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SWPBA

Southeastern Water Pollution Biologist Asso.

NEWSLETTER

Volume 21, Number 1

February 1997



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LETTER FROM THE PRESIDENT:

1

I would like to begin my term as your president by saying "WELL DONE" one last time to the folks from the ADEM for the excellent meeting in Gulf Shores. A special thanks to past president Vickie Hulcher for all of her work, as well as to Janet Glenn for working on the Newsletter. Also to Lisa Houston and Brien Diggs for their work in organizing the sampling exercise. The presentations were stimulating, the food good, and the comradery that we have come to expect at the annual SWPBA meeting excellent.

Fellow SWPBA Members, before we all know it, the next SWPBA meeting will be just around the corner. We are continuing to make great progress towards the meeting. We hope that you are making plans to attend! We are trying to amass as much literature about the Mississippi Gulf Coast as possible, and will include it in the mailing with the next newsletter. We've even found some stuff about deep sea fishing. Much of the specific information about the meeting was presented at Gulf Shores, but it will be repeated later in this issue of the newsletter. There is also an abstract form included on disc---it's not too early to begin thinking about your presentation! Consider this the FIRST CALL FOR PAPERS.

If anyone is interested in serving as a session moderator, please let me know. Its not hard work, and what a thrill to hold up the "STOP" sign! Likewise, if anyone has an idea or ideas for session topics, PLEASE feel free to contact us with your suggestions.

At this time I would also like to announce the Executive Committee: Skip Call (Kentucky), Trish Foster (Georgia), and Donna Wingfield (Tennessee). I have asked Skip to handle nominations and resolutions, Trish will be in charge of time and place for the next meeting, and Donna will handle constitutional amendments. I thank the members of the Executive Committee for their willingness to serve.

Soooooo, brush up on your Blackjack skills, hone your system of "How to win at Roulette" (if your system works, please contact me!), and exercise your wrists for playing the slots. Who knows, with a great deal of luck (and I do mean a great deal) you might just win enough to finance your trip.

BEST WISHES FOR A SUCCESSFUL 1997. WE LOOK FORWARD TO SEEING YOU IN BILOXI.



Mike Beiser
SWPBA President 1997
Mississippi Office of Pollution Control

The SWPBA Business Meeting was called to order at 11:00 am Thursday, November 7, 1996. Vickie Hulcher, the 1996 President, thanked everyone for their enthusiasm and participation in the meeting. Special thanks went to all of the Alabama participants for their active roles in the meeting.

Old Business

The minutes from the 1995 meeting were published in the March newsletter. A motion to approve those minutes was made by Mike Beiser and seconded by Joy Broach. With no objections, the minutes stood as printed in the newsletter.

There was no other old business to discuss.

New Business

The one and only order of business was to elect officers for next year. Mississippi accepted responsibility for hosting the 1997 SWPBA meeting.

Nominations for President were opened first. Skip Call nominated Mike Beiser from Mississippi. The motion was seconded by Lythia Metzmeier, nominations were closed and the vote was unanimously "aye". The nominations for secretary were then opened. Joy Broach nominated Doug Upton, Donna Wingfield seconded, the nominations were closed and the motion was passed with an unanimous "aye".

Vickie Hulcher announced the newly elected officers, and then passed the "worm" to Mike Beiser. As Mike Beiser took the podium, he thanked Alabama for hosting the meeting this year and thanked everyone for their attendance. He then proceeded with the 1997 SWPBA Meeting Preview as described below:

Tentative Dates:	Nov. 4-6, 1997
Location:	Biloxi, Mississippi
Accommodations:	The Broadwater and The President Casino
Room Rates:	approximately \$63.00 single or double
Registration Fee:	approximately \$20.00

Mike also mentioned many of the amenities to be enjoyed in Biloxi next year. With the list too long to include, next year's meeting place should offer something for just about everyone.

The meeting was adjourned at approximately 11:15 am.

Southeastern Water Pollution Biologists Association

MONDAY NOVEMBER 4, 1996

- 8:00 - 5:00 Region IV Macroinvertebrate Bioassessment Comparison
- 7:00 - 9:00 p.m. Registration / Poster Setup
- 7:30 p.m. Executive Committee Meeting

TUESDAY NOVEMBER 5, 1996

- 8:00 - 10:00 Late Registration
- 8:30 Welcome/ Introductions/Announcements

STATE AND REGION IV PROGRAM OVERVIEWS - Hoke Howard, Moderator

- 8:50 - 9:20 State and Region IV Program Overviews
- | | |
|----------|---------------|
| Alabama | Lisa Houston |
| Georgia | Chip Cutcliff |
| Kentucky | Skip Call |
- 9:20 - 9:40 BREAK**
- 9:40 - 11:00 State and Region IV Program Overviews, Cont.
- | | |
|----------------|------------------|
| Mississippi | Mike Beiser |
| North Carolina | Dave Penrose |
| Tennessee | Donna Wingfield |
| South Carolina | Jim Glover |
| Florida | Jim Hulbert |
| EPA Region IV | Antonio Quinones |
- 11:00 - 1:00 LUNCH**

ECOLOGICAL ASSESSMENTS (PART I) - Skip Call, Moderator

- 1:00 - 1:15 A Look at a Diverse and Endangered Aquatic Ecosystem - The Rivers and Streams of Alabama - **Dr. Charles Lydeard**, University of Alabama
- 1:20 - 1:35 Overview of NAWQA Program - **Carol Couch**, U.S. Geological Survey
- 1:40 - 1:55 Preliminary Results of Fish Tissue Analysis in the Mississippi Embayment NAWQA Program - **Barbara Kleiss**, U.S. Geological Survey
- 1:55 - 2:10 BREAK**
- 2:10 - 2:25 NAWQA Qualitative Macroinvertebrate Sampling Procedures: Can They Be Used to Develop Biocriteria in the Mississippi Alluvial Plain Ecoregion? - **Billy Justus**, U.S. Geological Survey (on loan from Mississippi DEQ)

METHODS DEVELOPMENT / BIOCRITERIA - Dave Lenat, Moderator

- 2:30 - 2:45 Revision of Rapid Bioassessment Protocols - **Dr. Michael Barbour**, Tetra Tech, Inc.
- 2:50 - 3:05 A Glimpse of Three of Rosgen's Short Courses: Applied Fluvial Geomorphology, River Morphology and Applications, and River Assessment and Monitoring - **Morris Flexner, Tony Able & Jim Harrison**, EPA Region IV - Atlanta
- 3:10 - 5:00 Biological Data Management using STORET X - **Chris Faulkner**, USEPA - Washington

WEDNESDAY NOVEMBER 6, 1996

- 9:00 - 9:15 National Biocriteria Implementation Workgroup Progress Report - **Jim Harrison**, EPA Region IV, Atlanta 5
- 9:20 - 9:35 Results of the SWPBA Questionnaire Survey - **Dave Penrose**, North Carolina DWQ
- 9:35 - 9:55 BREAK**

ECOLOGICAL ASSESSMENTS (PART II) - Donna Wingfield, Moderator

- 9:55 - 10:20 Savannah REMAP Monitoring: Assessing of the Ecological Health of the Basin - **Ron Rasche, Hoke Howard & Bob Quinn**, EPA Region IV - Athens
- 10:25 - 10:40 Chattahoochee River Modeling Project Update: Module 3 Trib Sampling - **Chip Cutcliff**, Georgia EPD
- 10:45 - 11:00 Habitat and Anthropogenic Effects in Northeast Florida - **Mike Hollingsworth**, Florida DEP
- 11:00 - 1:00 LUNCH**
- 1:00 - 1:15 Biological Reconnaissance of TMDL Sites in the Apalachicola Basin - **Bart Richard**, Florida DEP
- 1:20 - 1:35 Biological Assessment of TMDL Sites in the Chipola Basin - **Elizabeth Miller**, Florida DEP

LIMNOLOGY / FISH TISSUE - Bob Cooner, Moderator

- 1:40 - 1:55 A Case for Lake Specific Water Quality Standards Related to Cultural Eutrophication - **Dr. David Bayne**, Auburn University
- 2:00 - 2:15 BREAK**

WEDNESDAY NOVEMBER 6, 1996 continued

- 2:15 - 2:30 Illegal Commercialization of Freshwater Non-game Species - **Robert Seidler**, Alabama Dept. of Conservation and Natural Resources
- 2:35 - 2:50 Alabama Fish Tissue Monitoring Program - **Jeff Davies**, Alabama DEM
- 2:55 - 3:10 The ADEM Reservoir Water Quality Monitoring Program - Trends of the First Six Years - **Fred Leslie**, Alabama DEM
- 3:15 - 3:30 Water Resource Monitoring at TVA - **Don Dycus**, TVA

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3:30 - 5:00 MISSISSIPPI ALLUVIAL PLAIN BIOCRITERIA PANEL DISCUSSION

3:30 - 5:00 POSTER SESSION

Southern Appalachian Assessment via ArcView - **Jim Harrison**, EPA Region IV-Atlanta

Ecological Health Ranking of Nonpoint Source Impacted Agricultural Sites Using RBPII - **Trish Foster**, Georgia EPD; **Hoke Howard**, **Dave Melgaard**, EPA Region IV-Athens

Comparison of Hester-Dendy Multiplate Samplers and Multihabitat RBP Protocol: Monitoring Point Source Impacts and Agricultural Runoff. **Lisa Houston**, Alabama DEM and **Mike Beiser**, Mississippi DEQ

Development and Preliminary Results of NC DWQ Habitat Evaluation Protocol - **Nancy Guthrie**, North Carolina DWQ

Proposed Swamp Stream Rating Criteria for NC - **Neil Medlin**, North Carolina DWQ

Use of GPS/Computer Mapping to Locate Remote Sampling Sites for REMAP Biomonitoring - **Jim Maudsley** and **Bobby Lewis**, EPA Region IV

6:30

BANQUET at *The Gift Horse* (Arrival beginning at 6:15)

CHEMICAL INDICATORS - Jim Hulbert, Moderator

- 9:00 - 9:15 CleanER Methods of Collecting Water and Wastewater Samples for Metals Analysis - **Matt Matthews**, North Carolina DWQ
- 9:20 - 9:35 Measuring Aquatic Metals in Kentucky - **Giles Miller**, Kentucky DEP
- 9:40 - 9:55 BREAK**
- 9:55 - 10:10 Interpretation of Trace Metal Concentrations of Estuarine Sediments From Coastal Alabama - **Gary Halcomb**, Alabama DEM

TOXICITY TESTING - Matt Matthews, Moderator

- 10:15 - 10:30 The Effects of Development During High Water Flows on a Coldwater Fishery - **Lonnie Dorn**, Georgia EPD
- 10:35- 11:05 An Evaluation of Biological Communities in Relation to Historical Chronic Whole Effluent Toxicity Data - **Lythia Metzmeier & Skip Call**, Kentucky DEP
- 11:10- 11:25 The Use of Juvenile Mussels, *Utterbackia imbecillis* (Bivalvia: Unionidae) as a Standardized Toxicity Testing Organism - **Ron Weldon**, EPA Region IV - ESD
- 11:30 - 12:00 BUSINESS MEETING/1997 Meeting Preview**
- 12:00 MEETING ADJOURNED**

1996 SWPBA MEETING LIST OF ATTENDEES

ALABAMA

Steve	Bearss
Bob	Cooner
Jeff	Davies
Brien	Diggs
Tim	Forester
Janet	Glenn
Gary	Halcomb
Matt	Hicks
Lisa	Houston
Audra	Huff
Vickie	Hulcher
Fred	Leslie
James	Luken
Tim	McCartha
Terry	Reaves
Steve	Spencer

EPA

Chris	Faulkner
Morris	Flexner
Jim	Harrison
Hoke	Howard
Bob	King
Bobby	Lewis
Jim	Maudsley
Bob	Quinn
Antonio	Quinones
Ron	Raschke
Ron	Weldon

FLORIDA

Lee	Banks
Glenn	Butts
Laurence	Donelan
Mike	Hollingsworth
Jim	Hulbert
John	McCollum
Liz	Miller
Randy	Payne
Eric	Pluchino
Donald	Ray
Bart	Richard

GEORGIA

Chip	Cutcliff
Lonnie	Dorn

KENTUCKY

Skip	Call
Lajuanda	Maybriar
Lythia	Metzmeier
Giles	Miller

MISSISSIPPI

Mike	Beiser
Al	Gibson
David	Loch
Doug	Upton

NORTH CAROLINA

Nancy	Guthrie
David	Lenat
Matt	Matthews
Neil	Medlin
David	Penrose

SOUTH CAROLINA

Jake	Bickley
Harry	Gaymon
James	Glover
Bill	McDermott
Rick	Renfrow

TENNESSEE

Joy	Broach
Tammy	Hutchison
Jimmy	Smith
Donna	Wingfield

NON-MEMBERS

Don	Dycus
Anita	Masters
Amy	Wales
Wade	Bryant
Carol	Couch
Billy	Justus
Barb	Kleiss
Todd	Askegaard
Michael	Barbour
David	Bayne
John	Epler
Richard	Humphreys
Deedee	Kathman
Scotty	Long
Charles	Lydeard
Nat	Nehus
Pat	O'Neil
Bill	Posey
Robert	Seidler
Tom	Shepard
Cliff	Webber
Marianne	Whitehurst
Jim	Wise
Brien	Wisehart

**THE CONSTITUTION AND BY-LAWS OF THE SOUTHEASTERN
WATER POLLUTION BIOLOGIST ASSOCIATION**

CONSTITUTION

Article 1. NAME. This association shall be called the Southeastern Water Pollution Biologists Association (SWPBA).

Article 2. PURPOSE. The purpose of the Association shall be to promote further understanding of the aquatic biological communities and the impact of pollutants on the aquatic ecosystems and to provide a medium for exchange of appropriate information among the membership.

Article 3. MEMBERSHIP. Membership shall be restricted to Water Pollution Biologists whose programs are funded through the Region IV Environmental Protection Agency.

Article 4. ANNUAL MEETING. An annual meeting of the membership shall be held in one of the eight states in Region IV of EPA. The manner of choosing the host state of the next years meeting will be to offer the meeting in the following order: Mississippi, Georgia, EPA-Athens, South Carolina, North Carolina, Kentucky, Florida, Tennessee and Alabama. A state will either offer to accept or refuse the meeting. Upon refusal, the next state in order will entertain the offer, until the host state is confirmed. The time of the meeting shall be at the discretion of the host state with the agreement of the members of the Executive Committee.

Article 5. OFFICERS. The officers of the Association shall be a President and a Secretary. At the annual meeting consenting nominees (Three (3) maximum for any office) shall be voted on by a secret ballot with the majority vote recipient being declared winner. The officers shall hold office for a term of one year, and their terms of office shall not be

coterminous. The terms of the officers shall begin at the close of the annual meeting which they are elected.

Article 6. ACTIVITIES. The Association shall be organized and operated exclusively for scientific and educational purposes, and shall not be organized or operated for profit. No substantial part of the activities of the Association shall consist of carrying on propaganda, or otherwise attempting to influence legislation. The Association shall not participate in, or intervene in, any political campaign on behalf of any candidate for public office.

Article 7. DISSOLUTION. The Association may be dissolved following a poll of the entire membership, conducted at the direction of the Executive Committee, in which two-thirds of the mail ballots received within 30 days of issuance support the dissolution.

Article 8. RATIFICATION AND AMENDMENTS. The constitution shall become effective upon ratification by a two-thirds vote by the member agencies present at the annual meeting and may be amended by a vote of two-thirds of the member agencies present at the annual meeting, providing a quorum is present, or in an emergency, by two-thirds of the members responding to a mail ballot within thirty days of issuance.

BY-LAWS

Article 1. ANNUAL MEETING. The annual meeting will normally be held in the fall of each year and will include a business meeting and the exchange of appropriate information. The presence of two-thirds of the member agencies shall constitute a quorum, and the business meeting will be held according to Robert's Rules of Order.

Article 2. ELECTION OF OFFICERS. The President and Secretary shall be elected by a majority of the member agencies present at the annual meeting by a secret ballot. Each office shall not have more than three (3) nominees which will be selected by the Executive Committee. An unexpired term of President or Secretary shall be filled by majority vote of members responding within 30 days to a special mail ballot. In emergencies, interim appointments can be made by the Executive Committee.

Article 3. OFFICE OF PRESIDENT. The President shall be responsible for planning and organizing the annual meeting, and shall appoint a Local Arrangements Program Chairman. He shall appoint three (3) members to the Executive Committee, one of whom must be a member from the host state. He shall make other appointments that he deems necessary and shall serve as chairman of the Executive Committee. He shall preside as chairman of the annual meeting.

Article 4. OFFICE OF SECRETARY. The Secretary shall be responsible for keeping the minutes of the annual meeting, the printing and distribution of ballots, and the normal correspondence of the association. The Secretary shall disseminate the annual meeting agenda as appointed by the Executive Committee. No later than three (3) months after the annual meeting, the Secretary shall distribute to all of the members of the Association copies of the annual meeting and a roster of attendance at the meeting. The Secretary shall also serve as a member of the Executive Committee. The Secretary shall furnish incoming officers with a copy of the Constitution and By-Laws.

Article 5. EXECUTIVE COMMITTEE. The Executive Committee shall consist of the officers of the Association and the three (3) committee members appointed by the President, one (1) of whom must be from the host state. No member can be appointed to the Executive Committee more than three consecutive years. The President shall preside as chairman of the Executive Committee. The Committee shall meet prior to the annual business meeting and review all amendments to the Constitution or By-Laws and major motions to be presented at the annual meeting, if any. The Committee shall serve as a steering committee to decide the main points of discussion and presentation at the annual meeting. The Executive Committee shall decide the order and length of the paper to be given. It shall make recommendations concerning the policies of the Society. The Committee shall be responsible for notifying the members of the Society of the vacancies in elected offices and to solicit nominations for these offices. After reviewing the nominations, the Committee shall select a maximum of three (3) consenting nominees for each office and place their names on ballots to be distributed by the Secretary. The ballots received in 30 days will be opened and counted by the Secretary, and interim officers will be announced by mail.

Article 6. PROGRAM CHAIRMAN. The President shall preside as Program Chairman, and shall be responsible for preparing the call for papers, scheduling, appointing chairman for each session, and preparing the program for printing.

Article 7. LOCAL ARRANGEMENTS CHAIRMAN. The Arrangements Chairman shall normally be associated with the agency hosting the annual meeting. The Arrangements Chairman shall be responsible for securing adequate facilities to properly host the annual meeting. Responsibilities will include reserving rooms for formal meetings, social gatherings, and the banquet; securing audiovisual equipment required; arranging the banquet, coffee breaks, and luncheon facilities, providing registration receipts; advising members on lodging; arranging transportation, and serve to make the planned activities run smoothly. The Arrangements Chairman shall work closely with the President to achieve this goal.

Article 8. RATIFICATION AND AMENDMENTS. The By-Laws shall become effective upon ratification by two-thirds of the member agencies present at the annual meeting or two-thirds of the members replying within 30 days to a mail ballot. Proposed amendments

shall be submitted to the Executive Committee two (2) months before the annual meeting, and voted on at the meeting with a two-thirds vote of a quorum of member agencies present at the annual meeting or by a mail vote.

THE 1997 SWPBA MEETING 18 BY DAY AND 21 BY NIGHT!

Host City: Biloxi, MS

Host Hotel: The Broadwater Beach Resort 1-800-647-3964

Dates: November 4-6, 1997

Room Rates: \$63.00 (single or double occupancy) all taxes included. **NOTE: IF THE FEDERAL PER DIEM RATE INCREASES, THEN THE ROOM RATE WILL INCREASE TO THE NEW FEDERAL PER DIEM LIMIT.** Reservation Cards will be sent with the next issue of the newsletter. When you register, let the desk know that you are with the Southeastern Water Pollution Biologists Association.

Our block of rooms will expire October 3, 1997, after which the Hotel will no longer guarantee space or the convention rate. Things tend to fill up quickly in this part of the state.

FOR EACH ROOM RENTED/NIGHT, THE RENTER WILL RECEIVE A COUPON GOOD FOR A FREE BUFFET (LUNCH OR DINNER) AT THE PRESIDENT CASINO, LOCATED JUST ACROSS THE STREET.

Registration Fee: \$20.00 (pre-registration by 30 Sept., 1997)
\$25.00 (late registration and walk-ins)

Activities and other things to do:

1. Numerous Casinos
2. Scott Marine Education Center
3. Deep Sea Charter Boats (more about that next issue)
4. Golf, Golf, Golf on the Gulf (a nice course right behind the hotel) COST FOR THE 18 HOLE HOTEL COURSE IS \$36.00 INCLUDES TAXES, CART AND GREEN FEE.
5. Shearwater Pottery (Home of Artist Walter Anderson)
6. The Walter Anderson Museum of Art
7. The Seafood Museum
8. Beauvoir, the Jefferson Davis Home and Museum
9. Much, Much More!

We will include information on all of the above and more in the next newsletter.

Short Notes

Newsletters

Remaining newsletters will come out around May and then again in August or September. Contact persons will be receiving notices a month or so prior to the deadline.

Your colleagues in the southeast are interested in what you are doing so please take the time to contact your state's contact person with updates. This is your newsletter so lets make it as informational as possible. Thanks!

Membership Listing

Attached within the newsletter you will find a page titled **SWPBA Database Record**, if you have any changes in regards to membership status, new memberships, phone numbers, etc., please take a minute to make any changes. This will allow our SWPBA membership database to remain current and up to date. Any changes can be sent to your states contact person and mailed in with state updates. If there are any questions please call Doug Upton at (601)939-8553.

Shrimp Boil and Bonfire on the Beach

Our distributor of YSI products, C.C. Lynch and Associates, is going to sponsor a shrimp boil and bonfire on the beach on Wednesday evening November 5. They promise lots of shrimp and amenities (that means taters, corn and beer), lots of flames, and lots of sand. (Hopefully there WONT be lots of ceratopogonids.) We hope that all meeting attendees will come out and enjoy!

ANNOUNCING: The First SWPBA Mixed Doubles Tennis Tournament

Is there any interest??? Form a team, and mail the registration form to Mike Beiser. If interest is sufficient (i.e. more than just one team) we will establish the pairings prior to the meeting, and post it in the meeting and hospitality rooms. Trophies to the winners!!

There is no registration fee, each team will need to bring one new can of tennis balls. The winning team will take the unused can of balls to the next round. A match will consist of one "pro" set. First to nine games wins (must win by two games). No deuce during individual games.

SWPBA MIXED DOUBLES TENNIS

NAME _____ PARTNER _____

AGENCY(IES) _____

SWPBA Database Record

16

Codes: _____ Contact: Yes / No Newsletter: Yes / No Member: Yes / No

Name: _____

Title: _____

Phone: (_____) - _____ Fax: (_____) - _____

Date Joined: _____ / _____ / _____

Agency: _____

Division: _____

Section/
Group _____

Address: _____

City

State

Zip Code

Special Interests or Projects: _____

Interest Codes (Please Choose at least one or up to 5 Codes and enter at top of page.)

- | | |
|--|---|
| 1 Macroinvertebrate Taxonomy / Rapid Bioassessment | 16 Standards, Water Quality Criteria |
| 2 Toxicity Testing | 17 305b |
| 3 Laboratory Certification | 18 Aquatic Macrophytes |
| 4 Phytoplankton/Periphyton, Zooplankton | 19 Ambient Trend Monitoring |
| 5 Lakes/Reservoir Monitoring | 20 Sediment Analysis/SOD |
| 6 Estuarine Ecology | 21 Culturing Organisms for Toxicity Testing |
| 7 Marine Ecology | 22 Computer Modeling/Applications |
| 8 Wetlands | 23 Coastal Program |
| 9 401 / 404 Certification | 24 Microbiology |
| 10 Ecoregion Definitions | 25 Permit Compliance |
| 11 Estuarine/Marine Macroinvertebrate Taxonomy | 26 Program Manager |
| 12 Stream Surveys | 27 Groundwater |
| 13 Fish Taxonomy/Assessment | 28 Algal Assay |
| 14 Cercla Superfund | 29 Chemical Analysis |
| 15 Nonpoint Sources | 30 Risk Assessment |

SWPBA T-SHIRTS AND PRE-MEETING EXERCISE OPTIONS

A T-shirt design is being worked on for the 1997 SWPBA meeting being held this year in Biloxi, Mississippi. Many were impressed with the design that Lisa Houston came up with for Alabama's meeting. Nice work, Lisa!

We would like to know who would be interested in a T-shirt so that we can get an idea of how many to order.

We, and I believe many others who participated, were impressed with the interest in cooperative ventures between the SWPBA attendee's generated by the Joint Bioassessment that the Alabama folks orchestrated. We heard some people express an interest in conducting another Joint Bioassessment exercise, while others suggested that we at Mississippi may want to host a taxonomic workshop of some sort (perhaps on one of those taxonomic groups that causes one to want to throw their personal set of fine-tipped forceps against a concrete wall or maybe a group that we would just like to know a little more about to enhance our taxonomic prowess). Some possible candidates would be: Epler, for chironomids and Pescador, for baetids.

Below, cast your ballot for T-shirt size and number, and, whether you would prefer another Joint Bioassessment or a taxonomic workshop (only if you wish to participate, of course). Or, if there is something else that you would like to suggest we do, write it in the blank. Photocopy this page and mail your choices to the address below as soon as possible so that we can begin to set things up.

T-SHIRTS (place numeral by the size so we can get an idea of the count)

___ XXL ___ XL ___ L ___ M ___ S

PRE-MEETING EXERCISE

Joint Bioassessment ___

Taxonomic Workshop ___

Taxonomic Group _____

Suggested Taxonomic Expert _____

Other Suggestions _____

David Loch
Mississippi Dept. of Environmental Quality
Office of Pollution Control
1542 Old Whitfield Rd.
Pearl, Mississippi 39208

SWPBA ABSTRACT FORMS

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Again all abstracts will be submitted on diskette this year to expedite printing the SWPBA programs. Each state will be sent one diskette to work from. The diskette will be sent to a contact person as outlined below. Contact that person to add your abstract to the disk before the deadline (end of September). **I need the disks back in Mississippi by September 30, 1996.** *now late*

EPA(Athens)	Hoke Howard	Kentucky	Lythia Metzmeier
EPA(Atlanta)	Jim Harrison	Mississippi	Mike Beiser (Pearl, MS)
Alabama	Vickie Hulcher	North Carolina	Jimmie Overton
Florida	Jim Hulbert (Orlando, FL)	South Carolina	Jim Glover
Georgia	Chip Cutcliff (Atlanta, GA)	Tennessee	Joy Broach

Due to budget constraints, I am not sending a separate disk to each field office, so share if possible. If you are in a field office and need a separate disk, call your contact person and have them make you a copy.

The form is saved as a Word Perfect for Windows 6.1 document. If your word processor can't read or convert the document, let me know.

Please copy the form below to the bottom of the document and complete for each paper or poster session. The sections are formatted to the size and type style that will be used in final printing. Please do not change these defaults.

Don't forget to complete the equipment sections so we will be able to plan for all requirements.

If you have any questions or problems, call Doug Upton at (601) 939-8553.

NAME OF PAPER	
Presenters	
State or Department Name	
Please leave this section blank	
ABSTRACT	
This section is formatted to 10 point type that will allow a 12 line description (175 - 200 words).	
TYPE OF PRESENTATION: _____ Oral _____ Poster Session	
LIST EQUIPMENT REQUIRED	OTHER SPECIAL REQUIREMENTS:
_____ Slide Projector	
_____ Overhead Projector	
_____ _____	

EPA Region IV Update

The folks from EPA Region IV would like to make everyone aware of their new phone numbers and E-mail addresses.

EPA Region IV Science and Ecosystem Support Division Ecological Assessment Branch 980 College Station Road Athens, GA 30605

	Phone	E-mail address
Allan G. Auwarter	(706) 355-8704	last name.first name@epamail.epa.gov
Del Hicks		"
Hoke S. Howard	(706) 355-8721	"
Archie Lee	(706) 355-8707	"
Kay L. Millar	(706) 355-8711	"
Philip J. Murphy		"
William "Bill" Pettier	(706) 355-8713	"
Bruce Pruitt	(706) 355-8703	"
Antonio Quinones	(706) 355-8712	"
Ron L. Raschke		"
Don Shultz	(706) 355-8722	"
David R. "Dave" Smith	(706) 355-8705	"
Quentin "Jerry" Stober	(706) 355-8706	"
M. Ronald "Ron" Weldon		"
Chief, Toxics Evaluation Section		
Retired		
Aquatic Biologist		
Retired		
Aquatic Biologist		
Biologist		
Retired		
Biologist		
Chief, Ecological Evaluation Section		
Aquatic Biologist		
Retired		
Biologist		
Fisheries Scientist		
Aquatic Biologist		

EPA Region IV Water Management Division 100 Alabama Street, NW Atlanta, GA 30303

	Phone	E-mail address
Bill Ainslie	(404)562-9400	last name.first name@epamail.epa.gov
Ed R. Decker	(404)562-9383	"
Morris Flexner	(404)562-9277	"
R. F. "Mike" McGhee	(404)562-9330	"
David L. "Dave" Melgaard	(404)562-9265	"
Tom Welborn	(404)562-9345	"
Environmental Scientist		
Environmental Scientist		
Life Scientist		
Director		
Environmental Scientist		
Environmental Scientist		

EPA Region IV Water Quality Standards 100 Alabama Street, NW Atlanta, GA 30303

	Phone	E-mail address
James E. "Jim" Harrison	(404)562-9271	last name.first name@epamail.epa.gov
Environmental Scientist		

ADEM REORGANIZATION

ADEM recently announced several appointments as well as organizational changes. Mr. Richard Grusnick, formerly Chief of the Air Division, has been named Deputy Director. Mr. Ron Gore was named as his replacement and Mr. John Poole was appointed to Land Division Chief. Director Jim Warr also announced a realignment of several programs. Special Projects, which is responsible for coordination with EPA regarding Alabama Superfund sites and administration of the Alabama Hazardous Substance Cleanup Fund, was made a part of the Land Division. The Office of Education and Outreach, headed by Ms. Sue Robertson, absorbed the Pollution Prevention Program, the Ombudsman's Office, and personnel of the Mining/Nonpoint Source Section involved in Section 319 (nonpoint source pollution control) activities. Other personnel of the Mining/Nonpoint Source Section became a part of the Field Operations Division. The former Ecological Studies Section responsible for surface water assessment (where the majority of the Alabama SWPBA members work), has been renamed the Environmental Indicators Section and has added some personnel formerly residing in the Air Division responsible for ambient air monitoring. This Section will now be responsible for identifying and monitoring biological, chemical, and physical environmental indicators important in determining whether Alabama is meeting the goals of the various environmental legislative initiatives of the last 25 years.

RESERVOIR WATER QUALITY MONITORING (RWQM) PROGRAM

Water quality data were collected from reservoirs in the Coosa, Tallapoosa, and Alabama River systems during August 1996 for the RWQM Program. Reservoirs of other basins in the state will be sampled once in August 1997 to complete the two-year monitoring rotation of the RWQM Program.

Intensive monitoring of all reservoirs in the Coosa and Tallapoosa River systems has been proposed for 1997. Data collected from intensive monitoring will provide a view of reservoir water quality in the Alabama portion of the river systems throughout the growing season and can be used to determine any effects to water quality that may occur following water diversion and related activities proposed for the upper watersheds of the Coosa and Tallapoosa

Rivers. The tentative reservoir monitoring schedule has been submitted with monitoring to consist of monthly sampling, April - September, of multiple stations on most reservoirs. Each monthly sampling event will be conducted within a 3-4 day period to reduce weather-related water quality variation within the reservoir system. Variables to be monitored include those measured *in situ* (temperature, dissolved oxygen, pH, conductivity) as well as those requiring laboratory analysis (nutrients, chlorophyll *a*). As in previous reservoir monitoring activities, chlorophyll *a* concentrations will be used for determinations of trophic state using Carlson's Trophic State Index.

For further information on the RWQM Program contact Fred Leslie at (334) 260-2752 or fal@adem.state.al.us.

FISH TISSUE MONITORING PROGRAM

Scheduled fish sampling for FY 97 has been completed and tissue samples have been sent to the lab for analyses. Sampling efforts were concentrated on the Coosa River, Mobile, Baldwin and Escambia Counties. A total of 14 waterbodies were sampled at 19 locations. Results are to be released in the spring of 97.

The completion of the FY 1996 fish sampling and analyses marked the end of the first five year cycle of ADEM's ongoing Fish Tissue Monitoring Program. A report summarizing the results of this first cycle was released in September and is available upon request from the Field Operations Division. Contact Bob Cooner or Jeff Davies at (334) 260-2700.

SPECIAL STUDIES

Six Water Quality Demonstration Studies have been requested for FY 97 emphasizing toxicity testing and instream bioassessments. Effluent toxicity testing and instream bioassessments were conducted at Atmore, AL on Boggy Branch in December. The others will be completed as time allows.

BIOASSAY UNIT

The former Toxics Unit, now renamed the Bioassay Unit has continued to conduct acute and chronic toxicity tests over the last few months. We are conducting several extra definitive

tests this year at the request of the permitting sections in order to present additional information on SIDs and NPDES permittees.

OTHER HAPPENINGS

For those of you who were unable to attend the November SWPBA meeting, a bioassessment methods comparison study was conducted for the southeastern states (Region IV) in conjunction with the meeting. Two streams in Baldwin Co. were sampled and assessed by 10 state and federal agencies in order to compare sampling methods and evaluation techniques. Documenting comparability of assessments will allow these agencies to exchange data from shared ecoregions, river basins, or physiographic regions. Data was collected at several more sites in December by the Alabama crew to complete a performance based methods comparison. For more information on this project contact Lisa Houston at (334)260-2755 or e-mail at 'lh@adem.state.al.us'.

FLORIDA NEWS

New stonefly genus found

During November, Dr. Ed DeWalt of the Illinois Natural History Survey visited the Florida Department of Environmental Protection's Pensacola biolab to view our collection of the stonefly, *Leuctra*. Ed took a few specimens back to Illinois for further study, thinking there might be a new species. We then collected for *Leuctra* in the Blackwater River State Forest area, and found a couple of specimens at each site for taxonomic study.

We have also verified members of a new genus of the stonefly family Chloroperlidae, *Haploperla* (*Hastaperla* in the old keys). Six specimens were found in a 1992 sample from Alaquá Creek. Dr. DeWalt plans to return in April to collect *Haploperla* adults. Dr. Manny Pescador of Florida A & M University put out light traps this past fall and intends to return in April for *Haploperla* adults.

SWAMP goes to the Florida State Fair

The Florida Department of Environmental Protection had a whole building of exhibits at the Florida State Fair, February 6-17. Our Surface Water Assessment and Monitoring Program (SWAMP) had a small part of the building with the following displays set up:

- We set up two cylindrical algal culture tanks, one clear and the other made turbid (with flour), so the kids could read Secchi disks. This demonstration worked well.
- We blew up our full-color ecosummaries as posters (*see the following pages for a sample ecosummary and a template—the actual ecosummary, which has been modified to fit this page, is 8 1/2" by 14"*).
- We displayed sampling equipment and a Hydrolab.
- We ran a continuous video showing various river scenes and sampling.
- Our most popular attraction was an aquarium with live macroinvertebrates for the kids to look at and handle, along with a flipchart quiz.

Lake bioassessment development for Florida

The Florida Department of Environmental Protection has developed a lake bioassessment method. This approach measures how biological (macroinvertebrate) communities respond to water quality and physical (sediment) conditions. Using a geographical classification, we identified 47 lake regions based on topography, natural chemistry, lake origin, lake hydrology, and soils. Between 1993 and 1995, we sampled 108 undisturbed reference lakes and 47 potentially impaired test lakes, for a total of 235 observations in 37 of the lake regions.

For lakes smaller than 1,000 acres, we composited 12 petite ponar grabs taken from the sublittoral zone (two to four meters deep). In larger lakes, we composited a maximum of 48 dredges into four discrete samples.

Using a standard subsampling method, we identified a minimum of 100 organisms to the lowest taxonomic level. Based on the groups of invertebrates, most of the lakes grouped into three biological classes according to sediment type: sandy, muddy, or transitional. We tested 30 biological metrics and found that eight discriminated well between the reference and test lakes. These included measures of species richness (the number of taxa and the Ephemeroptera-Trichoptera-Odonata Index), measures of species composition (the Shannon-Wiener Diversity Index, % dominant taxon, % ETO), measures of trophic state (% collector-gatherers, % collector-filterers), and a pollution tolerance measure (Hulbert's Lake Condition Index). Chlorophyll *a*, a trophic state index, and Secchi depth were also useful measures.



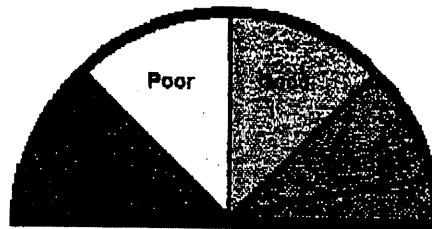
ECOSUMMARY

Stream Condition Index (SCI) Report

24

Surface Water Assessment & Monitoring Program
Central District

Mill Creek at NE 148th Terrace Bridge, Marion County,
September 16, 1996



Stream Health

Stream Condition Index (SCI): The standardized biological assessment tool used by FDEP biologists to indicate ecosystem health and identify impairment, as compared to reference (natural) conditions, of streams within the various ecoregions of the State of Florida.

PURPOSE

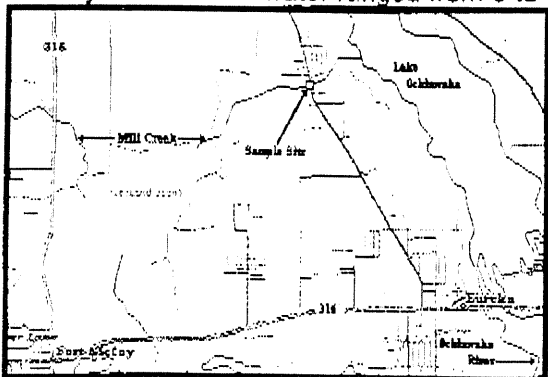
Although several sites in the area had been sampled in the past by DEP biologists, Mill Creek had not been monitored prior to this time. It was therefore chosen for biological and physical-chemical assessment.



Mill Creek, Marion County (N 29°24.108', W 81°55.711')

BASIN CHARACTERISTICS

The Mill Creek drainage basin covers 22,691 acres (35.5 mi²) in northern Marion County. It is made up of approximately 82% undeveloped wetlands and upland forests. Only about 13% is urban, the rest being devoted to agriculture and rangeland. Mill Creek flows east into Lake Ocklawaha, a reservoir formed by a partial impoundment of the Ocklawaha River at Rodman Dam, a component of the aborted Cross Florida Barge Canal Project. The site is 3 miles NE of Ft. McCoy and 16 miles NE of the Ocala city limits. Mill Creek meets the Ocklawaha 2 miles downstream of the never-finished Eureka Lock and Dam. Ill-defined in its middle reaches, Mill Creek flows through a wetland area SW of the site. At sampling, stream depth was 0.2 meters, and the velocity of the tannic water ranged from 0 to 0.1 m/sec.



RESULTS

Biological sampling yielded an SCI score of 29 for Mill Creek, putting it in the "excellent" category. Thirty-four different kinds of aquatic macroinvertebrates were collected at the site. Eight of these were members of the sensitive water quality group designated "EPT", which includes larvae of mayflies, stoneflies, and caddisflies. A score of 23 was recorded for Florida Index (good water quality) taxa. The macroinvertebrate community was well-balanced, indicating a healthy aquatic environment.

Physical and chemical measurements taken reveal good water quality. Nutrient levels were low to normal, as were chlorides and sulfates. Alkalinity, conductivity, turbidity, and pH measurements were normal. Dissolved oxygen was low, but this is to be expected in a small, shallow, tannic stream with very slow flow in warmer months of the year.

Mill Creek received an optimal habitat assessment ranking. Aquatic substrates were plentiful and varied. The riparian zone was extensive and bank vegetation was of high quality. There was little or no evidence of erosion, habitat smothering, or alteration of the natural stream channel.

SIGNIFICANCE

Results show that Mill Creek is a water body in very good health. This is probably due to the relatively low level of residential and agricultural development within its immediate watershed, which reduces the amount of point source and nonpoint source pollution and habitat destruction that might otherwise be present.

SUGGESTIONS

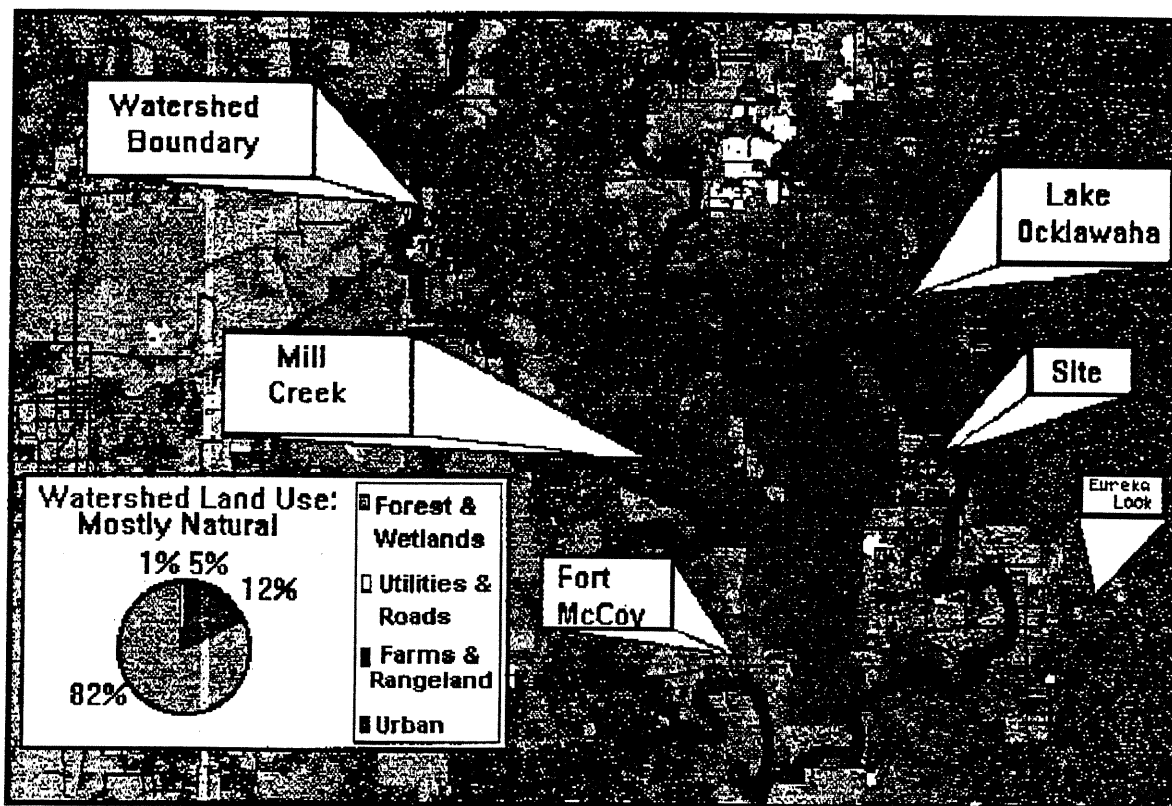
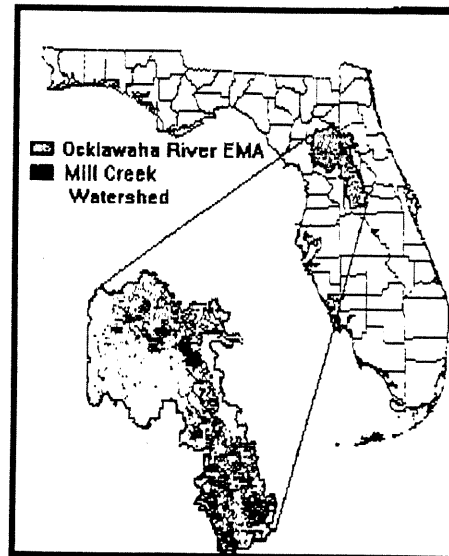
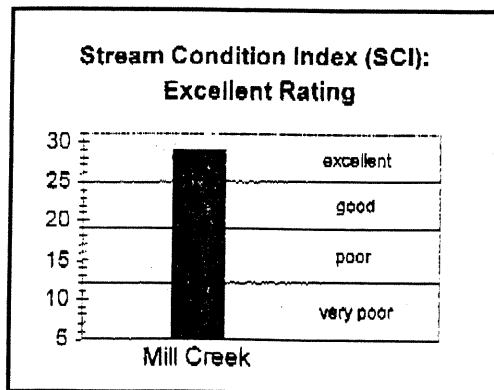
As a contributor to the Ocklawaha River, it is important to preserve the good water quality of Mill Creek. Assuming that present levels of impact are not increased, the outlook for Mill Creek looks positive.

For more information, call (407) 893-3313 (SunCom 325-3313), fax (407) 897-2966 (SunCom 342-2966), or write DEP at 3319 Maguire Blvd., Orlando, FL 32803-3767, attn: Dana Denson. E-mail: denso_n_d@orl1.dep.state.fl.us.



ECOSUMMARY

Mill Creek, p. 2



Water Quality: Good

parameter	value	comment
dissolved O ₂	3.6 mg/L	low; expected
pH	6.3 std. units	normal
conductivity	118 µmhos/cm	normal
turbidity	3.9 NTU	normal
alkalinity	43.7 mg/L	normal
tot. phosphorus	0.03 mg/L	good
nitrate/nitrite	0.06 mg/L	good
total ammonia	0.06 mg/L	normal
chlorides	7.7 mg/L	very low
sulfates	1.7 mg/L	very low

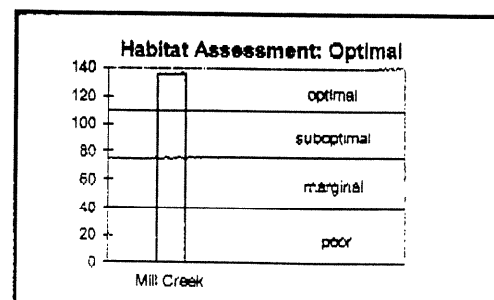


FIGURE 1 - Ecosummary Report Template

standard heading

report title

assessment type¹ & date sampled

standard header text for BioRecon²

variable text

site photo

standard header

variable text

locale map

speedometer³

standard header

variable text

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standard footer template

ECOSUMMARY
A Bioassessment Report

STROUD CREEK AT
STATE ROAD 78

A BioRecon Assessment
31 JULY 1996

Purpose
BioRecon: A rapid, cost-effective screening mechanism for identification of biological impairment.

A single BioRecon sampling was performed at this site in order to document the organisms that inhabit a potentially impaired stream in this geographical area, and to compare this stream with others which have minimal human impacts. This is important because impaired streams can still have adequate water quality, and the Biological Indicator thresholds that are the basis of BioRecon require further refinement.

DIGITAL CAMERA PHOTO HERE

Basin Characteristics

The drainage basin for Stroud Creek includes suburban and semirural residential areas and undeveloped open land. Major land uses in the area include residential and small agricultural areas. Fine sediments are the dominant natural vegetation.

ARCVIEW OR MAP EXPERT MAP HERE

Results

The BioRecon indicated that Stroud Creek is an impacted stream with habitats and macroinvertebrate species that differ from unimpacted streams in the same area, but has water quality adequate to support a marginally healthy population of invertebrates. The area is located in a residential area with a vacant lot on one side. Both banks are lined with Brazilian Pepper. Scattered cypress are also present. The understory on the banks is grass and poison ivy. The habitat consists of sand (65%), with a few snags, leaf litter, and about 10% exposed root/mudstone banks. Flow was evident but slow (0.1 m/sec). Stroud Creek barely passed the BioRecon threshold for a healthy stream. There were eighteen different taxa (minimum threshold = 18), five mayflies or caddisflies (minimum = 4), and a Forbes Index score of seven (minimum = 10). Water chemistry indicated that pH was rather low (5.5) and dissolved oxygen was 4.5 parts per million, below the Class III standard of 5 ppm.

Significance

These results confirm that this stream is at present somewhat impacted by human activities, but still provides adequate water quality for a healthy macroinvertebrate population.

Land in the immediate drainage area is not densely developed now; however, the potential exists for increasing impacts to the stream from more intensive residential and commercial development.

Suggestions

Maintain a monitoring program to detect effects of changes in local land use and provide data for refinement of BioRecon thresholds and methods, and encourage good land management practices in the basin.

For more information on the use of BioRecon, see the BioRecon manual, which is available from the U.S. Environmental Protection Agency.

1 - For SCI reports, header: "A Stream Condition Index Report"

2 - Standard text for SCI reports (Purpose): "SCI: To characterize the existence and severity of biological impairment in a freshwater stream"

3 - Note new speedometer format. If rating is "healthy", arrow is to the right of the midline and shading to left of arrow is green. If rating is "suspected impaired", arrow is to left of midline and shading to left of arrow is red. For SCI reports, speedometer is divided into four wedges and coloring rules apply similarly for Poor (or Very Poor) versus Good (or Very Good) as they do for the BioRecon speedometer's healthy versus suspected impaired.

**Watershed Planning and Monitoring Program (WPMP)
Water Protection Branch
Environmental Protection Division
Georgia Department of Natural Resources**

Is it already time for another newsletter? Time certainly does fly when you're havin' fun! Georgia would like to welcome Mike Beiser and Doug Upton as our new President and Secretary, respectively, for 1997. We know you guys will do a knock-down job running things this year. We look forward to the newsletters during the year and the November meeting in Biloxi.

Winter is already a busy time for us. There's lots being planned for 1997. The departure of Dave Kamps from the Ambient Monitoring Unit finds grant management of diagnostic feasibility studies on lakes Allatoona, Lanier and Blackshear being transferred to the Intensive Surveys Unit. These studies are in varying stages of development, with Allatoona and Lanier scheduled for completion in 1997. The WPMP will be continuing major lake studies for model development on West Point and Allatoona. Major lakes sampling pertaining to setting standards will be undertaken on West Point, Walter F. George (Lake Eufala) and Jackson Lake. Then, throw in monthly sampling of Lakes Hartwell, Russell and Clarks Hill for Basin Planning purposes, a dab of coastal monitoring and a pinch of continued Chattahoochee River data collection. There you have it. A recipe for a busy sampling season!

CHATTAHOOCHEE RIVER MODELING PROJECT

Work has continued through 1996 and into 1997 on this now four year running project. The model is currently being calibrated with data generated from 1993, 1994 and 1995. This project is designed to provide a time-variable hydrodynamic and water quality model for the Chattahoochee River from Buford Dam to West Point Lake. This general purpose model will be capable of supporting regulatory decision making for a variety of water resource and water quality issues into the 21st century.

A request for additional data collection for 1997 has been made of the WPMP, specifically in the area of continued monitoring on the Chattahoochee River and sampling of some of its tributaries. Some level of effort is expected to occur.

In January, associates from the WPMP presented a report to the director of the EPD summarizing the progress of the project and the results of the use of the current model on partitioning out the effects of a proposed Forsyth County discharge to the upper portion of the Chattahoochee River below Buford Dam.

RIVER BASIN MANAGEMENT PLANNING

Initial planning and sampling is underway for the Savannah / Ogeechee River Basin unit for 1997. Major lakes sampling will be undertaken on Hartwell, Russell and Clarks Hill as a segment of the data collection for this basin. Shannon Wisness of the Intensive Survey Unit (ISU) will develop a study plan for the lake sampling part of the project. The lakes will be sampled once a month, April through October. Sample parameters and plan design are still in the developmental stages.

Field work on Carters Lake for 1996 has been completed as scheduled. The Carters Lake Project was timed to coincide with the Alabama-Coosa-Tallapoosa (ACT) basin study. Field sampling occurred from January through December 1996. Three SOD sites were developed, AGP samples were collected twice, and seven lake stations established. Field parameters recorded included air/water temperature, conductivity, pH, secchi depth, DO, and wind speed. Integrated samples were collected to test for NH₃, BOD₅, CaCl, Ortho P, SS, TKN, Tot. Alk., TOC, Ptot and turbidity. Bacteria samples were also collected, as well as some deep water samples. Carters Lake is the deepest lake in the state of Georgia, with depths in excess of 400 feet. Chlorophyll a samples were also collected.

Initial sample data is indicative of good water quality. Some additional sampling will be scheduled for the spring and early summer of 1997.

EPD-ISU DIVE TEAM

Our dive team managed to stay wet this summer with work undertaken on Carters Lake. Three series of SOD tests were performed in August. Carters Lake posed a challenge to SOD diving due to its deep water and steep drop offs. A number of sites were identified during a reconnaissance trip in June of 1996. Three sites were tested: near midlake, near the public beach, and in the Coosawattee River headwaters of the lake. Initial data indicates that the test went well.

Diel DO measurements were also undertaken in two sites on the lake. Measurements were recorded twice during the summer. A diver-deployed buoy system was utilized. It was necessary to physically attach our probe anchor line to submerged trees to prevent our anchoring system from sliding down the very steep underwater slopes into deep and unrecoverable waters. We spent an anxious couple of hours searching for equipment (which we eventually recovered!) that "slipped" into deep water, dragging our cable, buoy and Datasonde units with it.

The Dive team may do an additional SOD site on Carters Lake this spring if time and resources allow. We are also planning a training course for our dry suit usage this spring, somewhere in crystal clear water!

ADOPT-A-STREAM

The Adopt-A-Stream Advisory Board met on January 16 to review and propose guidelines for the upcoming year. The agenda included reviewing the Adopt-A-Stream pilot program format. Each Regional Training Center will partner with either a government agency, school, private landowner or environmental center which is interested in wetland functions and values. The board agreed the goal of Adopt-A-Wetland is to enhance awareness of the nature, function and value of wetlands in Georgia. The Board also reviewed current monitoring protocols. Phosphorus will continue to be a parameter measured in advanced chemical monitoring and the usefulness of fecal coliform field kits will be tested.

MISSISSIPPI HAPPENINGS

What a great time in Gulf shores! Now, its our turn, and we're excited about hosting the SWPBA Meeting in Mississippi. The work has already begun, but we've got a long way to go. More on this in another part of the newsletter, we're going to talk about fish and bugs and Ceriodaphnia and things.

The big news in for us Mississippi is that we've gotten to add some new people. One individual at each field office now functions as Regional Biologist, and will coordinate monitoring activities, respond to complaints, etc. from that office. We hope it will lessen our response time to fish kills and emergencies, and allow us to increase efficiency.

As we announced at the Gulf Shores meeting, David Loch has moved into the Regional Biologist position for the central portion of the state. David has been a SWPBA member for some time now.

Barbara Viskup is the Regional Biologist for the southern portion of Mississippi. She is from Virginia, has a Master's Degree from the University of Southern Mississippi, and experience with the Missouri Department of Conservation.

Matthew Hicks has taken the Regional Biologist position for the northern third of the state. He is a Mississippi native, with an M.S. Degree from the University of Alabama. He has been working for the ADEM. Now he has to help host the SWPBA meeting two years in a row. Can anyone else out there match that?

We have also hired another person to work here at our lab in Pearl. Alice Dossett has joined our staff as an additional taxonomist. She will be doing field work as well. Alice was born in Panama, and received an M.S. Degree from the University of Southern Mississippi. She and Barb worked in the same lab. Alice has previous experience from her work for the Aquatic Resources Center, Inc. in Franklin, TN.

We're glad to have all of these hard workers on our staff.

New Ambient Monitoring Program

We are gearing up for the sampling season. During the winter months, we have revamped our monitoring program, both physical-chemical and biological, to increase the area covered by these programs. The Regional Biologists, in addition to their other duties, are responsible for monthly physical-chemical sampling (approximately 20 sites per region). A secondary network of physical-chemical sites is being developed to allow additional monitoring. There are a total of 41 sites throughout the state which will be bioassessed on an annual basis. Twenty-five sites will be sampled for tissue contamination in fishes. A like number

of sites will be sampled for Mercury in fish tissue, and we are preparing to do a whole basin assessment on the Pascagoula River basin later this year. A busy year lies ahead.

Mississippi Dioxin Studies

Our monitoring of the fisheries on both the Leaf and Escatawpa rivers continues, but a much lesser level of effort. This should be the last year of sampling on the Leaf River, and we have planned two additional years of sampling on the Escatawpa River. Levels of Dioxin in fish tissue in these streams has been reduced considerably since we began monitoring.

St Martin Bayou Study

The area around St. Martin Bayou is a densely populated area on the Gulf Coast which remains unsewered. It is an older community still on septic systems. Ditches in the community have extremely high fecal coliform levels, and plans are underway to get these areas on line in hopes of eliminating this problem. St. Martin Bayou empties into the Back Bay of Biloxi, a shellfish area. Our Regional biologist in the southern Region, Barb Viskup, is heading this investigation, which will involve monitoring the levels of fecal coliforms at about 30 sites throughout the communities, in St. Martin Bayou, and in the Back Bay. All homes in this area are scheduled to be on line by March, 1998.

Tallahala Creek Study

Last September, a series of bioassessments was completed on Tallahala Creek. Sites below several dischargers into the stream were assessed. Several years ago, many of these dischargers upgraded their treatment systems, and the biological sampling was undertaken to document improvements, if any, in this system. Results are incomplete as of this writing.

NORTH CAROLINA

As will be obvious in the writings below, we had a hurricane. Thanks to the shared experiences through SWPBA with South Carolina's Hugo stories, we had prior knowledge of what to expect in the coastal plain. The swamps filled, the swamps emptied, and the fish died. The media wanted to focus all impact to swine operations and treatment plant bypasses, but we collected information that suggested the total load was more related to other inputs that were hurricane related. Speaking of swine, its the topic of the year in the media and in legislature. There's too much to relay here, but if interested in new legislation, rules, general permits, and other fun activities, just get in touch. The Division has also been working on a nonpoint source management strategy for the Neuse River which if passed by the Commission and not overturned by the Legislature, would be precedent setting in required controls including mandatory buffers. Our long time leader in the Environmental Sciences Branch, Ken Eagleson, has moved into another area with the Water Quality Section. Ken is now leading the Data Management Group, which will surely take us into the twenty first century. We will miss him greatly at ESB, but are excited about working with him in his new capacity and having him guide our data management efforts. Jimmie Overton was recently bestowed the honor of keeping the highly charged group of individuals at ESB in check (like that's achievable!!!!).

BIOLOGICAL ASSESSMENT GROUP

FISHERIES

Since Hurricane Fran, which laid waste to eastern North Carolina like nothing seen since Sherman's waltz through Dixie, sampling efforts have been focused on helping others within the Environmental Services Branch to assess it's impact on the region's overall water quality. Up to 500 year flood levels and low dissolved oxygen levels resulting from a multitude of natural and man-made sources caused extensive and wide-spread devastation and fish kills throughout the region. Six fish community samples were collected in late October at sites which had been previously sampled in 1991, 1992, or 1995 and whose water levels had fallen and access was not denied by windfalls and snags. It seemed that the fish communities in the smaller streams which had risen and subsided quickly were less affected than those fish communities in larger streams where the water had stayed at high levels and had experienced prolonged periods of oxygen deficiencies. Almost two months (late October) after the hurricane, many sites remained inaccessible due to high water and deadfalls. Stream access will be an issue for many years and may complicate future basinwide stream assessments.

On the brighter side, benthic invertebrate and fish community studies were conducted in mid-October on the Cullasaja River (Macon County, southwestern NC), to determine any potential effects from the City of Highland's new wastewater treatment plant discharge point. No impacts were documented. Also in October and December, fish tissue samples were collected from the Pigeon River (Haywood County, western NC) and the North Pacolet River (Polk Co., southwestern NC) for analysis of mercury concentrations. Samples were collected because of concerns over possible mercury in the effluents from an upstream pulp and paper mill and from a municipal wastewater treatment.

In the last issue of the newsletter, a **request for information regarding IBI sampling** and metrics was sent out. The request bears repeating: "As more extensive IBI sampling is conducted on a basinwide level throughout North Carolina, some of the metrics (e.g., pollution tolerance rankings and incidence of disease) may be revised or "fine-tuned". If your agency has a statewide or river basin-specific method for determining the IBI of wadeable or non-wadeable streams, Bryn Tracy would be interested in receiving a copy of the procedures. He can be reached at (919)733-6946, (919)733-9959 (facsimile) or *via* e-mail at "bryn@dem.ehnr.state.nc.us".

BENTHOS

This section summarizes our activities since the last newsletter update, i.e., since August 1996. We are working on writing up the results for the basins sampled during summer of 1996, and we are in the process of planning sampling for 1997.

Basin Assessment

The 1997 basins will include the Tar, Catawba, and French Broad basins - all of these will be intensively sampled for the second time. We will be coordinating sampling of both fish and macroinvertebrates in the French Broad River basin with the US Geological survey and the Tennessee Valley Association. Overlap sites will be planned to aid in data comparisons, and sampling crews will be combined for labor intensive fish sampling on the mainstem of the French Broad River. We still hope to sample further sites in the Lumber and Waccamaw basins this winter, but we are impatiently (!) waiting for the waters to go down.

Hurricane Fran

The water is still too deep to sample the larger coastal plain rivers, but we have collected Post-Fran macroinvertebrate samples at about 20 sites in both the piedmont and coastal plain. Piedmont rivers, especially those with good habitat, showed relatively small changes that could be associated with Hurricane Fran. Smaller and sandier piedmont streams usually declined to a Fair rating. Coastal plain streams showed more severe effects, although we have not been able to sample most of the streams with greatest potential for damage. The effects of the Hurricane may make it difficult to assess long-term trends in the Tar basin.

Discharger Studies

*Cullasaja River, 4 sites, 10/96. Invertebrates were sampled at 4 sites on the Cullasaja to determine if a wastewater discharge was causing a decline in water quality. No change in water quality was found over 4 collections in 1990, 1991, 1994, and 1996.

*Mackey Creek, 2 sites, 9/96. A very small discharge was found to have a severely toxic effect on the macroinvertebrate fauna. This information will be used in selecting toxicity limits.

Alabama Methods Test

We had a good time sampling in Alabama, and key personnel sampled all available night life (light-trapping) in this portion of the state. We also sampled three streams as part of an inter-agency test involving 10 different groups. In comparing the two test sites (Majors Creek and Little River), we obtained the following results:

1. Much lower abundance of macroinvertebrates at Majors Creek, especially for EPT taxa. EPT abundance values were 120 at the Little River, but only 53 at Majors Creek.
2. Lower richness of EPT taxa at Majors Creek - Little River: 30, Majors Creek: 23.
3. Greater abundance of intolerant taxa at Little River, producing a lower Biotic Index value - Majors Creek: 5.35, Little River: 6.15.

The benthos group has found a new slogan; we think you also will find it useful:

"Science is not about being correct, science is about being less and less wrong."

Robert O'Neill, 1996

AQUATIC SURVEY AND TOXICOLOGY UNIT

In keeping with the North Carolina Division of Water Quality's (DWQ) basin-wide approach for planning and management of water resources, associations of NPDES dischargers are forming in the various river basins statewide. On July 27, 1994, the first legal document between DWQ and the Lower Neuse Basin Association was signed. Since that time, a discharger association has formed in the Lower Cape Fear River Basin and two more associations are forming in the Yadkin and the Upper Cape Fear River Basins. The concept of these associations is to integrate instream sampling requirements as set forth in their NPDES permits with DWQ's basinwide management strategy. A legal contract specifies that one organization (usually a contract lab) conducts all the instream sampling and performs the required analyses, instead of each discharger conducting individual sampling. Monitoring sites and parameters are established such that instream monitoring is more efficient, effective, basin-oriented, and yields better quality, more usable data. The increased efficiency provides economic incentive for dischargers to join these coalitions, and the data will benefit both DWQ and the discharging facilities. The coalitions are required by their memoranda of agreement to directly enter collected monitoring data to STORET with their own agency code. In addition to the aforementioned advantages, the discharger association concept allows for a collective, voice among the dischargers located in a particular river basin. In effect, this coalition monitoring more than doubles ambient monitoring coverage for several parameters (e.g. coliforms, DO, pH, temp., cond., nutrients, some metals) in those basins where it is being conducted. This information will provide staff much more water quality information by which to make water quality management decisions. For information on these programs contact Cathy Tyndall at (919) 733-6510.

AQUATIC TOXICOLOGY GROUP

Hurricane Fran severely curtailed what had been aggressive toxicity testing plans for the fourth quarter of the 95-96 fiscal year. In addition to wreaking havoc with sampling activities during the week of September 6, 1996, Fran destroyed the Yates Mill Pond dam, turning our dilution water source into a mud hole. We evaluated several water sources as a replacement, finally settling on Sycamore Lake in Umstead State Park. Due to the evaluation process and the need to re-establish a new reference toxicant database, the group was unable to resume NPDES facility testing until the first week of November.

As of the end of the 95-96 federal year, the group had performed 26 acute and 30 chronic effluent toxicity tests, 63 quality assurance tests, nine contract laboratory related tests, and nine ambient chronic tests. During the same period, the group reviewed 2446 NPDES WET toxicity reports, generated 286 NOV's for WET noncompliance, 64 NOV's for failure to report WET results, reviewed issuance or re-issuance of 149 permits with WET, reviewed and responded to 53 TIE/TRE plans and/or activity reports, reviewed 39 biocide use applications, and completed 18 biological laboratory inspections, among other things.

USEPA Headquarters, along with assistance from its regions and North Carolina has developed a Whole Effluent Toxicity training course for state and federal permit writers and compliance/enforcement staff. This two day course was taught last year in San Francisco, Chicago, Seattle, and Washington, D.C. Planned though not yet scheduled sites for 1997 include Atlanta, Anchorage, Dallas, and Boston. Those interested in attending the Atlanta or one of the other workshops should contact Larry Ausley at (919) 733-2136 <lausley@dem.ehnr.state.nc.us> or Lisa Spurlin with EPA Region IV at (404)562-9280 ext. 29760 <spurlin.lisa@epamail.epa.gov>.

GET INVOLVED! SETAC and the Carolinas' Chapter of SETAC is actively seeking increased governmental membership. This professional organization represents the cutting edge of its sciences through balanced representation of government, business, and academic viewpoints and has proven itself to be a working forum for exchange of scientific ideas. Need Proof? Get a copy of the recently published "Whole Effluent Toxicity Testing: An Evaluation of Methods and Prediction of Receiving System Impacts" SETAC Press. Pensacola, FL, the culmination of the 1995 SETAC Pellston meeting of national experts on WET representing the three interests. This type of forum and exchange represents a model of cooperation from which we can all prosper. Need info? Call Larry Ausley at (919) 733-2136.

ECOLOGICAL ASSESSMENT GROUP

Stream bank Stabilization

Streams and rivers throughout N.C. have been long been eroded and degraded by increased flow from urbanization and channelization. With large amounts of impervious surfaces, erosion rates are higher and invasive vegetation often takes over and disrupts the functions of these aquatic systems. Consequently, there is a great demand for projects related to stream restoration and relocations. **Streams restoration** may occur as a result of compensatory mitigation or for other enhancement purposes. Degraded streams or rivers in need of restoration may have eroded stream banks, a lack of or poorly vegetated riparian zones or may be severely incised or downcut below the natural riverbed. Impacted streams may also be full of sediment. Restored streams have increased habitat resulting in more diverse macrobenthic, fish or wildlife populations as well as enhanced recreational use. Often invasive non-native vegetation should be removed and replaced with native vegetation which has been proven to have effective root systems for stabilization.

Streams are often **relocated** during construction processes. During this process, it is important to minimize impacts to water quality, wetlands and wildlife habitat. The main goal of relocating stream channels is to match or improve the original stream to a pre-disturbance configuration. Variables such as width, depth, gradient, substrate and meanders should be similar or better than the original stream design. A handout on stream stabilization and alternatives to rip-rap was prepared and is constantly being update as new information is acquired. Several of the Environmental Sciences staff will be attending a week long course in May on 'Applied River Morphology' taught by David L. Rosgen, a well known hydrologist.

Mitigation Banking

Sponsors of a wetland mitigation bank for the Great Dismal Swamp watershed have been discussing the contents of a Memorandum of Agreement with the NC Division of Water Quality. The bank, as currently proposed, will provide compensatory mitigation for wetland impacts within this watershed. This may be the first wetland mitigation bank established in North Carolina. A variety of natural resource management agencies have been involved with the negotiations. These include the US Corps of Engineers, the US Fish and Wildlife Service, the NC Division of Water Quality, and Division of Coastal Management, the NC Wildlife Resources Commission, and related agencies from the state of Virginia. Issues discussed include the definition of a bank credit, service area, the accounting of impacts in both states, the role of preservation, and technical aspects of restoration. A mitigation credit has been proposed, but further negotiations are needed before a formal definition is established. Currently discussions have focused on one credit equaling 1.0 acre of restoration or 0.9 acres of restoration plus 10 acres of preservation.

The NC Legislature established a Wetland Restoration Program during its 1996 legislative session. This program will be responsible for writing wetland restoration plans for each of the state's 17 river basins, and providing oversight on implementing state and private sponsored wetland restoration. Further details will be available as this inchoate program develops.

SOUTH CAROLINA

Nineteen ninety six proved to be a year of change for the Water Quality Monitoring Section. With the reorganization of the Bureau, Mr. David Baize has become our new division director. David comes to us from the Underground Storage Tank program and has several years of managerial experience. We look forward to David's exciting ideas for our section. Our division, called the Division of Water Monitoring, Assessment, and Protection, now consists of the Shellfish Sanitation Section, Geohydrologic Section, Groundwater Assessment and Development Section, and our own.

On a more somber note, we lost Mr. Bruce Allen Gibson in late 1996. Bruce, 35 died suddenly on December 28, 1996. Bruce, a graduate of Auburn University, had been a member of our section for six years in the capacity of fisheries biologist. He had developed the Sections current fish tissue monitoring program and was developing an index of Biotic Integrity protocol. He had worked for SCDHEC for a total of nine years. Bruce is survived by his wife, Carla Gibson, a son Adam Gibson, and a daughter Ariella Gibson.

Mrs. Kathy Stecker, who worked in our clean lakes program, recently accepted a position outside our section in the Watershed and Planning Section. Kathy is a joy to be around and our loss will be their gain.

At the time of this writing Peyton Sasnett is expecting to give birth any day. We will be without Peyton for a few months after her baby is born. The non-source point pollution program will be left in the capable hands of our newest employ Mr. Chad Altman. A graduate of Clemson University Chad came to work for us in November.

Aquatic Macroinvertebrates

We are still completing the identifications and data analysis for the Savannah River basin. We will be starting our winter trend samples in February and look forward to continue our studies on swamp streams in South Carolina. This year we will be sampling in the Saluda-Edisto. Our goal is to collect 75-100 sites in this basin. The 1997 Carolina Area Benthological Workshop (CABW) meeting will be hosted this year by SCDHEC on March 3 and 4. We are fortunate to have Dr. John Morse of Clemson University coming to give us an overview of the current status of Trichoptera taxonomy. For more details on this meeting contact Jim Glover (803-734-5394).

Phytoplankton

The trend monitoring and special studies programs for phytoplankton and chlorophyll continued this past sampling season. About 50 lake stations were sampled once per month during the period May through October. Counting replicates for each station, approximately 900 chlorophyll samples were analyzed. Phytoplankton samples [50] for analysis were selected based on sites that exhibited high chlorophyll

concentrations or where an adequate phytoplankton record needed to be established. Data from several hundred recently completed phytoplankton analyses have been added to our database. We believe the database is now large enough to possibly allow some expanded types of data interpretation. We would like to look at the feasibility of developing indices or metrics using phytoplankton data. The Water Quality Monitoring Section is now using a Turner Model 10-AU fluorometer equipped with the Welschmeyer system of filters for chlorophyll analysis. We are very pleased that this equipment provides greatly improved accuracy in determining chlorophyll by fluorometry. The method eliminates the need for a sample-acidification step during analysis [Hooray!] and we get a direct reading of chlorophyll concentration.

Toxicity

South Carolina requires two-group (pass/fail) toxicity tests consisting of groups of twenty *Ceriodaphnia dubia* in major NPDES permits. The first phase of a simulation study of statistical methods used for analysis of these toxicity tests has been completed. In this phase, Type I error rates and power were evaluated for Fisher's exact test, the chi-square test and EPA's flow-chart tests applied to mortality data. Type I error rates only were evaluated for the EPA flow-chart tests and student's *t* test for reproduction data. For mortality data, chi-square had a Type I error rate equal to the rejection criterion of 0.05 when the binomial parameter of the parent distribution was 0.10. At lower parameter values the Type I error rate approached zero. Student's *t* and Satterthwaite's *t* and Fisher's exact test behaved similarly, but had lower Type I error rates than chi-square. The discreteness of the data cause the reduction in error rates as binomial parameter values were decreased. The EPA application of student's *t* to mortality was more powerful than Satterthwaite's *t* and Wilcoxon's rank sum tests, but its power was decreased by binomial overdispersion, while the power of chi-square was not. Chi-square was the most powerful test against all alternatives and is the most appropriate test for *C. dubia* mortality data using the current design.

EPA's flowchart approach is not necessary for controlling Type I error rates under the current design. Student's *t* test maintained a Type I error rate equal to the rejection criterion of 0.05 even when parent distributions were non-normal. The second phase of this study will compare the power of the flowchart tests and student's *t* test under a variety of alternatives and parent distributions. The third phase will examine the use of *r*, the Malthusian parameter or intrinsic rate of population growth, as a test statistic in toxicity tests.

Beach Monitoring

There has been a growing interest in the water quality of South Carolina's ocean beaches, especially in the Myrtle Beach area. South Carolina has been criticized because we currently do not monitor our beach water. Of particular concern are bacteria densities and the risk of illness to swimmers.

Since South Carolina has no wastewater discharges to the ocean, we have not thought monitoring of ocean beach waters to be the best use of limited resources; however, because of the perception of risk, we decided to study the issue further. We established a Beach Monitoring Workgroup, which includes scientists from within DHEC and representatives from local governments all along the coast.

At its first meeting last December, the Workgroup discussed indicator organisms and health risks. There was consensus that some type of monitoring would be useful, and municipalities expressed interest in initiating local monitoring activities.

A second meeting, held in January, focused on stormwater contributions and the use of enterococci rather than fecal coliforms as an indicator. It was decided that DHEC's Bureau of Water would draft a model study plan to be adapted by participating municipalities. In a February meeting, the workgroup will finalize plans for a Summer 1997 cooperative surf monitoring survey.

This is the State's new motto. Come see us on the Internet at <http://www.state.tn.us>

Watershed Management Section

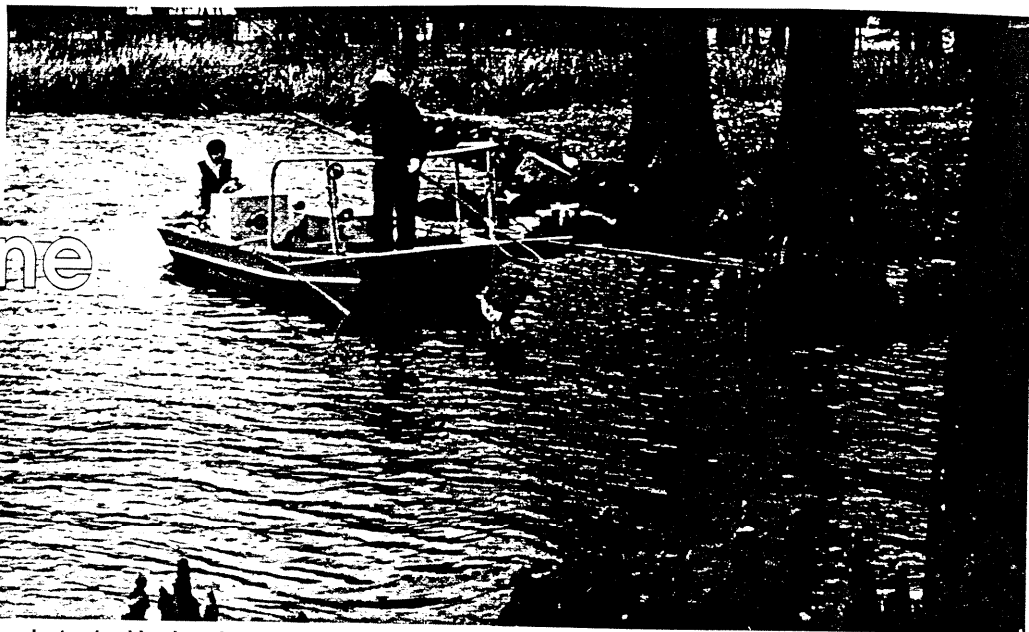
Our section is gearing up for the **Southeast Watershed Conference** which will be held in conjunction with the **6TH NALMS Southeast Conference** on March 6-8, at the Radisson Read House in Chattanooga, Tennessee. Tennessee is new at "watershed-based" planning so we hope to learn from the experiences of our neighboring states, especially in shared watersheds. HEY!! We gotta learn how to do it right! We're surrounded! For more information call Barbara Hamilton (532-0998) or you friendly NALMS contact.

The Tennessee Conservationist

It's not often you can blow your own horn, so when you can, do it LOUDLY! We did! In a Tennessee magazine. Knowledge is Power...but it doesn't do much good unless you can explain it to the general public. The articles feature Amy Fritz (Jackson Field Office) Beverly Brown (Johnson Field Office) Joy Broach (Central Office...I had to get my name in there some way.) Debbie Arnwine (Aquatic Biology Section) and Jennifer Thompson (Nonpoint Source Program). Happy Reading!

"Seining in the Rain"

Biologists Determine Aquatic Health



An electroshocking boat is used by biologists from the Aquatic Biology Section, Tennessee Department of Health, Division of Laboratory Services, known as Lab Services, to collect fish from Reelfoot Lake for tissue analysis.

by **Debbie Arnwine**
Environmental Labs
Tennessee Department of Health

When aquatic biologists in Tennessee go out "seining in the rain," it is not for amusement but to determine the health of aquatic communities in water bodies across the state. Attired in chestwaders and loaded down with nets, specimen jars and field identification guides, they collect and survey the small critters that live in streams, rivers and lakes. Like the proverbial postman, they work in

spite of rain, cold or sweltering heat to assess water bodies that have been targeted by the state for monitoring.

Aquatic biologists conduct benthic macroinvertebrate surveys, examining benthic macroinvertebrates like crayfish, mayflies, stoneflies, freshwater clams and snails, which live on the bottom of streams, lakes and rivers. The term "benthic" refers to their stream bottom habitat. "Macro" refers to their size, too large to fit through a 500 micron sieve; and invertebrates do not have a backbone.

By assessing the health of macroinvertebrate community, the quality of the water and potential impact on the

environment and human health can be determined. When a stream survey is conducted, the biologists first assess the condition of the habitat by scoring the quality of various aspects important to colonization by macroinvertebrates. This includes such factors as the amount of sedimentation, erosion of banks, loss of canopy (tree cover or shade), channelization (where the stream has been altered by man to straighten it), and run-off from surrounding areas.

Next, water quality parameters important to stream life, such as dissolved oxygen, pH, and temperature, are measured. Once the stream condi-



Above: Fish are being collected using a backpack electroshocker by Debbie Arnwine of Lab Services. With her is Joy Broach of the Central Office of Water Pollution Control (WPC) and Beverly Brown of the Johnson City WPC field office. **Next page:** Donna Wingfield of Lab Services and Beverly Brown of Water Pollution Control perform a riffle kick to collect macroinvertebrates as part of a nonpoint source pollution study.

tions are documented, macroinvertebrates are collected, by using nets and hand picking, from all available habitats like rocks, sediment, leaf-packs, and undercut banks.

Until recently, sampling was done using methods requiring many samples, like three or more for each site. These were intensive quantitative measures that were time consuming and complex.

Everything had to be measured, not just one sample. These methods required specialized equipment like Surbers, brass frames with specific sized nets used to collect organisms off the bottom of the streams. Larger rivers and lakes were sampled using Modified Hester Dendy Substrates, which are wooden plates suspended in the water for 30 days to let animals colonize on them. The plates were then collected and the animals removed and identified.

These remain excellent ways to collect organisms, especially if subtle differences in community structure need to be measured. However, the analysis was time consuming due to the number of organisms recovered. Reports for large studies often took years to complete.

In response to the need for a dependable method for analyzing the benthic community faster, the Environmental Protection Agency established Rapid Bioassessment Protocols (RBP) in 1989. Since that time, most biologists from various agencies in Tennessee, including the Aquatic Biology Section, have adopted a modified version of this method as the primary tool for assessing macroinvertebrates.

The most intensive form is the RBP III which consists of two semi-quantitative riffle kicks (photo 1) and qualitative collections of all available habitats. The term "riffle kick" refers to the action of one biologist kicking rocks loose in a riffle, or a fast moving shallow stream where rocks break the surface. The rocks are disturbed and animals wash into a net held by another biologist. Semi-quantitative means that a sub-sample of the net is taken, for instance, not all bugs, but a portion. Qualitative collection means you are looking for diversity of animals, not how many of those types there are.

All organisms are returned to the laboratory to be identified, using a microscope. Macroinvertebrates are identified by looking at mouth parts,

body hairs and antenna segments, as well as other tiny parts not visible to the naked eye. Once the organisms are classified, a compilation of seven different statistics are used to determine the water quality of the stream. These include statistics which evaluate tolerance values, functional feeding groups, and community structure.

The results of these statistics, the habitat classification and professional judgment, enable an experienced benthic biologist to determine whether a stream is healthy. This is further aided by comparison to a reference stream in the same ecological subregion to determine what is natural for the stream under study.

Tennessee has 25 sub-regions. These regions are areas with similar climate, geology, soils and plant and animal communities.

For the past seven years, the Aquatic Biology Section has been conducting intensive quantitative surveys on five target watersheds for the Nonpoint Source Section of the Department of Agriculture to determine the effects of Best Management Practices (BMPs) on water quality. These areas are the Nolichucky River in Upper East Tennessee; Davis Creek and Bear Creek in East Tennessee; the Duck River in Middle Tennessee; and Beaver Creek in West Tennessee.

Fish population studies are sometimes performed in conjunction with macroinvertebrates. They are not always conducted since the mobility of fish makes them less useful for certain types of studies, such as upstream and downstream of a pollution source. However, fish are good indicators of overall water quality since their mobility also enables them to move out of an impacted area.

Fish are sampled in wadable streams by using a backpack electroshocker. The insulated biologist carries the shocker on his back and inserts a probe into various fish habitats while wading the stream. An electric current

stuns the fish, enabling a second biologist to scoop them into a bucket of water (photo 2). If conducting a fish population study in a lake or large river, an electroshocking boat is used. The fish are not permanently damaged and are released after identification.

Most of the fish are identified to species level in the field, although representatives of difficult individuals (those that cannot usually be identified in the field) especially minnow and

some darters, are returned to the lab for confirmation of identification.

As with the macroinvertebrates, a series of statistics, which include assessments of tolerance, feeding groups and community structure, are used to assess the health of the fish community.

In addition to stream surveys, the Aquatic Biology Section collects fish for tissue analysis. Fish are periodically collected in lakes, rivers and large creeks where the fish are rou-



Dustin Armitage

The Aquatic Biology Section with the Tennessee Department of Health, Division of Laboratory Services conducts both laboratory and field investigations of water quality as it affects living organisms. The first aquatic biologist was hired around 1950 for what was then the Department of Public Health. Since that time, the Aquatic Biology Section has gone through a number of division and departmental name changes, and has expanded to become a core group of seven specialized biologists who perform water quality studies state-wide. The section, now located in the Tennessee Department of Health, is a service organization which conducts investigations for any state agency.

The majority of the work is requested by the division of Water Pollution Control, Tennessee Department of Environment and Conservation and the Nonpoint Source Pollution Section, Tennessee Department of Agriculture. The aquatic biologists either work independently or in conjunction with biologists from other divisions, depending on the needs of the requesting agency.

tinely consumed by the public. The fish are collected using a boat rigged with electroshocking equipment which stuns the fish. Three species are generally targeted; the primary game fish for the water body (usually bass), a catfish species, and a rough fish (carp or suckers).

Five individuals of each species are collected, returned to the lab and filleted. The fillets are analyzed by the chemistry sections of the Lab Services for heavy metals and pesticides which are harmful to health. The results are sent to the Planning and Standards Section of Water Pollution Control. If levels are high enough to pose significant risk to people who eat the fish, the water body is posted to limit or prevent consumption.

The Aquatic Biology Section also performs toxicity tests as part of the bio-monitoring program. There are two major types of tests: acute tests, which look at life and death within 48 hours; and chronic tests, which look at effects to the normal growth or reproduction of living organisms. Toxicity tests are routinely performed on National Pollution Discharge Elimination System (NPDES) permitted dischargers, such as industries, power plants and sewage treatment plants, to make sure their effluent is not adversely impacting the aquatic life.

They can also be used to assess the potential harm of runoff from farms,

golf courses, residential areas, parking lots or other sources. They are often used to determine the impact of a chemical spill. In each case, the test organisms are exposed to various concentrations of the pollution source in question. For example, if a discharger constitutes 10 percent of the receiving stream's flow, and animals survive, grow and reproduce normally at a 10 percent concentration of the discharger's effluent, it is likely that the effluent under question is not causing impact to the stream community.

Two different organisms are raised by the lab for use in these tests, *Pimephales promelas* (fathead minnows) and *Ceriodaphnia dubia* (water fleas). The fathead minnow is a common minnow found in streams all over the state. This, combined with the minnow's moderate tolerance to various pollutants, makes it an ideal organism for toxicity testing. Larval fish less than 24 hours old are used for testing since this is the most sensitive life stage. If juvenile fish cannot survive in the environment, the community will eventually perish. The fish tests look at survival and the ability of the fish to grow normally during a seven day exposure.

Ceriodaphnia dubia (Cd) are a primitive planktonic crustacean. Their role at the bottom of the food chain makes them an important indicator organism. If the Cd cannot survive, neither can

the population which feeds on them. The Cd are short-lived and run through their entire life cycle in one week. Therefore, a seven day test will show whether the animals can survive and reproduce normally.

All of the various responsibilities of the Aquatic Biology Section are geared toward protecting the life in Tennessee's streams, lakes and rivers. A clean environment is reflected by a diverse population of native fish and macroinvertebrates. This, in turn, results in a safe and healthy environment for people who also depend upon clean water for drinking and recreation.



Debbie Armwine is the manager of the Aquatic Biology Section of the Division of Laboratory Services with the Tennessee Department of Health.



David Stuckl of Lab Services conducts a toxicity test using *Ceriodaphnia dubia*, which are a primitive planktonic crustacean.

Canaries of the Stream:

Using Nature As a Laboratory for Water Quality Analysis

**Photos and story
by Jennifer Thompson**



As Pulaski Mayor Dan Speer looks on, a group of elementary school children cast nets in a Gilles County stream to assess the macroinvertebrate population.

Within the dark confines of coal mine shafts, miners kept caged canaries to warn them of impending danger. If oxygen levels fell too low, the canaries were the first to be affected. The absence of the canaries' song alerted miners that conditions were unsafe and they must evacuate to avoid disaster.

Today, biologists and researchers use aquatic organisms to monitor water quality, making these live environmental barometers the 'canaries' of streams, rivers and lakes. It makes a lot of sense to look to nature for evidence of water degradation. After all, these organisms, which include insect larvae, fish, snails, crustaceans and mussels, live and thrive in the water. They suffer when their environment is inundated with excessive nutrients, sediment, chemicals and thermal pollution.

If the results of a particular water body study show a decline in population diversity, this indicates that a source of pollution, either a point source such as an industry, or a non-point source, such as runoff from fields or seepage from septic tanks, is adversely affecting the aquatic community.

A healthy aquatic community is made up of many different types of species. An abundance of one or two dominant tolerant species usually indicates that the environmental quality has become degraded. In this environment, only the most adaptable species survive and quickly reproduce while other species die out.

Water pollution takes many forms. Excessive nutrient loading can result from various forms of phosphorus and nitrogen from animal wastes, septic tanks, or detergents. Chemicals are

introduced from pesticides and herbicides, industrial discharges or from residue from solid waste.

Hydrocarbons, such as oil and coolants from automobiles, are washed off from roads and parking lots. Thermal pollution from releases of wastewater from factories or sewage treatment plants can kill aquatic organisms. Even sediment itself is a pollutant. It suffocates aquatic organisms and covers up their nesting habitat, affecting reproduction and can be a vector of other pollutants.

In addition to causing a chemical imbalance in the water, nutrient loading causes algal blooms, or excessive growth of algae, which contributes to a diurnal oxygen demand.

This means that during daylight, algae give off oxygen. At night, the oxygen is taken back up by the plants, thus

depleting available oxygen for fish and other organisms. This is especially true of lakes and ponds, where there is little water movement to oxygenate the water. Decaying plant and animal materials also use up oxygen in the decomposition process, further complicating the problem.

A biologist may survey populations of benthic macroinvertebrates (bottom-dwelling organisms lacking backbones which are large enough to see without the aid of a microscope; fly larvae and crayfish, for example), analyze fish tissue or fresh water mussel tissue; or they may conduct tests which expose adult or juvenile organisms to a specific pollutant, depending on the type of information needed. (See related articles.)

Stream surveys by volunteer monitoring teams have gained popularity in the last few years. The surveys may include a combination of collection

and analysis of the macroinvertebrate populations, chemical monitoring and habitat analysis. The benefit is that this can be done relatively cheaply and inexpensively. Perhaps the most important benefit of citizen monitoring that involves students, is that it takes them into a living classroom, the stream environment. There, they learn to appreciate the intricate web that connects all living organisms.

The data from citizen monitoring may be misinterpreted and should not be used to point a finger at an industry or landowner. What this type of monitoring can do, however, is point to the development of problems within a watershed. The problems noted should be reported to professionals who are authorized to deal with these problems. Water pollution complaints should be referred to the closest regional field office of the Tennessee

Department of Environment and Conservation, Division of Water Pollution Control. If they are related to agriculture, they should first be referred to the Tennessee Department of Agriculture, Division of Forestry or Division of Agricultural Resources.

Education is the key to success in getting the community involved in protecting water quality, a responsibility we all should claim. By looking to the gilled creatures within our streams, lakes and rivers, we can monitor our own activities and help to protect the delicate balance of nature.



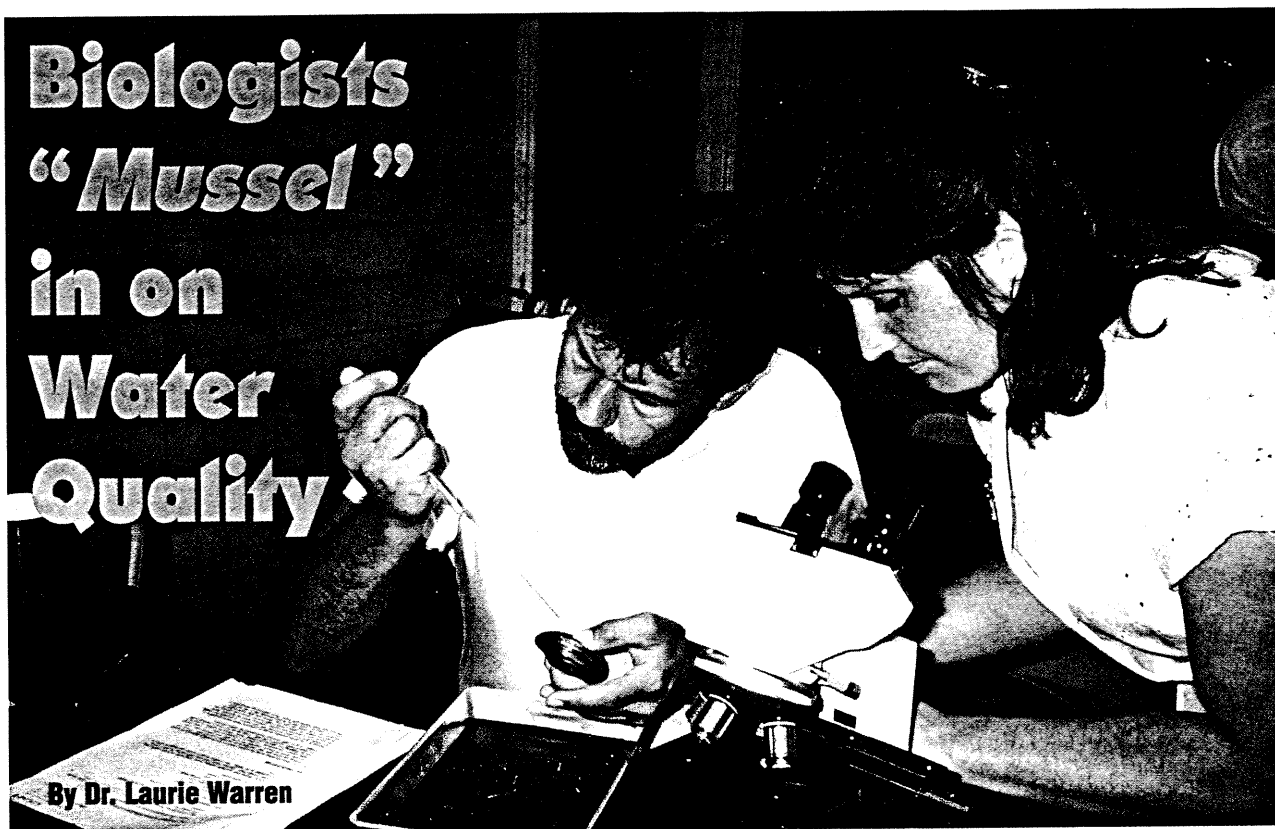
Jennifer Thompson is an environmental specialist with the Nonpoint Source Program with the Tennessee Department of Agriculture, Division of Agricultural Resources.



A Richland Creek stream assessment in Giles County, sponsored in part by the City of Pulaski, Martin Methodist College and TVA, gets high school students involved in monitoring health of streams in their area.

Biologists "Mussel" in on Water Quality

By Dr. Laurie Warren



Photos Courtesy of TN Department of Agriculture, Nonpoint Source Program

Dr. Steve Klaine, left, and Amy Fritz extract glochidial larvae from the adult mussel in order to examine them under a microscope at a training workshop. At bottom: Juvenile mussels are placed in vials and attached to crates such as these which are then anchored in the streams. Don Green, in background, with the Nonpoint Source Program, assists with the study.

The first study to use live, laboratory-cultured juvenile mussels in a field analysis to test water toxicity was undertaken in the Clinch and Powell River watershed in Northeastern Tennessee and Southeast Virginia.

Mussels serve as excellent water quality indicators. Because mussels feed by filtering sediment, they are more quickly affected by water pollution than other aquatic organisms.

Juvenile mussels are deemed suitable indicators of aquatic toxicology for a number of reasons; initially, because they are the first independent life stage. Their small size, no more than one millimeter in length the first month of life, provides them close association with both sediment and overlying water. Mussels are filter-feeders and

may readily accumulate contaminants present in a variety of forms. They are important for use in the fresh water pearl industry.

Although this particular study did not link mussel stress and mortality to a particular pollutant or group of pollutants, it did pilot the way for future studies to do so. The successful culture and use of juvenile mussels for laboratory and field testing may not only be useful for monitoring both point and nonpoint source contamination in aquatic systems, but also has positive implications for protection and potential reintroduction of threatened and endangered mussel species.

The Clinch and Powell watershed is said to host the most diverse population of fresh water mussels in the world. However, concern has been



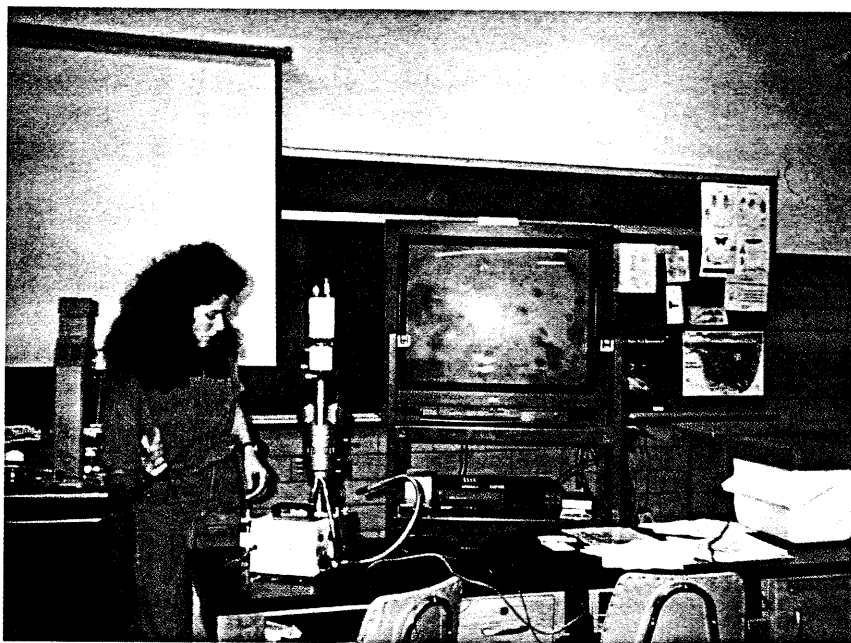
generated over rapid decline in both numbers and diversity of indigenous mussels during the last 30 years in North America. This reduction has been attributed to not only the invasion of the zebra mussel, habitat destruction and degradation by human activities, but also environmental contamination by metals, pesticides, and acid mine drainage. Decline in diversity and population is undoubtedly connected to water quality. According to the "Federal Endangered and Threatened Species of Tennessee," dated September, 1995, 36 of the 73 species of birds, fish, mammals and invertebrates listed are fresh water mussels.

The successful culture and use of juvenile mussels for laboratory and field testing may not only be useful for monitoring both point and nonpoint source contamination in aquatic systems, but also has positive implications for protection and potential reintroduction of threatened and endangered mussel species.

The study was initiated by Dr. Steve Klaine, principal investigator, and Laurie Warren, a former doctoral student in the Department of Toxicology at Clemson University in Clemson, South Carolina. Both laboratory and field bioassays, coordinated by Warren, were conducted in the Clinch and Powell watersheds using live juvenile mussels.

Juvenile mussels are more sensitive to toxicants and are metabolically more active than adult mussels, having greater filtration rates and gill areas in proportion to mass. As a result, they have an increased potential for exposure to, and accumulation of, aquatic contaminants.

The life cycle of most freshwater mussels is dependent upon an intermediate fish host for metamorphosis from larval, or glochidial stage, to juvenile stage. Upon release from the adult, some larvae become encysted upon the gills or fins of the host. This initiates the transformation process. Once metamorphosis is complete, the juveniles drop from the fish host to undergo a free-living existence.



Dr. Laurie Warren provides instruction at a training workshop held at Austin Peay State University in Clarksville. The workshop, focusing on the culture and care of juvenile mussels and how they are used in toxicity studies, was a part of the contract between the Nonpoint Source Program and Clemson University of Clemson, S.C.

The widespread mussel species, *Utterbackia imbecillis* was used as the test organism for the Clinch and Powell Rivers project. This species can be successfully transformed in the laboratory without the fish host by using a tissue culture technique in which mussel larvae are extracted from the adult, placed in a media simulating the composition of fish gill constituents, and incubated for seven to nine days under controlled conditions until metamorphosis is complete.

Mussels cultured at Clemson were used for laboratory testing at six to 14 days post-metamorphosis. Juveniles actually placed at selected sites in the Clinch and Powell Rivers for the field study were reared in the laboratory until six to eight weeks of age to facilitate greater ease of handling and observation in the field. The mussels were confined in small vials constructed of glass and mesh that were attached to weighted storage crates at the sites. After continuous exposure to existing river conditions for seven to 14 days, the juvenile mus-

sels were retrieved and observed for signs of stress and mortality.

The study was funded through a grant from the Nonpoint Source Program with the Tennessee Department of Agriculture, Division of Agricultural Resources in 1994-1995. Personnel from the Nonpoint Source Program, which at the time was part of the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, assisted with the study.

Warren, who received her Ph.D. in environmental toxicology, was responsible for both field and laboratory analysis and technical report preparation.



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