

Toward a Regional Nowcast Model for Southern Lake Michigan Using Data Readily Available to Beach Managers



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science for a changing world

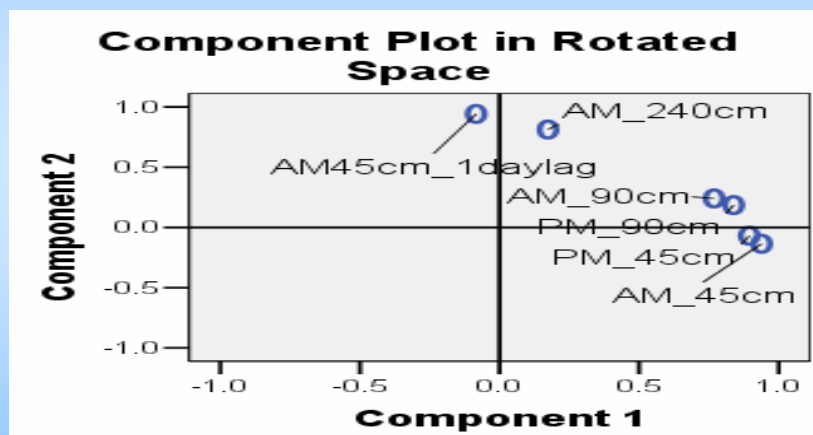
Local Forces

- Morphology
- Shoreline Exposure
- Sources
 - Direct (e.g., sewage, birds, swimmers, streams)
 - Indirect (e.g., re-suspension, sands, algae, runoff)



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Factor Loading Plot, PCA, AM & PM Water @ 63rd St.

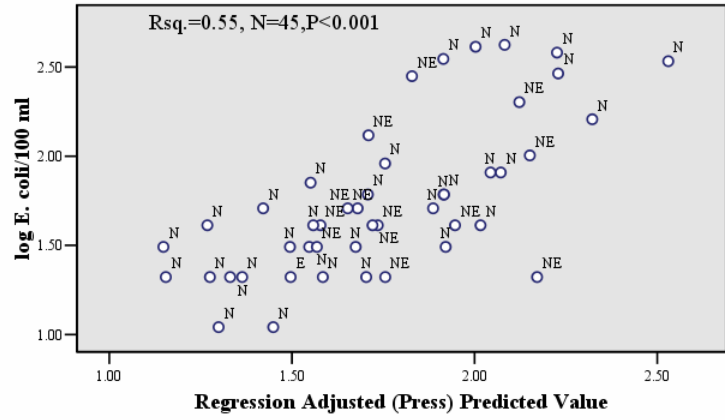


Burns Ditch: Westerly Wind



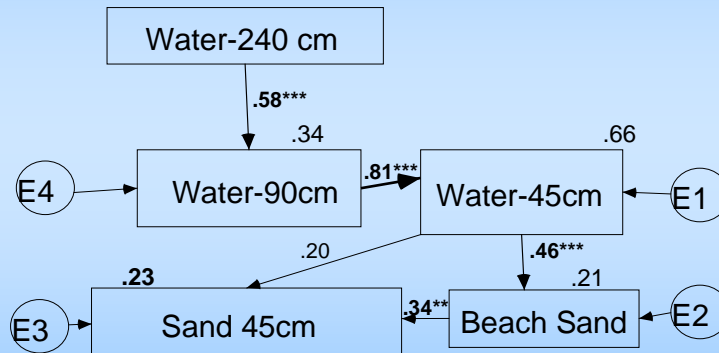
E. coli Predictions For North to Northeast Winds, Ogden Dunes

$$\text{Log } E. coli = 0.833 + 0.015(\text{Color}) + 0.007(\text{Chl.}) - 0.012(\text{Turb.}) + e$$



Path Analysis of *E. coli* in sand and water, 63rd Street, Chicago

(N=66, Chi-square=6.6, df=5, p=0.251)



Cumulative R square above box, Regression Weights above arrows

Regression Weights Significance (*=0.05, **< 0.01, ***< 0.001)



General Forces

- Currents
- Season
- Diurnal & Lunar
- Weather
- Offshore conditions



Regional Forecast Model

- 55 southern Lake Michigan beaches
 - *E. coli* data 2000-2003
- 15 meteorological stations
 - 3 GLERL Coastwatch Station
- 2 coastal wave/direction gauge US ACOE
- 1 offshore buoy (NDBC-NOAA)
- 4 visible (IN, IL), 1 UV (IL) solar radiation
- ADCP (NOAA, USGS, Chicago)



Southern Lake Michigan Beaches

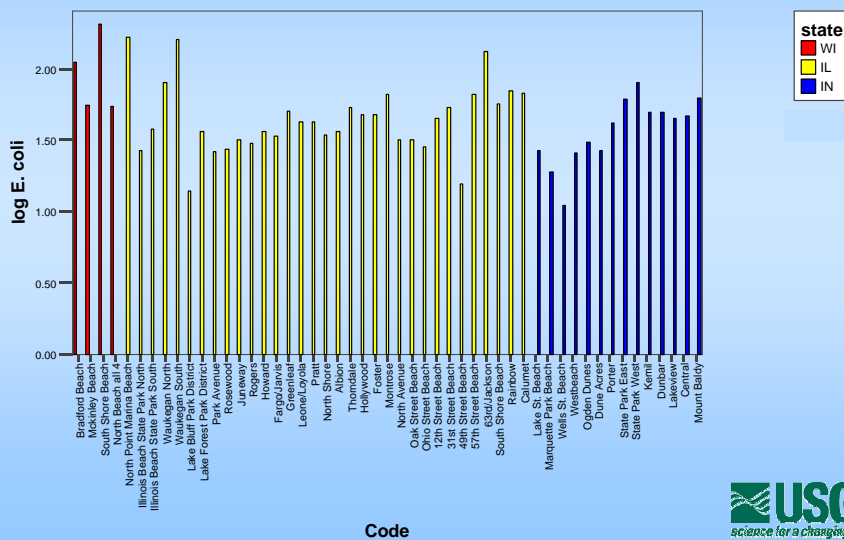


LakeSat.org
 ERSC MODIS image
 September 3, 2002

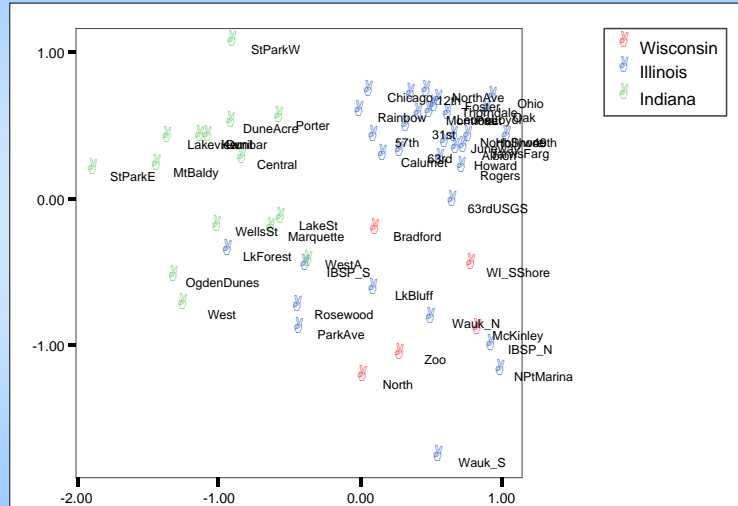
Lake Michigan



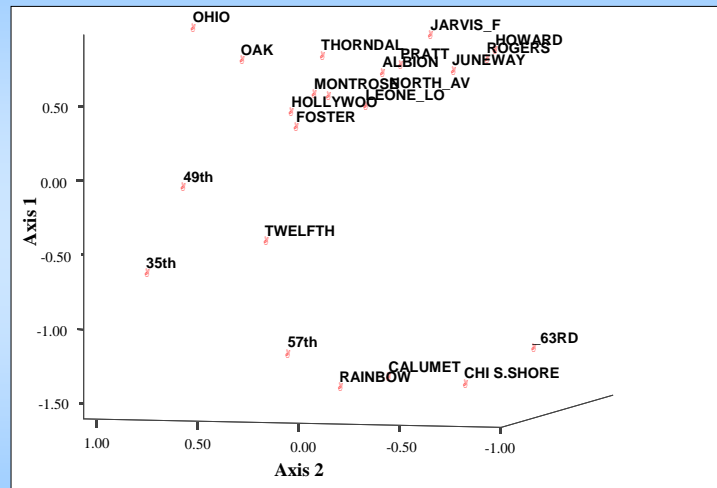
Median Log *E. coli*/100ml For 55 Beaches of Southern Lake Michigan, Summer 2000-2003.



MDS Plot of *E. coli* at All Beach Sites



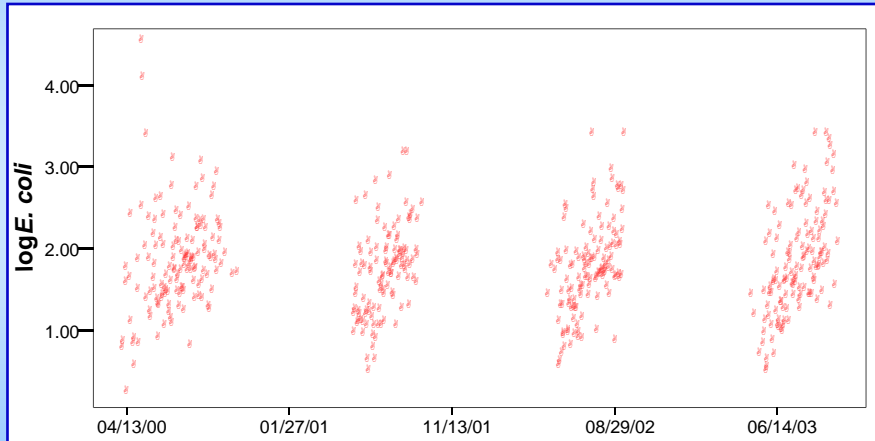
MDS Plot of *E. coli*, Chicago Beaches



Stress=1.3, Rsq=0.93



E. coli Counts During Summers 2000-2003, Southern Lake Michigan



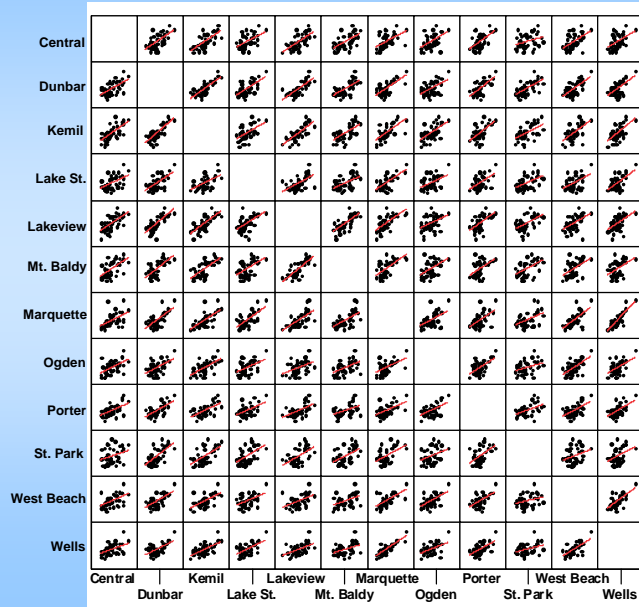
Indiana Beaches



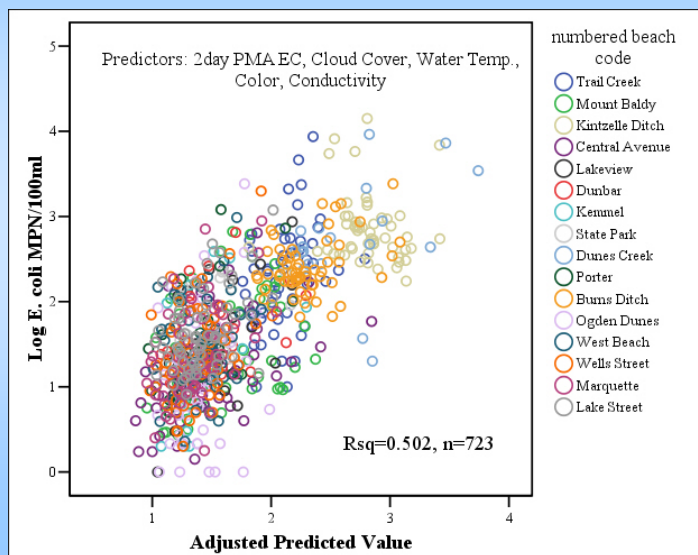
LakeSat.org
ERSC MODIS image
September 3, 2002



Indiana Beaches Scattergram



Prediction Model 13 Beaches, 3 Creeks of Indiana



Wind Direction		Function
		1
Southerly	EC_3dayPMA	.736
	Rain	.441
	Temp_10PMA	.350
	Stage	.295
	Wave ht.	.264
	Insolation ^a	-.137
	Windspeed ^a	.063
	Pressure ^a	.023

Correlations between Discriminating Variables and Canonical Discriminant Functions

a. Variable not used in the analysis ($p > 0.05$)

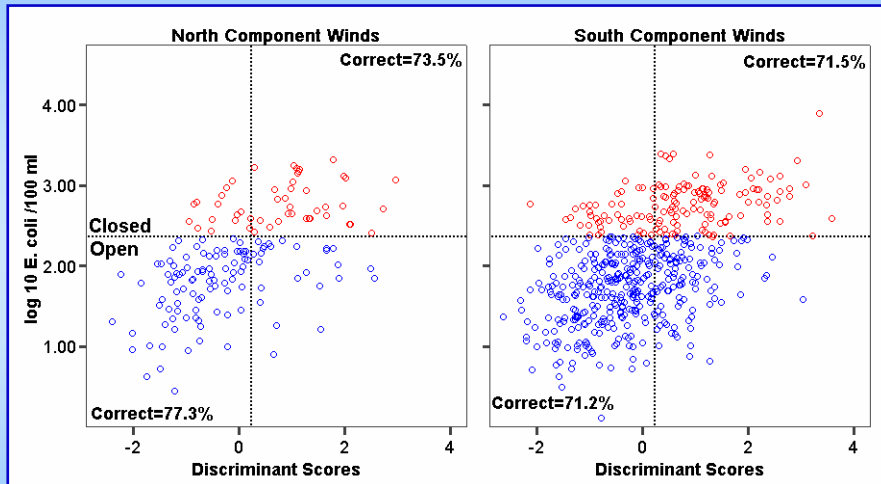


Wind Direction		Function
		1
North Component	Wind Speed	.531
	Stage	.529
	Wave Ht. ^a	.443
	Rain	.436
	EC_PMA	.348
	Insolation ^a	-.134
	Pressure ^a	.050
	Temp_PMA ^a	.025

Correlations between Discriminating Variables and Canonical Discriminant Functions

a. Variable not used in the analysis ($p > 0.05$)





Acknowledgments

GLERL NOAA, Cities of Milwaukee, Racine, Chicago, Gary; National Park Service, Chicago PD, Indiana DNR, Lake County, IL, USGS, EPA, US ACOE, IN Dept. of Environment, NWS, State Meteorologists: IL, IN and WI.





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