Modeling the 10-year changes of juvenile fish assemblages in Lake-Michigan near-shore water

Project Report

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1. Project Summary

We have compiled all data for juvenile fish species, zooplankton and macroinvertebrate assemblages and input these data into a Microsoft Access database. We also have analyzed the three datasets with multivariate techniques (NMDS and DCA) for long-term trends. The primary results showed remarkable and systematic changes in juvenile fish and zooplankton assemblages.

We have also made efforts to compile a range of environmental data, including weather and water level data in the IL shoreline of Lake Michigan from NOAA web sites. We have being worked to access to water quality data from IL EPA. This second effort was delayed because of the busy schedule of IL EPA staff in the sampling season. However, we expect to obtain the data shortly and will complete the final modeling in a couple of months by linking the changes in juvenile fish assemblages to zooplankton and environmental factors.

2. Proposal Submitted

We have used the grant to support the preparation of three research proposals this year, submitted to three federal funding agencies, USFWS (proposal-1), NSF (Proposal-2), and USEPA (proposal-3). Below are some details about the proposals.

Proposal -1: Predicting and classifying substrate distributions in the nearshore of western Lake Michigan for effective biodiversity conservation and bioassessment (Restoration Grant Proposal)

Funding Agency: US Fish and Wildlife Services (USFWS)
Program: Great Lakes Fish and Wildlife Restoration Act FY 2010

Investigators
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Scudder Mackey (Co-PI) - Habitat Solutions (scudder@sdmackey.com)
Lizhu Wang (Co-PI) - Institute for Fisheries Research, University of Michigan (Lizuwang@umich.edu).

Total project cost: $220,000
Total GLFWRA Funding requested: $180,000
Total Non-federal Partner Match: $40,000
Project dates: Oct 1, 2010 – Sep. 30, 2012

Submission Date: January 22, 2010
Outcome: the proposal was ranked 51st out of 165 proposals received by FWS, but only the top 40 were invited for a full proposal.

Proposal -2: Collaborative Research: Ground/Surface Water Exchange in Lake Michigan-Nutrient/Element Cycling, Ecological Significance & Climate Change.

Funding Agency: NSF
Program: Water Sustainability and Climate (WSC)

Investigators:
Kontar, Y. (PI), Illinois State Geology Survey (kontar@isgs.illinois.edu)
Wuebbles, D. (Co-PI), Department of Atmospheric Sciences, University of Illinois (wuebbles@illinois.edu)
Cao, Y. (Co-PI), Illinois Natural History Survey (yongcao@illinois.edu)
Others (Co-PI)

Summary
The project (L02118204) will address the objectives of the NSF WSC program to understand, quantify, forecast and protect Lake Michigan water resources and ecosystems. Submarine Groundwater Discharge (SGD) is an important pathway for fluid, solute, and energy transport including freshwater, nutrients, trace metals, bacteria, and other pollutants. Given the vast population, agriculture, and industry surrounding Lake Michigan, there is high potential that the SGD can significantly contribute nutrients, heavy metal contaminants and organic pollutants to the lake. These pollutants likely impact water quality and ecosystem health, and must be considered by area managers, ecosystem modelers and the general public to fully understand the water, nutrient, and metal budgets of the lake under influence of climate change.

Total Project Budget: $1293,869
Project Date: July 1, 2010 – June 30, 2013
Submission Date: April 15, 2010

Outcome: This proposal was returned without review because the Post-Doctoral Mentoring Plan was missed by one collaborator from a different university.

Proposal – 3: Urban Ecosystem Indicators for Planning
Funding Agency: US-EPA
Program: Great Lakes Restoration Initiative

Investigators
Brian K. Miller (PI), Illinois-Indiana Sea Grant, University of Illinois (millerbk@illinois.edu)
Brian Anderson (PI), Illinois Natural History Survey, University of Illinois (bdanderson@inhs.illinois.edu)
Stephen Wald (PI), Institute of Natural Resource Sustainability, University of Illinois wald@inrs.illinois.edu
Cao, Y. (Co-PI), Illinois Natural History Survey (yongcao@illinois.edu)
Szafoni, D (Co-PI), Illinois Natural History Survey (szafoni@illinois.edu)
Othes (Co-PI)

Project Cost: $988,413
Project Date: May 1, 2010 – April 30, 2012

Summary: An interdisciplinary team of scientists, planners, Great Lakes extension specialists, and partners will assemble a suite of nearshore ecosystem indicators, correlate them to land use alternatives using cutting edge mathematical modeling techniques, and build a web-based decision support system for the benefit of local planners, developers, and citizens in the Chicago metropolitan area, with plans to expand throughout the Great Lakes

Submission Date: April 10, 2010
Outcome: not funded

3. How these seed funding has allowed (will allow) you to develop a future, larger program

We have used the funding to build a research network for future growth of our programs. In Feb 2010, one of us (Cao) visited USGS Great Lake Science Center and Michigan Institute for Fisheries Research at Ann Arbor, presenting a talk and meeting colleagues. The funding was also used to support a student travel to ASLO-NABS Joint Meeting at Santa Fe, NM in June 2010. In addition, the project has supported

closer collaboration between Cao's stream ecology lab in Champaign and Czesny's Lake Michigan Biological Station at Zion, IL. Currently, we are finishing a manuscript focusing on the mortality of lake trout larvae in relation to fatty acids and thiamine in the eggs.

4. Student training

We initially requested funds to support a summer student to help the data compiling and analysis. We interviewed two graduate students with statistical backgrounds earlier this summer, but none of the students had the experience or time needed for the job. We decide conducting the analysis ourselves. However, we supported two visiting students from Zhejiang University of China this summer, who helped to organize the project data and learnt about zooplankton sampling and fish gill-net sampling in Lake Michigan.

5. Publications/manuscripts

We expect to write one manuscript based on the data analysis in this project and will acknowledge the supports of Illinois-Indiana Sea Grant Program.