

## Benthos Accomplishments: 2012

In 2012, the Biological Assessment Unit (BAU) conducted a major update of our benthic macroinvertebrate distribution maps as well as the effects of seasonality on benthic macroinvertebrate occurrences. These refinements contribute to more accurate and reliable benthic macroinvertebrate taxonomic data and thereby also result in more accurate and reliable bioclassification assignments of water quality.

Several special studies were conducted in 2012 by BAU biologists. These studies included 20 benthic macroinvertebrate samples obtained in the North Toe River watershed (Frenchbroad River Basin) in support of efforts by the Asheville Regional Office (ARO) and other local stakeholders in identifying and correcting current water quality issues in the catchment. In addition, two samples were collected from Blount's Creek (Tar River Basin) in support of an ongoing Washington Regional Office and State Bureau of Investigation criminal examination of an area WWTP. Three benthic macroinvertebrate samples were also obtained for a special study conducted in the Upper Cape Fear River Basin for a joint NCDWQ/USGS study investigating the effects of land application of residuals on surface water quality. Another special also conducted in the Upper Cape Fear River basin was a re-sample of Ferrell's Creek. The resample of Ferrell's Creek was executed in an effort to remove it from the 303(d) list as an earlier sample (which placed it on the 303(d) list was taken during a severe drought. Results of the 2012 Ferrell's Creek resample (which was taken during normal flow conditions) confirmed the impaired status of this waterbody and this stream will remain on the 303(d) list. Finally, 2012 marked the final year of multi-year benthic macroinvertebrate monitoring effort undertaken in conjunction with the Asheville Regional Office in an effort to identify and correct possible deleterious impacts associated with pesticide runoff from agricultural operations in the Mills River catchment (French Broad River). The benthic macroinvertebrate data, combined with surface water quality monitoring data obtained by the ARO, has resulted in \$200,000 in 319 grant monies being allocated for planning and implementation of BMPs in the watershed.

The BAU also conducted an Outstanding Resource Waters (ORW) and High Quality Waters (HQW) study in the Stony Creek watershed in the Yadkin River basin. Six stream locations were sampled as part of this study. Two additional ORW/HQW samples were collected to complete ORW/HQW studies initially conducted in 2011.

BAU benthic biologists sampled nearly 30 sites as part of the Random Ambient Monitoring System (RAMS) program and participated in the collection of four samples as part of an ongoing Ecosystem Enhancement Program (EEP)/NCDOT stream restoration project as well as obtaining pivotal data in evaluating the effectiveness of a another stream restoration project undertaken by the North Carolina Division of Forest Resources at DuPont State Forest. In addition, BAU biologists continue to provide (quarterly) specialized technical field support for an ongoing NCDOT sampling program of the Currituck Sound.

BAU also conducted its routine basinwide sampling for benthic macroinvertebrates in the Frenchbroad, Catawba, and Tar River basins. In total BAU has collected nearly 150 total benthic macroinvertebrate samples from three river basins including approximately 40 benthic macroinvertebrate samples in the Tar River Basin, 49 samples in the Catawba River Basin, and 58 samples from the Frenchbroad River Basin.

As part of NPDES 316(a) thermal variance requirements, as well as other NPDES permit requirements that mandate the reporting and evaluation of biological data, the BAU reviewed biological data from nearly 14 permitted facilities for compliance.

Finally, advances were made in associating unknown stonefly *Isoperla* larvae with their adult counterparts. *Isoperla* larvae are one of the best indicators of water quality as the nymphs are highly intolerant to pollution. However much remains unknown about the numbers and types of species that occur in North Carolina. As a result of BAU's insect rearing program, at least two new species of *Isoperla* (*Isoperla psuedosimilis* and *Isoperla kirchneri*) have been discovered that were previously unknown as larvae. In addition, North Carolina specimens reared from nymphs have been designated as paratypes (Kondratieff and Szczytko, manuscript in preparation). The goal of this project (which is conducted during routine sampling operations) is the production of a comprehensive nymphal key of *Isoperla*. Such a resource for this very large and ecologically important genus currently does not exist.

## **Wadeable Stream Fish Community Accomplishments: 2012**

85 wadeable sites were sampled as part of the Catawba, French Broad, and Tar River basinwide monitoring program (43, 29, and 13 sites, respectively). One additional site in the North Toe River watershed was assessed at the request of Asheville Regional Office staff. Field assistance in 2012 was provided by 20 staff from the Intensive Survey and Ecosystems Unit and the Asheville, Mooresville, and Winston-Salem Regional Offices; additional assistance was provided by the NC Natural Heritage Program and the NC Wildlife Resources Commission. In addition, six sites were assessed as part of the Random Ambient Monitoring System Program. .

Non-field work activities in 2012 included reviewing and critiquing industry environmental monitoring reports and study plans as required by conditions of the NPDES permits. In legal matters, staff was deposed in a case involving DWQ and the Southern Environmental Law Center regarding the Pigeon River and Evergreen Packaging Company and issuance of its NPDES permit. Significant amounts of time were devoted in preparing to go to trial over the contentious permit. Before the case went to trial, there was a successful resolution of the legal suit, based, in part upon my analyses of the fisheries and temperature data and my recommendation of a new weekly temperature average.

Considerable efforts and accomplishments were made in data analyses, memorandum writing, selection of reference sites, site visits, etc. for the continued development of fish community criteria for rating Sand Hills streams. A 7-Metric NCIBI was derived and was able to identify impairment and to differentiate between highly impacted non-reference samples rated Poor or Fair and reference and near-reference samples rated Good or Excellent. Relationships were determined between the seven metrics and the 7-Metric NCIBI total score versus specific conductance, pH, total habitat score, landuse types, and landuse disturbance gradients. Based upon the existing dataset, reference sites and other least impacted fish community sites in the Sand Hills should have: 1) low specific conductance, low pH, low abundances of fish, and low percentages of tolerant fish; 2) high percentages of Key Sand Hills species, Key Sand Hills fish, and Insectivore Cyprinids; 3) at least two intolerant species; and 4) high quality instream habitat characteristics. Impacted sites would have the converse for these characteristics. Lastly, 21 sites have been identified as new potential reference sites and will be sampled in 2013 as a Special Study.

Five sites were assessed in the Stony Fork watershed (Yadkin River Basin) in Wilkes County as part of an external reclassification request. One site in Caldwell County was assessed as part of the on-going Buffalo Creek watershed (Yadkin River Basin) reclassification study. In addition, reclassification studies (based on internal NCDWQ data) were completed for the Tuskegee Creek, Little Tennessee River, and Watauga River watersheds to ORW, HQW, and Tr. Memoranda for these qualifying watersheds (based upon Excellent fish community ratings) were postponed indefinitely because of changes in reclassification priorities and the lack of benthic macroinvertebrate data to support the fish community results.

Finally, reintroduction efforts were completed in April and October for the Richland Creek and Pigeon River Reintroduction and Recovery Project. In 2012, approximately 5,000 fish representing nine species were reintroduced into Richland Creek. Preliminary results have shown that of the eight reintroduced species collected in June 2012 at Richland Creek at Howell Mill Road (the basinwide assessment site); five of them have already established reproducing populations.

## **Fish Tissue Accomplishments: 2012**

2012 was the fifth year of long term statewide fish mercury monitoring in partnership with the NC Division of Air Quality (DAQ). In the summer of 2012, BAU collected and processed over 300 fish-mercury samples from 13 lakes and rivers across North Carolina in conjunction with the DAQ's mandate to document mercury emission reductions from the state's 14 major coal-fired power plants. The goal of the fish-mercury component of the study is to establish potential trends among largemouth bass over a ten year period as new scrubber technologies are installed at these power plants. Despite considerable mercury emission reductions from NC coal-fired electricity generating units, the finding of no significant change in mercury fish levels over the period of 1990 to 2011 is consistent with the DAQ deposition modeling results indicating that mercury deposition in NC is largely attributed to mercury emission sources distant from NC. The second DAQ report to the NC Environmental Management Commission was completed in July of 2012 and included a component summarizing DWQ's fish tissue monitoring efforts through 2011.

The BAU also conducted long term fish mercury monitoring in 2012 in the lower Cape Fear basin. For 2012, six sites and 107 individual fillet samples were obtained. Until the late 90's, the HoltraChem Manufacturing Company in Riegelwood North Carolina represented a substantial source of mercury emissions through its production of chlorine bleach. The Division has been monitoring mercury levels in the area since the plant's conversion. The last time fish tissue samples were collected from these locations was in fall of 2008. A BAU report summarizing these monitoring efforts and mercury trend analyses at these locations will be written this winter following laboratory analyses.

Starting in 2010, elevated levels of PCBs were found in channel catfish collected from Mountain Island Lake, resulting in a fish consumption advisory for that species. PCB monitoring efforts were expanded in 2011 within the Catawba River basin to include additional samples from Mountain Island Lake, Lake Norman, and the North Carolina portion of Lake Wylie. Funding for these efforts was garnered by the Mecklenburg County Water Quality Program. In total, over 30 composite fillet samples were tested for 209 PCB congeners among five common fish species. Results from 2011 showed elevated levels of PCBs among blue catfish collected from Mountain Island Lake. In 2012 the BAU collected six additional blue catfish samples from Mountain Island Lake upon request from NCDHHS for human risk assessment. The North Carolina Wildlife Resources Commission is also assisting collection efforts in the Catawba basin during 2012. Three composite samples of striped bass are to be collected this late-fall from Lake Norman for 209 PCB congener testing with additional funding from Mecklenburg County.

Finally, concerns about PCB contamination in fish tissues were also addressed in the Yadkin River basin during the summer of 2012. Falls Reservoir just below Badin Lake was sampled for three trophic levels of fish following the detection of PCBs in sediment samples in early 2012. In total, 15 fillet and fillet composite samples were collected, processed, and sent to the USEPA Region IV Analytical Laboratory in Athens, Georgia for PCB congener analysis. Results from the 2011 PCB monitoring efforts in the Yadkin basin (High Rock Lake and Lake Tillery) are currently being analyzed by NCDHHS for human risk assessment.