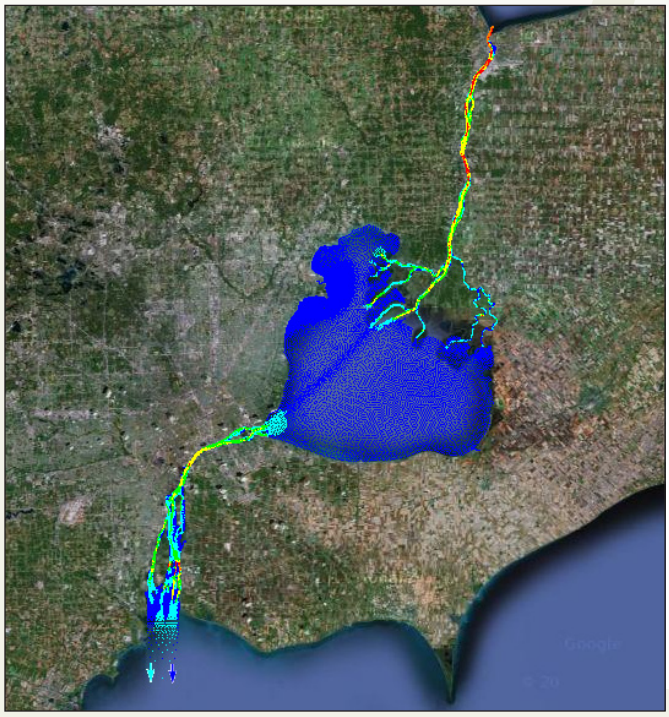
Predicting and Tracking Contaminant Spills in the Huron-Erie Corridor

PROJECT OVERVIEW

CILER Assistant Research Scientist Eric Anderson, GLERL researcher David Schwab and the Great Lakes Observing System (GLOS) developed and used the Huron to Erie Connecting Waterways Forecasting System (HECWFS) -- a computer model that predicts real-time water levels and currents -- to simulate various contaminant spills in the Huron-Erie Corridor (HEC). The corridor includes Lake St. Clair, and the St. Clair and Detroit rivers. The model was able to show them where, and how quickly, potential contaminant spills may travel in the corridor. To ensure the validity of the model's predictions, Anderson and Schwab then released a small amount of water soluble dye into the St. Clair River to mimic different spill scenarios. The results from the model and dye releases allowed Anderson and Schwab to develop a Spill Reference Library, which includes information like how quickly and at what concentration a contaminant may travel to different locations. This information will allow decision makers, such as water intake managers, to better prepare and react to contaminant spills. This project is the first of its kind for the Huron Erie Corridor and fulfills a crucial forecasting gap in the Great Lakes region.



The Huron-Erie Connecting Waterways Forecasting System as viewed through Google Earth.

THE HURON-ERIE CORRIDOR

The Huron-Erie Corridor is made up of the St. Clair River, Lake St. Clair and the Detroit River system. These three serve as the only connecting waterway between Lake Huron and Lake Erie and the only commercial shipping route between the upper and lower Great Lakes, making it a high-use area.

The area is heavily industrialized – including several petrochemical plants. The presence of this industry combined with the area's drinking water intake facilities, recreational beaches and more than 150,000 registered recreational boats make the corridor a high-risk area for contaminant spills and the potential negative impacts a spill could have on the area's industry, recreation, human health and wildlife.

HURON TO ERIE CONNECTING WATERWAYS FORECASTING SYSTEM (HECWFS)

Anderson, with the cooperation of Schwab and funding from the GLOS, developed HECWFS in order to provide real-time nowcasts (present conditions) and forecasts (predictions) of physical conditions such as water currents and levels in the HEC. Currently, HECWFS provides nowcasts every 3 hours, which are made available to the public in real-time using Google Earth, and 48-hour forecasts every 12 hours.

Before 2008, when HECWFS became operational, a real-time prediction system was unavailable for the corridor despite the crucial role it plays in recreation, drinking water, industry and commercial shipping. HEC decision makers, stakeholders and law enforcement can use the information provided by HECWFS to aid in HEC navigation, spill response, identifying fish kill sources, search and rescue, forensics, drinking water safety, beach quality forecasting and more.

Please see the resources listed on the back page to access HECWFS real-time data and for more information.

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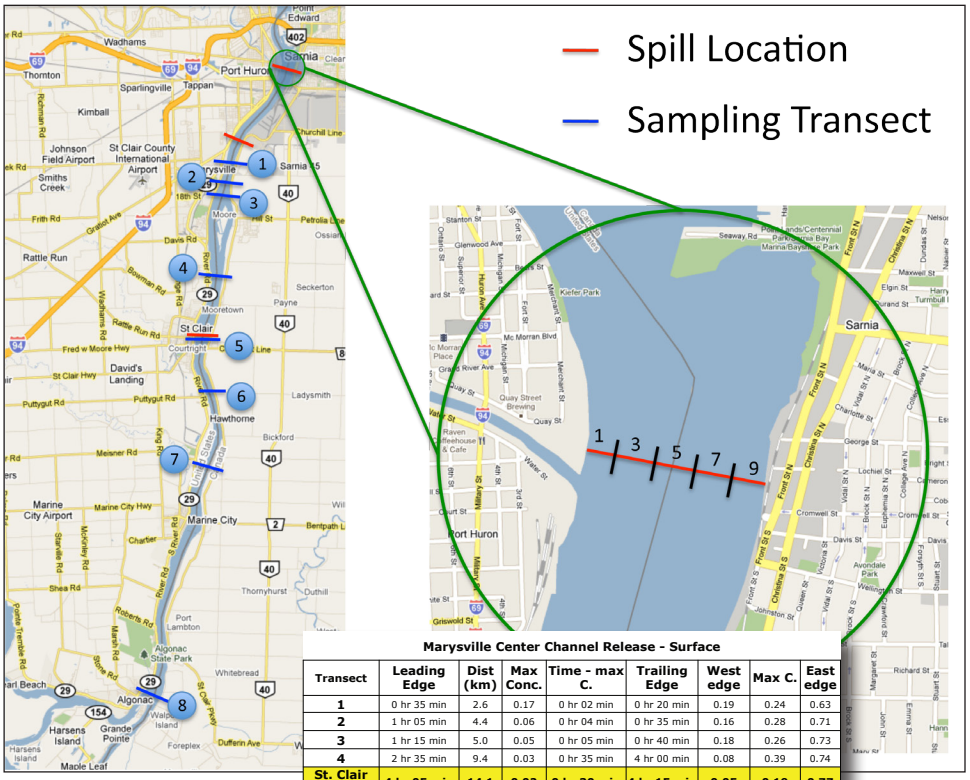
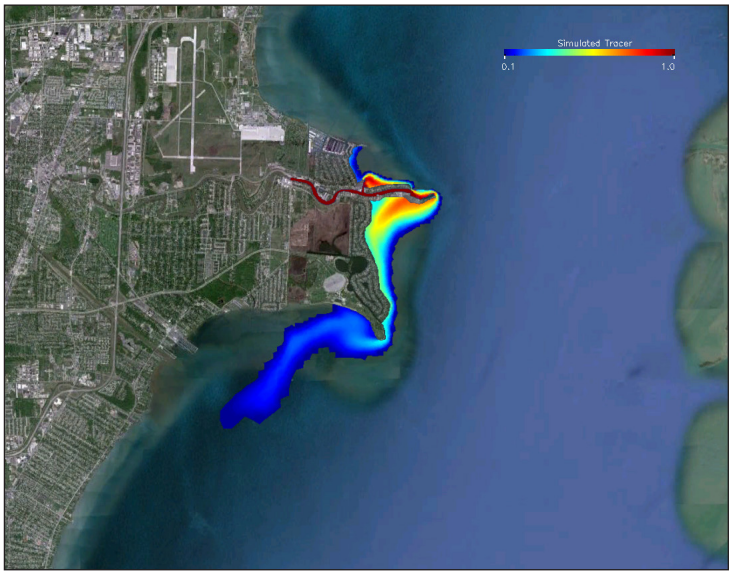
SPILL REFERENCE LIBRARY

Using HECWFS and the subsequent dye release data, Anderson and Schwab carried out several contaminant spill scenarios for the HEC. This information was used to develop the Spill Reference Library, which contains several sets of tables that aim to inform and give decision makers the tools needed to plan for, and react to, a contaminant spill. Each table includes information about how an area might be impacted, like the estimated arrival time of the leading and trailing edge of the spill, the maximum concentration of the contaminant and whether the contaminant mixed vertically or horizontally in the water column. The full Spill Reference Library is being compiled and will be distributed through GLOS and NOAA-GLERL.



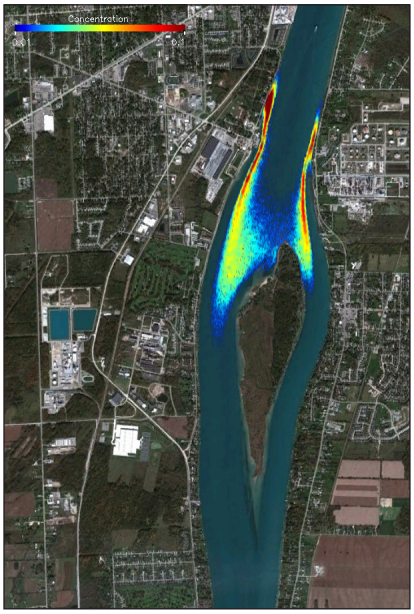
Marysville Center Channel Release - Surface

Transect	Leading Edge	Dist (km)	Max Conc.	Time - max C.	Trailing Edge	West edge	Max C.	East edge
1	0 hr 35 min	2.6	0.17	0 hr 02 min	0 hr 20 min	0.19	0.24	0.63
2	1 hr 05 min	4.4	0.06	0 hr 04 min	0 hr 35 min	0.16	0.28	0.71
3	1 hr 15 min	5.0	0.05	0 hr 05 min	0 hr 40 min	0.18	0.26	0.73
4	2 hr 35 min	9.4	0.03	0 hr 35 min	4 hr 00 min	0.08	0.39	0.74
St. Clair intake	**4 hr 05 min**	**14.1**	**0.02**	**0 hr 30 min**	**4 hr 15 min**	**0.05**	**0.19**	**0.77**
6	5 hr 05 min	17.3	0.02	0 hr 35 min	4 hr 25 min	0.07	0.23	0.81
7	6 hr 10 min	21.0	0.02	0 hr 45 min	4 hr 35 min	0.14	0.34	0.82
8	11 hr 15 min	36.4	0.01	2 hr 00 min	6 hr 30 min	0.04	0.17	0.97



Anderson and Schwab used modeled spills to simulate how a contaminant may travel in the waterway.

A tracing dye was used to predict where Clinton River water goes and how it affects nearby recreational beaches, such as Metro Beach.



FOR MORE INFORMATION

GLOS HECWFS website:
http://data.glos.us/hecwfs/

GLERL HECWFS website:
http://www.glerl.noaa.gov/res/hecwfs/

REFERENCES

EJ Anderson et al. 2010. Real-time Hydraulic and Hydrodynamic Model of the St. Clair River, Lake St. Clair, Detroit River System. *Journal of Hydraulic Engineering* 136(8).

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