Water Festivals in Alabama

A Guidance Manual
Volume II
Reference Materials

The Alabama Department of Environmental Management is a Groundwater Guardian Affiliate of the Groundwater Foundation

ADEM & UAH

Volume II
Attachments

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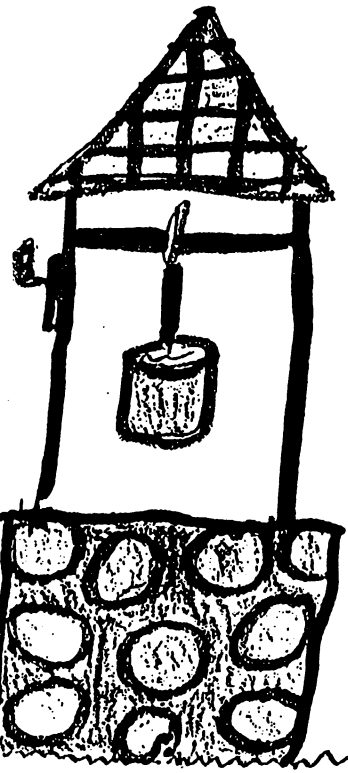
ATTACHMENT 1

Natures Hidden Treasures



Sample T-shirt Design

Course of Study and SAT Objectives

Water Concentration

Course of Study Objectives

1. Exhibit habits necessary for responsible scientific investigation.
   - Curiosity - Patience
   - Creativity - Attention to detail
   - Honesty - Objectivity
2. Relate events in daily life to aspects of the water cycle.
3. Construct mental, verbal, or physical representation of ideas, objects, and events.
4. Communicate scientific content effectively.

SAT Objectives

1. Apply an understanding of precipitation.
2. Understand causes and effects of weather phenomena.

Rainsticks

Course of Study Objectives

1. Construct mental, verbal, or physical representation of ideas, objects, and events.
2. Exhibit habits necessary for responsible scientific investigation.
   - Curiosity - Patience
   - Creativity - Attention to detail
   - Honesty - Objectivity

SAT Objectives

1. Apply an understanding of precipitation.

Amazing Water

Course of Study Objectives

1. Relate events in daily life to aspects of the water cycle.
2. Exhibit habits necessary for responsible scientific investigation.
   - Curiosity - Patience
   - Creativity - Attention to detail
   - Honesty - Objectivity
3. Communicate scientific content effectively.
4. Construct mental, verbal, or physical representation of ideas, objects, and events.

SAT Objectives

1. Make a prediction about water pollution.
2. Draw a conclusion based on experimental data.
3. Understand causes and effects of weather phenomena.

Course of Study and SAT Objectives

Aquifer in a Cup

Course of Study Objectives

1. Relate events in daily life to aspects of the water cycle.
2. Demonstrate the appropriate use of instruments and procedures when learning new information.
3. Construct mental, verbal, or physical representation of ideas, objects, and events.

SAT Objectives

1. Use date to make generalizations of Earth processes.
2. Understand causes and effects of weather phenomena.
3. Use observations to determine the source of Earth products.
4. Apply an understanding of precipitation.
5. Draw a conclusion based on experimental data.

Wetlands

Course of Study Objectives

1. Relate events in daily life to aspects of the water cycle.
2. Construct mental, verbal, or physical representation of ideas, objects, and events.
3. Recognize the effects of manipulated and controlled factors on the outcomes of events.
4. Demonstrate the appropriate use of instruments and procedures when learning new information.

SAT Objectives

1. Make a prediction about water pollution.
2. Draw a conclusion based on experimental data.
3. Understand causes and effects of weather phenomena.
4. Relate causes and effects of Earth phenomena.

Filtration

Course of Study Objectives

1. Exhibit habits necessary for responsible scientific investigation.
   - Curiosity - Patience
   - Creativity - Attention to detail
   - Honesty - Objectivity
2. Recognize the effects of manipulated and controlled factors on the outcomes of events.
3. Relate events in daily life to aspects of the water cycle.

SAT Objectives

1. Draw a conclusion based on experimental data.
2. Make a prediction about water pollution.

Course of Study and SAT Objectives

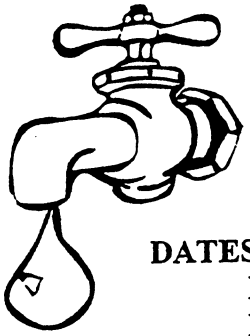
Van Gogh

Course of Study Objectives

1. Relate events in daily life to aspects of the water cycle.
2. Construct mental, verbal, or physical representation of ideas, objects, and events.
3. Communicate scientific content effectively.

SAT Objectives

1. Apply an understanding of precipitation.
2. Make a prediction about water pollution.
3. Relate causes and effects of Earth phenomena.



1999 Groundwater Festivals in North Alabama

DATES:

March 25, 1999 – Colbert & Lauderdale Counties, Northwest Shoals Community College
May 10, 1999 – Limestone County, Athens State University
May 12-13, 1999 – Madison County, University of Alabama in Huntsville

PARTICIPANTS:

4th grade students and teachers from the Colbert, Lauderdale, Limestone, and Madison County School Systems

WHAT IS THE GROUNDWATER FESTIVAL?

Approximately 4,500 4th grade students and their teachers will attend Alabama's Groundwater Festivals. Numerous water educators and enthusiasts from across the State will be teaming up for an exciting and interactive day of learning for the students and teachers. The students will participate in hands-on learning activities focusing on what groundwater is, the importance of water to all life, the water cycle and groundwater's role in it, the interdependence of plants, trees, wildlife, soil, and water, and the effect of human actions on water and all nature and the need for responsible action. Steve Trash, environmental magician, will perform water-related magic tricks and illusions with the students.

PURPOSE OF THE FESTIVAL

The main goal of the Festival is to educate children about all aspects of groundwater and other related natural resources (i.e., surface water, wetlands, forestry, wildlife, etc.) and to instill in them a general environmental awareness and stewardship ethic. The students will learn where their drinking water comes from and how to protect it and keep it clean.

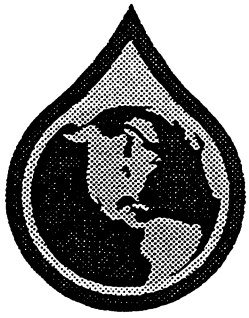
WHAT CAN YOU DO?

Fundraising for the Festivals is currently underway. If you would like to be a sponsor of any of the Festivals, present a hands-on activity at the Festivals, or serve as a classroom presenter, tour guide, or runner, please contact the persons below. As a sponsor of the Festival your organization's logo will appear on the Groundwater Festival t-shirts which are given to all students, teachers, volunteers, and sponsors. Your organization will be invited to a VIP breakfast on the day of the Festival, followed by a VIP tour of the event. All volunteers receive a free t-shirt and lunch will be provided.

For more information please contact :

Vanessa Colebaugh
Groundwater Festival Coordinator
256-922-5747
vanessa@atmos.uah.edu

Enid Bittner
ADEM
334-271-7953
EIB@adem.state.al.us



Sample Fundraising Letter

Date

Contact Person
Company Name
Address
City, State Zip Code

Dear *Contact Person*,

We are proud to announce *Name of County* County's *Number* Annual Groundwater Festival. We are anticipating **Number** students to participate from *School Systems*. As a leader in the *City* community and because of your company's recognized leadership in the environmental field, we are asking *Company Name* to launch this successful program. Attached please find our Groundwater Festival Fundraising Packet with a budget and detailed information inside. We are asking that your organization underwrite at least one of the areas listed on the budget.

The Groundwater Festival will be held on *Date* at *Location.* Numerous water educators and enthusiasts from *City* and across the State will be teaming up for an exciting and interactive day of learning for the students and teachers. The students will participate in hands-on learning activities focusing on what groundwater is, the importance of water to all life, the water cycle and groundwater's role in it, the interdependence of plants, trees, wildlife, soil and water, and the effect of human actions on water and all nature and the need for responsible action. A *Type and Name of Performer* will also perform *List What Performer Will Do* with the students. By sponsoring the Festival, *Name of Company* could help to educate the *Name of County* County community to conserve and protect Alabama's most precious resource.

We have formed a Groundwater Festival Advisory Committee consisting of *Number* members representing a cross-section of groundwater resource users and regulators from different water authorities in *Name of County* County and the State of Alabama. This committee meets monthly to help plan and organize the Festival.

With your sponsorship, your organization will receive recognition in the Festival Program according to the following scale:

Gold Level $1,000.00 & up
Silver Level $500.00 & up
Bronze Level Contribution under $500.00

Your organization's logo will appear on the tee shirts if you give a donation of *Amount* or more. Gold and Silver level sponsors will be invited to a VIP breakfast on the day of the festival, followed by a VIP tour of the event. Gold level sponsors will also be given the opportunity to display their organizations banner at the Festival.

We hope this annual event will help students realize that learning about our groundwater is the first step toward carefully managing and protecting it so that clean and abundant water will be available now and for future generations. If you have any questions about the *Year* Groundwater Festival please contact ***Contact Person*** at ***Phone Number*** or ***Email.***

Sincerely,

Name
Fundraising Chairman

Enclosure

ATTACHMENT 4

Sample Sponsorship Form

SPONSORSHIP FORM

Contribution Levels

Gold Level	$1,500.00 & up
Silver Level	$500.00 & up
Bronze Level	Contribution under $500.00

As a sponsor of the Groundwater Festival your organization's logo will appear on the Groundwater Festival t-shirts which are given to all students, teachers, volunteers, and sponsors. Your organization will be invited to a VIP breakfast on the day of the festival, followed by a VIP tour of the event. However, only Gold Level sponsors will be given the opportunity to display your organizations banner at the Festival.

****

☐ Yes, my organization would like to provide financial support for the Children's Groundwater Festival.

☐ Yes, my organization can provide in-kind donations.

☐ No, my organization will be unable to participate at this time.

_____ Level Amount of Contribution $_____
Indicate Support Level

Contributor's Name (Contact) _____

Name of Organization _____

Address _____

City, State & Zip _____

Phone: ( ) _____

Fax No.: ( ) _____

Please make check payable to UAH Groundwater Festival
Mail Sponsor Form and check to:

Vanessa Colebaugh
University of Alabama in Huntsville
Earth System Science Laboratory
Huntsville, AL 35899

ATTACHMENT 5

Sample Teacher Memo Announcing Festival

Earth System Science Laboratory
The University of Alabama in Huntsville
Huntsville, AL 35899
Phone: 256-922-5747
Fax: 256-922-5723
E-mail address: vanessa@atmos.uah.edu

MEMORANDUM

TO: Fourth Grade Teachers

FROM: *Name*
Groundwater Festival Coordinator

DATE:

SUBJECT: 1999 Groundwater Festival for 4th Grade Teachers and Students

The *Location of Festival* will be the host of ***Name of County*** County's *First, Second, Third, etc.* Annual Groundwater Festival. The Groundwater Festival is being made possible by donations from local industries in *Name of County* County. This Festival is for all *Grade Level* teachers and their students from *Name of School Systems* School Systems. It will be held at *Location* on *Date*. At this **FREE**, one-day event the students will participate in hands-on learning activities focusing on water education and attend a *Type of Entertainment* show by *Name of Performer*, will be performing *List What Performer Will Do*. It is designed to be fun and memorable in a field day atmosphere. There is a morning session (9 am – 11:30 am) and afternoon session (10:50 – 1:45 pm). Each school/class will attend one session. **Every student and teacher attending will receive a free Groundwater Festival T-shirt and a bag of educational materials.**

The purpose of this event is to educate children about all aspects of water and other related natural resources (i.e., surface water, wetlands, forestry, wildlife, etc.) and to instill in them a general environmental awareness and stewardship ethic. The students will learn what groundwater is, the importance of water to all life, the water cycle and groundwater's role in it, the interdependence of plants, trees, wildlife, soil and water, and the effect of human actions on water and all nature and the need for responsible action.

On *Date*, every fourth grade teacher will be receiving more detailed information about the Festival and registration forms. We are also having a logo design contest with the winning logo appearing on the Water Festival T-shirts. The student with the winning logo and his/her teacher will both receive $50 saving bonds. The registration forms and logo design entries will be due on *Deadline Date*. We hope you make plans to attend this educational and fun experience.

If you have any questions about the Festival, please contact *Name of Contact Person*, Groundwater Festival Coordinator at *Phone Number* or via email at *Email Address.*

Sample Teacher Memo with Registration Form

Earth System Science Laboratory
The University of Alabama in Huntsville
Huntsville, AL 35899
Phone: 256-922-5747
Fax: 256-922-5723
E-mail address: vanessa@atmos.uah.edu

MEMORANDUM

TO: Fourth Grade Teachers

FROM: *Name*
Groundwater Festival Coordinator

DATE:

SUBJECT: *Year* Groundwater Festival for *Grade Level* Grade Teachers and Students

On *Date*, the *Host Facility* will be the host of *Name of County* County's *First, Second, Third, etc.* Annual Groundwater Festival. The Groundwater Festival is being made possible by donations from local organizations in *Name of County* County. We are very excited about it! The Groundwater Festival is open to all *Grade Level* grade students and their teachers from *Name of School Systems* School Systems.

We invite you to join us at the *Year* Groundwater Festival on *Day of Week, Date* to learn about groundwater and how it relates to our world. Numerous water educators and enthusiasts from *Name of County* County and across the State are teaming up for an exciting and interactive day of learning for you and your fourth graders.

The Groundwater Festival is divided into two sessions. The morning session is 9:00 am -11:45 am and the afternoon session is 10:50 am - 1:45 p.m. (a lunch break is included in this). The morning session will be given to the schools furthest from *Location of Festival* to give them ample time to get to *Location of Festival* by 9:00 am.

This event promises to be a successful, learning experience for everyone -- with many hands-on activities and displays. The students will also be entertained by *Name of Performer*, who will be performing *Type of Performance*. So come along and bring the topic of water alive for your students by taking part in this unique opportunity to celebrate Alabama's precious resource!

There is NO CHARGE to attend the Festival. **It is FREE! Even your bus transportation is being paid for by the *Name of County* County Board of Education. In addition, each student and teacher will receive a free *Year*Groundwater Festival T-shirt along with a bag filled with water-related goodies. Please complete the size of t-shirts needed for you and your students.** To register, just fill out, detach, and mail the registration form. You may also fax the form to me at *Fax Number*. **YOUR REGISTRATION IS DUE BY *DEADLINE DATE.*** Upon receiving your registration form we will send you a Groundwater Festival Teacher's Packet which contains many hands-on lessons and resources on water.

In addition, we are having a logo design contest. We invite all your students to enter. The winning logo will be printed on the Groundwater Festival T-shirts and the winning student and his/her teacher will both receive $50.00 saving bonds. We do request that the logo design is related to our theme "*THEME*". Please send your entries along with your registration form no later then *DEADLINE DATE*. **If you have any questions concerning the Groundwater Festival, please call *CONTACT PERSON* at *PHONE NUMBER* or via email at *EMAIL ADDRESS.***

You might want to provide your students with the following background information to help them with their logo designs. Groundwater is water located below ground, hence, "Nature's Hidden Treasure" since we can't see it. It fills the spaces between rocks and soil particles underground – in much the same way as water fills a sponge. Groundwater sometimes feeds lakes, springs, and other surface water. The majority of *NAME OF COUNTY* County residents rely on groundwater for their drinking water. Unfortunately, it is easy for contaminants to seep into our groundwater which is why we are having this Groundwater Festival – to educate the students as to where their drinking water comes from, and how to protect it and keep it clean. **Please send all logo design entries along with your registration form by *DEADLINE DATE.***

Please detach and mail this portion of the flier, by *DEADLINE DATE* or fax to *fax number*.

MAIL TO:

CONTACT PERSON
ADDRESS
ADDRESS
CITY, STATE, ZIP CODE

No. of t-shirts needed for students & teacher:
Youth Med. _____ Youth Large _____

Adult Med._____ Adult Large _____

Adult X-Large _____ Adult XX-Large _____

Grade _____

School _____

Address: _____

City/Zip Code: _____

School Phone: _____

Number of students attending: _____

Teacher's Name: _____

Teacher's Home Phone: _____

Teacher Email: _____

Sample Teacher Memo to Teachers Who Had Not Registered

Earth System Science Laboratory
The University of Alabama in Huntsville
Huntsville, AL 35899
Phone: 256-922-5747
Fax: 256-922-5723
E-mail address: vanessa@atmos.uah.edu

MEMORANDUM

TO: Fourth Grade Teachers

FROM: *NAME*
Groundwater Festival Coordinator

DATE: *DATE*

SUBJECT: *YEAR* Second Annual Groundwater Festival

Hi! I am coordinating the **Groundwater Festival on *DATE*** that we are having for *NAME OF SCHOOL SYSTEM* School System's *GRADE LEVEL* grade students. We have not received your registration form and I just want to give you more information about the Festival in hopes that you will decide to attend. It is a great learning experience for all students and **it is completely FREE! We've extended the registration deadline to *DATE*!** We have found that most adults and children have no idea where their drinking water comes from (groundwater). We feel that that is why it is so very important to educate our youth about why it is so important to learn where their drinking water comes from and how to protect it and keep it clean. Also, this Festival fits in perfectly with the fourth grade water curriculum and HASP water unit! Please discuss this with the other fourth grade teachers and if you decide to attend (and I hope you do!) you can mail or fax (*FAX NUMBER*) the attached registration form by *DEADLINE DATE*. Upon receiving your registration I will send you further details.

Here is more detailed information about what will take place at the Festival. Your school will either attend the morning session (9 am-11:45 am) or the afternoon session (10:50-1:45pm) depending on how far your school is to *LOCATION OF FESTIVAL*. The schools furthest from *LOCATION OF FESTIVAL* will attend the morning session and schools closest to *LOCATION OF FESTIVAL* will attend the afternoon session. As each class arrives on campus, they are greeted by a volunteer who will serve as their tour guide for the day. Every teacher's class stays together throughout the festival and each class has their own tour guide. Tour guides are provided so that no one will get lost or confused as to where to be. Your tour guide will take your class to your first hands-on activity. Each activity is 30 minutes long and there is a 5 minute break between activities. The Tour Guide will walk the class to their next activity which will be in the same building but in a different room. There is only one class per room, so your class will not be combined with any other class (this eliminates overcrowding). There are at least two presenters per classroom who will be teaching and working with your students. After the third activity, there is a 20 minute break to give the classes time to walk to *LOCATION OF ENTERTAINMENT* for the exciting 45 minute *TYPE OF ENTERTAINMENT* performance. The *ENTERTAINMENT* is the only time that your class will be combined with other classes. Upon entering *LOCATION OF ENTERTAINMENT* you will be greeted by another volunteer who will

take your class to their appropriate seats. Following the *ENTERTAINMENT* show the classes board the buses at *LOCATION OF ENTERTAINMENT* and return to school.

FESTIVAL SCHEDULE

Morning Session		Afternoon Session	
8:15-8:45 am	Buses arrive at *LOCATION*	10:30	Arrive at *LOCATION*
9 – 9:30 am	Activity 1	10:50 - 11:20	Activity 1
9:35 - 10:05 am	Activity 2	11:25 - 11:55	Activity 2
10:10 – 10:40 am	Activity 3	12:00 - 12:30	Activity 3
10:40 – 11:00 am	Break	12:30 - 1:00	Lunch
11:00 – 11:45 am	Entertainment	1:00 - 1:45	Entertainment
11:45 am	Buses depart *LOCATION*	1:45	Buses depart *LOCATION*

Here is a description of the activities that we are offering:

Aquifer in a Cup - Students build an aquifer and learn what an aquifer is, how it works, what non-point source pollution is, and how hazardous wastes effect our groundwater.

Water Under Foot – Students learn how groundwater is a part of the water cycle and the relationship between groundwater and wetlands.

Filtration - Students learn how pollutants enter our water supply and how difficult it is to remove pollutants.

Water Balance - Students learn about the balance between how much rain goes into and out of the soil and what happens to our aquifers when we have too much or too little rainfall.

Endangered Species of North Alabama - The Fish and Wildlife Service conduct this activity about endangered species of North Alabama. The students participate in a cave food chain activity.

Water Necklaces - Students learn about the water cycle and make water cycle necklaces.

What do the students and teachers receive? Every student and teacher receives a free Groundwater Festival t-shirt. We will bring the t-shirts to the schools one week before the Festival. We ask that all the students and teachers where the t-shirts to the Festival. Each student also receives a bag filled with activity books and other goodies. In addition, each teacher receives a bag filled with free posters, curriculum, booklets, and other environmental educational material.

CONTACT: If you have any questions about the Festival, please call *NAME* at *PHONE NUMBER* or via email at *EMAIL ADDRESS*

****

Please detach and mail this portion of the flier, by *DEADLINE DATE*. Or you may fax forms to *FAX NUMBER*.

MAIL TO:

NAME
ADDRESS
ADDRESS
CITY, STATE ZIP CODE

School _____

Address: _____

City/Zip Code: _____

School Phone: _____

Number of students attending: _____

Teacher's Name: _____

Teacher's Home Phone: _____

Teacher's Email: _____

No. of t-shirts needed for students & teacher:
Youth Med. _____ Youth Large _____

Adult Sm._____ Adult Med. _____

Adult Lg. _____ Adult X-Large _____ Adult XX-Large _____

Sample Letter to Teachers Attending

March 1, 199X

Dear _____,

I am pleased to inform you that your registration to attend the Children's Groundwater Festival on May 13, 199X has been selected. Your fourth grade class is now being scheduled into Festival events and activities. If you are unable to attend the Festival please contact me ASAP at 256-922-5747. **Your school has been scheduled to attend the morning session from 9:00 – 11:45.**

The following information is very important. Please read the information carefully.

DATE: Thursday, May 13, 1999, University of Alabama in Huntsville (UAH)

ARRIVAL/DEPARTURE LOCATIONS - You need to arrive on the UAH campus between 8:15 – 8:45 am. Upon your arrival there will be a volunteer to greet you at the parking lot and will be your "Tour Guide" for the day. This person will take you to all your events/activities so that no one will get lost or confused as to where to be. The school buses will pick up you and your students at the Spragins Hall Gymnasium after you all have seen the magic show. In the next mailing we will send you campus maps with locations for buses to drop off you and your students.

BUS TRANSPORTATION – You will need to make your own arrangement for buses.

SCHEDULE OF EVENTS

8:15 - 8:45 am	Arrive at UAH
9:00 - 9:30	Activity 1
9:35 - 10:05	Activity 2
10:10 - 10:40	Activity 3
10:40 - 11:00	Break
11:00 - 11:45	Magic Show

BREAK - A break is scheduled from 10:40 - 11:00. This is time to take bathroom breaks and give you time to get to the magic show in the Spragins Hall Gymnasium.

LUNCH - You have two options for lunch: 1) You can have your students bring sack lunches and have them eat on the bus or have a picnic outside (after the magic show). 2) You can wait until you get back to your school and have students eat sack lunches there. The magic show will end at 11:45.

ACTIVITIES - Each class will attend 3 hands-on activities dealing with groundwater and will attend a performance by Mr. Steve Trash, a wonderful and dynamic entertainer who will perform magic tricks and illusions with the students. All schools will attend the magic show at the same time.

SCHOOL GROUP DESIGNATIONS - In order to keep the number of students in each activity less than 30, we have separated your school's classes. Each class will have different schedules of activities at the Festival, but will all attend the morning session.

TEACHER/PARENT SPONSORS - Naturally each class needs to be accompanied by a teacher. We also encourage you to bring additional teachers and/or parents. We suggest bringing one teacher or parent for every 10 students. As previously stated, you will also have a volunteer tour guide to help you find your way around the Festival.

"NAMETAGS" - We encourage you to have your students create simple nametags to wear at the Festival. The nametags may include the students' names (teachers and parents can do this too) and your school. This is helpful for presenters who would like to know the students' names and where they are from.

GROUNDWATER FESTIVAL TEACHER'S PACKETS – A Teacher's Packet filled with many hands-on water activities will be sent at a later date. We hope that you will use some of these activities with your students before the Festival. This will better prepare your students for what they will be learning and participating in at the Festival.

T-SHIRTS – Your t-shirts will be delivered to your school approximately one week before the Festival.

NEXT MAILING – At a later date, you will receive another mailing with your schedule of activities that you will be participating in and a campus map with the exact locations where the buses need to drop off and pick up you and your students.

QUESTIONS? - If you have questions on anything, please call Vanessa Colebaugh at 256-922-5747 or via email at vanessa@atmos.uah.edu.

Sample Letter to Teachers Attending Morning Session

Dear *NAME OF TEACHER* _____ *DATE*

NAME OF COUNTY County's *FIRST, SECOND, THIRD, ETC.* Annual Groundwater Festival is just two weeks away! We are very excited about it and are looking forward to seeing you and your students there! Below are details about the Festival. **If you are unable to attend the Festival, please contact *NAME OF CONTACT PERSON* at *PHONE NUMBER* immediately. PLEASE READ THE FOLLOWING INFORMATION CAREFULLY.**

DATE: *DAY OF WEEK, DATE OF FESTIVAL, LOCATION OF FESTIVAL*

ARRIVAL/DEPARTURE LOCATIONS – You will need to make your own bus arrangements. You need to arrive at *LOCATION OF FESTIVAL* by 8:45 am. Have your bus driver drop you off in front of the *NAME OF BUILDING* **(see enclosed map).** In front of the *NAME OF BUILDING* there will be greeters and tour guides You will see volunteers standing in front of the buildings directing the buses. Please do not have your students unload from the bus until the volunteer gives you the okay. **We want to unload one bus at a time.** Once all your students are off the bus there will be a "tour guide" for each class who will be holding up a sign with your school name and the last name of each teacher. Please find the tour guide with your name. That tour guide will walk you to your first event which will begin at 9:00 am and will stay with you for your three activities. Once your students are off your bus, the bus driver will park the bus at *PARKING LOCATION.* **You must be seated for the *TYPE OF ENTERTAINMENT* show by 11:00 am. If you plan to eat lunch at *LOCATION OF FESTIVAL* then you will be responsible for walking back to your bus. If you are returning to school directly after the *TYPE OF ENTERTAINMENT* show, then the buses will pick you up at 11:45 am at the same location they dropped you off.**

TEACHER AND STUDENT BAGS - After the *TYPE OF ENTERTAINMENT* show a volunteer will hand each student a bag with goodies as they are leaving the gymnasium. We felt it was better to give the students their bags at the end of the Festival so they would not lose them throughout the day. Also, each teacher will be handed a bag filled with educational materials.

T-SHIRTS - Every teacher and student will receive a free Groundwater Festival t-shirt that was designed by a *GRADE LEVEL* grader (*NAMET OF STUDENT*) from *NAME OF TEACHER* class at *NAME OF SCHOOL.* Your schools t-shirts will be delivered to your school by *DAY OF WEEK, DATE.* They will be left at the front office of your school. Every school has a different colored t-shirt. Please have your students wear their t-shirts to the Festival.

BUILDING YOUR ACTIVITIES WILL BE IN: _____

ACTIVITY 1 Room # _____

ACTIVITY 2 Room # _____

ACTIVITY 3 Room # _____

SCHEDULE OF EVENTS

8:45	Arrive at *LOCATION OF FESTIVAL*
9:00 - 9:30	Activity 1
9:35 - 10:05	Activity 2
10:10 - 10:40	Activity 3
10:40 - 11:00	Break
11:00 - 11:45	*ENTERTAINMENT* in *LOCATION*

LUNCH – You can have a picnic lunch on the campus after the magic show or have the students wait to eat lunch when you return to school. If you choose to eat on campus, please remember that this is a litter-free campus and you will need to make sure you do not leave any trash on the campus.

BREAK - A break is scheduled from 10:40 - 11:00. This is time to take bathroom breaks and give you time to walk to *BUILDING* for the *TYPE OF ENTERTAINMENT* show. The *TYPE OF ENTERTAINMENT* show will begin promptly at 11:00 so please walk to *BUILDING* as quick as possible. There will be volunteers to greet you and show you where to sit.

ACTIVITIES - Each class will attend 3 hands-on activities dealing with groundwater and will attend a performance by *NAME OF PERFORMER*, who will perform *TYPE OF PERFORMANCE*. All schools will attend the *TYPE OF PERFORMANCE* show at the same time.

SCHOOL GROUP DESIGNATIONS - In order to keep the number of students in each activity less than 30, we have separated your school's classes. Each class will have different schedules of activities at the Festival, but will all attend the morning session.

TEACHER/PARENT CHAPERONES - Naturally each class needs to be accompanied by a teacher. We also encourage you to bring additional teachers and/or parents. We suggest bringing one teacher or parent for every 10 students. There will be 2 presenters in every classroom, however, some presenters may call upon you to help distribute materials.

"NAMETAGS" - We encourage you to have your students create simple nametags to wear at the Festival. The nametags may include the students' names (teachers and parents can do this too) and your school. This is helpful for presenters who would like to know the students' names and where they are from.

GROUNDWATER FESTIVAL TEACHER'S PACKETS – Enclosed is your Teacher's Packet filled with many hands-on water activities. We hope that you will use some of these activities with your students before the Festival. This will better prepare your students for what they will be learning and participating in at the Festival.

SPECIAL NEEDS STUDENTS – If you have any students with special needs, please call *NAME OF CONTACT PERSON* at *PHONE NUMBER* by *DATE* so special arrangements can be made.

QUESTIONS? - If you have questions on anything, please call *NAME OF CONTACT PERSON* at *PHONE NUMBER* or via email at *EMAIL ADDRESS*.

Sample Letter to Teachers Attending Afternoon Session

Dear *NAME OF TEACHER* _____ *DATE*

NAME OF COUNTY County's *FIRST, SECOND, THIRD, ETC.* Annual Groundwater Festival is just two weeks away! We are very excited about it and are looking forward to seeing you and your students there! Below are details about the Festival. **If you are unable to attend the Festival, please contact *NAME* at *PHONE NUMBER*immediately. PLEASE READ THE FOLLOWING INFORMATION CAREFULLY.**

DATE: *DAY OF WEEK, DATE, LOCATION OF FESTIVAL*

ARRIVAL/DEPARTURE LOCATIONS - ARRIVAL/DEPARTURE LOCATIONS – You need to arrive at *LOCATION OF FESTIVAL* by 10:30 am*E*. Have your bus driver drop you off in front of the *NAME OF BUILDING* **(see enclosed map).** In front of the *NAME OF BUILDING* there will be greeters and tour guides. You will see volunteers standing in front of the buildings directing the buses. Please do not have your students unload from the bus until the volunteer gives you the okay. **We want to unload one bus at a time.** Once all your students are off the bus there will be a "tour guide" for each class who will be holding up a sign with your school name and the last name of each teacher. Please find the tour guide with your name. That tour guide will walk you to your first event which will begin at 10:50 am and will stay with you for your three activities. Once your students are off your bus, the bus driver will park the bus at *PARKING LOCATION*. **You must be seated for the *TYPE OF ENTERTAINMNET* show by 1:00 pm. The *TYPE OF ENTERTAINMENT*show will begin promptly at 1:00 pm at *LOCATION*.** There will be volunteers at *LOCATION* to walk you to your seats. The buses will pick you up at 1:45 pm at *LOCATION*.

TEACHER AND STUDENT BAGS - After the *TYPE OF ENTERTAINMENT* show a volunteer will hand each student a bag with goodies as they are leaving the gymnasium. We felt it was better to give the students their bags at the end of the Festival so they would not lose them throughout the day. Also, each teacher will be handed a bag filled with educational materials.

T-SHIRTS - Every teacher and student will receive a free Groundwater Festival t-shirt that was designed by a *GRADE LEVEL* grader (*NAME OF STUDENT*) from *NAME OF TEACHER* class at *NAME OF SCHOOL*. Your schools t-shirts will be delivered to your school by *DAY OF WEEK, DATE*. They will be left at the front office of your school. Every school has a different colored t-shirt. Please have your students wear their t-shirts to the Festival.

BUILDING YOUR ACTIVITIES WILL BE IN: _____

ACTIVITY 1 Room # _____

ACTIVITY 2 Room # _____

ACTIVITY 3 Room # _____

SCHEDULE OF EVENTS

10:30	Arrive at *LOCATION OF FESTIVAL*
10:50 - 11:20	Activity 1
11:25 - 11:55	Activity 2
12:00 - 12:30	Activity 3
12:30 - 1:00	Lunch break
1:00 - 1:45	*ENTERTAINMENT* Show at *LOCATION*
1:45	Depart for School

LUNCH – Your students will need to bring a sack lunch which you will have to leave on the bus (or carry with you throughout your activities) until the lunch break at 12:30pm. You can eat your lunches in the room of your third activity or have a picnic lunch outside. If you eat in the classroom you will need to have a chaperone bring the lunches to this room so that you can eat immediately following the activity. You will have 30 minutes to eat and get to the gymnasium for the magic show. HINT: Last year many teachers packed all the lunches in a cooler and had a chaperone carry the cooler with them to the 3 activities. The classes then ate their lunches in the room of their third activity. **If you choose to eat on campus, please remember that this is a litter-free campus and you will need to make sure you do not leave any trash on the campus.** Remember, the magic show will begin promptly at 1:00 pm.

ACTIVITIES - Each class will attend 3 hands-on activities dealing with groundwater and will attend a performance by *NAME OF PERFORMER*, who will perform *TYPE OF PERFORMANCE* with the students. All schools will attend the *TYPE OF PERFORMANCE* show at the same time.

SCHOOL GROUP DESIGNATIONS - In order to keep the number of students in each activity less than 30, we have separated your school's classes. Each class will have different schedules of activities at the Festival, but will all attend the afternoon session.

TEACHER/PARENT CHAPERONES - Naturally each class needs to be accompanied by a teacher. We also encourage you to bring additional teachers and/or parents. We suggest bringing one teacher or parent for every 10 students. There will be 2 presenters in every classroom, however, some presenters may call upon you to help distribute materials.

"NAMETAGS" - We encourage you to have your students create simple nametags to wear at the Festival. The nametags may include the students' names (teachers and parents can do this too) and your school. This is helpful for presenters who would like to know the students' names and where they are from.

GROUNDWATER FESTIVAL TEACHER'S PACKETS – Enclosed is your Teacher's Packet filled with many hands-on water activities. We hope that you will use some of these activities with your students before the Festival. This will better prepare your students for what they will be learning and participating in at the Festival.

SPECIAL NEEDS STUDENTS – If you have any students with special needs, please call *NAME OF CONTACT PERSON* at *PHONE NUMBER* by *DATE* so special arrangements can be made.

QUESTIONS? - If you have questions on anything, please call *NAME OF CONTACT PERSON* at *PHONE NUMBER* or via email at *EMAIL ADDRESS*.

Sample Letter to Teachers Not Selected

March 5, 199X

TEACHER
SCHOOL
ADDRESS
CITY, STATE ZIP CODE

Dear Ms. *TEACHER*,

Thank you for showing interest in the Madison County Children's Groundwater Festival. We received your registration for the Festival, but I am sorry to tell you that your registration for the 199X Children's Groundwater Festival was not selected. Unfortunately, we have already reached the maximum number of students allowed to attend the Festival. Since registration is on first come, first serve basis, we can not accept any more registrations. Your class will remain on the waiting list and if a registered group cancels, you will be called.

If you would like to receive a free 199X Groundwater Festival Teacher's Packet (which includes groundwater information and activities), fill out the form below and return it to myself at the following address: UAH, Earth System Science Lab, Huntsville, AL 35899.

Again thank you for your interest. We look forward to seeing you at the Festival next year.

Sincerely,

Vanessa Colebaugh
Groundwater Festival Coordinator

_____ Please send a 199X Teacher's Packet. (These will be sent out in April.)

Name _____ School _____

Address _____ City _____ Zip _____

Sample Schedule

Limestone County
Morning Session

Room	Room Description	Activity	Presenters	9:00-9:30	9:35-10:05	10:10-10:40
CB 101	desks, tiled floor	Aquifer	Franklin Busbee, Mary	Elkmont- Thorton	Elkmont- Glass	Elkmont- Bailey
CB 114	Bolted tables with chairs	Rainsticks	Mike Jones, Glenda Humphrey	Elkmont- Glass	Elkmont- Bailey	Elkmont- Thorton
CB 201	desks, tiled floor	Amazing Water	Petty Shakleford	Elkmont- Bailey	Elkmont- Thorton	Elkmont- Glass
CB 202	Bolted tables with chairs	Rainsticks	Jessica Coleman, Phillip Eddy	East Limestone- Spragins	East Limestone- Hadley	East Limestone- Screws
CB 203	desks, tiled floor	Aquifer	Sharon Stokes, Tim Johnson	East Limestone- Hadley	East Limestone- Screws	East Limestone- Spragins
CB 205	desks, tiled floor	Amazing Water	Tracy Cole	East Limestone- Screws	East Limestone- Spragins	East Limestone- Hadley
CB 210	Bolted tables with chairs	Filtration	Amy McCrory, Phillip Eddy	East Limestone- Smith	East Limestone- Yost	Johnson- Clem
CB 214	Bolted tables with chairs	Van Gogh	Rod Goode, Don Webster	East Limestone- Yost	Johnson- Clem	East Limestone- Smith
PE 8	slanted desks	Caves	Shelia Smith	Johnson- Clem	East Limestone- Smith	East Limestone- Yost
WH 101	desks with chairs, tiled floor	Edible Aquifers	Vicky Mitchell, Mike Roden	Johnson- Williams	Piney Chapel- Ferguson	Piney Chapel- Terry
WH 102	desks with chairs, tiled floor	Wetlands	Brad Bole, Kevin Walker	Piney Chapel- Ferguson	Piney Chapel- Terry	Johnson- Williams
WH 104	desks with chairs, tiled floor	Amazing Water	Sonja Warren	Piney Chapel- Terry	Johnson- Williams	Piney Chapel- Ferguson

ATTACHMENT 13

Sample Volunteer Form

VOLUNTEER FORM

☐ Yes, I would like to take part in this year's Children's Groundwater Festival.

☐ No, I will be unable to participate in this year's event.

Preferred Area of Participation

_____ Classroom Presenter

_____ Tour Guide

_____ Magic Show Escort

_____ Teacher Resource Room

_____ Bus Transportation

_____ Runner

Groundwater Festival to volunteer for: _____
Colbert/Lauderdale, Limestone, or Madison County

Colbert/Lauderdale Groundwater Festival – March 26, 1999
Limestone County Groundwater Festival – May 7, 1999
Madison County Groundwater Festival – May 12-13, 1999

Volunteers Name (Contact) _____

Name of Organization _____

Address _____

City, State & Zip _____

Phone: ( ) _____

Fax No.: ( ) _____

Mail Volunteer Form by *DATE* to:
Vanessa Colebaugh
University of Alabama in Huntsville
Earth System Science Laboratory
Huntsville, AL 35899

ATTACHMENT 14

Sample Sponsor Thank You Letter

DATE

CONTACT PERSON
COMPANY
ADDRESS
CITY, STATE ZIP CODE

Dear *CONTACT PERSON*,

Thank you for your recent donation in support of the 199X Children's Groundwater Festival. We were proud to have your support as a sponsor of Alabama's first Groundwater Festival.

The Groundwater Festival drew approximately 1,150 fourth grade students and teachers from Madison County. We received a lot of positive feedback from teachers, students, and volunteers about what a great learning experience it was for all involved. They all enjoyed learning about Alabama's groundwater through the hands-on activities and the entertaining magic show. We succeeded in meeting our goal of educating the students and citizens on where their drinking water comes from, how to protect it and keep it clean for future generation.

You truly helped to provide a wonderful and important opportunity for the students and citizens of Madison County. Again, thank you for helping to make the Groundwater Festival a great success.

I have enclosed a Groundwater Festival t-shirt which was designed by *STUDENTS NAME* from Ms. *TEACHERS NAME* class at *SCHOOL*. I have also enclosed an article that was written about the Festival in The Huntsville Times.

Sincerely,

Vanessa Colebaugh
Groundwater Festival Director

Enclosures

Sample Tour Guide Letter

Tour Guide **199X *NAME OF COUNTY* COUNTY**
CHILDREN'S GROUNDWATER FESTIVAL
FORMAT

Many thanks in advance for volunteering at the *YEAR* Children's Groundwater Festival!! The following information should provide you with everything you need to know to make the day run smoothly. PLEASE READ EVERYTHING CAREFULLY!

THE BASICS – The Festival is *DATE*, at the *LOCATION OF FESTIVAL.* Approximately *NUMBER OF STUDENTS ATTENDING* 4th grade students and their teachers will participate in activities from 9:00 am to 1:45 pm. Each class will participate for 3 hours on *DAY OF WEEK.*

LOGISTICS – The schedule is as follows.

Session I		Session II	
8:00 - 8:45	am Arrive at *LOCATION*	10:00 – 10: 30	Arrive *LOCATION*
9:00 – 9:30	am Activity 1	10:50– 11:20	Activity 1
9:35 – 10:05	am Activity 2	11:25 – 11:55	Activity 2
10:10 – 10:40	am Activity 3	12:00 – 12:30	Activity 3
11:00 – 11:45	*ENTERTAINMENT* Show	12:30 – 1:00	Lunch
		1:00 – 1:45	*ENTERTAINMENT* Show

In order to make the festival a better experience for the children, sessions have been scheduled so students do not spend long periods in each session. For some presenters, this means you may have MORE sessions, with many of them back-to-back. Some school groups will be moving from one building to another so **it is important for you to stay on schedule.** Please start and end on time. Also, be sure that you have the right group before you begin. Sometimes groups go in the wrong classroom by mistake. We will try to have everything clearly marked so that everyone will be where they need to be.

VOLUNTEER ORIENTATION – Volunteers include guides, presenters, and attendants. **Your specific duty is printed in bold at the top of this page.** There is a training session for all presenters. There are two training sessions held on *DAY OF WEEK, DATE* at *TIME* and *TIME*. Each presenter needs to come to one of these sessions. The training will be held at the *LOCATION* at *ADDRESS* (see enclosed map). We have scheduled this training several days before the festival, so that we could give you an opportunity to familiarize yourself with your responsibilities. Presenters will be trained on their activities and will collect supplies for the day of the festival. We hope you will be energized by what you see and hear. T-shirts will be distributed at the training. Training for Guides will be at *DAY OF WEEK, DATE, TIME* at the *BUILDING* at *LOCATION.* The Guides will do a walk through of the locations of the activities and receive their t-shirts.

MAP – A map is included in this packet for locating the *LOCATION OF TRAINING* and *LOCATION OF FESTIVAL*. Specific room assignments for presenters and attendants will be given at the orientation.

PRESENTERS – Attached is a copy of the exercise that you will be presenting. Please read the activity over carefully. We will demonstrate and answer questions about the activity during the orientation. There will be 2 people per room so that you can give each other assistance and help answer student questions. Your activity supplies will be handed out at the orientation. Please take every opportunity to remind the students that groundwater is a precious resources that must be protected. Emphasize the importance of water to *NAME OF COUNTY* County, which relies heavily on groundwater for drinking.

GUIDES – Will be responsible for meeting the school buses, identifying their group, and escorting the classes to each activity. It is important that the guides keep on schedule and move the classes as quickly as possible to the next activity.

ATTENDANTS – Attendants will be responsible for one of the following: bus transportation, runners, magic show escorts, the teacher resource room and food. Teacher resource room attendants will distribute material packets to teachers and students. *ENTERTAINMENT VOLUNTEERS* will walk the students to their seats at the *TYPE OF ENTERTAINMENT* show and help set up food. Runners will make sure that the presenters are re-supplied with materials on a regular basis. Buses will be arriving throughout the day. The bus attendants will make sure that the buses unload at the proper locations (*LOCATION*) and do not block traffic. Attendants should report to the *BUILDING*. no later that 7:45 AM, *DATE*.

LUNCH – Lunch will be provided to the volunteers at 12:30 in *ROOM NUMBER* of *BUILDING*. The last session of the day will be over at 12:30 at which time the volunteers can pick-up their lunch and attend the *TYPE OF ENTERTAINMENT* Show.

LITTER FREE EVENT – The festival is a litter free event. If you are distributing hand-outs, encourage students and teachers to take only what they will use. Remind students to look for trashcans throughout the building and outdoors.

Sample Instructions to Tour Guides

NAME OF COUNTY COUNTY GROUNDWATER FESTIVAL
DATE

REMINDERS FOR TOUR GUIDES

Your job as a tour guide is one of the most important to the success of the Festival. **We really appreciate your help!** Below are some things that you need to do.

1. You will be walking with the class to their 3 activity rooms, showing them where each room is to make sure no one gets lost. As you are walking with the class to the building please point them in the direction of how to get to *BUILDING WHERE ENTERTAINMENT WILL BE.* You will not be able to stay with them to walk them to this building (for the show) since you will need to pick up your next class at 10:30 am. In fact, you need to take them to their third activity and then quickly return to buses to meet your afternoon class. There is a 5 minute break to get from one classroom to the next. **IT IS VERY IMPORTANT THAT YOU KEEP YOUR CLASS ON SCHEDULE. EVEN IF A LESSON IS RUNNING LONG IT IS IMPORTANT FOR YOU TO TELL THE PRESENTER THAT THE CLASS HAS TO LEAVE FOR THEIR NEXT SESSION.**

2. Please wear your volunteer t-shirt. Dress casual, i.e. jeans and tennis shoes are fine.

3. Please be at the *BUILDING* no later than 8:00 am on *DATE* so that you can get your schedule. We will give you a sign and class schedule. As the buses arrive you will hold up your sign which has the school and teachers last name on it. The teachers have been told to look for the tour guide who is holding the sign for their class. When you find that class please introduce yourself and welcome them to the Festival and explain that you will be their tour guide for the day.

4. Below is a schedule of events for the day:

Morning Session		Afternoon Session	
8:30-8:45	Arrive at *LOCATION*	10:30	Arrive at *LOCATION*
9:00 - 9:30	Activity 1	10:50 - 11:20	Activity 1
9:35 - 10:05	Activity 2	11:25 - 11:55	Activity 2
10:10 - 10:40	Activity 3	12:00 - 12:30	Activity 3
10:40 - 11:00	Break	12:30 - 1:00	Lunch break
11:00 - 11:45	*ENTERTAINMENT* Show	1:00 - 1:45	*ENTERTAINMENT* Show
11:45 am	Depart for School	1:45	Depart for School

5. You will have to leave Activity 3 (morning session) early in order to get to the buses by 10:30 am to start the afternoon session. You need to be in front of the University Center for your next class by 10:20 am. Please tell the teacher you have to leave and remind her that she and her students need to be at *BUILDING* by 11:00 am for the *TYPE OF ENTERTAINMENT* show. DO NOT WALK THE CLASSES TO THE *TYPE OF ENTERTAINMENT* SHOW.

6. For the afternoon session, please remind the teachers that the students can eat in the classroom of their third activity. At the conclusion of this activity, please join us for a luncheon for all volunteers. It will start at 12:30. You can eat and then watch the *TYPE OF ENTERTAINMENT* show.

Sample Tour Guide Sign

ROLLING HILLS

(Name of school)

ATTACHMENT 17

KING

(Teachers last name)

Sample Tour Guide Schedule

MADISON COUNTY GROUNDWATER FESTIVAL
May 12, 1999

Tour Guide Schedule

Building: Administrative Science Building

Morning Session

School: Lynn Fanning Teacher: Turner

Time	Activity	Room
Activity 1 (9:00-9:30)	Hydro Van Gogh	106
Activity 2 (9:35-10:05)	Wetlands	121
Activity 3 (10:10-10:40)	Filtration	109

Afternoon Session

School: Harvest Teacher: Carter

Time	Activity	Room
Activity 1 (10:50-11:20)	Hydro Van Gogh	106
Activity 2 (11:25-11:55)	Wetlands	121
Activity 3 (12:00-12:30)	Filtration	109

Colbert/Lauderdale Counties Water Festival 1999

Activity: *Aquifers*

Supplies Needed:

1. Quart baggies-42
2. Syringes-168
3. Pitcher-1
4. Food coloring-2 per group tubes
5. Bins-15
6. Paper towels-3 rolls
7. Gravel
8. Sand
9. Plastic cups-168

Activity: *Filtration*

Supplies Needed:

1. Gallon baggies
2. Coffee filters-42
3. Food coloring-1tube
4. Pencils-7
5. Cheese cloth-1 pkg
6. Containers- 7
7. Pitcher-1
8. Strainer-7
9. Leaves, grass, dirt, etc.
10. Vinegar-1
11. Oil-2
12. Paper towels- 3 rolls
13.

Activity: *Wetlands*

Supplies Needed:

1. Bins-7
2. Sponges-168
3. Sand
4. Food coloring-2
5. Cups-7
6. Paper towels-3
7. Quart baggies-42
8. Syringes-42
9. Pitcher-1

Dixie cups- 84

Activity: *Hydro Van Gogh*

Supplies Needed:

1. Construction paper-1 per child
2. Markers-7 sets
3. Water Dance book-1
4. Aquifer poster-1

Activity: *Rainsticks*

Supplies Needed:

1. Tubes-168
2. Crayons or markers
3. Tape- roll
4. Feathers-1 or 2 per student
5. Yarn
6. ~~Nails~~ styro foam peanuts
7. Scissors-7
8. Contact Paper
9. Rice, macaroni, seeds, beans
10. Pins

Activity: *Water Concentration*

Supplies Needed:

1. Water cards-7 sets
2. Water story-1

Activity: *A-maze-ing Water*

Supplies Needed:

1. Post-it notes
2. Yarn

Sample News Release

Press Release

First Annual Children's Water Festival
Colbert and Lauderdale Counties

March 25, 199X
Northwest Shoals Community College

You are invited to attend Colbert and Lauderdale Counties First Annual Water Festival to be held on March 25, 199X at Northwest Shoals Community College. Approximately 1,000 fourth grade students from Colbert and Lauderdale County school systems will be attend the Festival. Numerous water educators and enthusiasts from across the State will be teaming up for an exciting and interactive day of learning for the students and teachers. The students will participate in hands-on learning activities focusing on groundwater and surface water, the importance of water to all life, the water cycle and groundwater's role in it, the interdependence of plants, trees, wildlife, soil, and water, and the effect of human actions on water and all nature and the need for responsible action. Steve Trash, environmental magician, will perform water-related magic tricks and illusions with the students.

The main goal of the Festival is to educate the children about all aspects of water and other related natural resources (i.e., surface water, groundwater, wetlands, forestry, wildlife, etc.) and to instill in them a general environmental awareness and stewardship ethic. The students will learn where their drinking water comes from and how to protect it and keep it clean.

Schedule:

Morning Session		Afternoon Session	
8:45	Buses arrive at NWSCC	10:30	Buses arrive at NWSCC
9:00 - 9:30	Activity 1	10:50 - 11:20	Activity 1
9:35 - 10:05	Activity 2	11:25 - 11:55	Activity 2
10:10 - 10:40	Activity 3	12:00 - 12:30	Activity 3
10:40 - 11:00	Break	12:30 - 1:10	Lunch break
11:00 - 11:45	Magic Show	1:10 - 1:45	Magic Show
11:45	Depart for school	1:45	Depart for School

For more information please contact:

Vanessa Colebaugh
Groundwater Festival Coordinator
256-922-5747
vanessa@atmos.uah.edu

Enid Bittner
Project Manager, ADEM
334-271-2953
EIB@adem.state.al.us

Sample Sponsor Thank You Letter

DATE

CONTACT PERSON
COMPANY
ADDRESS
CITY, STATE ZIP CODE

Dear *CONTACT PERSON*,

Thank you for your recent donation in support of the 199X Children's Groundwater Festival. We were proud to have your support as a sponsor of Alabama's first Groundwater Festival.

The Groundwater Festival drew approximately 1,150 fourth grade students and teachers from Madison County. We received a lot of positive feedback from teachers, students, and volunteers about what a great learning experience it was for all involved. They all enjoyed learning about Alabama's groundwater through the hands-on activities and the entertaining magic show. We succeeded in meeting our goal of educating the students and citizens on where their drinking water comes from, how to protect it and keep it clean for future generation.

You truly helped to provide a wonderful and important opportunity for the students and citizens of Madison County. Again, thank you for helping to make the Groundwater Festival a great success.

I have enclosed a Groundwater Festival t-shirt which was designed by *STUDENTS NAME* from Ms. *TEACHERS NAME* class at *SCHOOL*. I have also enclosed an article that was written about the Festival in The Huntsville Times.

Sincerely,

Vanessa Colebaugh
Groundwater Festival Director

Thank You Letter to Volunteers

DATE

Dear *NAME*,

Thank you for volunteering at *NAME OF COUNTY* County's *FIRST, SECOND, THIRD, ETC.* Annual Groundwater Festival. Your support played a vital role in making the Festival a success.

Enclosed is an evaluation form that I need for you to complete and fax to me by *DATE*. My fax number is *FAX NUMBER* or you can mail it back. It is very important that you be very candid in your comments so that we will know how to make the Festival better and easier for the students, teachers, and volunteers.

The Groundwater Festival drew approximately *NUMBER OF STUDENTS* fourth grade students and teachers. We received a lot of positive feedback from teachers and students about what a great learning experience it was for all involved. They all enjoyed learning about our groundwater the hands-on activities and the entertaining magic show. We succeeded in meeting our goal of educating the students and citizens on where their drinking water comes from, how to protect it and keep it clean for future generations. This could not have been done without your help.

You truly helped to provide a wonderful and important opportunity for the students and citizens of *NAME OF COUNTY* County. Again, thank you for helping to make the Groundwater Festival a great success.

Sincerely,

NAME
Groundwater Festival Coordinator

Sample Teacher Evaluation

199X GROUNDWATER FESTIVAL
NAME OF COUNTY

TEACHER EVALUATION

****

PLEASE RETURN BY *DATE* TO:

Name of Contact Person, Address, Fax Number
****

Teacher Name _____

School _____

1. Which activities were most effective in teaching your students about groundwater and/or related resources? Why?

2. Which were not effective? Why?

3. What suggestions do you have for improving the Festival?

4. Do you have any suggestions for new activities/displays/entertainment?

Continued On Back

5. Was the Teacher's Packet useful? If yes, how so? If no, how could it be improved?

6. Were the teacher bags containing free materials helpful? If yes, how so? If no, how could it be improved?

7. How was the format for the Festival? Did you like/dislike the 1/2 day schedule or would you prefer to spend all day and participate in more activities?

8. Did you and your students enjoy the *Type of Entertainment*?

9. Overall comments and suggestions:

Thank you for filling this out. We really need your comments so we know how to make the Festival better next year.

Sample Volunteer Evaluation Form

199X GROUNDWATER FESTIVAL
COUNTY

VOLUNTEER EVALUATION

****

PLEASE RETURN BY *DATE* TO:

CONTACT PERSON, FAX NUMBER (fax) or *MAILING ADDRESS.*

****

Name _____Affiliation_____

Volunteer Assignment_____

1. Please give general comments about how your volunteer assignment helped the Festival. Do you think it would be valuable for next year?

2. What could Festival organizers do to help make your volunteer job easier?

3. In your opinion, do you think teachers and students enjoyed their day at the Festival? If yes, what made it a valuable experience? If no, what could be done to improve their experiences?

Continued On Back

4. What was your overall impression of the Festival?

5. If you presented an activity, how can your activity be changed in order to make it better?

6. Additional comments and suggestions:

Thank you for filling this out. We really need your comments so we know how to make the Festival better next year.

1998 GROUNDWATER FESTIVAL SPONSOR BREAKFAST

PROGRAM

Buffet Breakfast

Overview of Groundwater Festival

Introduction of Sponsors

Tour of Festival

Sponsors

AL Dept. of Environmental management
Alabama Rural Water Association
Alabama Water Environment Association
AL Water Pollution Control Association
City of Madison Water Board
City of Huntsville Water System
Domino's Pizza
G.W. & Jones, Inc.
Harvest Monrovia Water Authority
Hughes Supply Inc.
Huntsville Botanical Gardens
Kentucky Fried Chicken
Madison County Board of Education
Madison County Commission
Madison Co. Soil & Water Cons. District
Miller Drilling
Ogden Environmental & Energy Services
Regions Bank
TARCOG
The Huntsville Grotto
University of Alabama, Huntsville
Wendy's Restaurant
Wesfan

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

POST OFFICE BOX 301463 ♦ 1751 CONG. W. L. DICKINSON DRIVE 36109-2608
MONTGOMERY, ALABAMA 36130-1463
(334) 271-7700

JAMES W. WARR
DIRECTOR

FOB JAMES, JR.
GOVERNOR

Facsimiles: (334)
Administration: 271-7950
Air: 279-3044
Land: 279-3050
Water: 279-3051
Groundwater: 270-5631
Field Operations: 272-8131
Laboratory: 277-6718
Education/Outreach: 213-4399

March 13, 1998

Ms. Kathy Horne, Executive Director
Alabama Rural Water Association
2807 D. E. South Blvd
Montgomery, Alabama 36116

Re: Groundwater Festival Sponsors

Dear Ms. Horne:

The Groundwater Festival Committee would like to express their sincerest appreciation to your organization for sponsoring the first Groundwater Festival in Alabama. It has been an exciting time for all of us as we prepare to host 1200 4th grade children and their teachers from Madison County to a day of fun and special experiences.

We cordially invite you and a guest to attend the VIP breakfast for the sponsors of the Groundwater Festival. We would also welcome the chance to explain the festival in more detail and to lead a tour of the activities.

The breakfast will be at 7:30 am on Friday March 20th at the Tom Bevill Conference Center (please reference the attached map for the location). Please direct questions regarding the breakfast or festival to Vanessa Colebaugh at 205-922-5747.

Thank you for your generous support.

Sincerely,

Enid Bittner
Committee Member

File/ GW/ Admin.

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Appendix A

AQUIFER IN A CUP

BACKGROUND

Groundwater comes from rain, snow, sleet, and hail that soaks into the ground. The water moves down into the ground because of gravity, passing between particles of soil, sand, gravel, or rock until it reaches a depth where the ground is filled, or **saturated**, with water. The area that is filled with water is called the **saturated zone** and the top of this zone is called the **water table**. Get it? The top of the water is a table! The **water table** may be very near the ground surface or it may be hundreds of feet deep. Think about this: have you ever dug a hole in sand next to an ocean or lake? What happens? As you're digging, you eventually reach water, right? That water is groundwater. The water in lakes, rivers, or oceans is surface water...it's **on** the surface. Groundwater and surface water sometimes trade places. Groundwater can move through the ground and into a lake or stream. Water in a lake can soak down into the ground and become groundwater. Groundwater is stored in the ground in materials like gravel or sand. It's kind of like the earth is a big sponge holding all that water. Water can also move through rock formations like sandstone or through cracks in rocks. An area that holds a lot of water, which can be pumped up with a well, is called an **aquifer**. Wells pump groundwater from the ground and then pipes deliver the water to cities, houses in the country, or to crops. Most groundwater is clean, but groundwater can become polluted or contaminated. It can become polluted from leaky underground tanks that store gasoline, leaky landfills, or when people apply too much fertilizer or pesticides on their fields or lawns. When pollutants leak, spill, or are carelessly dumped on the ground they move through the soil. Because it is deep in the ground, groundwater pollution is generally difficult and expensive to clean up. Sometimes people have to find new places to dig a well because their own became contaminated.

CONCEPTS

- Groundwater is the water which fills the spaces between rocks and soil particles under the ground.
- Groundwater is accessed through wells.
- We must be careful to protect our groundwater from pollutants.

MATERIALS

One mason jar for demonstration
Sand
Gravel
Clear plastic cup (one per 2 students)
Syringe (one per 2 students)
Food coloring (one per 2 students)

PREPARATION – If you are teaching this activity in a classroom with movable desks, arrange the desks so they are in groups of four. At the front of each class or in a corner of the classroom, fill 3 bins with gravel and 3 will sand. You will have to replenish these in between classes. Fill 14 cups about 1/2 full of water but do not give them to the students until they are needed. These can be filled during the 5 minute break between classes.

ACTIVITY ONE – Demonstration of an Aquifer

1. Ask the students if they know what an aquifer is. Discuss their answers and explain that an aquifer is like an underground storage area made up on rocks, sand, limestone, etc and hold holds water. Using the mason jar, tell the students you are going to demonstrate an aquifer and then they will make their own aquifer.
2. Pour a layer of gravel and sand, alternating and ending with a layer of gravel on top.
3. Tell the students that groundwater is stored in the ground in materials like gravel and sand. Ask the students what they think will happen when it rains on the gravel. Will the water stay on the top, flow to the bottom or do something else? Do not tell the students the answer. Let them form a hypothesis or prediction.
4. Next tell the students they will now make their own aquifer and discover the answer to this question.

ACTIVITY TWO – Student Aquifers

1. Have the students work with a partner. Give each team of two students one clear plastic cup.
2. Tell the students to place a layer of gravel in their cup, then a layer of sand. Keep alternating until the cup is about 3/4 full. Give them two cups and have them get a cup of sand and a cup of gravel from the bins. Reuse these same cups for each class.
3. Ask students to recall what their hypothesis or prediction was to the question as to what would happen if it rained on their aquifer.
4. Give each team a cup of water and have them pour it on their aquifer. Discuss with the students what happens – the water seeps into the aquifer filling the pores and spaces in gravel and sand. This is groundwater. Groundwater is stored in underground geological water systems called aquifers. Aquifers are different in different places. Different aquifers hold different amounts of water. Sand and gravel aquifers store the most water. Water can also be stored in soils, clay and rock under the ground. Explain to the students that many of them receive their drinking water from groundwater and others receive it from surface water.

ACTIVITY THREE – Making a Well

1. Tell the students that we use water in a aquifer, but how do we get it out? (water is pumped up by a well).
2. Tell the students that the syringe is going to represent a well. Take the mason jar aquifer and the large syringe and ask the students what will the water look like that we pump with our syringe? Will it look clear and clean or dirty?
3. Give each team one syringe and have them insert the syringe (well) into their aquifer. Have them slowly pull the stopper toward them. Tell them to watch the syringe fill with water. The syringe is like a pipe leading from a well. Have the students move the syringe to different spots in the aquifer and to different depths. Ask them if the water they extract is the same or different. It should be different depending on in what layer the syringe is placed. If it is placed in a layer of gravel they might extract dirt, small pieces of gravel, etc. Particles might seep off the rock and gravel. If the syringe is in the layer of sand they will extract sand. Tell the students that wells have filters that keep out the particles that they are extracting, but in our demonstration we do not have a filter on our well (syringe). Tell the students it takes hard work to drill wells, and a lot of energy to get water out of the ground and into our cities, homes and farms. Wells are used to extract water from aquifers. Proper well construction is important to good water quality. For example, well casings need to be seamless and the bottom of wells screened in order to filter out particles.

ACTIVITY FOUR – Contaminated Groundwater

1. Tell the students that it does not take much to degrade the quality of our groundwater. What we do on the surface of the land can affect the groundwater below. Ask the students what would happen if pollutants were poured onto the ground? (the pollution will get into our groundwater) Ask the students to think of pollutants that that could get into our aquifers. Examples are motor oil, pesticides, fertilizers, herbicides, gasoline, antifreeze, paint, detergents with phosphates. Try to lead the students to think of these examples by asking the following questions: Does anyone's mom or dad change the oil in the car? What do they do with the oil? Explain that many people pour the used/dirty oil right into the ground. The oil will eventually seep into our groundwater. Ask them what we spray spray on our yards to make the grass grow so green and lush. (Fertilizers). And what do we spray on our yards to kill the weeds? (herbicides) Have them think of farmers and what they spray on their crops to kill insects that eat their crops? (pesticides) Fertilizers, herbicides and pesticides all seep into the groundwater especially when they are overused. Explain that it is okay to use these products only if they are used in the quantities that are directed on the manufacturers label. Tell the students that we will now pollute our groundwater and see what happens to our groundwater.

2. Give each team a bottle of food coloring and have them place 2 drops onto the edge of the cup. Remind them to be careful with the food coloring since it will stain their hands and desks. Tell the students that the food coloring represents the pollutants that we just talked about (fertilizers, motor oil, pesticides, herbicides, etc.) Have the students observe what happens. (the pollution travels down into our groundwater).

3. Now have the students insert the syringe and pull up some water. What do they observe? (the well is pumping up contaminated water) Explain that the water will have to be treated at a water treatment plant so that it is usable/drinkable for human consumption. It is very expensive and difficult to clean contaminated water.

4. Tell the students that it doesn't take much to degrade the quality of our groundwater. What we do on the surface of the land can affect the groundwater below. We must all be good stewards by properly disposing of our wastes, and using chemicals carefully. Remind them to tell their families what they have learned and how important it is for us to protect our groundwater.

5. Please make sure you straighten and clean your room before leaving. It is very important we leave the room as clean as when we entered. Have the students dump **only** the contents of their aquifer into the rolling trash cans that will be in your room. You will additional trash bags to discard the plastic cups and syringes.

FILTRATION

CONCEPTS

- Various pollutants enter our water supply via nature or man.
- We must use various filtering techniques to remove these pollutants.
- Some pollutants cannot be removed by filters and must be treated chemically or otherwise. Some pollutants cannot be removed and the water supply is no longer useable.

MATERIALS

Small mesh strainer – 1 per group
Coffee filters – 1 per group
Pencils, sharpened – 1 per group
Cheesecloth – 1 per group
Confetti paper to represent trash, leaves, etc
Potting soil to represent soil, dirt
Vinegar to represent pollutants such as fertilizers, pesticides
Oil to represent motor oil
Small Dixie cups – 4 per group
Activity Worksheet
2 clear plastic cups

SETUP

If you are teaching this activity in a classroom with movable desks, arrange the desks so they are in groups of four. Prior to teaching the lesson, fill seven dixie cups with **each** pollutant - vinegar, oil, soil, confetti. Each group of four students will need one cup of each pollutant. There should be no more than seven groups in your classroom. Do not pass these out ahead of time to the groups. Pass them out one at a time as they are needed. These can be filled during the 5 minute break between classes.

ACTIVITY

1. Discuss with the students the fact that things get into our water supply. Have the kids think of many substances which get into water – some natural, some placed there by humans or animals. Try to cover garbage, sewage, animal wastes, dead animals and plants, runoff from roads and parking lots, fertilizer runoff, oil from boats on the water, etc.
2. Ask how do we get these substances out of the water so that it is safe to drink or use. Lead the students to the concept of using a filter.
3. Give each group a cup of water, the activity sheet and a pencil. Have the students choose one student (or they can take turns) who will answer the groups activity sheet.
4. Have each group answer question 1 on the activity worksheet describing the clean water. This needs to be done so that they can compare the polluted water with the clean water.
5. Give each group the cup of confetti and explain that the confetti represents pollutants such as grass, leaves, garbage, tires, etc. Have one student pour the confetti into the clean water.
6. Give each group the cup of soil and explain that this pollutant represents soil, dirt, etc. Have a student pour the pollutant into the cup of water

7. Give each group the cup of vinegar and explain that it represents chemical pollutants such as fertilizers, pesticides, paint, etc. Have a student pour the pollutant into the cup of water.
8. Finally give each student the last cup of oil and explain that the oil represents motor oil from cars or oil that has run off from parking lots. Have a student pour the pollutant into the cup of water.
9. Now their clean water has become contaminated. Have the students answer question 2 on the activity sheet describing the contaminated water.
10. Review with the students how in order to clean the polluted water we will need to use a filter. Pass out the three filters – strainer, coffee filter and cheese cloth. Have the students choose a filter and predict what pollutants that filter will remove. Have the students pour SOME of the polluted water into a clean cup. Have the students look at the filtered water, smell it, and feel it to see if the filter actually worked. Have them answer question 3 on the activity sheet. Have the students try each filter, recording the results on to the activity sheet.
11. Go over a few of the students' results. Make sure to cover each pollutant and which filters worked and did not work and possible reasons why. Have the students compare the descriptions of the polluted water with the clean water.
12. THE LAST QUESTION IS THE MOST CRITICAL. Discuss which pollutant could not be removed (vinegar) and how we can tell it was not removed (we can smell it). Ask the students if they would want to drink that water? (No, since it still has a pollutant in it.) Ask them how do we get rid of this pollutant. (Water treatment plant must treat/clean the water to make it safe to drink and use). Water treatment plants disinfect the water with chlorine or other chemicals to kill any germs in the water and to keep the water safe as it travels to the public. The water is sampled and tested throughout the treatment plant. Sampling is performed to make sure the processes are working and that the water is safe before it leaves the plant. In North America, governments have set standards for drinking water. When water leaves a treatment plant, it is clean or cleaner than required by these standards
13. Tell the students that it is very difficult to clean polluted water, therefore, it is important that we do not pollute our water supply.
14. Please clean and straighten your room. It is important we leave the room as clean as when we entered.

WATER CYCLE BRACELETS

Materials
Multicolor beads, 16" strands of leather, fish bead

Representation of beads
Transpiration – green
Evaporation – red
Condensation – clear/white
Precipitation – blue
Infiltration – black

Preparation: In a zipper baggie, place two beads of the same color, one fish bead and one 16" strand of leather. Set one out for each student.

Concepts
- The water, or hydrologic, cycle is nature's recycling system
- Processes or steps include transpiration, evaporation, condensation, precipitation, and infiltration
- The many forms that water takes on are proof to us that the water cycle exists, is successful, and never-ending.

Activity 1
1. Ask the students to raise their hands if they think the water that they drink and use today (for cooking, bathing, etc) is the same water that the dinosaurs used millions of years ago. Tell the students that whomever raised their hand is correct – the water we use today IS the same water that the dinosaurs used. This is due to the water cycle. The water on earth today has been here for millions of years . Because of the water cycle, water moves from the earth to the air to the earth again. It changes from a solid to liquid to gas, over and over again. Tell the students that they are going to learn about the hydrologic cycle in this activity. In the word "hydrologic", "hydro" means water and "logic" is how events, situations objects interact.
2. Explain to them what the HYDROLOGIC CYCLE is, a perpetual motion – a natural process of water molecules recycling from the land, to the air, and back to the land (use the poster of the Water Cycle as a visual aid). Not all water goes through the cycle together. Some of it stays in certain processes longer than the remainder. You might want to also explain other types of cycles that we have – the seasons of the year, the lunar cycle, planetary cycle, etc. – and how they are also a part of our daily life.
3. Tell the students that the hydrologic cycle does not have a beginning or an end, however, in today's lesson you will begin with PRECIPITATION. Ask the students, "Who can name a kind of precipitation?" (rain, snow, sleet, and hail). Explain that precipitation happens when water falls to the earth. Whether or not it hits the earth as a raindrop, snow crystal, piece of hail or whatever depends on the temperature, season, and location. When the humidity is low the air is very dry and the rain will not reach the ground. It will evaporate on the way down. Use the poster to point out precipitation. Tell the students that they will use the blue bead to represent precipitation. Have everyone tie a knot in their leather strand about two inches from the end. Take one blue bead out of the baggie and feed the longest section of the leather strand from the knot through the hole in the bead.

4. Ask the class if anyone knows what the next part of the hydrologic cycle is? INFILTRATION. Infiltration happens when water fills the pore spaces between individual soil particles . It is kind of like when dirt becomes mud. Not all water gets infiltrated, some runs off across the land surface (called runoff) or falls into a body of water. Some also seeps into the ground and becomes groundwater, which is where many of you receive your drinking water. Think of groundwater as water that fills the spaces between rocks and soil particles underground, in much the same way as water fills a sponge. Groundwater begins as precipitation and soaks into the ground where it is stored in underground geological water systems called aquifers. Sometimes groundwater feeds springs, lakes, and other surface waters or is drawn out of the ground by humans (via wells). Ask the class if they know what the word "recharge" means. Explain that recharge is when water falls directly into a body of water (river, lake, etc) and fills it up/replenishes it, or when water seeps into the ground and travels into an aquifer or when it travels over the ground surface eventually landing in a river or lake. Use the poster to show/explain recharge. When water becomes "runoff", it is caught by dams or grassy patches and collected. Many farmers build "terraces" or dig trenches or ditches to catch runoff to use for growing plants and food. Have the students feed a black bead onto their leather strand to represent infiltration.

5. Now tell the students that once water is infiltrated into the soil, it can be sucked up by plants and used to keep the plants alive. It's like their roots drink it up. Once they've used all the water they need, they give it off through their leaves as water vapor or gas. This process is called TRANSPIRATION. Have the students feed a green bead through the leather strand for transpiration.

6. Ask the class if they know the next part of the hydrologic cycle? (EVAPORATION). Explain evaporation. If the water that goes through the soil is not sucked up by a plant, it will move slowly through this rock you can see on the poster until it reaches the surface again in the form of a "seep", spring, or artisian well (water from an aquifer that rises above the ground). Once it reaches a surface body of water again like a lake or ocean storage, the sun heats it up and it evaporates. So, we have reached the point of EVAPORATION. The sun makes water evaporate from building, land, people, and bodies of water. When it evaporates, it leaves behind minerals like salts (such as you find in oceans), but this is a natural process – fish and plants in the ocean are made to survive in the salt water. Evaporation might also happen in the form of water vapor that is released when animals breathe or when machines such as engines run hot and burn water up.

7. When the water gets up high in the earth's atmosphere, it condenses together to form clouds. That's why we call it CONDENSATION. Condensation occurs when water vapor rises until it reaches cold air. It then changes to a liquid, condenses and attaches to particles (dust, smoke, smog, etc) to form drops. The drops join to form clouds. As the drops get bigger, the clouds get darker. A cloud turns dark because light hits the cloud and is absorbed making the cloud dark. Have the students feed a white/clear bead onto their bracelet to show CONDENSATION.

8. Explain to the students they have finished one complete cycle and next you will review the water cycle again to finish making your bracelets. Have the students feed a fish bead through the leather strand. Next, start with condensation and ask a student to briefly explain condensation. Have them put a clear/white bead on the bracelet. Ask the students what part of the cycle is next? (evaporation) and have them place a red bead on the bracelet. Keep asking the students to name the next cycles (transpiration, infiltration, precipitation) until their bracelets are finished. Have them help each other tie the strings around their wrists. Remind them to show their bracelets to their family and friends and explain them the water cycle.

Activity 2

Materials - one sheet of paper with the following descriptions. **These descriptions are in order with the flow of the water cycle:**

- water falls to the earth (precipitation)
- water fills the pore spaces between soil particles (infiltration)
- water becomes "runoff" (infiltration)
- water seeps into the land and becomes groundwater (infiltration)
- water is sucked up by plants (transpiration)
- plants give off water through their leaves as vapor or a gas (transpiration)
- sun heats a surface body of water and it evaporates (evaporation)
- leaves behind minerals like salts (evaporation)
- water vapor rises until it reaches cold air (condensation)
- water vapor changes to liquid, attaches to particles to form drops (condensation)
- drops join to form clouds (condensation)

1. Give each student a sheet of paper with a phrase describing part of the water cycle. Some students will have the same descriptions. They will only have the description and not the part of the water cycle that is described.
2. Call on one student to have them pick a part of the water cycle. Let's say, for example, they choose CONDENSATION. Beginning with condensation, ask the students if any of them has on their paper a description of condensation. The student with the phrases stating "water vapor rises until it reaches cold air", "water vapor changes to liquid, attaches to particles to form drops", and "drops join to form clouds" should raise their hands. Have the students decide in which order these steps of condensation occur (refer to the order above). The students with these descriptions will come to the front of the class and stand in the correct order. Those students with the same cards can stand beside each other. Eventually all the students will form a circle. Once you are finished with CONDENSATION, ask the students what is the next step in the water cycle? (PRECIPITATION) The students with the sheets that state "water falls to the earth" should stand and join the line behind the condensation students. Keep asking the students what comes next making sure that THEY tell YOU and figure out the correct order of the descriptions. Do not give them the answers. You want them to discuss and derive with the correct order on their own, however, you can lead them questions to help them. Have the students continue joining the line until they have finished all the descriptions and have now formed a circle.
3. Please clean and straighten your room. It is important we leave the room as clean as when we entered.

water falls to the earth

water fills pore spaces between soil particles

water becomes “run-off”

water seeps into the land and becomes groundwater

water is sucked up by plants

plants give off water through their leaves as vapor or a gas

sun heats a surface body of water and it evaporates

leaves behind minerals like salts

water vapor rises until it reaches cold air

water vapor changes to liquid, attaches to particles to form drops

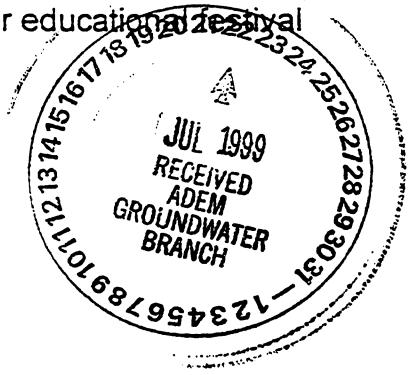
drops join to form clouds

Orange County Water District Groundwater Guardian Team

EDIBLE AQUIFER

OVERVIEW:

This yummy activity provides a fun opportunity for children of all ages to learn about the concept of aquifers, groundwater contamination and groundwater protection. It also includes some review of the water cycle, hazardous waste management and geology. This is a versatile activity that is appropriate for large or small groups of children in a classroom, lab, or outdoor/ indoor educational festival environment.



INGREDIENTS:

- ❑ clear plastic cups
- ❑ vanilla ice cream
- ❑ chocolate cake decorating sprinkles
- ❑ drinking straws
- ❑ napkins
- ❑ lemon-lime soda
- ❑ small ice cubes
- ❑ multi-color sugar crystals
- ❑ plastic spoons (optional)

LEARNING OBJECTIVES:

Through this interactivity, children will learn that:

- ♦ aquifers contain groundwater that is pumped to the surface by wells to provide us with a clean water supply
- ♦ aquifers are located beneath our feet, below layers of permeable rock, sand and soil, and they lie on an impermeable layer of bedrock
- ♦ aquifers are fed by underground streams and surface water that slowly seeps down through permeable layers
- ♦ contaminants can also be carried down through the permeable layers
- ♦ motor oil, pesticides, paint, cleaning solutions and chemicals are examples of hazardous wastes that can contaminate water supplies
- ♦ groundwater that is pumped from aquifers is continually tested by water suppliers for possible contamination
- ♦ if unsafe levels of contaminants are detected, wells must be shut down
- ♦ contaminated portions of aquifers can no longer be used for drinking water
- ♦ treatment of contaminated or polluted water is very costly
- ♦ construction of new wells is also very costly
- ♦ pollution prevention is a better option, environmentally and economically
- ♦ drinking water is a limited resource and needs to be protected
- ♦ we can help protect groundwater by properly disposing of hazardous wastes at home and at work

TIME REQUIRED:

15-30 minutes, depending on the size of the group and level of instruction

INSTRUCTIONS:

1. Prior to beginning your interactivity, place bottles of soda, chocolate sprinkles, multi-color sugar crystals and straws on tables so that each group of children shares one set.
2. Begin the interactivity by asking the children if they know about aquifers. Explain that they will learn about aquifers first-hand by building one. Tell them that will be able to eat their creations afterward, while they review what they've learned.

3 Using a diagram, review the concept of an aquifer: asking for input from the children. Show how it is situated beneath the earth's surface, pointing out permeable and impermeable layers. Ask the children to help define "permeable" and "impermeable." Briefly discuss the water cycle by asking them how water gets to an aquifer. Discuss wells by asking how water would come to us from an aquifer.

4. Distribute plastic cups that are about one-quarter full of ice. Explain to the children that the ice cubes represent bedrock. Remind them that bedrock is impermeable.

5. Ask them to carefully open the bottles of soda and pour enough soda in their cups to cover the bedrock and form an aquifer. Emphasize that the soda represents water in an aquifer. While they are pouring soda, remind them how aquifers are replenished.

6. Tell the children that, unfortunately, their aquifers about about to become contaminated. Ask them to sprinkle the colored sugar crystals onto the soda. As they do this, ask for ideas about what contaminants the different color crystals might represent, i.e., blue crystals are antifreeze, orange crystals are motor oil, green crystals are pesticides. Ask them to observe and discuss with each other how the contaminants react with the water, i.e., some sink, some dissolve, some float. Point out how the aquifer gradually becomes discolored.

7. Review the two existing layers - bedrock and aquifer - and remind the children that the contaminants they are watching would have had to seep down through several permeable layers to reach the aquifer. Explain that you are now going to add something that represents these layers. Place a scoop of ice cream in each cup, asking the children what substances are in the different layers represented by the ice cream, i.e., sand, gravel, soil.

8. Ask the children to add the last layer by shaking chocolate sprinkles on to the ice cream. Ask them what it represents (topsoil or soil).

   Tell them to add a straw, but not to drink from it until they are told to do so. Ask for ideas about what the straw might represent (well or pump). Discuss how the straw will work like a pump by bringing the water from the aquifer to the surface. Remind them not to drink from it until everyone is ready.

10. Tell them that after counting to three out loud as a group, they should sucking on their straws, paying close attention to what comes up through the straw. Count with the group and say, "Start your wells!" Ask if they are feeling the crystals or contaminants in their mouths. Explain that this is how actual wells bring contaminated water to the surface.

11. Apply what is happening to a real-life situation. Ask the children if a contaminated aquifer can continue to be used. Discuss how the well would have to be shut down if the contaminant level were unsafe. Explain the high costs of water treatment and new well construction. Discuss the better option - protecting aquifers through proper disposal of potential contaminants.

12. Congratulate the children on what a great job they have done and tell them to begin eating their aquifers. Use this time to go to each group and informally quiz them on the primary learning objectives. Examples of questions you might ask are: What do the layers in your cup represent? How do contaminants reach the aquifer? What things cause contamination? Whose job is it to detect contaminants? What happens when aquifers become contaminated? What can you do to help protect our groundwater?

FOR MORE INFORMATION ABOUT THIS ACTIVITY, CONTACT:

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(714) 378-3362 FAX (714) 378-3373
slien@ocwd.com

To: Allison Dollar - 256-740-5529

A-maze-ing Water

Imagine turning on your water tap and having everything that you dumped into the gutter last week flow into your glass.

■ **Grade Level:**
Lower Elementary, Upper Elementary, Middle School

■ **Subject Areas:**
Environmental Science, Health

■ **Duration:**
Preparation time:
Option I: 15 minutes
Option II: 50 minutes

Activity time:
Option I: 30 minutes
Option II: three 50-minute periods (includes drying time for maze)

■ **Setting:** Classroom

■ **Skills:**
Organizing (manipulating materials); Interpreting (identifying cause and effect); Applying (designing)

■ **Charting the Course**
Prior understanding of how water flows through a watershed supports this activity ("Branching Out!"). Students can investigate the role their school plays in adding to the city's runoff in "Rainy-Day Hike." The activity "Sum of the Parts" can be adapted to include the schoolyard as a nonpoint source contributor.

■ **Vocabulary**
storm drain, nonpoint source pollution, runoff, contaminants

Summary
Students "guide" a drop of water through a maze of drainage pipes to learn how actions in the home and yard affect water quality.

Objectives
Students will:
- describe urban forms of pollution.
- provide reasons why people should monitor what they put on their lawns or in streets.
- identify ways to treat urban runoff.

Materials
For Option 1:
- *Can or bottle labeled "chemicals" or "oil"*
- *Chalk*
- *Pieces of self-sticking paper, flour, or other materials to represent pollutants found in urban runoff*

For Option 2:
- *Cardboard 8 inches (21.3 cm) x 10 inches (25.4 cm)* (1 per student or group)
- *Wax paper*
- *Tape*
- *Wood glue*
- *Clay or modeling dough* (Following is a simple recipe for modeling dough: Knead together 1 cup (22.4 g) flour, ½ cup (11.2 g) salt, ¾ cup (180 ml) boiling water, 1 tablespoon (15 ml) salad oil, and 1 tablespoon (5 g) alum [optional]; if too sticky, add more flour and salt.)
- *Water*
- *Sugar, salt, pepper, food coloring, oil, and other materials to represent pollutants found in urban runoff*
- *Wax marking pencil*
- *Pipette or eyedropper*
- *Pencil and paper*

Making Connections
Most students have washed family cars, seen litter on the sidewalk, or walked a dog. In urban settings, car wash detergent, litter, animal waste, paint, and oil all wash into the street and down storm drains. Investigating what happens to these materials after they enter drainage systems helps students understand how these materials can affect water supplies and aquatic plants and animals.

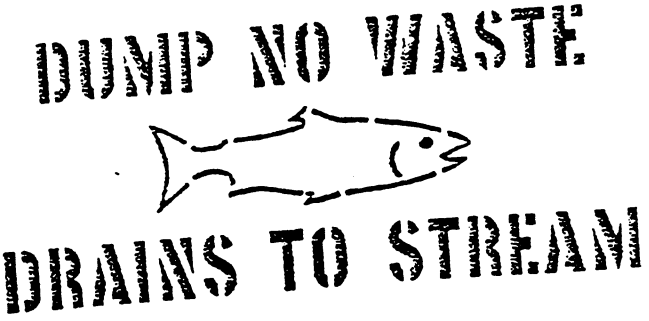
Background
Removing water quickly and efficiently from city streets, parking lots, and schoolyards following precipitation or snowmelt is an important task for municipal governments. Water flowing through city drainage pipes is often referred to as an urban watershed. Before storm drainage systems were common, cities experienced localized flooding because of poor or nonexistent drainage patterns and flooded sewer systems that overflowed with storm water. Both circumstances caused significant health and safety concerns that warranted solutions. Today, most city governments require housing developers to install city-approved storm water drainage systems.

Traditionally, water diverted to storm water systems received little or no treatment before flowing into a stream or body of water. Environmental agencies found that water draining off lawns, sidewalks, driveways, parking lots, and streets carried significant amounts of pollutants. These pollutants included fertilizers, motor oil, litter, pesticides, animal waste, and other contaminants. Receiving waters were degraded, and aquatic plants and animals were affected. Some communities resolved the problem by channeling storm runoff into a wastewater treatment plant. But this is an expensive procedure, and some plants are unequipped to process the inorganic

materials found in urban runoff. A more cost-effective system was needed to treat storm water discharge. The scenario below describes one such water treatment system.

Imagine the parking lot of a large shopping center. Each year thousands of cars park in the lot, each depositing a small amount of engine oil- and grit (loosened road materials). A gentle rain begins to wash the lot. At the lot's lowest point, oil- and gas-tainted runoff water begins to flow into the street's gutter. A few blocks away, an urban river flows, filled with floating debris, sediment, and multi-colored water from another street, then another, and another. The flow now nearly fills a ditch constructed to channel urban runoff. From a distance the storm water in the drainage system appears dark-colored. Perhaps the road salt used to melt ice on roads and sidewalks has mixed in. How about the paint a neighbor pours into the gutter? The pet waste near the sidewalk? Whoosh, more water moves by! What next? What about the nearby stream and the people using water downstream for their drinking supply?

You follow the water to a large pond that the city constructed to catch storm water. The water in the pond is now moving slowly through cattails and other emergent wetland vegetation, and its color has started to change. Where is the debris and the sediment? And what about other waste materials? A woman from the city health department tests the water as it enters a small stream; she concludes that the water is cleaner than the river it is about to enter.



Solutions to urban storm water pollution problems require participation by everyone. Homeowners can help by carefully following directions when applying pesticides and fertilizers, using biodegradable products whenever possible, cleaning up pet wastes, not disposing of household wastes in the street, and fixing oil leaks in vehicles. City sanitation departments can supply information on proper disposal procedures for paint cleaners, used oil, or leftover paint. In addition to developing wetland systems to help treat urban runoff, many city governments periodically sweep roadways to remove wastes. They plant greenways and preserve green space to help filter runoff from streets and parking lots.

Procedure

▼ *Warm Up*

Show students a can or bottle labeled "chemicals" or "oil." Tell students you need to dispose of the chemicals and plan to dump them in the street in front of the school. Ask students if they think this is a good idea. Have students describe what they think will happen to the waste material. Read the first paragraph of the scenario in the **Background**. Ask students what they think might happen to the runoff.

▼ *The Activity*

Following are two options for simulating urban runoff being collected within a storm drain system.

Option 1

1. **Discuss how water is used to clean things, such as the surface of a table after a spill. Relate how rainwater washes the outdoors.** Explain that as it flows over plants, soil, and sidewalks, it picks up and carries away soil and other materials. Inform students that cities use water to clean the waste from city streets and sidewalks. Often the water goes down storm drains, collects in pipes, and flows to a river or a treatment plant. (If a media center or water table is available, younger students can use pieces of tubing and plastic pipe to create a mini-water transport system. They can explore how pipes help water travel over distances by pouring water into one end of a tube and watching it run out in a different location.)

2. **Draw a simple but large maze on the school blacktop (see example on page 222) or arrange the chairs in the classroom to form the maze. The maze represents underground pipes that collect and transport surface water that has flowed down storm drains. Have students run the maze. Inform them they are water flowing through the drainage pipes to the river or treatment plant.**

3. **Discuss sources of water that run into the storm sewer system (streets, lawns, parking lots, etc.). What might this water carry? (Oil from cars, fertilizers, litter.)**

4. **To simulate surface water transporting pollutants into drainage pipes, have several students**

ition themselves along edges of maze. They represent storm ins and the contaminated water ving through them. They should d pieces of self-sticking paper or vls of flour to symbolize the lutants. When other students run ough the maze, the students resenting storm drains stick ces of paper or sprinkle flour to the clothing of the maze ners to represent contaminated ter mixing with water (that may may not be clean) flowing ough the system. Allow students take turns playing different roles.

After several trips through the ze, discuss what happens to this ty water. What if it flows into the er? Can treatment plants process the waste? Have students summa- e why they should not litter.

To represent a treatment system, e two students stand at the maze . Similar to the game London dge, the two treatment students p" each passing water student remove as many pollutants as ible before he or she goes into river. What are students' atti- s about the quality of this water g into the river?

n 2

pare or have students make representing storm pipes g away street runoff. A d pattern is provided on . Build each maze on a piece board covered with wax The walls of the maze are om clay or modeling dough. walls and floors of the maze od glue and allow to dry. one day for clay to dry, and for glue to dry.)

maze should have one Point and two exits. One to a sewage treatment the other flows into a stream. Use a wax pencil to label the exits.

3. Have students list materials people purposefully or inadvertently add to gutters and storm drains. Have students draw a picture of a city street depicting these activities. They can switch drawings with a partner to see if their classmates can identify the polluting activities.

4. Place drops of food coloring, salt water, and sugar water mixed with pepper on different places in the maze. (See *Suggested Maze Pattern.*) Allow one day for the water to evaporate. Drops of oil can also be placed at certain locations. These all represent contaminants added to urban waste systems.

5. Tell students to place a drop of water at the starting point and to tilt the maze so that the drop flows slowly toward one of the exits. Toward which one should they aim?

6. As the drop flows through the paths, it should pick up dye from the food coloring, particles from the salt and pepper, and possibly oil droplets. This represents water moving through a municipal storm water system.

7. When the drop reaches the exit, have students describe what the drop looks and feels like. If it ended in the treatment plant, the drop gets replaced with a clean drop of water. If it ended in the overflow ("untreated water" exit), the drop is added to a cup labeled "stream."

Wrap Up and Action

Discuss the problems associated with untreated urban runoff entering rivers or other bodies of water. Have students identify or research ways contaminated water affects aquatic life and drinking water supplies.

Introduce students to the many actions people can take to limit contaminants entering urban runoff. These include properly disposing of pet waste and litter, and discarding chemicals and oils according to manufacturer's directions. Inform students that many cities have developed systems to treat runoff. Refer to the scenario in the **Background** and read the second paragraph.

Have students contact their local wastewater treatment plant or public works department to determine whether their street runoff enters the treatment plant or if it flows directly into the river or filters into ground water systems.

Students may want to begin a storm drain monitoring program. This involves sending messages to the community illustrating how and why it should monitor what flows down streets into storm drains. Students can design a brochure describing ways individuals can reduce their contribution to surface and ground water pollution via urban runoff. Students can contact recycling centers, wastewater facilities, or their state department of natural resources to research ways individuals can reduce the amount of fertilizers and pesticides they use, choose alternatives to home and garden chemicals, and safely dispose of household wastes. If the city or county recycling office has a hazardous waste collection program, this could be included in the brochure as well.

In addition to the brochure, students can start a stenciling program. Students can make or purchase a stencil (see **Resources**) with a message about monitoring what flows down storm drains (e.g., "DUMP NO WASTE—DRAINS TO STREAM"). The stencils are used to spray-paint the message near neighborhood storm drains. Students can include information about the stenciling and its intent in their brochure, which they deliver to community members who live near the drains. Make sure students obtain permission from city or county public works departments before beginning the project.

Assessment

Have students:

- identify urban sources of pollution (***Warm Up***, **Option 1**, step 3, and **Option 2**, step 3).
- design mazes to simulate storm water drainage systems (**Option 2**, steps 1-4)
- explain why certain materials should not be dumped into the street or used carelessly (**Option 1**, step 5 and ***Wrap Up***).
- design a brochure describing steps individuals and communities can take to prevent surface water contamination (***Wrap Up***).

Extensions

Students can research alternatives to house and lawn chemicals and cleaning agents. Contact the local recycling center, the waste treatment facility, or a local environmental group for details. Invite a representative from the local water treatment plant to enrich the activity. Visit a local gas station and have the manager explain what happens to oil after cars are serviced.

Resources

Cole, Joanna. 1986. *The Magic School Bus at the Waterworks*. New York, N.Y.: Scholastic, Inc.

Environmental Concern Inc., The Watercourse, and Project WET. 1995. Activities "Treatment Plants" and "Water Purifiers." *WOW! The Wonders of Wetlands*. Published through a partnership between Environmental Concern, Inc., St. Michaels, Md., and The Watercourse. Bozeman, Mont.

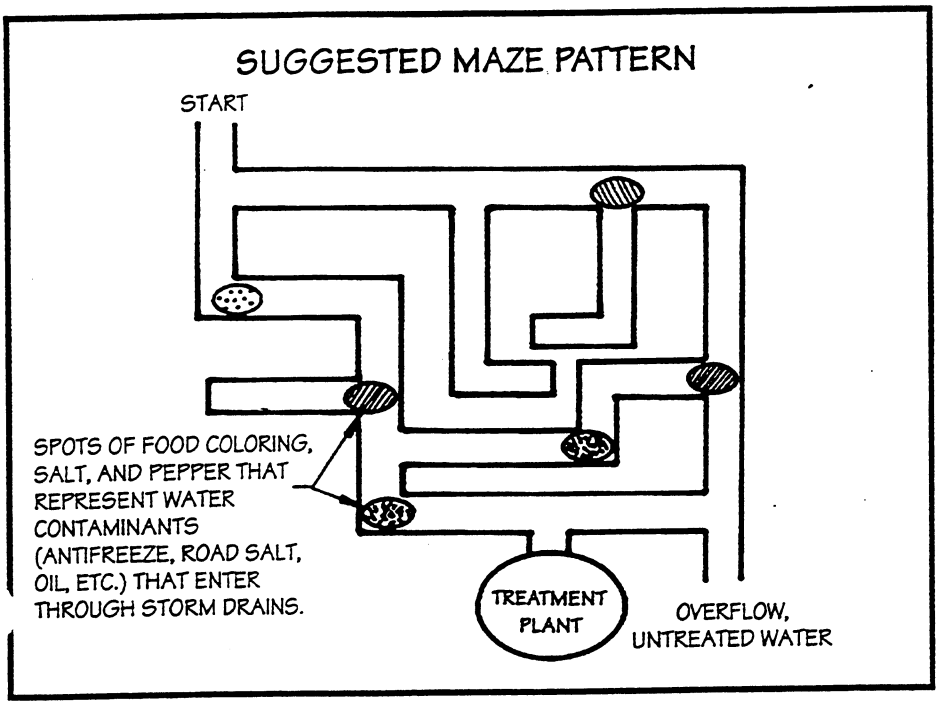
The Water Education Foundation, 717 K Street, Suite 517, Sacramento, CA 95814. (916) 448-7699.

For information on storm drain monitoring and stenciling programs, contact:

Step Coordinator, Oregon Department of Fish and Wildlife, P.O. Box 59, 2501 S.W. First Avenue, Portland, OR 97207.

Earthwater Stencils, 4425 140th SW, Dept. WT, Rochester, WA 98579.

Center for Marine Conservation, 306A Buckroe Avenue, Hampton, VA 23664.



The Rainstick

■ **Grade Level:**
Upper Elementary, Middle School, High School

■ **Subject Areas:**
Fine Arts, Geography, History, Anthropology

■ **Duration:**
Preparation time: 50 minutes
Activity time: up to one week

■ **Setting:**
Classroom or outdoors (This is a messy activity.)

■ **Skills:**
Gathering information (listening); Organizing (manipulating materials); Analyzing (comparing and contrasting); Applying (building); Presenting

■ **Charting the Course**
Other aspects of precipitation are explored in "Poetic Precipitation" and "The Thunderstorm." The effect of climate on cultures is discussed in "Piece It Together." The activity "Water Celebration" also explores cultural influences of water. "Raining Cats and Dogs" demonstrates how cultures express relationships with water through language.

■ **Vocabulary**
rainstick, culture

Can you use the materials around you to create the sound of rain?

Summary

Students build a rainstick out of materials in their own environment and, like people of ancient cultures, imitate the sound of rain.

Objectives

Students will:

- relate the sound produced by an instrument to the type and quantity of materials used in its construction.
- recognize how other cultures create rainsticks from materials found within their own environments.
- imitate the sound of rain with various materials.

Materials

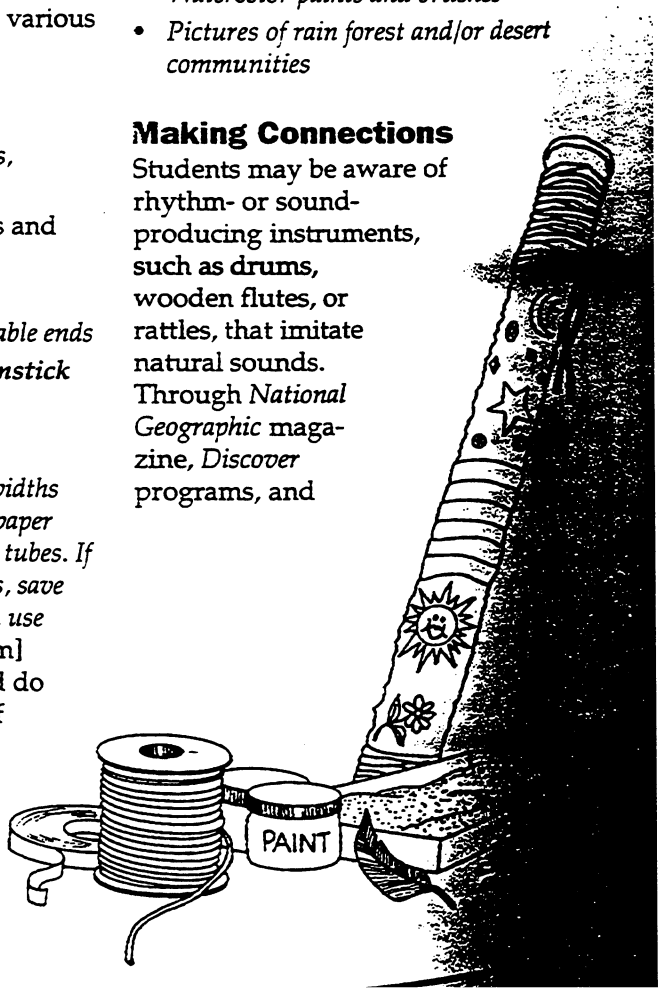
- *Tape recordings of nature sounds, including rainfall*
- *Simple instruments* (e.g., rattles and bells)
- *An actual rainstick* (optional)
- *A premade rainstick with removable ends*
- *Copies of* ***Build Your Own Rainstick***
- *Goggles*

Materials for making rainsticks:

- *Cardboard tubes of a variety of widths and lengths—from toilet paper, paper towels, giftwrapping, or mailing tubes. If these tubes have caps on the ends, save them to seal the tube. Otherwise, use masking tape.* (One-inch [2.5 cm] diameter tubes are sturdy and do not require a large quantity of fill. Paper and mailing supply companies carry tubes.)
- *A tool to make holes in the tube* (If using a drill, select a bit that creates a hole into which a toothpick fits snugly. An awl may also be used to punch holes in the tube.)
- *Toothpicks or other similar thin pieces of material* (Flat-head nails may also be used. With a 1-inch diameter tube, use a 7/8-inch [2.2 cm] nail.)
- *Wood glue*
- *Scissors or wire cutters*
- *Masking Tape*
- *A large quantity* (at least a cup [240 ml] per student) *of dry seeds, beans, pebbles, rice, macaroni, beads, etc.*
- *Funnels* (optional)
- *A variety of materials for decorating the tubes: sand, leaves, twine, yarn, shells, dried herbs, etc.*
- *Watercolor paints and brushes*
- *Pictures of rain forest and/or desert communities*

Making Connections

Students may be aware of rhythm- or sound-producing instruments, such as drums, wooden flutes, or rattles, that imitate natural sounds. Through *National Geographic* magazine, *Discover* programs, and



other media, students may already have made the connection that diverse cultures produce these instruments from elements available within their own environments. Experiencing how ancient cultures developed instruments to imitate the sound of rain encourages students to explore their own perception of water more closely.

Background

The rainstick is a type of tubular rattle, a sound-producing instrument that belonged to the earliest cultures. Throughout time, the rainstick has been used by diverse cultures in various ways. It has served ceremonial purposes and has been made and played by children. People continue to use the rainstick today. In some parts of the world it has cultural meaning as a traditional ·trument associated with the onset :ain, and in other places it is simply played as a percussion instrument.

The rainstick is a hollow tube with an unusual internal structure. An interior matrix formed of cactus spines, wooden pegs, bamboo, or palm slivers distinguishes the rainstick from other tube rattles. The cylinder is filled with pebbles, hard seeds, beans, sand, rice, or tiny shells. The ends of the tube are sealed. The rattle may be decorated with paint and feathers or sheathed with a woven cover.

The rainstick is a product of the environment in which it is found. Rain forest people create rainsticks from bamboo or the midrib of a raphia palm frond. A section of the center stem is cut from the palm frond, split lengthwise, and hollowed out. Material is left at each end of the tube so that the ends are osed. The tube is filled with rice and fastened together with palm slivers.

The palm rainstick imitates the timbre of rain in the forest. Grains of rice tapping against each other, the slivers, and the sides of the tube create the muted sounds of raindrops on ferns, leaves, and the damp forest floor. In desert communities rainsticks have been constructed from various species of cactus.

The sound produced by a rainstick is determined by the material from which the tube is constructed, its length and circumference, the tiny objects enclosed, and the position of the internal needles. The needles or pegs may bisect the tube or only extend halfway through, like the spokes in a wheel.

The way in which the rainstick is "played" affects its sound. Sometimes the tube is shaken like a rhythm instrument. The angle at which the stick is held determines not only the quality but also the duration of the sound.

Some musicologists believe that the rainstick evolved in different parts of the world at the same time. A tubular rattle with pegs has been found in Northern China. However, other investigators maintain that the rainstick was developed in West Africa and introduced to other areas, such as South America, where it is also found today.

Procedure

Warm Up

Ask students to list sounds from the natural environment. Have them listen to music that incorporates these sounds. Guide students to understand that many musical instruments were designed to imitate natural sounds. Have simple instru-

ments on display (e.g., gourd, baby rattle, bell, mouth harp, drum, wooden whistle or flute). Discuss how these are made and the sounds that they produce.

The Activity

1. **Play the rainstick. Ask students what sounds in nature they think the instrument imitates and compare it to recordings of rain.** Another approach is to tell a story about rain or read *The Rainstick, A Fable* and demonstrate the rainstick.

2. **Discuss the use of the rainstick.** Ask students how ancient cultures might have used the rainstick (for ceremonial reasons to celebrate the rain, for musical accompaniment, for children's toys).

3. **Ask students to hypothesize how the rainstick is constructed and what materials were used to make it.** How would using different fill materials affect the sound? Using a premade rainstick with ends that open, ask students to predict the sound before you add new material. Test their predictions. Have students suggest other materials from their environment that could be used to make rainsticks. Have them speculate what materials ancient people in rain forest or desert communities might have used. (Show pictures of these communities for clues.)

4. **Explain and demonstrate how to design a rainstick. Have students build their own rainsticks.** (See *Build Your Own Rainstick.*)

NOTE: Depending on time and students' skill levels, drilling can be done in advance or as part of the activity. If done during class time, adults or responsible students can supervise the drilling at specified work stations. Students can plan how to decorate their rainsticks or write stories or poems about rain while waiting for their sticks to be drilled. Students with drilled sticks can begin the next step. If they use nails, drilling holes is not necessary.

For hearing-impaired students, larger fill material may be used so that the vibrations can be felt. You may obtain clear PVC pipe from a hardware store and get the school shop to drill holes.

Wrap Up

Have students compare the sounds produced by their rainsticks. Challenge students to arrange their rainsticks in order from a *light* to a *heavy* rain. Have them perform a rainstick medley. Discuss how the sound of rain affects people differently. A gentle rain might create a sense of comfort and well-being, whereas a violent storm can evoke fear and anxiety.

Assessment

Have students:

- predict the sound a rainstick will produce based on its construction and fill materials (step 3).
- speculate about the materials that cultures of diverse environments might have used to create rainsticks (step 3).
- build a rainstick (step 4).
- arrange rainsticks on a sound scale (*Wrap Up*).

Upon completing the activity, for further assessment have students:

- express the personal significance or special meaning of their rainsticks.

Extensions

A rainstick can be a type of journal. Students may decorate rainsticks with items that have personal significance. On a field trip students may create a "natural journal" by collecting material and decorating their rainsticks. They may also design rainsticks that reflect particular environments (e.g., an ocean rainstick or a forest rainstick). Caution students to collect materials only where such activity is allowed. Also, feathers should not be collected because of legal restrictions involving most bird species.

This instrument may be used to study sound. Students can investigate how the rainstick's sound varies by changing: the diameter of the tube; the length of the tube; the spacing of the internal pegs; the number of internal pegs; the weight of fill material (a heavy substance like corn compared to a lighter material like rice); or the outer coating of the tube.

Resources

Fraginals, Manuel Moreno, ed. 1984. *Africa in Latin America.* New York, N.Y.: Holmes & Meier Publishers, Inc.

Izikowitz, Karl Gustav. 1934. *Musical and Other Sound Instruments of the South American Indians, A Comparative Ethnographical Study.* Göteborg, Sweden: Elanders Boktryckeri Aktiebolag.

Martin, Claude. 1991. *of West Africa: Ecology Conservation.* Basel, Switz Birkhäuser Verlag.

Nketia, J. H. Kwabena. 19 *Music of Africa.* New Yo W. W. Norton & Com

Robinson, Sandr *Rainstick, A Fable.* P a partnership betw Publishing Co., Inc and The Watercou Mont.

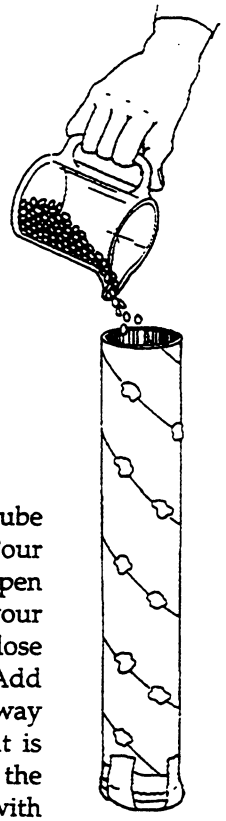
Von Hornbostel *Ethnology of ments." Journ Institute of Afr Cultures* 6 (2)

Build Your Own Rainstick

As people build rainsticks from materials found in the environments in which they live, you too can create your own rainstick with things available within your home.

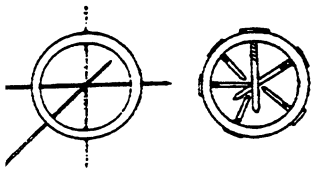
What you'll need

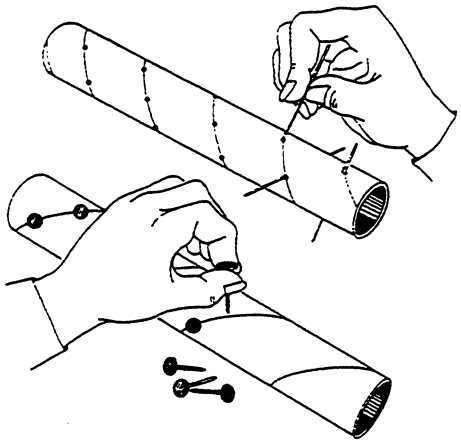
- *Cardboard tubes from paper towels, gift wrapping or mailing tubes*
- *A tool to punch holes in the tube, such as a drill or awl*
- *Small hammer*
- *Toothpicks or flat-head nails* (1-inch diameter tube, 7/8 inch nail)
- *Glue*
- *Masking tape*
- *Wire cutters or sturdy scissors*
- *"Fill" seeds, pebbles, rice, dried beans, shells, beads and so forth.*
- *Materials to decorate the outside of the tube: paint, crayons, sparkles, sand, etc.*



The Steps

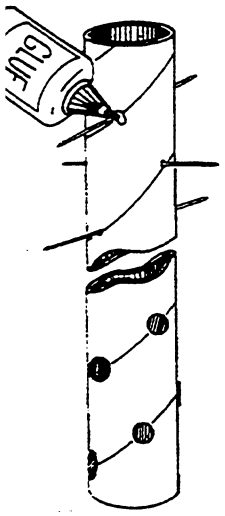
1. Drill or poke holes in the cardboard tube. Be careful not to collapse the tube by pressing too hard. Drill the holes through one side only or all the way through both sides of the tube. If you are using nails, it is not necessary to drill holes.





2. Punch the toothpicks through the holes. Leave a little bit of the toothpick (a nub) remaining outside the tube. If holes were drilled straight through the cylinder, push the toothpick all the way through the tube. Inserting the toothpicks to different lengths will produce a variety of sounds.

If you are using nails, insert nails that are slightly shorter than the diameter of the tube in a spiral pattern. A small hammer may be useful.

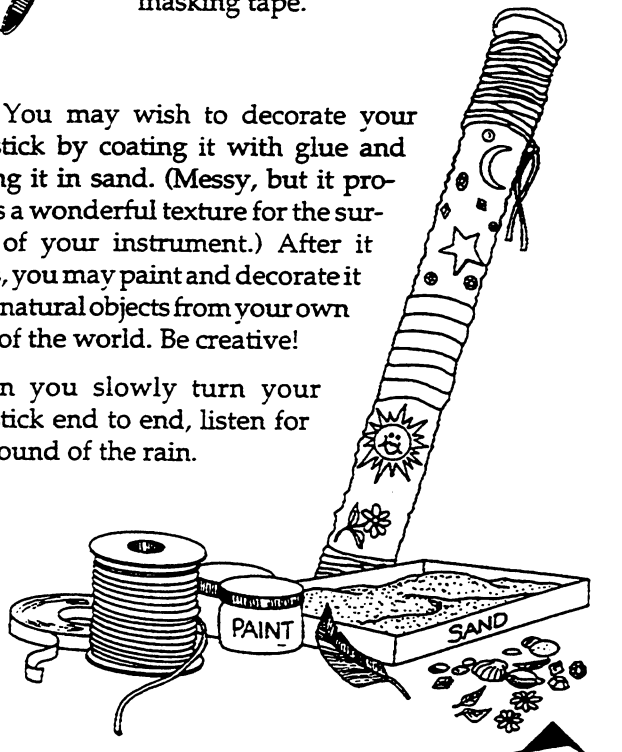


3. Apply glue to the nubs and allow to dry. Cut off the nubs if they stick out more than 1/4 inch from the tube. Or, seal the nail heads with glue or wrap the entire tube with masking tape.

4. Seal one end of the tube with masking tape. Pour in the fill. Cover the open end of the tube with your hand and invert it. Close your eyes and listen. Add more fill or take some away to create a sound that is pleasing to you. Cover the other end of the tube with masking tape.

5. You may wish to decorate your rainstick by coating it with glue and rolling it in sand. (Messy, but it provides a wonderful texture for the surface of your instrument.) After it dries, you may paint and decorate it with natural objects from your own part of the world. Be creative!

When you slowly turn your rainstick end to end, listen for the sound of the rain.



RAINSTICK ACTIVITY

SUPPLEMENTAL GUIDANCE

IMPORTAINT – **DO NOT HAND OUT CRAFT MATERIALS UNTIL AFTER YOUR 5-10 MINUTE INSTRUCTION ON, WATER AND ITS RELATIONSHIP TO PLANTS, ANIMALS AND DIFFERENT CULTURES**

SUGGESTED TOPICS TO DISCUSS:

- **EXPLAIN THE CONCEPT OF CLEAN WATER AND IT'S IMPORTANCE TO US.**
- **EXPLAIN THE MANY DIFFERENT THINGS WE DO WITH CLEAN WATER (drink it, bath, fish, swim, water plants, etc)**
- **EMPHASIZE HOW ALABAMA IS FORTUNATE TO HAVE ABUNDANT CLEAN WATER {NUMEROUS SPRINGS, RIVERS, LAKES, RAINFALL (50-80 inches per year)}**
- **SOME PARTS OF THE WORLD ARE NOT SO LUCKY (DESERT REGIONS OF THE WORLD)**
- **EXPLAIN THE CONCEPT THAT WATER CONNECTS ALL LIVING THINGS – FOOD WEB, OUR BODIES MADE UP MOSTLY OF WATER (app. 75%)**
- **WITHOUT CLEAN WATER TO DRINK PEOPLE WILL NOT SURVIVE LONGER THAN A FEW DAYS.**
- **PEOPLE IN DESERT REGIONS OF THE WORLD MAY RECEIVE ONLY 2-3 INCHES OF RAIN PER YEAR.**
- **MANY CULTURES FOCUSED ON THE IMPORTANCE OF WATER AND THE RAINY SEASON. (BRINGS LIFE TO THE DESSERTS, PLANTS BLOOM AND FRUIT, PONDS FILL WITH WATER.**
- **SOME OF THESE CULTURES CELEBRATED THE COMING OF THE RAINS WITH DANCE AND MUSIC. ONE OF THE INSTRUMENTS THEY MADE WAS CALLED A RAINSTICK. (SHOW CHILDREN EXAMPLE OF A RAINSTICK THAT YOU HAVE ALREADY MADE. ASK THEM TO LISTEN TO THE SOUND IT MAKES.**
- **PASS OUT THE MATERIALS TO THE STUDENTS, ASK THEM TO DRAW THINGS THAT HAVE SOMETHING TO DO WITH WATER AND THAT TELL A STORY – HOW IS WATER CONNECTED TO THE OCEANS, THE SKY, THE SOIL, THE RIVERS, ANIMALS, PEOPLE ETC., (ask the teachers to help pass out supplies and assist the students).**
- ***NOTE –MAKE SURE ENDS OF TUBES ARE TAPED BEFORE PUTTING THE "RAIN" INTO THE RAINSTICKS. (RICE TENDS TO WORK BEST (fill the tube with Styrofoam peanuts and add no more than a quarter cup of rice, beans, and or macaroni combined).**
    - **It is best to pre-cut the yarn and tape for the ends of the tubes**
      Give only two feathers per student. ---You choose the colors!!!!!
- **IF TIME ALLOWS: ASK EACH STUDENT TO SHARE WITH THE CLASS THE DRAWINGS ON THEIR RAINSTICKS.**

Water Under Foot

[Adapted from "There Is No Away" in Living Lightly on the Planet *by Maura O'Connor, National Audubon Society, 1989. Used with permission of Schlitz Audubon Center, 1111 E. Brown Deer Road, Milwaukee, WI 53217. The Hazard Cards and all references to wetlands were added.]*

Grade Level
4-12

Subject Areas
Environmental Science

Duration
1 hour, plus setup time

Setting
Classroom

Skills
Gathering and interpreting information

Charting the Course
Precede this activity with "Soak It Up!" for a look at how wetlands are supplied with water. Try "Do You Dig Wetland Soil?" and "How Thirsty Is The Ground?" later to study wetland soil types and what makes them unique.

Vocabulary
aquifer, percolation, leach, ground-water discharge, ground-water recharge

Summary

Students make a ground-water model and demonstrate its relationship to the land and to wetlands.

Objectives

Students will:

- describe ground water as part of the water cycle.
- visualize how ground water is stored in an aquifer.
- describe the relationship between ground water and wetlands.
- explain how discarded materials leach from land and contaminate ground water.

Materials

- *clear, flat-bottomed container (e.g., glass or plastic aquarium from Delta Education [see Resources])*
- *enough sponges to cover bottom of container*
- *scissors*
- *watering can full of water*
- *5 clear jars*
- *red and blue food coloring*
- *meat baster*
- *2 quarts sand for each demonstration (replace each time)*
- *Hazard Cards*
- *clean, empty containers from consumer products (described on the cards)*
- *paper and pencils*

Prepare the model for the demonstration. Fill the clear container no more than two-thirds full of sand. Place a layer of sponges on top of the sand to represent topsoil. (Soil is not used because it will discolor the water and prevent the results from being clearly visible.) Elevate one end of the container to create a slope. Mix approximately 10 drops of red and blue food coloring (separately) in two jars filled with ¼ cup of water each. These solutions will represent pollutants in step four of the activity.

Making Connections

Often, what is out of sight is out of mind. Students may not think of water once it seeps into the ground. Likewise, they may think only of surface water when they consider water pollution. An investigation of the role of wetlands in replenishing the ground-water supply and reducing pollution helps students appreciate a hidden resource.

Background

Ground water is an important component of the water cycle, especially in terms of its contribution to clean drinking-water supplies. Half of the United States' freshwater supply comes from ground water. Wetlands can help replenish the ground water stored beneath them. Ground water, in turn, helps sustain many wetlands by keeping them saturated.

Ground water is stored underground in sediments or water-bearing rock layers called aquifers. Rainwater percolates down through the topsoil and is stored in pore spaces between soil, sand, gravel, and rock material below. Aquifers can be found just below the surface of the ground (as in many wetlands) or much deeper. In some places, wells must be at least 100 feet deep to reach an aquifer.

When the aquifer beneath a

wetland is at or very near the surface, ground water feeds the wetland from below. During periods of dry weather, ground water also seeps into rivers, lakes, and wetlands and helps maintain their water level. This is called ground-water discharge. Conversely, when the ground-water level is low, any rain and runoff that collects in a wetland will trickle down to the aquifer and replenish it. This is called ground-water recharge.

In some highly populated areas, the demand for water is so great that the water stored underground is used up more quickly than it can naturally be replenished. The recharge and discharge functions of wetlands help prevent this situation. However, much of the wetland acreage in such developed areas has been filled or paved over, and this important benefit is lost.

The health of wetlands affects the quality and quantity of our water supply. Improperly used or disposed substances can leach through soil to contaminate the ground water and, ultimately, our drinking water. In many areas there have been incidences of illness due to contaminated drinking water. When wetlands are degraded because of their association with contaminated ground water (as well as from substances deposited with runoff), their important cleansing functions can be diminished or lost.

The government has begun to regulate the disposal of toxic substances as well as the construction and operation of landfill dumps. Each of us should also become aware of ways we can avoid contributing pollutants to the environment.

Procedure

Warm Up

Ask students to describe what happens to water after it percolates into the ground. Where might it end up? In many communities, it may end up in someone's water glass! Do students think wetlands are related to ground water? How might wetlands affect ground water. Have students present possible connections.

Present students with the following scenario:

Jessica has just changed the oil in her car. What should she do with the old oil? What would happen if she poured it in her backyard?

Have students express their views about Jessica's action. Tell students that the following demonstration will help them visualize the effects of pollutants leaching into ground water.

The Activity

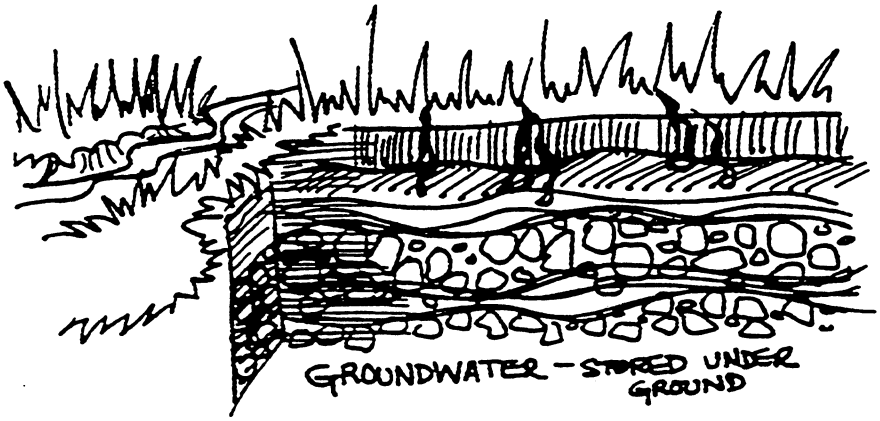
1. **Have students gather around the model to investigate the role of aquifers. Explain that the layer of sponges represents the topsoil, the layer of sand represents an aquifer, and the bottom of the container represents a layer of bedrock. Use the watering can to sprinkle a few cups of "rain" on the model. Note how the "topsoil" becomes saturated, and how the water percolates down into the aquifer. Continue sprinkling until the model is saturated, but not to the point of creating standing water. Explain that ground water is not visible because it is stored between the pore spaces in the sand.**

Note: It takes a few minutes for the water to percolate down into the sand. Do not add water too quickly or, before you know it, the model will contain standing water and you will have to begin again.

2. **Designate an area of sponge near the lower end of the model as a wetland. Discuss how wetlands aid in replenishing ground water and how they are also fed by ground water. Pour some rain directly onto the wetland area and watch how it eventually soaks through to the ground water. This demonstrates ground-water recharge, the wetland supplying water to the ground-water supply.**

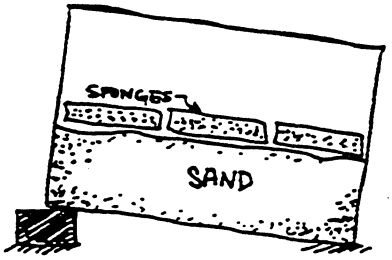
3. **Relate the sponges' absorbing action to the way the wetland is fed with water from below. Pick up a sponge and wring it out. Put it back on the saturated sand to soak up more water, then wring it out again. This is ground-water discharge. Ground water is released or absorbed into the wetland.**

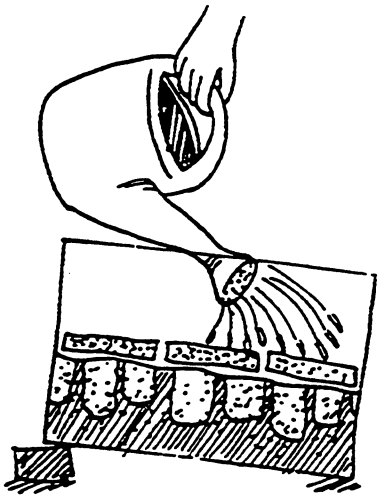
4. **At the lower end of the model (near the wetland), use a meat baster to simulate a town well pumping water from the aquifer.**

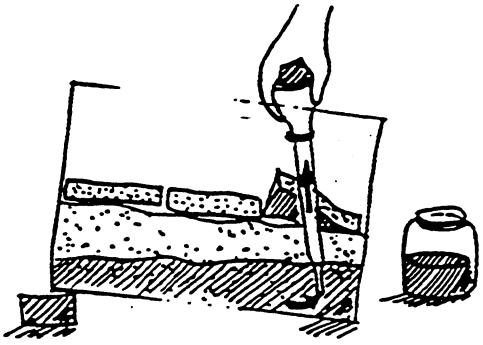


Place some of the pumped water in a clear jar. Some sand will also come up, but it will settle to the bottom of the jar. Ask how the wetland "helps" the well and explain that it does so by replenishing the water supply, especially during dry seasons when other surface areas dry out more quickly.

5. Introduce the idea of pollution from household products. Divide the class into groups and give each group one of the product



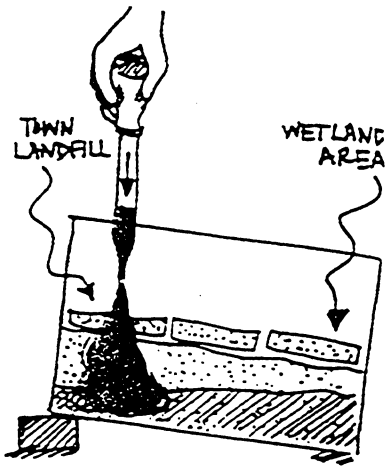


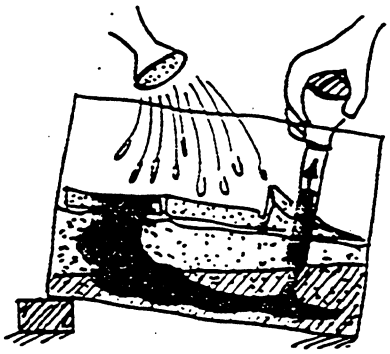


samples and the corresponding Hazard Card. Give them a few minutes to decide how that product was improperly disposed of or poorly used. Remember: Pollutants are often dumped or applied directly onto the land—they do not always leach from landfills!

6. Develop a scenario for your model, one to which your students can relate. Make up a name for the town or use the name of a town in your area. Include the students as characters: uninformed citizens who pollute. Designate the sponge surface at the elevated end of the model as the town's landfill. Remind the class that the lower end is a wetland that replenishes the town's ground-water supply, and is in turn replenished through ground-water discharge. Ask them to describe some other benefits this wetland gives the town.

7. Have students use the meat baster to drop samples of the colored pollutants onto the landfill and other areas designated as yards, parking lots, and so on. Call on a representative of each group to present the group's product to the class: how it has been misused or discarded (one of the choices on the Hazard Cards), and how the product might leach into the ground. For example, a student might hold up a bottle of cleaning fluid and say, "I bought this triple-strength spot remover which removed the spot so well that it put a hole in my carpet! I then threw it in the trash can, but the lid was loose and the container was not well wrapped, so it leaked at the dump." The student would then drop some colored solution onto the model. Repeat for each group. *[This part adapted from "The Drain Game" in*





Bay B C's: A Multidisciplinary Approach to Teaching about the Chesapeake Bay by Britt Slattery, U.S. Fish and Wildlife Service, 1989]

8. When all the groups have presented and added their pollutants, simulate rain by sprinkling water over the model's surface. As the food coloring soaks through the sponge layer, suggest that the rain is washing pollutants away. Ask: Where is "away"? Is the pollutant really going away? Then use the baster to pump some water from the town well. What has happened to the ground water? The pollutants have leached or percolated down through the topsoil into the aquifer.

9. Keep pumping water out of the well until the well runs dry. Then add more rain and see if the added water is purer when it is pumped from the well. It will still be colored. Make the point that

once ground water is polluted, it is very difficult to clean it up.

Draw students' attention to the wetland. Has anything happened to it? Some of the pollutants may have spread or run off along the surface into the wetland area, contaminating it. (If this has not occurred, remind the class that it could.) Toxic substances can kill plants and animals in a wetland, and may destroy the wetland—and its beneficial functions—altogether. Review the idea that ground-water discharge can pollute a wetland. As contaminants accumulate in a wetland, they can spread back into the ground water through ground-water recharge when it rains. Be sure the class understands that this residual effect is not the "fault" of the wetland—thoughtless human activity caused the problem!

Wrap Up and Action

Discuss a few of the other improper disposal choices on the cards. Why are these wrong? What harm will these actions cause? Discuss some ways to prevent this sort of pollution. Use the answers on the backs of the cards for help.

Have students sketch a ground-water system, identifying the role of wetlands in the system.

Can students think of other ways to keep such pollutants out of the water? *Hint:* Wetland plants and soils filter out many pollutants before the pollutants can enter the ground water.

Students can develop a nontoxic/safe disposal brochure to distribute to friends and family.

Assessment

Have students:

- sketch the location and functions of topsoil, an aquifer, and bedrock in a ground-water system.
- describe the function of wetlands in ground-water discharge and recharge.
- discriminate between correct and incorrect disposal of hazardous wastes.
- identify ways to prevent ground-water contamination.

Extensions

- Look in the government listings in the phone book (under "Public Works") for offices of landfills and utilities (sewer collection, wastewater treatment, etc.). Call your state, county, or city office of waste management to arrange a visit to a nearby landfill. If possible, arrange to have someone at the facility talk with the students briefly about how the trash is handled. Is the trash crushed? Can toxic substances leak out of well-wrapped containers? Is leaching a problem? What procedures do they recommend for disposing of potentially harmful products? Are there facilities to handle hazardous waste? Does the city or county offer special collection for hazardous waste?

Before the visit, have the class locate the facility on a topographic map. Locate nearby waterways and wetlands that might be harmed by runoff from the landfill. If you have time and a nearby site is accessible, check out its water when you visit the landfill (you may be able to make arrangements through the landfill staff). Bring a small jar to collect a water sample. Use some of the water-quality tests in this book or take the sample to a lab for analysis. What have you found out? Are students now more willing to change the products they use and the ways they dispose of them?

- Ask the office of municipal wastewater treatment in your area if any facilities use wetlands to treat wastewater. This method of treatment using natural systems was developed at NASA in the mid-1970s. Today there are more than 100 created marsh and aquatic systems treating municipal sewage in the United States. Have older students research the communities that use constructed marshes to treat their wastewater. Could something similar be done in your community? Hundreds of other constructed marshes are used to treat the highly acidic water that flows from coal mine sites. Is there a mine in your area that the class could visit? Call your state's department of natural resources or environmental management for mine information.

Nature in Your Neighborhood

Make a list of chemicals and other products used in your home. Check the kitchen, bathroom, laundry room, and garage. Read ingredients and warnings listed on the labels. Could any of these products be harmful to the environment? Many companies' labels now include information for the safe use and disposal of the product and container. Is your family using and discarding things carefully?

Ask your family members to discuss which of these products they might do without, or more natural substances they might use instead. If your family shares your concern, participate in the next shopping trip by reading labels to help your parents decide on safer

Association of Ground Water Agencies (AGWA) Presents...

Hydro Van Gogh

the aquifer's personal artist

Overview:

This activity for children of all ages has two parts: instruction and practice. The instruction involves learning about the aquifers—rivers of water that flow underground. The practice gives children the opportunity to become Hydro Van Goghs by painting an aquifer. Children also learn about groundwater contamination and how to protect the groundwater.

Materials:

aquifer map and/or aquifer model
5" x 7" artists canvas panels
oil pastels

Learning Objectives:

- Hidden below ground are aquifers that hold huge quantities of water
- Aquifers are fed by surface water and underground streams
- Cities pump the water in aquifers to give us clean water to drink and bathe in
- Like water seeps through the ground to the aquifer, so can dangerous contaminants

Time Required:

20-30 minutes

Instructions:

Using a map of an aquifer and/or an aquifer model, explain how an aquifer works, pointing out the different layers. If using an aquifer model, pour water in to show how water seeps into the difference layers. Then pour in colored water to show how contaminants also seep into the ground and contaminate the water.

Pass out a artists canvas panel to each child and one set of oil pastels for 2-3 children.

Talk about how they draw pictures of what their world looks like around them: they draw their family trees, animals, houses, etc. Now ask them to imagine that they're not a kid, but a drop of water. As a drop of water that lands on the ground and is seeped into an aquifer, ask them to draw what their world looks like.

Encourage each Hydro Van Gogh to take their masterpiece home to explain why it is important to protect aquifers to their family.

Appendix B

FESTIVAL FACTSHEET

Mission Statement: To educate students and their families about all aspects of groundwater and other related natural resources (i.e., surface water, wetlands, forestry, wildlife, etc.) and to instill in them a general environmental awareness and stewardship ethic.

History of Alabama's Groundwater Festivals - In 1997 the Alabama Department of Environmental Management (ADEM) granted the University of Alabama in Huntsville (UAH) with seed money to organize Alabama's First Groundwater Festival. ADEM's goal in this project was to educate children and communities as to where their drinking water comes from, how to protect it and keep it clean for future generations. An Advisory Committee was formed to plan the Festival in Madison County. Because the Festival was a great success, other counties are now planning to host Groundwater Festivals in their communities. On May 10, 1999, Limestone County will hold its first Groundwater Festival. Colbert and Lauderdale Counties will offer a joint Water Festival on March 25, 1999 and Madison County's Second Annual Groundwater Festival will be held on May 12-13, 1999.

Who attends the Festival? The Festival is offered for fourth grade students and teachers. It is felt that this age group is able to understand groundwater concepts, while still young enough to form their own value system. Approximately 5,000 students will receive fun and innovative messages of environmental stewardship and awareness during this event. Each class participates in three hands-on groundwater activities and attends an exciting magic show by environmental magician, Steve Trash, who performs water magic tricks and illusions for the students.

Festival Schedule – The Groundwater Festivals will be a one-day, free, event for fourth grade students and teachers. Upon arrival to the Festival, a volunteer will greet each class at the parking lot and will act as "Tour Guide" for the day. The Tour Guide will take the class to all their events/activities so that no one will get lost or confused as to where to go. The classes/students will attend three 30-minute hands-on activities. There is a 5-minute break in between each activity to allow the classes time to walk to the next activity room. After the third activity, the classes have a 30-minute restroom break and to walk to the magic show. Steve Trash's magic show performance lasts 45 minutes. Following the magic show the classes board the buses and return to school.

Festive activities will be intermingled into the children's scheduled day of classroom sessions, allowing them to participate in water related experiments, activities, and entertainment designed to help them retain the environmental principles of water.

What do the students, teachers, and volunteers receive? Every student, teacher and volunteer receives a free Groundwater Festival t-shirt. A t-shirt design contest is open to all the students attending. The winning entry's design will appear on the printed t-shirts and the winner will receive a $50 savings bond. Each student also receives a bag filled with activity books and other goodies. In addition, each teacher receives a bag filled with free posters, curriculum, booklets, and other environmental educational material.

ACTIVITIES AND ENTERTAINMENT

Hands-on Activities

The activities include 30 minute sessions that are repeated throughout the day. Each student will participate in three hands-on groundwater or surface water activities and attend a magic show. The following are examples of activities presented at the festivals.

Aquifer-in-a-Cup – Students build an aquifer and learn what an aquifer is, how it works, what non-point source pollution is, and how toxic wastes effect our groundwater.
Water Under Foot – Students learn about the water cycle and the relationship between groundwater and surface water.
Filtration – Students learn how pollutants enter our water supply and how difficult it is to remove the pollutants.
Water Balance – Students learn about the balance between how much rain goes into and out of the soil.
Endangered Species of North Alabama – The Fish and Wildlife Service presents an activity that teaches the students about endangered species.
Water Necklaces – Students learn about the water cycle by making water cycle necklaces.
Hydropower – Students will learn how water is used to create electricity for use throughout the state.

Objectives of the Activities

Students learn:

- The role of surface and groundwater in the water cycle
- The importance of water to all life
- The interdependence of plants, trees, wildlife, soil and water
- The effect of human actions on water and all nature
- That all individuals need to act environmentally responsible

Entertainment

Each student will attend a 45-minute performance by Steve Trash, a wonderful and dynamic entertainer who will perform magic tricks and illusions with the students. Steve Trash has traveled all over the world (Japan, Australia, England, Canada, Greenland) performing magic and teaching about the environment.

FINANCIAL NEEDS STATEMENT

1999 Limestone County Groundwater Festival	
Activity Supplies	$3,500
Food/Beverages	$1,025
Teacher Guides	$600
T-shirts	$4,500
Savings Bond (Logo contest winner)	$100
Decorations	$200
Entertainment (Steve Trash, magician)	$1,200
Total Projected Budget	**$11,125**
1999 Colbert/Lauderdale Water Festival	
Activity Supplies	$3,500
Food/Beverages	$1,025
Teacher Guides	$1,025
T-shirts	$7,500
Savings Bond (Logo contest winner)	$100
Decorations	$200
Entertainment (Steve Trash, magician)	$1,200
Total Projected Budget	**$14,550**
1999 Madison County Groundwater Festival	
Activity Supplies	$2,000
Food/Beverages	$2,000
Teacher Guides	$1,025
T-shirts	$12,000
Savings Bond (Logo contest winner)	$100
Decorations	$200
Entertainment (Steve Trash, magician)	$2,400
Total Projected Budget	**$19,725**

FESTIVAL SPONSORS AND PARTICIPANTS

Sponsors

Fundraising for the 1999 Groundwater and Water Festivals is currently underway. Sponsors of the 1998 Groundwater Festival were ADEM, UAH, Madison County Commission, Harvest-Monrovia Water Authority, Alabama Rural Water Association, Alabama Water Pollution control Association, Alabama Water Environment Association, city of Madison Waste and Water Board, TARCOG, G.W. Jones & Sons Engineering Firm, Ogden Environmental & Energy Services, The Huntsville Grotto, Miller Drilling Company, Inc. Hughes Supply, Regions Bank, Huntsville Utilities, Domino's Pizza, Kentucky Fried Chicken, Burger King, Wendy's, and the Huntsville Botanical Gardens.

Volunteers

More than 100 presenters and volunteers contributed their time and energy to make the 1998 festival possible. The following are organizations represented by the volunteers:

Alabama Department of Environmental Management
University of Alabama, Huntsville
Madison County Water Department
City of Madison Waste and Water Board
Master Gardeners
Ogden Environmental & Energy Services
Huntsville Utilities- Water System
Alabama Fish and Wildlife Services
US Army Missile Command
Flint Creek Watershed District
Alabama Rural Water Association
USDA- natural Resources and conservation Service
Tennessee Valley Resource conservation and Development council
Alabama Forestry Commission
Madison County Commission
Top of Alabama Regional Council of Government (TARCOG)
Earth Team Volunteer Program
CAWACO RC & D
Limestone County Soil & Water conservation District
Harvest Monrovia Water Authority

Participants

Twelve schools from Madison County School System participated in the 1998 Children's Groundwater Festival

Questions

Contact Vanessa Colebaugh at 256-922-5747 or via e-mail at vanessa@atmos.uah.edu

SPONSORSHIP FORM

Contribution Levels

Gold Level	$1,000.00 & up
Silver Level	$500.00 & up
Bronze Level	Contribution under $500.00

With a $200 or more donation your organization's logo will appear on the festival t-shirts, which are given to all students, teachers, volunteers, and sponsors. Gold and Silver Level sponsors will be invited to a VIP breakfast on the day of the festival, followed by a VIP tour of the event. Gold Level sponsors will also be given the opportunity to display its organizations banner at the Festival.

****

☐ Yes, my organization would like to provide financial support for the Children's Groundwater Festival.

☐ Yes, my organization can provide in-kind donations.

☐ No, my organization will be unable to participate at this time.

_____ Level Amount of Contribution $_____
Indicate Support Level

Groundwater Festival to Contribute To _____
Limestone, Colbert/Lauderdale, or Madison County

Contributor's Name (Contact) _____

Name of Organization _____

Address _____

City, State & Zip _____

Phone: ( ) _____

Fax No.: ( ) _____

Mail Sponsor Form to:
Vanessa Colebaugh
University of Alabama in Huntsville
Earth System Science Laboratory
Huntsville, AL 35899
Make checks out to UAH Groundwater Festival

VOLUNTEERS

General Concept

The Children's Groundwater Festival is designed to accommodate approximately 950 fourth grade students at the Limestone County Festival, 1800 fourth grade students at the Colbert and Lauderdale County Festival, and 2,400 fourth grade students at the Madison County Festival. For an event of this magnitude to be successful, the assistance of many dedicated individuals is needed. Festival volunteers are called upon to lead, as well as serve in many different capacities. A volunteer base of over 100 for each festival is vital to a smoothly run event. Please review the following volunteer descriptions and then decide where you would best serve the many wonderful children attending the 1999 Children's Groundwater Festival.

Volunteer Descriptions

Classroom Presenters – Classroom presenters are needed to demonstrate and teach the following activities: aquifers, wetlands, filtration, surface water, water table, water cycle, and endangered species. There will be at least two presenters per room. Each presenter will attend a training session to learn how to teach their activity to the students. A free dinner will be provided at the training session. Each activity is 30 minutes and will be presented 6 times throughout the day.

Tour Guides – The role of the tour guides is to greet the classes of students as they arrive at the festival. Each tour guide will take one class to all their events/activities throughout the day so that no one will get lost or confused as to where to be. A training session will be held for the tour guides to familiarize them with the campus and the organization of the festival.

Teacher Resource Room – Volunteers are needed to organize the teacher materials that are given to the teachers. There will be many materials to organize and to stuff in bags.

Magic Show Escorts – Volunteers will escort the classes to their seats in the gymnasium for the magic show.

Bus Transportation – Volunteers are needed to help unload and load students from the buses at the drop-off and pick-up locations.

Food – Volunteers are needed to set and clean-up the lunch provided to all of the volunteers.

Runners – Runners are needed to check on the activity classrooms to make sure that the presenters have all the materials needed.

Benefits

The volunteers are an integral part of the festival. As a volunteer, you will be provided with a free lunch and a Groundwater Festival t-shirt. Most importantly, you will gain the satisfaction of contributing to make this a great day of fun and learning for the Tennessee Valley area children.

How Do You Become Involved?

If you decide that you would like to serve as a volunteer, please complete the Volunteer Form in this packet and return to the address provided.

Questions

Contact Vanessa Colebaugh at 256-922-5747 with questions.

VOLUNTEER FORM

_____ Yes, I would like to take part in this year's Children's Groundwater Festival

_____ No, I will be unable to participate in this year's event

Preferred Area of Participation

____ Classroom Presenter

____ Tour Guide

____ Magic Show Escort

____ Food

____ Teacher Resource Room

____ Bus Transportation

____ Runner

Groundwater Festival to volunteer for is: _____
(Colbert. Lauderdale, Limestone, or Madison county)

Colbert/Lauderdale Water Festival – March 25, 1999
Limestone County Groundwater Festival – May 10, 1999
Madison County Groundwater Festival – May 12-13, 1999

Volunteers Name: _____

Name of Organization: _____

Address: _____

City, State, & Zip: _____

Phone: ( ) _____

Fax: ( ) _____

Mail volunteer Form to:
Vanessa Colebaugh
University of Alabama, Huntsville
Earth System Science Laboratory
Huntsville, AL 35899

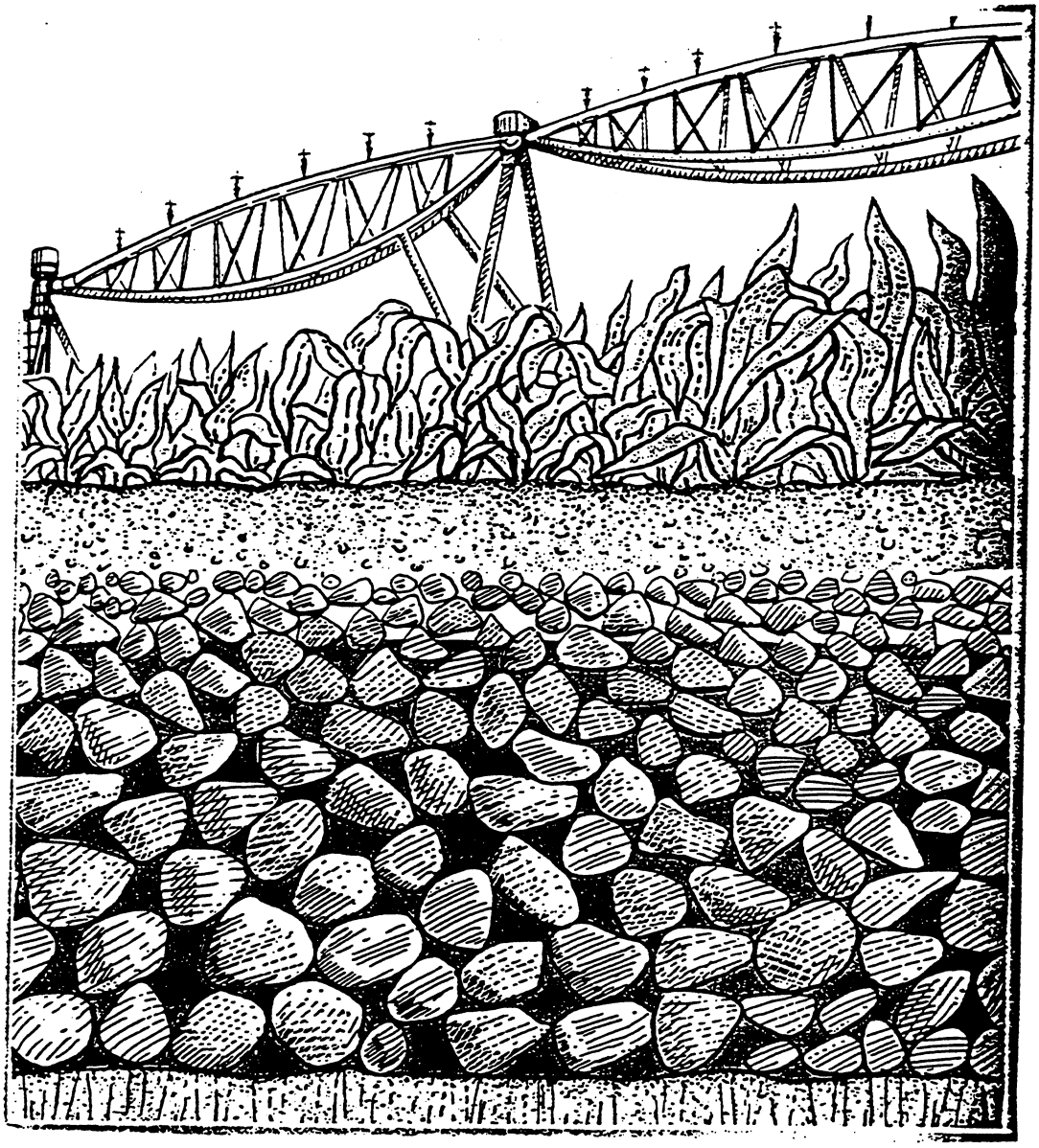
PLANNING COMMITTEE AND CONTACT LIST

Appendix C

TEACHER'S PACKET

1999 Water Festival

Colbert/Lauderdale Counties



March 25, 1999

Northwest Shoals Community College

1999 WATER FESTIVAL TEACHING PACKET

WELCOME TO COLBERT & LAUDERDALE'S FIRST ANNUAL WATER FESTIVAL!

In this packet you will find information and activities to prepare you and your class for the Water Festival. You may also wish to do some activities after the Festival. The packet includes groundwater definitions, terms and maps; classroom activities; and "Puddle Pictures" games; a list of songs about water; water and environmental quotes and a bibliography and resources list.

SUBJECT OUTLINE

Below is a suggested outline for a unit on groundwater. Some of the concepts are covered in the activities in this packet. Please see the resources and bibliography list for additional activity information or call Ms. Vanessa Colebaugh, Groundwater Festival Coordinator at 922-5747 if you need additional sources or activity ideas.

I. The Nature of Water
   - A. Hydrological Cycle
     1. Amounts of water
     2. Forms (fresh, salt, frozen)
   - B. Water makeup
     1. Solid, liquid, gas
     2. Universal solvent
   - C. Goundwater
     1. Aquifers (confined, unconfined)
     2. Wells
   - D. Surface water

II. Water Uses
   - A. Home
   - B. Agricultural, Industrial
     1. Irrigation
     2. Transportation
     3. Manufacturing
   - C. Recreational
   - D. Uses in the environment
     1. Plants
     2. Animals

III. Water Issues
   - A. Quantity
     1. Drought
     2. Flooding
     3. Interstate water transfers
     4. Water Rights
     5. Dam Building
   - B. Quality
     1. Contamination/Pollution
        - a. Point and Nonpoint Source Pollution
        - b. Leaky underground storage tanks
     2. Agricultural Uses
        - a. Sediment, Erosion
        - b. Chemigation
     3. Hazardous Wastes
        - a. Landfills
        - b. Radioactive dump sites
     4. Environmental Disasters
        - a. Oil Spills
        - b. Disappearance of wetlands

IV. Water Conservation

WATER TERMS

- **Groundwater:** Water located below ground level.
- **Surface water:** Water found in rivers, streams, lakes, oceans.
- **Aquifer:** Underground water is stored in dozens of reservoir-like layers. Most of the water in aquifers is contained in beds of sand, gravel or other materials and can be pumped to the surface.
- **Acre-foot:** The acre-foot is the equivalent of 325,851 gallons and will cover an acre one foot deep.
- **Depletion:** Water supplies that are being used up, gradually in most cases, without being replaced.
- **Recharge:** This refers to putting water back into the ground, via rainfall or melting snow. Water from passing rivers and streams also percolates downward.
- **Mining:** If you take more water out of the ground each year than you put in, it's mining. We are taking five to six million acre-feet of water a year from underground sources, while restoring only about one million acre-feet.
- **Water table:** This refers to the position of the underground water or the depth to which you must drill to reach it. The water table may be a few feet down, or hundreds of feet. The depth depends in part on the amount of water that has been removed.
- **Impoundment:** Water can be seized or impounded in storage areas known as reservoirs, behind dams. Impoundment prevents flooding and allows for irrigation, recreation and power generation.
- **Watershed:** Imagine a maple leaf. The stalk in the leaf is a river such as the Tennessee. The veins threading into the stalk are the tributaries flowing into the river. The complete leaf represents a river drainage system or watershed.
- **Contamination:** This is any physical, chemical, biological or radiological substance found in a water source. Contaminants can be naturally occurring, or human made.
- **Hydrologic cycle:** The endless circulation of water between earth and the atmosphere, the cycle uses the same amount of water now as a million years ago.
- **Protection:** These steps taken to protect current or future releases into the ground or groundwater.
- **Saturation:** The region below the ground surface which all pore spaces are filled with water. The upper surface of this zone is known as the water table.

Activity 33
Water Conservation
Nature's Waterwheel

Subject Area: Science

Objectives:
1. The students will be able to identify and describe what groundwater is.
2. The students will be able to identify and describe how the hydrologic cycle operates.

Suggested Grade Level: 5-6

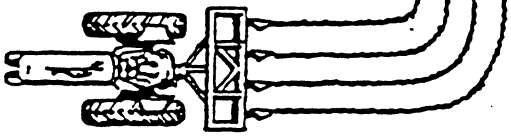
Background: Hydrology is the study of the movement and distribution of the waters of the earth. In nature, water circulates through a system called the water cycle or hydrologic cycle. This cycle begins when heat from the sun causes ocean water to evaporate and become water vapor. The atmosphere holds the water vapor while the vapor gradually cools and forms clouds. The water eventually falls as rain or snow. Most rain and snow falls back into the oceans. But some falls on the land and flows back to the seas or soaks into the land (groundwater) which eventually is used by nature and transpires or evaporates into the air completing the cycle.

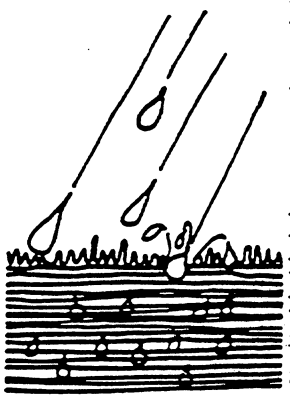
There are two main sources of fresh water: surface water and groundwater. Surface water flows over the land in lakes, rivers, and streams. Groundwater seeps through the soil or through cracks and cavities in rock.

Groundwater is water beneath the surface of the earth. It is the source of water for wells and springs. Groundwater provides much of the fresh water in the United States. Most rural areas and some cities depend heavily on groundwater for their needs.

Groundwater accumulates chiefly from rain that filters through the soil. It also forms from water that seeps into the ground from lakes and ponds. The water settles into the pores and cracks of underground rocks and into the spaces between grains of sand and pieces of gravel. A layer or bed of such porous materials that yields useful amounts of groundwater is called an aquifer. Wells are drilled down to an aquifer to draw groundwater to the surface.

The surface of groundwater, called the water table, drops when more water is withdrawn that can be replaced naturally. In some areas that have large





population or little rainfall, the groundwater supply may have to be recharged artificially. However, many regions of the world are using up the groundwater faster than aquifers are being recharged. This lowering of the water table caused special problems in coastal areas, because salt water from the ocean enters reservoirs of groundwater.

Pollution of groundwater is a serious problem, especially near cities and industrial sites. Pollutants that seep into the ground can come from contaminated surface water, leaks from sewer pipes and septic tanks, and gasoline and chemical spills. Groundwater may also be polluted by chemical fertilizers and buried radioactive wastes.

Materials:

1. Water
2. Hot Plate
3. Pie Pan (tin or aluminum, smaller would be better)
4. Ice cubes
5. Worksheets 1 and 2
6. Glass jar (such as a mayonnaise jar)

Procedure:

1. Place ice cubes in pie pan, to begin cooling pan.
2. Place jar of water on hot plate and wait for it to boil.
3. While waiting for water to boil, pass out Worksheet 1. Read together and discuss.
4. Hold the pan of ice cubes over the steam from the boiling water. Steam from the boiling water condenses when it hits the cold ice cube pan. The condensed water then falls back to be changed to steam again, creating a water or hydrologic cycle.
5. Discuss the demonstration relating to Worksheet 1. Discuss how water seeps or infiltrates into the soil creating (and adding to) groundwater.
6. Have students turn Worksheet 1 over. Pass out Worksheet 2. Ask students to complete Worksheet 2 from memory.

Additional Activity:

1. Construct a classroom water cycle that can last all school year. In the bottom of a fish bowl, aquarium or large glass jar, place an 1- inch layer of gravel for drainage. Add a layer of peat moss and a layer of soil (potting soil will work). Plant ferns, mosses or other plants in the terrarium. Water lightly and cover. You should not have to add more water. The plants

AQUIFER ADVENTURE

OBJECTIVES

The student will do the following:

1. Observe and/or use several simple aquifer models.
2. Locate areas of major aquifers on a U.S. map and name states.
3. Infer the meaning of terms based on the Latin root word "aqua."

SUBJECTS:
Science, Social Studies, Language Arts

TIME:
90-120 minutes

MATERIALS:
acetate sheets
overhead projector
wipe-off transparency pens
U.S. map
clear plastic cups (1 per student)
drinking straws (1 per student)
chipped ice
lemonade or juice drink
clear glass bowl
aquarium gravel
modeling clay
water
jar or bottle
blue food coloring
pump (from liquid soap bottle)
teacher sheets (included)

BACKGROUND INFORMATION

An aquifer is an underground layer of rock or soil that holds the water that we call groundwater. The word "aquifer" is derived from the Latin "aqua," meaning "water," and "fer," meaning "to yield." The ability of a geological formation to yield water depends on two factors—porosity and permeability. Porosity is determined by how much water the soil or rock can hold in the spaces between its particles (as with a sponge). Permeability means how interconnected the spaces are so that water can flow freely between them.

There are two types of aquifers. One is a confined aquifer, in which a water supply is sandwiched between two impermeable layers (geological formations through which water cannot pass). These are sometimes called artesian aquifers because when a well is drilled into this layer, the pressure is so great that water may spurt to the surface without being pumped. This is an artesian well. The other type of aquifer is the unconfined aquifer, which has an impermeable layer (or one of lower permeability) under but not above it. It is the most common type.

Aquifers may be categorized according to the kind of material of which they are made. A consolidated aquifer is composed of a rock formation (that is porous or fractured). An unconsolidated aquifer is composed of a buried layer of sandy, gravelly, or soil-like material.

The top surface of the groundwater is called the water table. The water table depth varies from area to area and fluctuates (rises and falls) due to seasonal changes and varying amounts of precipitation. Excessive pumping from the aquifer can also lower the water table.

Perhaps the largest aquifer in the world is the Ogallala aquifer located in the Midwestern part of the United States. This aquifer is named after a Sioux Indian tribe. It is estimated to be more than two million years old and to hold about 650 trillion gallons (2,500 trillion liters)! It underlies parts of 8 states, stretching about 800 miles (1,288 km) from South Dakota to Texas. The Ogallala aquifer supplies vast amounts of water to irrigate the crops grown in this vitally important agricultural area.

Terms

aquifer: an underground layer of unconsolidated rock or solid that is saturated with usable amounts of water.

artesian aquifer: an aquifer that is sandwiched between two layers of impermeable materials and is under great pressure, forcing the water to rise without pumping. Springs often surface from artesian aquifers.

confined aquifer: see artesian aquifer.

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.

impermeable: not permitting water or other fluid to pass through.

unconfined aquifer: an aquifer containing unpressurized groundwater, having an impermeable layer below but not above it.

water table: the top surface of the groundwater.

ADVANCE PREPARATION

A. Collect materials for activities and demonstrations.

1. Fill a jar or bottle with water. (Size will depend on how large the glass bowl is.) Tint the water blue with food coloring (probably one drop). Set it aside.

2. Pat out a "pancake" of modeling clay. Size it to fit into the glass bowl with a good (but not necessarily tight) fit.

B. Make a transparency of each of the teacher sheets.

C. Have several dictionaries available.

PROCEDURE

I. Setting the stage

A. Pass out clear plastic cups and drinking straws to each student.

B. Put the word "aquifer" on the board and ask students if anyone knows what the word means. Then put the Latin derivation on the board so they can see the parts of the word and how we arrived at its definition.

C. Tell students they are all going to make a model aquifer. Fill each cup with chips of ice. The ice represents rock and soil-like materials underground. Pour into each of their cups lemonade or juice drink. The drink represents groundwater. Explain that the cup and drink represent an aquifer and groundwater. The bottom of the cup is the layer of rock or soil that keeps the water from seeping down any further. The top of the water is the water table, the top of the underground water layer.

C. Have the students examine a map showing groundwater resources in the United States.

1. Share the following information with the students: Groundwater is almost everywhere. The layers of rock and soil-like material under the ground hold water in varying amounts. Some places have a lot of groundwater, but it is deep in the earth and not easy to get from wells. Some places do not have as much groundwater. Some places have abundant supplies of groundwater. In these places people rely on water from wells for irrigating crops and for water supplies for both individual families and whole communities.

2. Show the students the transparency of the teacher sheet "Major U.S. Aquifers." Explain that the crosshatching on this map marks the places in the continental U.S. where abundant fresh water is available from aquifers. In these areas, large groundwater supplies are used by industries, communities (municipal water systems), and irrigation of crops. In the areas where there are no markings there is less likely to be plentiful groundwater available. These places will, however, have wells that supply individual households and livestock operations.

3. Ask a student volunteer to come up and mark on the map (with a wipe-off transparency pen) about where your community is located. Is it in an abundant aquifer region?

4. Ask the students to answer the following questions by naming states. (Allow them to refer to a labeled map if it is needed.)

   a. Name several states where plentiful groundwater is available almost everywhere. (Florida, Mississippi, Louisiana, Iowa, Delaware, Nebraska, Michigan, New Jersey)

   b. Name several states that have the least groundwater in many places. (Montana, Wyoming, Colorado, Utah, Pennsylvania, Kentucky, West Virginia, New York, Vermont, New Hampshire, Maine)

III. Follow-Up

A. Have the students choose their state and four others (their choice). Have each student write down his/her five states and indicate whether each is likely to have large groundwater supplies or not. They may use yes/no answers, a symbol of their choice, or a sentence.

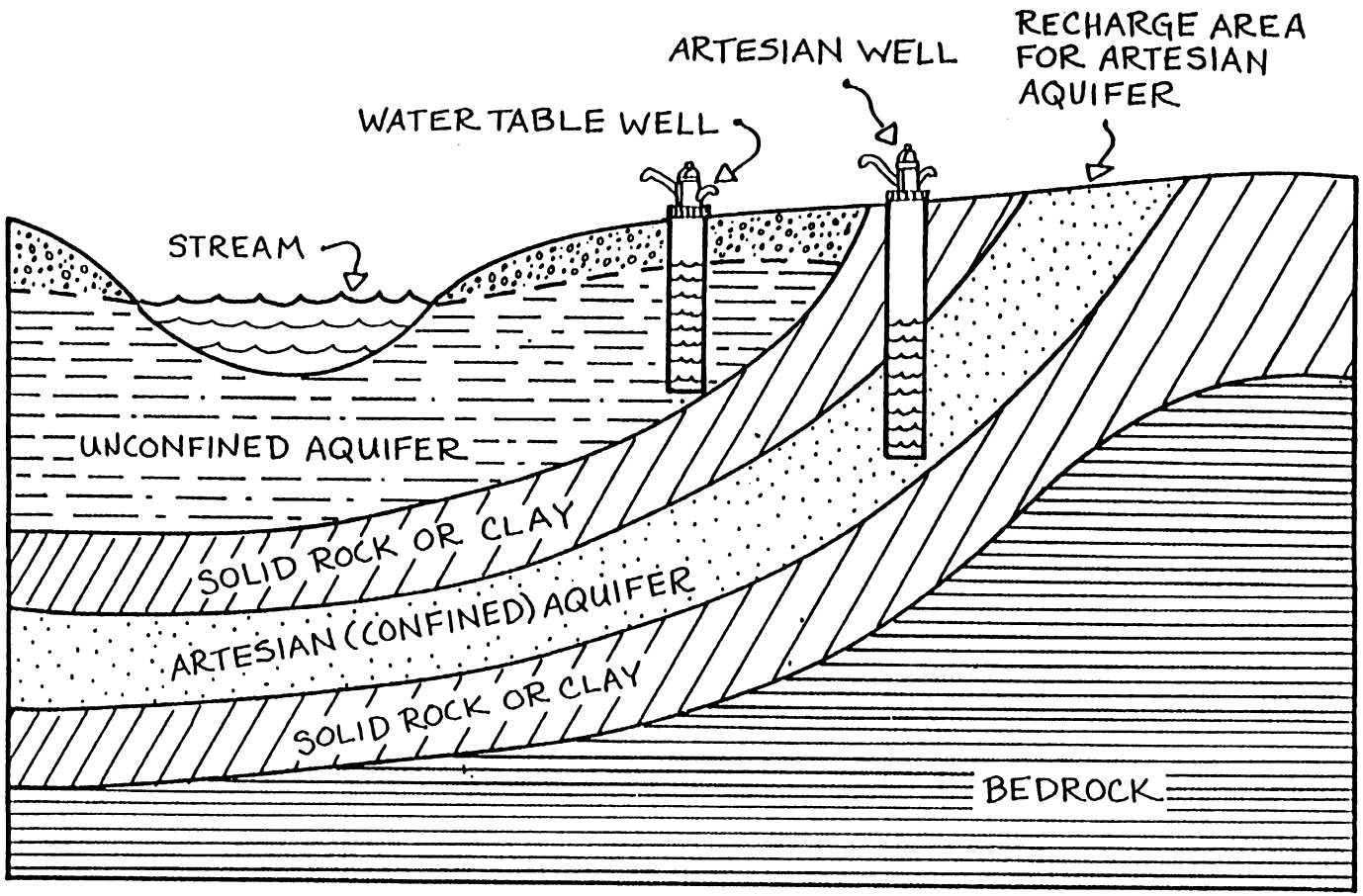
B. Have the students research specific U.S. aquifers (and perhaps others in different parts of the world). After sharing the information with the rest of the class, the students could plot the U.S. aquifers on the maps from activity II C.

IV. Extensions

A. Share with students the following information about dowsing or "water witching" and divining rods. Some people will not have a well drilled without calling a "water witch" or a "dowser" to locate the groundwater. Water witches or dowsers have been around for hundreds of years. They use metal or wooden sticks ("divining rods") to locate places where wells should be drilled. Some even predict the depth of the water table. Dowsers are not always successful in their efforts, but many people believe in their special ability to find water. Ask students to research the local use of dowsing.

B. Refer the students to the Latin derivation of the word "aquifer." Write on the board a list of other words that share the root word "aqui" or "aqua." Have the students list the words on their paper. (List these words on the board: aquacade, aqualunger, aquamarine, aquanaut, aquaplane, aquarelle, aquarist, aquarium, aquarius, aqueduct.) Divide the students into groups. Have them

AQUIFER DIAGRAM



BELIEVE IT OR NOT!

OBJECTIVES

The student will do the following:

1. Define groundwater supply.
2. Recognize that groundwater is unevenly distributed throughout the world.
3. Answer groundwater supply questions by using statistical information provided.

SUBJECTS:
Science, Math, Language Arts, Social Studies

TIME:
120 minutes

MATERIALS:
acetate sheet
overhead projector
teacher sheet (included)
student sheet (included)

BACKGROUND INFORMATION

Fresh water is not evenly distributed worldwide. In some areas, water is so scarce that people harvest plants such as succulents and cacti for water. In other areas, people have more water than they use. Some people take fresh, clean water for granted, while others treasure every drop and use it for all it's worth.

The amount of water we have depends on several factors: the rate of precipitation, the rates of evaporation and transpiration , the amount of stream flow, the amount of groundwater flow, and people's use of water.

Terms

aquifer: an underground layer of unconsolidated (porous) rock or soil that holds (is saturated with) usable amounts of water.

groundwater supply: the amount of fresh water stored beneath the earth's surface.

evaporation: conversion of a liquid to the vapor state by the addition of heat.

transpiration: the passage of water from plants and animals directly into the air in the form of a vapor.

precipitation: any or all of the forms of water particles, whether liquid of solid, that fall from the atmosphere and reach the ground.

ADVANCE PREPARATION

A. Make a transparency from the teacher sheet, "Believe It or Not! (Groundwater Supply Factsheet)."

B. Contact a guest speaker from your local water utility. Brief him/her on what questions the students will ask.

BELIEVE IT OR NOT!
(GROUNDWATER SUPPLY FACTSHEET)

I. United States (U.S.) Facts

A. The estimated supply of groundwater in the U.S. is 65 quadrillion gallons (246 quadrillion liters).

B. About 1/5, or 20%, of the rain that falls in the U.S. becomes groundwater.

C. Groundwater is an excellent source of water for drinking water supplies. Many medium-sized cities and small communities use groundwater. Some large systems, like Long Island, New York (part of New York City metropolis); Miami, Florida; San Antonio, Texas; Honolulu, Hawaii; and Memphis, Tennessee, use groundwater. Most of the community water systems in the U.S.—about 4/5 or 80%—withdraw groundwater.

D. If you add up all the people who depend on groundwater for their drinking water, they amount to about 1/2, or 50%, of the people in the U.S.

E. Almost everyone (97% of the people) who lives in rural areas depends on groundwater.

F. The average American uses 150 gallons (570 liters) of water per day for household and personal uses.

G. In some places, we are using groundwater about 100 times faster than rainfall replaces it.

H. About 2/5, or 40%, of the water used for irrigating crops is groundwater. Most of this occurs in dry midwestern and western states.

II. Regional U.S. Facts

A. The Ogallala aquifer in the Midwest (from South Dakota down to Texas and New Mexico) supplies water to irrigate over 12 million acres (4.8 million hectares) of farm land—1/5, or 20%, of all the farm land in the U.S.

B. In the western states, about 7/10, or 70%, of the water used for irrigation comes from wells.

C. There is about 1/5, or 20%, as much water in Florida's aquifer as there is in all the Great Lakes combined.

D. California pumps many times more groundwater per day than any other state.

III. World Facts

A. In Germany, more than 7/10, or 70%, of the water comes from groundwater.

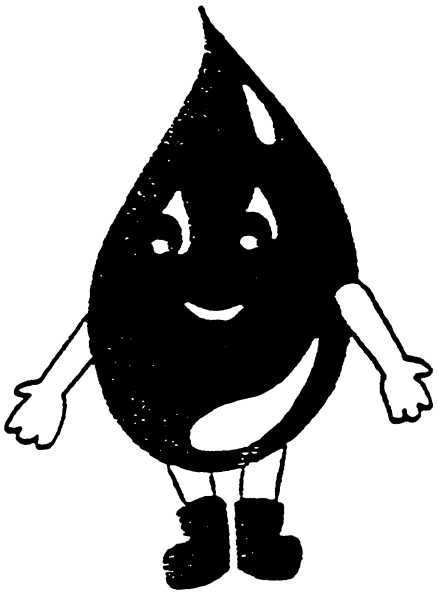
B. Just over half, or 54%, of the water used in Israel is groundwater.

C. Only about 20% of Great Britain's water is groundwater.

D. If all the groundwater in the world was pumped to the surface, it would cover the earth to a depth of about 10 feet (3 meters).

Water Tripping:
A water conservation game

Adapted with permission from A Sense of Water, Southern Arizona Water Resources Association, Inc., Tucson, AZ, 1984



SUMMARY: Students are given a limited amount of tickets with which to "buy" their water for several days. This leads to serious thought about water use and water conservation.

OBJECTIVES: To have students think through how people use water. To determine that water is essential to everyday living and that water is a part of the standard of living to which we are accustomed in our society.

VOCABULARY WORDS:
conservation, supply
TIME REQUIRED: 15 minutes first day; 15 minutes third or fourth day
MATERIALS NEEDED:
30 copied tickets (3 sheets) for each student
Envelope for each student
ollection box for tickets

PROCEDURE:

1. Tell students that the class is going to play a game that demonstrates water use and the reasons for conserving water.
2. As a group, list trips students take during a school day when they use water. Charge one ticket for each use of water on each trip. (Categories may include: drinking fountain, rest room, lunch, recess, etc.)
3. Give each student 30 tickets and an envelope in which to keep them. Have each student put her or his name on the tickets.
4. It costs the students one ticket each time they use water. Use a central collection box.
5. Have students keep a record of their water use.
6. Discussion Questions on the third or fourth day:

a) On what kinds of things have you spent your water tickets? On some activities more than others?

b) What if there were no water tickets left for the rest of the week?

c) What can we do to save water?

d) What can we do to get more water?

e) If one person has some tickets left over, and another person doesn't, is it fair to trade?

f) If you are out of tickets now, do you wish you had saved some for later?

g) If you played this game again, would you do anything differently?

7. List with students things that they can do to make the water they have (at home and at school) go further. This list may include: turn water off while brushing teeth (saves about 2 gallons); take a short shower instead of a bath (saves at least 24 gallons); shut off dripping faucets (saves 1,000 gallons or more per year); turn the faucet off while soaping your hands, hair, or body; only get water in restaurants when you are going to drink it; etc.

EXTENSION:

1. Have older students write an essay entitled "The Day the Water Ran Out," and discuss that topic in class. Have younger students talk about what would happen if the water ran out.

BACKGROUND:

On average, the human body requires about 2.5 quarts (2.4 liters) of water per day. But we use a lot more water than is needed internally. In the box below are some estimates of daily household water use for an American family.

Using the figure of 23 gallons (87 liters) per person per day, we use about 37 times more water than the body needs to survive. Some of this goes into activities like food preparation and hygiene, but how much water is wasted by one's lifestyle?

Compare the following domestic use per capita figures for an "average" family:

India:	6.75 gallons/day
Nigeria:	32.4 gallons/day
USA:	92 gallons/day

These figures demonstrate that lifestyle, availability of technology, and availability of water all affect the consumption rate of water.

Amount of Water Used Per Day Per Four-Person Household

Use	gallons	liters
toilet	25	95
shower	28	106
washing dishes	15	57
laundry	18	68
lavatory	3	11
basic needs	3	11
total	92	348

This activity and many other excellent groundwater activities are available in the "Adventures in Water Education" curriculum guide. To order, write the Ecology Center at the address below.

waterlogged: saturated with water.

ADVANCE PREPARATION

A. Gather needed materials.

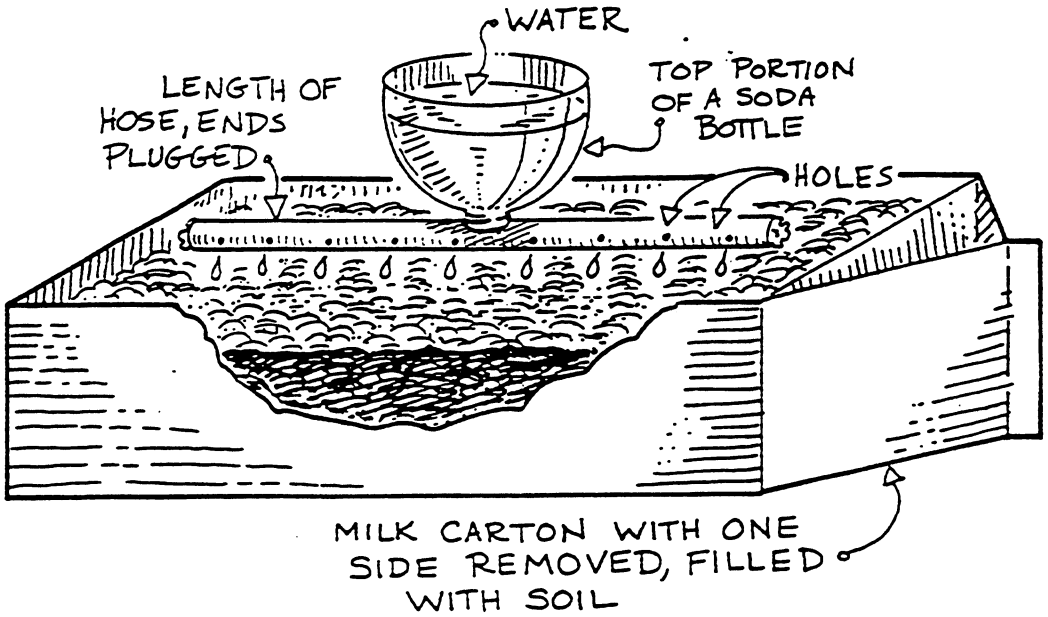
B. Make drip irrigation unit(s). (NOTE: "Drip vs. Spray" experiment may be performed as a class demonstration or as a team project.)

1. Cut the end of a liter bottle off so that you have a section (with the bottle's neck) that is about 4 inches (10 cm) tall.

2. Cut a section of old hose or plastic tubing about 6 inches (15 cm) long and cut a hole in the center big enough to fit the neck if a liter bottle in it. Use an ice pick or awl to poke holes in the piece of hose as shown. Plug hose ends with clay.

3. Insert the bottle into the hose and secure it in place with duct tape.

4. Cut a side out of a milk carton as shown. Put 1 cup (250 mL) of topsoil in the carton and shake down until the surface is even.



C. Prepare the second milk carton the same way.

D. Make a transparency from the teacher sheet "Irrigation: Problems and Solutions."

E. Photocopy the student sheets.

PROCEDURE

I. Setting the stage

A. Place a container of water on one end of a table and a potted plant on the opposite end.

5. Instruct students to read each block of information, making a mark on the time line for each one. They will have to decide how to divide the line. (NOTE: You may have to help younger students.)

6. Have the students locate on a globe or large wall map of the world each area designated in a block of information. (NOTE: Do this together as a class with younger students.)

7. Instruct students to use the information to provide the following for each mark:

   a. The approximate date

   b. One- to two-sentence summary

   c. A picture representing each block.

8. After completing the tasks, have the students write at the bottom of the page one summarizing sentence that describes the role of irrigation in our world's history.

9. Share and discuss the time lines.

B. Explain that while irrigation has been a great benefit to humans by helping produce more crops, its use has also caused problems where it has used too much of the groundwater.

   1. Show the transparency "Irrigation: Problems and Solutions." Discuss each item briefly.

   2. Point out that although the problems can be severe, they can be prevented or slowed down by simply irrigating more efficiently.

C. Conduct a drip irrigation vs. spray irrigation experiment as a demonstration. Have students help you.

   1. Explain that the most popular method of irrigating land is using the pivot-sprayer. A large sprayer (some 1000' [300 m] long) turns in a circle spraying water on the plants; this is like a gigantic lawn sprinkler. This experiment is designed to compare two ways to distribute irrigation water.

   2. Distribute the student sheets.

   3. Place the milk cartons on several newspapers or towels. Point out that they contain equal amounts of soil.

   4. Fill the sprayer with 1 cup (250 mL) of water. This water will be used to simulate spray irrigation.

   5. Fill another container with 1 cup (250 mL) of water. This water will be used with the drip irrigation unit.

   6. Have students formulate a prediction of which method will use the most water to saturate the soil. They are to record this on the student sheets.

   7. Using student assistants, spray water into one carton while pouring water into the drip system.

Little, Charles E., "The Great American Aquifer," Wilderness, Volume 51, Issue 178, Fall, 1987, pp. 43-47.

Postel, Sandra, "Water for Agriculture: Facing the Limits," World Watch Institute Paper 93, Washington, DC, December, 1989.

"Stretching Our Scarce Waters," Successful Farming, Volume 86, December, 1988, pp. 24-25.

SOURCE: WATER SOURCEBOOK from the Water Environment Federation - a series of classroom activities for Grades 3-5. Produced for LEGACY, INC. Partners in Environmental Education; in cooperation with U.S. Environmental Protection Agency; prepared by Tennessee Valley Authority Environmental Education Section

PUDDLE PICTURES WORDS

Irrigation

- Run off
- Transpiration
- Clay
- Flow
- Canoe
- Diving
- Tidal
- Waterfall
- Hydroelectricity
- Surf

'ipes

- Brook
- Stream
- Watercolor
- Cloudburst
- Waterfowl'
- Skiing
- Wastewater
- Mist
- Fish

›rinkler

- Spray

Landfill

Evaporation

River

Ship

Stream

Shower

Tide

Wave

Dam

Wave

Ocean

Tributary

Gallons

Drink

Liquid

Waterbug

Fishing

Wash

Moisture

Erosion

Thunderstorm

Sea

Swamp

Reservoir

Rain

Condensation

Gravel

Splash

Whirlpool

Lake

Rain Gauge

Rapids

Sea

Geyser

Faucet

Watermelon

Creek

Waterbed

Swimming

Waterheater

Skating

Acid Rain

Vapor

Fresh Water

Water

Bath Pond

"Water flows over these hands. May I use them
llfully to preserve our precious planet."

Thich Nhat Hanh

"Deep peace of the running wave to you, of water flowing, rising and falling, sometimes advancing, sometimes receding...May the stream of your life flow unimpeded!"

Mary Rogers

"Water like a boundless mirror, reflecting the sun's golden rays and the scudding clouds..."

Gregory Petrov

"Gratitude to water: clouds, lakes, rivers, glaciers, holding or releasing, streaming through all our bodies salty seas..."

Gary Snyder

"The great sea has set me in motion. Set me adrift, and I move as a weed in the river."

Eskimo song

he frog does not drink up the pond in
ich he lives."

Indian proverb

"Because the icebergs are always changing, one sees a unique and personal iceberg, which no one else has ever seen or ever will see."

Diane Ackerman

"Water carries the imponderable things in our lives: death and creation. We can drown in it or else stay buoyant, quench our thirst, stay alive."

Gretel Ehrlich

"Patience, patience, patience, is what the sea teaches. Patience and faith. One should lie empty, open, choiceless as a beach—waiting for a gift from the sea."

Anne Morrow Lindbergh

"In coming close to earth, I have come close to heaven."

Gilean Davis

"Trees stir memories, live waters heal them."

Annie Dillard

"To trace the history of a river, or a raindrop, as John Muir would have done, is also to trace the history of the soul, the history of the mind descending and arising in the body. In both, we constantly seek and stumble on divinity, which, like the cornice feeding the lake and the spring becoming a waterfall, feeds, spills, falls, and feeds itself over and over again."

Gretel Ehrlich

"Here we all lie on the palm of the poisoned sea our mother, where life began and is now ending, and we return."

Marge Piercy

N O T E S

GROUNDWATER QUALITY

OBJECTIVES: Students will learn how water is stored in groundwater aquifers and how pollutants enter the water.

MATERIALS:
2 quart glass jars - one 3/4 full of soil and the other 3/4 full of gravel
1 orange
1 measuring cup
red food coloring

BACKGROUND

Madison County's groundwater comes from the Tuscumbia-Ft. Payne aquifer. There are 20 wells in Madison County that pump groundwater from the Tuscumbia-Ft. Payne aquifer. The best aquifers are gravel or coarse sand and gravel mixtures. In some areas water is just beneath the surface while in others, it may be up to several hundred feet deep. There are still other areas where groundwater is either too deep to feasibly pump or too poor a quality to be a value. In some areas, groundwater may be nonexistent.

Aquifers can be recharged by water percolating downward from streams, lakes and even from rainfall on the soil surface. Water percolating through the soil and through the geologic formations can carry pollutants into the groundwater supply. Good quality water can be polluted by this process.

Some of the pollutants that can get into groundwater through mismanagement are fertilizers, pesticides, soaps or detergents, sewage wastes and fuels. Proper management of these will usually keep them out of the groundwater.

PROCEDURE

1. Ask the students, **"Where does our drinking water come from?"** *(groundwater or surface water source, i.e. Tennessee River). Most of Madison County gets their drinking water from groundwater. The remaining citizens get their drinking water from the Tennessee River. For more information see background information in "What about groundwater in Madison County? in the Teacher's Packet).*

2. Have the students demonstrate an aquifer. Fill two quart glass jars three-fourths full, one with gravel and the other with medium texture soil. Pack the materials lightly and pour one cup of water into each. Compare the rate that the water moves through the two materials. You may want to have the students time the water movement. Notice that the water moves faster through the gravel because the particles are more course (large). The saturated zone represents a water bearing aquifer and the top of the water represents the water table. This is the way groundwater lies beneath the soil. Wells are drilled into the aquifer and pipes are inserted to pump the water out.

3. Now, put a lid on the jars and gently tip them to a horizontal position. Notice that the gravel gives up the water and it easily flows out. Notice also that the soil does not give up the water and it is held around the soil particles. The small solid particles have more surface area than the gravel. Water in the soil is held as a thin film around the individual soil particles so tightly that it can't be poured off. Gravel

has less surface area so some of the water is held in the pore space between the gravel particles.

4. Demonstrate this by cutting an orange in four pieces. Before, there is enough peeling to cover the whole orange. After cutting, there is more surface area and not enough peeling to cover it. Soil is a good median to grow plants because it holds more moisture in the root zone that can be used by the plants. Gravel is poor for growing plants, but is a good aquifer to store water in.

5. Now have the students add one half cup of water with red food coloring to each of the jars. The food coloring is to represent a pollutant. Again, compare the rate that the pollutant moves to the groundwater. Discuss with the students the following questions:
Are people placing pollutants where it can be washed into a groundwater aquifer? If so, what kinds of pollutants are being washed into the groundwater? Could management practices be used to eliminate the threat to the groundwater? Remember, some pollutants in drinking water can be injurious to your health.

6. Discuss management techniques for the pollutants that have been mentioned. Below are some common pollutants.

   a) For fertilizers (especially nitrogen and phosphorus), one should apply only the amount that the current crop will use in one growing season. Irrigate properly so the water does not go below the crop root zone. When irrigation water goes below the root zone of plants, it carries some nutrients out of the reach of plants and the nutrients are wasted.

   b) Pesticides should be applied according to the directions on the package. Excessive application of pesticides can cause pollution. On the soil, some chemicals decay faster than others. The ones that decay the fastest pose the least threat to groundwater.

   c) Water containing soaps and detergents should be disposed of through the cities sewage disposal system or through a farm septic system. These allow micro-organisms to digest them or filters to remove them in the sludge. Make a trip to the treatment plant and get an explanation from the operator.

   d) Sewage wastes should be run through the treatment systems. Livestock manures should be spread on the cropland soil in the summertime to increase a biologic breakdown by micro-organisms.

   e) Care should be taken to see that fuels (gas or diesel fuel) are not spilled on the soil. Waste hydrocarbons should be recycled. Contact a local oil company for recycling information.

   f) Consult the Waste Disposal Guide for improving waste management. Make a copy for the students to take home.

SOURCE: Adapted from Stop, Look and Learn About our Natural World, Nebraska Resources Commission Education Guide.

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