Developing Benchmarks of Biological Integrity for Iowa Lake and Reservoir Restoration Success

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Duration:	January 2008 to December 2012
Funding Source(s):	Iowa Department of Natural Resources

Goals and Objectives:

To provide ecological benchmarks of lake and reservoir restoration through an integrated, interdisciplinary approach combining measures of macroinvertebrate and fish assemblages, and water quality.

Progress:

Six water bodies representing a wide range of trophic conditions in Iowa were sampled seasonally in 2008 with multiple gears (i.e., seines, benthic trawls, fyke nets, gill nets, electrofishing) to determine standard sampling protocols for future sampling. A total of 43 fish species and 61,293 individuals were sampled in 2008 across all seasons and gears. Probabilities of species detection indicated strong selectivities and seasonal trends. The evaluation of total species richness and the total number of individuals sampled using multiple gear combinations demonstrated that appreciable benefits over relatively few gears (e.g., three to four) used in optimal seasons were not present. Our results indicated that the characterization of lentic fish assemblages was highly influenced by the selection of sampling gears and seasons, but did not appear to be influenced by waterbody type (i.e., natural lake, impoundment). Methods established from fish sampling in 2008 were used to sample 39 additional lakes in 2009, 2010, and 2011. Sampling methods included trawling during the summer (i.e., late June – mid July) and fyke netting and nighttime electrofishing during the fall (i.e., mid-September – late October). The lakes and impoundments sampled were selected from "high water quality" water bodies (e.g., West Okoboji) or "restoration priority" water bodies (e.g., Clear Lake, Storm Lake) designated by Iowa DNR. Sampling from 2008 to 2010 yielded a total 50 species and 149,108 fish across all 45 lakes.

Conclusions and Recommendations:

Our results indicated that increased species diversity in reservoirs was most strongly related to morphometric characteristics (i.e., larger surface area, increased depth); whereas, fewer species were observed in natural lakes with low water clarity and high suspended solids. Fish assemblage structure between natural lakes and reservoirs was also consistently dissimilar for taxonomic and trophic data. Overall, distinct differences in fish assemblage structure were observed between natural and artificial lentic ecosystems. Our results emphasize the need to consider waterbody origin (i.e., natural or artificial) on fish assemblage characterization and subsequent inferences made from environmental correlations.