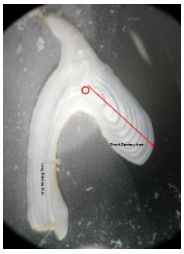
Recent and Current Research in Dr. Whitledge's Lab

Stable isotopes and trace elements as natural markers of fish and invertebrate environmental history



- Identification of recruitment sources for invasive bighead carp and silver carp in the Mississippi, Illinois, and lower Ohio rivers and sources of fish introduced into Chicago area ponds using otolith chemistry (collaborations with USGS and IDNR)
- Evaluation and applications of dentary bone chemistry as a natural marker of paddlefish environmental history
- Identifying natal river for shovelnose, pallid, and lake sturgeons in the Mississippi River using pectoral fin ray microchemistry (collaboration with Missouri Dept. of Conservation)

- Recruitment sources and natal dispersal of catfishes in the Ohio and Mississippi Rivers
- Sources and environmental history of invasive black carp collected from the Mississippi River and tributaries

- Distinguishing stocked and naturally reproduced sport fishes in rivers (sauger in the Kaskaskia River) and reservoirs (muskellunge and smallmouth bass in Kinkaid Lake; crappies in Kentucky Lake) using otolith or fin ray chemistry
- Stable isotopes as tracers of aquatic macroinvertebrate sources and dispersal (collaboration with Dr. Matt Whiles)

- Verification of natural reproduction and identification of natal environment for unmarked lake trout in Lake Michigan (collaboration with Illinois Natural History Survey)
- Distinguishing aquaculture-derived and naturally-reproduced grass carp in the Great Lakes (collaboration with USGS)

- Natal environment and dispersal of spotted bass in Ohio River tributaries
- Identification of the principal natal environments for sauger in the lower Ohio River

Stable isotopes and fatty acids in fish diet and nutritional studies (collaborations with Dr. Jesse Trushenski)

- Stable hydrogen isotopes and fatty acid biomarkers as indicators of fish nutritional sources, with emphasis on large river-floodplain ecosystems
- Fatty acids as indicators of channel catfish energy sources and habitat use in the Kaskaskia River

VHS and aquatic nuisance species

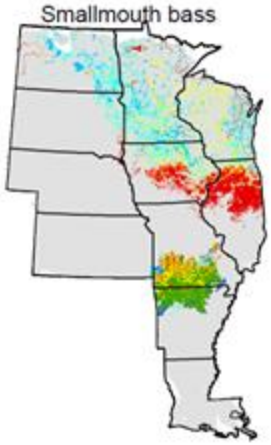
- VHS surveillance in Illinois' lakes and rivers
- Ploidy, age and growth of feral grass carp in the Great Lakes region (collaboration with USGS)
- Monitoring black carp range, population characteristics, and ecological impacts in the Mississippi River basin (collaboration with USGS)
- Field evaluation of Zequanox® for controlling zebra mussel infestations in lakes (in cooperation with Marrone BioInnovations and Forest Preserve District of DuPage County)
- Integrated chemical and biological approaches for controlling aquaculture pond snails
- Movement of VHS-susceptible fishes from Lake Michigan into the Chicago Area Waterways
- Movement and passage of Asian carps at Starved Rock Lock and Dam on the upper Illinois River

Fish-habitat relationships

- Habitat associations of fish assemblages in the Cache River watershed
- Projecting impacts of climate and land use changes on distributions of warmwater stream fishes in the central U.S.
- The influence of stream flow regime on population-level variation of fish life history traits

Fisheries management

- Long-term electrofishing monitoring of the lower Ohio River fish assemblage
- Population dynamics of catfishes in the Ohio River and evaluating effects of size and bag limit regulations
- Recruitment, growth, and mortality of spotted bass in Ohio River tributaries
- My students and I assist Shawn Hirst, IDNR Fisheries Biologist, with annual trap net surveys for muskellunge in Kinkaid Lake



Selected Publications:

Norman, J.D. and G.W. Whitledge. 2015. Recruitment sources of invasive bighead carp (*Hypopthalmichthys nobilis*) and silver carp (*H. molitrix*) inhabiting the Illinois River. Biological Invasions. Advance online publication. DOI: 10.1007/s10530-015-0929-9.

Bouska, K.L., G.W. Whitledge, and C. Lant. 2015. Development and evaluation of species distribution models for fourteen native central U.S. fish species. Hydrobiologia 747:159-176.

Whitledge, G.W., M.M. Weber, J. DeMartini, J. Oldenburg, D. Roberts, C. Link, S.M. Rackl, N.P. Rude, A.J. Yung, L.R. Bock, and D.C. Oliver. 2015. An evaluation of Zequanox® efficacy and application strategies for targeted control of zebra mussels in shallow-water habitats in lakes. Management of Biological Invasions 6:71-82.

Young, M.P., G.W. Whitledge, and J.T. Trushenski. 2015. Fatty acid profiles distinguish channel catfish from three reaches of the lower Kaskaskia River and its floodplain lakes. River Research and Applications. Advance online publication. DOI: 10.1002/rra.2856

Young, M.P., G.W. Whitledge, and J.T. Trushenski. 2014. Changes in fatty acid profiles of three tissue types in channel catfish *Ictalurus punctatus* transferred from river to pond environments. Journal of Applied Ichthyology 30:895-905.

Rude, N.P., K.T. Smith, and G.W. Whitledge. 2014. Identification of stocked muskellunge and potential for distinguishing hatchery-origin and wild fish using pelvic fin ray microchemistry. Fisheries Management and Ecology 21:312-321.

Wittmann, M.E., C.L. Jerde, J.G. Howeth, S.P. Maher, A.M. Deines, J.A. Jenkins, G.W. Whitledge, S.R. Burbank, W.L. Chadderton, A.R. Mahon, J.T. Tyson, C.A. Gantz, R.P. Keller, J.M. Drake and D.M. Lodge. 2014. Grass carp in the Great Lakes region: establishment potential, expert perceptions, and re-evaluation of experimental evidence of ecological impact. Canadian Journal of Fisheries and Aquatic Sciences 71:992-999.

Bouska, K.L. and G.W. Whitledge. 2014. Habitat associations of fish assemblages in the Cache River, Illinois. Environmental Biology of Fishes 97:27-42.

Rude, N.P., W.D. Hintz, J.D. Norman, K.L. Kanczuzewski, A.J. Yung, K.D. Hofer, and G.W. Whitledge. 2013. Using pectoral fin rays as a non-lethal aging structure for smallmouth bass: precision with otolith age estimates and the importance of reader experience. Journal of Freshwater Ecology 28:199-210.

Phelps, Q.E., G.W. Whitledge, S.J. Tripp, K.T. Smith, J.E. Garvey, D.P. Herzog, D.E. Ostendorf, J.W. Ridings, J.W. Crites, R.A. Hrabik, W.J. Doyle, and T.D. Hill. 2012. Identifying river of origin for age-0 *Scaphirhynchus* sturgeons in the Missouri and Mississippi rivers using fin ray microchemistry. Canadian Journal of Fisheries and Aquatic Sciences 69:930-941.

Gahagan, B.I., J.C. Vokoun, G.W. Whitledge, and E.T. Schultz. 2012. Evaluation of otolith microchemistry for identifying natal origin of anadromous river herring in Connecticut. Marine and Coastal Fisheries 4: 358-372.

Myers, D.J., G.W. Whitledge, and M.R. Whiles. 2012. Evaluation of δD and $\delta^{18}O$ as natural markers of invertebrate source environment and dispersal in the middle Mississippi River-floodplain ecosystem. River Research and Applications 28:135-142.

Rude, N.P., G.W. Whitledge, Q.E. Phelps, and S. Hirst. 2011. Long-term PIT and T-bar anchor tag retention rates in adult muskellunge. North American Journal of Fisheries Management 31:515-519.

Smith, K.T. and G.W. Whitledge. 2011. Trace element and stable isotopic signatures in otoliths and pectoral spines as potential indicators of catfish environmental history. Catfish 2010: Proceedings of the 2nd International Catfish Symposium. American Fisheries Society Symposium 77:645-660.

Noatch, M.R. and G.W. Whitledge. 2011. An evaluation of hydrated lime and predator sunfish as a combined chemical-biological approach for controlling snails in aquaculture ponds. North American Journal of Aquaculture 73:53-59.

Smith, K.T. and G.W. Whitledge. 2011. Evaluation of a stable isotope labeling technique for mass-marking fin rays of age-0 lake sturgeon. Fisheries Management and Ecology 18:168-175.

Smith, K.T., N.P. Rude, M.R. Noatch, D.R. Sechler, Q.E. Phelps, and G.W. Whitledge. 2011. Contrasting population characteristics of yellow bass (*Morone mississippiensis*) in two southern Illinois reservoirs. Journal of Applied Ichthyology 27:46-52.

Zeigler, J.M. and G.W. Whitledge. 2011. Otolith trace element and stable isotopic compositions differentiate fishes from the middle Mississippi River, its tributaries, and floodplain lakes. Hydrobiologia 661:289-302.

Smith, K.T. and G.W. Whitledge. 2010. Fin ray chemistry as a potential natural tag for smallmouth bass in northern Illinois rivers. Journal of Freshwater Ecology 25:627-635.

Whitledge, G.W., P.G. Bajer, and R.S. Hayward. 2010. Laboratory evaluation of two bioenergetics models for brown trout. Transactions of the American Fisheries Society 139:929-936.

Zeigler, J.M. and G.W. Whitledge. 2010. Assessment of otolith chemistry for identifying source environment of fishes in the lower Illinois River, Illinois. Hydrobiologia 638:109-119.

Phelps, Q.E., M.R. Noatch, H.A. Lewis, D.J. Myers, J.M. Zeigler, J.S. Eichelberger, M.J. Saltzgiver, and G.W. Whitledge. 2009. Otolith chemistry of prey fish consumed by a fish predator: does digestion hinder Russian doll techniques? Journal of Fish Biology 75:2606-2614.

Stahl, M.T., G.W. Whitledge, and A.M. Kelly. 2009. Reproductive biology of middle Mississippi River shovelnose sturgeon: insights from seasonal and age variation in plasma sex steroid and calcium concentrations. Journal of Applied Ichthyology 25 (Suppl. 2):75-82.

Whitledge, G.W. 2009. Otolith microchemistry and isotopic composition as potential indicators of fish movement between the Illinois River drainage and Lake Michigan. Journal of Great Lakes Research 35:100-105.

Vandermyde, J.M. and G.W. Whitledge. 2008. Otolith $\delta^{15}N$ distinguishes fish from forested and agricultural streams in southern Illinois. Journal of Freshwater Ecology 23:333-336.

Whitledge, G.W., B.M. Johnson, P.J. Martinez, and A.M. Martinez. 2007. Sources of non-native centrarchids in the upper Colorado River revealed by stable isotope and microchemical analyses of otoliths. Transactions of the American Fisheries Society 136:1263-1275.

Whitledge, G.W., B.M. Johnson and P.J. Martinez. 2006. Stable hydrogen isotopic composition of fishes reflects that of their environment. Canadian Journal of Fisheries and Aquatic Sciences 63:1746-1751.

Whitledge, G.W., C.F. Rabeni, G. Annis, and S.P. Sowa. 2006. Riparian shading and groundwater enhance growth potential for smallmouth bass in Ozark streams. Ecological Applications 16:1461-1473.

Whitledge, G.W., P.G. Bajer, and R.S. Hayward. 2006. Improvement of bioenergetics model predictions for fish undergoing compensatory growth. Transactions of the American Fisheries Society 135:49-54.