Path to Mitigation: Why do I want to work on my beach?

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Challenges to Beach Monitoring and Remediation

- **Why?**
- **Where to start?**
- **Cost?**
- **Political will**
- **I have used it since 1930!**

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A part of our history and heritage.

Recreational Water:
An Integral Part of the Culture of Water-Rich States

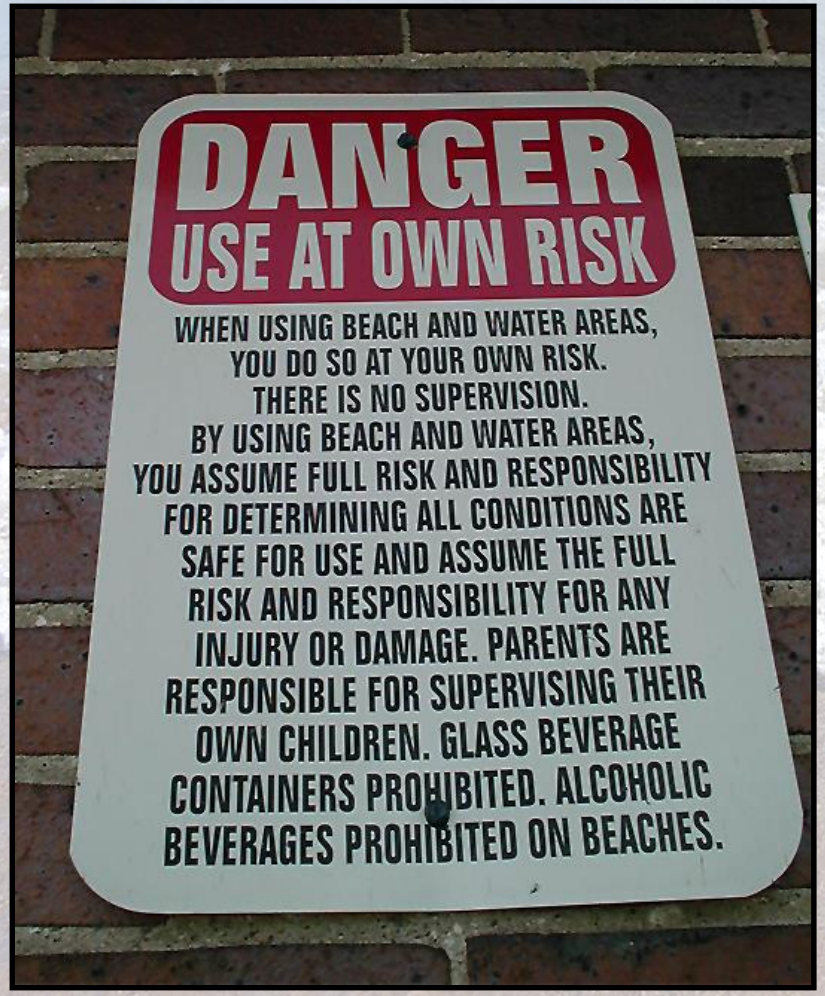
Oshkosh, WI - 1911

EVERYONE POOPS

By Taro Gomi

KM Kane/Miller Book Publishers

A Public Health Issue



Indicator organism results provide an assessment of the "RISK" of contacting a more pathogenic microorganism.

What is "Risk"?

A statistical probability of an event occurring in a population

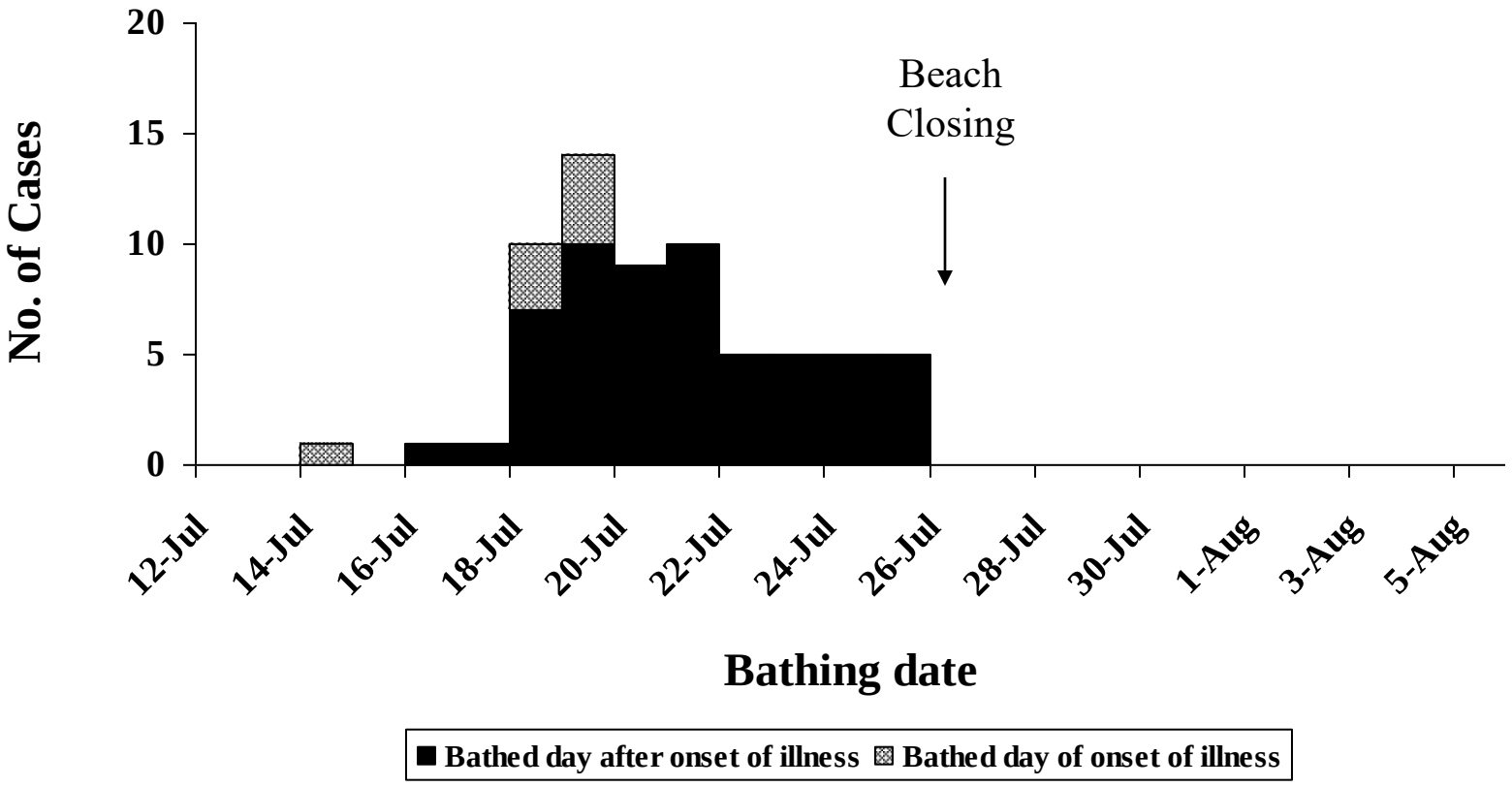
In order to assess 'real' risk you must know the source!

Beach Monitoring

While any data that helps make decisions is good…no substitute to monitoring.

Here is why…..

2002: Days that symptomatic campers bathed in Nicolet Beach



From: R. Kohlberg, DC Health Department

2016: Eagle Beach, Eagle River, WI

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Much Monitoring has Occurred Since BEACH Act…
There is still more that is needed!

Beach Sanitary Survey

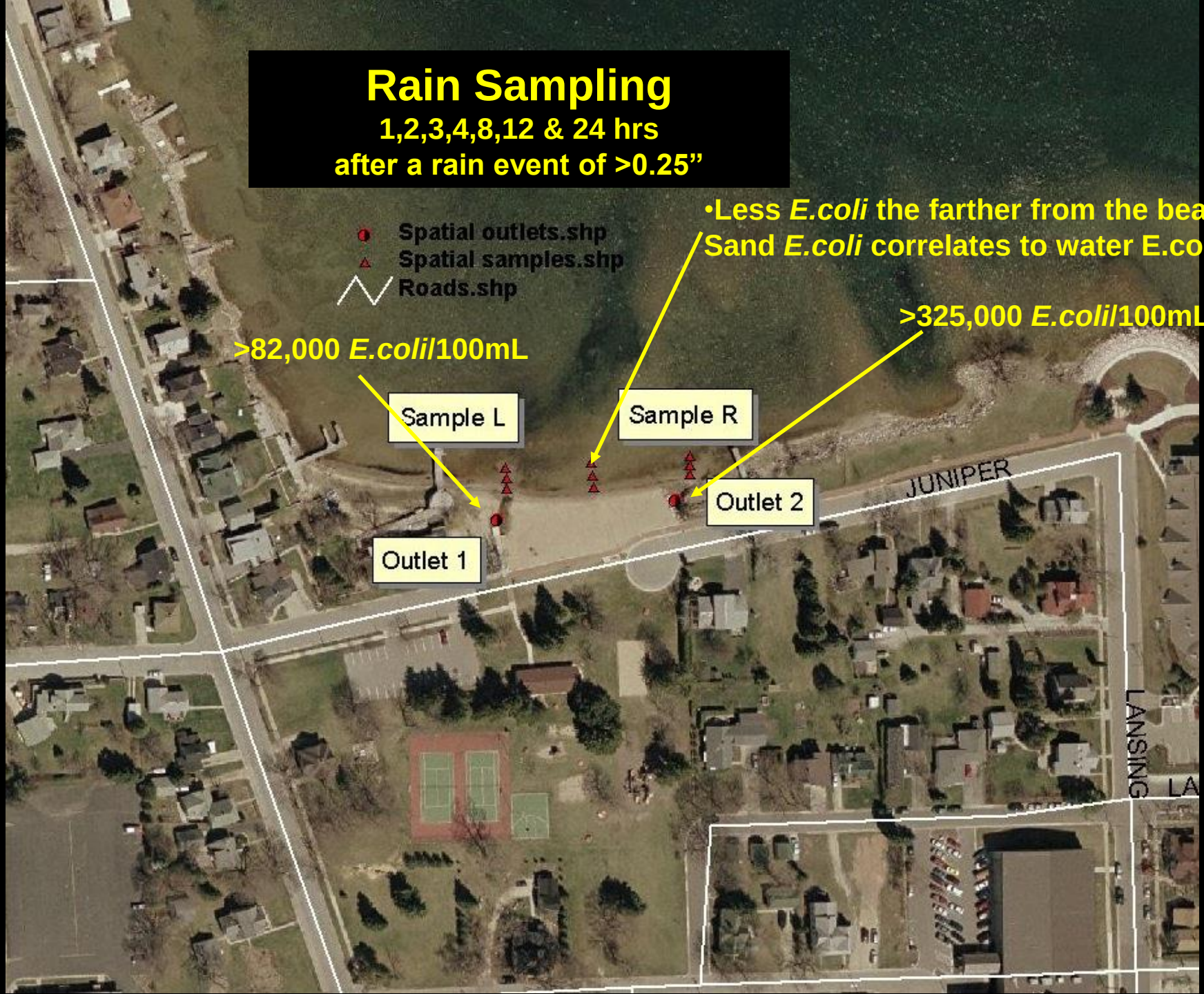
To explore and accurately characterize beaches along Lake Michigan and Lake Superior in terms of possible sources of microbial pollution entering the beach area.

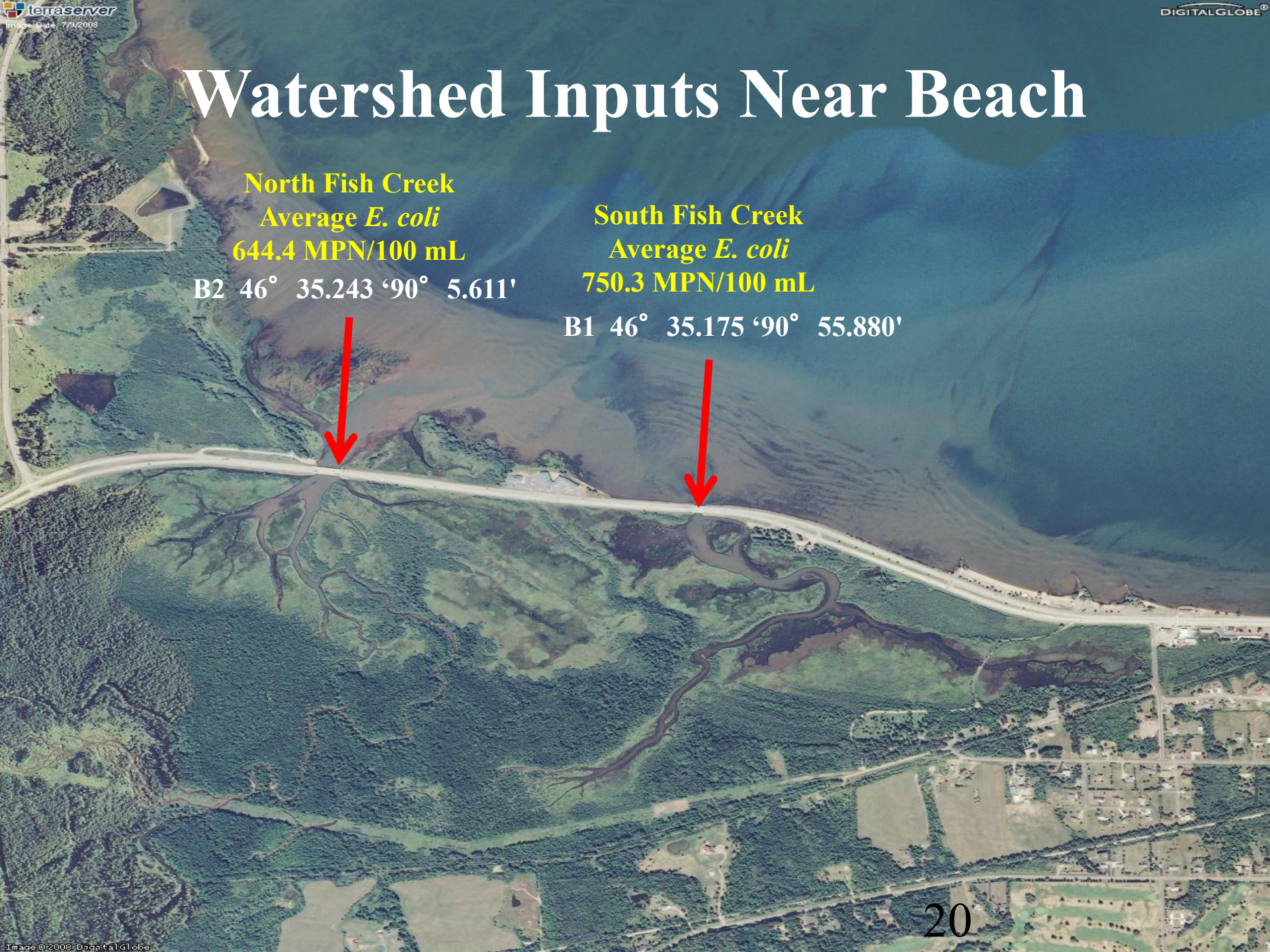
Find Sources

Find Sources

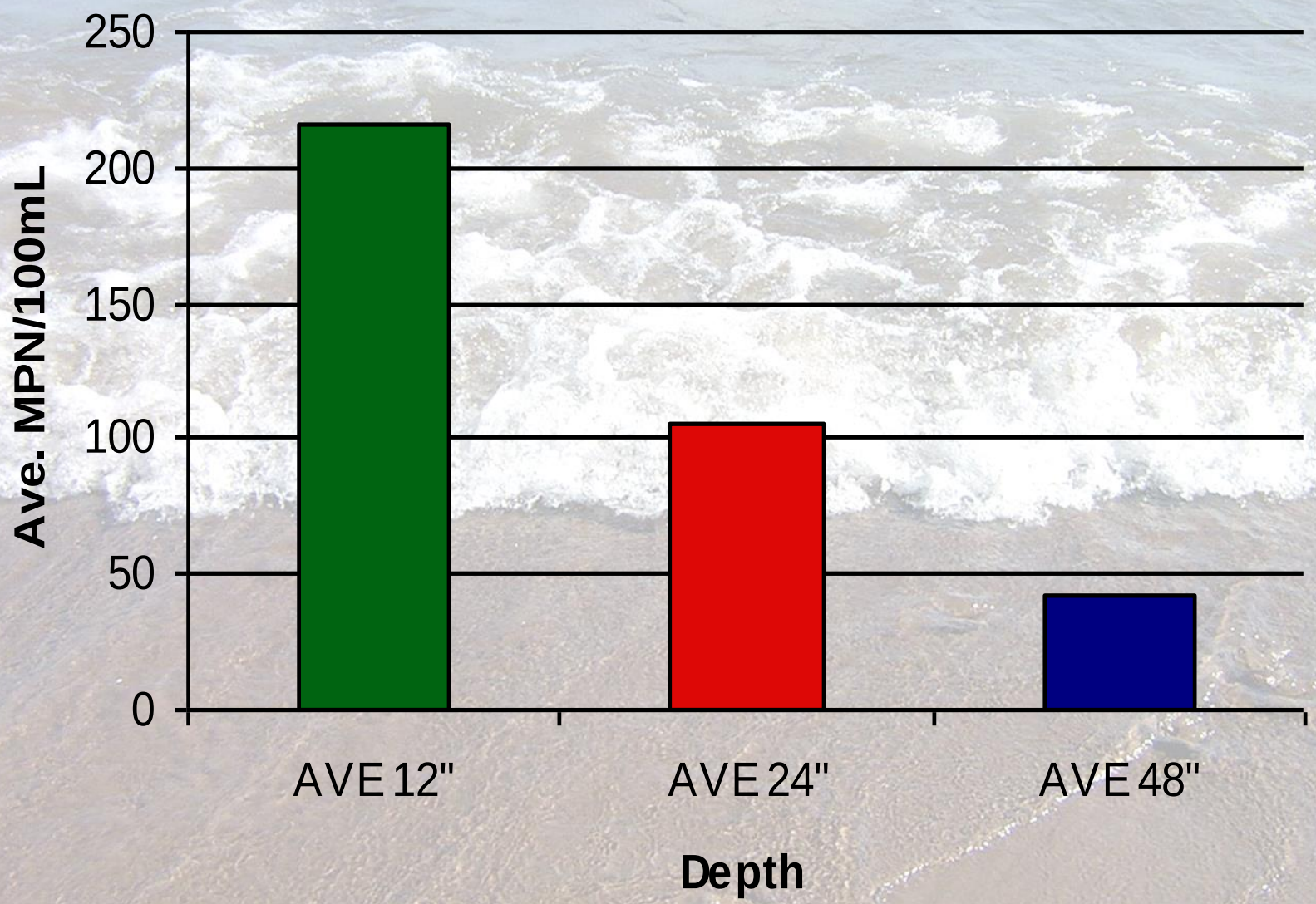
Find Sources


Unknown Lake, WI
<1
210
230
480
620
850
1980
1890
>2419
>2419
>2419
>2419
>2419
<1
Next year… no test over 100 MPN/100mL!!!
© LandVoyage.com, USGS

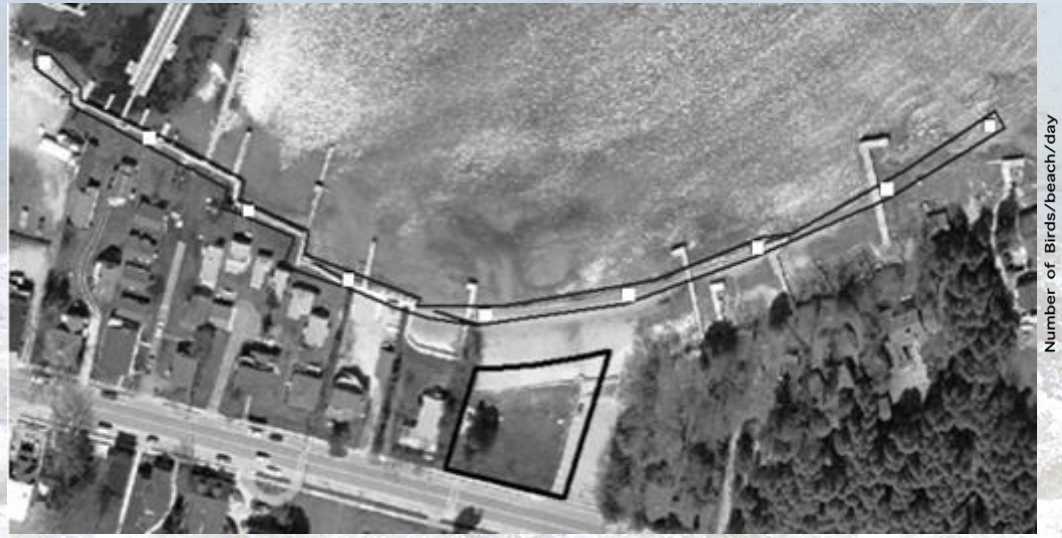

Rain Sampling
1,2,3,4,8,12 & 24 hrs
after a rain event of >0.25”
Spatial outlets.shp
Spatial samples.shp
Roads.shp
•Less E.coli the farther from the beach
Sand E.coli correlates to water E.coli
>325,000 E.coli/100mL
>82,000 E.coli/100mL
Sample L
Sample R
Outlet 1
Outlet 2
JUNIPER
LANSING

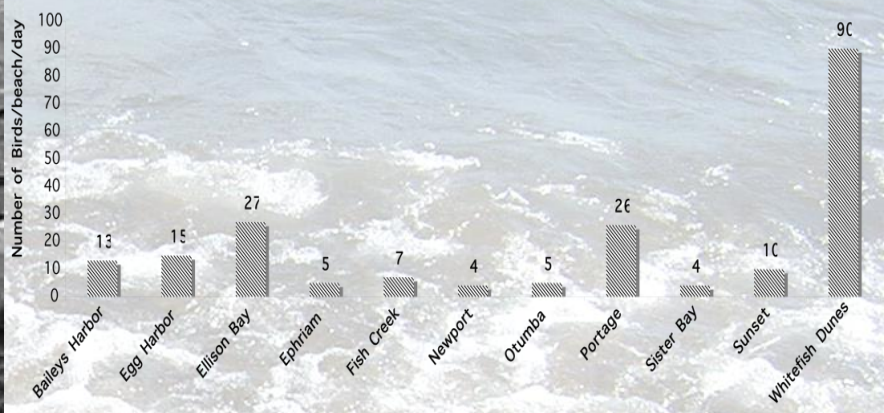

terraserver
Image Date: 7/3/2008
DIGITALGLOBE
Watershed Inputs Near Beach
North Fish Creek
Average E. coli
644.4 MPN/100 mL
B2 46° 35.243 '90° 5.611'
South Fish Creek
Average E. coli
750.3 MPN/100 mL
B1 46° 35.175 '90° 55.880'
Image © 2008 DigitalGlobe

Depth is very important



Avian Waste





Beach	Mean $\log_{10}$ *E.coli* Concentraion	Gulls as a Percent of Total Birds Present	Geese as a Percent of Total Birds Present
Baileys Harbor	1.44	78%	21%
Egg Harbor	1.45	53%	43%
Ellison Bay	1.65	41%	27%
Ephraim	1.05	61%	27%
Fish Creek	1.58	36%	30%
Newport	0.79	88%	4%
Otumba	1.68	18%	73%
SisterBay	1.30	67%	7%
Sunset	1.79	78%	18%
Whitefish Dunes	1.17	100%	0%

Beach	Avian Waste vs. Bird Counts	Avian Waste vs. Bird Counts: p-value	Avian Waste vs. *E.coli*	Avian Waste vs. *E.coli*: p-value	Bird Count vs. *E.coli*	Bird Count vs. *E.coli:* p-value	Notes
Baileys Harbor	0.138	0.745	-0.365	0.374	-0.434	0.282	High bird levels.
Egg Harbor	-0.191	0.574	0.521	0.100	-0.149	0.662	
Ellison Bay	0.063	0.871	0.043	0.913	**0.880**	**0.002**	
Ephraim	0.563	0.090	-0.135	0.711	-0.117	0.748	
Fish Creek	0.000	1.000	-0.216	0.524	-0.057	0.868	
Newport	**0.853**	**0.003**	-0.166	0.670	-0.036	0.927	
Otumba	0.229	0.474	-0.184	0.567	**0.695**	**0.012**	Higher goose levels.
Sister Bay	0.103	0.778	-0.008	0.982	0.478	0.162	
Sunset	-0.255	0.424	0.505	0.094	-0.045	0.891	Higher goose and duck levels.
Whitefish Dunes	0.129	0.397	-0.172	0.259	**0.345**	**0.020**	Mostly gull waste. High levels.

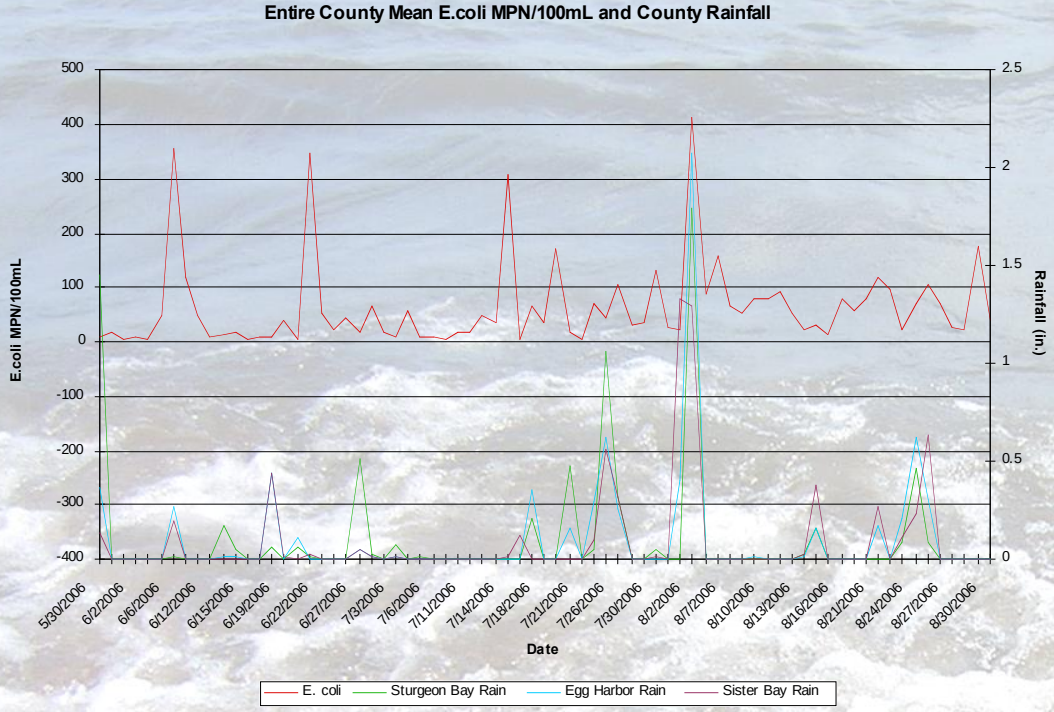
E.coli and Sand

Table 1. Beaches included in the sand evaluation study and summary of data from 2005.

Beach	Mean Upshore Sand *E.coli* CFU/g	Mean Swash Sand *E.coli* CFU/g	Mean Submerged Sand *E.coli* CFU/g	Mean *E.coli* from water MPN/100mL
Baileys Harbor	56.6	106.5	3.5	169.8
Ephraim Beach	43.6	52.2	7.8	134.6
Fish Creek	73.7	137.9	8.7	196.9
Otumba Park	18	190.4	11.9	335.4
Sunset Park	99.4	136.7	58.1	107.3
Whitefish Dunes	216.7	91.5	2.8	259.5

Table 2. Beaches included in the sand evaulation study and summary of data from 2006.

Beach	Mean Upshore Sand *E.coli* CFU/g	Mean Swash Sand *E.coli* CFU/g	Mean Submerged Sand *E.coli* CFU/g	Mean *E.coli* from water MPN/100mL
Baileys Harbor	76.1	31.6	9.8	127.2
Ephraim Beach	13.1	29.3	0.4	38.9
Fish Creek	5.4	21.3	2.4	58.1
Otumba Park	29.7	127.2	11.5	89.4
Sunset Park	59	115.2	21	184.4
Whitefish Dunes	78.7	39.9	1.9	141.3



Overall Evaluation and Data Analysis

Overall Impact

(ANOVA-Overall)

Beach	p-value
Baileys Harbor	0.000
Whitefish Dunes	0.110
Egg Harbor	0.849
Murphy Park	0.000
Sister Bay	0.000
Ellison Bay	0.000
Sunset	0.011
Nicolet	0.041

Case #1

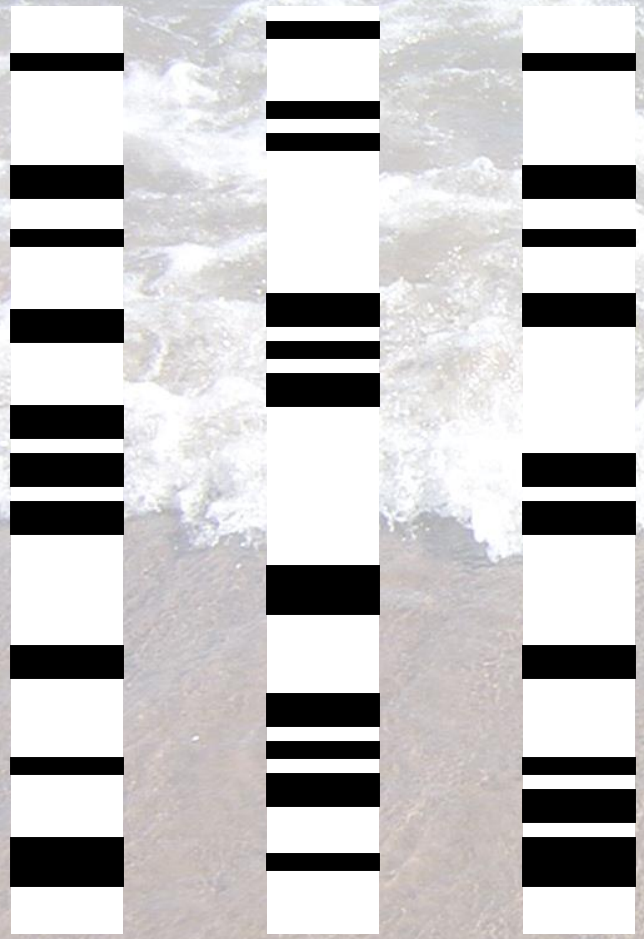
	Seasonal Mean	1-3 hour mean	8 hour sample	12 hour sample	24 hour sample
Seasonal Mean	1.000				
1-3 hour mean	0.000	1.000			
8 hour sample	0.000	0.467	1.000		
12 hour sample	0.024	0.031	0.853	1.000	
24 hour sample	0.754	0.000	0.119	0.647	1.000

Case #2

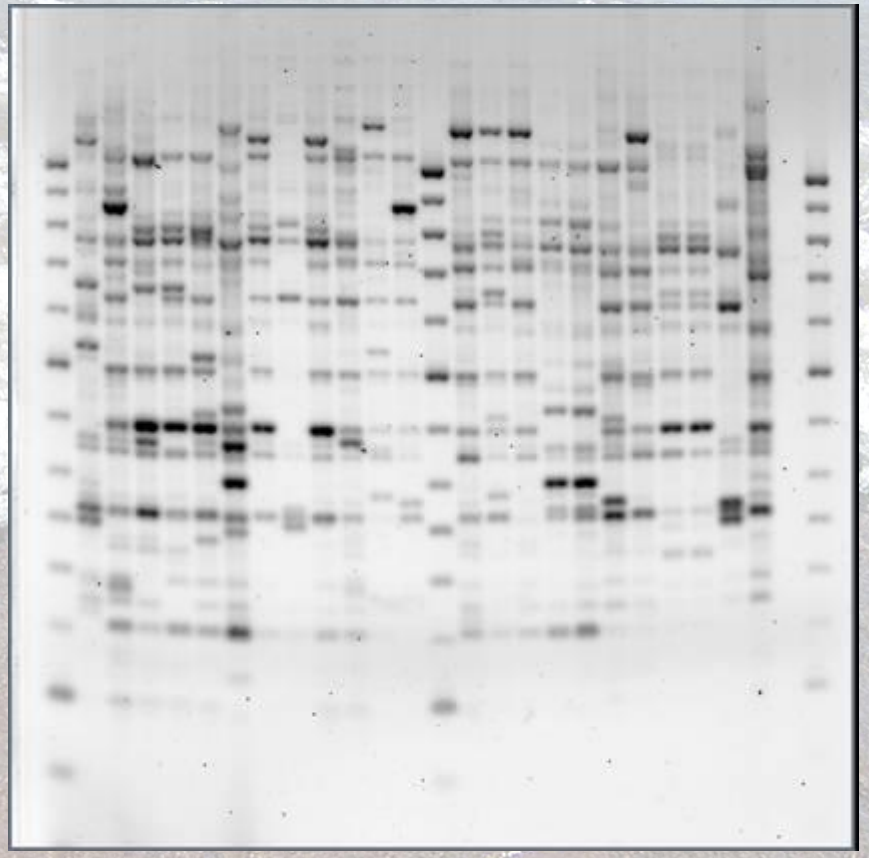
	Seasonal Mean	1-3 hour mean	8 hour sample	12 hour sample	24 hour sample
Seasonal Mean	1.000				
1-3 hour mean	1.000	1.000			
8 hour sample	0.967	0.955	1.000		
12 hour sample	0.973	0.987	0.862	1.000	
24 hour sample	1.000	0.999	0.995	0.976	1.000

Genetic Evaluations

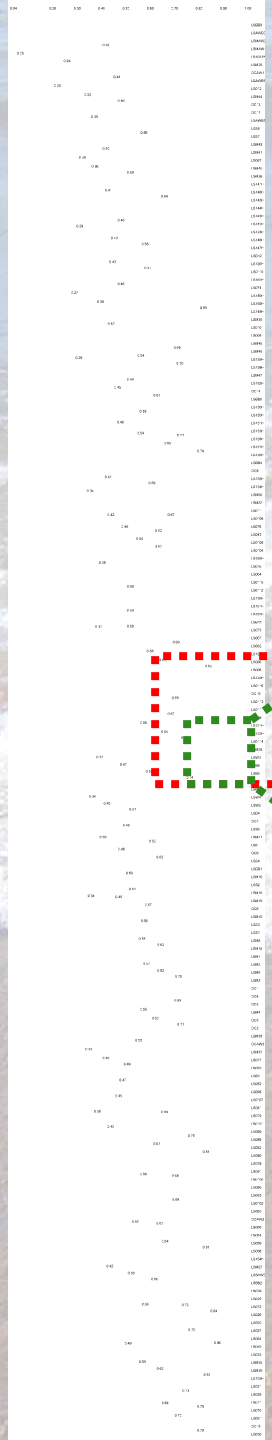
Human **Avian** **Water**

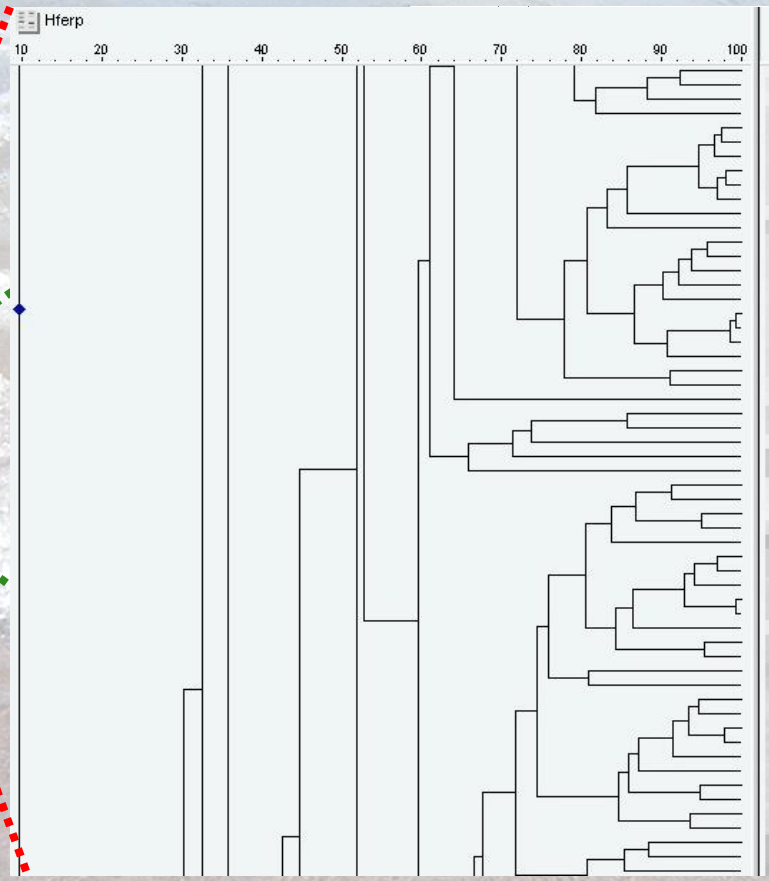


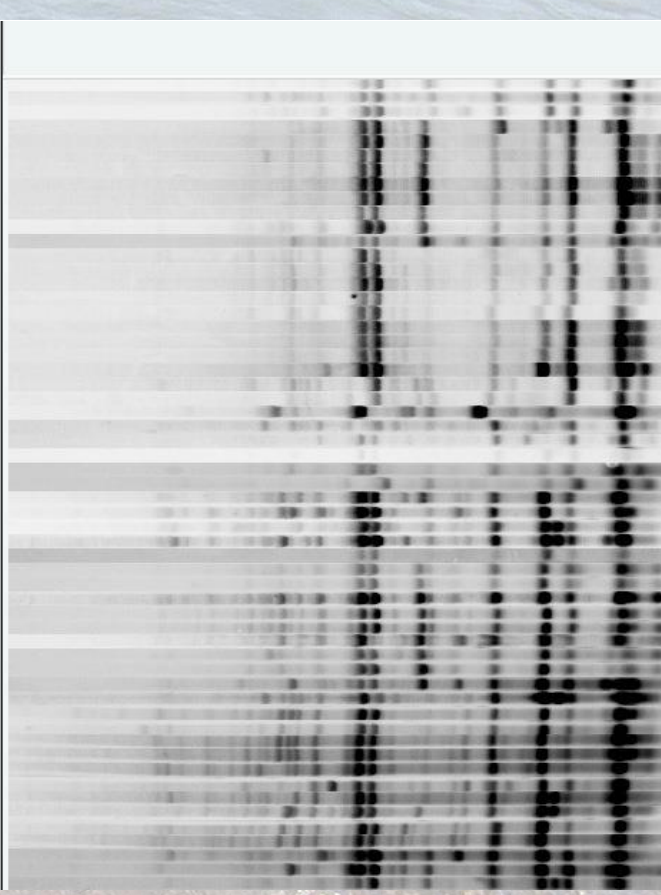
Gel showing DNA from *E.coli*



Genetic Evaluations







Good Data

You must have good data to make good decisions and allow regulators to see why your beach benefits the public and is different than a private beach.

Best Management Practices

- **Regular Maintenance of Storm Sewers and catch basins - Significant source of *E.coli***
- **Street and Impervious Surface Cleaning**
- **Know where pipes ‘come from’ and ‘go’**
- **Beach Grooming**
- **Removal of algae and organics**
- **Storm Water Ordinances**
- **Public Signage/Public Education**
  - **Pick-up pet waste, pick-up trash, Do Not feed birds, etc.**
- **Others?**

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Now that we have all this data…what can we do?
Make a Difference!

Process?

- **Leverage local work and resources – DON'T REINVENT THE WHEEL!**
- **Stage/Phase the work**
- **Projects should be additive**
- **Write grants!**
- **$50K to $1 million per beach**

"Healthy Waters, Strong Economy"

- The Brookings Institution, September 2007

  http://www.healthylakes.org/site_upload/upload/GrtLakesCostBenefit.pdf

  - Investing $26 billion in the GL will result in over $80 billion in short- and long-term economic benefits
  - Direct economic benefits from recreation
  - Raises property values
  - Makes local area more attractive to businesses and workers
  - Direct economic benefits from recreation

Before

After

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SCIENTISTS
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BEACH PARK

Challenges to Beach Monitoring and Remediation

- Why?
- Where to start?
- Cost?
- **Political will**
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Economic Benefit

- Improving water quality not only for healthier beaches
- Value for beachgoers
  - $45-60/person/day at the beach
  - 150 visitors x 30 beaches x 90 beach days x $50 each = >**$20 mil**
- $18.5 bil industry in WI ($313mil)
- Billions related to water.
- What does that mean for local community?
- Increased property values
- Recruitment of business.
- Increased visitors:
  - Restaurants
  - Hotel
  - Small businesses
  - Other local tourist attractions

Beaches, water recreation & related activities generate billions of dollars annually

Photo courtesy Richard Whitman

Beach can be centerpiece of a community!!

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Social Equity

- Beaches are part of the social history of Wisconsin
- Beach resources are a public good that must be maintained for the larger citizenry of the State
- Interestingly, you need permits, large amounts of testing and maintenance at a waterpark, but there are no such requirements at public beaches.
- Anyone can visit a beach and partake in our natural resources and there are no wristbands to buy.
- In communities where cost has been influenced by outside factors beaches can be a recreational resource for all members of society without regard to social or economic status.

In the End….

A protected beach with mitigated sources of input:

- Protects Public Health
- Increases water quality
- Makes beach a destination in the community
- Makes community a destination
- Drives economic growth of communities
- All members of the community benefit!

Beaches are a rare example of:

Environmental, Economic, and Social Benefits from one project!

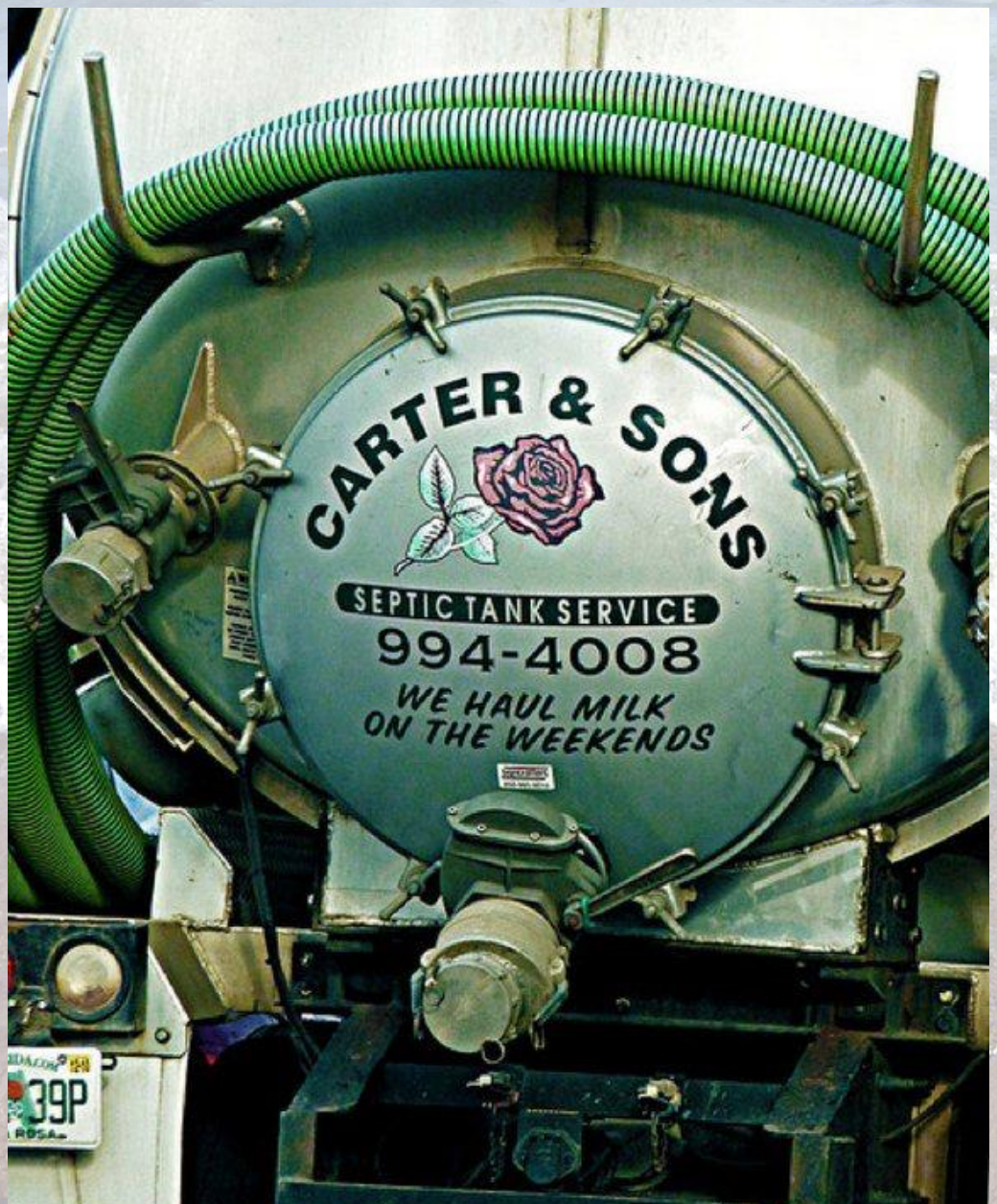
If nothing else….

Have a sense of humor!

Sense of Humor

Sense of Humor

Sense of Humor



Sense of Humor

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Thank you!