

Fishing for Answers

by Tom Augspurger,
Jim Dwyer,
and John Fridell



Fish and Wildlife Service biologists will compare results of the lab tests to the water quality in the Cape Fear shiner habitats as part of a threat analysis for the listed fish.

Photo by Greg Cope/NC State University

How much pollution is too much for endangered species? Chemicals inevitably enter the environment because of their wide use by all of us. As in every State, the discharge of treated wastewater into North Carolina's waters from "point sources," such as municipalities and industries, is regulated by permit. These permitted levels are designed to maintain water quality at a level in compliance with the State's water quality standards. Pollution from "non-point sources," such as agricultural and residential activities, also finds its way into our waters.

Our current water quality standards were developed from information on the pollution sensitivities of many common freshwater organisms, such as the rainbow trout (*Oncorhynchus mykiss*), fathead minnow (*Pimephales promelas*), and a small crustacean, the cladoceran (*Ceriodaphnia dubia*). However, the extent to which these standards protect threatened and endangered fishes and mussels is not known. Because listed species may be more sensitive to certain contaminants, the existing water quality standards may not be sufficient for their protection. Because it is also possible that some listed species are protected by existing water quality standards, biologists need additional information to ensure that recovery efforts are directed to address the most significant threats. The Fish and Wildlife Service's (FWS) Environmental Contaminants Program has forged a number of partnerships to address this data need and improve water quality for North Carolina's threatened and endangered aquatic species. The most exciting aspect of the North Carolina experience has been the spin-off benefits in the form of public outreach and a better understanding of these rare species.

In partnership with the Columbia (Missouri) Environmental Research Center, a facility of the U.S. Geological Survey's Biological Resources Division, toxicity tests are being conducted on three species of federally-listed fishes in North Carolina: the endangered Cape Fear shiner (*Notropis mekistocholas*), the endangered shortnose sturgeon (*Acipenser brevirostrum*), and the threatened spotfin chub (*Hybopsis monacha*). The tests, or bioassays, assess species growth and survival under varying pollutant conditions. To conserve native populations, captive raised individuals were used. Preliminary results indicate that two of the listed species were somewhat more sensitive to some contaminants than commonly used test organisms, with the sturgeon being among the most sensitive fish species tested to date. When final results are in, they will be used by the FWS, along with the North Carolina Division of Water Quality and U.S. Environmental Protection Agency (EPA), to improve water quality standards where needed. In addition, toxicity information will help in developing recovery goals for these species.

Captive rearing has yielded an additional benefit to these fish species. Recovery efforts for the Cape Fear shiner, which was listed in 1987, got a boost with the first successful captive propagation of this fish in 1997. Under contract with the FWS, a private company, Conservation Fisheries, Inc., produced several thousand fry from 30 adult Cape Fear shiners collected in North Carolina's Rocky and Deep rivers. With support from the FWS Albemarle-Pamlico Coastal Ecosystems Program, Conservation Fisheries collected brood stock and transported them to their facility in Knoxville, Tennessee, with 100 percent survival. The North Carolina

Wildlife Resources Commission's Nongame and Endangered Wildlife Program and the FWS Raleigh and Asheville, North Carolina, field offices—key partners in the project—assisted with collection of the brood stock. The adults reproduced in holding tanks within which yarn mops, which are used to mimic the structure of aquatic vegetation in the species' natural habitat, were placed.

The FWS Roanoke-Tar-Neuse-Cape Fear Ecosystem team joined the effort when 1,200 Cape Fear shiner offspring from the propagation effort were transferred to Edenton National Fish Hatchery in Edenton, North Carolina. The fish are being reared in three ways, with the effects of each treatment being evaluated relative to fish growth and survival. This information will be valuable in future propagation efforts. The hatchery's experienced staff volunteered expertise, time, and space in their facility to foster the project.

Progress is not just limited to research findings. The North Carolina Zoological Park received an FWS grant for a project that combines Cape Fear shiner life history research with much needed environmental education. The zoo has begun scientific documentation of the species' reproductive and feeding behaviors, and later this year the zoo will include the shiner in its "Stream-side" exhibit. That exhibit, viewed by about 800,000 visitors each year, will be used to discuss the endangered status of the species, the importance of conserving it, and the need to protect water quality in the Cape Fear River basin. This protection will be vital to the long-term health of the Cape Fear shiner and people living within the watershed.

Since water quality is related to the overall health of aquatic species, we also enlisted the help of North Carolina State University's College of Veterinary Medicine to conduct a health assessment of the Cape Fear shiner. Our Warm Springs Fish Technical Center assisted with the field and lab components of this project last year. Upon

completion, this will be the first report of diseases detected in this fish.

North Carolina also has a diverse molluscan fauna that includes five species on the Endangered Species List.



Because these organisms also depend on good water quality for their survival and recovery, toxicologists have begun to include them in their evaluation of water quality standards. We have developed partnerships with the EPA's Science and Ecosystem Support Division and the University of Georgia's Department of Environmental Health Science, both located in Athens, Georgia, to conduct bioassays.

These projects are good examples of the integration of our Environmental Contaminant Program into recovery efforts. They compliment habitat assessments, threat analyses, and habitat conservation already in place through traditional Ecological Services programs, and the most direct beneficiaries will be North Carolina's endangered aquatic fauna. The lessons learned in these efforts, however, will likely have benefits nationwide.

Tom Augspurger, Jim Dwyer, and John Fridell are Biologists in the FWS Raleigh, North Carolina, Columbia, Missouri, and Asheville, North Carolina, field offices, respectively.

The endangered Cape Fear shiner was listed in part due to water quality concerns. Environmental Contaminants staff are assisting recovery efforts.

Photo By Dick Biggins/USFWS

As Rachel Carson pointed out in *Silent Spring*, "...one of the most alarming aspects of the chemical pollution of water is the fact that here...are mingled chemicals that no responsible chemist would think of combining in his laboratory..." because "...interactions between these freely mixed chemicals...could easily occur, changing the nature of the chemicals in a way that is not only unpredictable but beyond control."