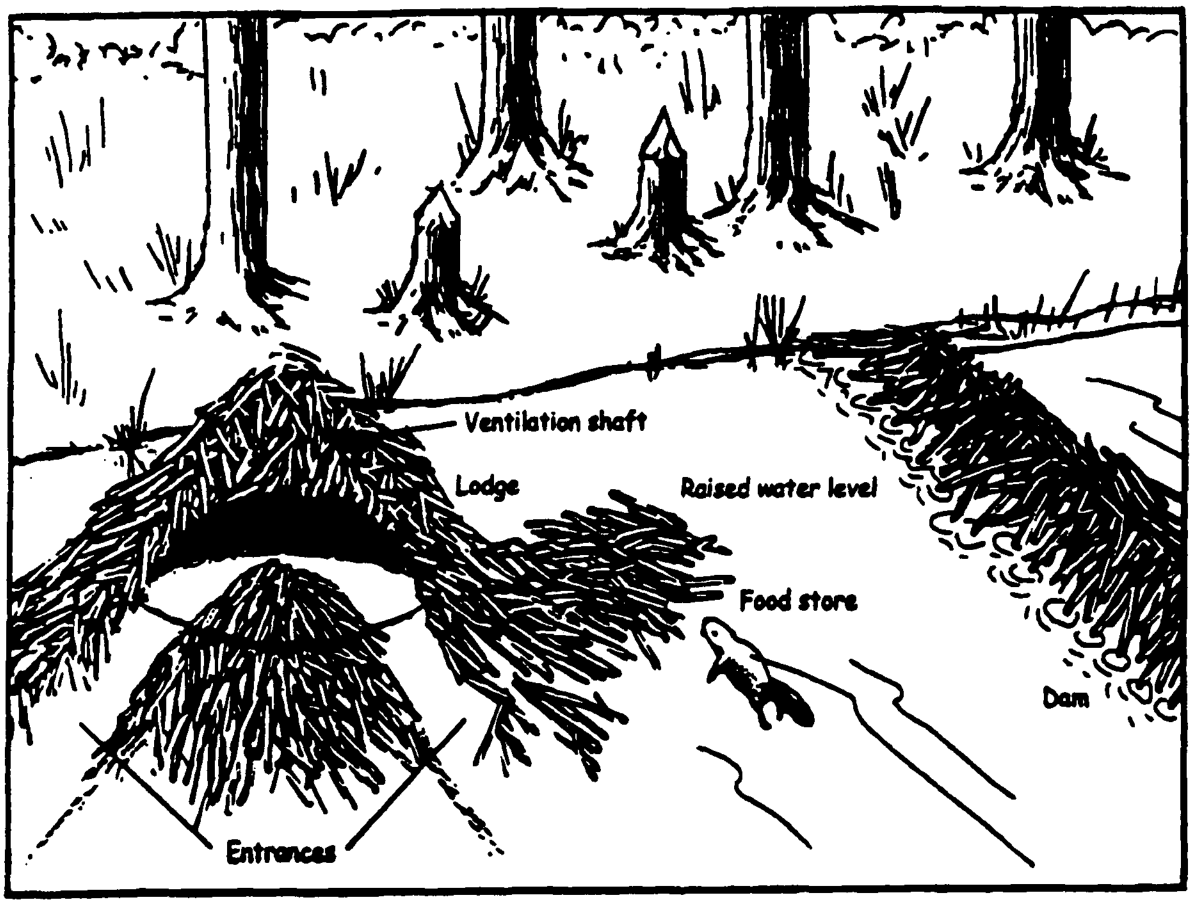
In a small stream where the water gently rippled over pebbles in a beautiful meadow hidden by a lush green forest, two beavers discovered the perfect place to build their new home. They would work very hard to make suitable lodging to raise a family of young beavers called kits or pups. No one had ever taught them how to build a house, but they went right to work gathering twigs and rocks, and cutting down small trees by gnawing with their four, strong, curved, front teeth. After the beavers had gathered all their materials, (*begin to build the dam by molding all the materials in a haystack shaped mound to fit the width of the stream*) they began to firmly wedge the trees, twigs and rocks plastering them together with mud from the bottom of the stream. They needed to build a strong house to keep out mean wolves, foxes, and bears. The beavers would dive to an underwater passage they had made that led to a comfortable, dry, softly-lined sleeping chamber for their baby kits. As the twigs began to pile up and their home grew bigger and stronger, a small pond began to appear. (*Pour water down the stream to form a small pool of water.*) The beavers had built a dam. As the dam grew, the pool became bigger and deeper and flooded the nearby meadow making a place where the beavers could swim, play, and exercise. Soon the kits will be squeaking and grunting as they hide in the sleeping chamber. Their home, which is not a dam, was built up gradually through many nights of hard work.

# Human-made Dam
# Masonry Dam

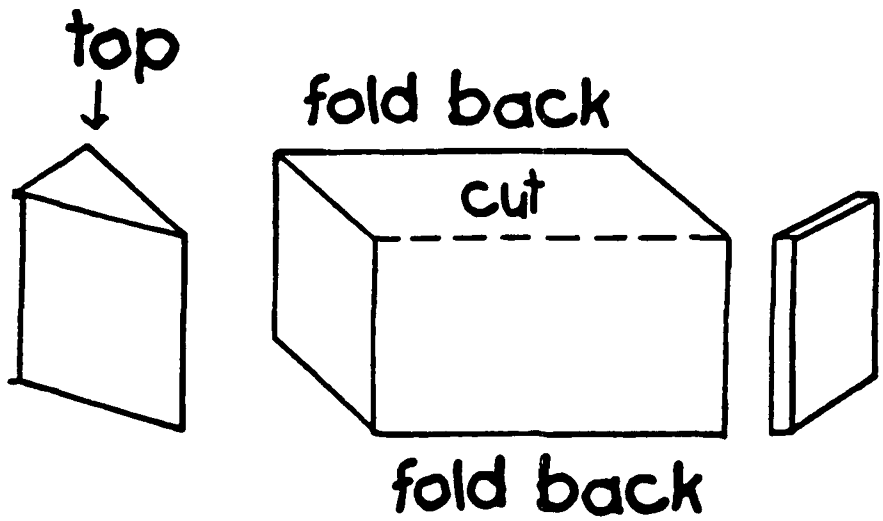


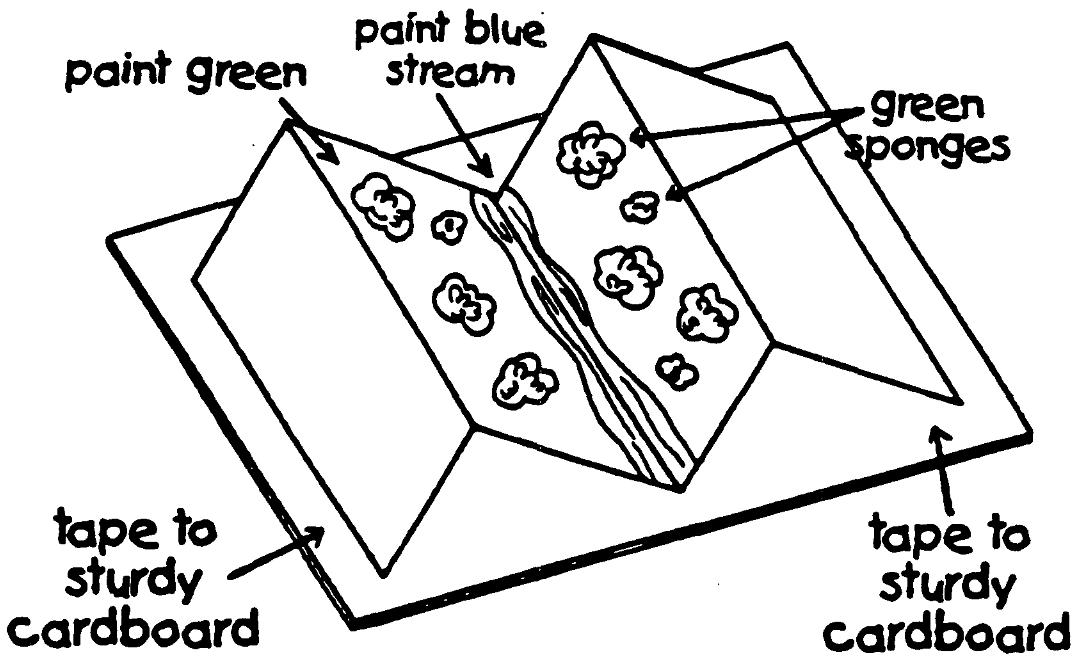
# Beaver-Made Dam

## Enbankment Dam



# Dam


top
fold back
cut
fold back


paint green
paint blue stream
green sponges
tape to sturdy cardboard
tape to sturdy cardboard

# WATER WORKS FOR US

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Name, orally or in writing, ways that moving water can do work;
2. Act out ways that water is used to perform work; and
3. Give an oral or written definition of kinetic energy.

**SUBJECTS:**
Science, Music, Creative Drama

**TIME:**
20 minutes

**MATERIALS:**
aluminum pie pan
scissors
pencil
ruler
knitting needle with a flat head
liquid dish detergent bottle
teapot
hot plate

## BACKGROUND INFORMATION

Water moving from a higher level to a lower level has energy. The energy of moving water is called kinetic energy. The faster the water moves the more energy it has. Moving water turns water wheels that can run machines. One important use of water is for turning water wheels called turbines. Turbines generate electricity for homes and businesses.

Term

**kinetic energy:** the energy of a body resulting from it's motion.

## ADVANCE PREPARATION

A. Gather materials.

B. Make water wheel - cut the round bottom out of an aluminum pie pan. Make a small hole in the center with a nail. From the center divide the circle into eight equal sections. Mark the sections with a pencil. With scissors cut the pencil lines to about 1/2 inch from the center hole. Bend each section at approximately right angles to the circle to form blades. In the center hole, insert a knitting needle that has a flat head on the end.

C. Make charade cards.

## PROCEDURE

I. Setting the stage

   A. Explain the background information to the students.

II. Activities

   A. Working water

   Using water from the faucet or from the liquid dishwashing detergent bottle squeezed with a lot of force, direct a stream of water onto the blades of the water wheel causing it to spin.

   B. Working steam (water in the gas form)

   Using a teapot with a spout, heat water on a hot plate until steam is coming out rapidly. Hold the aluminum water wheel so that the steam hits the blades causing them to turn.

III. Follow-Up

   A. Sing the song, "I've Been Watching Water Work" to the tune, "I've Been Working On the Railroad."

**I've Been Watching Water Work**
(to the tune of "I've Been Working On the Railroad")

I've been watching water work
All the live long day.
It produces electricity
to make life easier each day.

Don't you like to watch the TV
and run your computer too?

Don't you like to cool your house
and heat it when it's cold?

Water works so much
Water works so much
Water works so much for us for us.

Water works so much
Water works so much
Water works so much for us.

IV. Extension

A. Play charades with ways we use water. Make charade cards with the names of ways to put water to work. Examples: cooking, washing clothes, drying clothes, dish washing, heating, cooling, and as a power source for electrical appliances. Let the children draw a card and act it out for the others to guess.

## RESOURCES

Victor, Edward, Science for the Elementary School, Fourth Edition, MacMillan Publishing Company, Inc., New York, pp. 339, 376, 377, 1980.

Walpole, Brenda, 175 Science Experiments to Amuse and Amaze Your Friends, Random House, New York, p. 25.

# WATER FUN FOR EVERYONE!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Pantomime, by drawing or in writing, water recreational activities;
2. List, orally or in writing, five ways water is used for recreation; and
3. Discuss water safety.

**SUBJECTS:**
Science, Social Studies, Art, Health

**TIME:**
45 minutes

**MATERIALS:**
scissors
magazines
paste or glue stick
poster board

## BACKGROUND INFORMATION

Water is an essential part of everyday living. Water may be used for fun and enjoyment. Some possible water activities are swimming, boating, jet skiing, water skiing, parasailing, diving, canoeing, sailing, snorkeling, surfing, fishing, and man-made water parks. Safety is essential in all of these activities.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Sing "Row, Row, Row Your Boat," "Crawdad Hole," and other songs pertaining to water recreation.

B. Share water activity stories.

II. Activities

A. Game

1. To one of the students the teacher whispers a recreational water activity to act out while the class guesses.

2. When the class names the activity, the teacher writes it on the board.

B. Activity Collages

1. Give each small group of students a poster board and magazines. Instruct them to create a collage of water activities.

III. Follow-Up

A. Give each group the activity page called "Water Safety." Assign each group 3-4 activities. They should create a list of safety rules for their activities.

1. Each group will share his/her report as students choose several safety measures to record on the chart.

B. Ask a Red Cross safety instructor to come in and teach artificial respiration and/or teach water safety. (May consider doing as whole group for young students).

IV. Extensions

A. Arrange "A Day at the Beach" activity day. Play water games and volleyball, and have a picnic lunch.

B. Art Activity - use colored sand for sand painting.

## RESOURCE

Official Water Watcher Resource Manual, Southwest Florida Water Management District, 2379 Broad St, Brooksville, Florida, 34609-6899. 352-796-7211.

# Water Safety

| activity | safety measure |
|---|---|
| swimming | |
| diving | |
| surfing | |
| snorkeling | |
| boating | |
| canoeing | |
| fishing | |
| water skiing | |
| sailing | |
| jet skiing | |
| water parks | |
| parasailing | |

# DON'T BOAT WITHOUT A FLOAT

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, safe boating practices;
2. Discuss the role of surface water in recreation;
3. Simulate the need for wearing a life jacket; and
4. Give an oral or written definition of "a personal flotation device" (PFD).

**SUBJECT:**
Science

**TIME:**
1 hour

**MATERIALS:**
3 different types of PFDs
1) life jacket
2) throwing device (buoyant cushion)
3) life vest
3 chairs
stopwatch (or watch/clock with a second hand)
The Wreck of the Zephyr by Chris Van Allsburg

## BACKGROUND INFORMATION

Boating is a major recreational activity in the United States. Rivers, lakes, streams, and coastal areas are used for boating, jet skiing, canoeing, swimming, and many other water sports. It is important for children to know safety procedures when enjoying our nation's waterways.

Term

**PFD:** personal flotation device or life jacket.

## ADVANCE PREPARATION

A. Collect materials.

## PROCEDURE

I. Setting the stage

A. Read the book, Wreck of the Zephyr by Chris Van Allsburg (Houghton, 1983). Discuss/ brainstorm how the wreck occurred and what happened to the passenger(s). Ask: "Were they wearing a "personal flotation device?" "How did you know?" "How could it have changed the outcome of the story?"

II. Activities

A. Introduce the lesson by stressing the importance of putting on a "personal flotation device" (PFD) BEFORE getting into a boat. The one minute it takes to put it on could save a life!!

B. Line the chairs one behind the other as in a boat. Put a PFD under each chair (that is where most PFDs are kept). Have a student sit in each seat. "Signal" for the boat to start to sink. Have each student spend one minute to find the PFD under the seat and put it on correctly. "Signal" at the end of one minute. See which student(s) were able to save themselves and which student(s) "drowned." (It usually takes only one minute for a nonswimmer (struggling to stay afloat) to drown.)

III. Follow-Up

A. Brainstorm and list various types of boats.

B. Discuss rules of safe boating. List the rules on a piece of poster board (cut in the shape of a boat) as they are discussed. Review the rules. Role play selected rules.

C. Determine how these rules might be different for different boat types.

D. Provide various materials (polystyrene foam, aluminum foil, popsicle sticks, etc.). Have students construct boats of various types.

E. Conduct boat races. Test each for safety.

IV. Extensions

A. Discuss boat terms: port, starboard, bow, stern, fore, aft.

Practice: Make a large outline of a boat on the floor using yarn or paper. Have a student get into the pretend boat. Let the observing students take turns naming the boat terms. The student in the boat will move into the area of the boat that is named.

B. Provide nautical maps. Plan a short trip by boat and calculate the distance by water. Plan the same trip by land and calculate the distance. Are land miles and nautical miles the same? (Convert if possible.) Compare the two distances. Which is the greater distance?

C. Invite a Red Cross safety instructor to speak to the class.

D. Invite a Coast Guard representative to speak to the class.

## RESOURCE

Tennessee Valley Authority, Cedar Creek Learning Center, Knoxville, Tennessee.

# GRANDMA'S BOAT RIDE

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Sort items according to "garbage" or "recycle"; and

2. Identify, orally or in writing, at least two items which should not be placed in rivers, streams, lakes, or oceans.

## BACKGROUND INFORMATION

Sometimes people throw garbage on the ground or in water. This garbage makes our land and water dirty and sometimes hurts animals and plants that live there. Instead, people should dispose of garbage properly and, whenever possible, recycle items such as glass, aluminum cans, paper, and plastic.

**SUBJECTS:**
Language, Art, Music

**TIME:**
30-40 minutes

**MATERIALS:**
The "Grandma's Boat Ride" story booklet
2 garbage cans
2 cardboard boxes
a variety of garbage items (include some aluminum cans and paper, as well as other types of garbage)

## ADVANCE PREPARATION

A. Make copies of "Grandma's Boat Ride" for each student and teacher. Staple pages together so that each person has the complete story.

B. Gather at least as many items of garbage as you have students. (See materials list.)

C. Prepare four labels on sentence strips or construction paper:

garbage — mount each labeled piece of construction

recycle can (aluminum cans) — paper on the side of an empty garbage can recycle box (paper) — mount each labeled piece of construction paper on the side of an empty cardboard box.

recycle box (plastic)

## PROCEDURE

I. Setting the stage

A. Share the background information.

II. Activities

A. Read "Grandma's Boat Ride" to the class.

B. Pass out the individual booklets.

C. Read the story again, allowing them to follow along.

D. Have students draw illustrations in their booklets.

III. Follow-Up

A. Place the container of garbage items (collected earlier), the garbage cans and the boxes in front of the class. Let a student select a piece of garbage. Have the class sing this song with the teacher:

(tune, "Mary Had A Little Lamb")

Garbage should not go in water,
Go in water,
Go in water.
Garbage should not go in water,
It should go in here.

Have the student place the piece of garbage in the correct container (garbage can, recycle (aluminum cans) can, recycle (paper) box, or recycle (plastic) box). Let each student have a turn.

B. Discuss the impact of polluted water on recreational water activities.

IV. Extension

Write the word "Grandma" on the chalkboard. Have the students go through their booklets, page by page, circling the word, "Grandma". Count how many times the word is in the booklet.

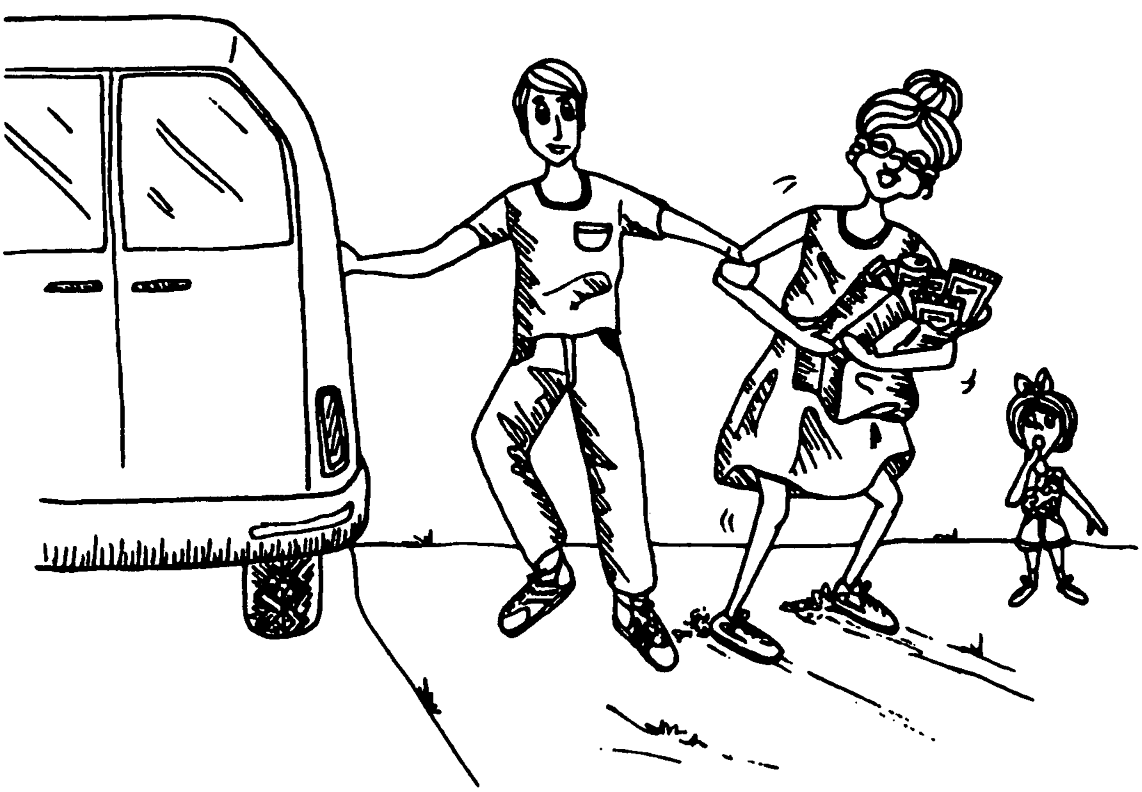
Optional: Repeat the activity with other words.

## RESOURCE

Bittinger, Gayle, Learning and Caring About Our World, Warren Publishing House, Inc., Everett, Washington, page 73, 1990.

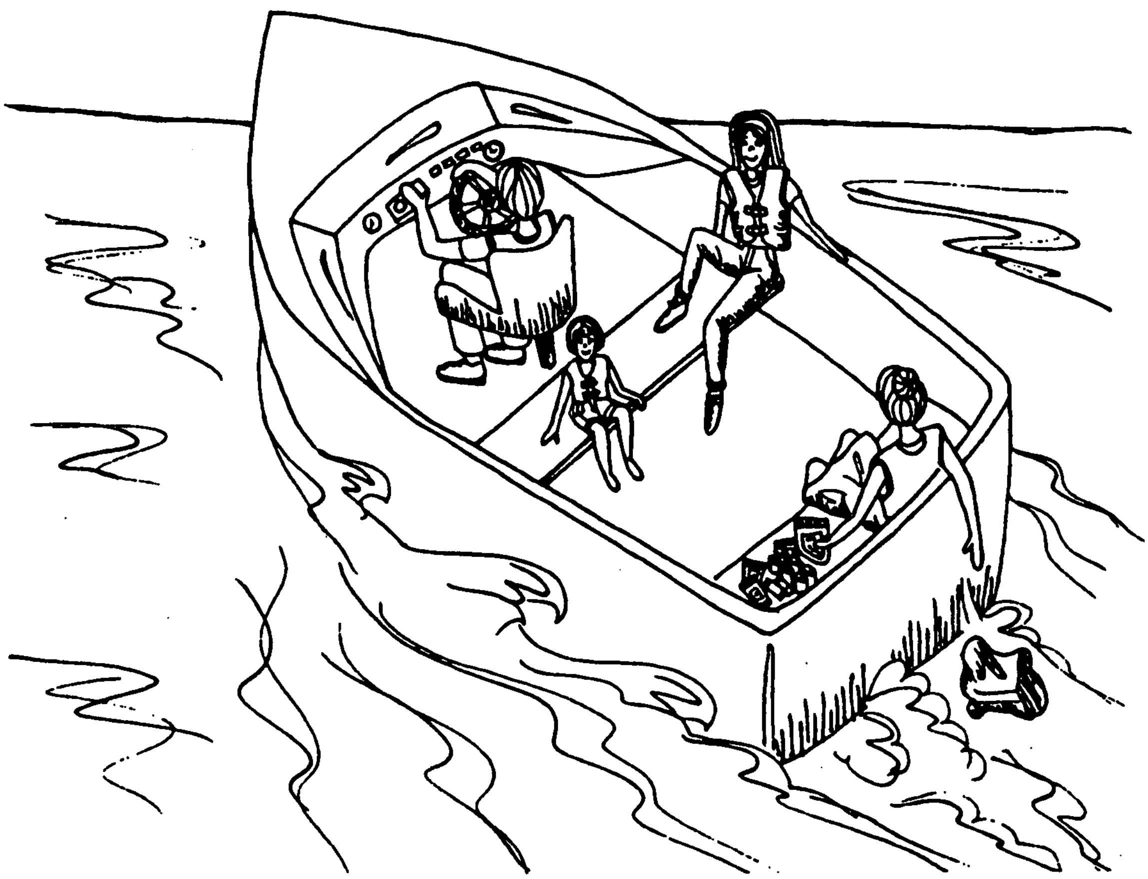
-1-

One day my family went for a boat ride. Grandma said she wouldn't go. But she did.



-2-

When we got into the boat,
Dad told us not to throw
garbage into the water.
Grandma said she wouldn't.
But she did.



-3-

Grandma threw candy wrappers in the water.

Grandma threw cans in the water.

-5-

Grandma threw plastic bags in the water.

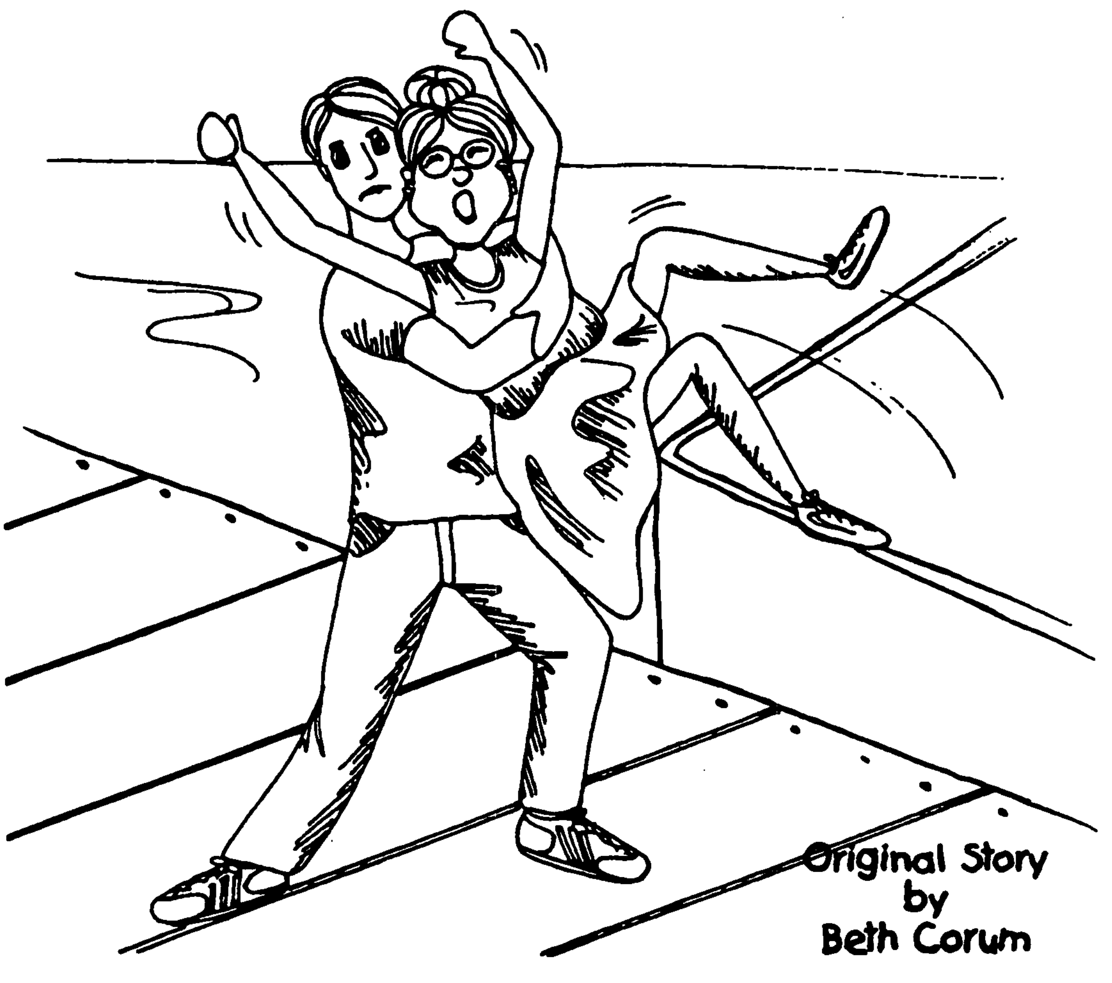
-6-

Dad told Grandma to stop polluting. He explained that we must take care of our water by helping keep it clean.

# -7-

Grandma said she wouldn't throw garbage in the water again. But she did.

Dad stopped the boat. Grandma said she wouldn't get out. BUT SHE DID!



Original Story
by
Beth Corum

# RAIN WATER RUNOFF

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the effects of rainwater runoff;
2. Conduct an experiment on soil erosion and give an oral or written description of the results;
3. Compare and discuss, orally or in writing, the effect of sloping and erosion on soil samples; and
4. Give an oral or written definition of the new terms: erosion, nonpoint source pollution, point source pollution, runoff, and sediment.

SUBJECTS:
Science, Language Arts, Math

TIME:
1 hour

MATERIALS:
each group of 3 students will need:
3 1.89 liter (half-gallon) milk cartons
outdoor source of soil
2-liter bottle
metric ruler
plastic bucket (5 gallon ice cream bucket)
water supply
paper towels or cloth hand towel
newspaper
3 large baby food jars
masking tape
Rain, Rain Rivers by Uri Schulevitz

## BACKGROUND INFORMATION

Sediment is one of our most destructive water pollutants. America's water is polluted by more than one billion tons of sediment annually. Every year, Americans lose millions of dollars because of sediment pollution.

Sediment is caused by erosion, which is the gradual wearing down and carrying away of the Earth's materials. Soil erosion occurs when soil is moved from one place to another by natural means. Wind blows soil, and moving water washes soil away. Normally, soil erosion occurs slowly over a long period of time because trees and grasses hold the soil in place. Erosion can also occur naturally from forest and prairie fires, hurricanes, or tornadoes which strip the land of its protective vegetation cover. Nonpoint source erosion by people also can cause soil erosion to advance much more quickly that normal by allowing over grazing by farm animals and by digging and building on steep slopes, cutting down trees, and plowing the land for crops. The rapid soil erosion that results from such activities can be very harmful to the environment.

Erosion by water often starts when rain strikes bare soil. Large amounts of rain washing down a sloping area pick up loose soil and carry it away. Harmful pollutants can be washed away with the soil during the runoff event. Substandard agricultural and other land practices often prepare fields and their topsoil to be washed away. Besides making the water less attractive to swim in and drink, the soil kills fish and other organisms living in the water.

Terms

**erosion**: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents; processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is removed from the Earth's surface.

**nonpoint source pollution** (NPS): pollution that cannot be traced to a single point because it comes from many individual sources or a widespread area such as urban, rural and agricultural runoff.

**point source pollution**: pollution that can be traced to a single point source, such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges).

**runoff**: water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a water body; may pick up and carry a variety of pollutants.

**sediment**: eroded soil material (often suspended in water that consists mainly of particles derived from rocks, soil, and inorganic materials).

## ADVANCE PREPARATION

A. Collect a plastic gallon bag of soil for each group. Do not use potting soil.

B. Use scissors to cut out the side panel of a milk carton under the spout, leaving the spout intact.

C. Fill a 2-liter bottle with water. Divide the bottle into thirds by drawing a band around the bottle with a permanent marker and collect supplies on a cardboard tray (box from four 6 pack soft drinks works great) or tub.

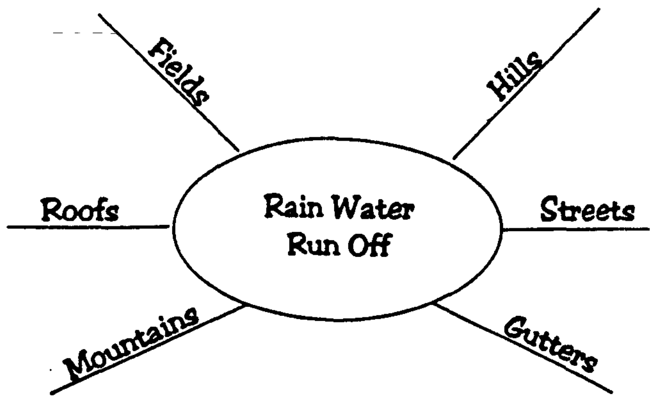
D. Reproduce one copy of student activity pages for each student.

## PROCEDURE

I. Setting the stage

A. Read Rain, Rain Rivers by Uri Schulevitz to students.

B. Explain what erosion is and that rain is important to animal and plant life. Much of runoff is uncontaminated. Runoff waters are necessary to renew many wetlands and habitats. However, erosion due to running water can be harmful to our environment. Pollution such as garden insecticides, automobile emissions caked on parking lots, and lead from paints and exhaust, are washed by runoff into surface waters, streams, rivers, lakes, and oceans. Look back through the book for examples of erosion. Silently hold up pictures again and have students write on a group semantic map (a graphic organizer) different types of erosion in the book. Discuss the different types observed and what each type of erosion could be washing away.




II. Activity

A. Ask students to describe what happens when water moves over soil. Does the slope of the and affect the washing away of loose soil? (What does slope mean?)

B. Group students into pairs and have them cover the work area with newspaper.

C. Hand out the record sheet. Show students the tray of materials and describe the procedure.

D. Hand out the trays to each group of students. Also hand students three strips of masking tape to label numbers on baby food jars (1, 2, 3) and place them on the empty jars. Guide students through the experiment.

E. Lay the milk carton on its side, with the cut out panel facing up, then fill the carton half-full with the soil. (Use no more than 1/3 of soil in bag.) Pat the soil to smooth the surface. Place spout side of milk carton on the edge of a desk. Place jar #1 in the middle of the bucket. A student will hold the jar and bucket under spout during the experiment.

F. Ask students to observe the water in the 2-liter bottle and record their description on the record sheet. To simulate rainfall, have one student pour 1/3 of the water from the bottle over soil while another student is catching water from spout in baby food jar #1 in a plastic bucket. The goal is to provide a constant flow of water over a flat surface. When jar is full, remove jar and observe the color of water. Are there any soil particles in water? Set jar aside and record observations.

G. Now repeat steps E and F with another milk carton and a fresh soil sample, but raise the end of the carton to 3 cm. Have students problem solve what to use from the classroom to raise the slope. Place jar #2 in the bucket and hold under spout. Be sure to use the same amount of water as in the first trial. Observe the difference in the flow of the water. When the jar is full, remove it from the bucket and observe the color and amount of soil particles. Set jar aside and record observations.

H. Repeat procedure for a third time, raising the carton to a height of 5 cm. Place jar #3 in the bucket and hold under spout. When the jar is full, remove from bucket. Observe the color of the water and amount of soil particles. Set jar #3 aside and record observations.

I. Allow each jar at least ten minutes for soil particles to settle. Ask students to observe jars. (Remind students to not move the jars when measuring). Then measure and record the amount of soil particles in the bottoms of the jars. Tell students that when soil particles settle from water it is called sediment. Have students write a definition for erosion and sediment at the bottom of the record sheet. When the slope of the carton was increased, what happened to the amount of soil particles?

J. To clean up, collect cardboard trays and supplies. Have students take milk cartons outside and dump the soil in flower beds around school. Collect milk cartons in garbage bag. You may possibly be able to rinse, dry, and store for use again. Use the overflow water in the buckets to water plants around the school.

III. Follow-Up

A. Have the students demonstrate their knowledge of soil erosion by performing the following task.

1. Explain how water gets muddy. (The runoff of rain water over soil.)

2. Define sediment. (Tiny bits of rocks, soil, and other materials carried into water.)

3. Define erosion. (The removal or wearing away of soil or rock by water.)

4. How can erosion be both harmful and helpful? (Erosion can be harmful when it removes soil from the land or destroys property along a riverbank. It can also be harmful when the runoff picks up harmful pollutants and deposits them in our surface water. It can be helpful when the soil is dropped somewhere else, building up new land.)

5. Have students complete "What Causes Erosion?" activity page.

IV. Extensions

A. Conduct a tour around the schoolyard to look for signs of erosion. In an urban setting, look for such things as cracked and pitted sidewalks, rounded pebbles used for decorative stone, and rivulets carved in dirt by water flowing along street gutters or down slopes on the schoolyard.

1. Construct a chart with names of areas of erosion. Brainstorm possible solutions.

2. Write a letter to the principal explaining what you have been studying, along with the areas noted on your tour and possible solutions. Ask permission to enlist help from parents and the community to correct problem areas.

3. Set up a work session with students and parents to follow through with solutions designed by the class.

## RESOURCES

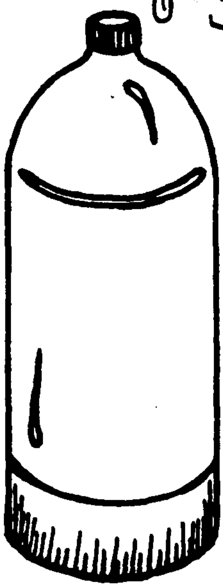

Butzow, Carol M. and Butzow, John, W., Science Through Children's Literature, p. 150-157, Teacher Ideas Press, Englewood, CO, 1989.

Lind, Karen K, Water, Stones, and Fossil Bones, p. 50-51, National Science Teachers Association, Washington, D.C., 1991.

Shulevitz, Uri, Rain, Rain Rivers, Farrar, Straus and Girous, New York, 1969.

Soils, Science and Technology for Children, p. 53-58, National Academy of Science, Washington, D.C., 1994.

# RAIN WATER RUNOFF



_______________
scientist name

1. Describe water in bottle.

| color | solid particles |
|---|---|
| | |

2. Hypothesis:
After the rain shower I think the water will

_______________________________________________

Experiment_____________________________________

| 3. JAR 1 | 4. JAR 2 | 5. JAR 3 |
|---|---|---|
|  |  |  |

color_________________________________________
soil pieces
_______ cm    _______ cm    _______ cm

6. erosion-______________________________________
7. sediment-_____________________________________

# What Causes Erosion

List the things in this picture that could cause erosion:

__________________
__________________
__________________
__________________
__________________
__________________
__________________
__________________
__________________
__________________

Name: ____________________ Date: ________________

# THE WATER SOURCEBOOK
# GROUNDWATER

GROUNDWATER

# WATER HERE AND THERE

K-2

**SUBJECTS:**
Language Arts, Art, Creative Movement

**TIME:**
1 hour (does not include prep time)

**MATERIALS:**
large paper grocery sack for each child
blue crepe paper
brown crepe paper

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Give an oral or written definition of precipitation;
2. Tell at least two things that can happen to precipitation after it falls to Earth; and
3. Give an oral or written definition of the new terms: aquifer and water table.

## BACKGROUND INFORMATION

Precipitation is defined as water that falls to Earth in the form of rain, snow, or hail. Precipitation falls on all types of surfaces: water, mountains, grass, concrete and roof tops. Some of the precipitation evaporates, some runs down into bodies of water, and some seeps down into the ground and becomes part of the water table.

Terms

**aquifer**: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

**precipitation**: water droplets or ice particles condensed from atmospheric water vapor and sufficiently massive to fall to the Earth's surface, such as rain or snow.

**water table**: upper surface of the zone of saturation of groundwater.

## ADVANCE PREPARATION

A. Cut grocery sacks (one per student). Cut a hole in the bottom of the sack large enough for the student's head to fit through. Cut a hole in each (short) side of the sack for the arms of the student to fit through. (Sack should resemble a t-shirt.)

B. Use blue crepe paper wrapped around a circle of chairs to form a body of water.

C. Use brown crepe paper wrapped around a circle of chairs to form a representation of an area of ground.

## PROCEDURE

I. Setting the stage

Share background information.

II. Activities

A. Give each student one of the prepared grocery sacks. Have each one draw a large raindrop on the front of the sack.

1. Have 1/3 of the class also draw a snowflake on the backs of their sacks.

2. Have 1/3 of the class also draw a hailstone on the backs of their sacks.

B. Divide the students into two groups. Each group should have some students dressed like rain, snow, and hail. Have one group stand behind the blue roped-off area and the other group stand behind the brown roped-off area. The snowflakes and hailstones should stand backwards so the pictures show. Read the narration prompting students' movements as they dramatize the lesson.

C. Narration:

"Water falls to the Earth in three forms: rain, snow, and hail. This is called precipitation. Sometimes precipitation falls into a body of water." (Have one group jump into the blue "body of water.")

"Snow and hail melt and become water. Sometimes precipitation falls on the ground." If enough precipitation falls to the ground, puddles may form. (Have part of the second group jump into the brown "ground" area.)

"Snow and hail melt and become water. Some of the water runs off down a slope." (Have one student slide out from under the roped area.)

"Some of the water seeps down through the ground (the students slowly squat), around rocks, and through soil and other rocks until it reaches a layer that is already filled with water. This layer is called an aquifer and the water in it is called groundwater. Gradually, the water in the puddles seeps down through the ground or it evaporates." (Have some of the students stand up slowly on the table.)

"Some of the water from the aquifer is pulled up through a well by pumps and is used by people. We all depend on groundwater and it should be kept clean."

III. Follow-Up

A. Have the students draw pictures showing precipitation and water seeping down to an aquifer.

IV. Extension

A. Tell your students, "The depth of the aquifer varies from place to place." Ask, "Why do you think that is?" Discuss and extend the concept of precipitation.

## RESOURCE

Groundwater Concern, Inc., 1794 Columbia Road, NW, Washington, D.C., 20009, 1984.

# IT'S TIME TO CONSERVE

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Design (draw) posters on 8" x 10" paper for water conservation in the classroom;

2. Tell or write ways to conserve water around the home; and

3. Give an oral or written definition of the new terms: conserve, hydrologists, and hydrology.

**SUBJECTS:**
Science, Social Studies, Math

**TIME:**
30 minutes over a 2-day period

**MATERIALS:**
bucket
8" x 10" paper
pencils
crayons

## BACKGROUND INFORMATION

Water is absolutely essential for life. All living things require water for survival. Water is one of our most precious resources and because of its importance in our lives, we must learn to respect it. Therefore, the practice of water conservation is an important concept to teach young children. The first step in teaching young children how to conserve water is helping them become aware of where water is used and how much water is used in daily living.

This lesson will help young children become aware of our limited supply of available fresh water. Much of this supply is found beneath the Earth's surface as groundwater. The lesson will help young children understand the impact we can have on the fresh water supply if we all conserve water by changing the lifestyle we have become accustomed to which depends heavily upon having plenty of clean water. Although there is plenty of water on Earth, it is not always available in sufficient quantity. Sometimes the quality is not adequate either. There is increasing evidence of chemical wastes improperly discarded in the past which are showing up in our water supplies today. The impact of everyone conserving water at home could mean the difference in health and the economic effects of a shortage of clean water in the future. There are many inexpensive ways to reduce water usage in and around school and home. We all need to practice conservation of water for a better future. See attached sheet for "Ways to Conserve Water."

Terms

**conserve**: to preserve and protect a natural resource from wasteful use.

**hydrologist**: a person that applies scientific knowledge and mathematical principles to solve water-related problems in society such as problems of quantity, quality, and availability.

**hydrology**: the science that encompasses the occurrence, distribution, movement, and properties of waters of the Earth and their relationship with the environment.

## ADVANCE PREPARATION

A. Read the list of "Ways to Conserve Water." Explain that, during times of drought, groundwater supplies dry up. These take years to replace.

B. Copy "It's Time to Conserve" for each student after the sheets have been completed with the students' suggestions.

## PROCEDURE

I. Setting the stage

A. Discuss the importance of conserving water at school. Ask students how they could conserve water around school. Have students help make a list of ways to conserve water and write their comments on the board or chart paper. Some suggestions: check water sources for leaks or drips; catch used drinking water to water plants; rinse paint brushes; and install water-saving devices for general washing duties in the classroom.

II. Activities

A. Using the list of ways to conserve water as suggested by the students, have students make 8" x 10" posters to display as reminders. For example if students have suggested cleaning out a classroom pet's cage once a week and using "used drinking water" for cleaning, have them or an adult write this on a poster or posters, then draw a picture or pictures. Display the poster in the location of the pet.

B. As the year progresses, students may think of other ways to conserve water. This is a good opportunity for students to make additional posters and display them. This is an ongoing process and may be continued throughout the year.

C. If you have students from rural communities, some may get their water directly from wells or springs. How do they safeguard their water supply?

III. Follow-Up

A. Discuss how families can conserve water around the home. Suggest ways from the "Ways to Conserve Water" sheet attached. Write students' suggestions on the board or chart paper.

B. Complete the "It's Time to Conserve" form by writing students' suggestions in the "Practice of Water Conservation" section. Have students draw pictures in the "Pictures of Practice" section to help them remember each suggestion. Each student will take his/her list home and have it completed with the help of their parents. Students will check in the section

"Practice we plan to use" section the practices they were able to complete at home and plan to use in the future.

C. When students return their completed lists, discuss what they found around the home and what they accomplished.

IV. Extensions

A. Create a weekly classroom job of Hydrologist. Explain the important role this person would play in the classroom, and have the students decide what this person might do.

B. If a leaky faucet is found in the school, have the students test how much water is leaking from the faucet. Set a bucket under the leak and catch the water that leaks for one hour or one minute depending on the leak. A faucet leaking 100 drops per minute can waste 350 gallons of water each month. Help students to determine how much water is being wasted each day or each year from the leak.

## RESOURCES

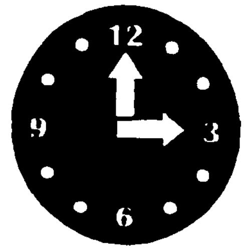

Carroll, Jack, Water Conservation Checklist For the Home, Mississippi Cooperative Extension Service, Mississippi State University, Mississippi, 1989.

Owen, Oliver S., Natural Resource Conservation: An Ecological Approach, Macmillan Publishing Company, New York, 1985.

# Ways to Conserve Water

1. Inspect the plumbing system to see that there are no leaks and replace all rubber washers every 6 months.
2. Turn off all water if the building or residence is vacant for an extended period of time.
3. Never use toilets as trash baskets for facial tissue. Each flush uses 5-7 gallons of water.
4. Check to see how often water softening equipment regenerates and backwashes.
5. Wait until there is a full load for washing clothes or dishes in machines.
6. Set water level on machines at the lowest level possible.
7. Use energy saving levels as often as possible on washing machines and dishwashers.
8. Change into play clothes after school so that school clothes may be worn several times before washing.
9. Urge family members to take showers instead of tub baths.
10. Fit shower heads with flow restrictors or low-volume heads to use less water.
11. Limit showers to 2 to 5 minutes and keep water level at 5 inches of water for a tub bath.
12. Turn off shower water while applying soap to the body or while lathering hair with shampoo.
13. Use a pan of water when peeling and cleaning vegetables and fruits rather than letting the tap water run.
14. Limit the use of the garbage disposal to once per meal or use the disposal even less by saving food scraps for a compost pile.
15. Use the smallest amount of water necessary to cook vegetables and stews. It preserves nutrients as well as saves water.
16. Use tight-fitting lids on pans to prevent water from boiling away and also to cook food faster.
17. Wipe up small spills as they occur to avoid frequent mopping.
18. Do household cleaning chores together to save water.
19. Wash the car less often or take advantage of a spring rain to wash the car.
20. When washing the car, turn off the water while soaping.
21. Cover the pool when it is not being used to prevent evaporation.
22. Clean the pool filter often to keep from replacing the water as often.
23. Use a broom, not a hose, to sweep the garage, sidewalks, and driveway.
24. Install any water-saving devices that may be available in yourarea.
25. Put water-filled plastic bottles in the tank of all toilets to save water during flushes.

# It's Time to Conserve




| Practice of water conservation | Picture of practice | Practice we plan to use (check) |
|---|---|---|
| * | | |
| * | | |
| * | | |

# AWAY IT BLOWS: HOT SPRINGS AND GEYSERS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Demonstrate, either orally or through activity, an understanding of the movement of water molecules;
2. Demonstrate, either orally or by simulation, an understanding of the pressure of hot water molecular movement and how it can cause an eruption;
3. Identify, orally or in writing, pictures of hot springs and geysers around the United States; and
4. Give an oral or written definition of the new terms: geyser, hot springs, and molecule.

**SUBJECTS:**
Science, Art, Cooking

**TIME:**
45 minutes

**MATERIALS:**
popcorn
popcorn popper (clear dome)
oil
construction paper
coat hanger
hot plate
pan

## BACKGROUND INFORMATION

In some places, groundwater is near to underground hot volcanic material such as magma. As this water is heated up by the hot volcanic material, it rises to the surface and may erupt as a geyser. One of the most famous geysers is Old Faithful in Yellowstone National Park.

Hot springs are very much like geysers. They do not erupt but they flow to the surface. There are almost 1,000 hot springs in the United States. Sometimes they are used to produce electricity.

Terms

**geyser**: heated groundwater which erupts through the Earth's surface.

**hot springs**: heated groundwater that flows to the Earth's surface.

**molecule**: the smallest particle of a compound that can exist in the free state and still retain the characteristics of the compound.

## PROCEDURE

I. Setting the stage

A. Review the states of water: solid, liquid, and gas.

B. Have students act out molecular movement for solid, liquid, and gas. Each student portrays a water molecule.

1. Solid - Students huddle closely together and barely move.

2. Liquid - The molecules begin to heat and students move a little bit more and separate slowly.

3. Gas - Students move rapidly and all over the room.

4. Compare the molecular movement of water in a solid to a group of people that are cold, they sit close together. When the group warms up, people move away from one another. (Liquid or gas, if students move far apart). Water is unique in that when in solid form, it occupies more space than when in liquid form.

II. Activities

A. Boil water - Ice water - Gas

B. Demonstrate an explosion caused by water heating and compare it to a geyser.

1. Explain to the students that popcorn kernels contain a drop of water. Ask students to describe what happens to water when it is heated/ (Demonstrate if necessary.)

2. Using a clear, domed electric popcorn popper, pop corn for the students. Note that, before the corn pops, precipitation forms on the dome. As more water turns to steam, the rapid pushing movement of the molecules causes the corn to explode or pop.

3. Relate the popcorn experiment to geysers.

III. Follow-Up

A. Illustrate water as a solid, liquid, and a gas. Show pictures that represent natural formations such as a frozen pond, a waterfall, and a geyser. Use a trifolded paper or a paper plate divided into thirds.

B. Create a mobile featuring famous water-related vacation attractions. Hang the pictures from a coat hanger.

IV. Extensions

A. Talk about other water attractions that are found in U.S. National Parks. Look at pictures or videos of these tourist attractions. If you have access to a computer with an encyclopedia, you can look up geyser on the encyclopedia and find some wonderful facts and pictures.

B. Many people believe hot springs can cure physical problems. Ponce de Leon searched for a Fountain of Youth. Ask, "Would you like to remain a child forever?" Why or why not?

## RESOURCE

Meister, Teddy and Simpson, Ann M., Independent Study Enrichment Projects, Center for Applied Research Education, New York, NY, 1988.

# OH WELL...- HOW WE GET WATER FROM THE GROUND

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Explain, orally or in writing, how water gets into an aquifer;
2. Demonstrate, orally or in writing, an understanding of how wells pump water from the ground;
3. Construct a model of a well; and
4. Give an oral or written definition of the new terms: aquifer, artesian well, groundwater, and well.

**SUBJECTS:**
Science, Language Arts

**TIME:**
1-2 hours

**MATERIALS:**
9-ounce cups or jars
large rocks (rinsed off)
small rocks
water
clay soil, top soil, or sand
clear plastic straws
paper cup with pin holes in the bottom

## BACKGROUND INFORMATION

A well is a hole in the ground from which water can be withdrawn. Wells are dug in the Earth until they reach a zone of sand, gravel, or rock that is saturated with water. These zones are called aquifers. Wells work because water will flow from soaked sand, gravel, or rocks into holes. Sometimes electric pumps are used to pump water up the well.

Terms

**aquifer**: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

**artesian well**: water forced up by hydrostatic pressure.

**groundwater**: water that infiltrates into the Earth and is stored in usable amounts in the soil and rock below the Earth's surface; water within the zone of saturation.

**well**: a bored, drilled, or driven shaft or dug hole; wells range from a few feet to more than six miles in depth, but most water wells are between 100 and 2,000 feet in depth.

## ADVANCE PREPARATION

A. Gather materials for the experiments. The first experiment can be done with sand instead of rocks. However, for efficient pumping of the water into the cup, use different size rocks rather than sand. The sand can clog the straw and make it difficult to trap water.

## PROCEDURE

I. Setting the stage

A. The teacher should review what happens in the water cycle. Place emphasis on the 'accumulation' step of the cycle. Remind the students that water from rain and melting snow trickles down into the ground and is trapped below the surface as groundwater.

II. Activities

A. Construction of a model well

1. Place a clear straw into the 12-ounce cup and press it against the wall of the cup. Place about 1/4 cup of large rocks and 1/4 cup of small rocks into the cup.

2. Pour or sprinkle, from a paper cup with pin holes in the bottom of it, about 1/3 cup of water over the rock layers. Discuss with the class where the water accumulates (aquifer).

3. Now to remove the water from the aquifer, place a finger over the top of the straw. This will trap some water in the straw.

4. Release finger from the top of the straw and water should move into another cup.

5. Discuss how this experiment simulates a well by explaining how a machine, called a pump, is used to get water up from the ground.

III. Follow-Up

A. Students can construct their own wells and describe how they work in their daily journals.

B. The water added to the rock layers simulates rain. Discuss how various levels of rainfall affect a well.

C. Predict what will happen to the well if it doesn't rain for several days. Explain prediction. Test it.

IV. Extensions

A. Do this experiment again, but this time use clay soil, top soil, or sand instead of rocks. Describe the results. Determine which of the materials works best in a well.

B. Discuss flowing artesian wells and why pumps are not required to get the water out of the ground from this kind of well.

## RESOURCES

Allen, Maureen, et. al., All About Water, Developed in cooperation with Dept. of Water Resources, State of California, 1992.

World Book Encyclopedia, Young Scientist, Vol 4, p. 72-73, World Book, Inc., Chicago, 1992.

# WHAT'S THE POINT: POINT VS. NONPOINT

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Define, orally or in writing, point and nonpoint source water pollution;
2. Identify, orally or in writing, types of point and nonpoint pollution;
3. Discuss and evaluate, orally or in writing, lifestyle changes to minimize the damaging effects on habitats;
4. Identify, orally or in writing, ways to prevent water pollution; and
5. Give an oral or written definition of the new terms: bacterial water pollution, conserve, erosion, fertilizer, nonpoint source pollution, point source pollution, sewage, and thermal pollution.

**SUBJECTS:**
Science, Language Arts, Math

**TIME:**
50 minutes

**MATERIALS:**
Verde Frog's habitat from Mudpuppy Pond Story (found in "Surface Water Chapter")
construction paper (red, blue, yellow, green, brown)
bucket, basket, or box
Mudpuppy Pond big book
student activity page
assortment of recycled materials: fabric scraps, wooden skewers, popsicle sticks, plastic lids, wood pieces
11 sheets of 11" x 14" chart paper

## BACKGROUND INFORMATION

Water pollution originates from different sources: point sources and nonpoint sources. Nonpoint source pollution is water pollution which cannot be traced to any specific point or location. It literally comes from everywhere and is washed off the land into our lakes and rivers. Rainfall runoff carries soil, pesticides, and other residues of everyday human activity into our lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

Pollution contributed to water from a discrete source, such as a pipe, ditch, tunnel, or well, is referred to as point source pollution. Generally, pollution from point sources is controlled to some degree by federal, state, and local agencies. Wastewater treatment plants, storm drains, and factories are places associated with point source pollution.

Cleaning polluted water can be extremely expensive. Keeping pollutants out of the water in the first place is the best way to ensure clean water. Many individuals and industries around the country are taking steps to do just that. For example, some industries are reducing their production of toxic chemicals and developing ways to make their products without using toxic raw materials. Many people have switched to phosphate-free detergents and other less-polluting products. Also, governments are passing tough water pollution control measures designed to prevent water pollution, from both point and nonpoint sources.

<u>Terms</u>

**bacterial water pollution**: the introduction of unwanted bacteria into a body of water.

**conserve**: to use a resource wisely and efficiently.

**erosion**: the wearing away of the Earth's surface by running water, wind, ice, or other geological agents by which material is removed from the Earth's surface.

**fertilizer**: natural and synthetic materials including manure, nitrogen, phosphorous, and treated sewage sludge that are worked into the soil to provide nutrients and increase its fertility.

**nonpoint source pollution**: pollution that cannot be traced to single point, because it comes from many individual places or a widespread area.

**nutrient pollution**: a nourishing contamination that causes unwanted plant growth.

**point source pollution**: pollution that can be traced to a single point source, such as a pipe or culvert.

**sewage**: waste and wastewater produced by residential, commercial, and light industrial establishment; typically discharged into sewers and sometimes into septic tanks.

**thermal pollution**: varying temperatures above or below the normal condition (e.g., a power plant turbine heated water); heat reduces the ability of water to dissolve oxygen; deep dams often let extra water flow downstream, when the water comes from the bottom of the dam, it is much colder than normal.

**toxic pollution**: pollution that kills living things.

## ADVANCE PREPARATION

A. Cut two inch squares from red, blue, yellow, green, and brown construction paper. Use enough red, yellow, and blue squares for all of the students but two. Use one green and one brown. Students will get one square of colored construction paper.

B. Copies of pages 3-13 of Mudpuppy Pond story from "Surface Water Chaper" (8 1/2" x 11" size).

C. Copy student activity page.

D. Cut 11 sheets of 11" x 14" chart paper into water drop shapes. Glue a page from Mudpuppy Pond story on back.

E. Gather assortment of recycled materials for students to use to problem solve ways to prevent pollution from entering waterways.

F. Gather water pollution reference books from library.

## PROCEDURE

I. Setting the stage

A. Ask the students, "What is pollution?" Tell students there are two types of water pollution, point source and nonpoint source, in the story Mudpuppy Pond. Write the words on the board.

B. To help students understand these two types, do this pollution simulation activity. Pass out one red, green, blue, yellow, or brown construction paper square to each student. (There will only be one square of green and one square of brown passed out). The squares represent different types of pollution. Tell the students to write the color of their "pollution" square on a piece of scratch paper. Then the students will place the "pollution" squares into a bucket (the pond). Mix the squares, then have all the students with red squares come up and pick out the exact pollution square they put into the bucket. Since all the red squares look alike, it is impossible to find the exact square. Have all red students sit together with pollution squares in the middle. Do this activity with all the colors until all "pollution" squares have been passed out.

Tell students that it is easy to point to the brown and green "pollution" squares. They are called point sources. Point source pollution can be traced to a certain pipe or culvert. Nonpoint source pollution comes from specific areas or the red group, blue group, and yellow group, but it cannot be assigned or pointed to one person or source. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground carrying pollutants with it. This type of pollution is hard to control because it comes from many different places with people and animals contributing to the problem. We all contribute to the problem without realizing it.

II. Activity

A. Prior to reading Mudpuppy Pond story again to the class, pass out the student Point/ Nonpoint Source activity page. Pause after reading each page for students to write a naming word that tells who polluted the waterway, recording it under the heading they believe is correct. After reading the story, discuss the various sources of pollution. Record the source under the correct heading on chart paper and discuss.

III. Follow-Up

A. Tell students each individual can play an important part in stopping pollution by changing certain everyday habits or by using the land responsibly. Brainstorm ways to prevent pollution from entering waterways.

1. Place students in 11 cooperative groups. Pass out chart paper. Have each group read its part of the story. Then, turn the sheet over and semantically map ways to keep pollution from getting into the water. The group may use reference books or brochures which have been placed in the classroom reference center.

2. Display each group's web on a bulletin board.

B. After gathering information, each group will use recycled supplies to correct problems in simulated Mudpuppy Pond community.

IV. Extensions

A. Make a chart with the three headings "Problems, Causes, Solutions," placed where everyone can see it.

B. Write and illustrate an environmental leaflet that addresses the causes and solutions to point source and nonpoint source pollution.

## STUDENT RESOURCES

"Water Play," a 15-page color workbook for grades K-3. Connect the dots, decode messages, fill in the missing words, word search, color and more; these are all avenues taken in this workbook to teach children the basic ideas behind water-where it comes from, how to purify it, and how to conserve it. Order from: Innovative Communications, 207 Coggins Drive, Pleasant Hill, CA 94523, (510) 944-0923. Cost: $.50 each Student Workbook, and $2.00 for each Teacher's Guide.

## RESOURCES

Hansen, Nancy Richardson, Controlling Nonpoint-Source Water Pollution, The Conservation Foundation, Washington, D.C., 1988.

Ranger Rick's Naturescope, Pollution: Problems and Solutions, National Wildlife Federation, Washington, D.C., 1990.

Water Quality: Potential Sources of Pollution, U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO, 80225.

What You Can Do To Reduce Pointless Pollution, Alabama Department of Environmental Management, Water Division, Mining and Nonpoint Source Section, 1751 Congressman W.L., Dickinson Drive, Montgomery, AL 36109.

## Point Source Pollution

## Nonpoint Source Pollution

# SOAK IT UP

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Sort the materials that will absorb into group;
2. Sort materials that repel water into a group; and
3. Give an oral or written definition of the new terms: absorb and repel.

**SUBJECTS:**
Science, Math, Music

**TIME:**
25 minutes

**MATERIALS:**
plastic medicine droppers for each child
plastic meat tray for each child
small cup for each child
water
two 2"x4" pieces of white paper for each child
3 plastic measuring cups
3 different sized sponges
test materials:
- aluminum foil
- plastic wrap
- waxed paper
- feathers
- cotton balls
- sponges
- wooden blocks
- paper towels
- stones
- cotton fabric
- vinyl fabric or plastic sheeting

song "Ducks Like Rain"

## BACKGROUND INFORMATION

Water soaks into many materials. These materials absorb water. There are a lot of materials that water will not soak in to. These materials repel water.

Terms

**absorb**: to take in or soak up a liquid.

**repel**: to not take in a liquid.

## ADVANCE PREPARATION

A. Gather materials.

B. Cut the test materials so that each student has a piece of each material.

C. Give the students two 2"x4" pieces of white paper. Have them write "absorbs" on one and "repels" on the other. These are the category cards into which the students will sort the test materials.

## PROCEDURE

I. Setting the stage

A. Sing the song "Ducks Like Rain" by Raffi. Explain the background information to the students.

B. Ask questions such as "Why do you think ducks do not mind being in the rain?"

II. Activities

A. Give each student a meat tray that contains a piece of each test material, a plastic medicine dropper, and a small cup of water.

B. Have the students test the cotton fabric by dropping water onto it and observing what happens. Sort the fabric into the correct category (absorbs).

C. Next put water on the plastic sheeting or vinyl material. Ask the students which they would rather use to make a raincoat, cotton fabric or plastic material. Have the students sort the plastic sheeting and vinyl materials into the correct category (repels).

D. Have the students test the remaining materials and sort them into the "absorbs" or "repels" category.

E. Discuss the conclusions after completing the activity. Ask the students what the advantages and disadvantages are of the various materials absorbing or repelling water.

III. Follow-Up

A. The following activity may be placed in the science center or done as a small group activity.

1. Put sponges in three different meat trays. Make sure the three sponges are different sizes.

2. Using a plastic medicine dropper, have the students add water to each sponge until it can hold no more and water gets in the meat tray.

3. Have a student squeeze the water from a sponge into a measuring cup. Do the same for the remaining two sponges.

4. Have the students compare the amount of water that each sponge held.

5. Have the students put the sponges and the cups of water in order from smallest to largest.

6. Discuss why some sponges held more water than others.

7. Relate the experiment to water absorption in the Earth and how some materials, such as sand, soak up water more quickly than clay.

B. Have the children test materials found in the classroom as to whether or not the material will repel or absorb water.

# GROUNDWATER AND SOIL TYPES

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Examine and describe, orally or in writing, soils from different locations;
2. Compare, orally or in writing, soils from different locations;
3. Match, orally or in writing, identical soil samples; and
4. Give an oral or written definition of the new terms: clay, humus, loam, permeability, and porosity.

**SUBJECT:**
Science

**TIME:**
1 hour (may consider using 2 class periods for this lesson)

**MATERIALS:**
hand lens
8-ounce cups
shovel or trowel
newspaper
small spoons
paper
small bucket
plastic bags or baggies

## BACKGROUND INFORMATION

Particles of rock and humus are the two main components of soil. It is the proportion and combination of decaying plant and animal parts, rocks, rock particles, fungi, and live animals that determine the texture and water retaining properties of soil.

Terms

**clay**: soil which consists of illite, kaolin, micas, vermiculite, and other mineral particles; clay particles are small and the spaces between them are small; clay soils absorb water slowly but can hold water longer than a sandy soil.

**humus**: organic soil formed from decaying organic material and mineral particles; most humus is black or dark brown, and holds large amounts of water.

**loam**: a fertile rich soil composed of varying amounts of silt, clay, sand, and humus.

**permeability**: the capacity of a porous material to transmit fluids; permeability is a function of the sizes, shapes, and degree of connection among pore spaces, the viscosity of the fluid, and the pressure driving the fluid.

**porosity**: the property of being porous, having pores; the ratio of the volume of minute channels or open spaces in soiled rock to the total volume of solid matter.

## ADVANCE PREPARATION

A. Select several outdoor sites from which the students can take soil samples.

1. If sandy, clay, and loam soils are not available on school property, samples may be provided for the students. However, the activity is most effective if the students can dig and examine at least one soil sample from the school grounds.

2. Collect a bucket full of each type of soil because it will be used for three different activities.

3. For the first activity, students need about one cup of soil from different locations. Cover the remaining soil and store it in a cool, dark place.

B. Prepare materials students need to conduct this activity (hand lens, shovel/trowel, sand buckets, newspaper, cups, small spoons, paper for drawing and writing a list, and plastic bags for storing soil samples).

C. Prepare student study areas. Cover tables with newspapers and pass out spoons, cups, and a hand lens for students to use in examining soil samples.

D. Prepare plastic bags by filling them with each soil type.

## PROCEDURE

I. Setting the stage

A. Have students compose a working definition of soil.

B. Make a chart listing students' ideas of the contents of soil.

C. Tell the students that they will be examining soil to see whether they can discover what it is made of and whether all soil is the same.

II. Activities

A. Prepare to go outside.

1. Give each group a sand bucket and a shovel or trowel. Tell each group where the preselected study sites are located and ask each group to choose a different site from which to dig a soil sample.

2. Have each group of students go to its preselected site, dig a soil sample, and place it in the bucket.

B. Each group should get a large cup of soil from its sand bucket.

1. Have students dump their samples onto their newspaper and examine the sample with a hand lens.

2. Students should sort the materials found in the soil into different cups. Put live animals in one cup, things that look as though they were once alive (plant and animal parts) in another cup, and rocks or pebbles in a third cup. Put the remaining soil in a fourth cup. If the students find any human-made materials they should put them in a separate cup.

3. Have the students further examine the soil by feeling and smelling it. They should also examine the particle size using a hand lens.

III. Follow-Up

A. Discuss the contents of each sample with the groups.

B. Help groups to list the contents they find in their samples.

C. Pass out blackline master "Soil Match."

1. Pass out plastic bags for soil samples. Be sure each group gets the sample it collected.

2. Have each group compare its sample with the identical soil samples labeled 1, 2, and 3.

3. The group will guess which sample matches its own, recording the guess. Students should work with the soil until they are comfortable with matching the samples.

IV. Extension

A. Have students rotate from table to table examining each sample and making comparisons. The students will need experience with all three soil types to build background for future lessons.

# Soil Match

1. Guess which soil matches your sample. Circle yes or no for each bag.


yes no


yes no


yes no

2. Discuss what type of soil your group collected. Circle your prediction.

sandy clay loam

3. Compare your soil to the teacher's labeled samples. Did you answer correctly?

yes no

My soil is ______________________________ .

# DOES IT LEAK?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Collect solid waste materials and tell, orally or in writing, how they can become liquid waste;
2. Create a model of a landfill;
3. Hypothesize, orally or in writing, about landfills leaking into the groundwater; and
4. Give an oral or written definition of waste.

**SUBJECT:**
Science

**TIME:**
two 30-minute days

**MATERIALS:**
deep clear plastic container
soil
clay
grass seeds
plastic tube
garbage
clear plastic
resealable plastic sandwich bags
chart paper

## BACKGROUND INFORMATION

Wastes are discarded or unwanted by-products of human or animal activities. Waste, just like other matter, occurs in three forms: solid, liquid, and gas. In the United States, billions of tons of solid waste are created every year. This includes garbage, rubbish, old cars, dead animals, waste treatment sludges, and many other materials. This is often placed in landfills.

One big concern is the contamination of groundwater from these landfills. Liquid formed by the breakdown of the solids may leak into the groundwater and be toxic to humans.

Term

**wastes**: discarded or unwanted by-products of human or animal activities.

## ADVANCE PREPARATION

A. Collect samples of solid wastes. Be sure to include food, plant materials, and other substances that will decay or breakdown to a liquid form.

## PROCEDURE

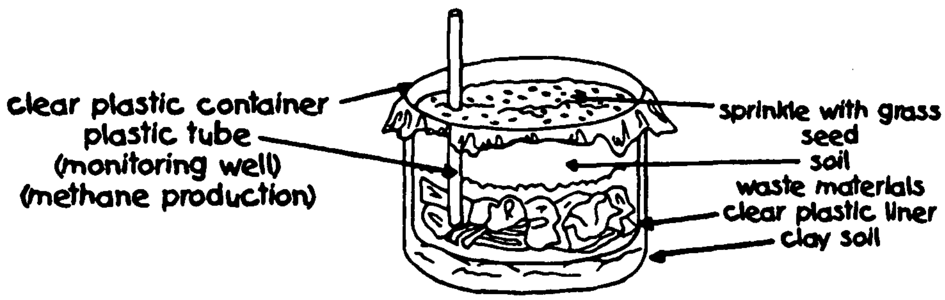
I. Setting the stage

A. Ask students to name things they throw away. On the board or chart paper, categorize them as solids or liquids.

B. Share background material, explaining that landfills are places in which solid wastes are buried.

II. Activities

A. Build a model landfill.




1. Container - represents the solid ground and shows that it is not touching the groundwater.

2. Clay - does not allow water to penetrate easily.

3. Clear plastic liner - most modern landfills are lined to prevent leakage.

4. Soil and grass - helps to keep animals from digging up the garbage, also for safety.

5. Monitoring wells (pipes) - help keep harmful gases controlled so that the landfill does not explode, Methane is a harmful gas often found at landfill sites.

B. Put selected garbage into resealable plastic bags; seal and tape to the window. In a few days, the liquid formation will be obvious.

1. Compare this to what is happening in the model landfill. Hypothesize about how liquid might leak out of the landfill and get into the groundwater.

2. Discuss how leaking or "leaching" of harmful wastes can be stopped.

3. Explain the differences involved in managing wastes.

III. Follow-Up

A. Hypothesize about what happens when the landfills are full.

B. Use similar waste materials for an art project. This emphasizes recycling and reuse of materials.

C. Discuss how to reduce the amount of waste taken to landfills.

IV. Extensions

A. Invite someone from the local landfill or an environmental organization to talk about landfill controls.

B. Teacher can discuss with students proper disposal of household cleaners, car oil, and other hazardous wastes.

## RESOURCE

Waste: A Hidden Resource, Tennessee Valley Authority, Western Kentucky University, 1987.

# THE BAD GUYS VS. THE GOOD GUYS

K-2

**SUBJECTS:**
Science, Art, Math

**TIME:**
45 minutes

**MATERIALS:**
2 pieces of construction paper
old magazines
scissors
glue
index cards
student activity page (included)
poster board

## OBJECTIVE

At the end of this lesson, the students shall be able to do the following:

1. Distinguish, orally or in writing, between liquids which are harmful to people and liquids which are not harmful to people.

## BACKGROUND INFORMATION

There are many products that we use in our daily lives which are perfectly safe when used or disposed of as directed. Window cleaner, nail polish, and gasoline are just three such items that can be harmful to people when used and disposed of improperly. When poured on the ground, they can get into our drinking water supplies and make people sick.

## ADVANCE PREPARATION

A. Gather materials.

## PROCEDURE

I. Setting the stage

A. Share background information.

B. Let each student say the name of some kind of liquid. Discuss and list it on the chalkboard under the heading "Harmful" or "Not Harmful." Optional headings might be "The Bad Guys" or "The Good Guys."

Here is a partial list of common household products which are potentially harmful to people when used or disposed of improperly:

| | |
|---|---|
| bleach | furniture polish |
| window cleaner | bathroom cleaner |

| | |
|---|---|
| medicine | nail polish |
| hair spray | nail polish remover |
| antifreeze | car wax |
| diesel fuel | gasoline |
| motor oil | oil-base paint |
| rat poison | |

II. Activities

A. Divide the class into two groups:

1. Using old magazines and/or labels from old bottles, let one group make a collage on a piece of poster board showing products which can be harmful to people. Also mount some harmful product pictures on index cards.

2. Let the other group make a collage on a piece of poster board showing products which are not harmful to people. Also mount not harmful product pictures on index cards.

B. Sit on the floor with the students. Place one of the collages on each side of you and stack the index cards in front of you. Let each child turn a card over, identify it, and place it on the appropriate collage.

III. Follow-Up

A. Give each student a copy of the student activity page. Have students make a prediction about which group had the most cards and mark their sheets. Show the cards one at a time, allowing time for them to color the graph spaces. Count and discuss. Mark the bottom of the sheet.

B. What do these products have to do with our water supply? How are they used?

IV. Extension

A. Read the warnings on some of these products. Are any of them poisonous? How should we store them, especially if there are toddlers at home? How should some of them be disposed of?

## RESOURCE

"Cap a Chemical," The 3-5 Water Sourcebook, Environmental Protection Agency, Atlanta, GA.

I think my class made more:

____ "harmful liquid" cards

____ "not harmful liquid" cards

(check one)

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| **"Harmful Liquid" cards** | **"Not Harmful Liquid" cards** |

My class made more:

____ "harmful liquid" cards

____ "not harmful liquid" cards

(results after counting and making graph)

# HOW LOW CAN YOU GO?: THE WATER TABLE AND AQUIFER

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Build a model of an aquifer;
2. Demonstrate, orally or in writing, an understanding of the zones associated with water tables;
3. Create a plastic bag book to illustrate the water table; and
4. Give an oral or written definition of the new terms: aquifer and water table.

**SUBJECTS:**
Science, Art

**TIME:**
45 minutes plus observation time

**MATERIALS:**
jar
sand
gravel
water (colored blue)
grease pencil or masking tape
ice
blue drink mix
impermeable paper

## BACKGROUND INFORMATION

Without precipitation, groundwater could not form. Plants use some of the water that infiltrates the ground, but some of it moves down to an aquifer. At the bottom of the aquifer is rock through which water cannot pass. This is the impermeable rock layer. The downward movement of the water stops here. In an aquifer, the rocks are saturated with water. The top of the aquifer is the water table. The water table often follows the shape of the land. A spring may be found where the water table reaches the land surface. If groundwater is used faster than it is replaced, the water table will sink farther below the surface of the Earth.

<u>Terms</u>

**aquifer**: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

**water table**: upper surface of the zone of saturation of groundwater.

## PROCEDURE

I. Setting the stage

A. Ask students, "Have you ever walked in a mud puddle? What did it look like and feel like?" Compare a mud puddle to a water table.

II. Activities

A. Simulating the Water Table.

1. Fill the jar with a mixture of sand and gravel. You may wish to use all gravel.

2. Slowly pour in blue water. Observe what happens to the water. Add until a section of the sand near the bottom of the jar is saturated.

3. Wait until all the water has had a chance to sink in. With a grease pencil or a strip of masking tape, mark the jar at the place that separates the saturated soil from the rest of the soil.

4. On a piece of paper make a diagram of the jar. Label the impermeable layer, the aquifer, and the water table. Suggestion: Do as a whole class once the individual pictures have been drawn. Discuss the meaning of each zone.

5. Put the jar on a window ledge and observe it each day for the rest of the week.

6. Relate the experiment to what happens underground.

III. Follow-Up

A. Does the water table change each day? Hypothesize about the changes. Can you prevent the lowering of the water table in the jar? Devise an experiment to check your hypothesis.

B. Make a drinkable water table using small pieces of ice and blue presweetened drink.

IV. Extension

A. Make a class plastic resealable bag book to illustrate the water table. Have the students work in groups to make each of the three pages. Use regular 8 1/2" x 11" paper.

1. Page one - write "grass"<br>color green

2. Page two - write "dirt"<br>(unsaturated zone)<br>color brown

3. Page three - write "aquifers"<br>draw rocks and color blue

4. Insert each page in a gallon-size resealable plastic bag. Stack the pages in order and staple together.

## RESOURCE

Groundwater: A Vital Resource, Tennessee Valley Authority, Knoxville, TN, 1986.

THE WATER SOURCEBOOK

# WETLANDS/COASTAL

WETLANDS/COASTAL

# IT'S TOO SALTY!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Discuss the shortage of water in parts of the world and locate them on a map;
2. Demonstrate, orally or in writing, the sequence of changing salt water to fresh water using a shoebox TV;
3. List, orally or in writing, reasons why water is important and ways to conserve water; and
4. Give an oral or written definition of the new terms: brackish, desalinization, desert, fresh water, salinity, and salt water.

**SUBJECTS:**
Science, Social Studies, Language Arts

**TIME:**
1 hour

**MATERIALS:**
world map
chart paper
salt
cucumber seeds
other types of seeds
pan
electric skillet or hot plate
jelly roll pan
kitchen mitts
shoe boxes
straws
adding machine tape
eggs
resource book
11" x 14" shallow pan
aluminum foil
modeling clay
rock salt
water

## BACKGROUND INFORMATION

There are two main types of water on Earth, salt water and fresh water. Salt water contains a high level of dissolved salts (oceans, seas). Fresh water is usually found in the ground and in rivers and lakes. Fresh water does not have a lot of salt and is easily turned into drinking water. Most of the water on Earth is salty. Salt water is 3.5% salt. The salts in the sea are mainly composed of table salt. Sea water also contains magnesium, sulfur, calcium, and smaller amounts of all the elements contained in the Earth's crust. The oceans become salty because rivers flow down the mountainsides and over land, tearing loose tons and tons of minerals. Most of these minerals are different kinds of salts. The rivers carry these salts to the sea. There is usually not enough salt in a river to make the river water taste salty. It is very expensive to turn salt water into fresh water that is good to drink, but it can be done.

The salinity (saltiness) of sea water is affected by:

1. The rate of evaporation.
2. The amount of rainfall falling into the ocean.
3. The amount of fresh water added by streams and rivers.
4. The amount of salt in solutions in rivers and streams emptying into the ocean.
5. The amount of salt added by underwater volcanoes and vents.
6. The temperature of the ocean water.

With a shortage of fresh water in many areas of the world, such as the Middle East, desalinization has been identified as a solution, but the process is extremely costly.

Terms

**brackish**: water that is a mixture of fresh and salt water.

**desalinization**: the purification of salt or brackish water by removing the salt.

**desert**: an arid region lacking enough moisture to support vegetation.

**fresh water**: inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or ground water.

**salinity**: amount of salt dissolved in water.

**salt water**: water that has a high level of dissolved salts (oceans, seas).

## ADVANCE PREPARATION

A. Gather supplies on materials list.

B. Make a chart with terms.

## PROCEDURE

I. Setting the stage

A. Display a map of the world.

1. Discuss the availability of water.

a. Have you ever run out of water?

b. Are there places in the world that could run out of water?

c. Look at all this water (point to oceans.) Can we drink it?

d. Can ocean water be changed to make it drinkable?

2. Show the Middle East on a map. Explain that this region is desert and water is scarce.

B. Write these words on a chart and discuss briefly:

salinity
desalinization
brackish
desert
irrigation

C. Explain that places like Israel depend on desalinization to irrigate crops.

II. Activities

A. Cucumbers and salt = ?

1. Plant an equal number of seeds in two small cups of soil. Place the cups in the sun. Water each cup with the same amount of water—one with fresh tap water, the other with salt water (one part salt to 25 parts water). Using a journal, record the results through the week. What did you find out? Use other types of seeds. What happens?

B. Making Salt Water Fresh

1. Mix 1 part salt to 25 parts water. Is it salty? Taste the water. Put the water in a pan. Heat the water in an electric skillet or over a hot plate. Heat to boiling. Put ice cubes on a jelly roll pan. Using kitchen mitts, hold the pan above the steam, so that the steam condenses on the underside of the pan. Collect the condensed drops in a bowl. Taste the collected water. Is it salty? This process is done commercially in many countries that have an inadequate supply of fresh water. This collected water is called distilled water.

C. Make a shoebox TV to retell the sequence of changing salt water into fresh water. Create panels on adding machine tape. The first panel is the title. The other panels illustrate the steps of desalinization. (Have the students brainstorm the steps before making the panels.)

III. Follow-Up

A. Have students review vocabulary.

B. Make a list of ways to conserve water.

C. Make a list of ways water is used at home.

D. Crack two eggs. Float one egg in fresh tap water and the other in salt water (use a large amount of salt). Record in a journal what happens to the eggs.

IV. Extension

A. Ask the question, "How did the ocean become so salty?" Explain the process using background information. Demonstrate this process with the following experiment.

1. Form a mountain with aluminum foil in one side of an 11" x 14" shallow pan. (Use clay to cover mountain to give 'earthy' effect.) Make a crater in the top of the mountain and a trench down the mountain. Place rock salt (represents minerals and elements found in the Earth in the trench). Pour water slowly into the crater and down the mountain. As water gathers at the bottom of the mountain (ocean) dip it up and pour down the mountain. Students should be able to see how the water (river) melts or dissolves minerals and rocks and passes these salty elements on to the ocean.

B. Freeze salt water to see what happens.

C. Research other countries that desalinate their water and determine what methods they use.

## RESOURCES


Allen, Maureen, All About Water, developed in cooperation with Department of Water Resources, California, 1992.

Postel, Sandra, Last Oasis: Facing Water Scarcity, W.W. Norton and Company, New York, 1992.

Vesilind, Priit J., Middle East Water - Critical Resource, National Geographic, Vol. 183, No. 5, May, 1993.

Water Matters: Every Day, Everywhere, Everyway, National Geographic Society, 1993.

# SALTY OR FRESH

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, fresh water and salt water;
2. Locate fresh and salt water sources on a globe;
3. Name, orally or in writing, common fresh water sources: ponds, lakes, rivers, and springs; and
4. Give an oral or written definition of the new terms: fresh water, groundwater, salt water, and surface water.

**SUBJECT:**
Science

**TIME:**
45 minutes

**MATERIALS:**
blackline masters
salt
plastic cups
toothpicks
maps
globe

## BACKGROUND INFORMATION

The majority of the Earth's surface is covered with water. About 97% of this water is salt water. Polar ice caps, glaciers, icebergs, groundwater, and surface water sources provide the remaining 3% of fresh water.

Terms

**fresh water:** inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or groundwater.

**groundwater:** water that infiltrates the Earth and is stored in usable amounts in the soil and rock below the Earth's surface; water within the zone of saturation.

**salt water:** water that has a high level of dissolved salts (oceans, seas).

**surface water:** precipitation that does not soak into the ground or return to the atmosphere by evaporation or transpiration, and is stored in streams, lakes, wetlands, reservoirs, and oceans.

## ADVANCE PREPARATION

A. Copy blackline masters.

B. Display or duplicate local and state maps.

C. Collect salt, cups, and toothpicks for the experiment.

D. Prepare and label solutions for each classroom group.

Cup A - Fill with fresh water
Cup B - Fill with fresh water + three tablespoons of salt

## PROCEDURE

I. Setting the stage

A. Have the students examine a map or globe looking for bodies of water.

B. Make a word web listing different types of water sources they find. See if the students can add any other water sources they could not see on the map or globe.

C. Explain that some of these water sources are salt water and some are fresh water. Help students further divide the web to identify which sources are fresh and which are salty.

D. Discuss which sources would be used for drinking water and why.

II. Activities

A. Divide the students into small groups. Give each group a set of water solution cups and toothpicks for taste testing.

B. Have the students use their senses to make observations about what is in each cup.

C. Have students label the evaluation sheet indicating which cup contains fresh and which contains salt water (blackline master).

III. Follow-Up

A. Worksheet - See blackline master. Have students label the type of water found in the illustrations.

B. Sing the song:

**Water Sources**
(Tune: Go Tell Aunt Rhody)

What are water sources
What are water sources
What are water sources
Where can water be found?

Streams and rivers
Streams and rivers
Streams and rivers
Flow within our state.

Water flows underground
Water flows underground
Water flows underground
And bubbles up as a spring.

Bays and oceans
Bays and oceans
Bays and oceans
Are salty as can be.

Small ponds and big lakes
Small ponds and big lakes
Small ponds and big lakes
Act as reservoirs.

These are water sources
These are water sources
These are water sources
And where they can be found.

IV. Extensions

A. Investigate a local water source and have students identify what kind of water it contains.

B. Have the students examine a globe comparing the amount of land and water.

C. Have students further examine the fresh and salt water sources. Have students list the names of as many salt and fresh water sources as possible. This is a good timed activity for students. (Approximately 5-10 minutes.)

D. Read Getting the Water We Need to extend the students understanding of our need for water and how we use our water sources.

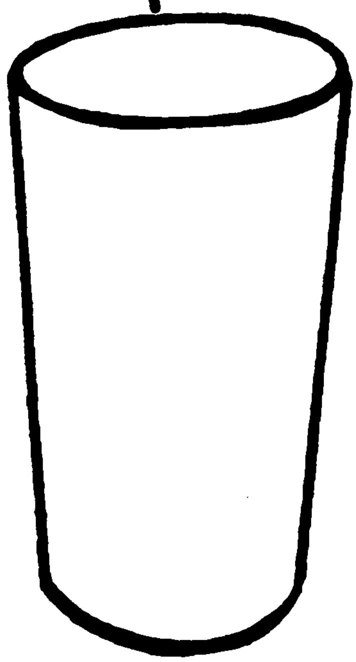
## RESOURCES

Biddulph, Fred and Biddulph, Jeanne, Getting the Water We Need, The Wright Group, 1995.

Official Water Watcher Resource Manual, Southwest Florida Water Management District, 2379 Broad Street, Brooksville, FL, 34609-6899. 352/796-7211.

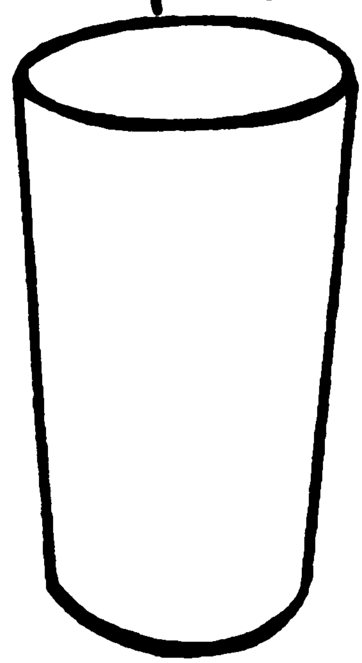
# Fresh or Salty

## Cup A



Cup A contains
_____water

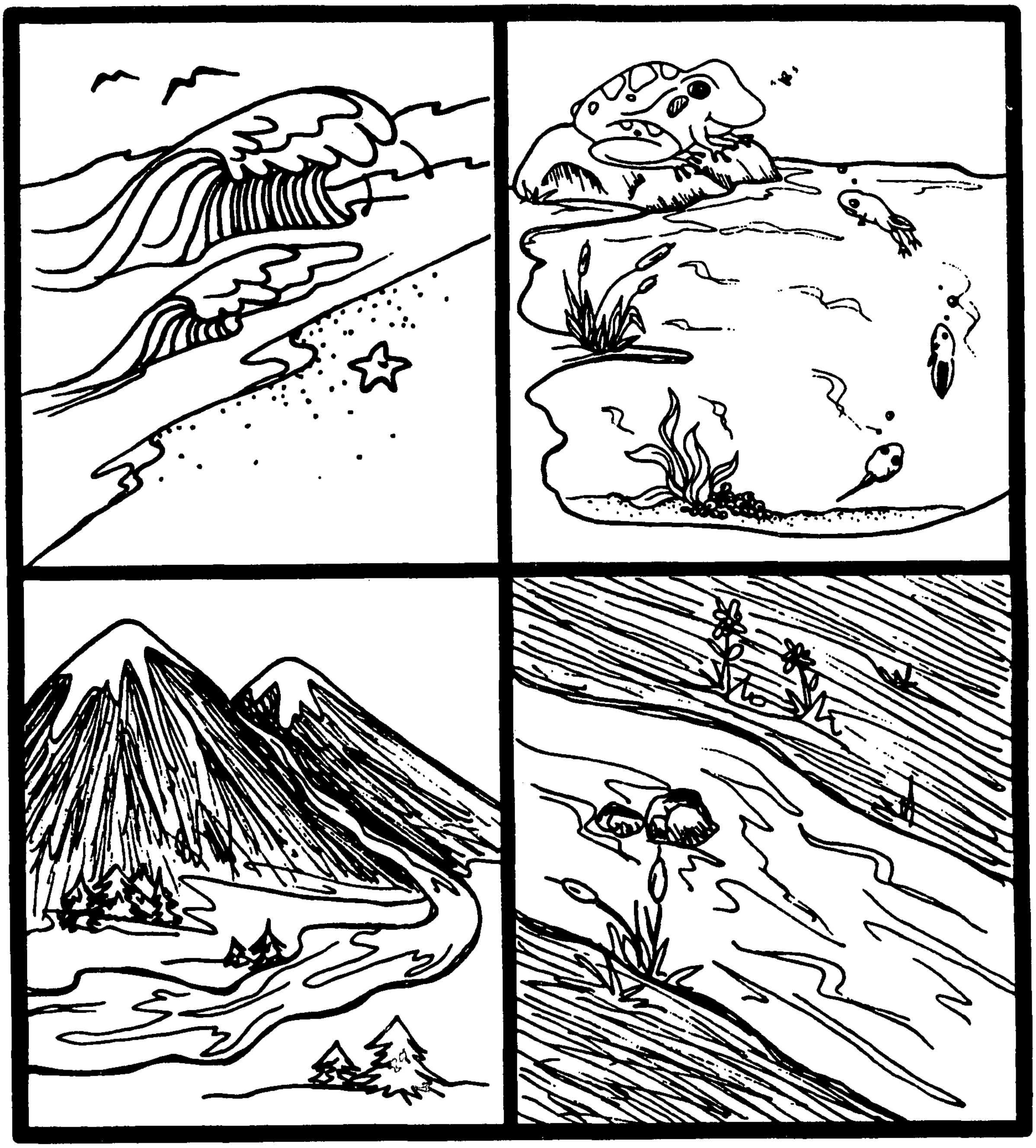
## Cup B



Cup B contains
_____water

Directions: Label the type of water found in each of the pictures below.

| Word Bank: fresh water |
| --- |
| salty water |



# WHAT IS A WETLAND?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, the characteristics of wetlands;
2. Identify, orally or in writing, some plants and animals that live in a wetland area; and
3. Give an oral or written definition of the new terms: brackish, habitat, tide, and wetland.

**SUBJECT:**
Science

**TIME:**
1 hour or 2 30-minute sessions

**MATERIALS:**
pictures of wetlands
books for reference
aluminum pan
clay
florist foam
cotton swabs
pine needles
twigs
pebbles
drawing paper
toothpicks
crayons
glue

## BACKGROUND INFORMATION

Wetlands are transitional areas where land and water connect. There are different types of wetlands. Some are full of salt water from the oceans. In some coastal areas, the water is fed by fresh and salt water. This makes the water brackish. Most coastal waters are affected by tides. Inland, the wetlands are fed by fresh waters. The plants and animals that live in a particular wetland are suited to a particular habitat. An important factor for survival is dependent on how much water is available during the seasons of the year.

Terms

**brackish**: water that is a mixture of fresh and salt water.

**habitat**: the place or type of site where a plant or animal naturally or normally lives and grows.

**tides**: the alternate rising and falling of the ocean's surface which occurs twice in each lunar day (24 hours).

**wetland**: areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions; wetland areas typically support plant life that are adapted to life in wet environments.

## ADVANCE PREPARATION

A. Gather pictures depicting various wetlands.

B. Copy the word search puzzle.

C. Make a model of a wetland to display for students to base their models on.

## PROCEDURE

I. Setting the stage

A. Explain what a wetland is and describe some of the different types of wetlands.

B. Show pictures of several different types of wetlands and make a list of names.

C. Explain that one of the most common types is the fresh water marsh.

D. Have students think of plants and animals that might live there.

E. Go on a scavenger hunt to gather pine needles, twigs, pebbles, moss, and weeds.

II. Activities

A. Make a model of a fresh water wetland.

1. Put clay sloping into an aluminum pan.

2. Use florist foam as the buffer.

3. Add water.

4. Have students illustrate animals of the fresh water wetlands; color, cut out, glue to toothpicks, and place in the marsh model. Use cotton swabs as cattails, pine needles to represent reeds, twigs for trees, and scatter pebbles around the model.

B. Provide students with the word search puzzle.

III. Follow-Up

A. Review the definition of a wetland and its characteristics.

B. Display models in the classroom.

IV. Extension

A. Provide reference books and have students make other models based on other types of wetlands, such as salt water marsh, fresh water swamp, mangrove swamp, or a bog.

## RESOURCES

Wading into Wetlands, Nature Scope, Vol 2, No. 5, National Wildlife Federation, Washington, D.C., 1986.

Young Scientist's Introduction to Wetlands, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

# Word Search:

# What is a Wetland?

## Word List:

| | |
|---|---|
| marsh | lake |
| swamp | pond |
| bog | tide |
| river | coastal |
| stream | wetland |

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

# EXPLORING WETLANDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Tell what they observed after visiting a wetland site;

2. Identify, orally or in writing, insects, animals, and plants observed at the wetland site;

3. Record, orally or in writing, information obtained through the observation of a wetland site; and

4. Give an oral or written definition of wetland.

**SUBJECTS:**
Science, Language Arts

**TIME:**
varies according to the time teacher would like to spend

**MATERIALS:**
assorted books related to wetlands
reference books for identification of plants, animals, and insects
jar or small fish tank
rocks and gravel
pond weeds
milk carton
plastic wrap
rubber band
small fish net

## BACKGROUND INFORMATION

Wetlands are transitional areas where land and water connect. Wetlands, for many years, were filled, drained, polluted, and channeled until their importance was recognized. They are a valuable habitat for waterfowl, various kinds of wildlife, fish, and shellfish. Wetlands are also used for recreation, erosion control, and water quality control. There are numerous places to look for wetlands:

- edges of ponds and streams
- low spots in a field or woods that hold water for a week or more
- drainage ditches that are frequently filled with water
- places with wetland plants such as cattails or the feathery-looking reeds called "phragmites"

Term

**wetland:** areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions; wetland areas typically support plant life that are adapted to life in wet environments.

## ADVANCE PREPARATION

A. Gather materials to make a "pond in a jar" and an underwater viewer.

B. Locate books to place in the classroom for information and research.

## PROCEDURE

I. Setting the stage

A. Ask the students the following questions:

1. What is a wetland?

2. How many of you have ever been to a wetland?

3. What did you see there? Make a list on the board or chart.

4. We are going to explore a wetland. Give the students a list of the things they will need to bring. Make an underwater viewer to take. Bring a net to collect samples. (See activities section.)

*When exploring a wetland area, dress in old clothes and shoes/boots. Use an insect repellent. Never go alone.

B. At the wetland, scoop up a handful of mud. What does it feel like? How does it smell? Look for signs of animals, like tracks, nests, and resting places. With a viewer look for fish, aquatic insects, eggs, and living things on the bottom.

II. Activities

A. Pond in a Jar

1. Put rocks, gravel, and pond weeds in a jar or fish tank.

2. Fill it with pond water and let it sit for a day.

3. Add collected animals and plants and keep the container in a bright, but not sunny, window. Small fish, fiddler crabs, aquatic insects, or grass shrimp are the hardiest of specimens, but remember to return collected water to where it was found in a few days.

4. Watch animals to see how they behave. Look for little specks moving around the surface of the water. Use an insect book for identification.

B. Underwater Viewer

1. Cut out the top and bottom of a milk carton or coffee can.

2. Stretch clear plastic over the bottom and use a rubber band to hold the wrap.

3. The viewer will allow you to look into the water without getting your face wet.

III. Follow-Up

A. Make a bulletin board to show Pond in a Jar life.

B. Write a big book about their day exploring a wetland.

IV. Extensions

A. Share journal entries.

B. Make posters showing what animals or insects were observed and information found about them.

## RESOURCE

Assignment EARTH...What is a Wetland, Outdoor Delaware, Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MI.

# SPONGY WETLANDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Sort things that absorb and things that do not absorb;
2. Predict, orally or in writing, what will happen to houses with or without wetlands;
3. Build a wetland area in a meat tray to show how wetlands absorb water; and
4. Give an oral or written definition of flood plain and wetlands.

**SUBJECTS:**
Science, Math, Language Arts

**TIME:**
30 minutes

**MATERIALS:**
11"x15" tray or lid
2 cups of water
blue construction paper
Monopoly game houses
10 sponges
meat trays for each student
glue and tape
markers
scissors

## BACKGROUND INFORMATION

Wetlands are vital in flood control and water storage, and they help to recharge the water table. Wetland areas spread out water over large sections of land, slowing its flow. The heavy, spongy vegetation absorbs water to help control any overflow providing a place for storage of excess water. Some of the water seeps far beneath the Earth's surface to become vital groundwater.

This lesson will show what happens when people build their homes in wetland areas or close to rivers and how the wetlands, like sponges, help to absorb water and control flooding.

Term

**flood plain:** relatively flat area on either side of a river or stream that may be under water during a flood.

## ADVANCE PREPARATION

A. Cut two 4" x 15" strips of blue construction paper. Prepare 11" x 15" tray with a strip of blue construction paper in the middle and Monopoly game houses along the sides. Place 2 cups of same amount of water near the tray.

B. Collect enough meat trays from the grocer for each student.

C. Cut enough sponges in small strips for the students to place in their wetland meat trays. Have materials ready for the wetland meat trays.

## PROCEDURE

I. Setting the stage

A. Spill a small amount of water on a table. Discuss suggestions on how to clean up the spill using paper towels, sponges, and clothes. Discuss why we use these items to clean up spills. Discuss the word absorb. Look around the room for things that absorb and things that do not. Place things that absorb in a tub and things that do not in a different tub. Ask the students to compare the items and decide why some things absorb the spill and others do not.

II. Activities

A. Using a plastic rectangular tray or lid about 11" x 15", display some houses from the Monopoly game along the 15" sides of the tray. Cut a 4" x 15" strip of blue construction paper and place it in the middle of the tray. Ask the students what they think will happen to the houses if water is poured on the blue paper. Slowly pour one cup of water on the blue construction paper and discuss how the homes get wet because the water has no place to go. Take everything out of the tray and dry it off. (See attached illustration.)

B. Place a dry piece of blue paper in the center and the same houses along the sides. Now place small sponges along the sides of the blue paper. Ask the students from what they already know what they think will happen now when the water is poured on the blue paper. Pour slowly another cup of water on the blue paper. Discuss the results. Relate this experiment to the wetlands. The wetland areas near rivers, streams, and oceans also absorb the water because of their sponge vegetation. If we remove the wetland areas to build homes, farms, or hotels, the excess water has no other place to go causing floods in these areas.

III. Follow-Up

A. Have students build their own wetland areas using meat trays from the grocer. Provide meat trays, sponges, construction paper, glue, tape, and markers. Encourage the students to place in their wetlands animals and plants that live there. They can make houses, farms, or hotels by drawing them, then cutting them out leaving a strip at the bottom to tape or glue to the meat tray. If they are folded they will stand up and make a 3-D effect. Display the wetlands on a table and have the students to dictate a short description of how wetlands help us.

IV. Extension

A. Let students experiment with growing different types of grass on a sponge. Place the wet sponge on a tray. Sprinkle small amounts of grass seed on top of the sponge and leave it in or near a window. Everyday the students will have to make sure the sponge is kept wet. The students may observe as the seeds begin to sprout and grow. Students may record the growth of their grass and compare growth with other types of seed. Explain that the sponge must stay wet or the grass will not grow. (The grass will not continue to grow because it cannot obtain the proper nutrients from the sponge to continue its growth cycle.) Explain that plants in wetland areas are plants that need the extra moisture in order to survive.

## RESOURCES


Cortesi, Wendy W., Explore a Spooky Swamp, National Geographic Society, Washington, D.C., 1978.

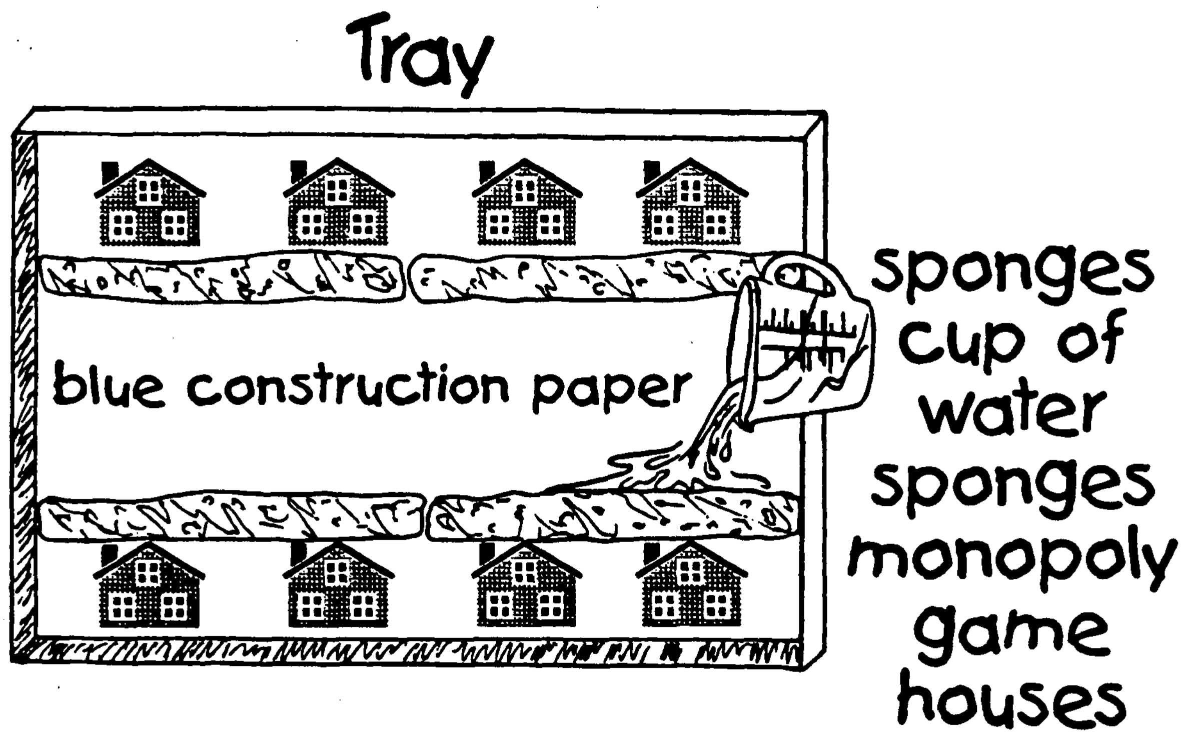
Dobrin, Arnold, Marshes and Marsh Life, Coward-McCann, New York, 1969.

Facklam, Margery, And Then There Was One, The Mysteries of Extinction, Sierra Club Books/Little, Brown and Company, San Francisco, 1990.

Greenway, Shirley, Animal Homes, Water, Newington Press, Connecticut, 1990.

Hoff, Mary and Rodgers, Mary M., Our Endangered Planet Rivers and Lakes, Lerner Publications Company, Minneapolis, 1991.

Liptak, Karen, Saving Our Wetlands and Their Wildlife, Franklin Watts, New York, 1991.


Tray
blue construction paper
sponges
cup of water
sponges
monopoly game houses

# WHO NEEDS WETLANDS?

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Name, orally or in writing, reasons to protect and save the wetlands;
2. Demonstrate, orally or in writing, a public awareness of the problems associated with the wetlands; and
3. Give an oral or written definition of the new terms: ecosystem and reclamation.

**SUBJECTS:**
Science, Social Studies, Language Arts, Art, Math

**TIME:**
1 hour

**MATERIALS:**
books on wetlands
paper bags (large, plain)
crayons
student letter
chartboard
envelope
Counting Cranes

## BACKGROUND INFORMATION

Scientists are busy working to find out about the function and value of the wetlands. They have found that wetlands help control flooding, filter pollutants, and lessen the erosion of soil. Wetlands are breeding grounds for many birds and water animals, some of which are endangered species. The wetlands also provide a quiet area for recreation such as fishing, boating, hunting, bird watching, and exploring.

At one time, the wet, soggy lands were considered useless. They became dumping grounds. In the name of progress, land conversion was begun by draining, filling, dredging for farmland use, and building highways and shipping channels.

We now know that the wetlands are a complex ecosystem where the existence of water, animals, and plants are interdependent.

Terms

**ecosystem**: the relationship between all the parts (living and non-living) within an environmental community.

**reclamation**: bringing land that has been disturbed by some process back to it's original condition.

## ADVANCE PREPARATION

A. Make a vocabulary chart using a wetland scene as a background on which to write terms.

B. Obtain pictures showing the destruction of the wetlands.

C. Obtain book Counting Cranes.

D. Obtain plain grocery bags.

## PROCEDURE

I. Setting the stage

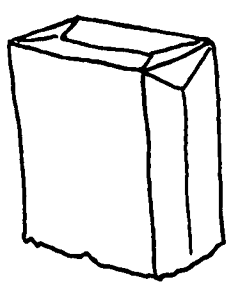
A. Give students background information discussing what the wetlands are, why they are important, and why we need to save them.

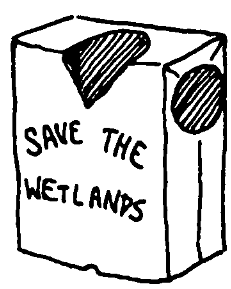
B. Read and discuss the book Counting Cranes.

C. Discuss the destruction of the wetlands and brainstorm why it is important to save them. List these on a chart.

II. Activities

A. Give each student a large, plain paper bag to make a vest that promotes saving and preserving of the wetlands.






B. Write a letter to a government official (the President, a Congressman, etc.) concerning the importance of the wetlands.

III. Follow-Up

A. Wear vests during the study of the wetlands.

B. Have students visit other classes while they wear their vests. Have them explain to other students the importance of the wetlands and reasons why it is necessary to save and preserve them as part of the ecosystem.

C. Collect letters and mail them to the appropriate government officials.

IV. Extensions

A. Have students research animals that are endangered in the wetland; such as whooping cranes, American crocodiles, or the manatee.

B. Read the book Paper Crane. Locate Japan on a map. Make an origami crane. For Christmas, Tree of Cranes could be read.

C. Vocabulary could be used to work on dictionary skills or create a word search.

D. Map migration of the cranes.

## RESOURCES


Bang, Molly, The Paper Crane, Greenwillos Books, New York, 1985.

Mendoza, George, Were You a Wild Duck Where Would You Go?, Stewart, Tabori, and Chang, New York, 1990.

Nakano, Dakvohtei, Easy Origami, Viking Kestrel, London, 1985.

Owens, Mary Beth, Counting Cranes, Little, Brown and Company, Boston, 1993.

Say, Allen, Tree of Cranes, Houghton, New York, 1991.

# CRANBERRY BOGS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, the characteristics of a bog;
2. Locate bogs on a map;
3. Identify, orally or in writing, foods which can be obtained from bogs;
4. Identify, orally or in writing, various animals that live in bogs;
5. State, orally or in writing, the important values of a bog; and
6. Give an oral or written definition of the new terms: acid, bogs, and peat.

**SUBJECT:**
Science

**TIME:**
45 minutes

**MATERIALS:**
Cranberry Thanksgiving by Wende and Harry Devlin
vinegar
chicken bones
aquarium
gravel
soil
peat moss
venus fly trap and other plants
sphagnum moss
insects
cranberries
journal

## BACKGROUND INFORMATION

Bogs are fresh water wetlands. Peat, acid, and water are the characteristics of a bog. Rainfall is the primary source of water. The bogs were formed in kettle-holes, depressions left by receding glaciers. Bogs are usually found in colder parts of the world, but they do exist in temperate areas. They form in wet areas where there is little water flowing in or out of the wetland. Bogs look very much like swamps, but a strong thick web of plants grow over the bogs. These plants are called peat and feel very spongy to walk on. Peat forms as plants die and their leaves, stems, roots, and other parts fall into the acid water of the bogs. Over time, this acid-rich material is compressed, forming layers of peat. Because of the slow rate of decay, plants, and animals that fall into bogs can stay preserved for thousands of years. The bogs are very acidic, making it difficult for plants to grow in warm climates. Some plants have adapted like bladderworts, pitcher plants, sundews (which traps and digest insects), and cranberries. Moose, deer, bears, and other large mammals visit the bogs at various times of the year to find food, shelter, and water.

Terms

**acid**: a substance with a quantity of positively charged hydrogen ions.

**bog**: fresh water marsh with build-up of peat and high acidity, that typically supports mosses adapted to acidic soil conditions (particularly sphagnum); many are located in colder regions.

**fresh water**: inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or groundwater.

**peat**: rich organic material that is made up mostly of partially decayed plant material.

## ADVANCE PREPARATION

A. Place clean chicken bones in vinegar (acid) two weeks before lesson begins.

B. Gather materials needed to make the bog terrarium.

C. Locate the book Cranberry Thanksgiving.

## PROCEDURE

I. Setting the stage

A. Explain the definition of bog, peat, and acid. Show examples of peat. Let the students examine the texture. Let the students describe the chicken bone that was in the vinegar (acid). How is it different from a chicken bone that was not soaked in an acid? Explain how prehistoric animal parts have been found preserved in bogs. Scientists have learned much about our past by studying remains found in bogs around the world. Read Cranberry Thanksgiving to set the stage for making a bog terrarium. Discuss how cranberries must have a bog in order to grow and produce fruit.

II. Activities

A. Construct a bog by using an aquarium. Have the students help assemble it.

1. Place gravel on the bottom.
2. Mix two parts garden soil and one part peat moss.
3. Plant a variety of plants, one being a venus fly trap.
4. Add a layer of sphagnum moss to the top of the soil and around the plants.
5. Water the soil well.
6. Cover the terrarium.
7. Place near a window, but not in direct light.

(Will need insects for venus fly trap).

B. Keep a journal to describe what happens in this habitat.

III. Follow-Up

A. Make a recipe for "Grandmother's Famous Cranberry Bread" found in the book Cranberry Thanksgiving.

B. List other uses for cranberries.

IV. Extensions

A. Research other plants that eat insects. Draw a picture and write three facts about the plant.

B. Draw a monster plant and tell what it eats.

## RESOURCES


Devlin, Wende and Devlin, Harry, Cranberry Thanksgiving, Simon and Schuster, New York, 1971.

MacDonald, The Earth's Habitats, Fearon Teacher Aids, Simon and Schuster, New York, 1993.

Wading into Wetlands, NatureScope, National Wildlife Federation, Washington, D.C., 1989.

# DOWN BY THE SEA

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, the effects of urban and industrial development on coastal wetlands;
2. Discuss, orally or in writing, wetland conservation techniques;
3. Demonstrate, orally or in writing, an appreciation for the beauty of the coastal wetlands; and
4. Give an oral or written definition of the new terms: aquifer, barrier island, estuaries, and wetlands.

**SUBJECTS:**
Science, Social Studies, Math, Language Arts

**TIME:**
50 minutes

**MATERIALS:**

coastal wetland mural for bulletin board
pastel chalk (optional)
drawing paper
pictures of animals (land and sea)
straight pins
chart paper
Counting Cranes by Mary Beth Owens

## BACKGROUND INFORMATION

Along both coastlines of the continental United States are areas that are well protected from the direct onslaught of waves. Within these protected areas may be found areas called coastal wetlands. These areas could also include coastal lagoons, estuaries, and sloughs. In these quiet waters, soft sediments and organic matter are deposited by rivers and tidal flows resulting in the development of a soft mud bottom. This area serves as food, nursery, and refuge for fish, shellfish, birds, and other wildlife. The wetlands and barrier islands are important to 75% of the migratory waterfowl. The commercial fish and shellfish rely on the estuaries for at least part of their life cycle. The salt marsh also serves a vital role in linking the land with the sea by providing a buffer against flooding, and holding water so that it can percolate back into natural aquifers.

The demand for coastal land development has significantly increased in recent years and wetlands are being lost to urban, residential, and industrial development. In some areas, oyster harvesting has become prohibited because of poor water quality.

There are many things we can do to slow down the destruction of the wetlands and barrier islands. Sites for a development project could be located upland instead of destroying a wetland site. Not draining or filling wetlands is vital to protecting one of the most productive habitats in the world. Donating funds to private and public conservation agencies and purchasing federal duck stamps are other ways to support and encourage conservation of wetlands.

All around the salt marsh the sounds of shorebirds and migrating ducks and geese may be heard. The protection of coastal wetlands is vital for the survival of many shellfish and commercial fish. Becoming aware of the effects of urban and industrial development to coastal wetlands is important to saving this valuable area.

Terms

**aquifer**: porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for ground water.

**barrier island**: a body of land that is completely surrounded by water; it is roughly parallel to the shore and separated from the shore by a lagoon; barrier islands protect the shore from the direct onslaught of waves.

**estuary**: a marine ecosystem where freshwater entrs the ocean; the term usually describes regions near the mouth of rivers, and includes bays, lagoons, and marshes.

**wetlands**: areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions; wetlands areas typically support plant life that are adapted to life in wet environments.

## ADVANCE PREPARATION

A. Enlarge coastal wetland picture onto bulletin board paper. Add color and laminate for durability.

B. Enlarge and copy marine-animal pictures included in this lesson. Add color. Label with animal's name (grass shrimp, striped bass, blue crab, flounder, oyster, clam, mussel, pelican, flamingo, common loon, and great blue heron).

C. Draw two Marine Animals graphs.

| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| Grass Shrimp | Blue Crab | Flounder | Clam | Flamingo |

D. Locate a copy of Counting Cranes by Mary Beth Owens.

## PROCEDURE

I. Setting the stage

A. Show the students the bulletin board mural of a coastal wetland. Tell the students this is called a coastal wetland which is an area near the ocean that is covered with a thin layer of water most of the time. It is the home of many different kinds of animals and plants.

B. Play the game "Who Lives Here?"

1. Have the students sit in a circle. Display the pictures of the different animals. Have the students arrange them into groups by asking, "Which of these animals live in a coastal wetland?" Pin pictures of animals onto the mural. Discuss why they selected these animals.

C. Have students select three of the marine animals to draw, color, and cut out. Place these animals on the wetland mural.

II. Activities

A. In a whole group discussion, graph the number of each kind of marine animal found on the coastal wetland mural. Tell the students that the coastal wetlands provide important habitats for many types of sea animals and birds. It is also a home or habitat for waterfowl that fly south (migrate) when the weather gets too cold in the north.

B. Tell the students that since this is such a beautiful place, we're going to build a town here. Discuss and name some things a town needs in order for people to live, work, and grow (houses, hotels, grocery stores, malls, gas station, restaurant, factories, farm, park, fire station, hospital). Name the town. Write it on a piece of paper and post on the mural.

1. Put the students into pairs. Give each pair a name of one of the things needed to support the town people and a piece of drawing paper. Have each pair draw, color and cut out their building or park.

2. After the students have cut out the buildings, discuss the importance of each building to the town. Have each pair come up, select a site to put their building, and staple it to the mural. Continue this until all the buildings are in place.

3. You could extend this further by placing streets on the board to connect the buildings. (Roads could be cut from adding machine paper. Select the width and length to cut the paper from the dimension of the mural.)

C. Ask the students to name the animals they can still see after the town has been built. Graph the number of animals again on a separate graph. Compare the two graphs. Ask the students:

1. What happened to the animals? (They died or moved away. The loss of the wetland habitat resulted in the loss of the animals.)

2. Why did they go away? (The town drained and filled the wetland site and/or polluted the water, and moved in taking over the different marine animals' homes.)

3. What could we have done differently to have our town and save the coastal wetland habitat? (Locate upland from the wetland area, do not fill or drain the wetland, designate the wetland as a national protected wildlife area, and purchase federal duck stamps from your local post office to support the purchase of wetlands.)

D. After the discussion, relocate the town upland from the coastal wetland site.

III. Follow-Up

A. Have the students demonstrate their knowledge of effects of urban and industrial development on the wetlands and ways to protect the wetland by performing the following tasks:

1. Name the effects of building a town on a wetland site.

2. Name three things we could do to protect a coastal wetland.

IV. Extensions

A. Research the different types of marine animals listed. Write a report about the facts discovered and illustrate the animal as realistically as possible. Display reports and illustrations.

B. Look at old and new maps of your area or state. Are there any areas where there used to be wetlands that are no longer there? If yes, what happened to these wetlands?

C. Read the book Counting Cranes by Mary Beth Owens. Discuss what the cranes would do if the wetlands were destroyed.

## RESOURCES

Gulf Facts: Habitat Degradation, The Gulf of Mexico Program Office, John G. Stennis Space Center, Building 1103, Room 202, Stennis Space Center, MS 39529-6000.

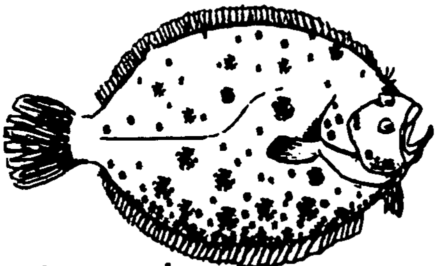
Dragonfly Pond, Aquatic Project Wild, Western Regional Environmental Education Council, Boulder, CO, 1987.

Niesen, Thomas M., The Marine Biology Coloring Book, Harper Collins Publishers, NewYork, 1982.

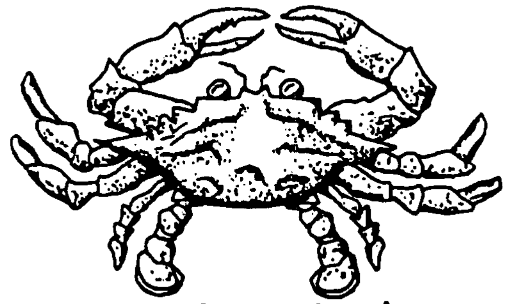
Owens, Mary Beth, Counting Cranes, Boston, Little, Brown and Company.

W.O.W.: The Wonders of Wetlands, Slattery, B.E., Environmental Concern Inc., P. O. Box P, St. Michaels, MD 21663.

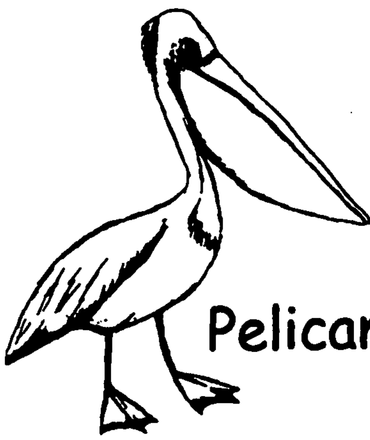
A limited supply of the "Wetlands" poster can be obtained at no cost from the U.S. Geological Survey, Box 25286, Denver Federal Center, Denver, CO 80225.



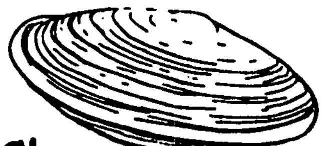
Flounder



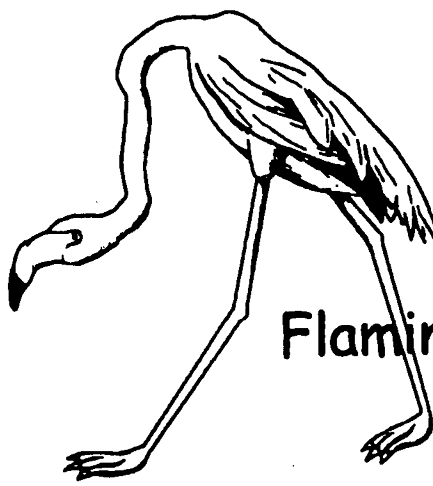
Blue Crab



Pelican

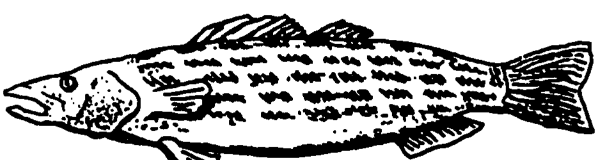


Clam



Flamingo

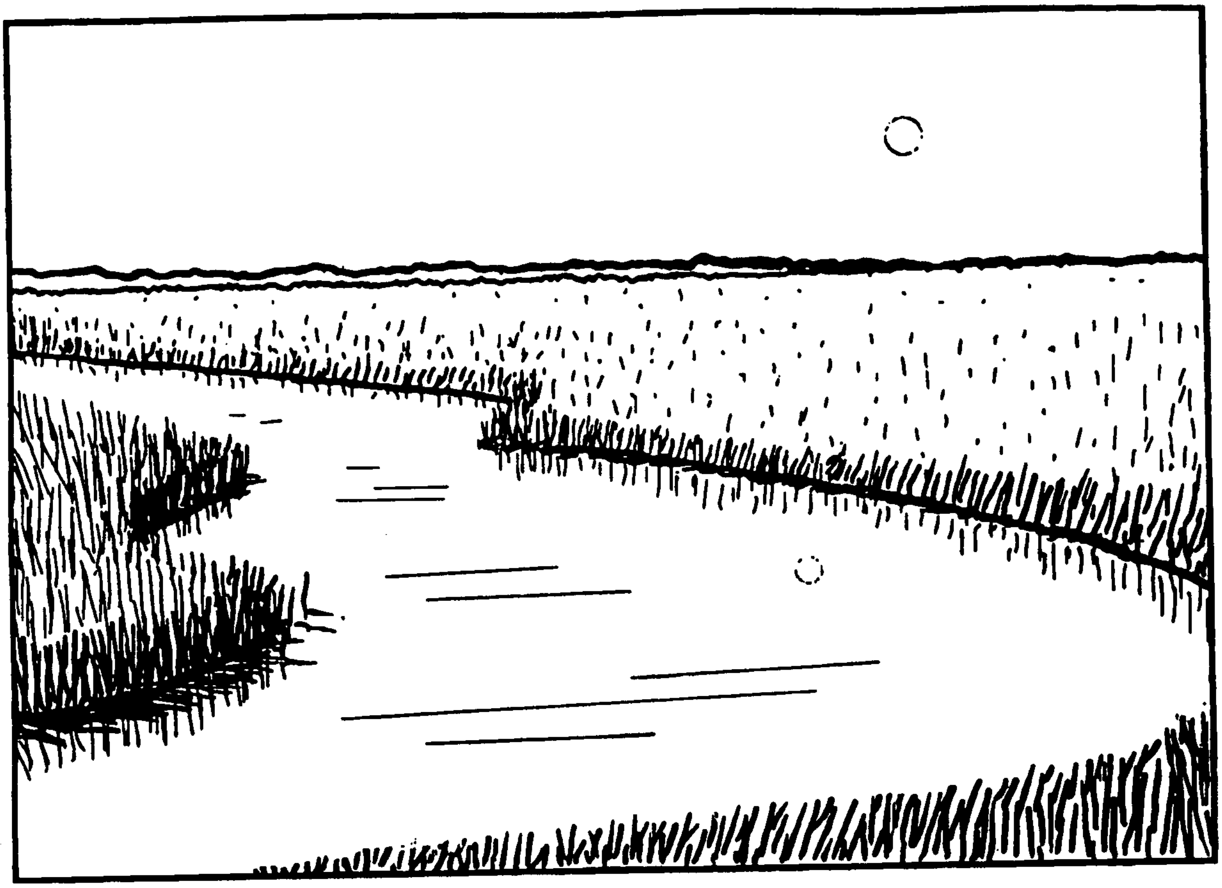
Oyster



Striped Bass

Grass Shrimp

# Mural Design for Coastal Wetland



# WETLANDS, SWEET, WETLANDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Describe, orally or in writing, and illustrate animals and plants found in wetlands;

2. Provide oral or written suggestions about how to create a bulletin board of the wetlands;

3. With help, design their own wetlands book; and

4. Give an oral or written definition of the new terms: food chain, fresh water, habitat, surface waters, and wetlands.

**SUBJECTS:**
Science, Social Studies, Language Arts, Writing, Art

**TIME:**
45 minutes

**MATERIALS:**
copies of teacher book
copies of student report sheets
white bulletin board paper
paper and crayons
scissors
yarn or string
copies of student book

## BACKGROUND INFORMATION

People once thought of wetlands as ugly, useless eyesores with slimy, crud-covered creatures crawling around. The fact is that wetlands are useful and our planet needs them. These soggy areas lie between dry land and fresh surface waters. Wetlands support plants and animals that otherwise could not live in wetter or drier environments. They act as kidneys to our planet and filter out harmful wastes that flow over land before they ever reach fresh water helping to prevent water pollution in our rivers, streams, and lakes. Studies have shown that submerged plant roots that wetlands provide act to increase the available dissolved oxygen for downstream uses. In addition to supporting fish, the increased oxygen makes the water more resistant to pollutants downstream since most pollutants act to decrease oxygen levels killing fish. Wetlands also stop floods by slowing or absorbing the runoff from big storms.

People have relied on wetlands for a long time. In Ireland, they use peat (decayed vegetation that has become packed down in swamps and bogs) as a low-cost fuel. Farmers in Asia plant their rice in wetland areas because the increased amount of water helps nourish the grain during its growing season. The wetlands in Iraq where the Tigris and Euphrates rivers join is the main source of fishing for Arabs. Many people enjoy exploring swamps, like the Okefenokee Swamp in Georgia in boats pushed through the water with long poles.

Wetlands are gaining a better reputation now that governments and conservation groups around the world are recognizing them as special habitats and valuable pollution fighters. Because we lost many of our wetland areas to farmland, research on constructed artificial wetlands is ongoing at many sites around the world. We need our wetlands. Let's instill a positive appreciation for wetlands in our children.

Wetlands are one of the most important ecosystems in the world. They provide habitat for many plants and animals, some of which could not survive anywhere else. Some of the plants found in wetland areas are cattails, saw grasses, rushes, orchids, spider lilies, and lily pads as well as cypress trees and mangrove trees. They provide food, shelter, and nesting areas for the animals. Many amphibians such as frogs and salamanders, reptiles such as snakes and alligators, and mammals such as rabbits and muskrats depend on the wetlands for survival. Many birds such as ducks, geese, and swans use them for breeding grounds and migrating stops. Herons, egrets, and wood storks could not survive with out the multitude of insects, clams, snails, and crabs the wetlands provide. All the habitats of the wetland areas are vital to the balance of nature and the Earth.

Terms

**food chain**: the chain of living things in an ecosystem in which each link in the chain feeds on a link below it and is fed upon by the one above it.

**fresh water**: inland water that has a low concentration of minerals, salts, and dissolved solids found as surface or ground water.

**habitat**: the place or type of site where a plant or animal naturally or normally lives and grows.

**surface waters**: precipitation that does not soak into the ground or return to the atmosphere by evaporation or transpiration; it is stored in streams, lakes, rivers, ponds, wetlands, oceans, and reservoirs.

**wetlands**: areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions; wetlands areas typically support plant life that are adapted to life in wet environments.

## ADVANCE PREPARATION

A. Reproduce the teacher's copy of the story In the Wetlands on tag board or construction paper and color the illustrations. Bind one end with staples, tape, or metal rings to complete the book.

B. Locate many different nonfiction books about the wetlands (see resources).

C. Reproduce "Student Report Sheet" for the number of students participating in activity.

D. Cut out a large shape of a house on white bulletin board paper to fit a bulletin board.

## PROCEDURE

I. Setting the stage

A. After reproducing the story In The Wetlands, read it to the students pointing to each word. Discuss the different plants and animals that are found in wetlands and why they use the wetlands as their habitat. Discuss the food chain of the frog and bird. Provide other books on the wetlands (see Resources).

II. Activities

A. After a discussion on different wetland plants and animals, have students to select one and make a report (see Student Report Sheet).

B. Each student will draw a picture of his/her plant or animal on the report sheet and write or dictate to someone important facts they remember. Have students discuss what they have drawn in front of the class, then display the reports.

III. Follow-Up

A. As students complete their reports, have them create their own wetland on a bulletin board. Cut out a large shape of a house on white paper to fit a bulletin board. Students draw sky, water, and trees on the house shape. The students then draw, cut out, and place their plants or animals on the house in cut-out windows and doors. Display their reports around the bulletin board attaching yarn or string from the report to the plant or animal. Have the class name and label their wetland.

IV. Extensions

A. Students may make their own In The Wetlands book. Reproduce the students' pages and cut in half. Students may illustrate to match the words on each page. Then bind the book for the students to read and reread. Students may take home their copy and read it to their parents.

B. Reread the story In The Wetlands. Have the students find words they recognize. Make a list of these words for each student to read. Then, have the students read the book pointing to each word.

## RESOURCES

Cortesi, Wendy W., Explore a Spooky Swamp, National Geographic Society, Washington, D.C., 1978.

Dobrin, Arnold, Marshes and Marsh Life, Coward-McCann, New York, 1969.

Facklam, Margery, And Then There Was One. The Mysteries of Extinction, Sierra Club Books/Little, Brown and Company, San Francisco, 1990.

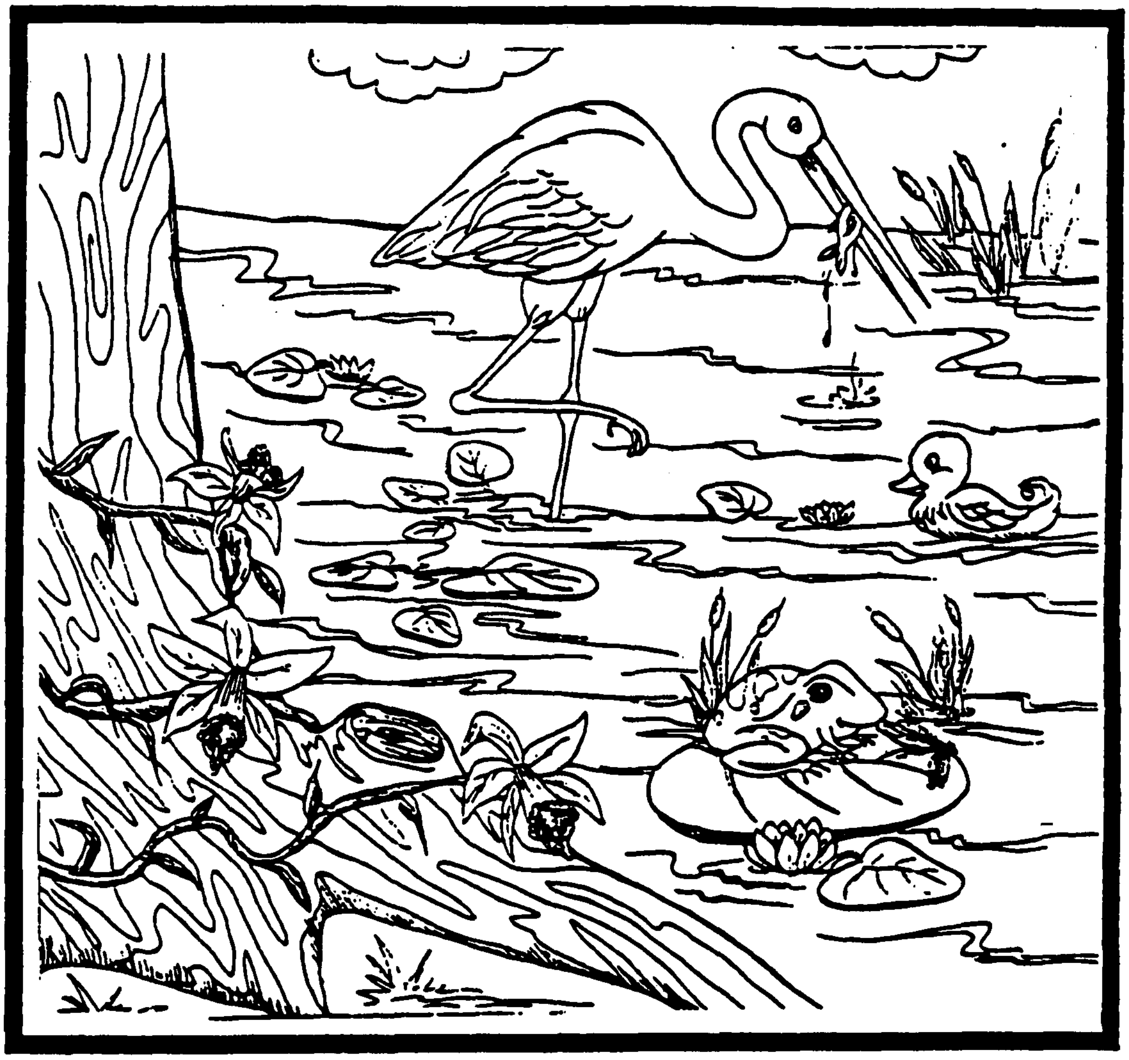
Geraghty, Paul, Over the Steamy Swamp, Harcourt Brace and Company, Orlando, 1988.

Greenway, Shirley, Animal Homes. Water, Newington Press, Connecticut, 1990.

Hoff, Mary and Rodgers, Mary M., Our Endangered Planet Rivers and Lakes, Lerner Publications Company, Minneapolis, 1991.

Liptak, Karen, Saving Our Wetlands and Their Wildlife, Franklin Watts, New York, 1991.

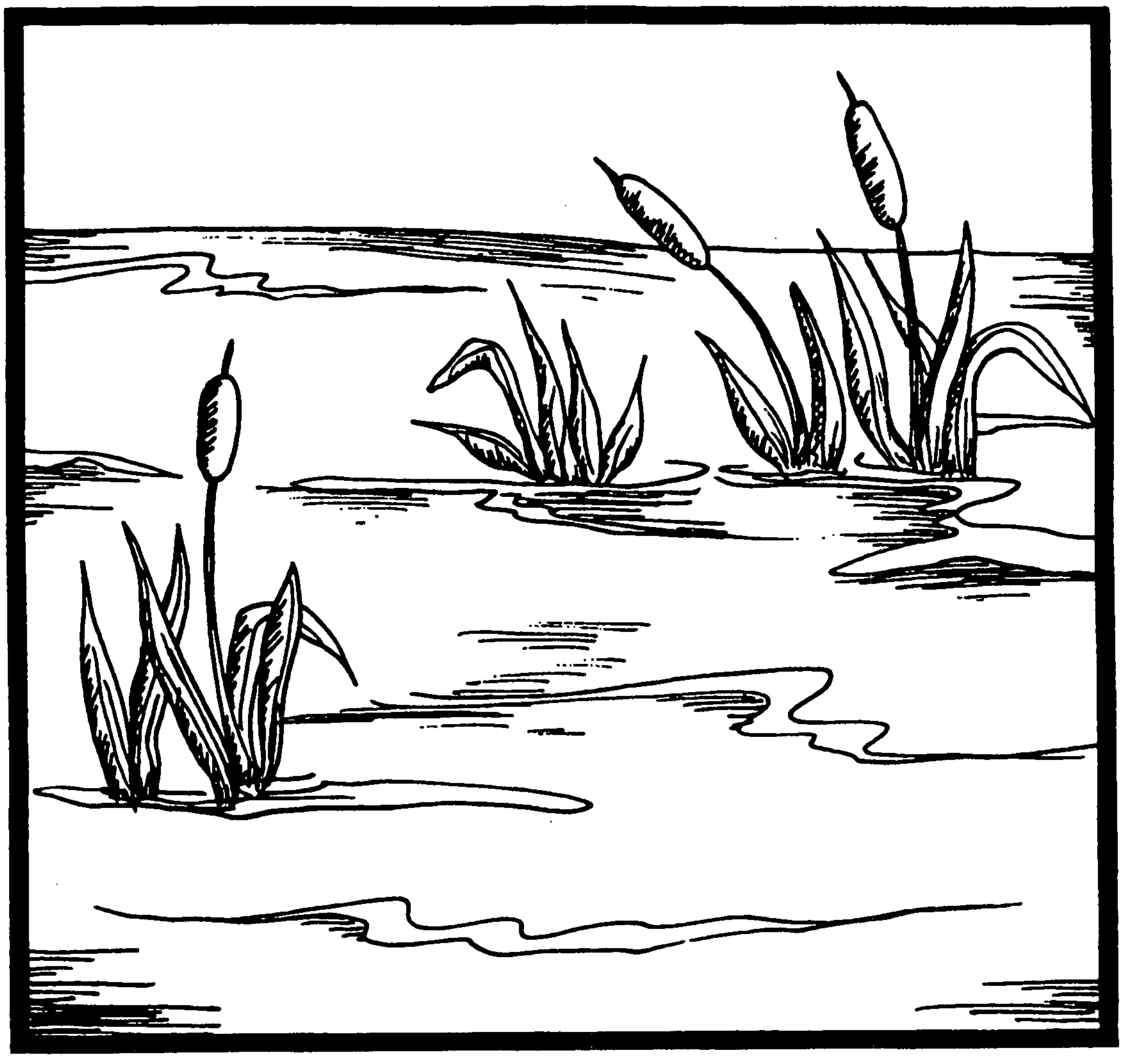
# In The Wetlands



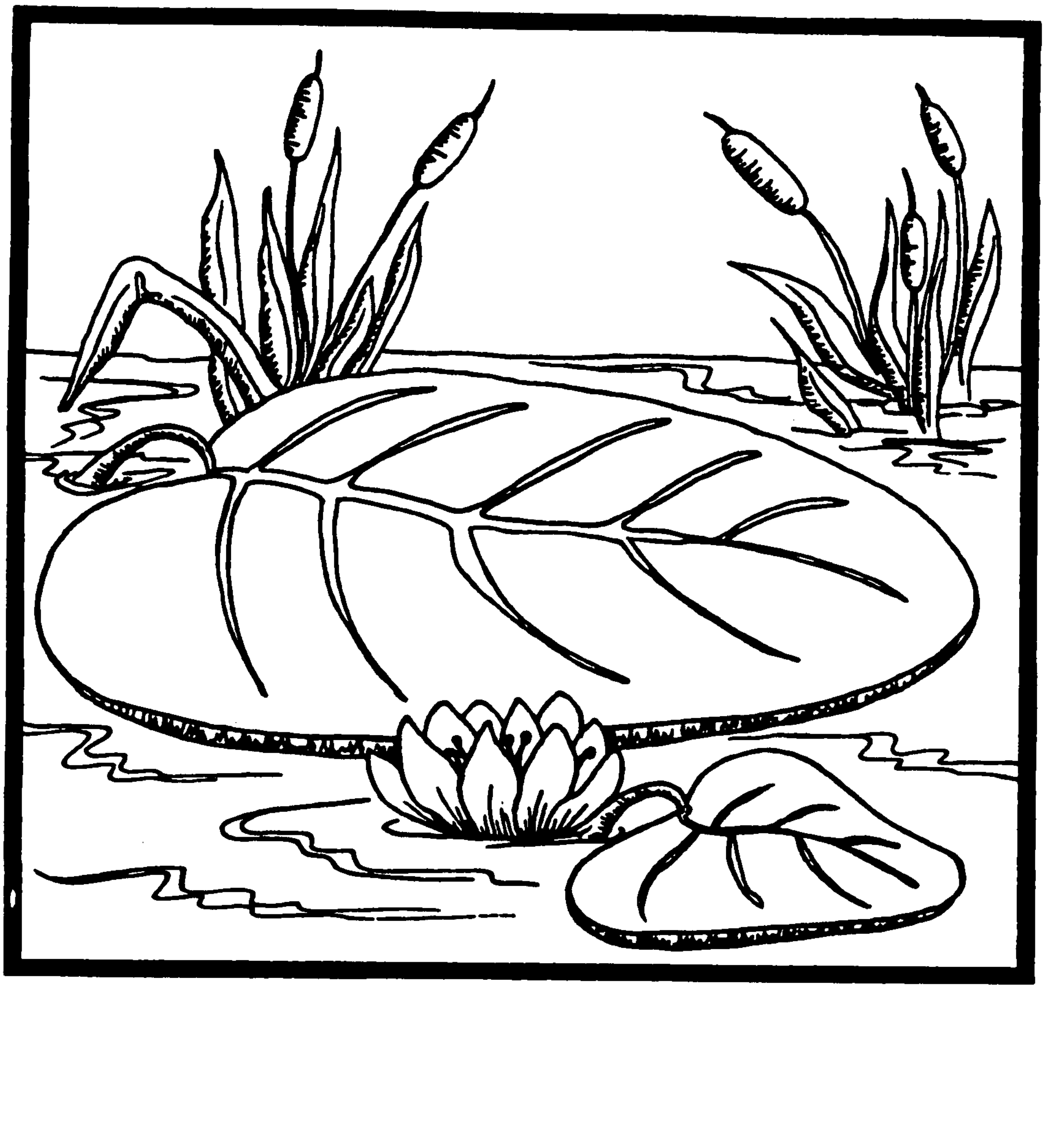
Words by Donna Morgan

Illustrated by______________

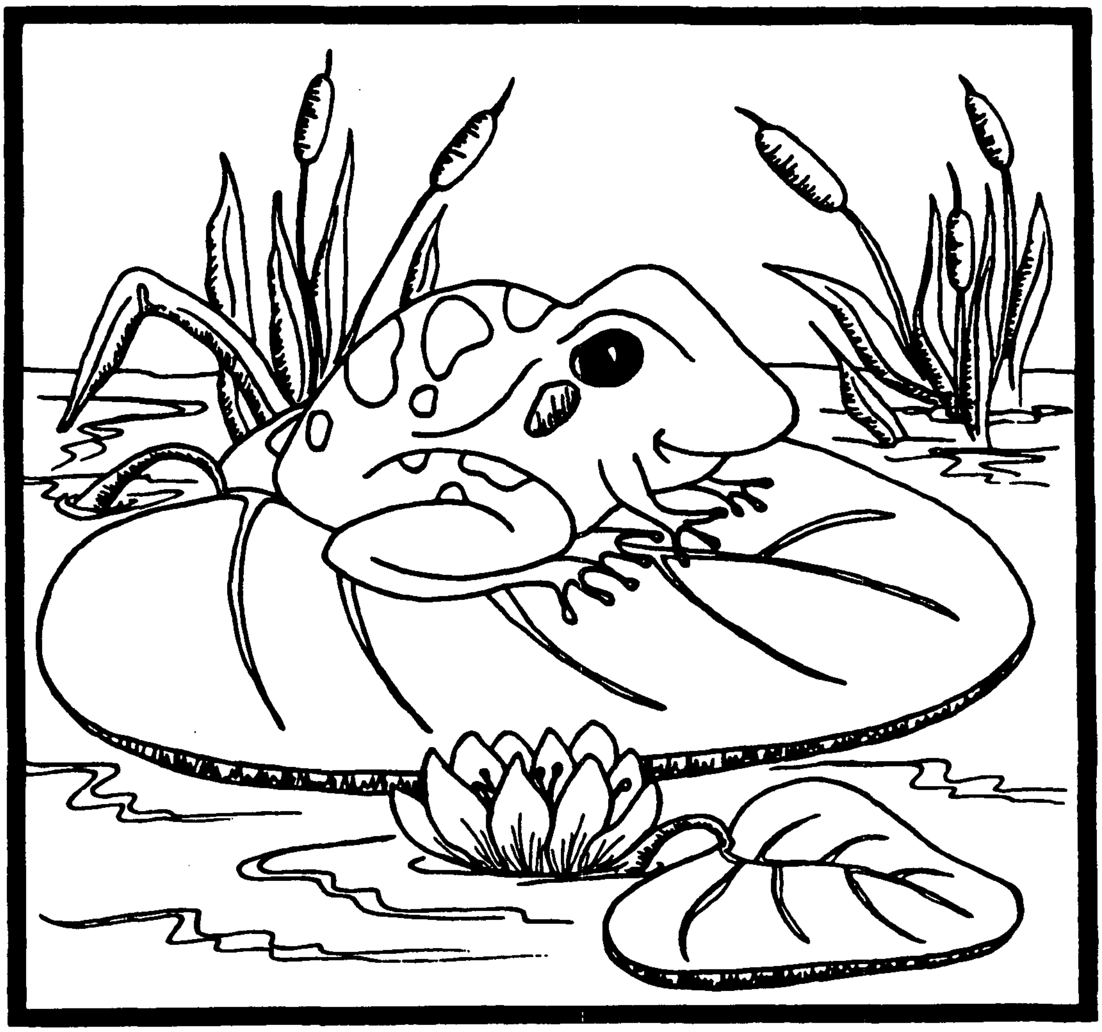
In the wetlands we see water.



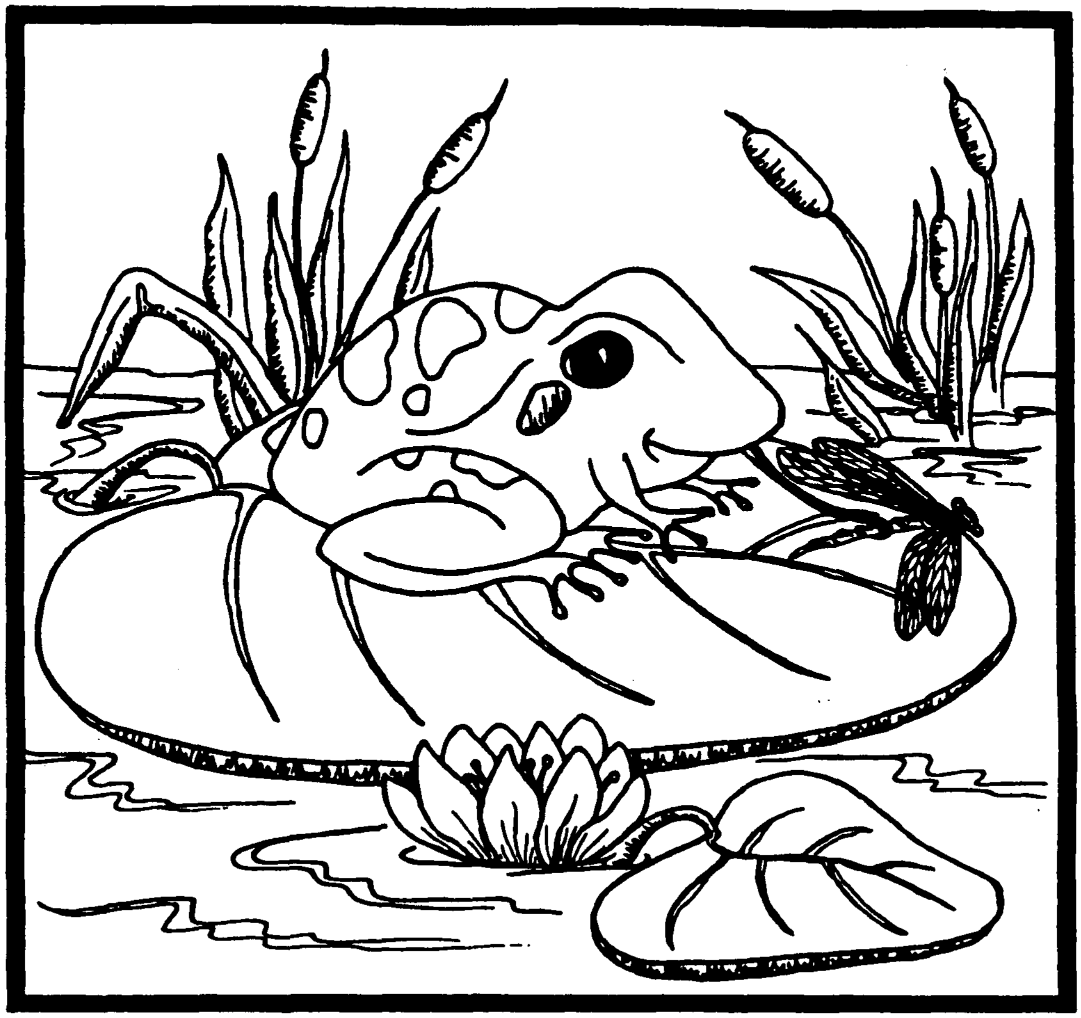
On the water we see lily pads.



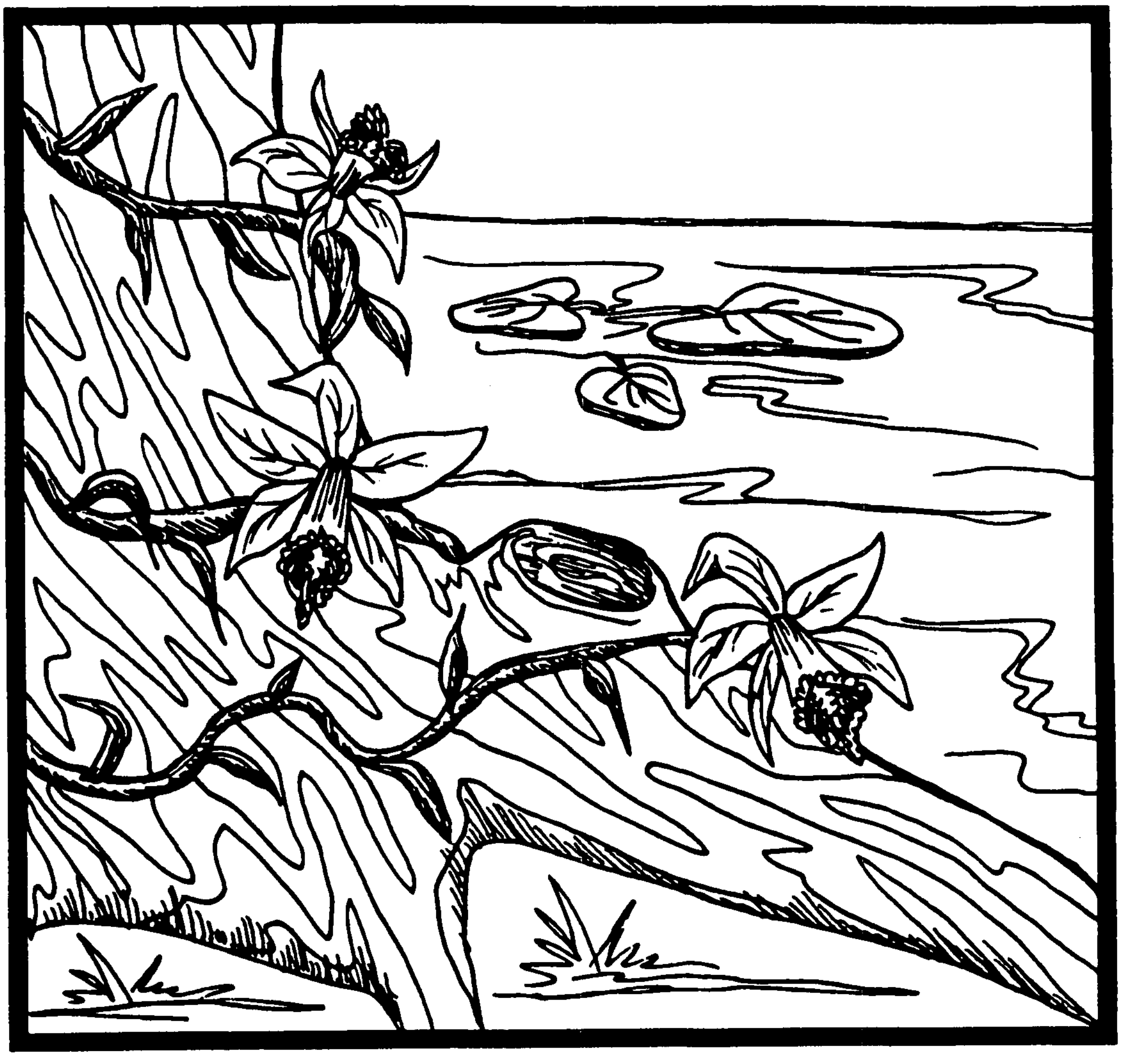
On the lily pads we see green frogs.



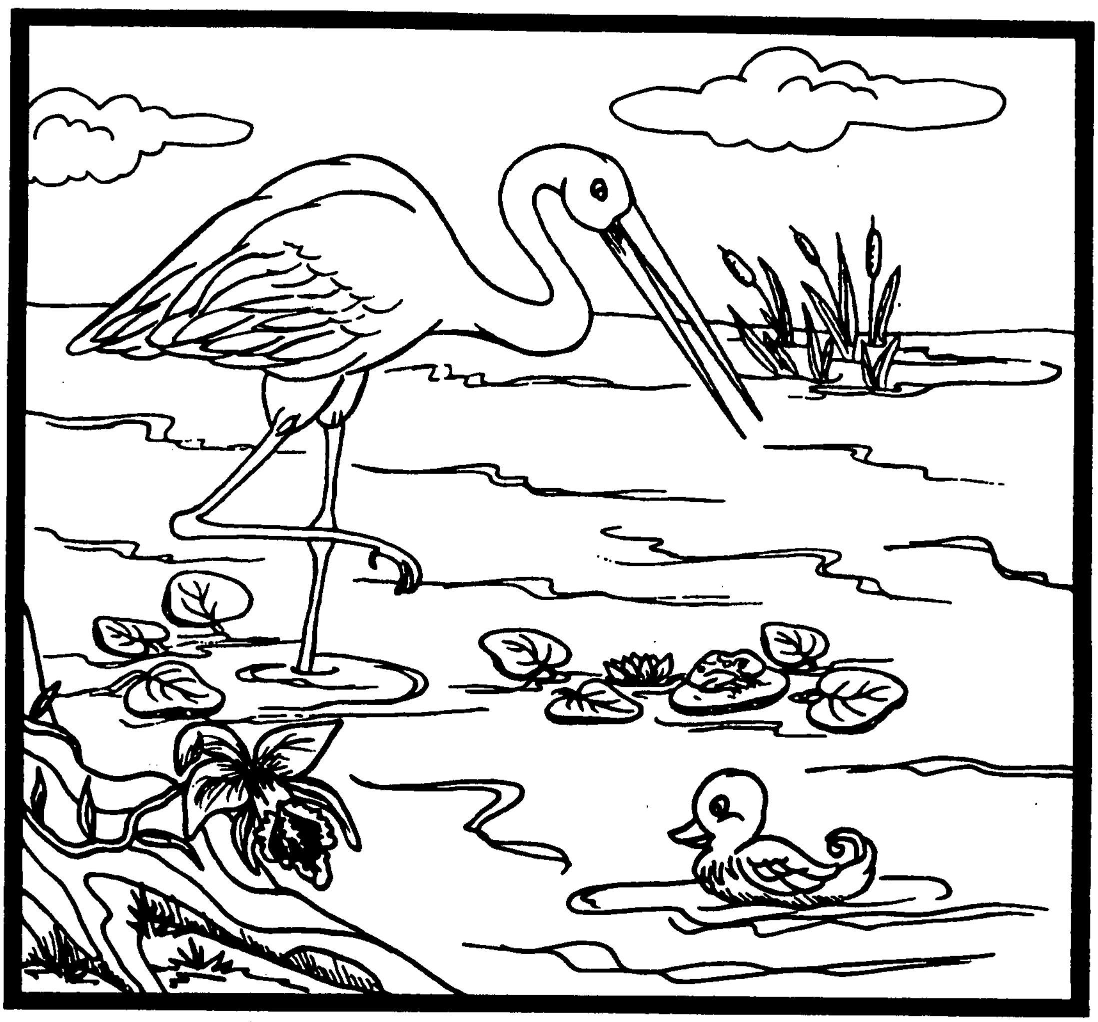
By the frogs we see dragonflies.



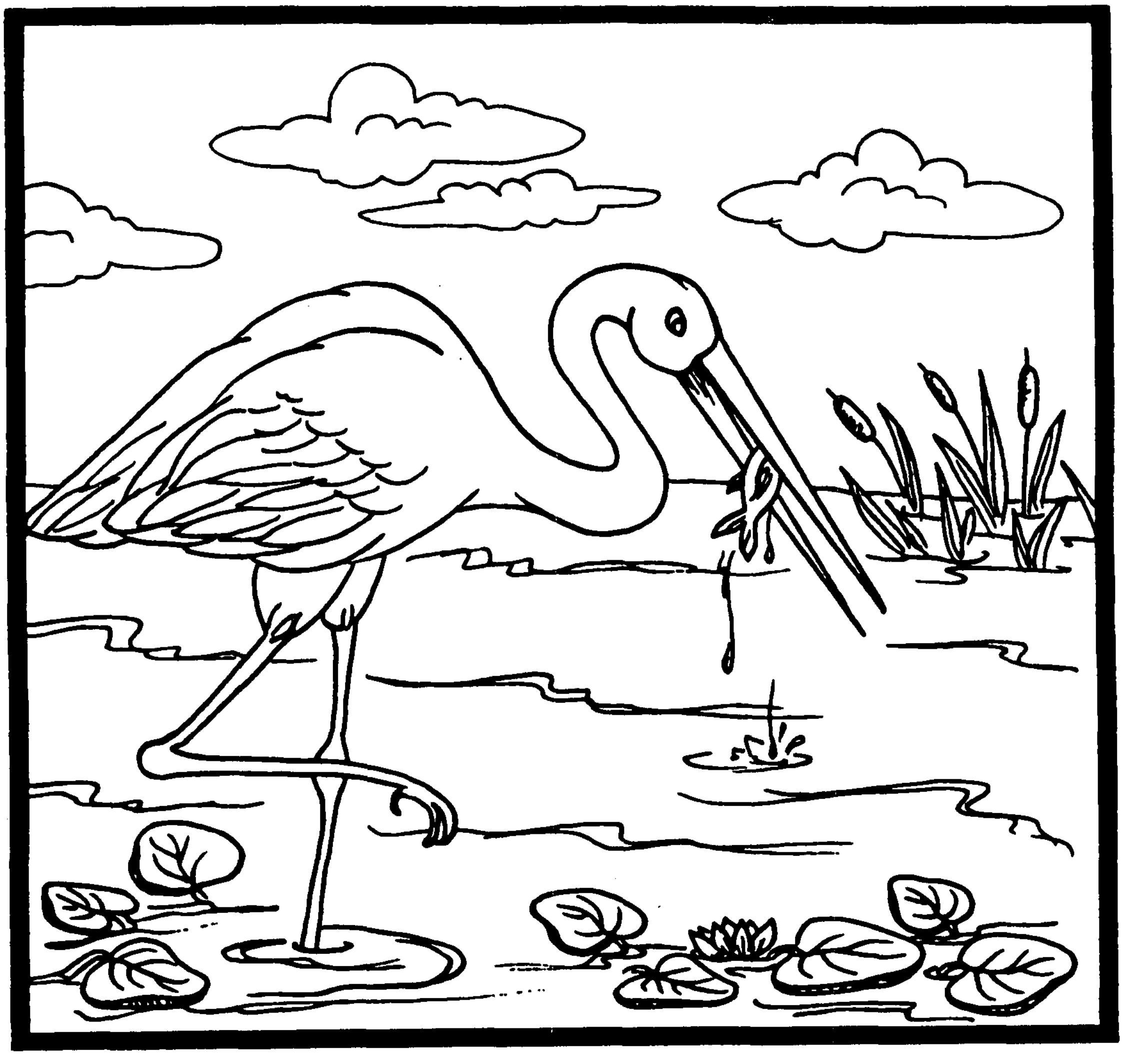
# In the wetlands we see orchids.



# By the orchids we see birds.

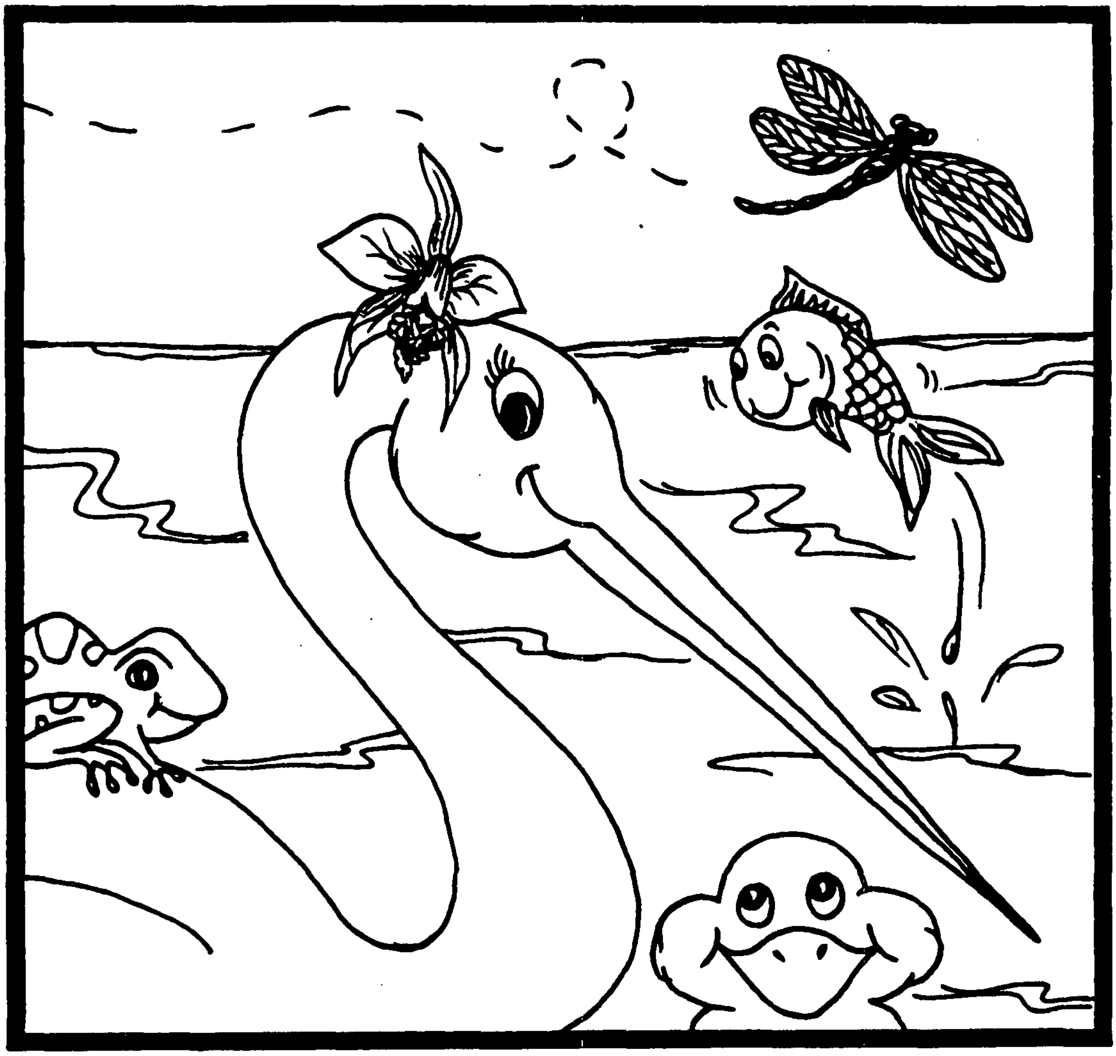


By the birds we see small fish.



In the wetlands we see many plants and animals.

# Wetlands are their home.



By________________________ Student Report Sheet

# The Wetlands

## Plants and Animals

# A B C's OF THE WETLANDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Tell or write the importance of the wetlands;
2. Identify, orally or in writing, the different types of wetlands;
3. Identify, orally or in writng, foods of the wetlands;
4. Identify, orally or in writing, animals found in the different wetlands; and
5. Give an oral or written definition of wetlands.

**SUBJECTS:**
Science, Language Arts, Social Studies

**TIME:**
1 week, 30 minutes a day

**MATERIALS:**
books on the wetlands
encyclopedia sets
dictionaries
pictures of different kinds of wetlands
writing paper
construction paper
pencils
crayons
materials to make student books
ABC books
Geography From A to Z: A Picture Glossary by Jack Knowlton

## BACKGROUND INFORMATION

Wetlands are known as the "kidneys of the landscape." They function as removers of wastes from both natural and human sources. Wetlands are the homes to a variety of plants and animals. Wetlands are nurseries for many species of coastal fish. Wetlands are areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions. The characteristics of the wetlands and how they function is determined by what is happening in the area surrounding the wetlands. Wetlands are found in all parts of the world and are classified into types. There are fresh water and salt water wetlands. Some examples of fresh water wetlands are swamps, marshes, bogs, pasture ponds, and prairie holes. Salt water wetlands are mangroves and salt water marshes. Wetland areas typically support plant life that are adapted to life in wet environments.

We now know that from an economic and ecological standpoint, wetlands are extremely valuable, fertile areas. The misguided notion that wetlands were a wasteland led to its destruction. Between the 1950s and the 1970s the U.S. nearly lost 460,000 acres per year. The major loss resulted from drainage for agricultural development as well as construction of housing, highways, and commercial buildings.

## ADVANCE PREPARATION

A. Obtain ABC books.

B. Gather pictures of wetlands.

C. Gather materials to make student books.

## PROCEDURE

I. Setting the stage

A. Discuss with the students the term wetlands and share some information using pictures and books.

B. Share an ABC book with the students, then explain that they will be writing their own ABC book on the topic: WETLANDS. Begin brainstorming words that begin with the letter a, then the letter b, and so on. Show the students books on the wetlands that can be sources for them.

II. Activities

A. Have the students list the alphabet on paper.

B. Have the students find words pertaining to the wetlands for each letter.

C. Have the students write the definitions or use the word in a sentence.

D. Edit the work.

E. Put the "ABC's" of the wetlands in book form.

III. Follow-Up

A. Have students share their books.

B. Place them in the library for other students to read.

IV. Extension

A. Have the students produce a crossword puzzle using the terms and definitions from the ABC book.

## RESOURCES

Challand, Helen J., Disappearing Wetlands, Childrens Press, Chicago, 1992.

Knowlton, Jack, Geography From A to Z: A Picture Glossary, Thomas Crowell, New York, 1988.

Wading into the Wetlands, NatureScope, Vol. 2 No. 5, National Wildlife Federation, Washington, D.C., 1986.

# "BAY" WATCH: (BY THE BAY)

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, a bay as a source of water in the world around them;
2. Compare and contrast, orally or in writing, a bay to a lake or ocean;
3. Name, orally or in writing, an animal found by the bay;
4. Write two facts about the named animal; and
5. Give an oral or written definition the new terms: bay, gulf, and estuary.

**SUBJECTS:**
Science, Music, Social Studies, Language Arts, Art, Computer, Dramatic Play

**TIME:**
1 week, 30 minutes per day

**MATERIALS:**
Down by the Bay (book and song) by Raffi
local map
map of United States and/or world map
assorted pictures of bays from assorted resources
Word Web
transparency
assorted pictures of animals that live by the bay from assorted resources
"Tripping with Terwilliger--Bay Tidelands" (video or comparable video)

## BACKGROUND INFORMATION

A bay is a body of water partly enclosed by land but with a wide outlet to the sea. Bays are similar to gulfs, only smaller. Mobile Bay, Alabama is an example. Estuaries are influenced by the ocean tides resulting in a mixture of salt water and fresh water.

Bays are homes to many diverse and unique animals, both large and small. Bays and their beaches are also used for numerous recreational activities and water travel.

Terms

**bay**: a body of water partly enclosed by land but with a wide outlet to the sea.

**gulf**: a large body of sea or ocean water partly enclosed by land.

**estuary**: a marine ecosystem where freshwater enters the ocean; the term usually describes regions near the mouth of rivers, and includes bays, lagoons, and marshes.

## ADVANCE PREPARATION

A. Assemble resource pictures/books/videos to show pictures of bays. You may use old magazines (travel, sports, nature), geography texts, library books, National Geographic magazines, and assorted videos.

B. Assemble resource pictures/books to show animals that live by bays. You may use old magazines (travel, sports, nature), science and geography texts, library books, National Geographic magazines, Ranger Rick magazines, Your Big Backyard magazines, Zoobook magazines, and assorted videos.

C. Make transparency of Word Web.

D. Set up centers in room (optional).

E. Assemble materials associated with the environment "by the bay." Bays have historically been heavily utilized as centers of civilization due to the protected waters easing navigation.

F. Write vocabulary words on flash cards.

## PROCEDURE

I. Setting the stage

A. Build background by inviting the students to go with you on an imaginary "walk" along the bay. Name the sounds they hear on the walk. Describe the animals they see along the bay. Describe the smells. Provide additional information about the environment and animals as necessary from the assorted resource books.

B. Encourage the students to describe places with water they have seen. Record the description (that suggests the characteristics of different bodies of water) on the Word Web transparency.

C. Define the term "bay" and show the worksheet "Bodies of Water." Emphasize the bay and its characteristics. Distinguish bays from oceans and lakes.

D. Use the United States or world map to name some known bays.

II. Activities

A. Introduce vocabulary words associated with the theme: bay, wave, sand, deep, shallow, shore, lake, ocean, island, and sea.

B. Read Down by the Bay by Raffi (emphasize the setting of the book). Sing the song if time permits. Discuss the animals named in the book. Decide if they do/do not live by the bay. List these in the appropriate column on the board or the worksheet.

C. Use a local/state map to show the bay closest to the school. If there are no nearby bays, discuss other bodies of water that may be familiar to them.

D. Name some activities the students can do "down by the bay" (wading, collecting shells, sunning, walking on the beach, having a picnic, and fishing).

E. View video, "Tripping with Terwilliger." List animals named in the video (mussels, clams, spiders, beetles, barnacles, crabs, periwinkle snails, and shore birds).

F. Divide the class into pairs. Have each pair choose an animal (or assign an animal) from the above list. Allow the student pairs to use the resource books and encyclopedias to find and record two or more facts about their animal. Pairs should share their facts with the class.

G. Allow the students to go to various centers as time allows.

III. Follow-Up

A. Have the students demonstrate their knowledge of bays by labeling the correct bodies of water on the worksheet, "Bodies of Water."

B. Have the students draw a picture of an animal found by the bay and label their picture. Write two facts about the animal drawn. Assemble into a class Big Book. Vote on a title.

C. Sing the "Water Sources" song with students.

D. Read Morning Beach by Leslie Baker. Allow the students to examine the paintings in the book. Invite them to use watercolors to create "down by the bay" pictures.

E. Have the students write in their journals about experiences they have had with families or friends by the water.

F. Read Beach Ball by Peter Sis.

G. Create a "pretend" beach in the classroom. Let students create a name for the beach. Make a sign for the "beach" area.

H. Suggest items needed for a beach party (beach towels, bathing suits, beach balls, pails and shovels, and picnic food in a basket). List suggestions on a chart. Read to review.

I. Read At the Beach by Anne and Harlow Rockwell or Hurry Up, Jessie! By Harriet Ziefert and Mavis Smith.

J. Brainstorm, write, and display rules that are followed to keep people safe at the beach, such as swimming near a lifeguard, swimming with a friend, wearing a life jacket (if necessary), and staying close to the shore when swimming. Have each student choose a rule. Have each student draw themselves following the rule he/she chose. Share with the class.

IV. Extensions

A. Invite a naturalist to visit the classroom to discuss the importance of bays and the encroachment of man upon nature's wildlife environment.

B. Read A House for Hermit Crab by Eric Carle. Compare man's need for houses to those of animals and how they need them for the same purposes (for protection, meeting individual needs, sleeping, eating, and taking care of their young). Discuss how houses differ with location, sociological development, and materials available to use.

Centers to Set Up In Classroom

A. MUSIC

* During water play, listen to music.
* Make musical instruments to accompany themselves while singing "Down by the Bay." Use cereal boxes, jars with lids, milk jugs, paper towel tubes, shoe boxes, or coffee cans. Fill them with pasta, nuts, rice, sand, paper clips, rocks, or dried beans.
* Provide the tape of the song "Down by the Bay" at the listening center.

B. ART

* Have a supply of watercolor sets to create pictures.
* Provide art supplies for students to draw a map of an imaginary bay. Name the bays they have drawn.
* Provide sand to create a sand picture (after listening to the book For Sand Castles or Seashells by Gail Hartman).

C. SOCIAL STUDIES

* Globe
* Maps
* Resource pictures of bays

D. WATER AND SAND TABLES

* Provide cups, spoons, funnels, sifters, bottles, pails, and shovels for sandcasting and exploration.
* Place shells or stones in the sand and allow the students to have a shell treasure hunt.

E. SCIENCE

* Provide shells, sand, and rocks for hands-on experiences.
* Have a supply of books related to the theme (see resources).

F. COMPUTER

* Provide the CD "Beachy Keen!" by Carole Marsh.

G. DRAMATIC PLAY

* Have available clothes, materials, and props for a day at the beach, wading in the tidepool, or picnicking at the beach.

H. MATH

* Provide an assortment of seashells. Use these to sort according to attributes. Graph the results on a graphing mat.
* Provide tangram blocks. Have students create fish shapes using the tangrams.

I. LANGUAGE ARTS

* Read "The Left/Right Beach Story" by Pam Leiker and do the corresponding activity with the students.

## RESOURCES


A House for Hermit Crab, (video) Reading Rainbow.

Amos, William H., Exploring the Seashore, National Geographic Society.

Asch, Frank, Sand Cake, New York, Parent's Magazine Press, 1978.

Baker, Leslie, Morning Beach, Little Brown, Boston, 1990.

Bowden, Joan, Why the Tides Ebb and Flow, Houghton Mifflin, 1979.

Burnington, John, Come Away From the Water, Shirley, Crowell, New York, 1977.

Carle, Eric, A House for Hermit Crab, Scholastic.

Crews, Donald, Harbor, Greenwillow, New York, 1982.

Day, Alexandra, River Parade, Viking, New York, 1990.

Dodd, Lynley, The Smallest Turtle, Gareth Stevens, Inc.

Feeney, Stephanie and Fielding, Ann, Sand to Sea, University of Hawaii Press.

Florian, Douglas, A Beach Day, Greenwillow, New York, 1990.

Gunzi, Christiane, Tide Pool, Doring Kindersley, 1992.

Hartman, Gail, For Sand Castles of Seashells, Bradbury, New York, 1990.

Heyduck-Huth, Hilde, The Starfish, Macmillan.

Hopkins, Lee Bennett, The Sea is Calling Me, Harcourt Brace Jovanovich.

Jenkin-Pearce, Susie, The Seashell Song, Lothrop, Lee & Shepard.

Johnson, Sylvia, Hermit Crabs, Lerner Publications, Co.

Lund, Doris Herold, The Paint-Box Sea, McGraw-Hill Book Company.

Marsh, Carole, Beachy Keen! (Computer CD), Gallopade Publishing, Marietta, GA 30067, (404) 577-5085.

McDonald, Megan, Is This a House for Hermit Crab?, Orchard Books.

McMillan, Bruce, One Sun-A book of Terse Verse, Holiday House, New York, 1990.

Raffi, Down by the Bay.

Rockwell, Anne and Rockwell, Harlow, At the Beach, Macmillan, New York, 1987.

Rylant, Cynthia, Henry and Mudge and the Forever Sea, Bradbury, New York, 1989.

Samton, Shelia White, Beside the Bay, Philomel Books, New York, 1987.

Silver, Donald, One Small Square Seashore, W.H. Freeman and Company, 1993.

Sis Peter, Beach Ball, Greenwillow, New York, 1990.

Stock, Catherine, Sophie's Bucket, Lothrop, Lee & Shepard.

Taylor, Barbara, Shoreline, Dorling Kindersley, 1993.

Tripping with Terwilliger, Bay Tidelands (video), Terwilliger Nature Education Center, P O Box 722, Tiburon, CA 949920-0722.

Yamashita, Haruo, Mice at the Beach, Morrow, New York, 1987.

Ziefert, Harriett and Mavis Smith, Hurry Up, Jessie!, Harper Collins, New York, 1991.

Zion, Gene, Harry By the Sea, Harper, New York, 1965.

The Left/Right Beach Story, June/July—Creative Teaching Press.

# WATER SOURCES
(Tune: Go Tell Aunt Rhody)

What are water sources
What are water sources
What are water sources
Where can water be found?

Streams and rivers
Streams and rivers
Streams and rivers
Flow within our state.

Water flows underground
Water flows underground
Water flows underground
And bubbles up as a spring.

Bays and oceans
Bays and oceans
Bays and oceans
Are salty as can be.

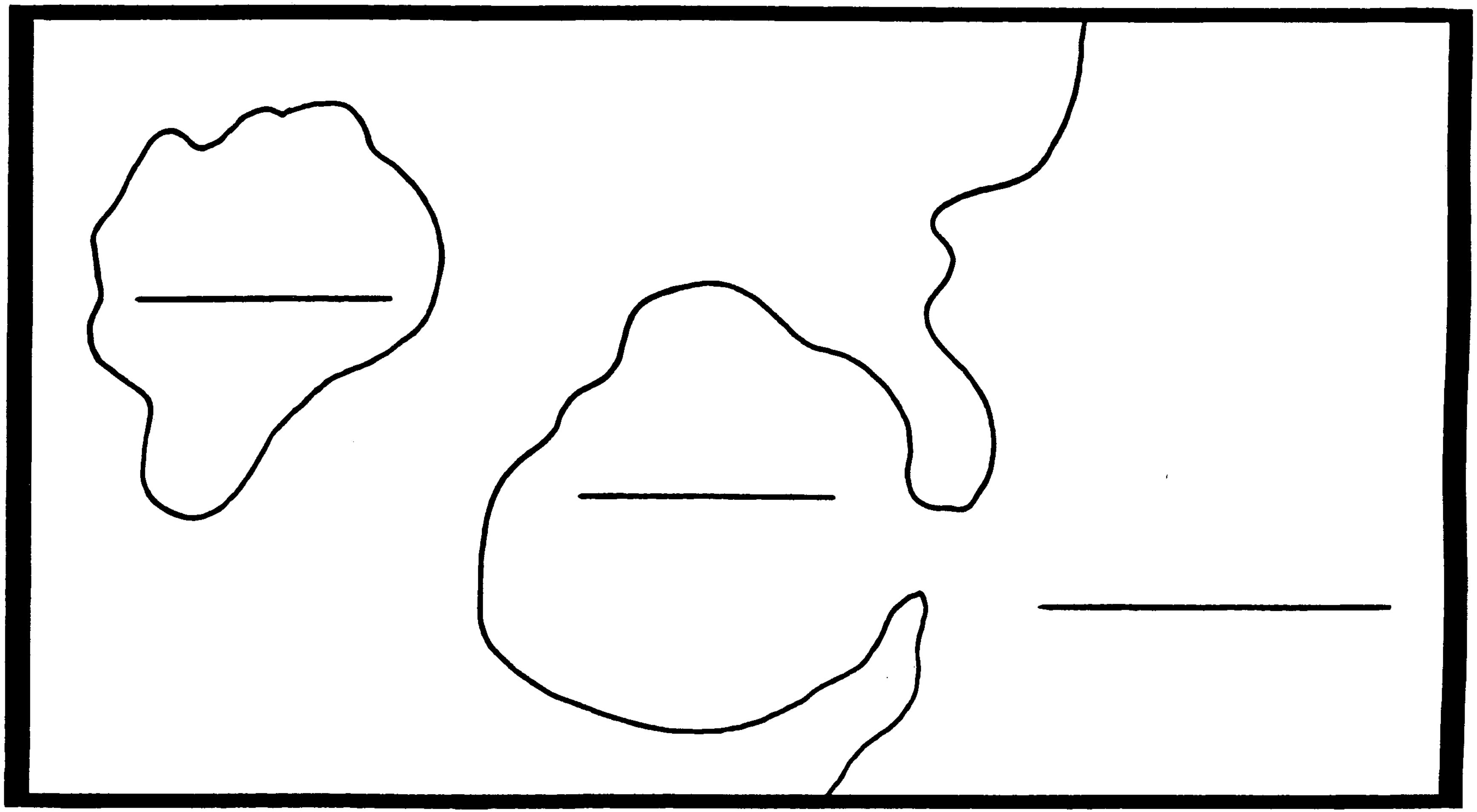
Small ponds and big lakes
Small ponds and big lakes
Small ponds and big lakes
Act as reservoirs.

These are water sources
These are water sources
These are water sources
And where they can be found.

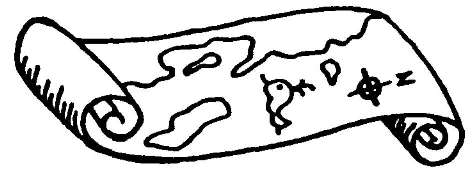
Name ________________

Label each body of water.

bay ocean lake



# Bodies of Water
## (setting the stage: C)



# MARIE DEBRIS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Tell at least two things they can do to reduce litter or protect marine animals; and

2. Give an oral or written definition of the new terms: debris and marine animals.

**SUBJECTS:**
Science, Art

**TIME:**
1 hour

**MATERIALS:**
1 large plastic garbage bag
1 small garbage bag for each student
miscellaneous garbage items
cash register tape
5 pounds sugar
drawing paper
glue

## BACKGROUND INFORMATION

Trash discarded in oceans and on beaches threatens the health and safety of people, birds, fish, and marine animals. An estimated 14 billion pounds of trash is dumped in the world's oceans each year. Many sea birds and marine animals die each year from entanglement in marine debris or from eating plastic. Boats are often damaged by trash in the water.

Terms

**debris**: the remains of something broken down or destroyed.

**marine animals**: animals that live in the sea or in a tidal pool.

## ADVANCE PREPARATION

A. Use a garbage bag (head) and garbage (facial features) to make the character "Marie Debris." Stuff the bag with crumpled newspaper. (See attached illustration).

B. Write information about marine debris on cash register tape (thin roll of paper). Place the roll of paper inside the bag and feed the end out through "Marie's" mouth. See marine debris fact sheet for needed information.

## PROCEDURE

I. Setting the stage

A. Introduce "Marie Debris." Ask students "What is debris?" Write the word "debris" on the chalkboard (the remains of something broken down or destroyed). Is debris harmful? Good? How?

B. Slowly pull the tape out through the character's mouth and read the information.

II. Activities

A. Let each child create their own trash character using small garbage bags and garbage. Help them think of trash related names like:

Ricardo Discardo
Ashley Trashley

1. Have students draw a picture of the effect debris has on sea animals on an 8 1/2" x 5 1/2" piece of drawing paper. May need to review marine debris facts.

2. Glue picture on back of Marie Debris.

3. Display trash characters by hanging them from the ceiling in order to display both sides.

III. Follow-Up

A. Walk around the school grounds and pick up trash.

B. There are things you can do to help. List the following things on chart paper and read them aloud:

1. Don't throw trash in the water or on the beach.

2. If you see trash, pick it up and put it in a garbage can.

3. Don't throw anything out of your car.

4. Don't use helium balloons, sometimes they fall in water and are eaten by marine mammals.

5. Reduce the amount of waste you generate by recycling.

IV. Extensions

A. Write "14,000,000,000 pounds" on the chalkboard. Ask the children what that number is. Tell them, 14 billion.

B. Pass around a five pound bag of sugar (let each student hold it). Write "five pounds" on the board. Say, "This bag of sugar weights five pounds. Is it heavy? Every year people put 14 billion pounds of trash in the oceans or on the beaches of the world.

C. Is that a lot of garbage? Use a calculator to show how many five pounds of sugar make 14 billion pounds.

## RESOURCE

Gulf of Mexico Program Gulf Facts, Stennis Space Center, Mississippi.

# MARINE DEBRIS FACT SHEET

An estimated 14 billion pounds of trash, much of it plastic, have been dumped in the world's oceans every year.

Over 1 million pounds of trash and debris were picked up on Gulf beaches during the 1988 beach cleanup.

Over 68% of the trash picked up during the 1988 cleanup was plastic.

The worldwide fishing industry dumps an estimated 150,000 tons of plastic each year, including packaging, plastic nets, lines, and buoys.

Plastics are lightweight and durable. Beverage 6-pack yokes may persist 450 years in the marine environment.

Within the U.S., an estimated 2 million seabirds and 100,000 marine mammals die each year from entanglement in marine debris or ingestion of plastics mistaken for food.

Waterborne debris fouls boat propellers and water intake structures, disabling engines, necessitating costly repairs, and creating a safety hazard for boat operators.

Debris such as plastic sheeting becomes entangled in fishing nets. Trawling nets are often snagged and torn on oil drums and other heavy objects at sea.

As much as 1 ton per mile of litter is picked up along Gulf Coast beaches each year during volunteer cleanups.

# Marie Debris

## Make a large character using a garbage bag.


Write background information on cash register tape.

# OCEANS AND PONDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Identify, orally or in writing, some animals that have an aquatic habitat;
2. Classify, orally or in writing, animals according to the type of aquatic habitat; and
3. Give an oral or written definition of the new terms: aquatic and habitat.

**SUBJECTS:**
Science, Art

**TIME:**
2 one hour sessions

**MATERIALS:**
index cards
chart paper
tape
blackline master, Water-Fresh-Salt
blackline master, Water Habitats

## BACKGROUND INFORMATION

Animals must have a home that provides all their needs: the right amount of water, the right kind of food, and the right temperature. A home that provides all these things is called a habitat.

There are many different habitats on Earth. Ponds and oceans are examples of aquatic habitats. An ocean is a salt water habitat. A pond is a fresh water habitat.

Terms

**aquatic**: living or growing in or on water.

**habitat**: the place or type of site where a plant or animal naturally or normally lives and grows.

## ADVANCE PREPARATION

A. Make two charts with the following titles:

Water Animals
Fresh Water/Salt Water (make 2 columns)

B. Copy the blackline masters:

    Water-Fresh-Salt
    Water Habitats

C. Prepare mural background.

D. Cut two large pieces of blue bulletin board paper. Cut one piece in the shape of a pond and the other wavy like the ocean. Label: Ocean - Salt Water, Pond - Fresh Water.

## PROCEDURE

I. Setting the stage

   A. Ask each student to name an animal that lives in water.

   B. Write the name of the animal on an index card and give it to the student. Have each student to tape his/her card on the Water Animals chart.

II. Activities

   A. Pass out the Water-Fresh-Salt worksheet (blackline master included).

      1. Go over the Water Animals Chart having the students classify each animal's aquatic habitat as fresh water or salt water by writing the name of the animal in the appropriate column.

   B. Display the ocean and pond murals. Ask each student to draw a picture of the animal he/she chose. Then cut out the picture and glue it to the pond or ocean mural.

III. Follow-Up

   A. Pass out the Water Habitats worksheet (blackline master included). Have students cut out the animal pictures and glue each one in its proper aquatic habitat.

   B. Make a whale as an example of a salt water mammal. Share why the whale is a mammal and not a fish (instructions included).

IV. Extensions

   A. Have each student choose one animal and write and illustrate a story about how/where the animal gets water.

   B. Make a book titled Animals and Water by stapling the students' stories together and making a cover. Place the book in your classroom library.

   C. Explore other types of animal habitats and create a diorama display of them.

## RESOURCE

DeBruin, Jerry, Creative, Hands-On Science Experiences, Good Apple, Inc., Carthage, Illinois, 1980.

# SACK WHALE PATTERN

1. Spread flat, large paper sack.

2. Trace fluke pattern at top of bag and paint sack.

3. Cut an X in the bag for the blow hole.

4. For the waterspout, roll a piece of 9" x 12" blue construction paper into a cylinder shape. Tape it so it won't unroll.

5. Let the students cut on the fluke pattern lines.

6. Have the students open bag and stuff with crumpled paper from the recycling bin.

7. Staple fluke closed.

8. Using markers, let the students make the whale's mouth and eyes.

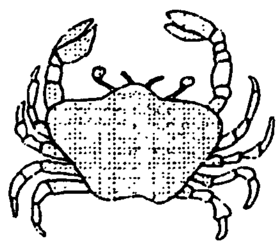
9. Let the students cut the blue construction paper cylinders halfway down all the way around. Cut the fringed strips to represent the waterspout. Insert into X shaped hole.

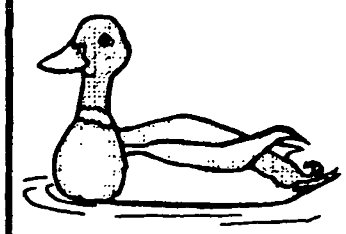
10. Cut two fins from construction paper and glue to the whale's side.

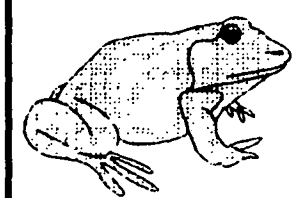
5-75

| Salt-water Habitat | Fresh-water Habitat |
| --- | --- |
| Ocean | Pond |

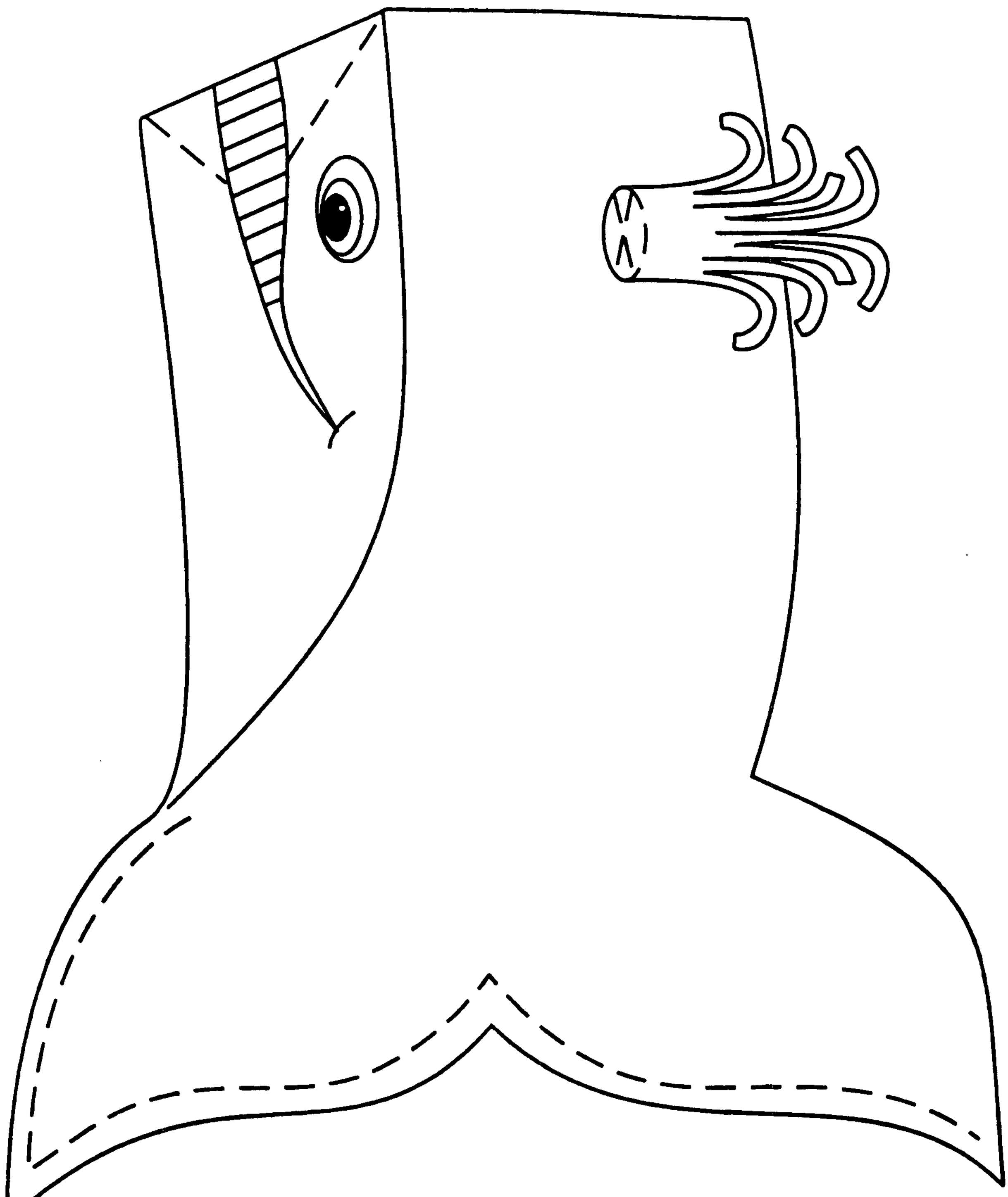
Cut out the pictures and paste each one in its natural habitat. Color the picture.







| Fresh-Water | Salt-Water |
| --- | --- |
| | |



# HOW DRY I AM, HOW WET I'LL BE!

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Make a model of the ocean tide to create a tidal pool;
2. Write or tell what plants and animals were found in a tidal pool;
3. Demonstrate, orally or in writing, the role of suction in the survival of tidal pool creatures; and
4. Give an oral or written definition of ocean tides.

**SUBJECTS:**
Science, Language Arts, Art

**TIME:**
1 hour

**MATERIALS:**
cake pan
blue or green gelatin
suction-cup hooks
sand
paper cup
water
small paper plate
crayons
scissors

## BACKGROUND INFORMATION

Many different areas of our world are covered with water. In each type of water, different types of plants and animals flourish. Survival of these plants and animals are determined by different water temperatures, water pressure, food supply, chemical balance, and other water characteristics. The physical characteristics of marine life and their adaptability determine their habitat. Coastal marine life must be able to adapt to tidal changes.

Term

**ocean tides**: the natural rise and fall of the ocean caused by the moon's gravitational pull.

## ADVANCE PREPARATION

A. Prepare gelatin, but remove from refrigerator before it is completely set.

## PROCEDURE

I. Setting the stage

A. Share stories about trips to the beach. Describe the waves and tides.

II. Activities

A. Demonstration of high and low tides.

1. Pour a layer of gelatin into one half of a cake pan and pour a layer of sand in the other half. Embed part of a paper cup in the sand. This will be a tidal pool.

2. Slowly tilt the pan so that the gelatin starts moving toward shore. Tilt the pan slowly forward and back, going forward more each time. This represents the tide moving in.

3. If the beach is rocky, water from high tide collects around rocks forming tidal pools. Some gelatin will remain in the cup as the tide goes back out to sea.

B. Demonstration

1. Use "My Home is a Tidal Pool" to show various creatures found in this habitat.

2. Explain that these animals must attach themselves to rocks or be swept out to sea. Explain suction by pressing a suction cup on the table or by using a vacuum cleaner hose and a paper plate. The animals secure their food as the water passes food over and around them. They open their mouths, never losing their hold on the rocks, and secure their nourishment.

III. Follow-Up

A. Write a dialogue between tidal pool inhabitants.

B. Research a particular tidal pool creature and report to the class.

C. Make a paper plate hermit crab. See "Hermy the Hermit Crab."

IV. Extensions

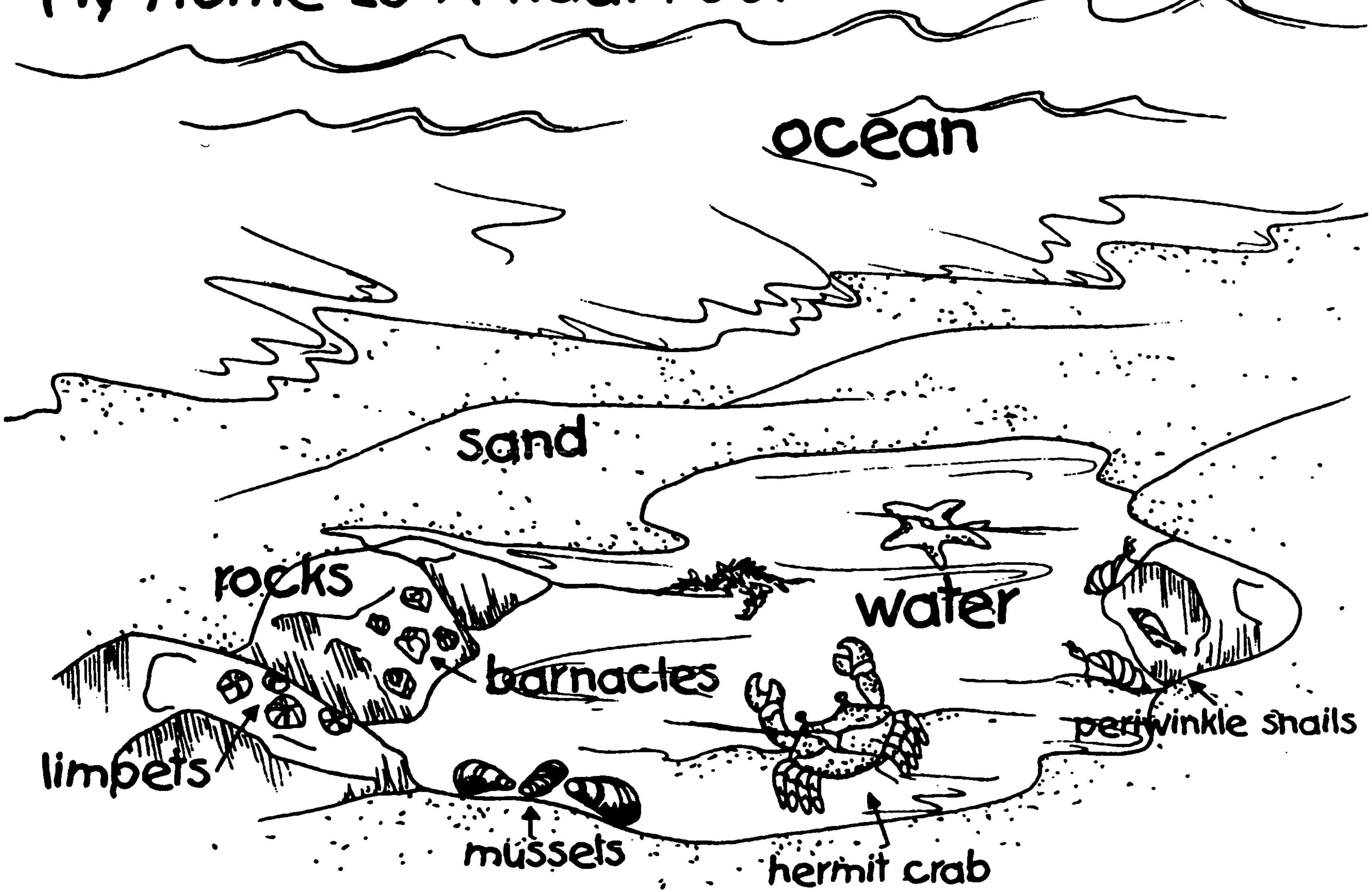
A. Discuss how the native Americans used these animals for food and ornamentation.

B. Write a story about a visit to a tidal pool.

## RESOURCE

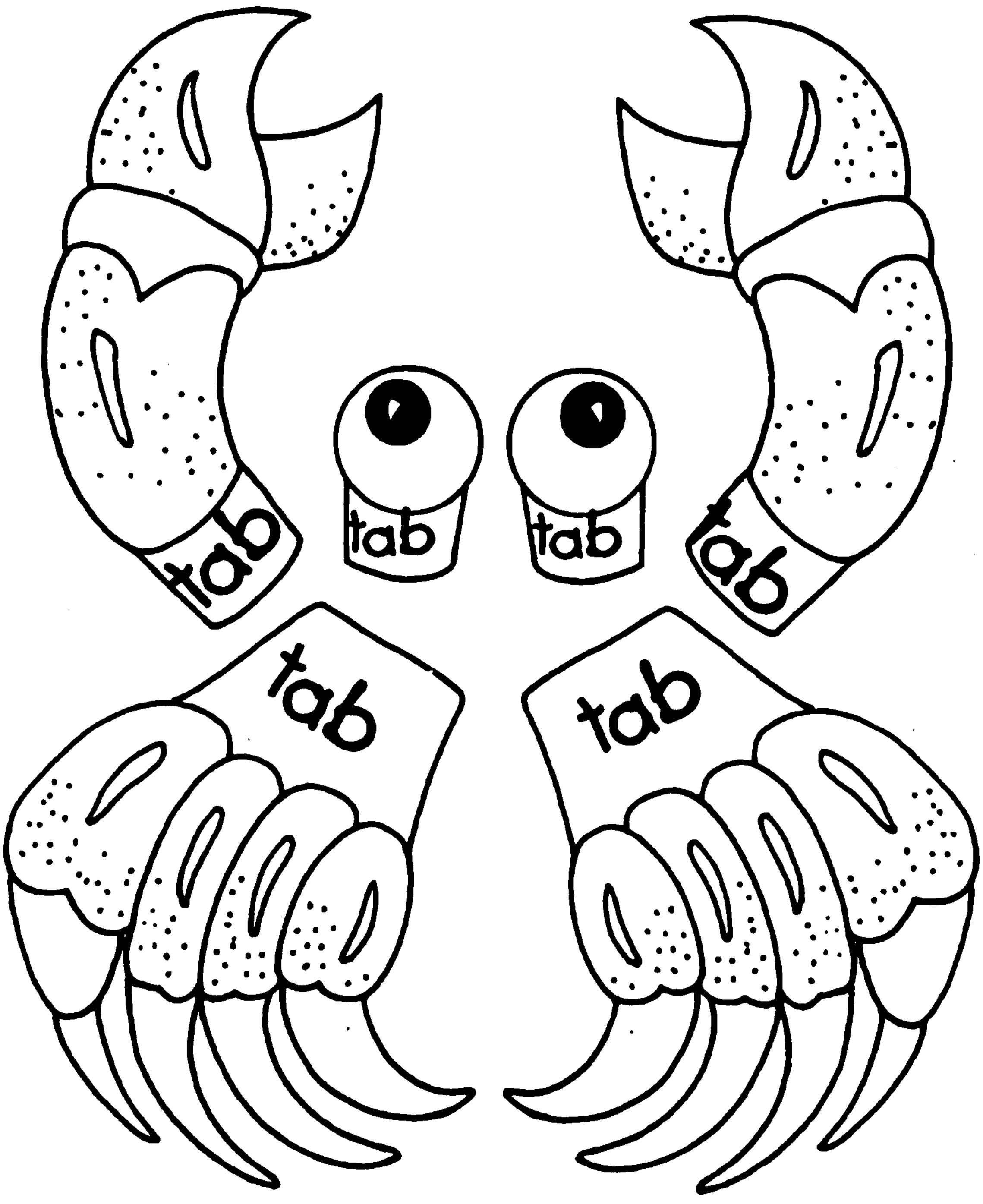
Schaffer, Frank, School Days, Sept/Oct, 1995.

# " My Home Is A Tidal Pool "



# Hermy the Hermit Crab

Fold a small paper plate in half and glue the tabs to it.



# GET THE OIL OUT!

K-2

## OBJECTIVES

At the end of this lesson, the students shall do the following:

1. Hypothesize, orally or in writing, what will happen when oil and water are mixed;
2. State, orally or in writing, that oil is less dense than water; and
3. Give an oral or written definition of the new terms: absorbents and oil spill.

**SUBJECT:**
Science

**TIME:**
20 minutes

**MATERIALS:**
colored water
oil
shredded paper, or sawdust
feathers
containers for the oil, water, and shredded paper

## BACKGROUND INFORMATION

Water pollution, one of the most serious types of environmental abuse, is evident in streams, lakes, rivers, and oceans throughout the world.

Oil pollution is a growing hazard and a new source of water pollution. It can potentially destroy the ecosystem of the water environment.

The oil and water do not mix. The oil is less dense than water so it will stay on top of the water, even if it is shaken or mixed. The oil can be removed from the surface of water through the use of detergents and emulsifiers. However, a significant amount of pollution from oil eventually settles as sediment in the rivers, lakes, and oceans.

Terms

**absorbents**: shredded paper, sawdust, and other materials that have the power to absorb; these can be dipped into or spread across an oil spill to absorb or soak up the oil.

**oil spill**: a form of pollution in which oil from various sources leaks into the water.

## ADVANCE PREPARATION

A. Have water, oil, and shredded paper or sawdust in separate containers.

## PROCEDURE

I. Setting the stage

A. Have children hypothesize what will happen when oil and water are mixed.

1. Pour the water and oil in a clear jar. Observe what happens. Shake the jar and let the students observe how oil and water will separate.

II. Activities

A. Sprinkle shredded paper or sawdust on top of the oil. Let the students observe how the paper and sawdust act as a sponge to absorb the oil. Dip sawdust or paper out and let a student run a feather (or their finger) across the water to see if the oil has been removed. Estimate how many times it will take before this procedure cleans the water. Repeat the feather test after each cleaning.

III. Follow-Up

A. Show the film "Free Willy II" and talk about how oil affects different kinds of wild life. You should also talk to the class about the disadvantages to this clean-up method. (The absorbents themselves have to be disposed of after they are used.)

IV. Extensions

A. Have the class bake a cake to show that sometimes with other ingredients, oil and water will mix and the results can be delicious! Let the class decorate the cake to culminate a special unit of study.

## RESOURCES

Freeman, Don, The Sea and the Slick, Viking, 1974.

"Alaska's Big Spill: Can the Wilderness Heal?," National Geographic, Vol. 177, No. 1, January, 1990.

# SIFTING THROUGH THE WETLANDS

K-2

## OBJECTIVES

At the end of this lesson, the students shall be able to do the following:

1. Predict, orally or in writing, if sand will go through a screen;
2. Form an oral or written hypothesis related to the experiment;
3. Create a commemorative stamp to display at the post office; and
4. Give an oral or written definition of the new iterms: bog, marsh, and swamp.

**SUBJECTS:**
Science, Social Studies, Math, Art

**TIME:**
45 minutes

**MATERIALS:**
pictures of different wetlands
coffee filter
dirty water
3 glass jars
window screening
construction paper
colored markers
sand, sticks, rocks, leaves
glass or clear plastic container

## BACKGROUND INFORMATION

Many wetland areas which have been lost to farming and commercial development were a valuable resource as natural sewage systems. Environmentalists have discovered that wetland plants can absorb excess nitrogen and phosphorous from sewage and can filter waste from runoff and streams that flow into the wetland area protecting bodies of water downstream. Dangerous wastes are absorbed by the wetlands until they have time to breakdown to safer levels. Many rich nutrients that are lost through runoff fertilize wetland plants which, in turn, feed wetland animals.

This lesson will help students to realize how wetlands are nature's kidneys or filtering system. By sifting sand (representing the water) through a window screen (representing the wetlands), students can see how the finer sand is filtered through leaving the larger pieces (the pollutants) behind. Wetlands play an important role in the balance of our world.

Terms

**bog**: freshwater marsh with build-up of peat and high acidity that typically supports mosses adapted to acidic soil conditions, many are located in colder regions.

**marsh:** wetland dominated by grasses.

**swamp:** wetland dominated by shrubs and trees.

## ADVANCE PREPARATION

A. Locate pictures of swamps, marshes, and bogs.

B. Place a coffee filter on top of a glass jar. Have dirty water with sticks, mud, leaves, and rocks in another glass jar.

C. Reproduce the Sand Box Graph on poster board for the number of students in the class. For younger children, do one graph with the whole class.

D. For each student make a 6" x 6" wetland window by stapling folded pieces of 6" x 2" construction paper to a 6" x 6" cut piece of window screen. Write on the top of the frame "Wetland Window, To See the Future of Our Wetlands." And on the sides write "Swamps," "Marshes," and "Bogs." (See attached diagram.)

## PROCEDURE

I. Setting the stage

A. Find pictures of different kinds of wetlands (see resources) and discuss with students the difference between a swamp, marsh, and bog. Discuss how important these wetlands are to our Earth.

B. To show students how wetlands filter pollutants and waste, pour dirty water with sticks, leaves, and mud through a coffee filter. Compare the dirty water with the filtered water. Then discuss how swamps, marshes, and bogs are nature's filters to get rid of unwanted substances.

II. Activities

A. Place a kitchen colander or strainer over a glass or clear plastic container with a glass of regular sand on a table for all students to see. Display the Sand Box Graph at the students' level with two different colored markers.

B. Show students the screen and a glass of sand. Ask students to predict what will happen if the sand is poured on the screen by coloring a square on the Sand Box Graph. Count how many students predicted all of the sand would fall through and how many predicted only some of the sand would fall through. Discuss which prediction had more. Then, ask how many more students predicted this. Using the prediction that had more, have the students to form a hypothesis. (Example: When pouring sand through a screen all of the sand will fall through the holes. Help the students to become more familiar with the word hypothesis by describing it as a guess that scientists make for their experiments). Then place the sand on the screen and discuss with the students what happened. Ask if their hypothesis is correct. (Scientist often rewrite their hypotheses to fit their experiments.)

C. Place students in small groups with their own "Wetland Window" to explore with "dirty" sand (sand mixed with sticks, leaves, and rocks) what happens when they pour it through the screen. The children will enjoy watching the screen filter out the larger materials and create the fine sand. Later, in large groups, ask the students how the Wetland Window is like the wetlands and which way they like the sand best, with the sticks, leaves, and rocks or without. Relate this to the wetlands. Just as the Wetland Window filters the sticks, leaves, and rocks from the sand to make it cleaner, the Wetlands filter pollutants from the water to make it cleaner. Have students take their windows home to show their parents.

III. Follow-Up

A. Discuss with the students what might happen if all the wetlands were eliminated from the planet. Discuss how valuable the wetlands are to our world. Ask students what they think they could do to help save the wetlands or reduce losses of wetlands. Direct them in drawing a commemorative stamp or writing a class letter to their state senator reminding him/her of the value of wetlands. Have them draw pictures of wetlands and how they are being destroyed for farmland or industry, and display them at the post office and/or send them to one of the following addresses:

Soil and Water Conservation Society
7515 Northeast Ankeny Road
Ankeny, Iowa 50021

Water Pollution Control Federation
601 Wythe Street
Alexandria, Virginia 22314

Worldwatch Institute
1776 Massachusetts Avenue NW
Washington, D.C. 20036

Help your students to understand that there is something they can do and that whatever they do will make a big impact on the health of our planet.

IV. Extension

A. Have students help write a letter for other information on wetland activities to:

WETLANDS
Mail stop 6217, Main Interior Building
U.S. Department of the Interior
Washington, D.C. 20240

## RESOURCES


Cortesi, Wendy W., Explore a Spooky Swamp, National Geographic Society, Washington, D.C., 1978.

Dobrin, Arnold, Marshes and Marsh Life, Coward-McCann, New York, 1969.

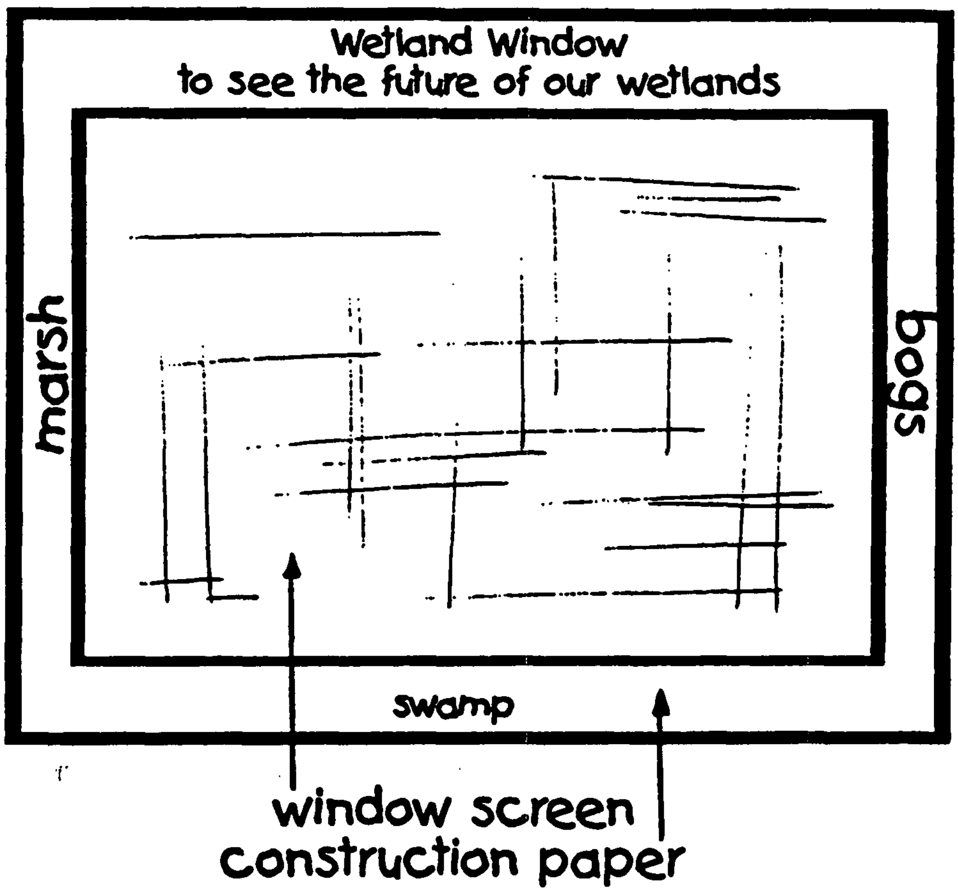
Facklam, Margery, And Then There Was One, The Mysteries of Extinction, Sierra Club Books/Little, Brown and Company, San Francisco, 1990.

Greenway, Shirley, Animal Homes, Water, Newington Press, Connecticut, 1990.

Hoff, Mary and Rodgers, Mary M., Our Endangered Planet Rivers and Lakes, Lerner Publications Company, Minneapolis, 1991.

Liptak, Karen, Saving Our Wetlands and Their Wildlife, Franklin Watts, New York, 1991.

Diagram

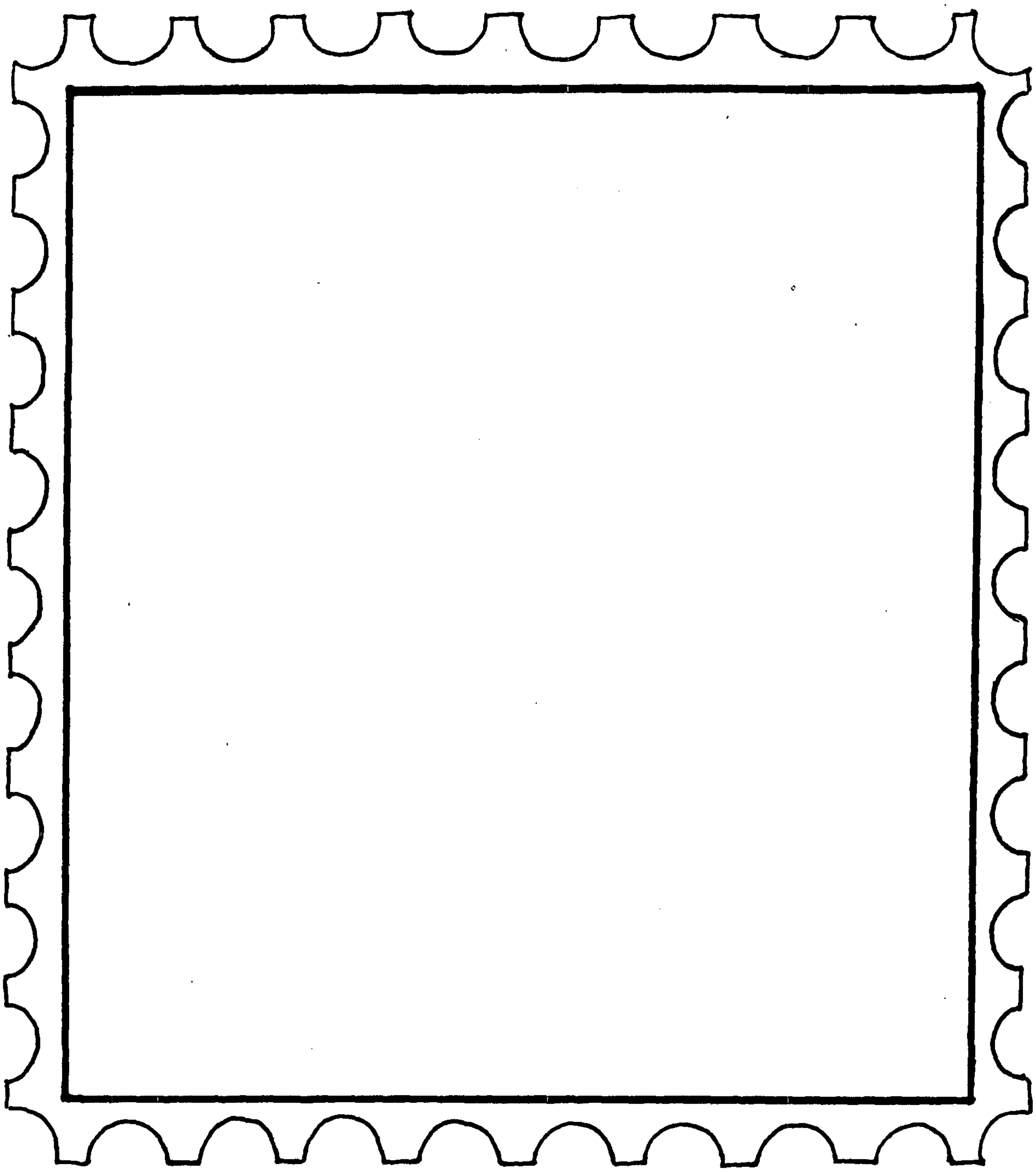

Wetland Window
to see the future of our wetlands
marsh
bogs
swamp
window screen
construction paper

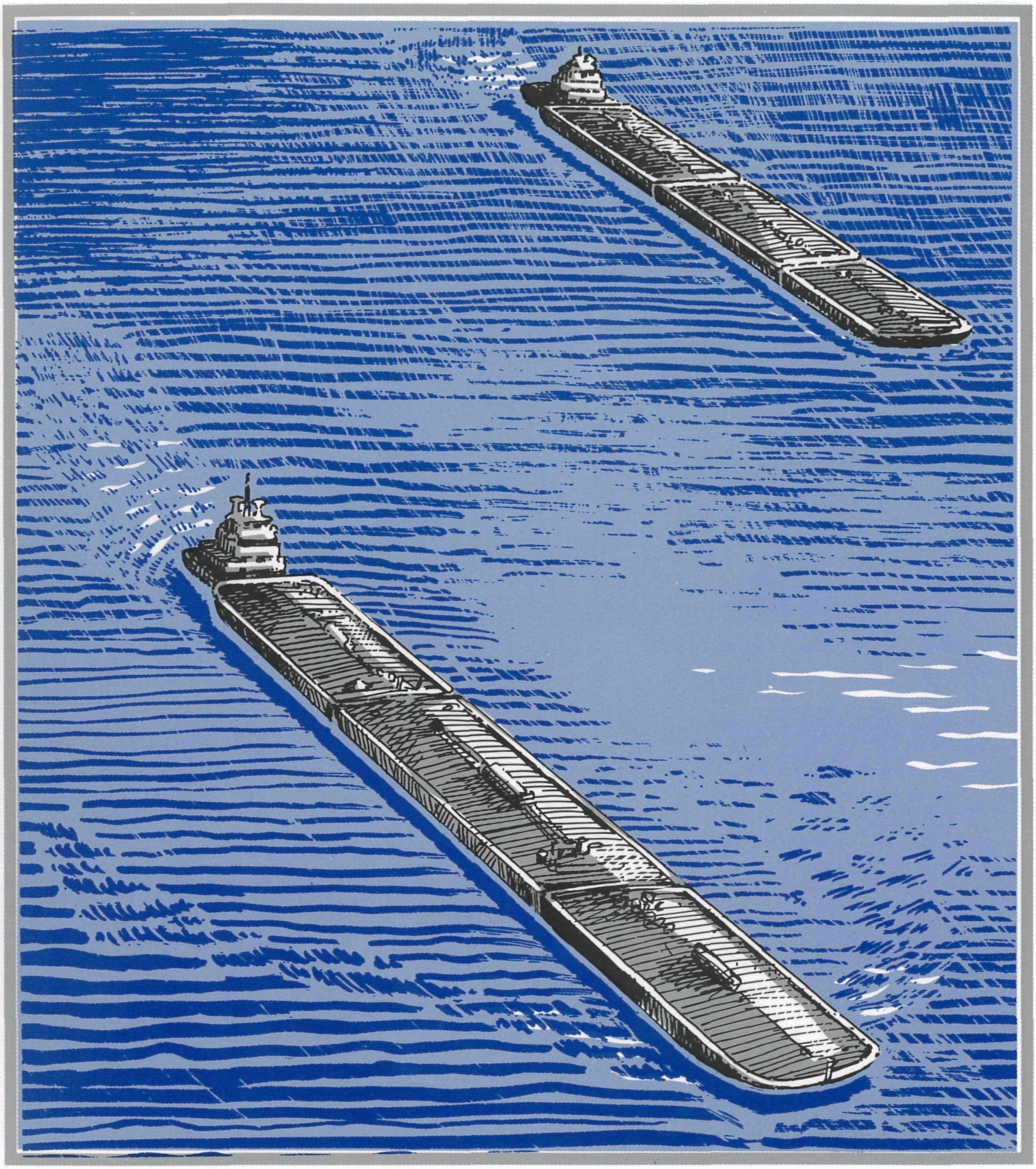
# Sand Box Graph

**Hypothesis:**

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| **All of the sand will go through the screen.** | **Some of the sand will go through the screen.** |

# Wetlands Commemorative Stamp





THE **WATER** SOURCEBOOK

# GLOSSARY

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**absorb:** to take in or soak up a liquid.

**absorbent:** shredded paper, sawdust, and other materials that have the power to absorb.

**acid:** a substance with a quantity of positively charged hydrogen ions.

**acid rain:** rain with a pH of less than 5.6; results from atmospheric moisture mixing with sulfur and nitrogen oxides emitted from burning fossil fuels; may cause damage to buildings, car finishes, crops, forests, and aquatic life.

**aeration:** exposing to circulating air; addition of oxygen to wastewater or water, as in first step of both activated sludge wastewater treatment process and drinking water treatment.

**agriculture:** farming, science of cultivating the soil, producing crops, and raising livestock.

**aquifer:** porous, water-bearing layer of sand, gravel, and rock below the Earth's surface; reservoir for groundwater.

**aquatic:** living or growing in or on water.

**aquitard:** a low-permeability layer of rock or clay that can store water but transmits it very slowly from aquifer to another.

**artery:** hollow tube that carries blood with oxygen and food to all parts of the body.

**atmosphere:** envelope of gases surrounding the Earth.

**bacteria:** very tiny organisms, some can be harmful to people.

**bacterial water pollution:** the introduction of unwanted bacteria to a water body.

**barrier island:** a body of land that is completely surrounded by water; it is roughly parallel to the shore and separated from the shore by a lagoon; barrier islands protect the shore from the direct onslaught of waves.

**base:** a substance that turns hydoin or pH paper blue.

**bay:** a body of water partly enclosed by land, but having a wide outlet to the sea.

**bog:** freshwater marsh with build-up of peat and high acidity, that typically supports mosses adapted to acidic soil conditions (particularly sphagnum); many are located in colder regions.

**brackish water:** water that is a mixture of fresh and salt water.

**buoyancy:** the abililty of water to support weight and the degree to which it can support weight.

**career:** a chosen pursuit or life's work; a job or profession one is trained to do.

**chemicals:** substances which are used in factories, farms and homes for a variety of purposes such as cleaning, painting, killing pests, and helping maintain vehicles.

**chlorination:** the addition of chlorine to water to destroy microorganisms especially for disinfection.

**clay:** soil which consists of illite, kaolin, micas, vermiculite, and other mineral particles; clay particles are small and the spaces between them are small; clay soils absorb water slowly but can hold water for longer than a sandy soil.

**coagulation:** the process by which dirt and other small suspended solid particles are chemically bound, forming flocs using a coagulant (flocculant) so they can be removed from the water (the second step in drinking water treatment).

**cohesion:** the force by which the molecules of a substance are held together.

**condensation:** the process of changing from a vapor (gas) to a liquid.

**condense:** water vapor that changes into a liquid.

**conservation:** wise use and protection from depletion and pollution.

**conserve:** save, protect, keep; to use a resource wisely and efficiently.

**contaminate:** to make impure, infected, corrupt or radioactive by contact with or by addition of something.

**contour plowing:** plowing horizontally across the face of the slope.

**cooling pond:** a pond where hot water from factories and power plants is stored until it is the same temperature as nearby bodies of water.

**cycle:** a process that repeats itself.

**dam:** human-made or animal-made barrier across a stream or river that holds and regulates flow of water.

**debris:** the remains of something broken down or destroyed.

**desalinization:** purification of salt or brackish water by removing salt.

**desert:** an arid region lacking enough moisture to support vegetation.

**dissolve:** to make a solution of, as by mixing with a liquid; blend with a liquid.

**drain field:** the part of a septic system where the wastewater is released into the soil for absorption and filtration.

**drought:** period of little or no rain.

**ecosystem:** the relationship between all the parts (living and non-living) within an environmental community.

**effluent:** treated wastewater, flowing from a lagoon, tank, treatment process, or treatment plant released into the environment.

**emissions:** a substance discharged into the environment.

**erosion:** the wearing away of the Earth's surface by running water, wind, ice, or other geological agents, processes, (weathering, dissolution, abrasion, corrosion, and transportation) by which material is removed from the Earth's surface.

**estuary:** a marine ecosystem where freshwater enters the ocean. The term usually describes regions near the mouths of rivers, and includes bays, lagoons, sounds, and marshes.

**evaporate:** to convert or change into a vapor.

**evaporation:** process in which the heat energy of the sun causes the water on the Earth's surface to change into a vapor.

**expand:** to take up more space.

**fertilizer:** natural and synthetic materials including manure, nitrogen, phosphorus and treated sewage sludge that are worked into the soil to provide nutrients and increase its fertility.

**filtration:** the process of passing a liquid or gas through a porous article or mass.

**flood:** a period of above average rain with excess water encroaching on the land.

**flow:** move smoothly.

**food chain:** the chain of living things in an ecosystem in which each link in the chain feeds on a link below it and is fed upon by the one above it.

**fossil fuels:** coal, oil, and natural gas, which were formed from the fossilized remains of ancient organisms.

**fresh water:** inland water that has a low concentration of minerals, salts, and dissolved solids found as surface water or groundwater.

**fresh water degradation:** freshwater that is either polluted or used up faster than it can replenish itself.

**freeze:** to harden into ice or into a solid body; to change from the liquid to the solid state by loss of heat.

**germs:** very small living things in the water that can make people sick.

**ground water:** water that infiltrates the Earth and is stored in usable amounts in the soil and rock below the Earth's surface; water within the zone of saturation.

**gulf:** a large area of sea or ocean partially enclosed by land.

**habitat:** the place or type of site where a plant or animal naturally or normally lives and grows.

**hail:** precipitation in the form of hard pellets of ice or hard snow.

**humus:** organic soil formed from decaying organic materials and mineral particles; most humus is black or dark brown, and holds large amounts of water.

**hydroin paper:** special paper for determining the strength (pH level) of an acid or base.

**hydrologist:** a person that applies scientific knowledge and mathematical principles to solve water-related problems in society such as problems of quantity, quality, and availability.

**hydrology:** the study of water, its properties, distribution on Earth, and effects on the Earth's environment.

**impurities:** materials that dirty water and make it unsafe for people to use.

**inland wetland:** wetlands that are not affected by tides; the type of water can be fresh water or salt water; they are: island marshes, wet meadows, forested wetlands, and shrub wetlands.

**island:** a body of land that is completely surrounded by water.

**kinetic energy:** the energy of a body resulting from its motion.

**lake:** a standing body of water surrounded by land which undergoes thermal stratification and turnover by mixing.

**liquid:** a free flowing substance that borrows the shape of its container.

**limestone:** brittle, sedimentary rock that has many cracks which can fill with water.

**loam:** a fertile rich soil composed of varying amounts of silt, clay, sand, and humus.

**mangroves:** trees that are the dominant plant found in a salt water wetland that occurs along the tropical coasts.

**marine animals:** animals that live in the sea or in a tidal pool.

**marsh**: wetland dominated by grasses.

**melt**: to change from a solid to a liquid usually through the process of heating.

**molecule**: the smallest particle of a compound that can exist in the free state and still retain the characteristics of the compound.

**municipal**: of or relating to municipality (city, town, etc.). Municipal wastewater is primarily domestic wastewater.

**neutral**: a substance that is neither basic or acidic.

**neutralization**: a process that causes toxic waste to react with another chemical to produce a harmless substance.

**nitric acid (HNO)**: a component of acid rain; corrosive; damages buildings, vehicle surfaces, crops, forests, and aquatic life.

**nonpoint source pollution**: (NPS) pollution that cannot be traced to a single point (e.g., outlet or pipe) because it comes from many individual sources or a widespread area (typically, urban, rural, and agricultural runoff).

**nutrient pollution**: a nourishing contamination that causes unwanted plant growth.

**ocean**: a very large body of salt water that covers nearly 3/4 of the Earth's surface.

**oil spill**: a form of pollution in which oil from various sources leaks into the water.

**peat**: rich organic material that is made up mostly of partially decayed plant material.

**permeability**: the capacity of a porouos material to transmit fluids. Permeability is a function of the sizes, shapes, and degree of connection among pore spaces, the viscosity of the fluid, and the pressure driving the fluid.

**pH**: a measure of the concentration of hydrogen ions in a solution.

**point source pollution**: pollution that can be traced to a single point source such as a pipe or culvert (e.g., industrial, wastewater treatment plant, and certain storm water discharges).

**pollutant**: any substance suspended or dissolved in water that builds up in sufficient quantity to impair water quality.

**pond**: a still body of water smaller than a lake where mixing of nutrients and water occurs primarily through the action of wind (as opposed to turnover).

**porosity**: the property of being porous, having pores; the ratio of minute channels or open spaces (pores) to the volume of solid matter.

**precipitation:** water droplets or ice particles condensed from atmospheric water vapor and sufficiently massive to fall to the Earth's surface, such as rain, sleet, or snow.

**purify:** to clean.

**reclamation:** bringing land that has been disturbed by some process back to its original condition.

**recycle:** a process to regain materials for human reuse.

**reservoir:** a place where water is collected and stored for use.

**red tide:** a reddish discoloration of coastal surface waters due to concentrations of toxic producing algae, fatal to many forms of marine life.

**residential:** pertaining to a place where people live, such as a neighborhood.

**riparian area:** of, adjacent to, or living on the bank of a river, stream, or sometimes, of a lake or pond.

**riprap:** large rocks placed along the bank of a waterway to prevent erosion.

**river:** a large body of flowing water that receives water from other streams and/or rivers.

**runoff:** water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters a waterbody; may pick up and carry a variety of pollutants.

**salinity:** the amount of salt dissolved in water.

**salt water:** water that has a high level of dissolved salts (oceans, seas).

**sand:** tiny, loose grains of crushed mineral particles formed by the weathering of rocks.

**saturated zone:** a portion of the soil profile where all pores are filled with water. Aquifers are located in this zone. There may be multiple saturation zones at different soil depths separated by layers of clay or rock.

**scrubbers:** a device in a smokestack that uses water to remove particles and some polluting gases.

**sediment:** eroded soil material (often suspended in water that consists mainly of particles from rocks, soil, and inorganic materials).

**sedimentation:** (1) the process of depositing sediment, or the addition of soils to lakes that is part of the natural aging process; (2) the drinking water treatment process of letting heavy particles in raw water settle out into holding ponds or basins before filtration (also called "settling"); (3) the process used in both primary and secondary wastewater treatment that takes place when gravity pulls particles to the bottom of a tank (also called "settling").

**septic tank**: a tank, commonly buried, to which all of the wastewaters from the home should flow and in which, primary digestion of the organic matter occurs by anaerobic bacteria; the main part of a septic system where scum and solids accumulate; derived from "sepsis" meaning "putrid decay" or "decay without oxygen."

**sewage**: waste and wastewater produced by residential, commercial, and light industrial establishment; typically discharged into sewers and sometimes into septic tanks.

**sinkhole**: a hole caused by collapse of the land surface, commonly because underlying limestone rock has dissolved away.

**sludge**: solid material that isn't broken down by bacterial digestion which settles to the bottom of septic tanks or wastewater treatment plants; it must be pumped out and disposed of in landfills, application to land, or by incineration.

**sleet**: precipitation consisting of generally transparent frozen or partially frozen raindrops.

**snow**: solid precipitation in the form of white or translucent ice crystals of various shapes originating in the upper atmosphere as frozen particles.

**solid**: a hard substance that keeps its own shape.

**storage tanks**: water tanks are used for storage and they are in several shapes and sizes; elevated, ground and standpipe.

**stream**: a body of flowing fresh water.

**sublimate**: to change from a solid to a vapor.

**sulfuric acid**: (chemical formula, $H_2SO_4$) the most widely used industrial chemical; a major component of acid rain that is formed by sulfur oxides combining with atmospheric moisture.

**surface tension**: a property of liquids in which the exposed surface tends to contract to the smallest possible area, as in the formation of a meniscus. It is caused by unequal molecular cohesive forces near the surface.

**surface water**: precipitation that does not soak into the ground or return to the atmosphere by evaporation or transpiration. It is stored in streams, lakes, rivers, ponds, wetlands, oceans, and reservoirs.

**suspended solids**: small particles of solid materials in water that cause cloudiness or turbidity.

**swamp**: wetland dominated by shrubs and trees.

**terracing**: series of level plots in step-like fashion on a slope.

**thermal pollution**: varying temperatures above or below the normal condition.

**tides**: the alternate rising and falling of the ocean's surface which occurs twice in each lunar day (24 hours).

**topsoil**: rich, upper layer of soil.

**toxic pollution**: harmful, chemical contamination in water.

**transpiration**: process in which water absorbed by the root systems of plants moves up through the plants, passes pores (stomata) in their leaves or other parts, and then evaporates into the atmosphere as water vapor; the passage of water vapor from a living body through a membrane or pores.

**urban stormwater runoff**: road salt, soil, lawn and garden chemicals, and pet wastes travel via streets and storm drains to nearby rivers, lakes, and ponds.

**vapor**: a substance in the form of a gas having no fixed shape.

**vein**: hollow tube that carries blood back to the heart.

**waft**: moving the hand in a wave-like motion over a substance causing a breeze which carries a faint odor of the substance.

**wastes**: discarded or unwanted by-products of human activities.

**wastewater**: water that has been used for domestic or industrial purposes.

**wastewater treatment**: physical, chemical, and biological processes used to remove pollutants from waste water before discharging it into the water.

**wastewater treatment plant**: a place where water is made safe to use; wastewater is filtered several times, and the germs left in the water is killed.

**water**: a clear liquid, solid, or gas made up of tiny molecules of 2 parts hydrogen and one part oxygen.

**water cycle**: continuous movement of water from the oceans and fresh water sources to the air and land and then back to the oceans.

**water pollution**: water that has been made unclean for aquatic life and plants by dumping in foreign objects or liquids from human activities or natural processes.

**water table**: upper surface of the zone of saturation of groundwater.

**watershed**: land area from which water drains to a particular surface water body.

**wave**: a ridge or swell moving along the surface of a large body of water and generated by the wind or gravity.

**weathering**: to break down rock naturally; water, growing plants, heat, cold, and ice all weather rocks; over many years weathering turns rock into soil.

**well**: a bored, drilled, or driven shaft or dug hole. Wells range from a few feet to more than 6 miles in depth, but most water wells are between 100 and 2,000 feet in depth.

**wetland**: areas that periodically have waterlogged soils or are covered with a shallow layer of water resulting in reduced soil conditions; wetland areas typically support plant life that are adapted to life in wet environments.