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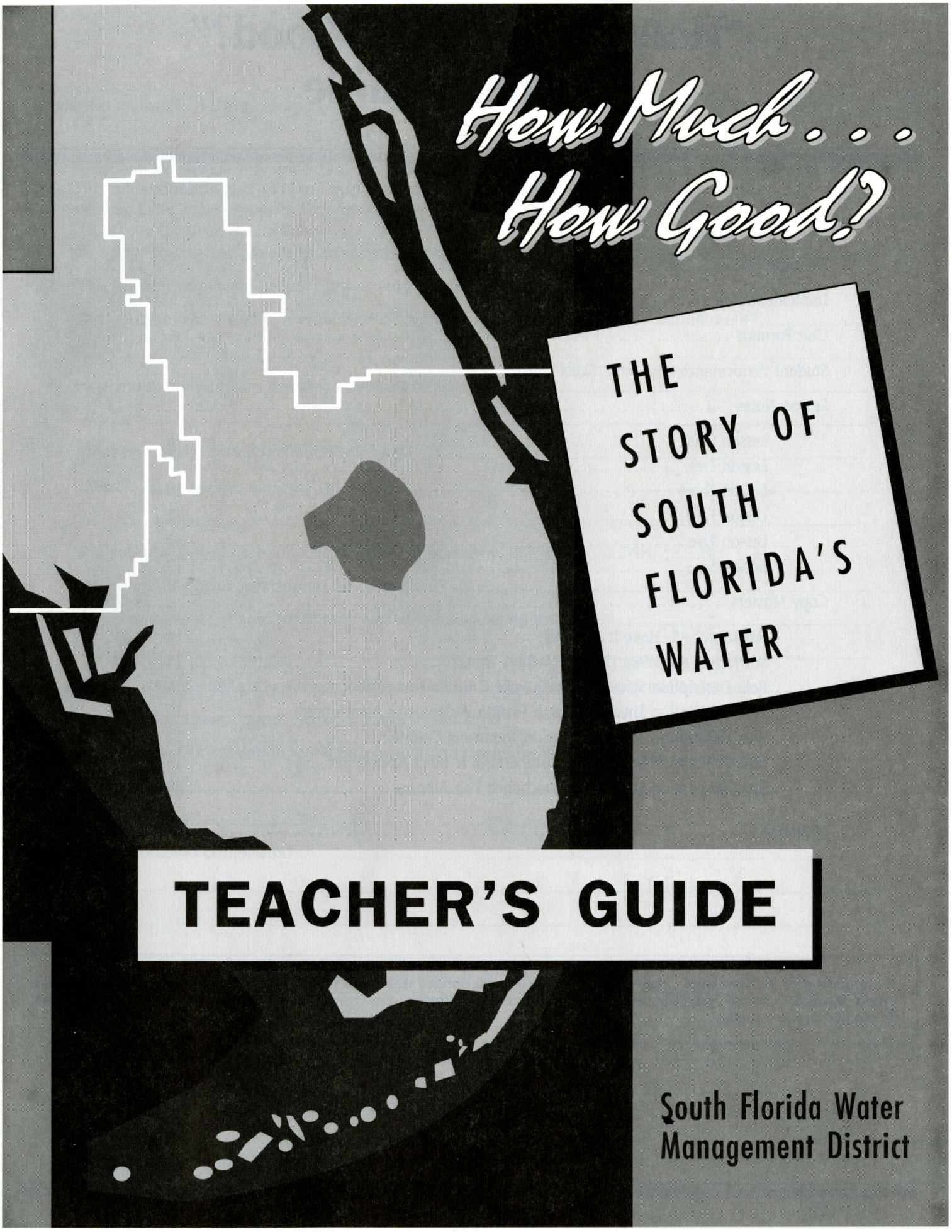
How Much . . .
How Good?
THE STORY OF SOUTH FLORIDA'S WATER
TEACHER'S GUIDE
South Florida Water Management District

"How Much...How Good?" Teacher's Guide

The teacher's guide for **"How Much...How Good?: The Story of South Florida's Water"** was produced by the South Florida Water Management District. Situations in the role descriptions and problem-solving scenarios, although based on technical information, are fictional and are intended for educational purposes only.

How Much . . . How Good?

Dear Educator:

These instructional materials are being piloted in the classroom with your assistance. Your comments and suggestions will be very important to us in developing the final product. Please take a moment to fill out this questionnaire and add your suggestions. Then simply tear it out and fold on the dotted lines on the reverse side. Tape or staple, then drop in the mail--postage is prepaid. THANKS!

1. In which course and at what grade level were the booklets used? _____
2. The reading level was: ___just right: ___too low; ___too high?
3. Did you use "How Much . . . How Good?" with your class as a unit or as a supplement? _____

   _____
4. How much time did you devote to using each lesson? _____

   Worksheets? _____
5. What part of the material did you like best? _____

   Least? _____

   _____
6. Did you use the"Hurricane to High Tech" video with your class? _____Yes _____No

   If yes, was the level appropriate for your class? _____
7. Approximately what amount of time was spent discussing the video? _____

   _____
8. What is your overall evaluation of the "How Much . . . How Good?" materials? _____

   ___excellent ___very good ___good ___fair ___poor
9. Would a teacher education workshop have made the material easier to use? _____

   _____

   More valuable? _____
10. Any additional comments? _____

    _____

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Introduction

Florida is called the Sunshine State, but it could just as easily be nicknamed the Water State. Florida is blessed with a bountiful supply of fresh water: an average annual rainfall of 55 inches; countless rivers, lakes, wetlands and springs; and a vast underground system of aquifers.

But despite this seeming abundance, Florida's unpredictable climate results in an uneven distribution of its vital water resources. Seasonable weather patterns can bring periods of prolonged drought or torrential downpours. In addition, rapid population growth and economic expansion jeopardize the integrity and availability of fresh water. Increased consumption leads to saltwater intrusion and contamination of wellfields. Pollution from agricultural and urban runoff and toxic wastes severely threatens the quality of our water supply.

Florida's concern for protecting its water resources led to a series of legislative acts in the 1970s and '80s designed to improve resource management and preserve Florida's highly water-dependent environment. Foremost among such legislation was the Water Resources Act of 1972 which created five regional water management districts. The districts, whose boundaries are drawn on hydrologic basins, are charged with managing water resources to ensure water quality and supply and protection against flooding. Over the years, the districts' responsibilities have grown to include permitting of surface water management and consumption, land acquisition and management, and environmental enhancement and preservation.

Today, Florida is recognized as a leader in water management and resource protection. Challenges and pressures from development are great, but the desire to preserve the natural beauty of this Water State is even greater.

The purpose of "How Much...How Good?: The Story of South Florida's Water" is to introduce water education to students and facilitate understanding and learning in an entertaining, but educationally sound, format. This endeavor originated out of concern for the water resources of South Florida and is sponsored by the South Florida Water Management District.

"How Much...How Good?" stresses the acquisition of a basic understanding of water in South Florida, the need to use water wisely and the importance of protecting our water resources. Beginning by building awareness and appreciation of water, the instructional material emphasizes cognitive objectives and teaches students how South Florida's water system works while emphasizing concerns about its efficient and effective operation for the mutual benefit of all user groups. In addition, students learn why they should be concerned about water problems. Identifying, evaluating and selecting appropriate solutions for water problems serve ultimately to validate the success of the program.

The unit examines the role of Lake Okeechobee as the keystone of South Florida's natural and man-made water system and explores the causes and effects of the ever-changing water quantity and quality in the lake. The teacher's guide offers a selection of two implementation formats, allowing you to choose the instructional plan that's best for your class.

The material is intended for use in science and social studies classes, grades nine through twelve. However, its usefulness for any given class should be determined by the individual teacher. Sometimes, the ability level of the students dictates a different implementation approach. If the tasks are too difficult, you might consider lengthening the amount of time devoted to the activities, e.g., teaching the three day unit over five days. We encourage you to use any or all of the material in your classroom to achieve desired educational objectives and foster positive environmental attitudes in your students.

Implementation

Unit activities are designed to be used in one of two implementation formats. The first is a four day plan in which the teacher assigns the students reading in the Student Book; concepts are reinforced by completing the four worksheets provided in the student materials.

The second unit format requires six days to complete. It utilizes the four lessons outlined in the shorter format plus two days of additional simulation activities. This format encourages students to apply their new-found knowledge by assuming the roles of various Lake Okeechobee water user groups, exposing them to the critical decision-making process experienced in real life.

The Unit Format outlines provide a choice of the format that's best for you. Each lesson plan offers student learning objectives, based on the student performance standards. The units are not "something more to teach," but they enhance what you are already teaching.

To help you use these materials most effectively, Lesson Notes provide answers to the worksheets, coded curricular concepts (based on the Department of Education's "Student Performance Standards for Florida Schools"), and step-by-step procedures for conducting the lessons.

"How Much...How Good?" has been designed so that you, the teacher, can put it to your best use. We hope that you and your students enjoy the materials.

Unit Formats

Day One

1. Introduction to the unit
2. Scene setting class activity
3. Video: "From Hurricanes to High Tech"
4. Discussion of the video
5. Introduction to the student materials
6. Reading of Chapter #1, with emphasis on an overview and the natural environment of Lake Okeechobee
7. Worksheet #1—Check the Data
8. Lesson review and closure

Day Two

1. Review of Day One material
2. Discussion of Worksheet #1
3. Introduction today's lesson
4. Reading of Chapter #2, with emphasis on commercial and sport fishing and agricultural use of Lake Okeechobee
5. Worksheet #2—Unloading the Nutrients
6. Lesson review and closure

Day Three

1. Review of Day Two material
2. Discussion of Worksheet #2
3. Introduction today's lesson
4. Reading of Chapter #3, with emphasis on water supply, flood control and conflicts over use of Lake Okeechobee
5. Worksheet #3—Views of the News
6. Lesson review and closure

Day Four

1. Review of Day Three material
2. Discussion of Worksheet #3
3. Introduction today's lesson
4. Reading of Chapter #4, with emphasis on many of the measures proposed to deal with Lake Okeechobee problems
5. Worksheet #4—Big Water Decisions
6. Discussion of Worksheet #4
7. Unit review and closure (Unit #1 only)
8. Lesson review and closure (Unit #2 only)

Day Five (used only in Format #2)

1. Review of unit material
2. Discussion of Worksheet #4
3. Introduction to simulation
4. Assignment of student roles—one of five constituent groups
5. Reading of role descriptions (from Teacher's Guide Copy Masters)
6. Role preparation in small groups
7. Worksheet #5—Have It Your Way (from Teacher's Guide Copy Masters)

Day Six (used only in Format #2)

1. Review of simulation procedures
2. Call to order of Okeechobee Planning Task Force Hearing
3. Constituent group presentations
4. Worksheet #6—What Do you (Really) Think? (from Teacher's Guide Copy Masters)
5. Unit review and closure

Student Performance Standards/ Skills Matrix*

Standards	Basic Lessons					
	Lesson One	Lesson Two	Lesson Three	Lesson Four	Lesson Five	Lesson Six
Reading						
A. The student will demonstrate knowledge of a basic vocabulary as determined by a specified word list.	1, 2	1, 2	1, 2	1, 2	1, 2	
C. The student will demonstrate literal comprehension skills.	12, 15, 16	12, 15, 16	12, 15, 16	12, 15, 16		16
D. The student will demonstrate inferential comprehension skills.		19, 20, 21	19, 20, 21	19, 20, 21	19, 21	
E. The student will demonstrate evaluative comprehension skills.				23	23	
F. The student will demonstrate the appropriate skills for obtaining information.	25, 26			25, 26		
Writing						
A. The student will compose grammatically correct sentences.		7, 9, 10, 12	7, 9, 10, 12	7, 9, 10, 12	7, 9, 10, 12	7, 9, 10, 12
B. The student will organize objects and information into logical groupings and orders.			20	20	20	20
C. The student will write a paragraph expressing ideas clearly.		25	25	25	25	25
D. The student will write for the purpose of supplying necessary information.	32, 33	32	32, 33	32, 33	32	32
G. The student will spell correctly.	52, 58	52, 58	52, 58	52, 58	52, 58	52, 58
H. The student will punctuate correctly.	62, 67	62, 67	62, 67	62, 67	62, 67	62, 67
I. The student will capitalize correctly.	70	70	70	70	70	70
J. The student will write legibly.	76, 80	76, 80	76, 80	76, 80	76, 80	76, 80
Science						
A. The student will apply basic process skills as tools for scientific investigation.	33			33	33	33
B. The student will apply basic process skills to problem solving in science.	47	46	46, 47	46, 47	46, 47	46, 47
C. The student will know basic life science concepts and facts.		93				
G. The student will know basic earth/space science concepts and facts.			224		224	
H. The student will apply basic earth/space science concepts and facts.	250	250	250		250	
J. The student will use science process skills and science information in daily activities.				276, 278	276, 278	276, 278
K. The student will describe the interactions among science, technology and society.		285, 288, 289, 290, 291, 292	282, 285, 288, 289, 291	282	282, 285, 288, 290, 291, 292	282, 285, 288, 289, 290, 291, 292
L. The student will describe the nature of the domain of science.				298, 299, 300	298, 299, 300	298, 299, 300

*Florida Department of Education, Division of Public Schools, Instructional Support Services, Florida Education Center, Tallahassee, FL 32399

LESSON 1

Okeechobee: Big Water for South Florida

Introduction:

This introductory session begins with an overview of the unit and an explanation of what the students will be studying and why. The videotape "From Hurricanes to High Tech," introduces the subject. Following a discussion of the video, the students receive the **Student Handbook** and a reading assignment of Chapter 1. Student learning is reinforced through the use of a worksheet. The lesson concludes with a review of the day's material.

Materials:

Videotape: "From Hurricanes to High Tech"

Student Handbook:

Reading, pages 1–4
"Worksheet #1: Check the Data," pages 5–6

Procedures:

1. Introduce the unit by informing the students that water is a resource of vital concern to South Florida.
2. Point out to the students that by examining the water scene in Florida, science principles can take on more personal relevance.
3. Introduce the videotape, "From Hurricanes to High Tech." Explain to the students that this video is designed to give them an overview of the water resource in South Florida and some of the present and future concerns over its use and supply.
4. After viewing the videotape, discuss the content of the video with the students. Encourage an exchange of viewpoints. Record issues for additional research or questions to be answered.
5. Introduce the **Student Handbook**. Note that this publication will be used for most, if not all, of their reading and seatwork assignments.
6. Hand out the **Student Handbook**.
7. Assign Chapter 1, "Okeechobee: Big Water for South Florida," pages 1–4, for reading.
8. When the students have finished the reading, have them complete "Worksheet #1: Check the Data," pages 5–6 in the **Student Handbook**. If the students need more time for the worksheet, it may be assigned as homework. Tell the class that their answers will be discussed tomorrow.
9. Conclude the lesson by reviewing the material from Chapter 1 and the videotape, and answering any remaining student questions.

"Check the Data" Answer Key

Reading the Data

1. 1975
2. Kissimmee River
3. Caloosahatchee River
4. 1981
5. July, 1977
6. October
7. April

Interpreting the Data

1. Given the current trend of growing population in South Florida, it is possible that a greater percentage of Lake Okeechobee water could be consumed as a backup supply by urban water users in the future, even if significant savings are achieved through water conservation. However, long-term planning is under way to augment urban water supplies in order to reduce dependence on the lake during droughts.
2. Lake level is lowest in mid-summer.

   The beginning of summer comes on the heels of the "dry season" when summer rains have not yet had a chance to restore high lake levels.

   Water releases also affect the level of the lake.
3. Unusually low rainfall from February through July kept the lake level low.

   CHART #1: "Monthly Level of Lake Okeechobee"
   CHART #2: "Rainfall in Lake Okeechobee Basin"
4. As the lake level drops, an increasing amount of habitat is exposed, especially in the littoral zone along the western and northwestern shores. Consequently, with more available feeding area, more birds are sighted feeding.

   CHART #1: "Average Level of Lake Okeechobee"
   CHART #2: "Birds Feeding on Lake Okeechobee"
5. Answers based on student responses. Be sure that the charts cited actually provide relevant data to the conclusion drawn by the student.

LESSON 2

A Question of Quality

Introduction:

Today's lesson focuses on the water quality of Lake Okeechobee. The students will read about the conditions which constitute a healthy lake and about those factors which can reduce the quality of such a water body. They will learn about natural and human impacts which can degrade the lake, their negative effects and some of the potential solutions for these problems. Finally, the students will examine the positions of the farmers and the commercial and sport fishermen. These two groups have competing interests and generally hold opposing opinions about the water quality issues affecting Lake Okeechobee.

Materials:

Student Handbook:

Reading, pages 7–10
"Worksheet #2: Unloading the Nutrients," pages 11–12

Procedures:

1. Begin the lesson by reviewing yesterday's material and answering any student questions.
2. Continue by discussing the students' responses on "Worksheet #1: Check the Data." Answers to the worksheet may be found on page 6 of this guide.
3. Introduce today's lesson on water quality in Lake Okeechobee. Relate this focus to any material already covered in the course of the regular curriculum, if appropriate.
4. Have the students read Chapter 2, "A Question of Quality," pages 7–10 in the **Student Handbook**. Note that they should pay particular attention to the conflicting interests of the farmers and the fishermen in regards to the lake's water quality.
5. After the students have completed the reading, have them complete "Worksheet #2: Unloading the Nutrients," pages 11–12 in the **Student Handbook**. Point out to the students that the nature of this exercise is analysis, not finding the best solution to the stated problems. Answers to the worksheet will be discussed in class tomorrow.
6. Conclude the lesson by reviewing the day's material and answering any remaining student questions.

"Unloading the Nutrients" Suggested Answer Key

Proposal #1: Herd Reduction

Farmer — A farmer would oppose this proposal at the stated buyout price of $600/head. This price does not take into account future productivity of the cattle; it only pays the farmer for the current value of each cow.

Fisherman — Fishermen would support this proposal. A direct correlation exists between reducing the herd and the phosphorus, although experts aren't certain how long it takes for phosphorus in the soil to wash away. There is also the question of who pays for the buyout. If the money is raised by general taxes, then the fisherman will perceive that he is paying to solve the farmer's problem.

Proposal #2: Sewage Plant

Farmer — Farmers would be totally opposed to this proposal. They would consider it an unfair burden on their small group. Even by raising the money to pay for the plant and its operation through an increase in milk costs, farmers would feel that the costs should be shared by a larger number of citizens, especially other users of Lake Okeechobee water.

Fisherman — Fishermen would totally support this proposal. They would be pleased with the significant reduction in nutrient levels at no cost to the fishing industry or the general public.

Proposal #3: Treatment Lake

Farmer — Farmers would generally support this proposal. The solution results in a significant reduction of nutrient loading with the costs to be shared by the fishing industry.

Fisherman — Fishermen would support this proposal somewhat. They recognize the benefits from the tremendous reduction in nutrient loading but they would still resent the fact that the fishing industry must pay for what they essentially view as a "farmers' problem."

LESSON 3

A Question of Quantity

Introduction:

This session looks at the problems related to water supply for the many users of Lake Okeechobee. Is there enough water for the lake's fishery? Enough for urban water users? Enough for the Everglades environment? What should be done with excess water when flood conditions exist? How can water managers balance the needs of several user constituencies? Following today's reading about these questions, the students will complete a worksheet which examines various problems related to the lake, issues of both quantity and quality, and the relative position of each user group.

Materials:

Student Handbook:

Reading, pages 13–16
"Worksheet #3: Views of the News," pages 17–18

Procedures:

1. Begin the class with a review of yesterday's topic; encourage discussion and answer any student questions.
2. Ask students to share their answers to "Worksheet #2: Unloading the Nutrients." Suggested answers to the worksheet are found on page 7 of this guide.
3. Once the worksheet discussion has been concluded, introduce today's focus—water supply, flood control and Lake Okeechobee.
4. Assign Chapter 3, "A Question of Quantity," pages 13–16 in the **Student Handbook**, for reading. Point out to the students that the lake's water quantity problems include **both** too much water, as well as too little water, for various groups at different times.
5. When the students have finished the reading, assign "Worksheet #3, Views of the News," pages 17–18 in the **Student Handbook**. The worksheet answers will be discussed at the beginning of Day Four.
6. Bring the class to closure by reviewing the material on water quantity problems. Answer any remaining student questions.

"Views of the News" Suggested Answer Key

Group	A. Lower Lake	B. Higher Lake	C. Trash Fish	D. Pollution Laws	E. BMP's Delay
Dairy Farmers	N/A	N/A	N/A	0	+
Sugar Cane Farmers	0	+/0	N/A	0	+
Urban Water Users	+/0	+/0	0	+	0
Environmentalists	+	0	0	+	0
Fishermen	+	0	0	+	0

A. "Second Year of Drought Keeps Lake Levels 30% Below Normal"

Dairy Farmers — Because most of their farms are located above the lake, the dairy farmers would likely be unaffected by a high lake level.

Sugar Cane Farmers — Cane farmers want abundant water available to irrigate their crops. A low lake means less water in storage. Such news would make them unhappy. An exception to this position would be in times of flooding. During flooding they want the lake to be able to capture the excess water to protect their land; but this headline specifies drought conditions.

Urban Water Users — City dwellers want as much water stored in the lake as possible so that it is available for direct water supply for lakeside communities and to recharge aquifers for coastal city supply. Water releases are also used to retard saltwater intrusion in the coastal aquifers. Like the cane farmers, however, urban water users are concerned that sufficient space be left in the lake for flood control during periods of heavy rain.

Environmentalists — Although environmentalists want adequate water releases to maintain healthy ecosystems in the water conservation areas and the Everglades, they also like the lake to be maintained with a lower water level to protect the habitat of the littoral zone on the western and northwestern shores.

Fishermen — Although a higher lake level might make it easier to launch and navigate their boats, fishermen would generally prefer a lower lake which could lead to reduced amounts of nutrients in the lake. Lower levels of nutrients promote a healthier biotic environment and consequently, better fishing in the long run.

B. "Hurricane Kathy Raises Okeechobee Waters 6 Inches"

Dairy Farmers — As in the case of the lower lake level, the dairy farmers are unaffected by a higher lake level.

Sugar Cane Farmers — Generally, sugar cane farmers are pleased with a high lake level so that adequate irrigation water is available for their fields. But in times of abundant rainfall, the lake serves to capture flood waters and protect the farmers' fields; thus, the farmers like to see some space in the lake for flood prevention during wet months.

Urban Water Users — Lakeside city dwellers are unhappy with a high lake level since less space is available to capture flood waters which might endanger their communities. However, more water stored in the lake, as long as it doesn't exceed the storage capacity, means more water to recharge underground aquifers during droughts.

Environmentalists — Higher lake levels mean the habitat in the littoral zone has been inundated, thereby displacing wildlife. If the floodwaters rise too high and emergency releases are required, habitats in the coastal estuaries, e.g., St. Lucie County, can be damaged by the sudden influx of fresh water. The use of "pulsed" releases can somewhat mitigate this problem.

Fishermen — Although some might argue that a higher lake level means more habitat for the fish, the most critical factors are availability of food and oxygen, which are not **directly** related to the depth of the lake. A lower lake might result in a lower nutrient level.

C. "University Study Reveals Increase in 'Trash Fish' Population"

Dairy Farmers — Since the dairy farms do not rely on lake water as a supply, they would be unaffected by a change in the water quality.

Sugar Cane Farmers — Although cane farmers rely on lake water for irrigating their fields, lower water quality due to nutrient loading, as indicated by growing numbers of "trash fish," would affect them very little, if at all. If anything, the nutrient-laden water would probably act as fertilizer for the cane crop.

Urban Water Users — The presence of "trash fish" is an indicator of poor water quality. Hence, urban water users who directly consume lake water would be concerned by an increase in their population. Cities which draw their water supply from an aquifer would be less concerned with poor quality of lake water since much of the pollutants are dissipated in the percolation process.

Environmentalists — Like the urban users, environmentalists have a keen interest in maintaining good water quality for a healthy habitat in the lake and in those areas which rely on water released from the lake.

Fishermen — The fishing industry probably would not be pleased with an increase in the "trash fish" population. Not only does this indicate a lowering of habitat quality, but "trash fish" "get in the way" and compete with the more desirable species, such as largemouth bass and speckled perch, which are preferred by both sport and commercial fishermen.

D. "Legislature Passes Tighter Pollution Regulations"

Dairy Farmers — Such legislation would displease the dairy farmers. Since they are major contributors to water quality problems in the lake, they would undoubtedly be forced to alter their operations and probably pay a significant amount to remedy the problem. Solutions might include wastewater containment and/or treatment, herd reduction or relocation, or even going out of business.

Sugar Cane Farmers — If the pollution was caused by the cane farmers' wastewater polluting the lake, such as from backpumping, or if their pollution affected the habitat of the wetlands of the water conservation areas and the Everglades, they would be faced with a price to pay similar to the dairy farmers.

Urban Water Users — City dwellers, especially those in lakeside towns who draw their water supply directly from the lake, would be pleased with any measures which improved their water quality, unless the cost of pollution control was passed on to the general public. Even then, they might favor it if the cost was not too high.

Environmentalists — This group would strongly favor stricter regulation which benefits both the plant and animal life in the littoral zone of Lake Okeechobee and throughout the affected wetlands areas.

Fishermen — Since polluted water in Lake Okeechobee adversely affects the lake's fishery, fishermen would favor tighter pollution regulations.

E. "State Delays New BMP Requirements for Dairies"

Dairy Farmers — Such a development would bring a happy response from the dairy farmers since these BMPs are aimed at the dairies. The requirements would cost these farmers money and force them to change many of their operations.

Sugar Cane Farmers — Although most BMP programs are currently aimed at the dairy industry, research is underway to study the effects of sugar cane farming on water quality in the Everglades Agricultural Area. Conceivably, BMPs will be adopted for cane growers affecting their operations and costing them money, too. Therefore, they would favor a BMP delay.

Urban Water Users — Considering their desire for improved water quality in the lake, urban water users — especially those lakeside communities which draw their drinking water directly from the lake — would be unhappy with any delay in BMP implementation.

Environmentalists — Once again, any delay in improving water quality for the lake's biotic community, and for those areas affected by the lake's water, would bring displeasure to the environmentalists.

Fishermen — Like the environmentalists, the fishing industry would be frustrated with any "footdragging" in implementing solutions to the lake's water quality problems. They view this as a threat to their livelihood.

LESSON 4

Protecting the Big Water

Introduction:

Today's lesson culminates our investigation of Lake Okeechobee's problems and potential. It brings together the various elements of conflict over the many uses of the Big Water. The class will examine several possible solutions for the problems explored in Days One–Three. The students not only will read about what has been and is being done to correct various problems, but they will also learn about some future options. The class concludes its study of the issues by engaging in some problem-solving of its own. The students will complete a worksheet which requires them to select what they think are the most reasonable compromises, trying to satisfy as many of the lake's user groups as possible.

Materials

Student Handbook:

Reading, pages 19–22
"Worksheet #4: Big Water Decisions," pages 23–24

Procedures:

1. Begin this session by reviewing the material on Lake Okeechobee's role in water supply and flood control. Encourage discussion and answer any remaining student questions on the subject.
2. Next, go over the students' answers on "Worksheet #3: Views of the News." Suggested answers to the worksheet are found on pages 9–10 of this guide.
3. Introduce today's lesson examining solutions to Lake Okeechobee's problems. Point out to the students that, as in any such situation where vested interests are diametrically opposed to each other, acceptable solutions, although not completely satisfactory to any one party, must be a result of compromise.
4. Have the students read Chapter 4, "Protecting the Big Water," pages 19–22 in the **Student Handbook**. Remind the students to note the solutions which are, or might be, acceptable to the various Okeechobee user groups. They should be aware of how much they think each group might be willing to"give" in reaching an acceptable solution to each problem.
5. After the students have finished the reading, assign "Worksheet #4: Big Water Decisions," pages 23–24 in the **Student Handbook**, for completion.
6. If time permits, review the students' responses to the worksheet. Since their answers are their own opinions, there are no "correct" responses. However, they should be able to provide reasonable solutions to the problems and project the probable effects of their recommendations on each user group. If necessary, culminate the unit at the beginning of tomorrow's class.
7. Conclude the unit by discussing the significance of Lake Okeechobee's water to all of South Florida. Review the various groups involved in using Okeechobee water, their importance to the region, and how their water use complements or conflicts with the other groups. Finally, discuss how some compromises might be reached to solve the major issues at stake.

LESSON

5 Preparing for the Hearing

Introduction:

Today's lesson is the first of two which, using the preceding material, allows the students to engage in some problem-solving and role-playing. This simulation activity expands the critical-thinking approach of the previous lesson and provides the class with a decision-making arena. Following a brief review of all of the material, the simulation stage is set and the students are assigned roles as one of the five constituent water user groups. Each group is given a role description sheet which supplies it with additional data about an individual member and the group's position. The remainder of the class is spent in small group work, using a worksheet to prepare the constituency's presentation for tomorrow's hearing of the Okeechobee Task Force.

Materials:

Teacher's Guide:

Role Description Sheets, pages 16–20
"Worksheet #5: Have It Your Way," page 14
(photocopy for your students)

Procedures:

1. Begin the lesson by "brainstorming" with students to briefly summarize the natural characteristics of Lake Okeechobee and its relationship to other bodies of water in South Florida.
2. Continue the lesson by asking students to recall the various uses of Lake Okeechobee.
3. Finally, ask students to summarize the basic problems which have evolved concerning the beneficial use of Lake Okeechobee's waters.
4. Introduce the group simulation activity by explaining to the students that each of them is about to take on the role of one of the five Okeechobee water user groups: environmentalists, sugar cane farmers, dairy farmers, urban water users and commercial fishermen. Note that they will work with others assigned to the same role in preparing a presentation at the hearing of the Okeechobee Task Force tomorrow. The purpose of this hearing is to allow all affected parties to present their views on how the waters of Lake Okeechobee should be managed in order to provide the most beneficial use of the resource, to the greatest number of people, while maintaining a healthy ecosystem.
5. Point out to the students that they should outline their group's concerns over the lake's use, present recommendations for solving the various problems and, most importantly, provide a rationale for their position. They also should note what support they share, if any, from any other group.
6. Answer any student questions regarding their tasks and the format of the simulation.
7. Assign the students to the five water user groups.
8. Hand out copies of the appropriate Role Description Sheets to each group. These sheets may be reproduced from the masters found on pages 16–20 of this guide. The contents of these sheets is "privileged information" and should be shared between groups only as a means of negotiating support from another group.
9. Hand out copies of "Worksheet #5: Have It Your Way." These worksheets should be completed by each student once his/her group has established a consensus position on each of the issues involved. Copies of the worksheet may be reproduced from the master found on page 14.
10. Have students spend the remainder of the class period working in their groups. They may also use this time to "lobby" for the support of other groups who share similar concerns to theirs.

LESSON 6

Okeechobee Task Force Hearing

Introduction:

Today's lesson is a culmination designed to expose the students to the breadth and complexity of the issues concerning Lake Okeechobee's use. It also allows students to experience a bit of the difficulty and frustration faced by water managers, and the voting public, as they seek to equitably balance the needs of each water user group with the health of the resource. Following a brief review of the simulation procedure, each group will make a 5-6 minute presentation on its position. Following the presentations, the students will complete a worksheet which seeks a compromise position of all of the groups, and also what the individual student considers the most appropriate combination of solutions.

Materials:

Teacher's Guide:

"Worksheet #6: What Do You (Really) Think?," page 15

Procedures:

1. Begin this final session by reviewing the procedures for today's simulation. Remind the students that it is important that they "play" their assigned roles as convincingly as possible, even if they don't share the view of that particular group.
2. Allow the small groups a few minutes to meet and finalize their presentation plans. Once again, remind them that they should:
   1) state their concerns clearly,
   2) outline their solutions to the problems succinctly,
   3) present a rationale for their position, and
   4) provide any additional support they have gathered from other use groups.
3. Call the Okeechobee Task Force to order. Ask the groups to make their presentations.
4. When the groups have completed their presentations, hand out copies of "Worksheet #6: What Do You (Really) Think?" Copies of the worksheet may be reproduced from the master found on page 15 of this guide.
5. Explain to the students that they may now take off their "role hats" and use the information and arguments offered in the hearing to come to some personal decisions on how they think the lake's problems should be solved. They should use Worksheet #6 to express their opinions.
6. Depending on the available time, you may choose to have the students submit their completed worksheets at the beginning of class tomorrow.
7. Conclude the unit by asking for discussion on what they have learned from this unit and why this subject is an important one—for them today and in the future.

Worksheet #5: Have It Your Way

Your task in the upcoming Okeechobee Task Force Hearing is to represent the interests of your group as effectively as possible. You want to maximize the use of Lake Okeechobee for your group's needs. Although you are aware that the lake's waters are put to other good uses, your primary concern is protecting your own interests. You're confident that other groups will look after their concerns.

In order to make an effective presentation at the hearing, you must be prepared to address all of the issues which will affect your interests. In the space below, write your recommended solutions and give reasons to support each proposed action.

Issue	Recommended Solution	Rationale
#1: Raising/ Lowering Lake Level		
#2: Limiting Nutrient Inflows		
#3: Timing, Volume & Location of Releases		
#4: Eliminating Backpumping		

Worksheet #6:
What Do You (Really) Think?

This final worksheet allows you to **step away from any particular interest group** and **act as an unbiased observer** of the problems facing Lake Okeechobee and the use of its waters. Using all you have learned in this unit, complete the chart below, like Worksheet #5, by making your **personal** unbiased recommended solutions. This time you should attempt to satisfy the needs of as many water user groups as possible. Remember, such considerations may require compromises.

Issue	Recommended Solution	Rationale
#1: Raising/ Lowering Lake Level		
#2: Limiting Nutrient Inflows		
#3: Timing, Volume & Location of Releases		
#4: Eliminating Backpumping		

South Lake Growers' Association (SLGA)

George Johnson's great-grandfather was a pioneer farmer in the area southeast of Lake Okeechobee, battling the hardships of the weather, mosquitoes and the Depression, to forge out a productive 10,000-acre family farm. Johnson's grandfather and father followed in the furrows the elder Johnson plowed for them. The family managed to survive the disastrous hurricanes of the 40s and the vagaries of the weather and economy of the last few decades. Now, the legacy of the family rests on the shoulders of George. He proudly represents his family, and all of the other farmers in the area, as president of the SLGA.

The SLGA, a powerful alliance of agricultural companies, was formed in the 1960s to look after the interests of farmers in the Everglades Agricultural Area (EAA).

The heart of Florida's multi-million dollar sugar industry is located in the EAA, south of Lake Okeechobee. Growers raise sugar cane on thousands of acres of land which must be irrigated by water from the lake.

The sugar companies employ several thousand people who grow and harvest the crops, haul them, and work in the refineries. The muck soil, in which the crops grow, provides some of the best land in the nation for growing sugar cane, as well as vegetables such as corn and lettuce.

Soil in the EAA is rich in nutrients, especially nitrogen. Farmers add to these growth-producing elements by using fertilizers on the crops. These farmers depend on water from Lake Okeechobee to irrigate their fields. They like to see the lake as full as possible.

During heavy rains, the farmers need to drain the fields to avoid flooding. Most of the water is pumped into nearby Everglades Water Conservation Areas, but under certain conditions water may be pumped back into Lake Okeechobee. Farming has been going on in this area for many years, and the growers are not happy with the idea that "newcomers" are talking about cleanup measures that may cost them money. They think "backpumping" should be used at the earliest warning signals that flooding may occur.

South Florida Water Users Association (SFWUA)

Harold Firebaum moved to South Florida three years ago. Harold worked in the auto industry for thirty-five years, his last 17 as shift supervisor. Sick of the traffic, freezing cold winters and the high taxes in the midwest, Harold retired early and moved to sunny South Florida with his wife Maude to live the good life in the fun and sun. After being elected president of his condominium association, a job Harold assumed would be more honorary than functional, water quantity and quality emerged more frequently as issues at the condominium association meetings. The "last straw" came when water restrictions were applied during the dry season two years running, and people could not wash their cars and water the nicely manicured lawn around the condominiums. Harold was asked to represent the condominium association at the South Florida Water Users Association where he quickly assumed more and more leadership responsibility. He currently serves as president.

The SFWUA is composed of people interested in the water supply for cities and towns in South Florida... both the densely populated coastal areas and the less crowded inland communities such as those around Lake Okeechobee.

Members of SFWUA represent the nearly four million residents, mostly big-city dwellers, who get water from the Biscayne Aquifer, and another 78,000 residents of towns served by water treatment plants drawing water from Lake Okeechobee. SFWUA also includes representatives from businesses that operate in South Florida, and some large companies, including two sugar refineries. City water departments, the utilities which supply water to all these users, are also represented in the association. The towns which take water directly from the lake are especially concerned about the quality of Okeechobee water. Many of the people in SFWUA have never even seen Lake Okeechobee. Most, however, are getting increasingly familiar with water restrictions as South Florida attracts more and more new residents each year. They want to see as much water as possible stored in the lake, to avoid water shortage problems. These people also get very concerned whenever there is a threat of flooding near them.

In the future, as population grows, water planners will investigate other technologies, such as reverse osmosis, wastewater reclamation and underground water storage, to supplement supplies. However, these alternatives will be very expensive. They could cost upwards of $250 million per year, or $156 per household.

Florida Tomorrow Coalition (FTC)

Susan Jones is no little old lady in tennis shoes. As a matter of fact, she doesn't even like to go birdwatching. She is, however, committed to insuring that some vestiges of the "natural" Florida remain for her children and their children after them. Susan is a member of a minority group; she is a "native" Floridian. In her forty-five years of experiencing Florida, she has watched the big cities of the east coast creep toward each other and virtually merge to form one huge megalopolis spanning the coast. When there was no room to grow north or south, the great and beautiful Atlantic Ocean left only west as a choice. As urban sprawl chipped away at the Everglades, Susan got catalyzed into action. Even though some of the environmental organizations she belonged to had been effective in small ways, no one group could tackle the impending demise of the Everglades alone. It was Susan Jones who facilitated the formation of the FTC, knowing that sometimes the "sum of the parts can be greater than the whole;" that is, by combining forces the synergistic effect of the various groups working together could be much greater than if they were a single organization.

The FTC is a diverse group of people who, for a variety of reasons, are concerned with protecting the environment of Florida. FTC's concerns include air pollution, water pollution, wildlife protection and overall environmental preservation. The group's goal is to protect all of Florida's ecosystems, from Georgia to the Everglades.

FTC's main interests regarding Lake Okeechobee center around protecting the birds, fish and other animals, as well as the plant life and habitat that support them. They feel that man's impact on the lake should be reduced as much as possible; the trend over the last three decades has been just the opposite.

They want to protect endangered species of animals, such as the wood stork, the Florida panther, the American crocodile and the manatee, while improving conditions for all wildlife.

To this end, while the FTC recognizes the lake's role in supplying water to agriculture and urban users, they strongly believe that environmental concerns must play a major role in decisions affecting management of the lake and its water. This includes protection of the shallow littoral zone along the west side of the lake where wading birds feed when the lake level is not too high.

In addition to Lake Okeechobee, members of the group are generally concerned with water quality in the Everglades and in the estuaries where the waters of the Caloosahatchee River and St. Lucie Canal mix with the sea.

The Sunshine Milk and Meat Association (SMMA)

Betsy Woodbridge has been a dairy farmer all of her life. She grew up on her father's farm and joined the 4-H Club in elementary school. All of her 4-H projects were about milk cows. In high school, she joined the Future Farmers of America and quickly rose through the membership to become president. After high school, she took over the family business because of her father's poor health. When the ranchers in the Kissimmee River and Taylor Creek-Nubbin Slough areas got together to form the SMMA, Betsy was the logical choice for president. Not only did she have leadership experience, she also was a good looking woman who did not take any grief from any man, or woman for that matter. She had everybody's attention when she stood up to speak at a meeting.

The SMMA was formed to represent the interests of the dairy farmers and cattle ranchers in the area north of Lake Okeechobee—along the Lower Kissimmee River and in the Taylor Creek-Nubbin Slough area. This area, north of the lake, is generally higher, and drains into ditches and creeks which eventually lead to the lake. Flooding in this area occurs when rainwater flowing down from the north accumulates on the pastures.

In addition to more than 40,000 beef cattle, there are about 50,000 dairy cows in the area, each of which produces about 85 pounds of high-phosphorus manure every day. Ranching in the area provides jobs for thousands of people—not only in raising and milking the cows, but in the many plants throughout South Florida where milk is processed into butter, cheese, ice cream and yogurt. These businesses contribute heavily to the economic well-being of the city of Okeechobee and other small communities.

In many cases, dairy farmers have been forced out of areas of South Florida because of growing population. The area north of Lake Okeechobee is now the only area in South Florida where large-scale dairy farming takes place.

Like the members of the South Lake Growers Association, the SMMA is skittish about new water quality rules which will cost them money.

Okeechobee Fish Alliance (OFA)

Charles Bluefeather was born and reared in Port Mayaca and has lived all 57 of his years along the shore of Lake Okeechobee. He caught his first lunker bass, a ten pounder, at age 8. He spent all of his free time as a kid exploring the "big water." In the early 60s, at age 20, he became one of the youngest, and most sought after, professional fishing guides on the lake. Over the last two and one-half decades, Charles has observed numerous algae blooms on Lake Okeechobee. When the big algal bloom was reported in 1986, his business declined by 40 percent and he lost thousands of dollars in income—right at a time when he had two kids in college and a third in 11th grade. When the Okeechobee Fish Alliance (OFA) was formed in 1985, Charles Bluefeather was elected its chairman, by acclamation. Everyone knew there was not another person alive who could represent the interests of the OFA better.

The OFA was formed in 1985 to represent the interests of sportfishing groups, commercial fishermen (and women), boat dealers, bait shop owners, marina operators and others interested in fishing in and around Lake Okeechobee.

The livelihood of many members depends upon the continuation of the productive fishery that exists in the lake. To that end, the OFA wants to see enough plant life in the lake to support a healthy fish population, but not so much algae, hydrilla, water hyacinth and other plant life to foul fishing lines. The alliance wants measures taken to reduce nutrient levels in Lake Okeechobee and "get rid of the weeds."

Bass fishermen have voted Lake Okeechobee the best in the U.S. for large mouthbass fishing. They believe that the lake should be managed in such a way that the quality of fishing in Okeechobee remains at that high level.

Most of these anglers believe that low water levels in the lake allows exposed bottom muck to oxidize, thus promoting better fishing.

GLOSSARY

ALGA(E) - aquatic plants which lack true roots, stems or leaves; important source of food for plant eaters and dissolved oxygen (from photosynthesis) in aquatic systems; may become overly abundant if excess nutrients are present, thus throwing the system out of balance.

AQUIFER - the underground formation of rock or sand which stores water; people pump water from aquifers with wells.

BACKPUMPING - the process of pumping water in the opposite direction than it would normally flow; routine backpumping into Lake Okeechobee was stopped in 1979.

BEST MANAGEMENT PRATICE - a scientifically designed way of controlling natural resources; in the dairy business, a change in agricultural operation to improve the quality of water flowing from a farm.

BISCAYNE AQUIFER - a major aquifer supplying water to much of South Florida.

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT - the C&SF Project; a massive flood control and water supply system authorized by Congress in 1948 and constructed by the U.S. Army Corps of Engineers; includes 1,400 miles of canals and levees, 252 water control structures, 18 major pumping stations and 13 boat navigation locks.

ECOSYSTEM - the interrelated living and non-living things in a given area.

ESTUARY - a water body ajacent to a coastline where fresh water and saltwater meet; highly productive nursery grounds for many organisms.

EUTROPHICATION - a natural biological process in which a lake changes over time (ages) because of physical and biological changes; the process can be greatly accelerated when excess nutrients (especially phosphorus and nitrogen) are released into the water.

EVERGLADES AGRICULTURAL AREA - approximately 700,000 acres of former Everglades drained by the C&SF Project; the peat/muck soils provide fertile ground for surgarcane and vegetable crops.

EVERGLADES NATIONAL PARK - a 1.4 million acre park at the southernmost tip of the Kissimmee-Okeechobee-Everglades ecosystem; created by Congress in 1947.

EXOTIC SPECIES - a non-native species found in a given habitat; the walking catfish, and the water hyacinth and hydrilla aquatic plants are examples.

FLOODPLAIN - the land along river banks which is periodically flooded when the river overflows.

GAMEFISH - a fish which is normally caught for sport and/or food.

GROUNDWATER - water which is found in underground formations of sand or rock called aquifers, in contrast to surface water found standing in ponds, lakes, streams or other wetlands.

LIMITING FACTOR - an environmental factor which regulates plant growth; for example, phosphorous functions as a limiting factor for plant growth in many aquatic systems.

NONGAME FISH - a fish not normally caught for sport or commerce; most species of fish fall into this category; for example, Lake Okeechobee has 42 species of fish, only 12 of which are considered gamefish.

OVERDRAFTING - the process by which humans remove more water from an aquifer than is replaced by the process of recharge through percolation (sinking down) of rainwater through porous soils.

PHYTOPLANKTON - microscopic (usually) drifting plants; a type of algae which often serves as the base/beginning of aquatic food chains.

RUNOFF - water washing off the land, streets, parking lots etc., which contains sediment and dissolved substances such as chemical nutrients.

SALTWATER INTRUSION - the process by which saltwater seeps into a coastal aquifer, contaminating it as a ready source of drinking water; overdrafting can be a contributing factor.

SELECTIVE ADVANTAGE - a characteristic a species possesses which gives it a competitive edge over competing species in the process of natural selection; exotic species often outcompete native species because they lack natural predators.

SHEET FLOW - the process by which water moves almost imperceptibly, in shallow, wide sheets rather than collecting in creeks, streams or rivers.

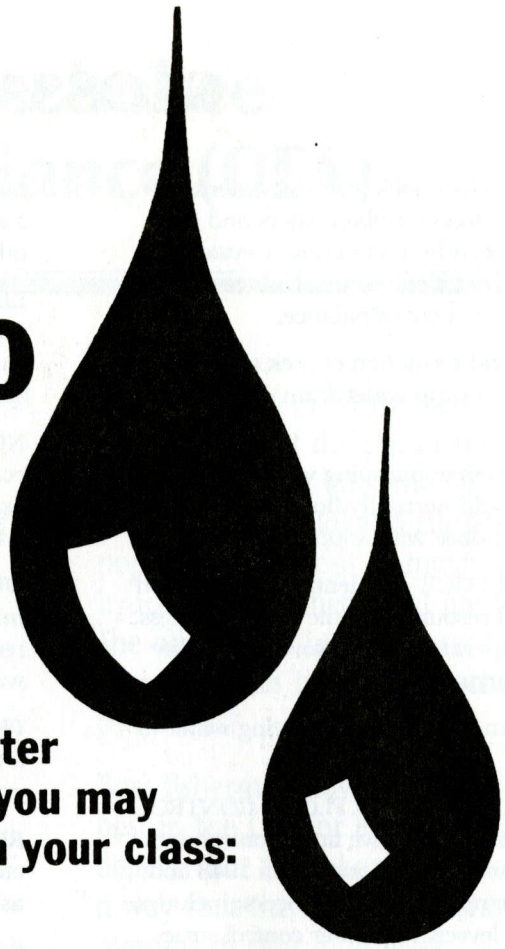
SOUTH FLORIDA WATER MANAGEMENT DISTRICT - formed in 1949 as the Central and Southern Florida Flood Control District; became the water management district as a result of the Florida Water Resouces Act of 1972 which created five districts in the state.

WATER CONSERVATION AREAS - large expanses (approximately 860,000 acres) of Everglades sawgrass wetlands which have been set aside to store water during times of flood and drought.

WATERSHED - the surface drainage area or hydrological boundary from which rainwater runoff flows into slough, creeks, and then rivers and on into a lake or estuary.

WATER TABLE - the point where one can find standing groundwater beneath the soil; the water table rises and falls depending on the amount of rainfall, human consumption and other factors.

How To Turn It Off.



Here are some water conservation tips you may want to share with your class:

INDOORS

- When buying new fixtures, invest in low-flow shower heads and faucets and low-volume toilets. Also, look for approved water conservation devices to save water with your existing fixtures.
- Run only full loads in the washing machine and dishwasher.
- Don't forget to use the proper load setting in your washing machine.
- Don't flush a toilet needlessly. Every flush uses up to 7 gallons of water.
- Take shorter showers, and turn off the water while lathering or washing hair.

OUTDOORS

Most homeowners use 50 percent of their water consumption out of doors, primarily on lawn watering. By utilizing some water conservation measures in your outdoor water-use, you can save a substantial amount of water and money.

- Xeriscape. Limit your grassy areas and choose plants that are naturally drought-resistant for your landscaping.
- Water lawns slowly to promote seepage, and only when grass shows signs of wilting.
- Water lawns early in the morning. Watering between 9 a.m. and 5 p.m. can waste 42 percent of the water to evaporation. Always avoid watering on hot, windy days.
- Turn off automatic sprinklers during and after rainfall.

WATER.

The lifeblood of South Florida