



RESEARCH FINAL REPORT GUIDELINES

Final reporting requirements consist of (1) a project abstract to help the reader quickly ascertain the project's purpose, including the main results and conclusions, for posting to the GLFT's public website, (2) a narrative response to the GLFT final report questions (if applicable), (3) a financial report accompanied by financial documentation verifying expenditures (form and instructions attached), and (4) attachments to include (a) a full narrative report (see guidelines below) on the research results and (b) copies of manuscripts accepted or submitted for publication (if applicable).

PROJECT ABSTRACT

Title: Making trend data for fish populations in Michigan streams available online

Abstract: Sharing information is key to successful management of common resources. Michigan Department of Natural Resources (MDNR) Fisheries Division biologists collaboratively manage fish communities and habitats in the Great Lakes, inland lakes, and streams with various agencies, tribal governments, and publics. In 2002, the MDNR Fisheries Division initiated a statewide Status and Trends Program (STP) to document long-term trends in important fish populations and habitat in streams. A key component of the STP is a network of over 40 population monitoring (or fixed) sites on streams that are sampled on a regular rotation. Rivers included in this program include all of Michigan's most renowned trout, salmon, and smallmouth bass fisheries. The fixed site surveys provide the State's highest quality data for assessing trends in stream fish populations, as all surveys are thorough and use standardized methods. Recent research in Michigan and elsewhere has shown that stream trout populations vary in synchrony over time at regional scales, and that map-based displays of fish population trend data from the STP would help show the spatial extent of these shared trends. Sharing these data as maps and graphs would be most useful to MDNR Fisheries Division and its partners but is technologically challenging, due to multiple sites, years, data parameters, and ongoing data collection, and has not been effectively accomplished due to agency restructuring and budget cutbacks.

We developed an online tool, the Stream Fish Population Trend Viewer, for sharing information on local and regional trends in abundance, growth, and survival of important

fish populations at STP fixed sites on Michigan streams. The tool has two main components, the first of which allows users to see regional patterns of trends in populations. It consists of a map showing fixed site locations in Michigan, with the sites being color-coded based upon how the most recent survey information compares with the average value at the site since 2002. Users determine the interactive map's display by selecting species and population parameters they are interested in. Data are available for important species at fixed sites including steelhead, coho salmon, brown trout, brook trout, and smallmouth bass. Parameters include estimates of population abundance (e.g., total numbers or numbers by age or size group), average length of fish at a given age, and annual survival rate. The second component of the Trend Viewer allows users to view trends as graphs or data tables for these species and parameters at any individual site. They can also export the information as a report or data file. The viewer is available at the following URL: <http://www.mcgi.state.mi.us/fishpop/#>.

To develop the Stream Fish Population Trend Viewer tool, we provided data from MDNR Fisheries Division's centralized database and worked with software developers at Michigan State University's Remote Sensing and Geographic Information Systems center. Michigan Department of Technology Management and Budget staff coordinated software development efforts and migrated the Trend Viewer to State of Michigan servers where it permanently resides. The Stream Fish Population Trend Viewer will be updated annually with the latest data from MDNR Fisheries Division surveys at STP fixed sites.

FINAL NARRATIVE REPORT GUIDELINES

- **Project Title:** Delivering stream salmonid trend data to facilitate collaborative management of Great Lakes and inland fisheries
- **Grantee Organization:** Michigan Department of Natural Resources, Fisheries Division
- **Project Team:** Troy Zorn and Todd Wills (MDNR Fisheries Division); Joel Lenz, Justin Booth, and Ashley DePottay (Michigan State University, Remote Sensing and Geographic Information Systems); Srinivas Yerukola and Christine Larson (Michigan Department of Technology Management and Budget); Henry Quinlan (United States Fish and Wildlife Service)
- **Contact Person:** Dr. Troy Zorn, Michigan DNR Fisheries Division, Marquette Fisheries Research Station, zornt@michigan.gov
- **Grant Amount:** \$43,279
- **Start and End Dates:** January 1, 2013 to December 31, 2014
- **Key Search Words** (streams, trend, steelhead, brown trout, brook trout, coho salmon, smallmouth bass, abundance, growth, length at age, survival, population dynamics)

Background/Overview

1. Briefly summarize the project description as outlined in the original proposal.

- a. We proposed to work with Michigan State University (MSU) and Michigan Department of Technology, Management, and Budget (DTMB) collaborators to develop an online tool to facilitate sharing of data on local- and regional-scale trends in abundance, growth, and survival of important fish populations assessed at fixed sites as part of MDNR Fisheries Division's Status and Trends Program. The tool uses maps, graphs, and tables to deliver trend data at both regional and local scales.
2. Briefly summarize any significant changes to the work performed in comparison to the originally proposed and funded plan of work. If changes were made, describe how they affected your ability to achieve the intended outcomes for the work.
 - a. No significant changes were made.

Outcomes

Please characterize key outcomes of the project related to *knowledge*, *training*, *relationships*, and *practice*. Not all projects will have outcomes of all types.

3. To what extent and how (if at all) did this research project advance scientific knowledge of the issue?
 - a. The Trend Viewer is broadly increasing all users' knowledge of the STP fixed site survey program, as well as regional and local understanding of trends in various aspects of Michigan stream fish populations described by the data. This project provides fishery managers with knowledge about whether salmonid populations in their region are in a high or low "phase", and will aid in interpreting individual surveys and informing management decisions. Properly serving these data is enlightening biologists, anglers, interest groups, and the public about current trends in abundance, growth, and survival of important sport fishes in rivers throughout Michigan, and allowing them to see the spatial extent of trends. We have given numerous presentations on the tool, and conducted MDNR press releases and various listserv postings to raise awareness of it and train individuals in how to use it.
4. To what extent and how (if at all) did this project contribute to the education and advancement of graduate or undergraduate students focused on Great Lakes fishery issues?
 - a. This project contributed to the experience of Ashley DePottey, a recently graduated Master's Degree student at Michigan State University, but was not a graduate student project per se.
5. To what extent and how (if at all) did this work help you or others on your team build new relationships with others in the research or management communities?
 - a. By making this information widely available, we are strengthening relationships among partners and publics that MDNR Fisheries Division interacts with. Access to these data may foster additional data-sharing and catalyze further efforts by interest groups, other agencies, and non-profits to collect long-term monitoring data at these and additional sites throughout Michigan.

6. To what extent and how (if at all) do the findings have action implications for fishery managers? If the research has direct management implications, do you have any knowledge of use of the findings by managers? If the research does *not* have direct management implications at this stage, to what extent did the research advance the process of identifying management responses to critical issues?
 - a. It is our desire that anglers, non-profits, other agencies, tribes etc. make accessing the Trend Viewer for stream fish population trend information a standard practice. Public access to trend information will save MDNR Fisheries Division biologists considerable time in summarizing and providing these data to meet the frequent requests from the public, interest groups, and other agencies. We are working with our biologists and interest groups to encourage their constituents and the public to make it a standard practice to look to the Trend Viewer for the latest information on stream fish population trends in their area before asking the biologist for this information. Michigan DNR fishery managers are routinely accessing this information as needed in their daily work.
7. Considering the above or other factors not listed, what do you consider to be the most important benefits or outcomes of the project?
 - a. There are a number of important benefits or outcomes from the project: 1) information from this important inventory program is being shared widely and in the most useful formats; 2) sharing this information helps fulfill the 2007 Inland Consent Decree mandate and MDNR's desire to share these data with the tribes, agencies, universities, and public; 3) the information will be useful to many parties, including fishery managers, anglers, non-profits, and interested publics; 4) the project will be maintained and data kept up to date at minimal cost; 5) personal requests to MDNR biologists for graphs and data summaries of this information should decline over time, saving MDNR personnel time and costs; 6) a process and platform for future data delivery efforts was created.

Related Efforts

8. Was this project a standalone effort, or was there a broader effort beyond the part funded by the GLFT? Have other funders been involved, either during the time of your GLFT grant or subsequently?
 - a. This was a standalone effort, though MDNR provided funding to complete this project.
9. Has there been any spinoff work or follow-up work related to this project? Did this work inspire subsequent, related research involving you or others?
 - a. This work has led to a subsequent pre-proposal to the Great Lakes Fishery Trust to make additional MDNR Fisheries Division survey data from the Status and Trends Program available online (as part of another decision support tool), and to assess online use of the proposed tool and the Stream Fish Population Trend Viewer.

Communication/Publication of Findings

10. List publications, presentations, websites, and other forms of formal dissemination of the project deliverables, tools, or results, including those that are *planned* or *in process*.

- a. The Stream Fish Population Trend Viewer is published and available online at: <http://www.mcgi.state.mi.us/fishpop/#>
- b. This project was presented at numerous venues by Zorn, and can be referenced as “Zorn, T. G., T. Wills, J. Lenz, A. DePottey, J. Booth, S. Yerukola, C. Larson, and H. Quinlan. Delivering local and regional trend data on stream fishes to facilitate collaborative management of Great Lakes and inland fisheries”. Presentations were given at the following venues:
 - MDNR Coldwater Resources Steering Committee meeting, Grayling, MI May 2014
 - Great Lakes Fishery Commission (GLFC) Lake Superior Technical Committee meeting, Ashland, WI, July 2014
 - GLFC Lake Michigan Technical Committee meeting, Manistee, MI, July 2014, (presentation by David Clapp)
 - American Fisheries Society 144th Annual Meeting, Quebec City, August 2014
 - Michigan’s Clean Water Corps 10th Annual Conference, Roscommon, MI, October 2014
 - Michigan DNR Fisheries Division Biologists Conference, Roscommon, MI, December 2014
 - MDNR Research Section meeting, Alpena, MI December 2014
 - MDNR, United States Forest Service (USFS), Keweenaw Bay Indian Community (KBIC), USFWS interagency meeting, December 2014, Kenton, MI
 - MDNR, Michigan Department of Environmental Quality (MDEQ), USFWS, US Army Corps of Engineers interagency meeting, Marquette, MI January 2015
 - Annual meeting of the Michigan Chapter of the American Fisheries Society, Bay City, MI, January 2015
- c. This project was also presented via a MDNR press release, which led to several newspaper articles. Similar information (and a link to the site) was also posted to listserves of the American Fisheries Society’s Michigan Chapter and Northcentral Division, and the Great Lakes Information

Network listserve. An article on the site is planned for the spring 2015 issue of the Michigan Chapter of Trout Unlimited's "Michigan Trout" magazine.

11. Please characterize your efforts to share the findings of this research with state, federal, Tribal and inter-jurisdictional (e.g., Great Lakes Fishery Commission) agencies charged with management responsibilities for the Great Lakes fishery. If other audiences were priority for this research, please characterize your outreach efforts to those audiences as well. (Please note: You may wish to consult midterm reports in which specific audiences for the findings, and means of outreach to these audiences, were identified.)
 - a. Our project was presented to Tribal and inter-jurisdictional agencies at the meetings below, and to some degree through other presentations and listserve announcements:
 - Great Lakes Fishery Commission (GLFC) Lake Superior Technical Committee meeting, Ashland, WI, July 2014
 - GLFC Lake Michigan Technical Committee meeting, Manistee, MI, July 2014, (presentation by David Clapp)
 - MDNR, USFS, KBIC, USFWS interagency meeting, December 2014, Kenton, MI
12. Please identify technical reports and materials attached to this report by name and indicate for each whether you are requesting that GLFT restrict access to the materials while you seek publication. (Please note that the maximum amount of time during which GLFT will restrict access to the results of funded research is six months, unless notified that more time is needed.)
 - a. The project is published online and no additional technical reports were developed.
13. Manuscripts. Grantees submitting one or more publications or pending publications in lieu of a standalone technical report must submit a cover memo that confirms that all aspects of the funded research are incorporated in the published work, and in cases of multiple publications, identifies or crosswalks the grant-funded objectives to the published article containing results.
 - a. Not applicable.
14. Compilation reports. Grantees working on several related subprojects under a single grant may submit a series of subproject reports rather than a single, integrated report. However, grantees must submit a cover sheet or introduction that outlines and crosswalks grant objectives with the location of the results in the compilation document.
 - a. Not applicable.

Discussion

Development of the Stream Fish Population Trend Viewer was the most important outcome of this project. Making this information available to state, tribal, and federal fishery managers, as

well as university and non-profit collaborators, anglers, and the public, will undoubtedly foster a better understanding of the dynamics of stream fish populations in Michigan, and hopefully foster additional data-sharing and collaboration. Hopefully, this work will stimulate similar data sharing efforts by other entities. Great Lakes fishery managers working on stream-spawning species will benefit from having ready access to trends in stream production of these species, for use as index data or inputs in larger-scale (e.g., Great Lake basin) population models. Biologists working on Michigan rivers, local tackle shops, anglers, and interested citizens will all benefit from species abundance data that can be used to compare with past fishing records and to forecast future fishing quality.

Development of a long-term mechanism for maintaining the project and keeping it fresh with the most recent data is also an important, long-term outcome of the project. We have a documented procedure for refreshing project data and ensuring correct linkages among data tables and display options, and will be implementing it in March 2015. Successfully executing the updates is key to the long-term utility and viability of the Trend Viewer. We will work to ensure the application works seamlessly after each update.

The map-based outputs and pairwise comparison of trends between sights confirms the occurrence of regional-scale synchrony in trout populations. However, the Map View display does not provide an exact picture of the extent of annual synchrony among sites, since fixed sites in the STP are sampled on a 3-years off and 3-years on rotation and we set up the Map View to use the most recent survey, so that data would be displayed for all sites. We thought it would be better to display information for all sites, than only half at once, and will monitor user feedback on this topic. Likewise, we will also be monitoring user feedback on the types of information that users found most helpful, as we suspected that there would be differences in the level of interest among data types (e.g., abundance vs. annual survival data).

This project could not have been accomplished without our collaborators. Programmers at Michigan State University impressed us with their technical wizardry and ability to tailor the project to our exact specifications. Project staff at Michigan DTMB have done an admirable job conforming the project to State of Michigan servers, and working through technical glitches that have arisen. We have even greater confidence in their capabilities for future collaborative efforts.

Obtaining information on website traffic would be useful for better understanding the number and types of people using the Trend Viewer. These data have not been obtained yet, given the recent release of the website and ongoing work to publicize it. Accomplishing this task was identified in a pre-proposal submitted to the Great Lakes Fishery Trust in January 2015.



Final Financial Report Instructions

| Reference Number | Instructions |
|------------------|---|
| I. | These are the approved expense categories according to the Grant Agreement or most recently approved budget revision. Definitions of these categories are available on the GLFT website (www.glft.org), under the Proposal Resources tab. |
| II. | These are the approved budget amounts according to the Grant Agreement or most recently approved budget revision. |
| III. | List the expenditures for the project reporting period for the budget line items in Column II. See V below regarding cash versus accrual basis accounting. |
| IV. | Subtract Column III from Column II. Line item amounts may be positive (unused) or negative (overspent). If the <i>total</i> amount in Column IV is positive, please return the unused funds by check made out to the Great Lakes Fishery Trust. |
| V. | Cash basis: The cost of goods and services is recorded when they are received and paid for within the statement period. Accrual basis: The cost of goods and services is recorded when received within the statement period, whether paid for or not. Goods and/or services authorized, ordered, or budgeted, but not yet received before the end of the statement period, should not be included. |

The financial report must be accompanied by financial documentation verifying expenditures (e.g., copies of invoices, record of hours expended, standard accounting ledgers used by your organization, and/or copies of canceled checks with descriptions).

Submit the signed form to the GLFT website following the attached instructions.



FINANCIAL PROGRESS REPORT

GLFT Grant Number: #2012.1243
 GLFT Grant Manager: Jonathon Beard

Organization Name:

FOR THE PERIOD: Start Date: January 1, 2013 End Date: December 31, 2014

| I Expense Categories | II Approved Budget Line Items | III Expenditures of GLFT Funds | IV Difference Between II & III | V Next Period's Proposed Budget |
|-----------------------------|-------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|
| Salaries | \$ | | | |
| Fringe Benefits | \$ | \$ | | |
| Supplies/Materials/Printing | \$ | | | |
| Other Direct Expenses | \$3,279.00 | \$3,471.70 | \$(192.70) | \$0 |
| Overhead/Indirect/Admin | \$ | | | |
| Contract Services | \$40,000.00 | \$39,637.88* | \$362.12 | \$0 |
| Engineering Design Costs | NA | | | |
| Facility Construction Costs | NA | | | |
| Total | \$43,279.00 | \$43,109.58 | \$169.42 | \$0 |

*NOTE: Column III includes cumulative expenditures.

VI: I hereby certify that this financial report form is prepared on (check the basis that applies) a cash basis an accrual basis, and the resulting balance is correct.

Crystal Thomas – Program Support/Financial Specialist

Chief Financial Officer Name and Title (please type)

Chief Financial Officer (signature)

02-13-15

Date

Troy Zorn, Fisheries Research Biologist

Project Director Name and Title (please type)

Project Director (signature)

02-13-15

Date