

# Dragonfly Gazette

GEORGIA PROJECT WET Environmental Protection Division

Volume 1, Number 6 | FALL 2002

## SAVING EDUCATION THROUGH THE ENVIRONMENT

BY DERON DAVIS, GEORGIA EIC COORDINATOR

**D**uring the Leadership Institute, the facilitator asked the ten Georgia EIC School teams to develop mottos for their programs. I was preparing the tables for lunch when I heard Kathleen Barrett, a teacher at Minor Elementary in Gwinnett County, say: "Our motto is 'Saving Education through the Environment.'" I've adopted their motto to explain the focus of the "Using the Environment as an Integrating Context for Learning (EIC)" initiative and environment-based education.

**ACCORDING TO EDUCATION AND THE ENVIRONMENT: Strategic Initiatives for Enhancing Education in California (2002),** *"Environment-based education focuses on educational results: using the environment to engage students in their education through "real-world" learning experiences, with the goals of helping them achieve higher levels of academic success as well as an understanding of and appreciation for the environment."*

This definition is based on the research and experience of the State Education and Environment Roundtable (SEER) in using the environment as an integrating context for learning (EIC). Data collected in 60 schools in 13 states, since 1996, indicates that EIC has significant positive effects on academic achievement, classroom behavior and instructional practices. EIC students exhibit:

- Improved performance on standardized tests in reading, writing, math, science and social studies,
- In 92% of the schools, students in EIC programs academically outperformed their peers in traditional programs,
- Reduced discipline and classroom management problems in some cases by as much as 95%,
- Increased engagement and enthusiasm for learning, resulting in substantially improved attendance, and,
- Heightened contributions to their communities through effective service-learning projects.

SEER, the Georgia Department of Education, the Georgia Environmental Protection Division, the University of Georgia and the Environmental Education Alliance of Georgia are bringing this innovative school improvement process to ten schools in the 2002-2003 school year.



The Midway Elementary Team can't stop smiling about EIC!

A forty-member committee of educators, representing a wide variety of specialties, reviewed applications from schools across the State and selected the top ten based on their strength to implement EIC, and their geographic and demographic diversity.

In June, 2002 the following Georgia EIC schools and community organizations participated in the EIC Leadership Institute where they developed units for their students using, the EIC Model's complex system of interconnectd and interrelated pedagogies:

- ARMUCHEE ELEMENTARY AND ARROWHEAD ENVIRONMENTAL EDUCATION CENTER IN FLOYD COUNTY
- MIDWAY ELEMENTARY AND THE GEORGIA FORESTRY COMMISSION IN BALDWIN COUNTY
- MINOR ELEMENTARY AND GWINNETT CLEAN AND BEAUTIFUL IN GWINNETT COUNTY
- SAINT SIMONS ELEMENTARY AND THE JEKYLL 4-H CENTER IN GLYNN COUNTY (SEE STORY ON PAGE 9)
- SHAKERAG ELEMENTARY AND KEEP SANDY SPRINGS/NORTH FULTON BEAUTIFUL IN FULTON COUNTY
- ARNOLD MIDDLE AND OXBOW MEADOWS ENVIRONMENTAL LEARNING CENTER IN MUSCOGEE COUNTY
- GAINESVILLE MIDDLE AND ELACHEE NATURE SCIENCE CENTER IN HALL COUNTY
- HENDERSON MIDDLE AND THE DEKALB COOPERATIVE EXTENSION SERVICE IN DEKALB COUNTY
- COLUMBIA HIGH AND WONDERLAND GARDENS IN DEKALB COUNTY
- STEWART-QUITMAN HIGH AND MEAL CREEK NURSERY IN STEWART COUNTY

Support for these schools and community organizations will be provided by the Chattahoochee Nature Center, EEinGEORGIA.org, The Georgia Conservancy, Georgia Learning Connections, Georgia Project Learning Tree, Georgia Project WET, Georgia Project WILD, Keep Georgia Beautiful, the National Wildlife Federation, and the State Botanical Garden of Georgia.

For more information on EIC visit [www.seer.org](http://www.seer.org) and [www.EEinGeorgia.org/EIC](http://www.EEinGeorgia.org/EIC).



## WHAT IS RIVER OF WORDS?

River of Words is an international environmental poetry and art project designed to nurture respect and understanding of the natural world. Students learn their "ecological address" by honing their observation skills and describing through poetry and art their "place in space." Each year eight students are chosen as National Grand Prize Winners and receive a trip to Washington DC. The contest is open to youth ages 5-19.

In Georgia, River of Words is coordinated by the Georgia Center for the Book and Georgia Project WET (Water Education for Teachers) who recognize winners at an awards ceremony each year. Award winning poetry and art is put on display in the Georgia River of Words Exhibit, which travels to schools, libraries, conferences, festivals, parks and public buildings.

### ORDER A FREE TEACHER'S GUIDE TODAY -

To receive a *FREE Teacher's Guide and River of Words/Rivers Alive poster*, send your name, organization, complete mailing address, phone number, fax, and e-mail to Monica Kilpatrick at:

*Monica\_Kilpatrick@mail.dnr.state.ga.us.*

*\*Limit two guides per organization - only one guide will be forwarded unless otherwise requested.*

### THE STARBUCKS FOUNDATION FUNDS GEORGIA RIVER OF WORDS



Thanks to a grant from The Starbucks Foundation, in the 2002-2003 school year, 400 students from Boys and Girls Clubs in Georgia will learn about their watersheds and express themselves through poetry writing and spoken word performances. Students will participate in these educational programs at the Dunwoody Nature Center in Atlanta and the Oatland Island Education Center in Savannah. In addition, Starbucks will fund ROW brochures; beautiful posters that feature award-winning poetry and art; the ROW Poetry and Art Journal and the 2003 Awards Ceremony.

### EIGHT GEORGIA STUDENTS FEATURED IN NEW CALENDAR

River of Words has published its first ever calendar. It is a collection of art and poetry selected from the entries National ROW receives from around the world. Georgia students include Chris Hendrikson from Clarkston, Shannon O'Keefe from Kennesaw, and Crystal Love from Decatur.

### TO ORDER THE CALENDAR -

Large orders - contact Amber Lotus Publishing at 1-800-526-2575 or [www.amberlotus.com](http://www.amberlotus.com)

Smaller orders - contact River of Words at [www.riverofwords.org](http://www.riverofwords.org) or (510) 548-POEM (7636)

## Dragonfly Gazette

Editors: Deron Davis, Petey Giroux and Monica Kilpatrick

Production artist: Jacob Escobedo

THE DRAGONFLY GAZETTE IS PRINTED ON RECYCLED PAPER. PASS IT ON TO A FRIEND, AND RECYCLE IT WHEN YOU'RE DONE.



The Dragonfly Gazette is published bi-annually. It is distributed to Georgia Project WET Facilitators and Educators in April and October.

## RIVER OF WORDS TIMELINE



### FEBRUARY 15

Annual deadline for entries

### APRIL

National winners announced and State winners selected

### MAY

Georgia's National and State Winners recognized at Awards Ceremony

### JUNE - DECEMBER

ROW exhibit travels to libraries across the State

### AUGUST

Georgia ROW brochure produced and distributed

### SEPTEMBER

Georgia ROW Teacher's Guide produced and distributed

### NOVEMBER - JANUARY

Georgia ROW Poetry and Art Journal produced and distributed

# WET WORKSHOPS

VISIT THE [www.EEInGEORGIA.org](http://www.EEInGEORGIA.org) CALENDAR FOR THE LATEST INFORMATION ON AVAILABLE WORKSHOPS

## TIP

Facilitator's Try This! - Include a discussion about environmental literacy in your workshops. Encourage participants to develop an outline for a unit, explain how the lesson they present supports the unit, and correlate the activity to the Quality Core Curriculum. For a sample agenda and more information, contact Deron Davis at [deron\\_davis@mail.dnr.state.ga.us](mailto:deron_davis@mail.dnr.state.ga.us).

## FACILITATOR TRAINING

Get the Project WET Curriculum and Activity Guide and become certified to lead other educators in Project WET.

**November 1-3, 2002 at Epworth by the Sea, St. Simons Island**

Registration fee: \$100.00 for Environmental Education Alliance of Georgia members and \$105.00 for nonmembers. Includes WET curriculum, t-shirt, facilitator notebook, educational resources, housing, meals and a water education field trip!

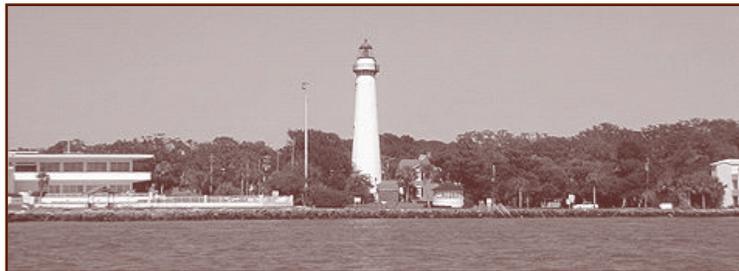
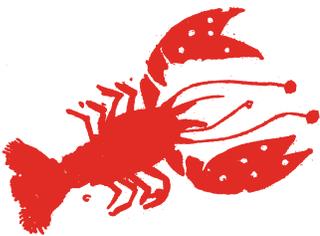
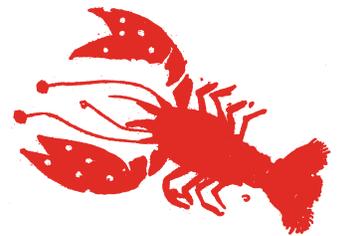


Photo copyright: sandyjones.com



Join us for this exciting 2½ day workshop and become certified as a Project WET (Water Education for Teachers) facilitator! You will become part of the National and State training teams for this international environmental education program. The workshop will begin at 1:30 PM Friday, finish at 12:00 PM Sunday and ONE SDU credit is available. Upon completion of this workshop, you will be certified to lead other educators in Project WET. As a certified facilitator, you are required to conduct ONE educator workshop per year.

**REGISTRATION DEADLINE: October 23, 2002**

Space is limited, and you must attend the entire workshop to become certified.

TO REGISTER, COMPLETE AND RETURN THE FORM BELOW.

Please return this portion with your \$100 or \$105 check made payable to:  
the Environmental Education Alliance of Georgia, c/o Monica Kilpatrick, Georgia Project WET, 4220 International Parkway, Suite 101, Atlanta, Georgia 30354

Name:

Organization:

Address:

Phone: W

H

Fax:

Email

Are you a member of the Environmental Education Alliance of Georgia?

YES - \$100 Registration Fee

NO - \$105 Registration Fee

Are you interested in receiving SDU Credits?

YES

NO

# w a t e r c o u r s e

**What is the Watercourse?** Established in 1989, The Watercourse is a not-for-profit water science and education program specializing in the development of educational materials on water and water-related management issues. Publications include curriculum such as Project WET, Wonders of Wetlands, and Conserve Water, as well as materials for students such as the Kids in Discovery series. To order these materials, visit [www.projectwet.org](http://www.projectwet.org) or call Deron Davis at 404-675-1762 to receive an order form by mail or fax.



## *Dive In with Healthy Water, Healthy People*

Healthy Water, Healthy People, a new program of the Watercourse sponsored by the Hach Scientific Foundation, is currently being developed and will be available this fall.

The goal of the program is to facilitate and promote the awareness, appreciation, knowledge, stewardship, and understanding of water quality topics and issues and to make evident the interdependence between science education and the public. The Healthy Water, Healthy People program believes that understanding the relationship of healthy water to healthy people will be critical as we collectively work to develop solutions for addressing future water quality challenges and opportunities.

The Healthy Water, Healthy People program contains publications with new, innovative, and interactive activities developed in the same process and format as Project WET materials. A selection of testing kits and users guides, training opportunities, networking opportunities, as well as an international water quality awareness campaign supports the activity guide and allows for deeper understanding and investigation of water quality in your local area.

Publications include a 200-page activity guide targeted for students in grades 6 through university level. This Healthy Water, Healthy People Water Quality Educators Guide will help educators address science standards and promote diverse learning styles through interactive activities that interpret water quality concepts, with foundations in the scientific method. In addition there are Healthy Water, Healthy People testing kits, The Healthy Water, Healthy People Testing Kit Manual, a technical reference manual that support the educators guide and testing kits, and an upper-elementary level publication, the Healthy Water, Healthy People Kids in Discovery Series (KIDS) booklet.

The Rivers Alive Education Committee (see page 11 for info. on Rivers Alive), in partnership with the Georgia Environmental Protection Division's Adopt-A-Stream and Project WET programs, the Georgia Department of Community Affairs' Keep Georgia Beautiful program, Columbus Water Works, Oxbow Meadows Environmental Learning Center and the Upper Chattahoochee Riverkeeper will host a training for Healthy Water, Healthy People facilitators in 2003.

Contact Petey Giroux at 404-675-1638 or [Petey\\_Giroux@mail.dnr.state.ga.us](mailto:Petey_Giroux@mail.dnr.state.ga.us) for more information on the training.

For more information on Healthy Water, Healthy People, contact John Etgen toll free at 1-866-337-5486, email to [healthywater@montana.edu](mailto:healthywater@montana.edu), or visit the Healthy Water, Healthy People website at [www.healthywater.org](http://www.healthywater.org) and join the Healthy Water, Healthy People Newsgroup.

# frog pond lessons

Many teachers across the State are engaging students with water education. Often these classes include studying the pond in the campus' outdoor classroom. This section of the Dragonfly Gazette will focus on stories and lessons for making the most out of trips to the pond.

You can share your pond lessons and receive a \$45 gift certificate for EE teaching materials from the Nature Watch Catalog. Qualify to win a library of over \$500 of environmental education books and curricula! Visit [http://www.eeingorgia.org/lesson\\_plans/](http://www.eeingorgia.org/lesson_plans/) for more information.

*The following lesson plan is reprinted with permission from [www.EEinGEORGIA.org](http://www.EEinGEORGIA.org), Georgia Learning Connections ([www.glc.k12.ga.us](http://www.glc.k12.ga.us)) and Karen Garland of The Georgia Conservancy ([kgarland@gaconservancy.org](mailto:kgarland@gaconservancy.org), [www.gaconservancy.org](http://www.gaconservancy.org)). To see it in its entirety visit [EEinGEORGIA.org](http://www.EEinGEORGIA.org).*

---

## **SURFACE TENSION: HOW A WATER STRIDER WALKS ON WATER**

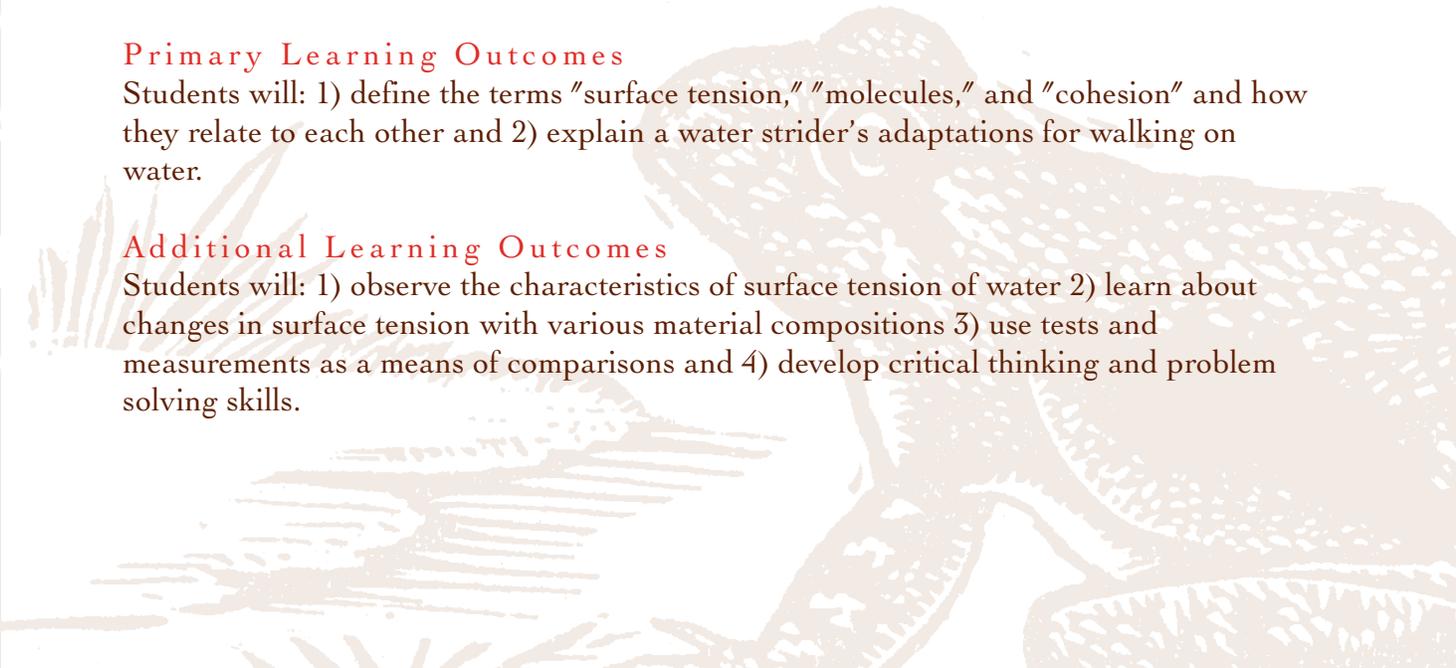
How is it that water striders and other insects have the amazing ability to walk on the surface of the water without sinking? What observable facts are occurring on the surface of the water that allow for this to occur? Through several interactive mini activities students will explore the water's surface to grasp the important role surface tension plays in the life of these insects.

### **Primary Learning Outcomes**

Students will: 1) define the terms "surface tension," "molecules," and "cohesion" and how they relate to each other and 2) explain a water strider's adaptations for walking on water.

### **Additional Learning Outcomes**

Students will: 1) observe the characteristics of surface tension of water 2) learn about changes in surface tension with various material compositions 3) use tests and measurements as a means of comparisons and 4) develop critical thinking and problem solving skills.



**PROCEDURES/ACTIVITIES****Step: 1 Duration: Day 1: One minute**

1. Distribute one Student Activity Worksheet to be completed by each student (to be used as an assessment tool). Additional research outside of class may be necessary to complete the worksheet.

**Step: 2 Duration: Day 1: Ten minutes**

Group activity 1. Ask the students if they are familiar with water striders. Have they seen a water strider walking on water? What adaptations do they think enables a water strider to walk on water? Visit the pond to look for water striders. By the end of the lesson the students should have the answer to this question. 2. Before beginning the interactive activities a basic background introduction on water striders should be completed by the instructor. 3. As a group have the students brainstorm what "surface" and "tension" mean. 4. Write all their comments on the board. 5. After the demonstrations have been completed have the students review these comments and form a definition of "surface tension" to be written on their worksheet.

**Step: 3 Duration: Day 1: Ten minutes**

Student activity 1. Place a few drops of cooking oil onto to each students' hand. Have them rub it over their entire hand area. 2. Next line them up at the sink giving each student a chance to let the water from the faucet run over their hands. Turn off the faucet and have them observe what happens to the water and oil on their hands. Note this observation on the worksheet. (If a faucet and sink are not available a large bucket of water may be used to immerse the student's hands and observe what happens.) 3. Have them wash their hands with soap. What do they observe happening to the water and oil on their hands? Note the observation on the worksheet.

*The water molecules "stick" together tightly and will not mix with the oil on your hand. Since water molecules are attracted to each other so strongly, they formed small balls or drops, which roll over your oil coated hand. There is an invisible "skin" of surface tension around each drop.*

*Soap molecules are attracted to both water and oil. One end of the soap molecule sticks to oil, the other end sticks to water. The soap breaks up the surface tension and keeps the oil drops mixed in with the water so that the oil can wash off your hand.*

**Step: 4 Duration: Day 1: Fifteen Minutes**

Group activity 1. Divide the students into groups of 3 or 4. 2. Distribute one eyedropper or pipette to each group explaining to them that they will compare/contrast the surface tension of water, cooking oil, and rubbing alcohol by observing and describing on their worksheet the shape of each drop. 3. Have each group place one drop of each onto wax paper. Describe the shape of each drop. 4. Next have each group try to make the drops bigger by adding one, two, and then three drops on top of the original. Describe any changes that occur in the shape of the drop on the worksheet. 5. Now try to make the smallest water drop. Using a hand lens carefully examine its shape. Describe on the worksheet how this drop compares to the larger drop. 6. Repeat this for cooking oil and rubbing alcohol. How does each drop compare? How does each drop differ?

**Step: 5 Duration: Day 2: Fifteen minutes**

Group activity 1. Divide the students into groups of 3 or 4 or have them remain in their former groups. 2. Ask them to fill a plastic cup to the rim with water. 3. On their worksheets have them predict how many drops can be added before the cup overflows. 4. Using an eyedropper or pipette carefully add drops of water to the center of the water surface. Periodically observe the height of the water dome by bending down and observing the top of the cup from eye level. 5. Repeat #2 - #4 using rubbing alcohol. 6. Repeat #2 - #4 using cooking oil. 7. Which cup could more drops be added to before it overflowed? 8. Have the students brainstorm as to why this is possible.

**Step: 6 Duration: Day 2: Fifteen minutes**

Group or student activity 1. Have each student or group of students shake pepper onto Petri dishes full of water at each table. Does the pepper sink or float? Does it clump or spread out over the surface of the water? (Surface tension will hold the pepper on top of the water. The cohesive properties of water will keep the molecules together and the pepper on the surface.) 2. Drop one drop of cooking oil onto the pepper floating on top of the water. Describe what happens to the pepper. 3. Next drop one drop of liquid soap onto the pepper floating on top of the water. Describe what happens to the pepper. 4. Challenge the students to answer the following question: "If you were to sprinkle more pepper on top of the water/oil/soap mixture what do you think would happen to the pepper?" Try it and describe what happens to the pepper. (The soap molecules get in the way of allowing the water molecules to be attracted to each other.) 5. Challenge the students to brainstorm as to why the pepper behaves this way.

*A water molecule inside the liquid is completely surrounded by other molecules and is attracted to each of them equally by cohesion. A water molecule on the surface of a water drop will not be completely surrounded by molecules. Since there is no water above the water molecule at the surface, the molecule is pulled more by the water below it. This extra force makes the surface of the water relatively quite tough.*

**Step: 7 Duration: Day 2: Five minutes**

Group or student activity 1. Have each student or group of students fill a plastic cup to the rim with water. 2. Carefully place a small piece of cork on top of the water's surface. Note where the cork is floating. (It will float near the center of the cup.) 3. Have the students remove a few tablespoons of water from the cup and repeat the cork float. Note where the cork is floating. (The cork will float near the side of the cup.) 4. Challenge the students to brainstorm why the cork does this.

*The water molecules are pulling and stretching to form a "skin" over the water. Water that is poured into the cup will rise over the edge of the cup and form a dome as the "skin" stretches. The water molecules on the surface of the dome are held by the water molecules below them, keeping the water in place. When the cup is filled to the rim the cork is being held in place by the water molecules pulling and stretching over the water. When some of the water is removed there is less pulling and stretching occurring and the cork is able to rest on the side of the cup.*

# frog pond lessons {continued}

## Step: 8 Duration: Day 2: Ten minutes

Student activity 1. Each student should receive five paperclips, a cup with water, and a plastic fork. 2. Explain to them they are to carefully lower the paperclip onto the surface of the water using the fork. They should be able to float the paperclips on the surface of the water (they may need to tilt the glass). How many clips can they support? 3. Have the students remove the paperclips and pour their water into a bucket. 4. Fill the cups with a new solution of sugar and water and repeat steps #2 and #3 5. Next fill the cups with a salt or pepper and water solution and repeat steps #2 and #3. 6. Next fill the cups with a soap and water solution. 7. Which solution can support the paperclips? Can any of the solutions support more paperclips than water? On the worksheet note the observations. 8. Optional: If time permits students may repeat each step to determine the average number of paperclips that can remain afloat for each solution.

*Normally, things that have a higher density (the mass per unit volume pressure) sink to the bottom. However, in this experiment, something different happened. Even though the paper clip is denser than water, it appears to be floating on the surface of the water. But, it isn't floating. If you take a look at the surface of the water, it appears to be bent inward as if it were elastic. This phenomenon is called surface tension. The surface of a liquid tends to be elastic and allows light objects to be able to remain on the surface. Surface tension can't prevent a rock from not sinking but it can allow a paper clip to remain on the surface.*

## Step: 9 Duration: Day 3: 5 minutes

Teacher will use the overhead projector to demonstrate. 1. Fill a clear container with water. Carefully place the container on top of an overhead projector and turn it on. 2. Arrange several toothpicks in a circle on top of the water. 3. Place a cube of sugar in the center of the circle of toothpicks. 4. Take another clear container filled with water and arrange the toothpicks in a circle again. This container should also be placed on top of the projector. This time place a few drops of liquid soap in the center of the toothpicks. 5. Students should observe what is occurring and note this on their worksheet. (The toothpicks should move toward the sugar and move away from the soap). 6. Why did the sugar draw the toothpicks and why did the detergent repel the toothpicks? 7. Have students report on instances in their day-to-day activities where they might have noticed surface tension (i.e. beads of water on a newly waxed car, droplets of dew on a spider web, oil/vinegar/water in a salad dressing).

*The sugar cube is able to soak up water, creating a current that carries the toothpicks with it toward the center. The soap, on the other hand, gives off an oily film that spreads outward. It weakens the surface tension, and the film carries the toothpicks away with it.*

## Step: 10 Duration: Day 3: Five minutes

Teacher will use the overhead projector to demonstrate. 1. Fill a clear container with water. Carefully place the container on top of an overhead projector and turn it on. 2. Place a live water strider on top of the water to observe the refraction cast on the bottom of the container. 3. Challenge the students to brainstorm as to why the water strider's refraction is larger in size than their actual foot size.

*It has to do with surface tension. The surface of the water is bent downward by the weight of the water strider and creates a lens affect with the water. The light is refracted differently where the water is bent. Even though the water is transparent it still casts a shadow on the bottom. To further demonstrate this point hold a magnifying glass under a light. The glass is transparent, but it still cast a shadow, except in the location where the light is being focused.*

## Step: 11 Duration: Day 3: 30 minutes

Student Activity—The Grand Finale! 1. Have each student cut a 2" x 3" insect shape out of Styrofoam or foam core board. It is very important to remember to include legs! 2. Use the pond, or fill a large container with water (the larger the better). 3. Have the students place their insects carefully on top of the water. Note on their worksheet what they observe with their insect. 4. Next pour a few drops of liquid soap near the back legs of the insect. Note on their worksheet what they observe with their insect. (Their strider should stride over the water!) 5. Challenge the students to brainstorm as to why this is happening. Hopefully by this point they will know that it is because of surface tension and will be able to explain it to you.

*Remember surface tension? The water molecules stick together and form a "skin" on the water's surface by pulling the surface molecules down. Before the soap is added surface tension pulls on all sides of the insect and it doesn't move. Upon adding the soap the bond between the water molecules is broken allowing the Styrofoam insects to glide. Thus, eliminating surface tension behind the insect causes the insect to be pulled forward. For additional information on understanding the concept of surface tension and how insects utilize this phenomena visit the website listed.*

## MATERIALS AND EQUIPMENT

1. Student Activity Worksheet (one per student) 2. Water 3. Liquid soap 4. Cooking oil 5. Rubbing alcohol 6. Wax paper 7. Eyedropper or pipette (one per group) 8. Petri dishes (one per group) 9. Paper clips (5 per student) 10. Plastic forks (one per student) 11. Clear, plastic cups (one per student) 12. Hand lens (one per student) 13. Piece of cork (one per group) 14. Sugar/Salt/Pepper 15. Paper towels 16. Clear container 17. Sugar cubes 18. Overhead projector (teacher demonstration use only) 19. Live water strider 20. Styrofoam or foam core board 21. Scissors

## TOTAL DURATION

3 days (45 minutes/day) depending on how many students, and what steps you include.

## ASSESSMENT

Assess students' understanding of surface tension by evaluating their discussion and answers to your questions. Did students correctly define molecule, cohesion, and surface tension? Did they grasp the connection or relationship between molecule, cohesion, and surface tension? Did they understand the role that surface tension plays in the survival of a water strider? You may also assess students' understanding by having each one complete the student activity worksheet. The criteria for success will be found by checking their student activity worksheet for a reasonable understanding of these concepts.

## VOCABULARY

- **ADAPTATION** is a modification of an organism or its parts that makes it more fit for existence under the conditions of its environment.
- **COHESION** is the attractive force between like substances that explains surface tension.
- **DENSITY** is the mass of a substance per unit volume.
- **HABITAT** is the place or environment where a plant or animal naturally or normally lives and grows. To be a healthy habitat it must include: shelter, water, food, and space.
- **HYDROFUGOUS SETAE** are the water repellent hairs found on the bottom of a water striders legs to prevent them from breaking the surface tension of the water.
- **MOLECULE** is the smallest particle of a substance that retains all the properties of the substance and is composed of one or more atoms
- **NICHE** is a) a habitat supplying the factors necessary for the existence of an organism or species b) the ecological role of an organism in a community especially in regard to food consumption
- **REFRACTION** is 1) deflection from a straight path undergone by a light ray or energy wave in passing obliquely from one medium (as air) into another (as water) in which its velocity is different 2) the action of distorting an image by viewing through a medium.
- **SURFACE TENSION** is the tendency of a liquid to hold together at its surface as if it had a thin skin.

## SURFACE TENSION: HOW A WATER STRIDER WALKS ON WATER

### Student Activity Worksheet

Please answer on a separate sheet of paper:

#### HYPOTHESIS

Surface tension helps objects to float in water. Will the surface tension of water be affected if oil, rubbing alcohol, or soap are added to the water? Does surface tension play a role in enabling a water strider to walk on water? What is your prediction?

#### LAB SAFETY AND PROTOCOL

What safety precautions did you follow and why?

#### PROCEDURES

1. What does "surface" mean?
2. What does "tension" mean?
3. What happens when you try to wash the oil off your hands with water only and no soap?
4. What happens when you try to wash the oil off your hands with water and soap?
5. Why do you think the soap helps wash off the oil?
6. Make a chart like the one below to complete the drawing and description of the water, rubbing alcohol, and cooking oil droplets. How does each drop compare or contrast with each other?

Liquid	Drawing and Description of Drop	Changes After 1 Drop	Changes After 2 Drops	Changes After 3 Drops	Smallest Drop
Water					
Rubbing Alcohol					
Cooking Oil					

7. How many drops do you predict before the cup overflows for:

Water? \_\_\_\_\_  
 Rubbing Alcohol? \_\_\_\_\_  
 Cooking Oil? \_\_\_\_\_

8. Which cup were more drops added before it overflowed? Why do you think this happened? (You may wish to refer back to #6)

9. Why did the cork float in the middle of the cup when it was filled to the top with water, yet floated to the side when water was removed?

10. Which solution supported the most paper clips? Why?

Solution	# of Supported Paper Clips FIRST ATTEMPT	# of Supported Paper Clips SECOND ATTEMPT	# of Supported Paper Clips THIRD ATTEMPT
Water			
Sugar and Water Solution			
Salt/Pepper & WaterSolution			

11. Why did the sugar draw the toothpicks toward the center of the bowl and the soap pushed the toothpicks away?

12. What is the water's strider's refraction on the bottom of the container larger than the actual size of the strider's foot?

13. What happens when you place your Styrofoam insect in the water without soap? With soap? Why?

#### CONCLUSION

*Further research may be required.*

Write a conclusion incorporating the following terms: molecule, cohesion, and surface tension.

What adaptations does a water strider have that enables it to walk on water? Why does a water strider live on water and not on land? What is a water strider's niche? Why don't more organisms live on top of the water or have the ability to walk on water? What role does a water strider play in the food chain?

# Soaking Wet

THIS SECTION OF THE DRAGONFLY GAZETTE RECOGNIZES PROJECT WET FACILITATORS, TEACHERS AND SCHOOLS AND PROVIDES A PLACE FOR THEM TO SHARE THEIR IDEAS AND ACCOMPLISHMENTS.

## GETTING OUR FEET WET TO LEARN ABOUT OUR ENVIRONMENT

*by Linda Chitty, Carol Palmatary, and Maria Reid  
St. Simons Elementary School*

Our adventure began after our school was selected to be a model EIC school. Linda Chitty, Maria Reid, Carol Palmatary, Nancy Rivers (teachers at St. Simons Island Elementary school), Melinda Cook (principal), Dawn Zenkert (local community 4-H representative), and Gail Lutowski (community education specialist) participated in an intense week long training session in the EIC model during the summer. Then we met before school started to discuss and plan how to implement the program.

Our first in-field program was on a very dreary, dismal day with intermittent rain showers. However, nothing could dampen our student's enthusiasm as they eagerly explored the salt marsh, the intertidal creek, the ocean and beach community.

Students tested the pH content of the creek, tested the rate of flow of the creek, and examined the water in the tidal pool and ocean. They also investigated the plants and animals in the salt marsh community, the dunes, the tidal pool and the ocean. Students eagerly inspected the marine life brought in while seining.



Student at St. Simons Elementary "up to his ankles" in water education.

While recording their information in their scientific log book, they got drenched with a sudden downpour (the remnants of Tropical storm Eduardo). Nevertheless, their excitement was at a fever pitch as they returned to the classroom to analyze their data and plan for the next session. Rather than sitting and listening to lecture, students are active participants in authentic fieldwork and are responsible for collecting the data they will later analyze, organize and compile into a PowerPoint presentation that they will present to their community.

Students use their acute observation skills, record keeping skills, research skills, deductive reasoning skills, reading, math and writing skills as they develop their EIC unit. Students are enthusiastic, on-task, and excited about learning. Students have so much fun while they are learning that it doesn't seem like work.



# SPLASH SUPERSTARS



Teachers and students across Georgia can participate in this special service-learning program.

## *Benefits*

Students will become leaders as they:

1) discover the many facets of water education, 2) teach other students, 3) monitor the quality of local waterways, 4) explore the school campus for sources of nonpoint source pollution, 5) identify their watershed and 6) express themselves through writing and art activities.

## *Students will receive:*

Certificates and Project WET bandanas. Their photographs and stories may be published in Georgia Project WET's Dragonfly Gazette newsletter.

## Criteria

### *SPLASH Superstars will:*

- Be introduced to a minimum of four Project WET activities.
- Lead other students through at least two Project WET activities.
- Monitor the quality of a local stream, river or other body of water using the Adopt-A-Stream program as a model.
- Study the way water flows on the school campus and identify sources of nonpoint source pollution.
- Identify their watershed and create poetry and artwork based on what they learned by participating in the River of Words project.

### *Teacher Requirements*

Teachers must be trained as Project WET educators, agree to lead students in the activities listed above, complete the Superstar registration form, submit a check made payable to Georgia Project WET/EEA for the number of students participating, and submit an end of the year reporting form on the Superstars' accomplishments including 10-15 photographs and student stories.

*Bandanas will be mailed upon receipt of registration form and payment. Splash Superstars certificates will be mailed upon completion of the reporting form.*

## REGISTRATION FORM

School: \_\_\_\_\_

Address: \_\_\_\_\_

Superstars Coordinator Contact Name(s)/Telephone/Email Address(es): \_\_\_\_\_

Why do you want your students to be SPLASH Superstars? \_\_\_\_\_

Grade level of students participating \_\_\_\_\_

\_\_\_\_\_ # of students participating  
x \$5.00/student

\$ \_\_\_\_\_ = total

Submit form and check made payable to Georgia Project WET/EEA to Petey Giroux, Georgia Project WET, Environmental Protection Division, 4220 International Parkway, Suite 101, Atlanta, Georgia 30354

# NEWS, NOTES AND UPCOMING EVENTS

## RIVERS ALIVE:

GEORGIA'S ANNUAL WATERWAY CLEAN-UP

Exciting things are happening in Georgia's waterways. People young and old are stepping up and cleaning them, removing hundreds of pounds of garbage as part of Rivers Alive. Rivers Alive is Georgia's annual volunteer river cleanup event, held throughout the month of October that targets waterways across the State of Georgia including streams, rivers, lakes, and wetlands. During 2001's River Cleanup, more than 18,000 volunteers cleaned over 650 miles of waterways and removed 120,000 pounds of trash and garbage including refrigerators, cars, furniture, and even a kid's bike from the State's waterways. The mission of Rivers Alive is to create awareness of and involvement in the preservation of Georgia's water resources.



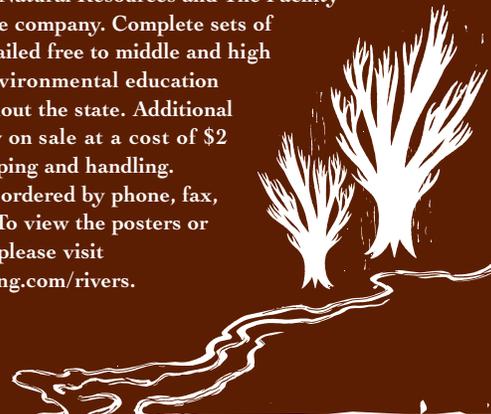
For information about Rivers Alive, please check out their website at [www.riversalive.org](http://www.riversalive.org) or call 404-675-1636.

### DID YOU KNOW?

- Georgia has 70,150 miles of streams and rivers.
- Our waterways provide us with fresh drinking water, great recreational opportunities like canoeing and fishing, and they serve as a pleasant respite from our busy day to day lives.
- October is the 30th anniversary of the Clean Water Act, Federal legislation to improve America's waterways.
- Our waterways support a diverse array of wildlife and are home to many species of fish and mollusks.
- There are 14 major Riverbasins in Georgia - Coosa, Flint, St. Marys, Satilla, Suwannee, Tallapoosa, Tennessee, Altamaha, Ocmuglee, Oconee, Savannah, Chattahoochee, Ochlockonee and Ogeechee.
- The Metro Atlanta area depends on the Chattahoochee River for 80% of its water requirements.
- Rivers and Streams of the American Southeast have been named as part of the World Wildlife Fund's The Global 200, a collection of the Earth's most outstanding and diverse terrestrial, freshwater, and marine habitats--areas where the Earth's biological wealth is most distinctive and rich, where its loss will be most severely felt, and where we must fight the hardest for conservation.

### P2AD GEORGIA RIVER POSTERS SERIES

Educational Posters featuring each of Georgia's 14 major river corridors, Altamaha, Chattahoochee, Coosa, Flint, Ochlockonee, Ocmulgee, Oconee, Ogeechee, Satilla, Savannah, St. Marys, Suwannee, Tallapoosa and Tennessee are now available for sale. The front side of each poster depicts a river map with surrounding towns along with river information, natural history, current and historical river uses, and related illustrations. The back side details state parks, nature-based educational experiences, national wildlife refuges, and environmental organizations. The posters were made possible by a public/private partnership between The Pollution Prevention Assistance Division (P2AD) of Georgia Department of Natural Resources and The Facility Group, a private company. Complete sets of posters were mailed free to middle and high schools and environmental education centers throughout the state. Additional posters are now on sale at a cost of \$2 each, plus shipping and handling. Posters may be ordered by phone, fax, mail or online. To view the posters or place an order, please visit [www.cipublishing.com/rivers](http://www.cipublishing.com/rivers).



### FREE FROM PROJECT WET (WHILE SUPPLIES LAST)

Make your selections below and fax to Deron Davis at (404) 675-6245.

# req. **CHILDREN'S BOOKS**

- Murky Water Caper (2 max)
- And Your Point Is (2 max)

**STUDENT INFORMATION KIT**

- Clean Water (2 max)

**CITIZEN'S GUIDE**

- Turning the Tide: A Citizen's Guide to Reducing Runoff Pollution (2 max)



NAME: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PHONE: W \_\_\_\_\_ H \_\_\_\_\_

FAX: \_\_\_\_\_ EMAIL: \_\_\_\_\_

# School Science and Real Life

by Mike Isbell, UNIVERSITY OF GEORGIA EXTENSION SERVICE, HEARD COUNTY

Our kids are back in school learning all kinds of things. Hopefully, they will remember what they've learned for a long time. One of these days, they may find themselves wishing they had paid a little more attention to the teacher.

Last week, someone called about a problem with his fish pond. Large numbers of fish suddenly started dying. The problem and the answer involved science principles our kids possibly learned about today at school.

Let me explain. Dissolved oxygen depletion is a common cause of fish kills and is usually the result of mismanagement of the pond. The major oxygen sources in water are photosynthesis (I know you learned that in school) and diffusion (there's another one). The oxygen produced is used by aquatic plants and animals for respiration (this is basic biology).

Warm summer temperatures cause ponds to form layers or to stratify (from your physical science class) because the surface water warms faster than the deeper water. The warm layer is lighter and does not mix with the cool deep water. If you dive into deep water, you will experience this layering, because you suddenly enter a layer of colder water.

Cool water near the bottom does not move very much, has low dissolved oxygen, and becomes stagnant. Fish rarely inhabit this area.

But certain weather conditions can cause a sudden mixing of the layers, or a "turnover." Especially during the summer months, turnover can cause oxygen depletion problems. Turnover during the summer is most likely to occur in small ponds after a period of strong winds or heavy rains, or the sudden passing of a cold front (and this is Earth Science).

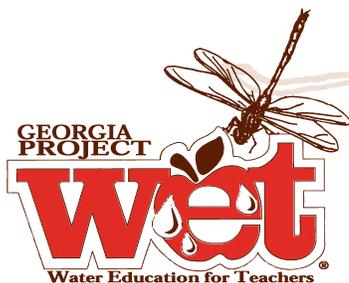
Cold rains put a layer of cold water on top of the warm water forcing it to the bottom and mixing the layers. If there is not enough oxygen in the mixture layer to maintain sufficient levels, then oxygen depletion and a fish kill can occur.

That's the exact weather condition that occurred before the pond owner called me about his dying fish.

So you see, there is a very good reason our kids are learning what they do in school. The principles and information they are learning have a real life use.

And you just never know when you might need to apply some of that information.

Heard County Extension Office, P.O. Box 503, Franklin, Georgia 30217, (706) 675-3513 phone, (706) 675-0819 fax, [uge2149@arches.uga.edu](mailto:uge2149@arches.uga.edu)



4220 International Parkway, Suite 101, Atlanta, Georgia 30354

## What's Inside this Issue?

- *Saving Education Through the Environment*
- *Order Your Free River of Words Teacher's Guide Today*
- *Become a Project WET Facilitator*
- *Lesson Plan on Surface Tension: How a Water Strider Walks on Water*
- *Healthy Water, Healthy People*
- *Soaking WET Teachers and Students*
- *Splash Superstars*
- *More Free Stuff*