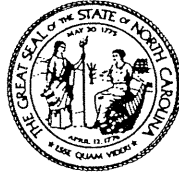


SOUTHEASTERN WATER POLLUTION  
BIOLOGISTS' ASSOCIATION

NEWSLETTER

MAY 1992





State of North Carolina  
Department of Environment, Health, and Natural Resources  
Division of Environmental Management  
Environmental Sciences Branch

James G. Martin, Governor  
William W. Cobey, Jr., Secretary

A. Preston Howard Jr., P.E.  
Acting Director

November 10, 1992

Mr. Ron Chandler  
Hydrolab Corporation  
P.O. Box 50116  
Austin, Texas 78763

Dear Ron:

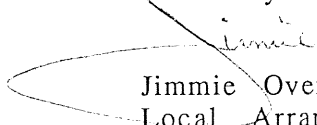
I would like to thank you for your attendance and support at the annual Southeastern Water Pollution Biologists' meeting. As local arrangements chairman, I appreciate the ability you afforded me in being able to put together a quality program.

It is beneficial to the membership to stay abreast of the latest technology in instrumentation available to the working water quality biologist. Hydrolab products are widely used within the industry and Hydrolab has been a leader in meeting expanding needs throughout my fifteen years.

I hope you found the meeting beneficial as well. You seem more like one of the members than a representative of a major instrument manufacturer. Even though the atmosphere is light, I appreciate the obvious strengths in limnology and instrument development you bring to the meeting.

Thank you again. We look forward to seeing you next year in Kentucky. Please pass my regards to Jim and Bill.

Sincerely:

  
Jimmie Overton  
Local Arrangements  
SWPBA

cc. Lythia Metzmeier





State of North Carolina  
Department of Environment, Health, and Natural Resources  
Division of Environmental Management  
Environmental Sciences Branch

James G. Martin, Governor  
William W. Cobey, Jr., Secretary

November 10, 1992

A. Preston Howard Jr., P.E.  
Acting Director

Mr. Kurt Browning  
YSI Incorporated  
Yellow Springs, Ohio 45387

Dear Kurt:

On behalf of the Southeastern Water Pollution Biologists' Association, I would like to thank you for your attendance and support at our annual meeting in Wrightsville Beach. The membership is fortunate in being able to have the latest advancements in technology readily available at such a meeting. YSI has been a leader in water quality instrumentation for many years, and my staff has always appreciated the resilience and dependability of your field meters.

I hope the format of the meeting provided you with ample opportunity to educate the membership on development of your multiparameter instrument. We attempt to provide a light atmosphere, but SWPBA represents a varied discipline of water quality experts.

Thank you again for taking your time to visit with us, share your products, and your volleyball skills. I look forward to seeing you next year in Kentucky.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jimmie Overton".

Jimmie Overton  
Local Arrangements  
SWPBA

cc. Lythia Metzmeier



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## EDITORIAL COMMENTS

In past newsletters this would have been the Editor's Comments. Being one editor shy, I'll try to adequately assemble this exchange of information. You might also note that the times of information provided vary from late winter to present. I fully understand the fun that Mr. Smith, Mr. Lenat, and Mr. Miller must have experienced in recent years. Actually I was probably the major holdup in trying to nail down a place to hold next year's meeting. But I did.

We have booked a block of rooms at the **Holiday Inn in Wrightsville Beach, N. C.** from **Monday October 26 until Friday October 30**. The rates are \$40.00 single or double including tax. Reservations must be received by October 12, 1992. I'm sure Bruce hopes he has his agenda in order by then. Please make your reservations as early as possible, as the negotiations included a certain number of rooms. Reservations can be made by calling (919) 256-2231 or even better (800) 532-5362. There is a complimentary bus to and from the New Hanover County Airport. Those who had problems with resorts should appreciate county being included in the name of the airport.

Thanks to:

Those who contributed information.

Karen Lynch for providing the artwork on the cover.

Teekeela Bernard for helping with meeting arrangements and in assembling this newsletter.

The next newsletter will go to the printer July 31. Please make a special effort to provide your input no later than July 15. Perhaps Bruce and I can provide more information on potential agenda items and meeting arrangements by then. If you have ideas, regarding next years meeting, please call Bruce or me.

**Circulate your copy of the newsletter**

Jimmie Overton

Dear SWPBA members,

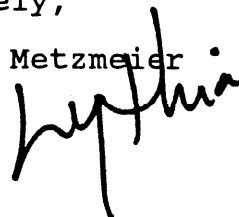
As far as I could tell, the 1991 meeting at Hilton Head was a great success, thanks to hard work and extensive planning by Dave Chestnut, excellent presentations by many SWPBA members, and gorgeous weather (outside the meeting room/sauna, that is). OK, so there was one MINOR glitch with the room reservations...take that as a lesson to plan ahead and reserve early next year...Delbert, Steve.

Congratulations to Bruce Pruitt, this year's misfortunate...I mean, president, and to Fern Winborne, new secretary. Thanks to Vickie Bauer, last year's secretary, for organizing the mailing list into a database. I'll bet North Carolina doesn't use dBase, but thanks to them anyway for "volunteering" to take over the newsletter. Personally, I think it's a great idea for the host state to handle the newsletter; that way no one has to have it for more than a year at a time. Question is, who's the editor? Or is it a COMMITTEE?

Anyway, the last year was fun, except for the last two weeks before the meeting, trying to fit everyone into the schedule (into a hopefully logical sequence). We had a much greater demand for talking-time than I expected (should have known, from this group...). I'm already looking forward to next year, especially the part where I wait until the VERY LAST MINUTE to submit a title for my talk.

Sincerely,

Lythia Metzmeier

A handwritten signature in cursive script, appearing to read 'Lythia', written over the printed name.

1991 Southeastern Water Pollution Biologists Association  
Hilton Head Island, South Carolina

Name	Agency	Name	Agency
Jeffery Davies	AL	Henry Folmar	MS
Cathy Matthews	AL	Kevin Crothers	MS
Vickie Bauer	AL	Mike Beiser	MS
Fred Leslie	AL	Fern Winborne	NC
Don Guinyard	EPA	Vince Schneider	NC
George Gibson	EPA	Karen Lynch	NC
Martha Hunter	EPA	David Penrose	NC
Dan Scheidt	EPA	Larry Ausley	NC
Jim Harrison	EPA	Trish McPherson	NC
Phyllis Meyer	EPA	Susan Carroll	NC
Delbert Hicks	EPA	Jimmie Overton	NC
Ron Weldon	EPA	Dan Rowe	NC
Ed Decker	EPA	Steve Tedder	NC
Don Schultz	EPA	Larry Eaton	NC
Bruce Pruitt	EPA	Chris Prescott	NC
Hoke Howard	EPA	Lance Ferrell	NC
Kathy Lurding	FL	Neil Medlin	NC
Russell Frydenborg	FL	Butch Younginer	SC
Broughton Caldwell	GA	Harry Gaymon	SC
Fred Parrish	GSU	David Chestnut	SC
Matt Lammar	GSU	Pat Horton	SC
Ron Chandler	Hydrolab	Jerry Brown	SC
Malcom Lynch	Hydrolab	Rick Renfrow	SC
Steve Reid	Johnston/ISCO	Earl Hunter	SC
Rodney Edwards	Johnston/ISCO	Mike Pearson	SC
Jeno Balassa	KY	Mark Giffin	SC
Jackie Balassa	KY	Bill McDermott	SC
Lythia Metzmeier	KY	Russ Sherer	SC
Karen Smathers	KY	Donna Wingfield	TN
Skip Call	KY	Debbie Arnwine	TN
Corrine Wells	KY	Dale Rector	TN
Giles Miller	KY	Don Dycus	TVA
Laura Beiser	MS	Rick Fielder	YSI
Billy Gene Justus	MS		

## I REMEMBER ED

I first met Ed Hall in 1966, soon after I had been hired by the Federal Water Pollution Control Administration (forerunner to EPA) in Atlanta. At the time, I was like so many other new biologists in water pollution, a person with a background somewhat afield from aquatic biology. We were hired because of the lack of specialists in the new field. Since we sampled similar waters around Atlanta, I first contacted Ed over the phone regarding pollution problems. I remember being greatly impressed with his quiet voice and personal grace which to me reflected true southern charm. I remember working with him trying to identify insect larvae with inadequate keys such as Pennak. We both took the water quality indicator species course given at Georgia State College in 1968 by Dr. Fred Parrish. Others who took the course were Harold Mulligan from Tennessee, John Williford from Alabama, and Dave Smith from EPA. Over the years our contacts have become less frequent and usually were limited to phone conversations or reading of his water quality survey reports. His passing will be mourned by many of us who helped develop the art of aquatic benthic analysis in the South. I will always remember him as a true representative of the quiet charm for which Southern history has been portrayed. The world is a better place for his contributions. Thanks Ed.

Don Schultz

Edward T. Hall, Jr.  
1933-1992

Edward T. Hall, Jr., an aquatic biologist and manager with the Georgia Environmental Protection Division from 1965 to 1988, died on January 26, 1992.

Ed was high school valedictorian in his home town of Grove Hill, Alabama. After earning degrees in biology from the University Of The South and The University of Virginia, Ed served 6 years in the U.S. Air Force. In 1965 he became the first aquatic biologist to work for the Georgia Water Quality Control Board, later to become the Georgia Environmental Protection Division (EPD).

At EPD, Ed soon realized that the stream life did not respond to water pollution as predicted by the established methods for assessing water quality. The stream life in Georgia was different and the methods used by aquatic biologists elsewhere in North America did not apply. Thus, even though he was a beginner in this field, Ed was cast by necessity as an innovator. He had to discover new methods of data interpretation that worked in Georgia.

Ed succeeded and soon the State of Georgia was making water quality decisions based on his system. This accomplishment won him the respect of his contemporaries in EPD, other water pollution control agencies and the academic community.

Ed was exceptionally articulate and personable. This was immediately apparent to anyone who met him. Whether in speaking to an individual citizen or addressing an environmental or civic organization, he was a steadfast and persuasive advocate of responsible environmental stewardship.

However, through investigating streams and writing about them he made his greatest contribution. With a profound knowledge of his subject and a facility with language he clarified the technically obscure and made interesting that which would have otherwise been tedious. Through his deft and thoughtful writing many scientists and lay persons alike have a better understanding of Georgia's rivers and streams.

Ed had many interests. One of these was music and the history of music and recorded sound. He amassed an extensive archive of rare and historic 78 RPM recordings which, along with a variety of other records and record playing devices, were bequeathed to the W. S. Hoole Special Collections Library at The University of Alabama.

Although Ed was devoted to his work, he cared for people the most and his primary concerns were always for the citizens of Georgia. He referred to those of us under his supervision as his colleagues and we always knew that, most of all, he was our friend.



## ALABAMA

The biologists are restless! Cabin fever has definitely set in and dreams of the "bug-hunt" are becoming feverish..... But on a more serious note we can finally see the light at the end of the tunnel.

Our portion of the 305b Report is completed and the coordinator is in the process of meshing all of that information into one intelligible report. Best of luck!

### ALABAMA ASSESSMENT OF COMPARATIVE RISK

In 1986 the Alabama State Legislature created the Alabama Environmental Planning Council. This state-wide group developed a long range environmental plan which identified significant environmental issues facing the state. Concurrently, the USEPA began looking at relative risks to U.S. citizens; releasing a report in 1990. Subsequently, EPA region IV has undertaken a comparative risk assessment for its states. Based on USEPA's Science Advisory board's recommendation of targeting environmental protection effort on the basis of opportunities for the greatest risk reduction, and EPA region IV's FY 92-96 strategic plan, the state of Alabama has begun an "Assessment of Comparative Risk". Risk will be characterized based on the magnitude and nature of health, ecological and welfare risks with a relative ranking developed. The Analysis will also identify possible environmental risk management efforts for integration into the State's strategic planning and budgeting process. Any questions concerning this project may be directed to our agency contact person, Bob Cooner [(205) 260-2700]. We are also interested in hearing from other states who have some experience with this type of project.

### WETLANDS INITIATIVE

The ADEM is currently in the process of applying for an EPA grant to assist the state in development of a State Wetlands Conservation and Management Initiative. If EPA funds this proposal, one of the projects will be to assess the current efforts nationwide from states that have completed, or are in the process of completing, biological narrative criteria for wetlands and their suitability for use in Alabama.

## BENTHIC MONITORING PROGRAM

Our macroinvertebrate biomonitoring folks have finished all of the identifications from last summer's collections. Our new database for storage and analysis of the macroinvertebrate data has saved us countless hours and calculator batteries. We are quite pleased with our report-ready taxa and metric tables that the program generates. The flexibility of this program will allow us to evaluate our multi-habitat method of collection and possibly streamline our collection effort.

This year we have scheduled approximately 50 sites throughout the state for macroinvertebrate assessments. These sites include ambient monitoring stations, nonpoint source project stations, Water Quality Demonstration Study stations, Ecoregional Reference Sites, and river monitoring sites in the vicinity of discharges associated with the Coalbed Methane Industry.

The AL/MS Joint Ecoregional Reference Site Project is entering its second year. The data collected at our candidate reference sites last year are currently in the analysis phase. The results from these sites will be presented at the progress meeting scheduled for April 16-17 in Montgomery. A report of the study results and conclusions will be drafted in the upcoming months. We will continue to evaluate these reference sites, and over the next months we will be completing reconnaissance of other streams in the subcoregions not shared with the state of Mississippi--the Sand Hills and Piedmont. Sites from these subcoregions will be included in our reference site sampling for this year.

## BLACK WARRIOR RIVER STUDY

The Black Warrior River study was initiated in 1989 to monitor effects of discharges to the river from the rapidly expanding coalbed methane mining industry. At present few concerns have been generated by water quality data collected from mainstem sampling locations. However, excessive turbidity in several tributaries from associated land clearing operations has generated concern. Monitoring activities resume later this spring.



## RESERVOIR WATER QUALITY MONITORING PROGRAM

Water quality data was collected on twelve reservoirs during the 1991 ADEM Fiscal Year. Reservoirs monitored in 1991 included those determined to be highly eutrophic from data collected during 1985, 1989, and 1990. Water quality data on Tennessee River Reservoirs in north Alabama were collected by the TVA as part of their Reservoir Vital Signs Monitoring Program.

Clean Lakes Program Phase I Diagnostic/Feasibility Studies on Weiss and West Point Reservoirs continue. The studies were initiated by ADEM in 1990 as a cooperative agreement with the Rivers and Reservoirs Laboratory at Auburn University's Fisheries Department and will continue through 1992. The ADEM has also applied for FY 92 Phase I Grants for W.F. George Reservoir on the Chattahoochee River and Neely Henry Reservoir on the Coosa River.

In 1991, the ADEM received additional funding through the Clean Lakes Program for additional trophic status and fish tissue monitoring on selected reservoirs.

During 1992, sixteen reservoirs will be monitored for the ADEM Reservoir Monitoring program. Additional FY 92 funding from the Clean Lakes Program will permit more intensive sampling of selected embayment areas of certain reservoirs.

## FISH TISSUE MONITORING PROGRAM

The ADEM Fish Tissue Monitoring Program was initiated in the fall of 1991. At present, the ADEM program exists as a cooperative agreement with the Alabama Department of Public Health (ADPH), the Alabama Department of Conservation and Natural Resources (ADCNR), and the Tennessee Valley Authority (TVA). Twenty-eight major reservoirs, 26 stream locations, and 19 ADCNR-managed state fishing lakes will be sampled over a period of five years. Sites in other waterbodies may be considered as additions or substitutions based upon an identified need.

At each sampling location, a composite sample of six individuals each from predator and omnivore/bottom-feeding species are collected. Skinless fillet composite samples are screened for PCB's, mercury, chlordane (total), DDT (total), toxaphene (mixture), dieldrin, endrin, heptachlor, mirex, and chlorpyrifos (Dursban) by the ADEM Central Laboratory in Montgomery. Results of analyses are expected later this spring.

## FISH TISSUE MONITORING PROGRAM Cont.

Analyses for the parameters mentioned in the previous paragraph were also conducted on composite samples of fish collected during 1990 from nine locations at five waterbodies. Concentrations of analytical parameters were non-detectable or less than ADPH consumption advisory limits.

## TOXICS UNIT

The Toxics Unit has almost reached it's commitment goal for FY 92 (July 1, 1991 to June 30, 1992). Since October, the Unit has performed 24 acute and 5 chronic toxicity tests on municipal and industrial permittees. Of the tests performed, only two samples indicated acute toxicity (one municipal, one industrial), while four of the five chronic tests indicated toxicity (all industrial samples).

The Unit has finished its first series of Algal Assays. Samples were collected from two reservoirs for two consecutive months - a total of 18 samples. Initial data analysis is currently under way.

## PERSONNEL

The Toxics Unit welcomes a new staff biologist, Janet Glenn. Janet was graduated at Auburn University at Montgomery and was a Cooperative Education student aide in the Unit while she was in school.

Cathy Matthews has transferred out of the Toxics Unit to join the field biologists of the Special Studies Section. Cathy will be primarily involved with stream studies including instream biological assessments using macroinvertebrates. She will also be working on lakes monitoring, and fish tissue collection.

## MEETINGS

Norman, Tim McCartha, Cathy, Fred and Jeff attended the ninth annual meeting of the Alabama Fisheries Association, February 26 - 28, 1992, at Joe Wheeler State Park Resort near Decatur, AL. This years meeting was a joint meeting of the AFA And the Wildlife Society of Alabama so the technical papers covered a wide variety of topics. The AFA is a nonprofit organization dedicated to the advancement of Fisheries technology and the protection of aquatic resources.

MEETINGS Cont.

Bob and Fred plan to attend the 1st Annual Southeastern Lakes Management Conference, March 19 -21, 1992, at Kennesaw State College, Kennesaw, Georgia. Information concerning the ADEM's Reservoir Water Quality Monitoring program will be presented.



NEWS FROM FLORIDA  
James L. Hulbert, Director  
Surface Water Ambient Monitoring Program (SWAMP)  
Florida Department of Environmental Regulation  
Orlando, Florida

I. Community Bioassessment Protocols (CBA) and Ecoregion Subregionalization (ER):

Work on these two contracts is continuing and will be covered by Dave Penrose (N.C.) in his upcoming biocriteria/bioassessment status review. For now, it will suffice to say that we have good news and bad news. The bad news is that Mike Barbour, who was heading up our CBA work, has transferred to Tetra Tech, Inc. in Columbia, Md. and, after a phasing out period, will not be working on this project. However, the good news is that Mike Bastian, EA Engineering, Science and Technology in Carrollton, Texas will be taking over the contractual work (hence, the "Mike and Mike Show").

II. Benthic Ecology Data Base:

The Environmental Requirements Committee of the Florida Association of Benthologists have just completed its 1991 (and first) edition of Benthic Ecology Data Base. The committee, under Bill Mason's chairmanship, has catalogued basic information on the taxonomy, habitat associations, food habits, distribution, and environmental requirements of approximately 150 species of common freshwater and estuarine macroinvertebrates of the coastal Southeast U.S. The goal is to include 2000 species in the data base by the year 2000. Copies may be obtained from: David L. Evans, c/o Water and Air Research, Inc., 6821 Southwest Archer Road, Gainesville, Florida 32608. Please include \$8 to cover postage.

III. North American Benthological Society - 1994 Annual Meeting:

Bill Mason and Jim Hulbert have informed the NABS Election and Place Committee of the intent to bid for the 1994 meeting to be held in Orlando, Florida, January 10 - 14, 1994. This is a preliminary notice of impending plans, plus a warning to any Florida NABS members that they will undoubtedly be contacted for much needed help on the Local Arrangements Committee, if the bid is successful.

IV. Florida Damselflies:

"Florida Damselflies (Zygoptera): A Species Key to the Aquatic Larval Stages," by Jerrell Daigle of the Florida Department of Environmental Regulation (FDER) has just been released. The manual includes drawings to identify the aquatic larvae of Florida's 44 damselfly species, including many never before described in the larval stage. Ecological and habitat notes are provided, as are a species checklist and references.

Dr. Landon Ross edited the manual and the key has been field-tested by the Tallahassee FDER biology staff. Future bioassessments will be enhanced through use of the manual. It should also increase awareness of Florida's several endangered damselfly species, including the Everglades Sprite (Nehalennia pallidula) which, sadly, may already be extinct. Copies may be obtained from: Jerrell Daigle, FDER, Division of Water Facilities, 2600 Blair Stone Road, Tallahassee, Florida 32399.

V. Florida Association of Benthologists (FAB) 1992 Spring Meeting:

The spring meeting of FAB will be held in Gainesville, Florida on Thursday, April 16 at the Doyle Connor Building. The agenda follows:

FLORIDA ASSOCIATION OF BENTHOLOGISTS  
Semi-Annual Meeting  
April 16, 1992

Doyle Connor Building Auditorium  
Florida Department of Agriculture  
1911 S. W. 34th Street  
Gainesville, Florida

Agenda

- 8:00 AM Registration- continuous until 11:00 AM
- 8:30 Welcome, Introduction of Guests, Announcements,  
and Agenda - Michael R. Milligan, President, FAB
- 9:00 FAB's Benthic Ecology Data Base - William T. Mason,  
Head Chair, Environmental Requirements Committee  
and National Fisheries Research Center, U. S. Fish  
and Wildlife Service, Gainesville, Florida  
(Distribution of the 1992 Catalogue)
- 9:30 FWS's Nonindigenous Species Data Base and GIS system  
- Charles Boydstun, National Fisheries Research  
Center, U. S. Fish and Wildlife Service,  
Gainesville, Florida
- 10:00 Bioassessment and Ecoregion Methods for Wetland  
Assessments in Florida - James L. Hulbert,  
Department of Environmental Regulation, Orlando,  
Florida
- 10:30 Florida's Keys to Chironomidae (Diptera) Project -  
John H. Epler, Consulting Ecologist, Rt 3, Box 5485,  
Crawfordsville, Florida
- 11:00 Invertebrate Densities on Native and Exotic  
Submerged Plants in Three Coastal Plain Streams -  
William Bartodziej, Bureau of Aquatic Plant  
Management, Florida Department of Natural Resources,  
Tallahassee, Florida
- 11:30 Lunch/Business Meeting
- 1:30 PM Invertebrate Communities in Lake Okeechobee -  
Gary L. Warren, Florida Game and Fresh Water Fish  
Commission, Okeechobee, Florida
- 2:00 Lake Management at Walt Disney World - Michael  
Crikis, Reedy Creek Improvement District, Lake Buena  
Vista, Florida

- 2:30 Benthic Macroinvertebrate Monitoring and Trend Analysis, Suwannee River, Florida - Robert A. Mattson, Suwannee River Water Management District, Live Oak, Florida
- 3:00 Culture of Benthic Invertebrates for Fish Food, Education, and Fun - Roger W. Rottmann, Department of Aquaculture and Fisheries, University of Florida, Gainesville
- 3:30 Florida Museum of Natural History's Collection of Mollusca and Other Taxa- Kim Trebatoski, Department of Natural Sciences, Malacology, Florida Museum of Natural History, Gainesville
- 4:00 Adjourn





## KENTUCKY

It has been a relatively mild winter so far in Kentucky. A bed of daffodils I pass on the way home should be blooming by this weekend (this is about two weeks ahead of usual). I just hope we don't get a touch of real winter weather that kills alot of the new plant growth.

Stream water temperatures in mid-February ranged from 3-7 C, based on ambient station results. Walleye, sauger, and white bass are just beginning to stage for their spawning run.

As most of you probably are, we are busy getting the 305b report out. Our ecological support biologists are working on identifying samples collected last year and making use support assessments based on their findings. Biologists continue reconning sites for reference reach work to be conducted this summer.

Personnel in the nonpoint section have continued work on three projects involving BMPs.

The bioassay section has been preparing for their 1992 work program. They plan to conduct studies at several industrial dischargers this year. This section has also released findings of an evaluation of their results. See attached paper for highlights of these findings.

Water quality standards have been adopted by the Commonwealth of Kentucky. Features of these standards include: removal of the dioxin criteria (see attached news release); updated criteria for human health; and the provision made that metal criteria for the purposes of regulation are total recoverable metals, unless it can be demonstrated to the satisfaction of the cabinet that a more appropriate analytical technique is available which provides a measurement of that portion of the metal present which causes toxicity to aquatic life.

The Ohio River fish consumption advisory was renewed. News of the advisory was released in February. Primary contaminants identified were PCBs and chlordane. See attached news release.

For those of you interested in mussels, I have attached an article from The ORSANCO OUTLOOK. The article entitled "Mussel Poachers Rob Ohio River of Resources" highlights the activities of illegal mussel fisherman exploiting the Ohio River.

## PROGRESS OF BIOMONITORING & TRE's IN KENTUCKY

An analysis of biomonitoring data and a review of facilities with toxicity limits was recently performed on four years of biomonitoring reports. The objective was to determine if any patterns of toxicity occurred among types of facilities, permit situations, etc. In the Kentucky biomonitoring program, a facility must fail two consecutive screening tests (a control and a single concentration, i.e. their permit limit), in order to proceed to a TRE (Toxicity Reduction Evaluation). Table #1 tallies the number of facilities in each permit class, number of facilities in TRE's, and the proportion in TRE's. Overall, the percentage of facilities in TRE's is about one-third. This TRE mechanism is apparently somewhat conservative, as 42.6% of all screen tests failed. Facilities exceeding the average are shown in bold print.

Table #2 further breaks down the municipal biomonitoring data by treatment type. Facilities with Biodisks or RBCs (rotating biological chambers) obviously have the greatest risk of entering a TRE, with 11 out of 14 facilities (79%) with RBCs being in TRE's. Older RBCs appear to have a greater rate of failure than do newer ones; this may be a reflection of RBCs' poor maintenance record.

Table #3A is a simplification of Table #1, and shows that industrial and municipal facilities each have about a one-third risk of entering a TRE. The largest single class of facilities in TRE's is municipal facilities with chronic permit limits, at 41%. It so happens that all RBC facilities are major (>1 MGD), chronic municipalities. Table #3B, repeats the municipal summary table of Table #3A, yet excludes all facilities with RBCs. This makes apparent the fact that RBCs are not a viable treatment option for removal of toxics among municipalities.

Of the 39 facilities presently in TREs about one-third are showing progress or success in removing or identifying the toxics problem(s), as summarized below (some categories overlap):

- Remediation progress (number of facilities):
  - New plants: 3
  - Plant improvements: 5
  - Changed operation: 5
  - Treatment options identified: 6
  - Toxic sources identified: 2
- Suspected toxins:
  - Metals: 8
  - Pesticides: 4
  - Others: 6
- To leave TRE soon: 12  
(5 industrial, 7 municipal)

The 12 facilities identified to leave the TRE mode represent the first wave of facilities eliminating toxic discharges as a direct result of the KPDES biomonitoring/TRE program; others are at varying stages of identifying their problems. Biomonitoring and TREs are still a relatively new regulatory tool, but it appears to be identifying facilities with problems that would otherwise have gone unnoticed. The next step of treating the problem, of course can be more difficult. However, as we are seeing in Kentucky, solutions range from simple plant operation changes to the more extensive solution of building a new plant. As biomonitoring matures and facilities adapt to meeting this regulatory limit, we learn more about what toxins are causing problems, where they are coming from, and how to deal with them. While the solutions may not always be easy, it appears progress is being made in identifying and removing toxic discharges from waters of the Commonwealth of Kentucky.

Table 1: Summary of Kentucky Biomonitoring Program by Facility Type, Percentages by Type						
	#	TRE's	% TRE	# Screen Test	# Screens Failed	% Failed
INDUSTRIAL						
Major Acute Chronic	20 6	5 1	25.0 16.7	263 73	60 32	22.8 43.8
Major Total	26	6	23.1	336	92	27.4
Minor Acute Chronic	6 3	3 2	*50.0 *66.7	30 66	21 25	70.0 37.4
Minor Total	9	5	*55.6	96	46	*47.9
INDUSTRIAL TOTAL	35	11	31.4	432	138	31.9
MUNICIPAL						
Major Acute Chronic	13 46	2 22	15.4 *47.8	180 645	47 357	26.1 *55.3
Major Total	59	24	*40.7	825	404	*49.0
Minor Acute Chronic	5 13	2 2	*40.0 15.4	37 153	12 62	32.4 40.5
Minor Total	18	4	22.2	190	74	38.9
MUNICIPAL TOTAL	77	28	36.4	1015	478	47.1
GRAND TOTAL	112	39	34.8	1447	616	42.6

\* Exceeds overall average.

TABLE 2: SUMMARY OF KENTUCKY BIOMONITORING PROGRAM  
BY TREATMENT TYPE

PERCENTAGES BY TREATMENT TYPE:

PRIMARY TREATMENT TYPE	#	MAJOR TRE'S	%	#	MINOR TRE'S	%	#	TOTAL TRE'S	%
Biodisks	14	11	79	0	0	--	14	11	79
Activated sludge	8	3	38	0	0	--	8	3	38
Trickling filter	4	2	50	2	0	0	6	2	33
Extended aeration	5	2	40	5	3	60	10	5	50
Lagoon	7	3	43	3	1	33	10	4	40
Oxidation ditch	14	4	29	5	0	0	19	4	21
Carousel	7	2	29	0	0	--	7	2	29
Redwood tower	2	0	0	0	0	--	2	0	0
Other	5	2	40	3	0	0	8	2	25
Total:	66	29		18	4		84	33	

Total number of facilities (84) is greater than the actual number of municipal treatment plants (77) due to the fact that some facilities have multiple treatment types.

TABLE 3: SUMMARY OF KENTUCKY BIOMONITORING PROGRAM

## A: BY FACILITY TYPE (ACUTE/CHRONIC)

FACILITY TYPE	PERMIT TYPE	#	# TRE 's	% TRE 's
INDUSTRIAL	ACUTE	26	8	31
	CHRONIC	9	3	33
		35	11	31
MUNICIPAL	ACUTE	18	4	22
	CHRONIC	59	24	41
		77	28	36

## B: MUNICIPALS WITH BIODISK FACILITIES EXCLUDED

FACILITY TYPE	PERMIT TYPE	#	# TRE 's	% TRE 's
MUNICIPAL	ACUTE	18	4	22
	CHRONIC	45	13	29
		63	17	27

# State Government News

Commonwealth of Kentucky . Brereton C. Jones, Governor

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## DIOXIN NOT FOUND IN FISH OR WATERS IN KY.; TO BE REMOVED FROM WATER QUALITY STANDARDS

FRANKFORT, KY. (Jan. 31, 1992)--Because results of testing in Kentucky show that dioxin is not present in fish tissue or river sediment samples in levels that approach "levels of concern" set by the Food and Drug Administration, the Kentucky Division of Water has proposed the deletion of the substance from state water quality standards. The Joint Committee on Agriculture and Natural Resources has now accepted the amended regulation.

Polychlorinated dibenzo-para-dioxins are a family of 75 chemicals that can be present in some manufactured chemicals and in waste from industrial processes, such as bleached paper production involving chlorine, refinery operations, and municipal incinerators. The U.S. Environmental Protection Agency (EPA) has classified the dioxin 2,3,7,8-tetrachloro-para-dibenzodioxin (2,3,7,8-TCDD) as a probable human carcinogen.

Eleven locations in Kentucky have been sampled as part of the National Dioxin Study and the National Bioaccumulation Study conducted by the EPA. The

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DIOXIN NOT FOUND IN FISH OR WATERS IN KY.:  
TO BE REMOVED FROM WATER QUALITY STANDARDS - PAGE 2

Ky. Division of Water has participated in these studies. Samples representing nine fish species have been collected and analyzed during these studies.

Only one sample collected in Kentucky during the studies has approached the FDA "level of concern" for dioxin, which is currently 25 parts per trillion (ppt) or 25,000 parts per quadrillion (ppq). A composite fillet sample from two striped bass collected during 1989 in the Big Sandy River near Catlettsburg in Boyd County was analyzed by the U.S. EPA/Region IV and found to contain 22.8 ppt dioxin.

Follow-up sampling analyses in 1990 of five different species collected from three different locations on the Big Sandy showed dioxins at a maximum of 2.70 ppt, well below the FDA level of concern.

Analyses of water, effluent, sludge, sediment, and groundwater in several locations in Kentucky have indicated either no detectable concentrations of dioxin or concentrations well below levels of concern. Samples were included from areas affected by operations of Ashland Petroleum Co. in Catlettsburg; Westvaco Corp., which operates a pulp paper mill near Wickliffe in Ballard County; and the Paducah Gaseous Diffusion Plant, a uranium enrichment facility located in McCracken County west of Paducah.

People who consume fish caught in Kentucky's waters or drink from those waters will not be affected by the deletion of dioxin because the compound is not present in waters at levels of public health concern, nor is it being discharged into waters at levels that require controls.

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DIOXIN NOT FOUND IN FISH OR WATERS IN KY.;  
TO BE REMOVED FROM WATER QUALITY STANDARDS - PAGE 3

On May 31, 1990, the Division of Water amended its water quality regulations to expand the number of numerical limits on concentrations of toxic chemical compounds. The limitations were intended to protect the legitimate uses of surface water of the Commonwealth, as well as to protect human health.

For substances associated with a cancer risk, concentration limits were set that would establish a risk level of no more than one additional cancer case in a population of 1 million people. For dioxin (2,3,7,8-TCDD), the limit was .000000014 ug/l, or .014 ppq, for protection from consumption of fish and .000000013 ug/l (.013 ppq) for protection of domestic water supply sources.

However, when the regulation took effect, the Interim Joint Committee on Agriculture and Natural Resources attached a statement of objection to it. The objection was based on the committee's determination that the regulation exceeded statutory authority. Thus the regulation was found to be deficient. The finding of deficiency meant that the regulation would expire at the end of this legislative session unless enacted in bill form or unless a new amendment was accepted by the committee.

To address the committee's objection, and in light of sampling results, the Division of Water amended Water Quality Regulations (401 KAR 5:031. Surface Water Standards) to delete numerical criteria for dioxin. A public hearing on this administrative regulation was held on Nov. 21.

Based on comments received, the regulation was amended to: (1) revise

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numeric criteria for five constituents making the levels of protection consistent with the latest values utilized by U.S. EPA in their proposed federal rule published in the Nov. 19 Federal Register, and (2) include a narrative provision to allow for a demonstration that a method other than total recoverable could be utilized in expressing the toxic fraction of the metals criteria associated with the protection of aquatic life.

The division also committed to study further other comments received. They will be considered during the Triennial Review of Water Quality Standards that will begin later this year. The dioxin deletion was retained in the amendment as proposed.

Areas where dioxin could reasonably be expected to occur in the environment have been targeted for monitoring. If the need for regulation of dioxin arises, the division will utilize the available narrative provisions in the regulations to establish appropriate environmental controls. Because of the costs and complex nature of dioxin analyses, the division will continue to pursue cooperative efforts with federal agencies and other state agencies. In addition, the division will await reports of EPA's Science Advisory Board which is reviewing dioxin studies to determine if their criteria need to be revised.

# NEWS

## RELEASE



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### OHIO RIVER FISH CONSUMPTION ADVISORY RENEWED BY STATE AGENCIES

FRANKFORT, KY. (Feb. 12, 1992)--Certain fish species caught in the Ohio River should not be eaten because of the potential health risk from polychlorinated biphenyls (PCBs) and/or chlordane, the state departments for Health Services, Environmental Protection, and Fish and Wildlife Resources advised today.

Because channel catfish, carp, white bass, and paddlefish and their eggs have been found to contain these contaminants, the three state agencies are issuing a fish consumption advisory for these fish if caught anywhere along the entire length of the Ohio River bordering Kentucky. This advisory continues one issued in March 1991 for the same species.

The advisory is being issued for the named species of fish only if caught in the Ohio River. Neither PCBs nor chlordane have been detected in the river's water.

Advisories regarding consumption of fish caught in the Ohio River were previously issued in February 1990 for channel catfish, carp, and white bass and in January 1991 for paddlefish,

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OHIO RIVER FISH CONSUMPTION ADVISORY  
RENEWED BY STATE AGENCIES - PAGE 2

commonly referred to as spoonbill catfish, and their eggs.

The present advisory is being issued following review by the three agencies of the 1991 fish contamination information from the Ohio River Valley Water Sanitation Commission (ORSANCO) and the 1990 and 1991 Department of Fish and Wildlife Resources and Department for Health Services paddlefish studies.

Data collected over the last five years (1987-1991) show that carp, channel catfish and paddlefish taken from various locations in the Ohio River are contaminated with levels of PCBs and chlordane that approach or exceed the action levels set by the U.S. Food and Drug Administration (FDA). Those limits are 2.0 parts per million PCBs and 0.3 parts per million chlordane.

Through the combined efforts of several state and federal water resource and wildlife agencies, 69 composite fish fillet samples were collected from the entire length of the river and submitted by ORSANCO for analysis. Species represented in this year's samples were carp, channel catfish, blue catfish, flathead catfish, spotted bass, smallmouth bass, largemouth bass, white bass, hybrid striped bass, and sauger. Samples were collected from 12 lock and dam locations. Through the use of electrofishing, samples were also collected from an additional 8 "mid-pool" locations.

Composites of fish fillets of each species were tested for organic chemical contaminants such as PCBs; pesticides, including chlordane, DDT, and dieldrin; and the metals mercury, cadmium, and lead. Results of analysis show contaminant levels in all species except carp, catfish, and paddlefish to be below the U.S. FDA guidelines for human consumption. However, frequent consumption of even low levels of PCB- or chlordane-contaminated fish may increase the risk of long-term adverse health effects.

Immediate human health effects from eating PCB- or chlordane-contaminated fish have not been documented. PCBs and chlordane accumulate more in high-fat species such as carp and catfish.

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## OHIO RIVER FISH CONSUMPTION ADVISORY RENEWED BY STATE AGENCIES - PAGE 3

These compounds also are known to accumulate in the eggs of various fish.

People who decide to eat these fish should follow the precautions suggested by the health and environmental protection agencies to reduce the risk of potential harmful effects of eating fish from the Ohio River:

- \*Women of childbearing age and pre-school age children should not eat the listed fish species.

- \*Others who intend to eat these fish can minimize the intake of PCBs and chlordanes by properly cleaning, skinning, trimming, and cooking the fish.

- \*Only skinless and boneless fillets with as much fat removed as possible should be eaten. The skin should be particularly avoided. Eggs should be discarded.

- \*Roasting or baking have been found to reduce levels of PCBs and chlordanes more than other cooking methods such as frying or microwaving. Cooking does not destroy PCBs or chlordanes nor does it lower their toxicity. The heat from cooking simply melts some of the fat in the fish, removing pollutants at the same time.

- \*None of the juices or fats that cook out of the fish should be eaten or reused for cooking other foods.

This action is not a ban on fish consumption but allows the public to minimize or avoid potential health risks. The Cabinet for Human Resources will continue to monitor tissue residue levels in the fish from the Ohio River that are caught for commercial use.

State and interstate agencies will continue to gather data on fish in the Ohio River.

The advisory will remain in effect until further notice.

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Editor: The attached chart may be used in conjunction with this article.

Ohio River Fish Tissue Results (1987 - 1991)													
Site	Species	PCBs (ppm)					Chlordane (ppm)					1991	1991
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991		
Ohio River RM 472.8 Cincinnati, OH	Carp	ND	-	-	1.16	-	ND	-	-	-	-	-	-
	White Bass	3.24*	0.77	-	-	-	0.16	0.05	-	0.14	-	-	-
	Channel Catfish	2.76*	2.54*	-	-	-	0.3*	0.28	-	-	-	-	-
Ohio River RM 483.9 Cincinnati, OH	Channel Catfish 50 cm	-	-	-	-	0.81	-	-	-	-	0.16	-	-
	Channel Catfish 60 cm	-	-	-	-	1.70	-	-	-	-	0.25	-	-
Ohio River Markland L&D RM 531.5	Carp	0.17	-	-	1.35	-	0.01	-	-	0.23	-	-	-
	Crappie/Bass	0.57	-	-	-	-	0.02	-	-	-	-	-	-
	Paddlefish	-	-	-	1.32	-	-	-	-	0.39*	-	-	-
	Freshwater Drum	-	-	-	0.91	-	-	-	-	0.13	-	-	-
	Smallmouth Buffalo	-	-	-	0.61	-	-	-	-	<0.10	-	-	-
	Channel Catfish 48-52 cm	-	-	-	4.02*	-	-	-	-	0.48*	-	-	-
	Channel Catfish 53-59 cm	0.74	-	-	2.86*	-	0.12	-	-	0.32*	-	-	-
	Channel Catfish 60-65 cm	-	-	-	6.12*	-	-	-	-	0.71*	-	-	-
	Paddlefish Fillets	-	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	-	0.42	-	-	-	-	0.31*	-	-
	#2	-	-	-	-	0.65	-	-	-	-	0.36*	-	-
	#3	-	-	-	-	0.17	-	-	-	-	0.16	-	-
	#4	-	-	-	-	0.17	-	-	-	-	0.13	-	-
	#5	-	-	-	-	0.25	-	-	-	-	0.13	-	-
	#6	-	-	-	-	0.37	-	-	-	-	0.32*	-	-
	#7	-	-	-	-	0.24	-	-	-	-	0.33*	-	-
	#8	-	-	-	-	0.40	-	-	-	-	0.21	-	-
	Paddlefish eggs	-	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	-	1.6	-	-	-	-	0.65*	-	-
	#3	-	-	-	-	1.14	-	-	-	-	0.49*	-	-
	#6	-	-	-	-	0.15	-	-	-	-	0.08	-	-

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane  
 ND = Not Detected

Ohio River Fish Tissue Results (1987 - 1991)												
Site	Species	PCBs (ppm)					Chlordane (ppm)					1991
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	
Ohio River RM 606.5 McAlpine L&D	Carp	0.74	-	-	-	-	-	-	-	-	-	-
	Channel Catfish 36 cm	-	4.6*	2.68*	1.14	0.82	0.24	0.6*	0.43*	0.13	0.09	-
	Channel Catfish 48 cm	-	-	-	-	0.03	ND	-	-	-	ND	-
	Channel Catfish 65 cm	ND	-	-	-	2.80*	-	-	-	-	0.38*	-
	Crappie/Bass/Sauger	0.08	-	-	-	-	0.01	-	-	-	-	-
	White Crappie	-	-	<0.10	-	-	-	-	<0.10	-	-	-
	Freshwater Drum	-	-	0.66	0.87	-	-	-	<0.10	0.14	-	-
	Smallmouth Buffalo	-	-	0.33	-	-	-	-	<0.10	-	-	-
	White Bass	-	-	-	0.35	-	-	-	-	<0.10	-	-
	Paddlefish Fillets	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	0.4	-	-	-	-	0.26	-	-
	#2	-	-	-	0.24	-	-	-	-	0.11	-	-
	#3	-	-	-	0.37	-	-	-	-	0.27	-	-
	#4	-	-	-	0.25	-	-	-	-	0.14	-	-
Ohio River RM 625.9 West Point, KY	Paddlefish Eggs	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	Tr	-	-	-	-	0.11	-	-
	#2	-	-	-	Tr	-	-	-	-	0.42*	-	-
	#3	-	-	-	1.5	-	-	-	-	0.6*	-	-
	#4	-	-	-	0.23	-	-	-	-	0.27	-	-
	Carp	0.27	2.35*	-	-	-	0.76*	0.35*	-	-	-	-
Ohio River RM 665.3	Channel Catfish	4.94*	0.64	-	-	-	0.88*	0.1	-	-	-	-
	White Bass	2.2*	-	-	0.26	-	0.12	-	-	<0.10	-	-
	Black Bass	-	0.06	-	-	-	-	<0.05	-	-	-	-
	Smallmouth Buffalo	-	-	-	<0.10	-	-	-	-	<0.10	-	-
	Spotted Bass	-	-	-	<0.10	-	-	-	-	<0.10	-	-
Ohio River RM 665.3	Channel Catfish 45 cm	-	-	-	-	1.00	-	-	-	-	0.09	-
	Channel Catfish 53 cm	-	-	-	-	2.29*	-	-	-	-	0.25	-

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane

ND = Not Detected

Ohio River Fish Tissue Results (1987 - 1991)													
Site	Species	PCBs (ppm)					Chlordane (ppm)					1991	1991
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991		
Ohio River RM 436.2 Meldahl Ltd	Carp	<0.10	0.51	-	-	0.02	0.02	<0.05	-	-	ND	-	-
	Smallmouth Buffalo	-	-	0.31	-	-	-	-	<0.10	-	-	-	-
	Bass	0.13	-	-	-	-	ND	-	-	-	-	-	-
	White Bass	-	0.65	-	-	0.82	-	<0.05	-	-	-	-	-
	Channel Catfish 47 cm	0.18	0.2	-	-	1.86	0.03	0.16	-	-	0.09	-	-
	Channel Catfish 52 cm	-	-	-	-	1.42	-	-	-	-	0.24	-	-
	Channel Catfish 60 cm	-	-	-	-	1.85	-	-	-	-	0.17	-	-
	Paddlefish Fillets	-	-	-	-	-	-	-	-	-	0.20	-	-
	#1	-	-	-	0.28	-	-	-	-	0.22	-	-	-
	#2	-	-	-	0.36	-	-	-	-	0.29	-	-	-
	#3	-	-	-	0.61	-	-	-	-	0.55*	-	-	-
	#4	-	-	-	0.86	-	-	-	-	0.83*	-	-	-
	#5	-	-	-	0.54	-	-	-	-	0.22	-	-	-
	#6	-	-	-	1.2	-	-	-	-	0.88*	-	-	-
	#7	-	-	-	0.52	-	-	-	-	0.36*	-	-	-
	#8	-	-	-	0.42	-	-	-	-	0.68*	-	-	-
	#9	-	-	-	1.36	-	-	-	-	1.0*	-	-	-
	#10	-	-	-	1.3	-	-	-	-	0.97*	-	-	-
	Paddlefish Eggs	-	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	0.49	-	-	-	-	0.29	-	-	-
	#2	-	-	-	0.54	-	-	-	-	0.32*	-	-	-
	#3	-	-	-	0.13	-	-	-	-	0.54*	-	-	-
	#4	-	-	-	0.52	-	-	-	-	0.94*	-	-	-
	#5	-	-	-	0.66	-	-	-	-	0.47*	-	-	-
	#6	-	-	-	0.2	-	-	-	-	0.61*	-	-	-
	#7	-	-	-	0.66	-	-	-	-	0.50*	-	-	-
	#8	-	-	-	0.50	-	-	-	-	0.78*	-	-	-
	#9	-	-	-	0.41	-	-	-	-	1.08*	-	-	-
	#10	-	-	-	0.53	-	-	-	-	0.98*	-	-	-

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane  
 ND = Not Detected



Ohio River Fish Tissue Results (1987 - 1991)												
Site	Species	PCBs (ppm)					Chlordane (ppm)					1991
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	
Ohio River RM 341.0 Greenup L&D	Carp	0.47	-	-	1.86	-	0.07	-	-	0.25	-	-
	Freshwater Drum	-	-	-	0.8	-	-	-	-	0.2	-	-
	Smallmouth Buffalo	-	-	-	0.32	-	-	-	-	<0.10	-	-
	Nalleye	ND	-	-	-	-	ND	-	-	-	-	-
	Channel Catfish 36-42 CM	0.37	-	-	0.89	-	0.07	-	-	<0.10	-	-
	Channel Catfish 43-48 CM	-	-	-	1.96	-	-	-	-	0.42*	-	-
	Channel Catfish 54-57 CM	-	-	-	2.51*	-	-	-	-	0.43*	-	-
	Paddlefish Fillets	-	-	-	-	-	-	-	-	-	-	-
	#1	-	-	-	-	-	-	-	-	-	0.11	-
	#2	-	-	-	-	-	-	-	-	-	0.19	-
	#3	-	-	-	-	-	-	-	-	-	0.20	-
	Paddlefish eggs	-	-	-	-	1.2	-	-	-	-	0.45*	-

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane  
 ND = Not Detected



Ohio River Fish Tissue Results (1987 - 1991)												
Site	Species	PCBs (ppm)					Chlordane (ppm)					1991
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991	
Ohio River RM 778.0 Newburgh L&D	Carp	ND	-	-	-	0.34	ND	-	-	-	-	0.06
	Channel Catfish 36 cm	0.27	-	1.69	0.32	0.35	0.07	-	0.32*	<0.10	-	0.06
	Channel Catfish 49 cm	1.13	-	-	-	1.13	ND	-	-	-	-	0.14
	Crappie	0.1	-	0.28	-	-	-	-	<0.10	-	-	-
	White Bass	-	-	0.65	-	0.41	-	-	<0.10	-	-	0.06
	Smallmouth Buffalo	-	-	-	0.22	-	-	-	-	<0.10	-	-
	Flathead Catfish	-	-	-	0.24	-	-	-	-	<0.10	-	-
	Sauger	-	-	-	-	-	-	-	-	-	-	-
	Paddlefish (Composite)	-	-	-	-	0.20	-	-	-	-	-	0.02
	Fillet	-	-	-	-	-	-	-	-	-	-	-
Ohio River RM 806.9 Henderson	Eggs	-	-	-	0.12	-	-	-	-	0.11	-	-
	Paddlefish Fillets	-	-	-	0.56	-	-	-	-	0.03	-	-
	#1	-	-	-	-	-	-	-	-	-	-	0.063
	#2	-	-	-	-	-	-	-	-	-	-	0.033
	#3	-	-	-	-	-	-	-	-	-	-	0.028
	#4	-	-	-	-	-	-	-	-	-	-	0.16
	Paddlefish eggs	-	-	-	-	0.91	-	-	-	-	-	0.54*
	#5	-	-	-	-	-	-	-	-	-	-	-
	Carp	-	-	-	-	0.24	-	-	-	-	-	0.06
	Channel Catfish 44 cm	-	-	-	-	0.32	-	-	-	-	-	0.05
Ohio River RM 846.0 Uniontown L&D	Channel Catfish	ND	-	-	-	-	ND	-	-	-	-	-
	Crappie	ND	-	-	-	-	ND	-	-	-	-	-
	Smallmouth Buffalo	-	-	-	0.26	-	-	-	-	<0.10	-	-
	Freshwater Drum	-	-	-	0.3	-	-	-	-	<0.10	-	-
	Carp	0.19	-	-	0.24	-	0.04	-	-	<0.10	-	-
	Flathead Catfish	-	-	-	0.31	-	-	-	-	<0.10	-	-
	Channel Catfish 42-46 cm	-	-	-	1.06	-	-	-	-	0.2	-	-
	Channel Catfish 48-54 cm	-	-	-	1.88	-	-	-	-	0.47*	-	-

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane  
ND = Not Detected

Ohio River Fish Tissue Results (1987 - 1991)											
Site	Species	PCBs (ppm)				Chlordane (ppm)					
		1987	1988	1989	1990	1991	1987	1988	1989	1990	1991
Ohio River RM 918.5 Smithland L&D	Carp	0.45	-	1.71	-	0.48	0.07	-	<0.10	-	0.08
	Channel Catfish 36 cm	-	-	-	-	0.37	-	-	-	-	.05
	Channel Catfish 43 cm	-	-	-	-	0.77	-	-	-	-	0.10
	Channel Catfish 53 cm	-	-	-	-	1.18	-	-	<0.10	-	0.18
	Largemouth Bass	2.48*	-	0.5	-	0.05	0.21	-	-	-	0.01
	Sauger	-	-	-	-	0.22	-	-	-	-	0.03
	Smallmouth Bass	1.03	-	-	-	-	ND	-	-	-	-
	Striped Bass	-	-	<0.10	-	-	-	-	<0.10	-	-
	Blue Catfish	-	-	<0.10	-	0.71	-	-	<0.10	-	0.14
	Bignmouth Buffalo	-	-	0.38	-	-	-	-	<0.10	-	-
	Paddlefish (Composite)	-	-	-	-	-	-	-	-	-	-
	Fillet	-	-	-	0.17	-	-	-	-	0.17	-
	Eggs	-	-	-	Tr	-	-	-	-	Tr	-
	Paddlefish Fillet	-	-	-	-	-	-	-	-	-	0.063
Ohio River RM 927.85	#1	-	-	-	-	0.48	-	-	-	-	0.033
	#2	-	-	-	-	0.40	-	-	-	-	0.155
	#3	-	-	-	-	0.51	-	-	-	-	0.014
	#4	-	-	-	-	0.12	-	-	-	-	0.144
	#5	-	-	-	-	0.51	-	-	-	-	0.073
	#6	-	-	-	-	0.83	-	-	-	-	0.036
	#7	-	-	-	-	0.58	-	-	-	-	0.059
	#8	-	-	-	-	0.67	-	-	-	-	0.011
	#9	-	-	-	-	0.60	-	-	-	-	0.096
	#10	-	-	-	-	0.47	-	-	-	-	-
	Sauger	-	-	-	-	0.20	-	-	-	-	0.02

\*Exceeds FDA action level of 2.0 ppm for PCBs or 0.30 ppm for chlordane

ND = Not Detected

# Mussel Poachers Rob Ohio River of Resources

In what may be the largest non-game poaching case the Ohio Division of Wildlife has ever been involved in, 18 Tennessee residents were arrested October 1 for allegedly digging up more than four tons of mussels from the Ohio and Muskingum Rivers.

Most of the arrests were made on the West Virginia side of the Ohio River at Williamstown. The suspects took about 1,800 pounds of mussels from the river.

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*The suspects represent just a fraction of what may be an interstate poaching ring*

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Ten people pleaded guilty to various poaching and boating violations. They were sentenced to ten days in jail and fined from \$356 to \$1,788. Four others were arrested in West Virginia but have not appeared in court as of the writing of this article.

In Ohio, four suspects were arrested along the Muskingum River near Beverly in southeast Ohio. They had harvested nearly three tons of mussels in three days, said Richard Scott, law enforcement director for the Ohio Division of Wildlife. Included in this catch were 30 mussels from three endangered species.

The four Ohio suspects pleaded innocent to various poaching and licensing charges, including possession of an endangered species.

West Virginia authorities were alerted to the poachers by a fisherman who saw some of the suspects diving for mussels after dark north of Parkersburg, according to Captain Ben Gragg of the West Vir-

ginia Department of Natural Resources.

Gragg said the case was the first of its kind in West Virginia. Because mussel beds in Tennessee and Kentucky have been depleted, mussel poachers are expanding their operations into Ohio and West Virginia.

According to Gragg, the suspects admitted they could net \$3,000 a day digging up mussels from the river bed. They intended to take the mussels back to Tennessee, where they could receive \$7 per pound rather than \$4 per pound in West Virginia.

Authorities said black market mussels are often shipped to Japan or Indonesia where they are used to make cultured pearls, buttons, or cosmetics. To form cultured pearls, a plug is cut from the mussel and implanted in an oyster. Within two years, a cultured pearl is formed.

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*Poachers can wipe out the comeback efforts of the mussels in a very short time*

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According to Jerry Schulte, aquatic biologist with ORSANCOCO, poaching puts existing mussel populations at risk. While some mussels are on the endangered species list, biologists don't have a good understanding of the status of many mussel species. Therefore, the taking of any mussels is damaging, explained Schulte.

"You are taking creatures out of the environment just when they are trying to come back after years of abuse from pollution," said Schulte. "Poachers can wipe out that effort in a very short time be-

cause they collect mussels indiscriminately."

The suspects in this case represent just a fraction of what may be an interstate poaching ring, said Emerson Gorham, a special investigator for the U.S. Fish and Wildlife Service.

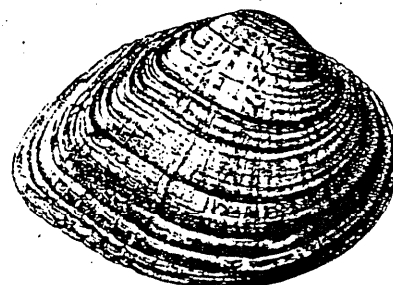
"From what the suspects say, we think we got about one-third of them," Gorham said. "Many of their boats had either expired registrations or phony registrations, which really got our interest."

Three years ago, Ohio passed a law against the commercial collection of mussels, according to Dave Ross of the Ohio Division of Wildlife.

The maximum penalty for possessing an endangered species in Ohio is a \$750 fine and six months in jail.

If you have reason to suspect poaching activities in your area, contact one of the following numbers:

Ohio	1-800-POACHER
West Virginia	1-800-NETGAME
Kentucky	1-800-25-ALERT
Indiana	1-800-TIP-IDNR
Illinois	1-800-252-0163
New York	1-800-847-7332
Virginia	1-800-237-5712
Pennsylvania Fish Commission:	
(717) 657-4518	
Pennsylvania Game Commission:	
(717) 787-4250	





## MISSISSIPPI HAPPENINGS

Spring finds us anxiously preparing for the upcoming collection season, with anticipation of new and undiscovered reference sites. Many exciting things are planned in our office for 1992. Several are outlined below.

### A NEW BOSS

As you may already know, longtime SWPBA member Phil Bass was promoted to chief of field services earlier this year. We'll miss him out here at our lab facility. Henry Folmar has been promoted into Phil's old position and is now Lab Director.

### A NEW LAB???

Sounds incredible! Plans are underway for the building of a new Office of Pollution Control Laboratory. Phase I is scheduled for completion later this year, and will house the biology section. We biologists are looking forward to moving into this shining new facility.

### AND NEW EMPLOYEES, TOO!!!

Now this is almost too good to be true, but it looks like our staff will increase by two in a very short time. One position will replace Stan Rodgers, while the other position represents an increase. Their duties will be to help out with ambient biological monitoring, macroinvertebrate taxonomy, and biological criteria development. More probably, in the next issue of the newsletter, about our new biologists.

### Tallahala Creek Study

Tallahala Creek has been the subject of a special study undertaken by our biologists since 1987, and has been the subject of numerous SWPBA presentations. Plans are underway to repeat the biological sampling in early September, 1992 now that the upgraded sewage treatment facilities have gone on line.

### Dry Creek Oil Spill Investigation

On 25 Feb., 1992 OPC Lab biologists Mike Beiser and Doug Upton responded to a request for assistance from our Emergency Response Section to perform biological assessments on Dry Creek in the Homochitto National Forest. There had been an oil spill cleanup the day previous, and a water quality study was completed on the aforementioned date. High water hampered the investigation, and may have contributed to scouring of the stream which may have masked any deleterious effects caused by oil influx into the stream. A site upstream and one downstream of the oil influx was sampled. Analysis has been completed on the samples, and although the effect of the high water can be noted, an impact was indicated on the waters of Dry Creek downstream of the entry point of the crude oil.

### Alabama/Mississippi Reference Site Project

Participants in this project from the MS OPC Lab, AL DEM and EPA have finalized plans for a meeting in mid April in Montgomery to plan the final steps toward completion of the project. It is anticipated that an additional series of joint-sampling exercises will be conducted, as well as reports presented on the selected reference sites. Some progress has been made toward identification and analysis of the samples collected as Mississippi's commitment to this project. Seven of the proposed sites have been identified and analyzed thus far. This represents 50% of the total sites sampled as a part of this project. Final delineation of the ecoregions/subregions and development of a database upon which biological criteria can ultimately be based will take some time.

### Toxicity Testing

Staff toxicologist Doug Upton has been kept busy answering questions from municipalities, because toxicity requirements have been added to municipal permits. Twelve of the seventeen scheduled toxicity tests have been completed for FY 92, as have all reports. The remaining 5 tests have been scheduled, and should be completed during the next quarter.

### Fish Tissue Monitoring

#### Cassidy Bayou Investigation

Six fish samples collected from Cassidy Bayou, site of a major fish kill several years ago, have been analyzed. A report on the status of pesticides in fish tissue in the Bayou was produced and reviewed by OPC personnel. Continued monitoring was deemed necessary as levels of Toxaphene (the causative agent of the kill) were still elevated.



### Dioxin in the Leaf and Pascagoula River Basins

Fish collections for the Leaf and Escatawpa River Dioxin Studies continued as the third round of sampling for each study was completed in November. For the year, 239 samples comprised of 787 organisms were analyzed for dioxin (2,3,7,8,-TCDD and TCDF). The data are being analyzed now and will be summarized in reports later this year.

We currently have advisories in place on the Leaf and the Escatawpa Rivers. The Leaf River advisory recommends limiting consumption of catfish larger than 22 inches from the mouth of Tallahala Creek to the Pascagoula River, a distance of approximately 45 miles. The Escatawpa River advisory covers 12 miles from I-10 to the Pascagoula River and applies to catfish, buffalo, and mullet.



## NORTH CAROLINA

### BENTHOS

#### Recent Activities

Most of the benthos group has been glued to word processors, leading to several acute cases of early spring fever. While we have been indoors too much, we have not been idle:

#### **Dischargers**

Dave Penrose looked at the effects of a discharger upgrade: Reidsville WWTP, Little Troublesome Creek. Comparing 1991 data with collections from 1986, we observed a large reduction in organic loading, but the discharge still remained toxic. Analysis was complicated by a "crash" at the upstream site, presumably due to urban runoff.

#### **Reclassifications**

Ferne Winborne and Neil Medlin looked at about 18 streams in response to a request that a number of stream segments be reclassified from WS-I to HQW (High Quality Water). These very small streams (most less than 4 meters wide) were no longer being used as water supplies. Rather than lose the protection given by a water supply classification, the Planning Branch proposed a shift to an HQW classification. This requires an Excellent bioclassification, but also leaves us with the problem of assigning rating to small streams.

ORW (Outstanding Resource Water) reports for two areas are still "in preparation": South and Black rivers, and the Waccamaw River. These are highly complex systems, complicated by atypical habitats and upstream water quality problems.

#### **Biocriteria**

Dave Penrose is in the process of updating the status of biocriteria programs and documentation for SWPBA. He has contacted all of the state representatives to get updates on state activities and plans to have a draft ready for each of the states for review by the end of February. However, the revised document will be much larger than the 1990 version (Biocriteria has caught on). Therefore, copies of the final document will be distributed only to each of the state representatives and EPA. Other copies will be available upon request.

Larry Eaton continues to work on biocriteria and sampling methods for estuarine areas. It appears that no one method will be appropriate for all portions of an estuary. Low salinity areas are particularly difficult to evaluate. Stay tune for further details.

Neil Medlin will be initiating a study of swamp streams in February. Our summer surveys of coastal plain stream in the Neuse River basin were very frustrating. Because of the stress caused by summer low flows (sometimes dry stream beds), it was not possible to differentiate "good" swamp streams from more impacted sites. We are hoping that winter sampling, during normal high flow periods, will work better. Unfortunately, this will require that we develop and test methods for nonwadable streams.

Dave Lenat has finished a review of all DEM collections from the Cataloochee Creek basin: an important reference stream. We have data from all seasons of the years and from a variety of stream sizes. This data set (231 taxa) was used to examine normal changes in our metrics that are due to stream size and/or collection date.

#### **Basin Assessment**

The majority of our time is now being spent on comprehensive assessment of water quality in specific basins: Neuse and Lumber during 1991; Tar, Catawba, and French Broad planned for 1992. All basins will be sampled on a five-year rotation. The Neuse River basin report (benthos section) has just been completed, summarizing information from almost 300 collections at 155 sites. This program replaces our old BMAN (Benthic Macroinvertebrate Ambient Network) sampling.

### Taxonomy

"One of the most basic impulses we have is to ask the names of things. Young children associate the name of something with the phenomenon so closely that their eyes widen in fear as they say the word *fire*, their eyes brighten with astonishment when they point to the sky and say *bird*."

Don Stap, Parrot without a Name, 1990

### **New and/or rare critters**

1. Oligochaeta - from Mark Wetzel's visit to our lab
  - a. L. tortilopennis: Cape Fear River near Fayetteville, January 1986; and Rock River near Norwood, March 1885. Both localities are sandy, large river, sites.
  - b. Bratislava unidentata. First DEM records, misidentified as Pristinella.
2. Ephemeroptera
  - a. Ephemerella subvaria. Cullasaja River, Macon Co., 12/90. These specimens were originally misidentified as E. hispida, but closer examination indicated that these specimens were E. subvaria. Berner (1977) gives only one other record in the southeast, a single collection from Swain County, North Carolina, in April. Does anyone else have verified records for the southeast?
  - b. Leptohyphes dolani. Neuse River, Johnston and Wayne Counties, July 1991. This is a very flattened species, almost resembling a Drunella. First NC record.

### **New Keys**

1. Bae, Y.J. and W.P. McCafferty. Phylogenetic systematics of the Potamanthidae (Ephemeroptera). Trans. Amer. Ent. Soc. 117: 1-143.

This publication contains updated keys to all Anthopotamus (new name for North American Potamanthus). Four species are possible in the southeast, most indicated as confined to the mountains.

As a test of our computer system, I printed out a list of collection sites for this genus, and roughly plotted the results by county. These results indicated two very distinct mountain and piedmont clusters. The mountain cluster (no records in the far western part of the state??) appears to be A. distinctus, an "Appalachian" species, (especially in the French Broad River basin) and A. verticus. The piedmont cluster tends to follow the fall line between the piedmont and the coastal plain, and consisted of A. verticus. These clusters appear to be more related to ecoregion than to drainage basins, and both groups seem to orient to the diagonal slant that is typical of geological formations in North Carolina.

"We make a wonder at the monstrous and mighty shoulders of Elephants, we marvel at the strong necks of bulls; we keep a wondering at the ravening of Tygres and the shag mane of Lions; and yet in comparison with insects there is nothing wherein Nature and her whole power is more seene, nether showeth she her might more than in these least creatures of all"

Early translation of Pliny the Elder,  
quoted by Edwin Way Teale, Days Without Time, 1948

### Miscellaneous

#### 1. New Publication:

Eaton, L.E. and D.R. Lenat. 1991. Comparison of a rapid bioassessment method with North Carolina's qualitative macroinvertebrate collection method. J. N. Am. Benthol. Soc. 10: 335-338.

This is the formal description and test of our "EPT" rapid bioassessment method.

2. The Third National Citizens' Volunteer Monitoring Workshop Monitoring Conference will be held in Annapolis, Maryland, April 2, 1992. For more information, call Ferne Winborne, 919-733-6946.

3. The Bioassessment Group regularly has openings for positions in both the macroinvertebrate and phytoplankton sections. We are not hiring for a specific position at this time, but we would like to have applications on file for the next time. If you are interested in working in North Carolina, call (919-733-6946) or send a resume to Trish MacPherson (DEM Water Quality, 4401 Reedy Creek Road, Raleigh NC 27607). All correspondence will be treated as confidential.

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"From the outside, science may seem like a collection of answers, a course in 'How the World Works'. From the inside, it doesn't look like that at all. From the inside, science looks like a bunch of people doing crossword puzzles. It's the doing them that's fun. If you solve one, you don't stop; you look for another."

Jack Horner, Digging Dinosaurs, 1988

"To me, the river was more than an impersonal voice of wild nature; it was a friend and companion and comforter in distress.....No matter how gloomy my thoughts and depressed my vitality, the river could restore my drooping spirits. Its good humor was contagious; its abundant vitality communicated itself to me when I came near. As I walked beside its foaming, sparkling waters or sat on a mossy rock watching its dancing surges and listening to its vibrant voice, gloom and doubts would dissolve away, and before I was aware of the change, I would be humming a tune."

Alexander Skutch, A naturalist in Costa Rica, 1971

## PHYTOPLANKTON

Since October, two new people, Lisa Williams and Greg Price have joined the phytoplankton group. They have been working hard learning phytoplankton identification and counting numerous samples. Dianne Reid has moved to DEM's Planning Branch to develop water quality standards.

Besides counting algal samples, we completed a water quality summary covering four years of data from the Albemarle-Pamlico estuary. After another year of data collection in 1992 and an update, five years of data will be completed, and summaries provided to the program.

We have been working on a couple of special projects with three enriched reservoirs, Wendell Lake, and Wiggins Mill and Buckhorn. Information from these water quality assessments and nutrient budgets developed for the watersheds will be used to evaluate management actions for these sub-basins.

Dr. JoAnn Burkholder from North Carolina State University has discovered a toxic dinoflagellate found in N.C. estuaries that may be responsible for some of the fish kills reported from the Neuse and Pamlico River estuaries.

During 1988, fish collected from the Pamlico River and placed in aquaria at the NCSU vet school later died. The water samples collected from the aquaria contained a dinoflagellate tentatively identified as Gymnodinium species. Attempts to eliminate this toxic dinoflagellate by using acidic and basic washes and autoclaving the bottom gravel failed as this dinoflagellate encysted when conditions became severe. Only when the aquaria were sterilized with clorox, did the organism disappear.

Subsequent experiments by Dr. Burkholder and NCSU Vet School personnel have demonstrated that the dinoflagellate is active under a salinity regime of 5 to 35 ppt,

although it is most active around 15 ppt. Under laboratory conditions when fish were introduced into the aquaria, this dinoflagellate would emerge from its cyst form and become active in the water column. Water samples collected soon after the fish died contained a monospecific culture of the dinoflagellate; however, days later without the presence of a live fish, the dinoflagellate again formed a benthic resting stage or cyst.

The Biological Assessment Group has received numerous algal bloom reports in conjunction with fish kills from the Pamlico and Neuse River estuaries. The fish kills usually occurred during summer and fall with salinity ranges generally between 5 to 11 ppt. Menhaden were the fish most often affected, although crabs, mullet, trout, spot, hogchokers and clams were also involved in some kills. These fish often exhibited erratic behavior such as skipping across the water's surface or spinning circles close to the water's surface.

Bloom reports from 1985 to 1991 show that there have been approximately thirty-five instances of fish or crab deaths coinciding with dominance by a similar dinoflagellate. We have tentatively identified this similar species as Gymnodinium aurantium although it may be a new genus and species! Dominance by this dinoflagellate means that it comprised greater than 8% of the biovolume or density estimates. There were also many reports of fish kills in which Gymnodinium aurantium was absent or was not found during quantitative algal counts. In addition, there were numerous instances when Gymnodinium aurantium occurred as a dominant species in ambient samples without reports of fish kills.

#### Summary from 'Albemarle-Pamlico Baseline Water Quality Monitoring Data Summary 1988 - 1991'

In 1988 the Division of Environmental Management (DEM) began an expanded ambient water quality monitoring program in the Albemarle-Pamlico study area. The baseline information generated by this monitoring provides a network of physical, chemical and biological information with usefulness for researchers and water quality managers.

This report summarizes the water quality information for the Tar-Pamlico, Neuse, Roanoke, Chowan and Pasquotank river basins. When reviewing these results, it should be kept in mind that while the lower Pamlico and Neuse rivers are similar physically and hydrologically, the other basins in the Albemarle-Pamlico area have different salinity regimes and smaller drainage areas, and so can function in ways different from the Tar-Pamlico and Neuse.

In the Tar-Pamlico River basin, data indicate that tributaries to the Tar and Pamlico rivers, and the lower Pamlico River from Washington to Hickory Point, had the most frequent occurrences of hypoxia. Mean nitrogen concentrations were highest in the upper riverine stations and in some tributaries, while highest phosphorus values were found in the mainstem river stations from Tarboro to the Pamlico Sound. Algal blooms and elevated chlorophyll-a levels commonly occurred in the lower Tar-Pamlico estuary and tributaries throughout the year.

In the Neuse River basin, the productive phytoplankton community in the lower estuary is reflected in the elevated pH values, supersaturated dissolved oxygen conditions, and elevated chlorophyll-a values.

Stratified dissolved oxygen conditions rarely occurred in the Roanoke River basin. The pH values reflected the swamp-like nature of the Cashie River and tributary stations. Nutrient concentrations were generally low, as were chlorophyll-a values at all stations.

In the Chowan River basin, dissolved oxygen levels were lowest in the Wiccacon River, while stratification occurred at the lower Chowan River stations. Nutrient levels were highest during the winter season. Algal blooms occurred frequently in the summer and early fall in the Chowan River.

For the Pasquotank River basin, dissolved oxygen values were lower at most upstream stations (with adjacent swamps), while stratification occurred at several

Albemarle Sound stations and on the Alligator River at Cherry Ridge Landing. Algal blooms were recorded at stations in Albemarle Sound, in Currituck Sound and at the lower Alligator River station.

Metals were generally below the laboratory detection level in the study area.

## AQUATIC TOXICOLOGY UNIT

### Data Assessment and Certification Group

As reported in the last newsletter, laboratories performing toxicity testing for North Carolina facilities have formed a loose association and have met twice to discuss common problems and solutions to those problems. This group, the Carolina Area Aquatic Toxicologists (CAAT) has since become an active workgroup within the Carolinas Chapter of SETAC (Society of Environmental Toxicologists and Chemists).

The number of facilities required to perform toxicity monitoring steadily increases. Statewide, 506 NPDES permits now have toxicity testing selfmonitoring requirements. Additionally, 54 self-monitoring requirements have been required by administrative letter. Since January 1, DAC Group personnel have also processed 18 applications for the use of biocidal compounds in cooling tower systems which have discharges to surface waters.

The Data Assessment and Certification Group welcomes Melissa Rosebrock to its staff as an Environmental Specialist I as of November, 1991. Melissa comes to the Group from the Ciba Geigy Corporation where she was involved in investigating the effectiveness of crop pesticides. Melissa has an M.S. in Crop Science from N.C. State University and a B.S. in Horticultural Education/Biology from Purdue University. Melissa will be working primarily with the laboratory certification program. As of April 7 of this year, Environmental Specialist Daniel Rowe has moved on to the Raleigh Regional Office in order to learn some new job skills and participate in field work on a regular basis. His upbeat disposition and concern for fellow employees will be missed.

### Toxicity Evaluation Group

Toxicity testing at the State Water Quality Lab has taken some interesting turns in FY 91-92, the most noticeable of these in the arena of personnel. We finally filled our vacant Environmental Technician position, only to lose an Environmental Biologist. Cheryl Harrington joined our ranks in December, two days before graduating from NCSU, where she majored in microbiology. Balancing the joy of Cheryl's arrival was the departure of Chris Prescott, who is now the chief scientist for the Puget Sound Water Quality Authority in Olympia, Washington. We're happy for both of them.

In January, Susan Carroll and Thom Mistele participated in a block of sediment toxicity tests with 11 samples from the Albemarle and Pamlico Sounds to assess sediment quality in areas of known contamination. All toxicity tests were performed in Gulf Breeze, Florida, with personnel from the EPA laboratory there. Test organisms were mysids (*Mysidopsis bahia*), amphipods (*Ampelisca abdita*) and worms (*Neanthes* sp.). Complete results of chemical analyses performed on sediment and associated water column samples have not been obtained yet. Only one site resulted in toxicity to test organisms. DEM staff received valuable training in culture and test protocols associated with marine sediment analysis.

A project currently under way in the tox lab is an evaluation of the chemical and toxicological characteristics of discharges from water treatment facilities throughout North

Carolina. Phase I of the study consisted of selecting seven facilities representative of those from different geographic regions and/or treatment processes. Effluent samples from those facilities were collected and analyzed for chemical parameters and toxicity. Test organisms were *Ceriodaphnia dubia* and fathead minnows. Chemical and toxicological results will be reviewed to determine the direction that DEM will take in future permit requirements for this class of discharger.

In addition, the Group has begun a preliminary culture of midges, *Chironomus tentans*, to obtain post-hatch larvae for use in freshwater sediment testing in conjunction with the Biological Assessment Group. The BAG has observed morphological differences in midges collected above and below a WWTP discharge. Therefore, laboratory toxicity testing will be performed to validate the assumption that sediment exposed to the facility's discharge is responsible for the effects noted in the organisms. More will be presented on this project as it develops.

During the first half of this testing year, the TEG has performed 42 acute toxicity tests, 17 chronic tests, 30 quality assurance tests, 33 tests relating to commercial laboratory certification (for the DACG), 35 toxicological analyses of ambient stations/samples, and seven special studies pertaining to a variety of water quality issues.

#### A Mercury Study of Abbotts Creek, North Carolina Cathy Tyndall

High Rock Lake is large run-of-the-river reservoir on the Yadkin-Pee Dee River System. It is located in Davidson and Rowan counties North Carolina and covers 15,750 acres. Abbotts Creek is a major tributary to High Rock Lake and is the site of an intensive mercury contamination study. The North Carolina Division of Environmental Management is conducting the two year study that is funded by the Federal Clean Lakes program.

In 1981, State environmentalists confirmed allegations that mercury contamination had occurred in Abbotts Creek. Sampling soon discovered that the fish and sediments in Abbotts Creek contained elevated levels of mercury. It was discovered that a major contributor was a Duracell battery plant. Duracell began operations in 1960, and has always been an indirect discharger in the subbasin. Duracell pretreats their waste on-site before sending it to the Lexington wastewater treatment plant. There, it receives additional biological treatment before being discharged into Abbotts Creek.

Since 1981, the State has continued to monitor the mercury contamination through routine sampling of fish tissue, the water column, and sediments. Beginning in June of 1991 with federal monies, sampling has intensified and new sampling initiated. An in-depth field study consisting of monthly instream sampling, monitoring of direct dischargers, nonpoint source sampling, ground water monitoring, sediment sampling, soils sampling, and fish tissue collection is being conducted. This intensive field study will help determine the three goals of the Abbotts Creek Phase I Diagnostic-Feasibility Study: (1) to document the spatial distribution of the mercury; (2) to identify current sources of mercury; and (3) to assess if remediation is feasible. The main concern of the project is the human health risk associated with the mercury contamination. Consequently, fish tissue analyses are playing a key role since fish are a direct path for human uptake of mercury.

In addition to the field study, historical information on all sources of mercury to the study area are being assessed and compiled. Past and present pretreatment mercury data are being reviewed. Ground water monitoring records from the Duracell site, Lexington landfill, and nearby wells are being reviewed. Soil contamination and air emissions from the Duracell Battery Plant are also being assessed.

In 1981, when the mercury contamination was discovered, a fish consumption advisory was posted on Abbotts Creek. In March of 1992, eleven years after the initial

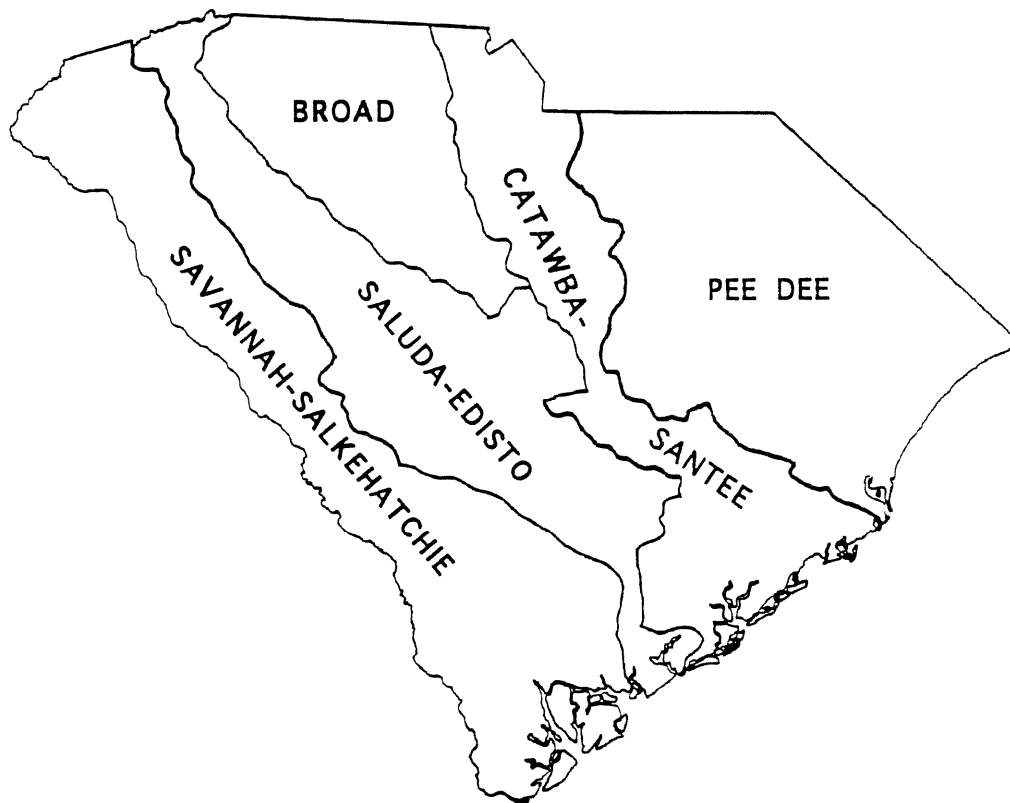


posting, the fish consumption advisory was lifted for all sections of Abbotts Creek. Results from the stations sampled routinely since 1981 indicated a mean mercury level well below the FDA action level of 1.0 mg/kg for the past two years (1990 and 1991). Annual fish tissue sampling and analyses will continue for at least the next two years to verify that levels of mercury are remaining below the FDA action level. Sampling will then continue every two to three years thereafter.

The State Health Director's decision to lift the fish consumption advisory is a very positive sign for all the State environmentalists and concerned citizens that have followed the mercury contamination problem since 1981. Evidently, the stringent limits placed on the wastewater treatment plant discharging into Abbotts Creek and rigorous pretreatment limits for mercury on Duracell have had an impact on the mercury concentrations in Abbotts Creek.

However, lifting the advisory will have little affect on the ongoing federally funded study. The in-depth field study will continue to address the spatial distribution of the mercury and to determine if there are any current sources of mercury entering the Abbotts Creek subbasin. Only after these two objectives have been addressed can remediation be considered.





Watershed boundaries for the Bureau of Water Pollution Control's Watershed Water Quality Management Plan.

### South Carolina

The South Carolina Department of Health and Environmental Control, Bureau of Water Pollution Control, is proceeding with the development of a Watershed Water Quality Management Strategy (WWQMS). The state has been divided into five major watersheds (pictured above) with the intent of developing a WWQMS for each watershed on a five year rotating plan. Each WWQMS will include a characterization of existing water quality, the identification of point source and nonpoint source impacts, compliance status of NPDES permitted discharges in the watershed, and the steps to be taken to address problem areas.

For the summer of 1992 the Water Quality Monitoring Section will be focusing our field activities in the Saluda-Edisto watershed. Macroinvertebrate sampling will focus on documenting known or suspected nonpoint source impacts in the watershed. Additional macroinvertebrate sampling may be conducted to address point source impacts and reference conditions as resources allow. In addition, seven major wasteload allocation studies are planned in the watershed, including long-term BOD measurement. Region IV USEPA personnel will assist in the measurement of SOD for several

of these studies.

While ambient chemical water quality monitoring will continue statewide, a large portion of our usual summer sampling resources are being shifted to better characterize water quality throughout the watershed. Additional sampling locations are also being established in the watershed to facilitate the updating of the 314 Lake Water Quality Assessment (LWQA).

Part of our LWQA grant will be spent on public education, including a pilot volunteer lake monitoring project. The Lake Wateree Homeowners Association (1100+ members) has begun supplementing our monitoring efforts by collecting monthly bacteria and phosphorus samples, as well as field data, in 12 streams in Fairfield and Kershaw counties. Ten volunteers were trained by our staff in March, and sampling began in early April. If this project is successful, we hope to expand the program to include other lakes.

## Lake Hartwell PCB Update

Over the past 16 years one of the projects we have been involved with has been the Lake Hartwell PCB Project. During that period of time, two papers have been presented on the subject at SWPBA meetings which we hope have been sparingly enough that you aren't tired of hearing about the subject. Since Lake Hartwell has been placed on EPA's SUPERFUND list for clean up, a lot of new research is being conducted on Lake Hartwell of which some of you may be interested.

For the last 16 years, the primary focus of the work conducted in Lake Hartwell was to evaluate the PCB levels in fish tissue to update the public health advisory. While there has always been concern about the overall effects of PCBs on the general health of the fish and other biota in the lake, there was never enough money to assess these concerns until recently.

Thus far, the project has been a multiple agency endeavor. The following lists the State and Federal Agencies involved and their areas of responsibilities:

1. Environmental Protection Agency (EPA): Direction and Funding
2. U. S. Army Corps of Engineers (USACOE): Overall Coordination & Management
3. South Carolina Department of Health and Environmental Control (SCDHEC): Fish Collection & Index of Biological Integrity
4. South Carolina Wildlife & Marine Resources Department (SCWMRD): Health Assessment Index, Age Determination, Benthic Bioassessment and Creel Survey
5. Georgia Department of Natural Resources (GADNR): Fish Collection and Largemouth bass tagging studies
6. Tennessee Valley Authority (TVA): Contaminant Analysis
7. Oak Ridge National Laboratory (ORNL): Biological Indicators and Reproductive Biology

There is an interesting story behind how the above agencies got selected by EPA to do the biological portion of the SUPERFUND study. It all began in 1990 when Mike Alexander (USCOE'S Lake Hartwell Fisheries Biologist) asked Al Brown (TVA) to come down and demonstrate the Health Assessment Index (HAI) in Lake Hartwell. Mike wanted to evaluate the HAI as a possible tool to assess the health of the fisheries in all the COE's lakes in the area. Perhaps because Lake Hartwell contained fish with the highest level of PCB contamination in the country, a lot of interest was devoted to Mike's request which snowballed to include other agencies and disciplines. Therefore, based on the results obtained by the above task force in 1990, EPA decided to fund them to follow up on some of those studies and to conduct new biological investigations to meet the needs of SUPERFUND.

The 1990 results were published by ORNL in the report titled Assessment and Evaluation of the Ecological Health of Fish Populations Exposed to PCBs in Hartwell Reservoir. Of course, we've only just begun (1992) the biological investigation for SUPERFUND and none of these data are available. The following is a summary of findings from the 1990 report. Anyone interested in having a copy of the report should contact Harry Gaymon.

## **Summary of Major Findings for the Hartwell Biomonitoring Study**

1. PCBs in the muscle tissue of largemouth bass are 50- to 80-fold higher in the 12 Mi Ck area of Hartwell Reservoir than at the reference site located on the Tugaloo arm of the reservoir. At the moderately contaminated study site located in the 18 Mi Ck area of the reservoir, PCBs in largemouth bass fillets are 4- to 7-fold higher than at the reference site. These findings further corroborate the results of previous contaminant analyses on fish from Hartwell Reservoir.
2. Concentrations of PCBs in the ovaries of female bass are approximately 5- and 25-fold higher at 18 Mi and 12 Mi Ck, respectively, than at the reference site. The levels of PCB accumulation in the ovaries are much higher than in muscle tissue, with an average of approximately 40 ppm in the 12 Mi Ck area. These relatively high values indicate significant maternal transfer of PCBs to the developing eggs, which could have serious consequences to the proper development of embryos and fry.
3. The activity of one component of the hepatic detoxification system, EROD activity, is significantly higher in both male and female bass from 12 Mi Ck as compared with the other two study sites, indicating that these fish have been exposed to contaminants that are capable of inducing the liver's mixed function oxidase enzyme system.
4. Evidence of impairment in gill or renal function of both male and female bass at 12 Mi Ck is provided by significantly elevated levels of BUN (blood urea nitrogen).
5. Evidence of liver damage in females from both 12 and 18 Mi Ck is shown by significantly elevated levels of the transferase enzyme ALT. Direct evidence of liver damage is seen particularly in female bass from 12 Mi Ck in which the necrotic parenchyma (dead or damaged tissue) is elevated over the reference site.

6. The use of all the bioindicators together in an integrated analysis indicates that the overall responses of LMB from the reference site are more similar to bass from 18 Mi Ck than 12 Mi Ck (i.e., the reference fish are more similar in their integrated stress response to 18 Mi Ck bass than to 12 Mi Ck bass). These results suggest that PCBs may be having a significant effect on the health of bass at 12 Mi Ck, and that there is generally a gradient of effects dependent on PCB levels in the environment.

7. Muscle PCB concentrations are significantly correlated with detoxification enzyme induction, splenic-somatic index, ALT, and liver histopathology. We tentatively conclude from this that PCBs are:

- a) inducing the detoxification enzyme system of the liver,
- b) adversely affecting organ function as shown by increased ALT concentrations,
- c) affecting liver health as evidenced by increased necrotic parenchyma in the liver, and
- d) influencing disease status of the fish as shown by an increased splenic-somatic index.

8. Ovary weights and estrogen receptor abundance are significantly lower at 12 Mi Ck than at either 18 Mi Ck or the reference site. PCBs are known from previous studies to cause similar effects in exposed fish. Serum levels of both 17B-estradiol and testosterone also tend to be lower at 12 Mi Ck. Batch fecundity, however, does not differ significantly among the three sites.

9. The abundance of estrogen receptors in the nucleus and cytosol of liver cells, which are known to be affected by environmental contaminants such as organophosphate pesticides, are significantly elevated at 18 Mi Ck. This observation (along with certain findings from the bioindicator component of this study) suggests a possible additional input of contaminants into Hartwell Reservoir near the 18 Mi Ck area.

10. The Health Assessment Index is highest at 12 Mi Ck, lowest at the reference site, and intermediate at 18 Mi Ck, suggesting that bass at 12 Mi Ck are in poor health relative to



the other two study sites.

11. Size classes of LMB from the reference site appear to be more evenly distributed over a wider range of sizes than at 12 and 18 Mi Ck. LMB from 12 and 18 Mi Ck have a disproportionate number of age 3<sup>+</sup> fish which decline by age 4. In addition, the mean age of bass at 12 Mi Ck is 0.5-0.6 years younger than that of fish at the other two sites. Future studies involving population-level processes and early life history dynamics should be conducted to determine mechanisms that may be responsible for the smaller proportion of larger LMB at the 12 Mi Ck site.

12. The instantaneous mortality and survival rates of 3<sup>+</sup> LMB from 12 Mi Ck were higher and lower, respectively, than the same age fish sampled from 18 Mi Ck and the reference site. In addition, growth rates of age 5-8 LMB from 12 Mi Ck were significantly lower than similar age fish from the other two sites.

13. Because of the lack of appropriate reference site information, an actual IBI could not be calculated for the three sampling sites at Hartwell. Studies are ongoing by TVA to develop the IBI for reservoir ecosystems.

14. Comparison of the six biomonitoring techniques used in this study (Table 12) indicates that five of the techniques (contaminant and bioindicator analyses, reproductive assessment, population studies, and the HAI) provide somewhat similar results relative to their conclusions as to the health status of LMB at each of the three study sites. The IBI or community evaluation is not yet sufficiently developed for use in Hartwell Reservoir.

15. The degree to which the health of the resident fish community in Hartwell Reservoir has been affected by the pronounced PCB contamination of the lake is still in question. Several lines of investigation indicate significant differences between contaminated and reference sites in factors ranging from detoxification enzyme activity in the livers of largemouth bass to population characteristics such as mean age of fish at a site.

However, when considered as a whole, the results of this study also suggest that the environmental health effects of chronic PCB contamination might not be as severe as originally anticipated. Future studies (see the following section) should be undertaken to better characterize the environmental effects of PCBs in Hartwell Reservoir. In addition to being a recreational resource sorely in need of remedial activities to clean-up one of the nation's worst cases of aquatic PCB contamination, Hartwell Reservoir should also be considered an unique natural laboratory in which to further explore the environmental effects of this ubiquitous man-introduced chemical hazard.

## Recommendations for Future Biomonitoring Studies in Hartwell Reservoir

1. The spatial distribution of PCBs in the sediment and principal biota (e.g., shad, LMB, hybrid striped bass) should be better characterized for the reservoir. This would involve a longitudinal gradient characterization from the source (12 Mi Ck) to the lower portions of the reservoir primarily on the South Carolina side, with spot checks on the uncontaminated portions of the reservoir in the vicinity of the Tugaloo River arm in Georgia. As a component of the PCB loading in the biota and particularly in top predator species such as LMB, the principal PCB congeners should also be identified (i.e., toxicity of PCBs in the early life history of fish depends on the particular congeners present).
2. Future studies should also focus on food-chain and predator-prey relationships between the contaminated and uncontaminated areas of the reservoir. For example, shad, which is the primary prey of LMB, is a species that tends to accumulate high levels of PCBs because of its particular behavior and feeding modes (i.e., benthic detritivore) and its high lipid content. Studies also need to be conducted on the PCB dynamics in shad, the relative importance of shad to the diet of bass in different areas of the reservoir, and the relative size distributions of shad available to predators in both contaminated and uncontaminated areas of the reservoir (i.e., lipid levels and therefore PCB concentration varies as a function of shad size). Assessments should be made on the relative availability of food for LMB in these three areas. The fillet lipid data from this study indicates that lipids are highest at 12 Mi Ck and lowest at the reference site, whereas certain nutritional indicators (Fig. 6) show that feeding may be less at the two impacted sites compared with the reference. Information on relative food availability would therefore help answer questions regarding differences in lipid and PCB dynamics in fish from these three areas. Because size selective mortality, survival, and growth are indicated for the larger LMB from 12 Mi Ck, PCB analysis and biological effects (bioindicators and reproductive) studies should be conducted on a wider size range of LMB to determine the relationships between size, contaminant body burdens, and

biological effects.

3. Many of the preliminary findings from this Phase I assessment need to be reexamined and verified during Phase II biomonitoring efforts on Hartwell Reservoir. Preferably, both sample sizes and the number of sampling sites involved should increase. Based on the findings of the reproduction and population studies of the present preliminary report, further emphasis should be placed on contaminant-related mechanisms that affect the health and survival of fish populations in the reservoir. This would involve studies at both the early-life history stages (e.g., eggs and larvae) and processes within the adult population such as size-selective angling pressure and overwinter survival of critical size classes. The literature indicates that effects of PCBs on fish populations may be concentrated at the early life history stages such as on hatching success and larval survival. Early life history studies would have to be conducted in the spring when fish are spawning and eggs could be obtained from ripe males and females. Comparisons could be made on egg fertilization success, hatching success, and larval survival between contaminated and uncontaminated areas of the reservoir. Laboratory tests of embryo and larval survival in water and sediment collected from these areas could also be conducted. Studies of this nature could complement other recommended studies including age and growth analysis, further examination of reproductive parameters in adult fish, and tagging and release studies and creel census data.

4. Additional studies should be conducted to identify and determine the nature of other contaminant sources and effects in other key areas of the reservoir. For example, results from various sections of this preliminary assessment suggest that bass from 18 Mi Ck might be exposed to contaminants other than PCBs which could confound the interpretation of results from future studies if these contaminants are not identified. If the nature and extent of effects from PCB contamination are to be separated from other possible stressors in Hartwell, other potential stressors need to be identified and characterized.

5. With the initiation of clean-up efforts at Hartwell Reservoir, selected biomonitoring techniques should continue to be employed on a routine basis in order to monitor the progress of remedial actions. Periodic analyses of contaminant loads in fish are recommended for routine assessment of changes in exposure risks. However, to assess any rapid changes that may occur in the ecological health of the reservoir, continued use of the HAI and select bioindicators of physiological and reproductive effects is also strongly recommended. Following completion of the majority of the clean-up efforts, a full suite of biomonitoring techniques, including population and community studies, could again be employed to definitively assess the effectiveness of the remedial actions at limiting the adverse effects of PCB contamination on the biota of Hartwell Reservoir.

6. The results of both current and future biomonitoring efforts on Hartwell Reservoir should be made available to and utilized by environmental risk analysts with the aim of improving and validating current estimates of the environmental risks associated with PCB contamination in the aquatic environment.



TENNESSEE DEPARTMENT OF HEALTH  
Environmental Laboratory, Aquatic Biology

Greetings from Tennessee. We have been slaving away to better the aquatic environment of our great state. We will be finishing up collection of 2 years worth of macro & fish samples for 4 nonpoint source projects this summer. We will have one year to ID everything and figure out what it means before we have to go out and do it again for 2 more years.

Other projects we are still working on include:

- Twenty five macroinvertebrate stations for the 1992 ambient monitoring program
- Three of the 17 chronic bioassays we started this summer
- Bimonthly chlorophyll analysis for the clean lakes project on Normandy Lake

As if we don't have enough work to do and we're only one year behind in IDing bugs, we're going to add some new projects to our repertoire.

Starting sometime this year:

- Biological monitoring on two more NPS projects
- Collection of fish for tissue analysis at 15 reservoirs for the clean lakes program
- Static screening bioassay program
- Biological monitoring at five? wetland sites

For those of you who haven't heard, our section chief, Dale Rector has left for greener pastures (not too green, he still works for the state). He has taken an Environmental Specialist V position out at Oak Ridge (you know the nuke place). He will be in charge of figuring out a way to clean up the mess the feds have made up there. We knew somebody would have to leave, this is the first time we had ever been at full staff (and it lasted two whole months). We are sorry it had to be Dale, we will miss him. So that we will not be cast adrift on a sea of uncertainty, our Assistant Director, Gloria Mickle is managing us until Dale's old position is unfroze. Who says Chemists and Biologists can't cohabitate? Just don't bring in any engineers!

We added a new biologist, Dan Murray, to our forces this January. Dan is turning out to be a good macroinvertebrate taxonomist. He even spent 2 weeks learning about worms (yuck!) at a consulting firm before we got him. Since that's 2 weeks more training than any of the rest of us have, that makes him our resident Oligochaete expert (ROE).

Until next time,  
Tennessee's Aquatic Biologists

Debbie Arnwine  
Donna Wingfield  
Lyle Mason

Deborah Gillis  
David Stucki  
Dan Murray





**ECOLOGICAL SUPPORT BRANCH ACTIVITIES FOR  
OCTOBER 1991**

1. A report on studies conducted on the Indian River lagoon located at Titusville, FL was distributed. The study, conducted at the request of FL-DER addresses the circulation and water quality issues associated with the Titusville North POTW.
2. Branch personnel participated in the "central and southern Florida ecosystem modeling reconnaissance workshop" in West Palm Beach, FL. Modeling activities will continue under the direction of the U.S. Corps of Engineers (COE). Future workshops are being planned to keep all regulatory parties involved in the modeling process.
3. Don Schultz and algal assay staff analyzed chlorophyll a samples for Savannah River and FLAP projects and continued algal assay tests on samples requested by several southeastern states.
4. During October 8-11, 1991, Messrs. Murphy, Lawhorn and Parsons, accompanied by Gary Collins of the Coastal Programs Unit, Water Division, conducted a video survey of the disposal pile at the Tampa, Site IV, Ocean Dredged Material Disposal Site (ODMDS). The survey consisted of continuous video of the pile and surrounding area using the OSV Anderson's video sled. This effort was followed by diver ground truthing of selected areas of the pile for still camera photography and visual biological assessment. The work was to assist the Water Division in their decision to redesignate Site IV as a permanent ODMDS.
5. On October 23, 1991, Philip Murphy attended a joint EPA/COE meeting in Atlanta. The meeting is an annual effort where the status of the EPA and COE's ocean dredged material disposal programs are presented and amendments to the EPA/COE MOU are discussed. The primary focus of this year's meeting was an intensive discussion of a regional implementation manual for the new Dredged Materials Testing Guidance Manual ("greenbook") being developed jointly by the EPA and COE.
6. Mel Parsons, Bruce Pruitt, David Smith, Candace Halbbrook, and Phyllis Meyer conducted an SOD study on Lake Lanier in GA.
7. Mel Parsons and Bruce Pruitt, along with Bill Ainsle, Rosalind Moore and Laura Mazanti of the Atlanta Water Management Division, conducted habitat evaluations in Western Kentucky utilizing the wildlife habitat appraisal guide (WHAG).

8. Don Lawhorn conducted refresher training on diving accident management and certified Region IV divers in the use of nitrox or oxygen enriched air.
9. Don Lawhorn conducted diving operations on the ocean disposal site off Tampa, FL to video and ground truth the off-shore dump site.
10. Don Lawhorn conducted diving operations off-shore Cameron, LA. This operation was at the request of Headquarters to deploy cages containing clams. The cages would be retrieved in 28 days to measure the uptake of radium 226 and 228 in very low concentrations being discharged in the well water from the oil rigs.
11. Jim Davee revised and completed station and parameter data for Bangs Lake, MS and Perdido Bay, FL.
12. Ron Weldon reviewed the Environmental Quality of Chattanooga Creek report and participated in a reconnaissance trip to the creek.
13. Several events shaped the course of the Ciba-Geigy floodplain study on the Tombigbee, AL. Region IV, coordinating with ERL-Corvallis and EMSL-Cincinnati, finalized and submitted the draft study plan. Given the project cost of the study, the PRP was provided the opportunity to conduct the study. This offer was accepted, and through a meeting and conference call, project plans were shifted to show Ciba's involvement and Regional oversight. This study should be underway in mid-November.
14. Alan Auwarter and Dan Scheidt conducted an overview of a contractor-conducted macrobenthic study involving the Greenback Industries site, Greenback, TN.
15. Phyllis Meyer researched results from Caldwell Systems, Lenoir, NC.

**ECOLOGICAL SUPPORT BRANCH ACTIVITIES FOR  
NOVEMBER 1991**

1. During the week of November 18, personnel from ESB conducted SOD studies of Lake Thonotosassa located near Tampa, Florida. The study conducted at the request of the Southwest Florida Management District will support management strategy for the lake.
2. ESB staff met with representatives from WMD, SCS and GA-EPD to tour BMP's demonstration sites for agricultural operations in Putnam County, Georgia. The level of cooperation remains high and progress is being made.
3. Hoke Howard completed the draft report for 1991 monitoring on Rooty Creek Watershed. This is a part of our non-point technical assistance being provided to the programs office and SCS.
4. Don Schultz, Delbert Hicks, Hoke Howard, Phyllis Meyer, Bruce Pruitt, Dan Scheidt, and Ron Weldon attended the SWPBA meeting in Hilton Head, South Carolina. Several of our attendees also presented papers at the meeting.
5. A short course on water pollution monitoring was taught by Don Schultz to students at the US Forest Service Training Center near Roswell, Georgia.
6. As part of the Ecology Non-point source activities, Don Schultz attended a dairy lagoon pumpout demonstration near Eatonton, Georgia. The procedure for slurring the lagoon sludge and liquid and land application were demonstrated. The demonstration went very smoothly and the method was very impressive.
7. Ron Raschke's work on FLAP data analysis continues as we await information from our contractors in North and South Carolina. Contact was made with Tom Wellborn for assistance on the regulatory aspects of the criteria.
8. The Everglades case continues. The judge has not made a final determination on the settlement agreement and the agricultural interests are suing via the state courts. Ron Raschke's work continues on developing graphics for the trial which may take place in the spring of 1992.
9. Monies were not available to carry forth the EPA Region IV portion of the National Lake Eutrophication Survey in 1992. With the expectation that monies will be available in FY 1993, contacts were made with state counterparts to determine interest in accessing and sampling lakes with EPA contract dollars. All states said they were interested in doing the work under EPA contract.
10. Ron Raschke attended a meeting at Kennesaw College with other Region IV personnel to assist the contractor in developing a citizen monitoring program for the Lake Alatoona project.

12. Jerry Stober reviewed a report and attended a workshop with Headquarters OST to review fish consumption survey methods and approaches which could be used to improve human health risk assessments.
13. ESAT responded to request by Art Smith, Region IV HAZMET team, to collect samples and perform toxicity tests on a pipeline spill of #2 diesel fuel. Staff travelled to Fountain Inn, SC and collected samples from six sites on Durban Creek and the Enoree River. Eighteen toxicity tests were ran on the samples taken below booms installed to intercept the fuel. Significant toxicity due to the petroleum was found in all samples analyzed. Splits of the samples were sent to a contract lab for chemical analysis.
14. Bill Peltier participated in the State Water Quality Director's annual meeting with the region's Water Managment Division in St. Petersburg, Florida. Bill presented an overview of current status of whole effluent toxicity testing and NPDES permit considerations.

## **SUMMARY**

### **STATUS OF BIOCRITERIA DEVELOPMENT**

**April, 1992**

The updated "status of biocriteria development", is now available for review by the SWPBA membership. Only introductory sections are presented in this summary for the newsletter. This updated status document includes the development of biocriteria programs for each of the five surface water types (streams and small rivers, large rivers, lakes and reservoirs, wetlands and, estuaries and near coastal areas) for each of our member states. The document will be distributed to monitoring coordinators in all 10 EPA regions as well as to other agencies.

### **EXECUTIVE SUMMARY AND RECOMMENDATIONS**

The primary objectives of the Clean Water Act are "to restore and maintain the chemical, physical and biological integrity of the Nation's waters." The Environmental Protection Agency, via a series of internal memoranda and national workshops, has strongly emphasized the need to develop applications of biological monitoring techniques and to promulgate biological criteria. EPA has demonstrated a commitment to provide the States with national guidance (Biological Criteria: National Program Guidance for Surface Waters) on performing technically sound biosurveys, developing biocriteria, and integrating them into a comprehensive water quality program. In addition, EPA's "National Policy on Biological Assessments and Criteria" is available. This document suggests that States designate aquatic life uses that are appropriate to address biological integrity and adopt biological criteria necessary to protect those uses. In support of these policies, technical guidance for freshwater streams is being reviewed by the States. Technical guidance for other surface water types will be written in the future.

Currently, all states in Region IV have general statements in their water quality regulations that pertain to biological assessment and analysis. In addition, most states are in the process of defining community structure of one or more community types that relate to biological criteria development. North Carolina uses narrative biological criteria to define its use classifications and is in the process of evaluating ecoregions, stream size and seasonal variables as a means to refine its bioclassifications. Specific biological indices and metrics are not included in North Carolina's water quality regulations. Biological criteria in Florida have historically relied on the use of the Shannon-Weaver diversity index. This numeric biocriterion states that diversity shall not be reduced to less than 75% of established background levels. All other State biomonitoring laboratories in Region IV are in the process of initiating studies to assess or implement biological criteria.

#### **Recommendations.**

It was the consensus of the membership present at the Jekyll Island (October 2-4, 1990) and Hilton Head Island (November 12-14, 1991) SWPBA meetings that the implementation of narrative biological criteria process be supported. However, there were several common concerns, or sources of variability, noted by the membership that need to be addressed. Primary among these are the effects of seasonality, stream size (order, average annual flow, catchment size), defining the reference condition, habitat analyses and choice of common metrics. Each of these variables need to be standardized, as much as possible, among Region IV States. Several recommendations are proposed here.

- First, the membership of SWPBA encourages EPA sponsored (or in some instances individual State sponsored) workshops to discuss the characterization of variability and other topics of concern, such as: use of statistical methods to define ecosystems/test the hypotheses; metrics to be used; how the biocriteria will fit into the regulatory process. These workshops should include individual expertise from consulting firms, academia or other EPA regions or laboratories to address specific topics as needed.
- Secondly, a forum should be established which would be able to characterize reference stream ecology and include specifics about species composition, seasonal trends, etc. These investigations (summaries) should not be limited to freshwater streams but include other surface water types.
- Also, the SWPBA encourages the development of interstate (Mississippi-Alabama), as well as interregional (i.e. North Carolina-Virginia, Kentucky-Ohio) biological investigations. The SWPBA newsletter and annual conference should serve as a means to disseminate information.
- SWPBA recognizes the Science Advisory Board's endorsement of the use of the ecoregion concept as a State water quality management tool. SWPBA encourages more ecoregion research, workshops, technical support and demonstrations.
- SWPBA also recognizes the National Research Council's recommendation on the use of ecoregions and reference sites to gauge recovery of aquatic ecosystems.

## **Purpose of this Document**

Development of this document was agreed to and voted on by the membership present at the annual Southeastern Water Pollution Biologists Association (SWPBA) meeting held at Jekyll Island, Georgia. At that meeting, a panel discussion concerning the use of biocriteria in State regulatory agencies indicated that there were a number of common concerns within EPA Region IV related to biocriteria development. However, it was agreed upon that the concept of biocriteria within Region IV States be developed. At the 1991 SWBPA meeting, held at Hilton Head Island South Carolina, the membership present decided to update this summary document and to include a discussion of recent developments. Therefore, this document includes brief summary discussions of pertinent state and federal activities related to recent biocriteria development in freshwater streams and other surface water types (large rivers, lakes and reservoirs, wetlands, and estuarine and near coastal areas). It is the intent of this document to 1) discuss biocriteria development at the national level and to review pertinent documentation regarding biocriteria, 2) review common concerns among State regulatory agencies in Region IV, 3) discuss biocriteria development within Region IV States, 4) briefly summarize regional and federal activities as they relate to biocriteria development in several surface water types in addition to wadable streams, and 5) suggest recommendations that would help state regulatory agencies formulate biocriteria into water quality regulations.

Finally, this document is initially intended only as a reference guide for State environmental managers. It is not intended to be a policy statement. However, it is proposed that this document serves as a basis of a SWPBA resolution on biocriteria.

## **BACKGROUND**

The principle objectives of the Clean Water Act are "to restore and maintain the chemical, physical and biological integrity of the Nation's waters" (Section 101). To achieve these objectives, EPA, the States, the regulated community, and the public need comprehensive information about the ecological integrity of aquatic environments. Such information will help us identify waters requiring special protection and those that will benefit most from regulatory efforts.

The background of biocriteria regulations within the EPA was summarized in a memorandum from Martha Prothro to Office of Water Directors (23 March 1990). In September 1987, a major management study entitled "Surface Water Monitoring: A Framework for Change" strongly emphasized the need to "accelerate development and application of promising biological monitoring techniques" in State and EPA monitoring programs (EPA 1987). Soon thereafter, in December 1987, a National Workshop on Instream Biological Monitoring and Criteria (EPA 1988a) reiterated this recommendation but also pointed out the importance of smoothly integrating the new biological criteria and assessment methods with traditional chemical/physical methods (Final Proceedings EPA-905/9-89-003). The need to integrate the new biological assessment tools into existing programs was again emphasized at the June 1988 National Symposium on Water Quality Assessment where a workgroup of representatives from State and federal agencies unanimously recommended that a national bioassessment policy be developed that both encouraged the expanded use of the new biological tools and directed their rational implementation across the water quality program (EPA 1988b). The memorandum goes on to note that the advantages of implementing biocriteria in State standards significantly outweigh the disadvantages, and that adoption of biocriteria should be at least strongly encouraged. Finally, in June 1991, EPA released a policy statement supporting the use of

biological criteria. This statement suggests that States designate aquatic life uses that are appropriate to address biological integrity and adopt biological criteria necessary to protect those uses.

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## EVALUATION OF EPA'S RAPID BIOASSESSMENT BENTHIC METRICS: METRIC REDUNDANCY AND VARIABILITY AMONG REFERENCE STREAM SITES

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**Abstract**—The data analysis scheme used in the U.S. Environmental Protection Agency's (EPA's) rapid bioassessment protocols (RBPs) integrates several community, population, and functional parameters (or metrics) into a single assessment of biological condition. A reference data base of macroinvertebrate data obtained from 10 ecoregions in Oregon, Colorado, and Kentucky was used to evaluate the appropriateness and variability of the benthic metrics and the similarities of results among ecoregions. Several statistical procedures, including principal component analysis, correlation coefficient, analysis of variance, and stepwise discriminant analysis, were used to test the efficacy of 17 community metrics. A general separation between the mountain ecoregions and the valley/plains ecoregions was determined to exist for the metrics. Two of the original eight metrics described in the EPA's RBPs for benthic macroinvertebrates were found to be highly variable and unreliable as measures of biological conditions in some ecoregions. Eleven metrics were determined as being valuable in discriminating between montane and valley/plains groupings of ecoregions.

**Keywords**—Bioassessment Metrics Ecoregions Macroinvertebrates Streams