Report of the First Annual
Great Lakes
Forecasting
System (GLFS)
Users’ Workshop

10:00 A.M. - 3:00 P.M.
Thursday, September 22, 1994
The Radisson Harbour Inn
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The Ohio State University
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Jeffrey M. Reutter, Director

The Great Lakes Forecasting System (GLFS) is an operational system that makes regularly scheduled forecasts or predictions of the physical and related variables of the Great Lakes. GLFS was developed by The Ohio State University and the National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Laboratory (GLERL) with support from several utilities, municipalities, and agencies, including Sea Grant.

On behalf of Drs. Keith Bedford, Ohio State, and David Schwab, GLERL, the first annual workshop and this report were coordinated by the Ohio Sea Grant Communications Program (project M/P-2, Grant NA46RG0482) with a special grant from Ohio Sea Grant (Project A/AS-6) and GLERL. Additional copies of this report are available from the Sea Grant office in Columbus. Additional information about the forecasting system is available from either Ohio State (614/292-9582) or GLERL (313/741-2235).

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Introduction

The Great Lakes Forecasting System is a real-time coastal prediction system for forecasting, on a daily basis, the physical state of each of the Great Lakes for the next two days. Forecast variables include the surface water level fluctuation, horizontal and vertical structure of temperature and currents, and turbulence. The system uses meteorological observations, satellite data, and forecasts from numerical weather prediction models as input.

Output from the model provides the current state of the lake and predicts changes for the next two days. This information is used by scientists, government agencies, commercial operations, and the public for enhancement of commercial and recreational activity, resource management, and hazard avoidance. The present system provides daily “nowcasts” of system variables for one lake, Lake Erie.

This meeting was held to solicit feedback from a limited group of users who had been given access to GLFS products in 1994. Feedback came during this informal meeting in Sandusky and from a questionnaire, which was mailed with the invitation to the meeting. Over 100 invitations were mailed to people who had seen GLFS products in 1993 and 1994, although we estimate that only about 30 of the people would be considered “regular” users of the system products if it were actually operational. Therefore, response to the invitation (51 responses), response to the questionnaire (27), and attendance at the meeting (10 users) were quite encouraging.

The questionnaire and the meeting were not intended to be a comprehensive market survey or cost/benefit analysis of the system, but, rather, an informal forum for feedback from a small sample of people outside the development group who might eventually be users of a fully operational system.

Results of the Survey

Of the 27 questionnaires, the greatest number (18) were from university-affiliated users, including Sea Grant. None of the respondents indicated that they were using GLFS products on a daily basis. Most (13) were accessing the system less than weekly but more often than monthly. Most of these used a modem to download the products. Product uses included education, advisory service, and decision-making. Almost all respondents (22) agreed that the system is valuable and needs to be continued, but almost none were able to offer resources to support its further development.
Based on the results of the survey, we might want to examine the development of products that would be useful on a weekly or monthly basis in addition to the daily products. There are also indications that it will be difficult to identify resources outside NOAA to support operation of the system.

Meeting Summary

Presentations were made by Ohio State University staff, Great Lakes Environmental Research Laboratory staff, by Sea Grant advisors, and by the marine focal point at the National Weather Service Office in Cleveland. In addition, during informal discussions, all of the users contributed their impressions of the system's usefulness and suggestions for its further development.

Results of the questionnaire: Keith Bedford from Ohio State noted that the system is in transition from research operation to full implementation. It was not surprising, therefore, that the questionnaires indicated users' desires for a more dependable system.

Procedure for announcing the availability of GLFS:
Announcement to the user community of GLFS availability has been ad hoc. Question was raised concerning a more systematic promotion of the system. One of the users asked about the availability of these types of products for use in commercial weather broadcasts (e.g., TV, radio, USA Today).

We expect that dissemination of products from the system through these channels will eventually be similar to the dissemination of weather data from NOAA. Daron Boyce from NWS Cleveland discussed NWS experience in operational support and distribution of Great Lakes marine products through the DMAWDS (Digital Marine Weather Dissemination System) at Cleveland. The main users of this system are commercial carriers who are given free access to the system in exchange for their participation in the NWS cooperative weather reporting program.

Daron also brought up the subject of liability. He noted that ease of access to the products on the DMAWDS system was important to users and that there is a steep learning curve involved in any electronic access procedures. Different mechanisms for obtaining hard copy output were also discussed. Daron's presentation led to discussion about whether customized products for a particular segment of users (recreational fishermen or divers, for instance) should be generated by the system or by users themselves from generalized system products. It is possible that marine information generated by GLFS could be incorporated into NOAA weather radio broadcasts around the Great Lakes. Daron pointed out that NWS is moving from strictly weather-oriented forecasts toward a broader spectrum of environmental forecasts, which may include subsurface marine conditions.

Present utilization of the system: Keith Bedford discussed EPA's delivering GLFS products shipboard by cellular telephone to optimize their biological/chemical sampling strategies in Lake Erie. Ohio DNR used the system to determine where to seed fish hatchlings in Lake Erie to maximize their survival rate.
Representatives from the Cleveland Water Department discussed their use of GLFS to identify conditions under which the Cleveland CSO would impact water quality at their water intake. The Cleveland Regional Sewer District wants to track run-off from their 17 release sites and major rivers into the lake to determine the impact on water quality at public beaches and shoreline areas.

New GLFS products: Dave Schwab (GLERL) discussed a composite surface water temperature map for the Great Lakes, which is generated daily at GLERL from CoastWatch satellite-derived water temperature maps. Phillip Chu (Ohio State) gave a presentation on the GLFSView 2.0 PC viewing program for GLFS products. Enhancements in version 2.0 include 256 colors, simplified installation, and an animation option. Phillip also talked about the GLFS WWW (World Wide Web) homepage for Internet access to GLFS products. John Kelley (Ohio State) discussed the strategy for using output from NWS (or other) numerical weather prediction models to drive the forecasting part of GLFS. He expected that some experimental forecasts for Lake Erie could be generated this fall. George Leshkevich (GLERL) gave a presentation on NOAA's Great Lakes CoastWatch program. Great Lakes CoastWatch distributes NOAA satellite imagery and related in situ data to over 20 academic and institutional users in the Great Lakes region. GLFS products will be available through the CoastWatch distribution network to CoastWatch users.

New user-defined products: Representatives from Ohio DNR were interested in whether parameters relevant to algal growth (such as turbidity, flow rate, and light regime) could be included in the system. They were particularly interested in nearshore areas at Ashtabula, the Cuyahoga River, the Black River, and Old Woman Creek. The ODNR Office of the Chief Engineer was also interested in how GLFS products could be used to help assess the effectiveness of proposed shoreline control measures before ODNR issues a construction permit. It was noted that although the nearshore zone is beyond the resolution of the current GLFS system, provisions have been made for nesting high resolution nearshore models within GLFS. ODNR also mentioned using GLFS products to assist them (and the U.S. Coast Guard) in search and rescue operations.

There was some discussion of how nowcast and forecast wind fields, waves, water levels, and temperatures could be made available in a format useful for recreational boaters at yacht clubs and marinas. The InterLake Yachting Association was mentioned as a possible contact point.

To optimize drinking water treatment, the Cleveland Water Department needs to know water temperature, turbidity, and dissolved oxygen levels at the water intake approximately 5 km offshore from Cleveland. The department is also interested in tributary coupling, water quality, and contaminant loading issues, as well as the effect of waves on shoreline erosion. Their primary concern regarding these issues is contamination from tributary run-off entering the water supply.
There was also considerable discussion of the educational applications of GLFS from elementary school to college. A high school teacher was particularly interested in incorporating GLFS products into science courses at her school. Ohio Sea Grant staff suggested producing an atlas of GLFS products, which would be useful for education as well as planning and advisory purposes. The last unanimous recommendation was that the GLFS user’s meeting be held annually.

**Recommendations**

As a result of the meeting, these recommendations are made based on comments from the users' group and from the developments team:

1. Continue operation of the Lake Erie GLFS at Ohio State and include forecasting capability.
2. Transfer operation of hazards-related forecasts to NWS Cleveland.
3. Continue development of GLFS for other lakes.
4. Develop nested nearshore models for specific areas that include the capability for predicting water quality parameters.
5. Develop products that are useful over weekly, monthly, or seasonal time periods.
6. Explore educational applications of GLFS.
7. Examine new avenues for dissemination of GLFS products, i.e., commercial weather broadcasts, marinas, NOAA weather radio, NWS Cleveland DMAWDS, etc.
8. Hold a GLFS user's workshop on an annual basis.

**Attachments**

1. List of invitees
2. Invitation letter
3. Questionnaire and results of survey
4. Agenda
5. List of attendees
### First Annual Great Lakes Forecasting System User's Workshop

**Mailing List (mailed 24 August 1994)**

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The Ohio Sea Grant College Program, NOAA's Great Lakes Environmental Research Laboratory (GLERL), and The Ohio State University request your participation in the First Annual Great Lakes Forecasting System (GLFS) User's Workshop on Thursday, September 22, 1994 from 10:00 A.M. to 3:00 P.M. at the Radisson Harbour Inn in Sandusky, Ohio. There is no registration fee, and lunch and afternoon refreshments will be provided. Participants will receive the latest GLFSView program and documentation. The time and place of this workshop were scheduled especially for those wishing to stay and attend the annual Ohio Lake Erie Conference on the following day, Friday, September 23 (see enclosure).

GLFS was initiated at Ohio State in 1992, and now distributes computer graphics four times a day through GLFSView, CoastWatch, Mosaic, and Internet FTP. The information is also deliverable to vessels on the lake. Short range and 36-hour forecasts of all of the system's variables are scheduled to begin this fall. GLFS is also the prototype for NOAA Coastal Forecast Systems on other U.S. coasts. The technical aspects of the system are well developed. However, to continue federal funding that will keep GLFS in operation, we must find a permanent administrative residence and show that there is public interest and practical application of the system. That is why we are asking for your help.

We plan to write a report on who uses our system, how you use it, and what new products you would like to have from it. To that end, we ask that you please fill out the enclosed questionnaire and workshop registration form and return it to us by no later than September 1 in the self-addressed stamped envelope provided. We will tally your responses and present them at the workshop. We also ask those of you who current use GLFS information to speak informally for 5 to 10 minutes on how you have used the system. (We will contact you in early September to confirm your talk.)

For further information, please contact Maran Hilgendorf at Ohio Sea Grant (614/292-8949), Dave Schwab at GLERL (313/741-2120), or Keith Bedford at Ohio State (614/292-6589). Thank you in advance.

Sincerely,

[Signatures]

Dr. Keith W. Bedford
Professor of Civil Engineering

Dr. David Schwab
Physical Scientist

Enclosures
First Annual
Great Lakes Forecasting System (GLFS)
User's Workshop

Thursday, September 22, 1994
10:00 A.M. to 3:00 P.M.
(LUNCH WILL BE PROVIDED)
Radisson Harbour Inn — Sandusky, Ohio

To reserve a sleeping room, phone 800/333-3333 by September 7 to receive the Ohio Lake Erie Conference discounted rate of $79.

AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 A.M.</td>
<td>GLFS Overview OSU/GLERL</td>
</tr>
<tr>
<td>10:30 A.M.</td>
<td>Survey Summary OSU/GLERL</td>
</tr>
<tr>
<td>10:45 A.M.</td>
<td>User Presentations Participants</td>
</tr>
<tr>
<td>12:00 P.M.</td>
<td>LUNCH</td>
</tr>
<tr>
<td>1:00 P.M.</td>
<td>User Presentations cont'd</td>
</tr>
<tr>
<td>1:20 P.M.</td>
<td>New Products OSU/GLERL</td>
</tr>
<tr>
<td>1:40 P.M.</td>
<td>New Products—User Defined Participants</td>
</tr>
<tr>
<td>2:20 P.M.</td>
<td>Defining New User Communities Participants</td>
</tr>
<tr>
<td>2:40 P.M.</td>
<td>Final Remarks All</td>
</tr>
</tbody>
</table>

For further workshop information, call 614/292-8949.
Great Lakes Forecasting System (GLFS) 1994 User's Questionnaire

Please take a few minutes now to complete this questionnaire. Your answers will help us determine who uses GLFS, which products are used, and why. If you aren't using GLFS, we need to hear from you, too. Return your response by September 9 in the self-addressed stamped envelope provided to:
Ohio Sea Grant College Program, The Ohio State University
1314 Kinneor Road, Columbus, OH 43212-1194
614/292-8949, FAX 614/292-4364

51 responses

Circle the response that applies.

1. Do you plan to attend the user's workshop on Thursday, September 22? Complete and send the workshop registration form with this questionnaire or as soon as your plans are confirmed.
   A. I do plan to attend.
   B. I do not plan to attend.

2. Are you an employee of the
   A. federal government
   B. state government
   C. local government
   D. university, including Sea Grant
   E. public school sector
   F. private sector (specify)
   G. interested citizen (not using GLFS for work purposes)
   H. other (specify)

3. Do you obtain GLFSView products,
   A. exclusively for yourself
   B. for other people to use, too
   3a. How many other people use your copy of the products? ______

4. Do you download and use GLFS products
   A. daily
   B. less often than daily but no more often than weekly
   C. less often that weekly but no more often than monthly
   D. never
   4a. If you obtain products daily,
      A. do you obtain them immediately when they're first available?
      B. do you obtain them whenever it's more convenient?

5. Do you store products for future use?
   YES NO

Circle all of the responses that apply.

6. How have you obtained products?
   A. modem – at 1200, 2400, 9600, 14,400 (circle baud rate used)
   B. Internet
   C. CoastWatch
   D. GLFSView
   E. Mosaic
   F. only used update provided by GLFS staff
7. Why do you use GLFS products?
   A. business or commercial use
   B. recreational activities
   C. education
   D. scientific purposes
   E. government agency
   F. private agency
   G. other (specify) __________

8. How to you use the information?
   A. decision making
   B. advisory service
   C. operations and planning
   D. other (specify) __________

9. If you do not use GLFS products, is it because
   A. it is too hard to run the program
   B. it is too hard to obtain the updates
   C. you have no application (use) for them
   D. you don't have the necessary equipment
   E. the information is not useful

9a. If you indicated that GLFS products are currently not useful, would you
   A. be willing to help identify improvement and/or applications?
   B. be willing to commit resources to develop the proper information?
   C. be willing to commit resources to purchase necessary equipment?

Circle the response that applies.

10. Would you agree that the system is valuable and needs to be continued? YES NO

11. Would you or your agency be willing to invest in creating new modules for the system? YES NO

12. Would you or your company be willing to help financially support the system? YES NO

13. If you are not a committed, frequent user, is it because GLFS is not yet permanent and therefore dependable system upon which to base decisions? YES NO

14. Would your daily or weekly activities suffer if this information were not available? YES NO

This questionnaire has been completed by

Name __________________________ Signature __________________________

Business/Agency __________________________ Date _________________
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