

HANCOCK BIOLOGICAL STATION ON KENTUCKY LAKE WINTER/SPRING 2013

NEWSLETTER

500TH CRUISE!

Kentucky Lake and Lake Barkley are the terminal reservoirs in the Tennessee River and Cumberland River basins. The reservoirs were designed for flood storage, hydropower generation, and navigation enhancement. Over the past 60 years, the reservoirs have become valuable human and ecological resources. Together with the Land-Between-the-Lakes National Recreation Area, they form one of the largest multiple-use systems in North America. The warm, eutrophic systems support highly productive sport and commercial fisheries. The economic value of goods and services is returned to the region several times over in the forms of salaries and wages, capital construction, transportation, resale of harvested resources, and the support network that undergirds the primary users of the lakes resources.

In 1987, Murray State University was awarded one of Kentucky's four Centers of Excellence, the Center for Reservoir Research (now the Watershed Studies Institute). The charge was to focus the resources of the Chemical Services Laboratory (CSL), the Mid-America Remote sensing Center (MARC), and the Hancock Biological Station (HBS) to begin to understand the ecology of Kentucky Lake and its watershed. The Kentucky Lake long-term monitoring program (KLMP) was designed in 1988 by G. Richard Marzolf in collaboration with Joe King, Mark Schram, Al Groeger, Karla Johnston, David White, and others. Stream sites and additional sites in Ledbetter and Panther embayments were added in 1995.

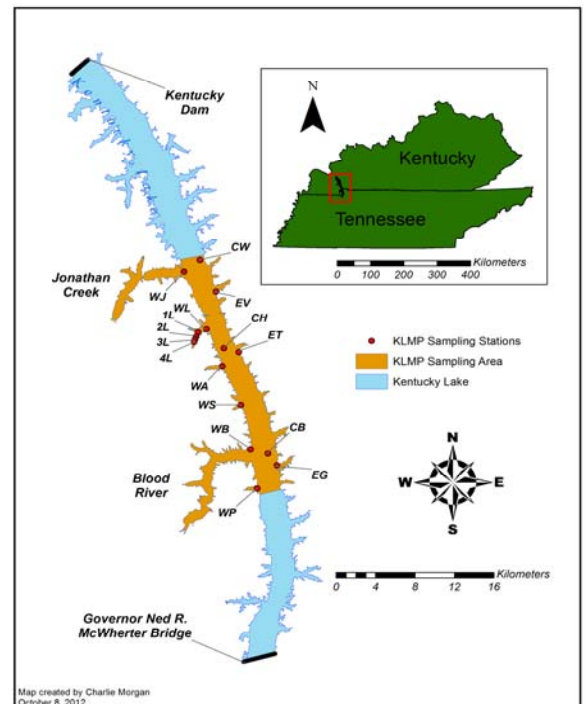
The goal of the long-term monitoring program has been to provide a base of physical, chemical, and biological data to assist researchers, students, and state and federal agencies in understanding the function of reservoirs in the environment, the effect of land use on physicochemical and biological quality, changes brought about by species introductions, and global climate change through the integration of field observations with remotely sensed data.

The underpinning of the long-term monitoring effort is 14-17 sites that are visited every 16 days (32 days in winter months). The 16-day interval corresponds with overpasses of the Landsat TM satellite. To originate and continue the long-term monitoring programs, it has had the cooperation and collaboration of more than 200 students, faculty, and researchers over its 25 year history. We thank and commemorate all who have participated.

The KLMP is now one of the longest (if not the longest) continuous, comprehensive data set on any major reservoir in the world. Results have been used in dozens of Master's theses, by state and federal agencies, and by researchers around the world. The data also have formed the basis for numerous research grants (see Silver Carp on Page 2).



August 22, 2008 was the 400th monitoring cruise.



KLMP Long-Term Monitoring Sites

November 8, 2013 will mark the 500th monitoring cruise. We are planning a celebration worthy of the occasion! More information will be forthcoming.



They're Here!!!

Asian carp, primarily silver and bighead carp, have been present in Kentucky Lake and Lake Barkley for at least 25 years but not in the numbers that now occur. Perhaps millions of pounds now are present in both lakes. Silver carp are known for their jumping ability, and a 40 pounder can seriously hurt a boater. In mid-March the Kentucky Department of Fish and Wildlife sponsored a two-day fishing tournament near Kentucky Dam that netted nearly 83,000 pounds. Silver carp are here to stay, and Fish and Wildlife hopes to promote a local commercial fisheries for pet food, oils, and fertilizers. Yes, and they are even tasty, but the name 'carp' has to be changed to something more 'palatable'.

Asian carp eat up to one third of their body weight in zooplankton every day, which eventually could have a dramatic effect on the Kentucky Lake ecosystem. Research by Dr. Michael Flinn and his students is addressing this question. They will be looking at what the fish actually eat and then compare what they find with the long-term (KLMP) zooplankton database. The research in part is funded the by US Fish and Wildlife Service.



Kentucky Department of Fish and Wildlife photo



HBS picnic area May 2010. HBS boathouse is in the background



2010 (upper) and 2013 (lower) water levels at the highland light monitoring site

↑ UPS and DOWNS ↓

As is happening in many areas of the country, the Tennessee valley and other parts of the upper Midwest are experiencing a cycle of extreme droughts and floods. For the second time in three years exceptionally high water levels have occurred on Kentucky Lake. As one TVA biologist had said – we put it in the trees when there is no other choice. Submerged trees and other debris can make boating dangerous. High water also plays havoc with the Station's real-time monitoring platforms. Fortunately all the equipment has survived even after being submerged for a couple of weeks each time. Although it is not something we had planned, data from the sensors are helping us to understand what happens during these episodic events that have become much more common in recent years.



HBS WEBSITE HAS A NEW LOOK.... The new web site was designed by Wen Zhu, and we hope you will find it attractive and easy to use. In addition to real-time data, you can watch the Kentucky Lake webcam. Also check out our video that was created by HBS students and staff. Wen has been working for HBS while completing his Masters in Computer Science.



The **Kentucky Organization of Field Stations** was officially created in February 2013 at Bernheim Forest. Present were representatives from 8 field stations. The Kentucky State Nature Preserves, Division of Water, US Forest Service, and The Nature Conservancy have expressed interest in being affiliated.



Want to know the latest Kentucky Lake weather and water conditions? Go to (www.murraystate.edu/hbs) for updates every 15 minutes. Real-time water quality and weather data have been gathered since 2005. You can have the data returned as a graph or a table if you are interested in long- term patterns. Look for the iPhone app in the not to distant future.

Along with helping us to maintain a world-class facility, gifts to the HBS Foundation account provide funds to assist deserving graduate and undergraduate students in research and in taking summer field courses. For more information on how you can help, contact Gerry Harris at 270-809-2272 or gharris@murraystate.edu

THE ECOLOGICAL CONSORTIUM OF MID-AMERICA (ecoma) carries out education, research, and service programs through HBS facilities. Member institutions are **Berea College, Indiana State University, Murray State University, St. Louis Community College, University of Kentucky, Vanderbilt University, and Western Kentucky University,**

YOU KNOW YOU'RE AT A BIOLOGICAL STATION WHEN.....

ADD YOUR MEMORY TO THE HBS FACEBOOK PAGE!

www.murraystate.edu/hbs

FOCUS ON....Watershed Watch

Watershed Watch programs occur throughout the country. The programs give opportunities for citizen scientists to monitor and understand conditions in their own watersheds. HBS is a partner and proudly supports the mission of the Four Rivers Watershed Watch.



Four Rivers Watershed Watch is a group of volunteers that conducts stream quality surveys on streams, rivers, and lakes in the Four Rivers Region of western Kentucky. We encourage all individuals to know about their waterways because the condition of our streams and rivers is an indicator of the health of our water and communities. Through our efforts, we provide citizens with the training necessary to scientifically explore and provide a snapshot of their own stream quality. The data collected by volunteers are used to help develop plans to enhance the streams for fishing, swimming, wildlife habitat, and drinking water supply.

The Four Rivers Region includes the parts of the Lower Cumberland River basin, Lower Ohio River Basin, the lower Tennessee River Basin, and the Mississippi River Basin in the following counties:

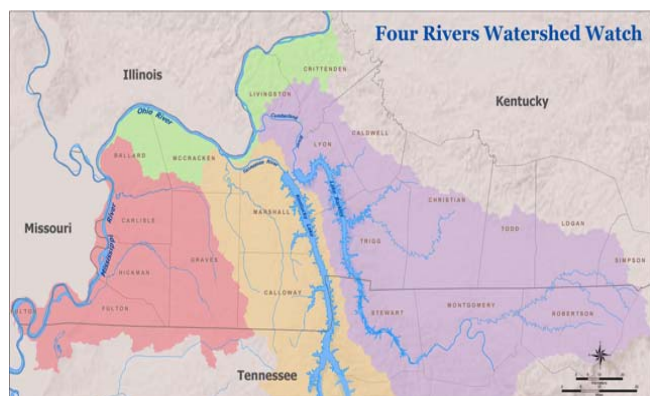
Kentucky: Ballard, Caldwell, Calloway, Carlisle, Christian, Crittenden, Fulton, Graves, Hickman, Livingston, Logan, Lyon, Marshall, McCracken, Simpson, Trigg, and Todd.

Tennessee: Montgomery and Robertson.

Partners include Tennessee Valley Authority, Virginia Environment Endowment, MSU Watershed Studies Institute, MSU Hancock Biological Station, MSU Mid America Remote Sensing Center, MSU Center for Environmental Education, West Kentucky Community and Technical College Biological Science Department, Kentucky Division of Water, and the City of Murray.

The Jackson Purchase Resource Conservation and Development Foundation, Inc. serves as the fiscal agent.

**For more information go to <http://4rww.jpj.org/>
or contact Maggie Morgan
Four Rivers Basin Coordinator
P.O. Box 1154 Benton, KY 42025
270-559-4422**



Congratulations again

More than 100 Masters' theses have been completed through Biological Sciences, Water and Watershed Science, Geosciences, and Chemistry that have used Station facilities or CRR/WSI databases. The list here contains theses since 2007. Some might be missing. In future issues, we will include earlier theses.

- Aubee, C. 2013. Activational Effects of Roundup® Exposure in the Adult Salamander, *Ambystoma maculatum*. Master of Science, Biological Sciences
- Burnett, M. 2008. Use of Geographical Information Systems Technology to Assess the Mussel (*Bivalvia: Unionidae*) Resources of Kentucky Lake, Kentucky. Master of Science, Biological Sciences.
- Earl, J. 2007. Lethal and sublethal effects of nutrient pollution on amphibian larvae. Master of Science, Water Science.
- Grosser, M. 2007. Archaean Diversity in Sediment Samples from the Littoral Zone of Ledbetter Creek Embayment at Kentucky Lake Reservoir. Master of Science, Biological Sciences.
- Knopp, R. 2012. The effects of prescribed fire restoration on amphibian and reptile diversity. Master of Science, Biological Science.
- Landolt, K. N. 2008. The effects of predator presence and intra-cohort interactions on the growth and development of the facultatively paedomorphic salamander, *Ambystoma talpoideum*. Master of Science, Water Science.
- Martin, A. 2012. Community shifts in dominant species composition of crappie in Kentucky Lake. Master of Science, Biological Sciences.
- Morgan, C. 2013. Long Term Monitoring and Analysis of Chlorophyll *a* and Primary Production in Kentucky Lake Using *in situ* and Remotely Sensed Data. Master of Science, Watershed Science.
- Ramsey, J. 2007. Life history, distribution, and secondary production of *Hexagenia bilineata* (Say) in Ledbetter Embayment of Kentucky Lake. Master of Science, Biological Sciences.
- Raper, K. 2013. Diet and Morphometry of *Erimyzon succetta* following Glyphosate application in a *Phragmites* Invaded Freshwater Marsh (Clear Creek Wildlife Management Area). Masters of Science, Biological Sciences.
- Rudh, N. 2013. Identification of sound producing hydrophilid beetles in underwater recordings using digital signal processing. Master of Science, Biological Sciences.
- Snapp, C. 2008. Diatom colonization patterns, ¹³C isotopic ratios, and water chemistry in springs of contrasting geologic origin in Land-Between-the-Lakes. Master of Science, Water Science.
- St. Clair, C. 2012. Effects of atrazine exposure on immune function and cannibalistic behavior of dragonfly larvae. Master of Science, Biological Sciences.

COMINGS.....

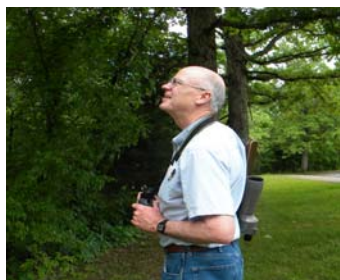


Xulong Peng has joined the Station and WSI as our Database Manager. He earned an M.S. degree from the University of Western Ontario in Canada and a B.S. degree from Northwest University in China, both in physical geography. He is currently working on a B.S. degree in Computer Science from Murray State University. Prior to joining HBS, Xulong worked for the Purchase Area Development District in Mayfield, KY, as a GIS/GPS Specialist. He has also held scientist positions at the Saskatchewan Research Council in Canada and the Chinese Academy of Sciences in Beijing, China. Xulong was involved in the creation, management and update of various geographic databases for state agencies including KY Transportation Cabinet, KY Infrastructure Authority, and the State Police. He was a member of a research group that was responsible for the design and creation of the first nationwide Resource and Environment Database of China. Xulong has contributed articles in international academic journals and was involved in editing three books including the China Resources Science Encyclopedia. He hopes to advance his professional career in a slightly new direction at HBS by enhancing database management and supporting research projects at HBS and WSI.



Clark Hendrix joined the Station and WSI as a Senior Field Technician in September of 2012. He earned his B.S. in Natural Resource Management from the University of Tennessee at Martin. He is also a 10 year veteran of the United States Air Force and currently is a member of the Tennessee Air National Guard based out of Nashville, TN. While serving in the active duty Air Force, Clark was stationed at Dyess AFB in Abilene, TX where he was an aircraft mechanic on the B-1B Bomber. As a member of the Tennessee Air National Guard, Clark worked on the C-130 Hercules as a mechanic, until transitioning into a new position. He is a native of Fulton, KY, and an avid bass fisherman and duck hunter who enjoys the abundance of fish and game that Kentucky Lake and the surrounding area has to offer. As the Senior Field Technician at the Station, Clark is looking forward to learning more about Kentucky Lake and its vast watershed through the various sampling methods used for research. He hopes that this information will better inform the public about the importance of environmental stewardship. Clark is in charge of the field portion of the Kentucky Lake Monitoring Program and KY99, HBS's National Atmospheric Deposition Program site.

.....AND GOINGS



Dr. Steve White Dr. Steve White is retiring after 32 years at Murray State University. He has offered and taught BIO 573/673 Ornithology in the summers of odd numbered years at HBS for most of those years. He graduated from WVU in 1974 completed a M.S. in fisheries at Colorado State University in 1975 where he study gray whales, and finished his PhD. from the Ohio State University in 1980 where he worked on large winter-roosting population of blackbirds. After a short stint at Cornell working on pine voles in apple orchards, Steve began teaching at Murray State University in 1981. Widely varied research interests included restoration of river otters in Kentucky, lead poisoning in Kentucky wintering waterfowl, and the return of nesting bald eagles to Kentucky and Tennessee. Steve notes proudly that gray whales were removed from the U.S. endangered species list in 1994, blackbirds roost problems have declined significantly, lead poisoning in waterfowl resulted in state and federal regulations requiring non-toxic shot in waterfowl harvest, otters are now common throughout Kentucky, and bald eagles nest more abundantly now in Kentucky and Tennessee

than at any time in history! Under his teaching and advisement, the Murray State University Student Chapter of the Wildlife Society won the Southeastern Wildlife Society Student Conclave twice in 1995 and 2001 and placed third on 5 other occasions! The establishment of the Stephen White Wildlife Biology Scholarship, endowed by his brother and sister as a tribute to his MSU career, will support the wildlife conservation biology program at MSU for years to come. Noting that the recovery of wildlife and populations during his life time have been nothing short of remarkable, Steve expects to be active in a few wildlife research topics and in reviving efforts to provide funding for non-game, non-endangered species management embodied in the Teaming With Wildlife conservation funding effort. He will continue to serve MSU as a Professor Emeritus of Biology and plans to teach Ornithology at HBS in the future.



Dr. Ralph Thompson from Berea College has been a Visiting Professor at HBS for 16 years and will teach Biology 553/653 Field Botany, for the last time this summer. Ralph previously taught at the Franz Theodore Stone Laboratory, Ohio State University, the Upper Cumberland Biological Station at Tech Aqua, and the Pymatuning Laboratory of Ecology. Ralph received his Ph.D. in Botany from Southern Illinois University at Carbondale and joined the Berea College Biology Faculty at in 1980. He retired in 2011 after 31 years of service at Berea College. Read more on Ralph's career in the Summer-Fall edition of the Newsletter. Ralph says that major pride and joy is being remembered by his students and colleagues as a supportive mentor, a dedicated colleague, and as a true and loyal friend while teaching at the Hancock Biological Station, his favorite teaching endeavor of his long and productive career.

FOCUS ON.....Graduate Student Research



Mike Moore is a graduate student with the Watershed Studies Institute at Murray State University. After growing up in New Hampshire and graduating from Gonzaga University in Washington, Mike has been conducting his research and living at HBS as one of our graduate residents since January 2012. Along with Drs. Howard Whiteman and Tobias Landberg, he is investigating how maternal effects mediate life history variation in salamanders.

Maternal effects are broadly described as any non-genetic influence that mothers have on their offspring's traits. Maternal effects are widespread in plants and animals and include the acquired immune systems passed from mothers to infants in humans. While a wide array of maternal effects exist, Mike is specifically examining the long-term consequences of embryo size differences on offspring. Using an exciting technique developed by HBS postdoc Landberg, the volume of embryonic salamander yolk reserves was reduced in one egg treatment. The larvae were raised at three densities in HBS's mesocosm facility and compared with larvae from un-manipulated embryos reared across a similar gradient of aquatic environments. Mike and his undergraduate research assistants, Emily Clouse and Katie Mount, spent all of last summer catching salamander larvae from his 54 cattle tank experiment, and their efforts were rewarded with some interesting results. Although the importance of maternal effects is widely believed to



attenuate over the course of an individual's development, the finding of this large experiment demonstrated that maternal effects influence growth, metamorphosis, and first year reproduction in his focal species. Furthermore, his work has illustrated that the role maternal effects can play depends on the environment in which they occur, which may have implications for human health.

Mike has attended several regional conferences and will be attending the national Evolution and Ecological Society of America meeting this summer to present his research. He plans to enter a PhD program next year where he can continue to explore questions about maternal effects and animal life histories.

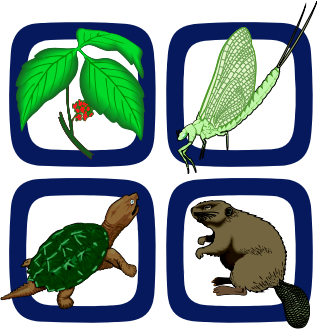


Ann Gilmore is a graduate student in Watershed Studies working with Dr. Claire Fuller of the Murray State Biological Department. After graduating from Ohio State, she spent several years as a field ecologist working for the Pennsylvania Natural Heritage Program and the USGS. Ann came to Hancock to live, work, and play in August 2011. Her research is examining how a common agricultural chemical affects larval macroinvertebrates in natural environments. Atrazine is one of the most widely used herbicides in the U.S. and is applied throughout the spring and summer to corn and sorghum fields. Given the high runoff potential and timing of application, atrazine is commonly found in surface waters at low, but persistent concentrations. Research examining the effects of atrazine on amphibians and fish indicates that it alters the physiology, behavior, and reproductive traits of freshwater biota. However, the effects on aquatic macroinvertebrates, keystone species in aquatic systems, are largely unknown. Ann's research examines how atrazine may alter growth, immune function, and

energy storage in larval dragonflies when combined with predation risk. She designed this project to investigate short and long-term exposure of environmentally relevant concentrations of atrazine using aquatic mesocosms at Hancock Biological Station.

Ann conducted her research in Spring 2012 and continued into early November 2012. She collected growth and immunity data on dragonflies throughout the fall and is currently working on fat extractions with the help of an undergraduate assistant, Celecia Scott, in Dr. Bob Volp's lab (MSU, Chemistry Department). In the meantime, she is focused on data analysis and writing her thesis. Preliminary data analysis indicates that sublethal atrazine exposure and predation risk alters immune function in larval dragonflies after fifteen days. After 30 days, dragonflies appear to acclimate to atrazine exposure, as no effects have been detected. Her research also implies that late-season atrazine exposure to aquatic macroinvertebrates that impairs immune function could lead to decreased parasite resistance and overwinter survival of larval dragonflies. Without dragonflies we will all suffer a lot more mosquito bites! Ann's research and coursework were funded by grants from the Watershed Studies Institute, the Kentucky Water Resources Research Institute, the Odis Sisk Memorial Scholarship, and the MSU Innovative Research Assistantship. This spring, she has been presented her research locally, regionally, and nationally at the Watershed Studies Symposium, the Kentucky Water Resources Research Symposium, the Midwest Ecology and Evolution Conference at the University of Notre Dame, and recently at the national meeting for the Society of Freshwater Science. She is on track to defend this fall and is currently looking into PhD programs or other post-graduate research opportunities.





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