Mapping and Modeling *E. coli* Occurrence in Lake Michigan Using GIS: Implications for Public Health

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Research Question and Approach

How does *E. coli* vary over space and time in a near shore fresh water lake environment?

- Using EPA EMPACT data from West Beach, IN
- Explore spatial and temporal variability using:
  1) Regression Modeling
  2) GIS and Visualization
  3) Geostatistics
- Explore policy implications for beach management policy and forecasting

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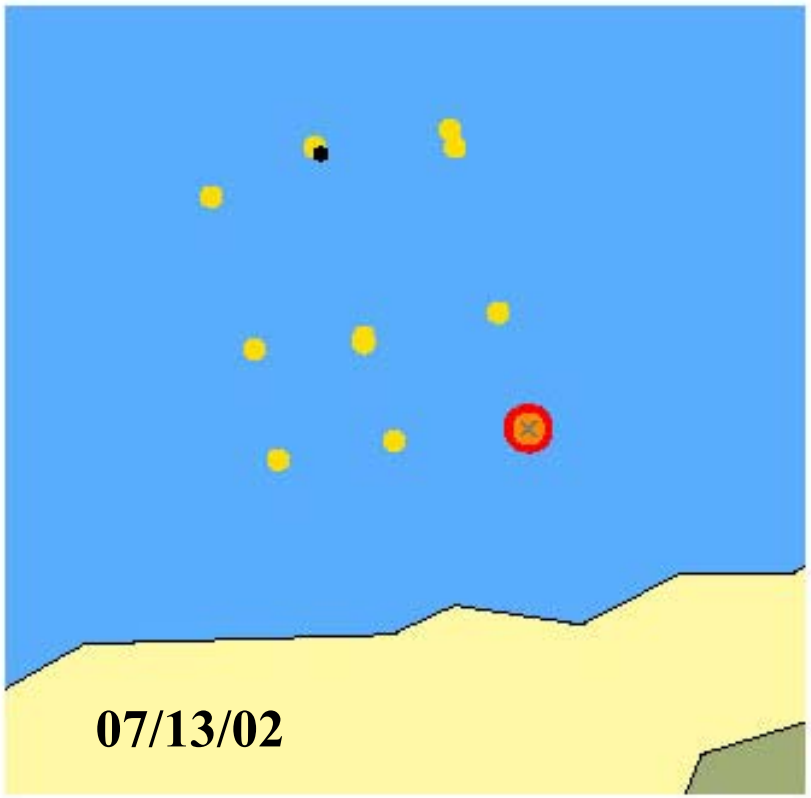
VARIABLES	COEFFICIENTS $R^2 = 0.294$ (N =2209)	t-values	Sig.
Constant	6.904	10.344	.000
Scheduled Time	Removed	**	**
Day Hour Code	2.074×10^{-3}	2.614	.009
Depth	- 0.222	-11.245	.000
Turbidity	1.88×10^{-2}	11.564	.000
pH	- 0.68	- 9.134	.000
Air Temperature	Removed	**	**
Water Temperature	$- 1.65 \times 10^{-2}$	- 1.959	.050
48 Hour Rain Total	4.059×10^{-2}	7.973	.000
Wind Vector	8.913×10^{-3}	6.051	.000
Bathers Nearby	7.323×10^{-4}	2.827	.005
Wave Height	$- 4.58 \times 10^{-2}$	- 1.731	.084
Sunny Day	4.531×10^{-2}	2.327	.020
Log *E. coli* 1 Day Lag	.265	10.585	.000
Seagull Presence	Removed	**	**

Visualization: Day by Day



Sampling Locations by *E. coli*
Density per 100mL

- 0
- 1 -124
- 125 - 234
- 235 - 6000
- No Data
- Mixed Forest and Dunes
- Beach
- Lake

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Future Directions: Regional Forecast Modeling

- USGS and EPA funded project plan:
  - Cooperate with numerous jurisdictions
  - Create regional spatial database using *E. coli* data from 52+ beaches including environmental variables
  - Conduct regional forecast mapping and modeling
  - Investigate policy implications and risk communication strategies

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