

# Effects of Introduced Common Carp and Invading Zebra Mussels on Water Quality and the Native Biological Community of Clear Lake, Iowa

**Principal Investigator:** Clay L. Pierce  
Timothy W. Stewart

**Student Investigator:** Michael E. Colvin (Ph.D.)  
Eric D. Katzenmeyer (M.S.)

**Collaborators:** Joe Larscheid, Iowa DNR  
Jim Wahl, Iowa DNR

**Duration:** May 2007 to June 2011

**Funding Source(s):** Iowa Department of Natural Resources

**Goals and Objectives:**

- Quantify major ecosystem components, including common carp, zebra mussels, and the native fish and macroinvertebrate communities.
  - Compilation and organization of existing data.
  - Assembly of empirical relationships from the literature and compiled data.
  - Construction of several component models describing portions of the ecosystem.
  - Combining component models into a single ecosystem-level simulation model.
- 

## Progress:

Field work began in May of 2007 to quantify portions of the Clear Lake ecosystem in order to monitor changes during the invasion of zebra mussels, and to use in a quantitative ecosystem simulation model. Over 2007 and 2008, data have been collected on the carp population, benthic invertebrates, benthic algae, fish community, benthic chlorophyll a, and juvenile zebra mussels. Additional ancillary data have been collected from existing data for Clear Lake and similar ecosystems and entered in a database for efficient retrieval. As a result, 46.3 megabytes of data have been stored in a relational database. Preliminary results have shown that juvenile zebra mussels can be found in Clear Lake throughout the summer months; however this is temporary and spatially variable. Zebra mussels appear to be increasing in spatial extent within Clear Lake, as indicated by veliger sampling and benthic surveys. Benthic invertebrate surveys showed an increase in zebra mussel densities on rocky substrates from 2007 to 2008. Veligers were not detected in Ventura Marsh in 2007 or 2008. The fish community is numerically dominated by carp, yellow bass, black bullhead and walleye. In 2007 and 2008, benthic algae communities were dominated by diatoms in Clear Lake, and green algae in Ventura Marsh.

In 2007 and 2008, we collected and processed aging structures from 561 common carp, 267 walleyes, 147 yellow bass and 89 black bullheads. Stomach samples were collected from 72 walleyes, five common carp, 14 black bullheads, 56 yellow bass, and ten spottail shiners and are currently being processed. The carp population was estimated to be 35,738 and 56,587 individuals, with an estimated biomass of 92.62 and 211.89 kg per hectare in 2007 and 2008 respectively. A preliminary Ecopath model has been developed and fit to data from 2007, reflecting the latent phase of the zebra mussel invasion. Preliminary simulations of the effect of zebra mussels on the trophic interactions of the biotic community indicates that the effect is negligible, relative to the effect of common carp.

## Future Plans:

This is a multi-year study, so many of the 2007, 2008, and 2009 activities will be repeated in 2010. Model development and evaluation will continue as the empirical database grows. Processing of field samples will continue in the laboratory. Many more presentations of preliminary findings are planned.