GREAT LAKES OBSERVING SYSTEM REGIONAL ASSOCIATION

IOOS FY11-15 Semi-annual Report
Grant Number: NA11NOS120041
Report Period: 06/01/16 through 12/31/16

PROJECT SUMMARY

The remaining work to be accomplished during the extension period includes:

- Seasonal deployment of buoys with associated remaining funds.
- Complete planned updates to GLOS Data Portal, GLATOS database, and Heidelberg data management projects.
- Complete data availability projects (DMAC mini-grants) which were competed and started late due to funding availability.

GOVERNANCE AND MANAGEMENT

Due to staff transition over the project period, a significant amount of funds that were allocated to staff or personal service contract support went unspent at the time of the NCXT request. To address this, the ED created a temporary position to support program and partnership development. Although this was not explicitly listed as a milestone in the original grant proposal, a similar type of position (Member Coordinator) was described in the 2013 and 2014 de-scopes provided by the previous GLOS ED.

This position, now called Strategic Advisor, develops and operationalizes organizational strategy in cooperation with the Executive Director, providing advice on the full range of operational and policy issues, as well as directing and cultivating stakeholder relationship management. Marvourneen Dolor is currently on contract through May 2017 to fill this position. She is located in the Washington DC area and represents GLOS at meetings and events. She is also helping us to identify areas to improve membership development, partnership opportunities, and ways to highlight GLOS services and programs to regional stakeholders.

DATA MANAGEMENT

Milestone: Operated and improved the GLOS data portal.
Status: On-track – The DMAC team implemented a streamlined bug report/feature request management workflow based on Github's issue tracking capabilities.

Milestone: *Operated the GLOS data management framework.*
Status: On-track – The DMAC team managed data and metadata streams related to the placement, operation, and removal of nearly 60 buoys and other fixed sensor platforms. GLOS now hosts new regional datasets from the Great Lakes Evaporation Network (GLEN) and the Great Lakes Environmental Assessment and Mapping Project (GLEAM). QARTOD implementation for selected netCDF-based datasets use in the specialized GLOS HABs data portal was piloted. THREDDS 4.6.5 and IOOS 52N SOS 1.1 were updated. Last, the DMAC team provided WAF-based access to TDS/SOS metadata for IOOS harvesting.

DATA MANAGEMENT (Mini-grants)

Milestone: Publication of Results and Nutrient Loading Estimates for the Maumee (OH) River
Status: On-track – During the reporting period, Heidelberg University continued to publish analytical results on a weekly schedule, and a netCDF packaging of the results through the GLOS THREDDS services was implemented and tested.

Milestone: Identify Datasets for2013 Lake Ontario CSMI and Creation of Metadata for the Zooplankton Database
Status: On-track – Identification of data sets to include under this contract is complete and were presented in previous progress report. Additional data are continuously identified and may be added to the databases after the completion of this grant.
A series of metadata documents for the zooplankton database are being reviewed by PIs. These documents outline and describe: database designs and use, data processing workflows and notes about additional processing completed for specific data sets, quality control measures taken before and after receiving data from data providers, and sampling and sample processing methods.

Milestone: Creation of a Bay of Green Bay Lower Fox River Data Mgmt. System
Status: On-track – The creation of the database and GIS mapping component is complete. The map, map application, and feature service are stored in FWWA ArcGIS online (AGOL) account, and is driving the user-interface on the Data Hub for spatial queries. Downloading data for further consideration and scientific use is possible as a JSON, GeoJSON, Shapefile, Excel or.csv. Additional data from all sources (UWGB, UWM, and NEWWater) are being prepared for uploading to the database.

Milestone: Conduct Outreach/Promotional Activities for the Coastal Beach Decision Support System, Virtual Beach
Status: On-track – Presentations on Virtual Beach and the opportunities available through the GLOS grants support (training material, site-visits, training workshop etc.) were given at the Great Lakes Beach Association (GLBA) Conference in Marquette, Michigan on October 6, 2016, and at the Wisconsin Coastal Beaches Workgroup Meeting in Oshkosh, Wisconsin on November 14, 2016. Potential collaborators for future site-visits were identified. An example is the Washington Ozaukee Public Health Department.

Milestone: Developed HAB and Water Quality Data Management Program for Western Lake Erie
Status: Completed – The University of Toledo, Lake Erie Center reviewed its monitoring data set for the year 2002-2014 in western Lake Erie, removing aberrant data caused by sensor malfunction and other causes. An online database has been created by Limnotech and populated with the 2002-2014 data. This database can currently be accessed at http://ltiweb02.limno.com/LEC-WLEB/Home.vbhtml The database also contains metadata such as site location, site name, and date. The database is easily searchable by site, data parameter, and date range. A visual plotting tool is included.

Milestone: Build a Great Lakes Adaptation Data Suite (GLADS)
Status: Completed – In support of the Great Lakes Integrated Sciences and Assessment (GLISA), the University of Michigan Climate Center put together the Great Lakes Adaptation Data Suite (GLADS). It is designed to provide climatological and hydrological information that is useful to the community to watershed managers, tourism and recreation professionals, city planners, municipal decision makers, public health coordinators, and natural resources managers. The University of Michigan Climate Center is in discussion with staff at the NOAA Great Lakes Environmental Research Laboratory about hosting the website for GLADs, which will be the public entry point for accessing these data.

OBSERVATIONS

Milestone: Seasonal deployment and retrieval of buoys.

Status: On-track – Contractors funded by the IOOS and Costal Storms and GLRI-SOAR Programs deployed and retrieved buoys.

Buoy ID	Lake	Initial Launch	Recover	Redeploy	Final Recovery
45023	Superior	May 2	n/a	n/a	Oct. 29
45025	Superior	May 9	July 28	Aug. 26	Oct. 18
45175	Superior	May 17	n/a	n/a	Oct. 27
45027	Superior	Apr. 14	n/a	n/a	Oct. 25
45028	Superior	Apr. 14	n/a	n/a	Oct. 25
45171*	Superior	May 3	n/a	n/a	Nov. 22
45172*	Superior	Jun. 17	n/a	n/a	Nov. 30
45173*	Superior	Jul. 16	Sept.15	n/a	Sept. 15
Endurance	Michigan	May 20	n/a	n/a	Nov. 14
45013	Michigan	May 20	n/a	n/a	Nov. 14
45014	Michigan	May 17	n/a	n/a	Oct. 24
45029*	Michigan	Late April	n/a	n/a	Oct.
45174*	Michigan	May 3	n/a	n/a	Oct. 25
45024**	Michigan	May 11	Jul. 21	Aug. 8	Oct. 19
45022**	Michigan	May 6	n/a	n/a	Nov. 2
45161**	Michigan	May	n/a	n/a	Early-Nov.
45162**	Huron	Mid-Apr.	n/a	n/a	Early-Oct.
45163**	Huron	Mid-May	n/a	n/a	Early-Oct.
ESF1	Ontario	Jun. 20	Oct. 22	n/a	Oct. 22
ESF3	Erie	Jul. 11	n/a	n/a	Oct. 31

*Supported by the Coastal Storms Program

**GLERL-CILER

Gilders/AUV/Vessels of Opportunity:

- Gichigami: Three deployments, totaling 34 deployment days. Western arm deployments and deployment in the vicinity of the Apostle Islands in support of the 2016 Coordinated Science and Monitoring Initiative (CSMI) in Lake Superior.
- Nokomis: Four deployments, for a total of 77 deployment days. This included a 38-day long deployment that traversed Lake Superior from East to West.
- The GLERL-CILER glider was deployed in collaboration with GLERL long term Muskegon transect study with operations support and using batteries purchased with $15,000 in NOAA funding totaling 43 days of operation including 37 days in June, 4 days in August and 2 days in September. The June deployment included a round trip from Muskegon to Milwaukee to continue the time series started in 2012 in collaboration with the UWM ferry and nearshore transects.
- Two sets of GLERL-CILER AUV deployments were run in Lake Erie to support HABs vertical migration investigations in Collaboration with NOAA GLERL and OSU Stone Lab.
- Lake Express High-Speed Ferry: The high-speed ferry monitoring system was installed on April 29 and recovered October 27. The system had one extended down-time period which resulted in

an atypical data gap in the 2016 season; the system was 79.9 percent operational. Some of these data have been used to calibrate and validate a Lake Michigan hydrodynamic / biogeochemical model (recently published in the Journal of Geophysical Research: Oceans).

- Northshore Water Monitoring: The over-winter nearshore monitoring system was deployed November 4, 2016.

Notable Observations:

- On July 28, a passing barge collided with and dragged the South entry Buoy 45025 approximately ¾ mile from its permitted mooring location, causing damage. The buoy, mooring line and 1,800 lb. anchor were found all attached. It was fully repaired over a 29-day period and redeployed on August 26. Michigan Tech, who is now in negotiations with the insurance carrier of the M/V Mohawk, covered the total repair costs.
- At no cost to GLOS, Michigan Tech has continued development and testing of energy harvesting technologies, which will allow buoy deployments lasting longer into the fall when ambient solar radiation becomes a limiting factor.
- The Duluth News Tribune published a story[1] on the University of Minnesota-Duluth glider program in October, 2016.
- A 1.5m TIDAS 9000 buoy (ESF1) was deployed in Lake Ontario off of the City of Oswego during the summer of 2016. The buoy snapped its mooring cable and washed up on shore soon after it lost communication on October 22. There was extensive damage to the buoy and weather station. Initial examination of the wave profile indicated the buoy was being battered by 10-15 foot waves for an extended period of time.
- A public presentation was made at the Great Lakes Sea Kayak Symposium in Grand Marais (July 16). The presentation was attended by ~20 kayakers, who were excited to make use of the buoy data.
- The Ludington buoy (45024) was damaged by a vessel on July 17. The local charter fishing partners provided vessel support to investigate the data outage and recover the buoy on July 21. The buoy mast, with all meteorological instruments had broken off and sank. Using spares loaned from Limnotech and GLERL the buoy was redeployed August 8 from a GLERL vessel.
- During a storm the night of September 9-10, the Munising buoy broke free of its mooring and again drifted toward Pictured Rocks National Lakeshore. The buoy managed to beach itself ~150 m offshore from Twelve Mile Beach (approximately 13.5 km east of its original location). The buoy was retrieved on September 15. The mooring line and anchor may be lost, as the line was severed, likely at a metal shackle.
- During a storm, the Oswego buoy (ESF1) was snapped form its mooring cabled, and washed up on shore soon after it lost communication on October 22. Ten to fifteen foot waves battered this buoy during this period of time.
- The GLERL GLRI SOAR program supported by CILER technicians also provides buoy data from four Western Lake Erie real time buoys to the GLOS HABS portal. These buoys have meteorological as well we nutrient (phosphate and nitrate) instruments. The data stream which is sent directly from these buoys to GLOS has been troublesome due to cellular data dropouts which results in time series gaps on the GLOS portal. For 2017 the data will be routed through the GLERL Real-time Coastal Observation Network (ReCON) with additional QARTOD checks which should ensure no gaps in the record.

[1] http://www.duluthnewstribune.com/news/education/4142404-gliders-provide-depth-scientific-data-lake-superior#.WEcb90Agt9s.link

RECENT PUBLICATIONS

Submitted manuscripts:

Watkins, J.M., P.D. Collingsworth, N.E. Saavedra, B. P. O'Malley L.G. Rudstam. 2016 submitted. Fine-scale zooplankton diel vertical migration revealed by traditional net sampling and a Laser Optical Plankton Counter (LOPC.). Journal of Great Lakes Research.

Kelly, P., B.C. Weidel, M. Paufve, B.P. O'Malley, J. M. Watkins, L.G. Rudstam. 2016 submitted. Concentration and biochemical gradients of seston in Lake Ontario. Journal of Great Lakes Research.

Scofield, A., J.M. Watkins, B.C. Weidel, F.J. Luckey, and L.G. Rudstam. 2016 submitted. Drivers of deep chlorophyll layer (DCL) formation in Lake Ontario: Importance of metalimnetic phytoplankton in a restructured ecosystem. Journal of Great Lakes Research.

O'Malley, B.P., L.G. Rudstam, J.M. Watkins, T.J. Holda, and B.C. Weidel. 2016 submitted. Effects of food web changes on *Mysis diluviana* diet in Lake Ontario. Journal of Great Lakes Research.

Riha, M., M. G. Walsh, M. J. Connerton, J. Holden, B. C. Weidel, P. J. Sullivan, T. J. Holda, and L. G. Rudstam. 2016 submitted. Vertical distribution of alewife in the Lake Ontario offshore: implications for resource use. Journal of Great Lakes Research.

"The Great Lakes Adaptation Data Suite: An Integration of the Physical Science Data for Decision-Making" (*Still in Progress: American Association of State Climatologists Journal of Service Climatology*)

BUDGET ANALYSIS

Spending under the No Cost Extension for Award: NA11NOS0120041 is expected to proceed as planned. Many outstanding GLOS subcontracts have submitted final invoices or are on track to spend out awards before May 2017. Due to recent turnover in the Business Manager Position, there is some concern that staff/personal service contract spending will continue to lag a bit, but we have plans to assess the status of these funds in January 2017 and hire additional temporary help if needed.

Financial reports are up to date. A SF-425 – Cash Flow for period end 09/30/2016 was submitted and accepted on 11/01/2016.