Friday, April 15
8:00 a.m.–9:30 a.m.

Session 9: Restoration and Remediation of Beaches

Developing and Implementing a "Healthy Beaches Action Plan"

Sarah U'Ren
The Watershed Center Grand Traverse Bay

Abstract

The Watershed Center Grand Traverse Bay (TWC) is a nonprofit organization based in Traverse City, Michigan, whose mission is to advocate for clean water in Grand Traverse Bay and protect and preserve the bay's watershed. In 2007, TWC drafted an *Action Plan for Healthy Beaches* in response to growing public concern over bacterial contamination at local beaches. TWC and local partners realized that the quality of life in the Grand Traverse region and the health of the local economy are inextricably linked to the health of our water resources. The action plan proposed a series of actions to reduce the levels of *E. coli* at area beaches in three phases. Phase 1 was taking immediate steps such as ordinance development, public education, and behavior change. Phase 2 outlined plans for a detailed sanitary survey and source tracking study. Phase 3 involved implementing stormwater controls once the sources of contamination were more accurately defined. Since then, TWC has worked with a locally formed Beach Stakeholders Group to implement portions of the action plan. These efforts include bacteria monitoring, source tracking work at local beaches, education via advertising and social media, and large-scale best management practices at beaches to reduce bacterial contamination. This presentation will discuss elements of the *Action Plan for Healthy Beaches*, describe the collaborative process in the Grand Traverse region for protecting public health at beaches, and outline major milestones since the inception of the Healthy Beaches Program.

Biosketch

Ms. Sarah U'Ren has served as the program director for The Watershed Center Grand Traverse Bay (TWC) for the past 14 years. She is responsible for overseeing and coordinating all watershed projects and grant activities at TWC and has 16 years of experience in watershed project management, research, and fieldwork. Ms. U'Ren authored the *Grand Traverse Bay Watershed Protection Plan*, specializes in beach and stormwater management and stormwater-related restoration activities, and has overseen more than 60 grant-funded projects in her tenure at TWC. She earned her bachelor's degree in biology from Alma College and her master's degree in environmental science from the University of Maryland.

Developing and Implementing a "Healthy Beaches Action Plan"

Sarah U'Ren, Program Director
The Watershed Center Grand Traverse Bay
231-935-1514, suren@gtbay.org

The Watershed Center
GRAND TRAVERSE BAY

Our Mission:

The Watershed Center advocates for clean water in Grand Traverse Bay and acts to protect and preserve the Bay's watershed

Grand Traverse Bay Watershed

- 973 square miles
- 132 Miles of Shoreline

TWC's E.Coli Monitoring Program

- **Background**
  - Watershed Center has monitored local beaches for *E.coli* bacteria since 2001
  - Tests taken weekly throughout swimming season: Memorial Day – Labor Day
  - Partner with Health Departments

TWC's E.Coli Monitoring Program

- **2006: Health Dept. changed their procedure for notifying the public of beach contamination**
  - Increase in notifications
  - Received a lot of media attention
  - After a number of posted advisories at area beaches, citizens called upon community leaders to **'do something'**

"Swimmers Should Take E.Coli Warnings Seriously"
(7/17 Editorial)

"Beach Contamination Must Be Addressed"
(9/5 Editorial)

"E.Coli Ruined My Summer"
(Quote from Letter the Editor in TC Record Eagle)

"… I will never swim in the Bay again"
(Quote from 8/28 article titled: "E Coli levels in bay watched")

"Living and Dealing With E.Coli"
(9/2 Forum Article by SOS Analytical Lab Manager)

"… NW Michigan's future is directly tied to the environment, what is, was, and will continue to be our Golden Goose… "
(9/10 Bill O'Brien Column)

"City Officials Tackle Beach-Related Issues"
(9/25 Article)

Starting Our "Healthy Beaches Program"

- TWC and Grand Traverse Health Dept **formed Stakeholder Group in 2007** to meet periodically and discuss beach issues
  - Monitoring plans
  - Outreach strategies
  - Future efforts
  - Funding
  - Reporting
- **Members include:**
  - TWC
  - County and City officials
  - Health Department officials
  - National and State Park officials
  - Water Quality Lab
- Group drafted '**Action Plan for Healthy Beaches**' in 2007

Beach Stakeholder Group Meeting March 2016

Action Plan for Healthy Beaches

Phase 1: Ordinances, Public Education, and Behavior Change

Phase 2: Detailed Sanitary Survey and Source Tracking

Phase 3: Stormwater Controls

Phase 1 – Ordinances, Public Education, and Behavior Change

Phase 1 – Ordinances, Public Education, Behavior Change

- **Ordinances:**
  - Prohibition on feeding waterfowl (passed in Traverse City)
  - Require dog owners to pick up after their pets
  - Better monitoring and enforcement on boat sewage tanks

Water Quality Monitoring and Notification Sign at Traverse City beach

Phase 1 – Ordinances, Public Education, Behavior Change

- **Public Advisory System – On-site Signage**
  - **Level 1:** No tag – E. Coli levels meet MDEQ swimming standards for full body contact
  - **Level 2:** Yellow tag – E. Coli levels meet MDEQ standards for wading, fishing and boating. Contact above the waist is not advised
  - **Level 3:** Reg tag – E. Coli levels exceed MDEQ standards; no body contact is advised
  - **Level 4:** Reg tag Health Alert – Excessive E. Coli levels and/or known gross contamination; avoid any kind of contact with beach waters

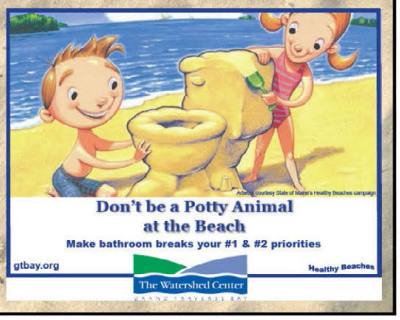
Phase 1 – Ordinances, Public Education, Behavior Change

- Public Education - Signage

Phase 1 – Ordinances, Public Education, Behavior Change

Phase 1 – Ordinances, Public Education, Behavior Change

- Public Education - Advertising and Marketing Campaign
  - Local newspapers
  - Public restrooms
  - Social media



Phase 1 – Ordinances, Public Education, Behavior Change

Phase 1 – Ordinances, Public Education, Behavior Change

- Public Education - Advertising and Marketing Campaign

Radio advertisements

- Don't Feed the Ducks: '…what goes in must come out… droppings contain E coli and other harmful bacteria that lead to beach closings…'
- Healthy Beaches #1: Litter/animal waste in trash, don't feed ducks and seagulls
- Healthy Beaches #2 : Dispose of boat/RV waste properly, maintain septic, don't dump oil in storm drains

"We all love Grand Traverse Bay's beautiful beaches. When we all do our part, our reward is Healthy Beaches!"

Phase 1 – Ordinances, Public Education, Behavior Change

- Public Education – Behavior Change
  - Placing 'doggie bag' dispensers on beaches, parks, and trails
  - Pavement cleaning practices at local marinas (waterfowl droppings getting into water)

Photo credit: www.dogipot.com

Behavior change can include waterfowl too!

Meet Piper, a border collie who patrols the Traverse City airport to chase away birds and geese to reduce wildlife hazards during takeoff and landing.

Photo credit: www.airportk9.org

Phase 1 – Ordinances, Public Education, Behavior Change

- Public Education – ***Grand Traverse Water Safety Task Force***
  - Community alliance formed in 2013
  - Purpose: Improve the overall health/safety of regional public beaches and prevent drownings
  - Members: Health Depts.; Coast Guard; local hospitals, schools, and law enforcement agencies; Red Cross, County Park and Rec., TWC

Three primary focus areas:

- Water Safety Outreach
- Water Quality/Beach Safety Equipment & Signage
- Water Safety Classes

Phase 2 – Detailed Sanitary Survey and Source Tracking

Phase 2 – Detailed Sanitary Surveys and Source Tracking

- Sanitary Survey – What is it?

Evaluate beach and surrounding area for existing and potential pollution sources and safety hazards affecting water quality, with a focus on fecal contamination .

Helped us to:

- ID priority locations for water testing
- ID sources of bacterial contamination
- Assess the magnitude of pollution
- Identify stormwater as a problem and conduct storm event testing
  - Levels of E.coli from storm drains VERY high

Phase 2 – Detailed Sanitary Surveys and Source Tracking

- Source Tracking – Where is fecal contamination coming from?
  - Illicit connections?
  - Leaks in Sanitary Sewer? (wastewater and stormwater separate systems)
  - Large congregations of waterfowl?
  - Animals in storm drains?
  - Dog poop?

- Important to identify source so you can begin to work on next steps
- Each source requires a different management plan

Phase 2 – Detailed Sanitary Surveys and Source Tracking

- Source Tracking – Laboratory Analyses
  - Partnerships with research agencies (MSU and USGS)
  - Samples taken in 2009/2010 – results at least 6-9 months later
  - Analyzed for human pathogens and gene markers
  - Requires water samples (wet-weather sampling for storm drains)
  - MSU project cost $50,000+ (our cost ~ $10,000)

MSU grad student taking water sample

TWC staff taking water samples for USGS

Phase 2 – Detailed Sanitary Surveys and Source Tracking

- Source Tracking – Canine Teams
  - Trained to detect human sewage
  - Samples 'sniffed' up storm drain line, can pinpoint sources
  - Can be done in dry weather
  - Results immediately
  - Cover a lot of ground quickly
  - Our cost < $8,000

Above: Scott and K-9 Sable inspect a storm drain
Below-Left: Recording storm drain information

Phase 3 – Stormwater Controls

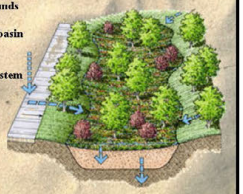
Phase 3 – Stormwater Controls

- Stormwater Remediation BMPs
  - Low Impact Development - decrease amount of runoff reaching piped systems, as well as provide treatment

Right-Above: Underground infiltration trench installed at Bryant Park using GLRI funds

Right-Below: Bioretention basin design

Left: Pervious pavement system installed at local hospital parking lot



Phase 3 – Stormwater Controls

- Stormwater Remediation BMPs
  - End-of-pipe filters
  - Oil/grit separators
  - Others:

Above: Anti-microbial filter unit installed at East Bay Park using GLRI funds

Left: Oil/grit separator unit installed at parking lot near local beach; debris contained in unit after large rainstorm

Phase 3 – Stormwater Controls

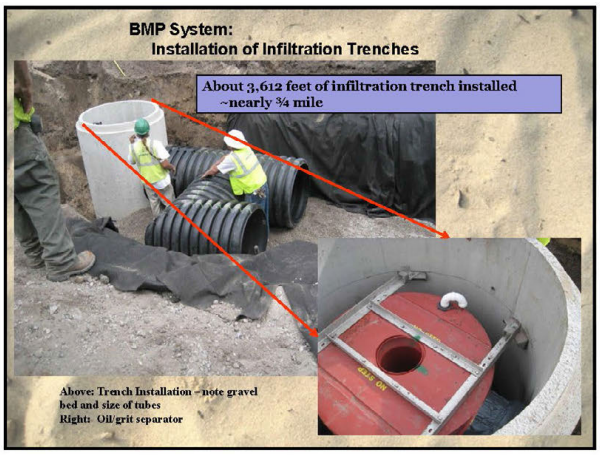
$987,000

Project Highlight:
Suttons Bay Stormwater Remediation Project

- Goal: Protect public health at beaches
- Concept: Utilize LID/green infrastructure to reduce runoff before end-of-pipe
  - 18 rain gardens
  - 3,600 ft of underground infiltration trenches
  - Constructed wetland outlet
- Installation completed Fall 2013

BMP System:
Installation of rain gardens (before, during, and after)

BMP System:
Educational Rain Garden Signs



E. coli Decrease in Southern and Western Lake Michigan: Management, Meteorology, or Mussels?

Richard Whitman, PhD
formerly with U.S. Geological Survey

Abstract

The BEACH Act of 2000 encouraged wider and more frequent fecal indicator bacteria (FIB) testing of beaches throughout the United States. More frequent data have provided better health protection for swimmers. With the accumulation of nearly 15 years of data and remote sensing, the second major benefit of the program can now be realized in the identification of longer term water quality trends. Trends in water quality could be attributed to three major factors or their combination: (1) changes in management practices including remediation and restoration, (2) food web changes, and (3) climatic changes. We explore these trends in Lake Michigan (i.e., in Illinois; Racine, Wisconsin; and Door County, Wisconsin) and Lake Erie (in Cuyahoga County) and discuss some of the factors that might account for observed changes. In general, mean FIB decreased from 2000 to 2015 in southern and western Lake Michigan ($p < 0.05$). Mean FIB populations were correlated with climatic trends, barometric pressure differential, increased temperature, and wind vector values, but seasonal trends contradict any suggestion of climatic effects on long-term trends. No evidence suggests that local management or restoration contributed to long-term regional trends in FIB concentration. The strongest trend relationships were found between invasive dreissenid mussels (Bivalvia), in situ transparency ship monitoring, and remotely sensed water clarity and FIB in Lake Michigan, but not in Lake Erie. While it is known that dreissenid mussels can efficiently consume FIB directly, it appears that decreases in FIB are more directly related to increased water clarity and resulting photo-inactivation of FIB in Lake Michigan. Neither FIB nor water clarity decreased in Lake Erie.

Biosketch

Dr. Richard Whitman is the retired station chief and a research ecologist at the Lake Michigan Ecological Research Station at the Great Lakes Science Center of the U.S. Geological Survey. He received his doctorate in wildlife and fisheries science from Texas A&M University. He was an associate professor at Indiana University Northwest for 10 years and served as chief scientist for Indiana Dunes National Lakeshore for 6 years before becoming the chief of the Lake Michigan Ecological Research Station, where he has been for the past 19 years. Previously, he worked for the National Aeronautics and Space Administration on spacecraft sanitation and environmental hygiene. Dr. Whitman is a recognized expert on the occurrence and distribution of indicator bacteria in temperate beaches. His scientific contributions include descriptions of new species, identification of new invasive indicator bacteria and descriptions of novel non-enteric sources of indicator bacteria (e.g., temperate beach sand, soil, and algae), and development of modeling paradigms for recreational water quality.

Turbulence and Triumph: Tackling the Complex Challenges Related to Healthy Beaches

Kathleen Bell, PhD
University of Maine School of Economics

Abstract

Maine's coastal tourism industry contributes billions of dollars annually to the regional economy, yet the coastal environment it depends on is vulnerable to a variety of factors, including pollution and climate change. Unsafe bacteria levels degrade ecosystems and threaten human health and coastal economies. Maine Healthy Beaches (MHB) provides a unified, quality-assured structure to monitor water quality and inform the public of coastal beach water quality conditions. However, timely and accurate assessments of pathogens and associated public health risk are difficult. Further, pollution sources are often varied and difficult to address. In response to complex challenges, MHB seeks the expertise of external partners to improve program effectiveness. A diverse advisory committee supports program improvements and compliance with evolving U.S. Environmental Protection Agency requirements. Applied research partnerships have been formed to help improve beach management decisions and program initiatives. Since 2013, MHB has partnered with the New England Sustainability Consortium (NEST) project, a collaborative effort among universities and colleges in Maine and New Hampshire focused on strengthening the scientific basis for decision-making and improving the management of beaches and shellfish beds. NEST blends sustainability science with a range of disciplines to tackle problems related to impaired coastal water quality. This work includes examining the role social feedback processes play in beach recreation and management decisions, as well as reducing the frequency and magnitude of closures. Data from recent surveys of coastal residents and beach managers in the two states will be shared, underscoring the value of a clean beach experience.

Biosketch

Dr. Kathleen Bell is a professor in the School of Economics at the University of Maine. She received her bachelor of arts degree in economics and environmental studies from Bowdoin College in Maine and her master of arts and doctoral degrees in economics from the University of Maryland. She gained an appreciation for the complexities of water quality management working as an economist at the U.S. Environmental Protection Agency in Washington, DC. In 2001, Dr. Bell joined the faculty at the University of Maine, where her research and teaching emphasize the use of markets, information, and technology to support decision-making. She has studied water and land management issues in the Mid-Atlantic, Pacific Northwest, and New England regions of the United States. Dr. Bell's main research interests include coupled human and environmental systems, private and public decision-making, nonmarket valuation, and land-use change. As a co-principal investigator of the National Science Foundation-funded New England Sustainability Consortium (NEST), she is researching challenges and opportunities for beach management in Maine and New Hampshire.

Turbulence and Triumph: Tackling the Complex Challenges Related to Healthy Beaches

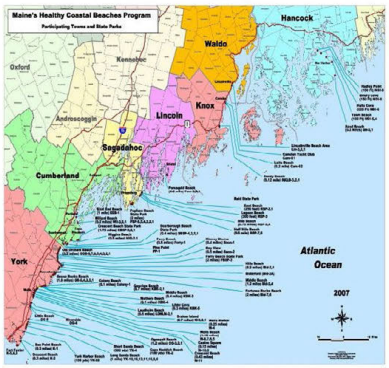
U.S. EPA's Recreational Waters Conference
April 15, 2016
New Orleans, Louisiana

Kathleen P. Bell
University of Maine
School of Economics

Keri Kaczor
University of Maine
Cooperative Extension

Maine's Healthy Beaches

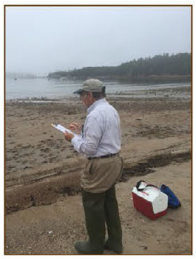
60 Beach Management Areas



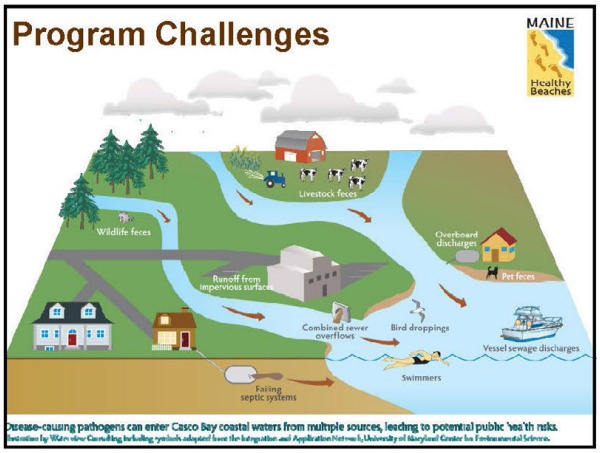
Funding provided by: US EPA/Maine DEP

Water Quality Monitoring, Assessment, & Notification

Diverse Partnerships: Building Local & Regional Capacity



Program Challenges



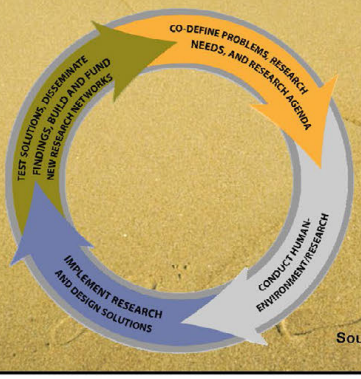
More Partnerships: Engaging With Researchers

NEST New England SusTainability Consortium

Mobilizing the collective capacity of New England universities and colleges to strengthen connections between science and decision making.

THE UNIVERSITY OF MAINE
University of New Hampshire
Plymouth State University
UNE University of New England
Keene State College
usm
Great Bay Community College
wells reserve
MDI Biological Laboratory

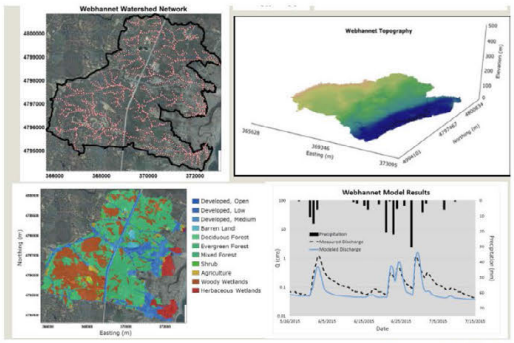
Collaborative research model



Source: Hart et al. (2015)

Safe Beaches & Shellfish Project

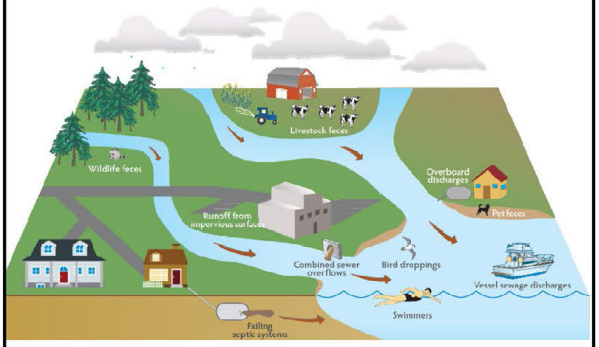
Complexity of Water Systems



Source: Smith et al. (2016)

Complexity of Human Systems

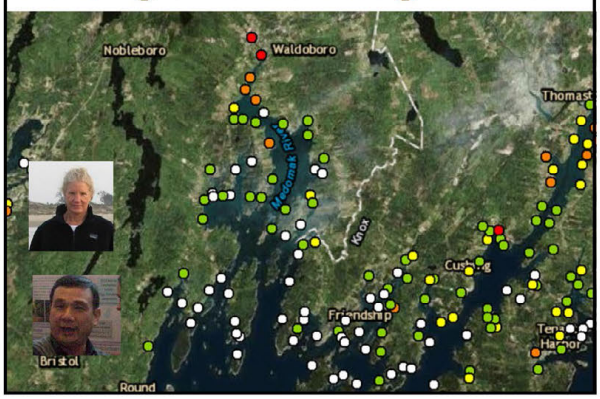
Coupled Natural & Human Systems



Research Team Updates

Improving Understanding of Watersheds

Learning from Monitoring Histories

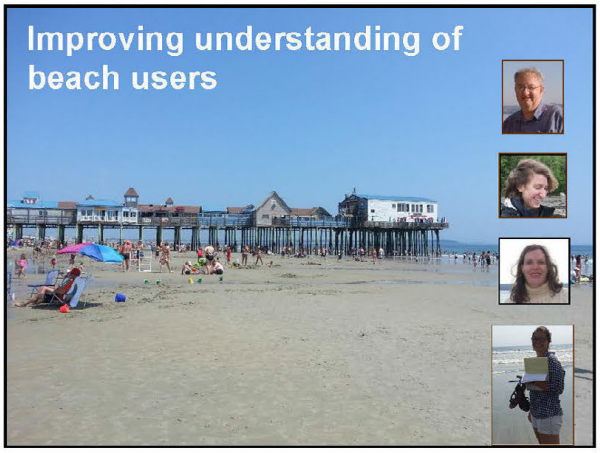


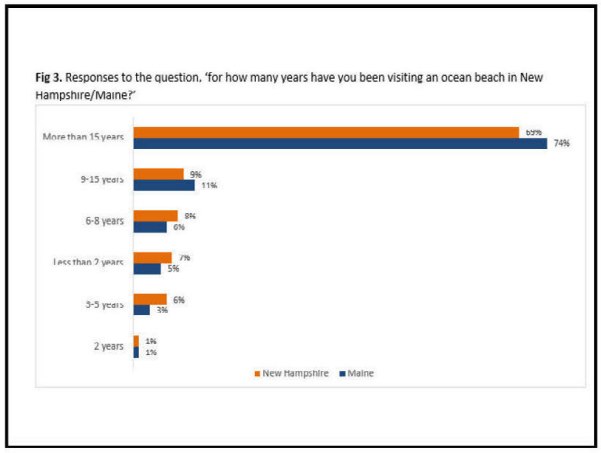
Digging in: excessive seaweed accumulation

Learning from coastal residents

Engaging with surfers

Improving understanding of beach users





"If an ocean beach is inviting then a Maine beach is downright magical. It offers a combination of varying weather condition, rugged beauty, and solace that few places can. Maine ocean beaches are generational and therefore timeless in the minds of many repeat visitors. It allows New Englanders a chance to smell the salty air and crisp water on their feet without having to drive a long way."

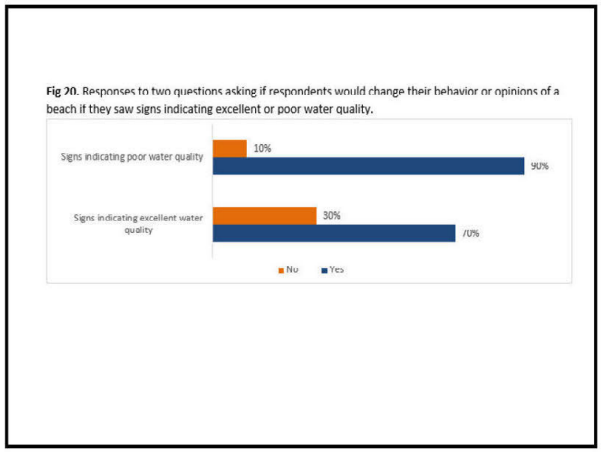


Fig 21. Select comments to the question: How would it [seeing a sign on a beach advising you to limit contact with ocean water] affect your behavior or opinions of the beach? *Spelling shown in context*

Group 1: Users who feel that advisories can happen at any beach, and are acceptable if they happen infrequently	Group 2: Users who feel that any amount of contamination, especially during their vacation, is too much contamination
"If this were a beach that I went to often and it was a rare occurance than my opinion wouldn't change....."	*"If I saw signs that showed low water quality, I would be displeased. It happened once, to my knowledge at Wells Sands and I was appalled that the city/town was not doing a better job about restricting polluted water run from the mainland onto the beach area"*
"Depends if there was, say, a one time event - sewer main break, for ex. Or if it were in regard to a frwquently occuring thing. Frequently occurring would cause me to go elsewhere"	*"I would think twice before choosing to go to that beach again."*
"...If the pollution was manmade, I would plan to only go to beaches with a good record of water quality. I live in Maryland and the main reason I travel over five hundred miles to Well for vacation is the quality of the water at the Beach and wellhanner river and the great surf conditions."	*"I would be less inclined to drive 100 minutes again if I had just done it only to find there is a water closure."*
"I would choose not to swim that day, but it wouldn't sway my opinion of the beach since a change in quality might be brought on by nature."	*"I wouldn't go in the water and it would be a less pleasant day. I wouldn't go to that beach again"*
"... It can happen to any beach. Would stop visiting that beach if this becomes a recurrent issue"	*"I wouldn't want to go swimming or let the kids play in the water. I would not want to return. I would feel that I wasted our vacation time traveling to such a destination."*
"Actually saw this for the first time this summer at North Hampton State beach...went north to enjoy our day at the beach...now would that particular beach after heavy rains...in general our beaches appear clean weather brings turbidity and always makes us suspect!!"	*"Hearful and disappointed. I would think twice about visiting again until the water safety was secured."*
	"It would gross me out. I wouldn't enjoy my stay"
	"I would probably decide to not go there for a few years and after would make sur to check out the quality of the water before"

Engaging with Program Participants

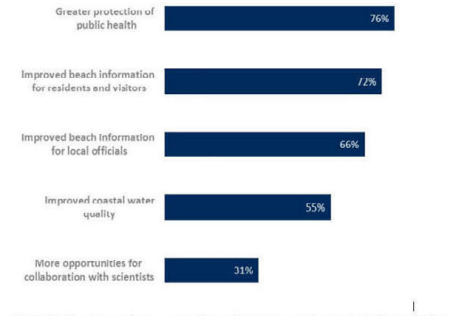


FIGURE 11. Benefits accruing to communities and parks from participating in the Maine Healthy Beaches Program

Engaging with Program Participants

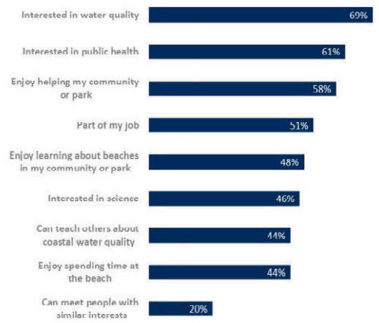
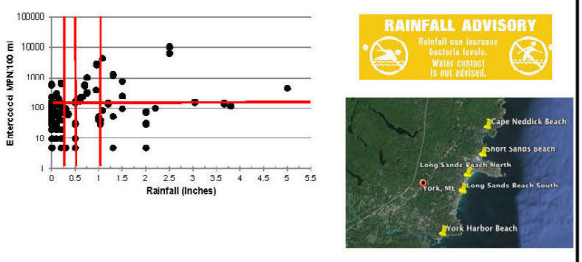


FIGURE 6. Motivations to participate in the Maine Healthy Beaches Program

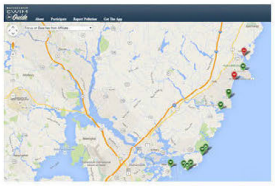
Tackling Challenges

Supporting precautionary rainfall advisories



Supporting new risk assessment & communication approaches

Informing the design of new communication approaches



Strengthening partnerships to keep Maine beaches healthy !

Acknowledgements

THE UNIVERSITY OF MAINE
University of New Hampshire
wellsreserve at laudholm
PLYMOUTH STATE UNIVERSITY
UNE UNIVERSITY OF NEW ENGLAND
usm UNIVERSITY OF SOUTHERN MAINE
NEST New England SusTainability Consortium
EPSCoR
NSF

Acknowledgements

Special thanks to NEST colleagues: Abigail Kaminski, Kate Beard, Sean M. Smith, Steve Jones, Caroline Noblet, Emma Fox, Jane Disney, Tom Safford, Shannon Rogers, Sophia Scott, Isaac Leslie, Frank Xu, Bridie McGreavy, John Peckenham, Brianne Suldovsky, Margaret Snell, Damian Brady, and Kelly Cole.

The Multidimensional Benefits to Beach Remediation and Restoration

Greg Kleinheinz, PhD
University of Wisconsin—Oshkosh

Abstract

Being able to provide healthy water to beachgoers is considered a universal desire of communities throughout the United States. How we get to that point, however, is often not well understood. With increased monitoring of recreational waters, due in large part to the BEACH Act and allied research, local communities are identifying demonstrable sources of contamination that can be remediated at local beaches. These sources range from small stormwater inputs and overland flow to beach areas, to combined sewers and cross-connections discharging directly to the beach. The results from the source identification work around the Great Lakes area suggest that the majority of contamination in the 40 locations to be discussed is of local origin, presenting the local community with an opportunity to invest in the beach as a resource for the entire community. This investment is not only important as a social equity issue for communities, but also as an economic driver for coastal communities. This presentation will discuss a multiyear, stepwise group of projects that took more than 50 locations from microbial source identification, to mitigation plan development, to beach reengineering and pollution mitigation. Examples will be provided with an emphasis on the approach, process, challenges, and overall success of the projects. Costs associated with each redesign plan and unanticipated challenges will be discussed in several case studies. Finally, both the intended and unintended benefits to the communities will be explored.

Biosketch

Dr. Greg Kleinheinz received his bachelor of science degree from Northern Michigan University and his doctorate from Michigan Tech University. Dr. Kleinheinz serves as the Viessmann Chair for Sustainable Technology, director of the Environmental Research and Innovation Center, and professor of environmental engineering technology at the University of Wisconsin Oshkosh. He is a registered sanitarian and has over 18 years of experience in working on water and wastewater issues. Dr. Kleinheinz and his beach group currently are conducting beach monitoring and/or research in 10 Wisconsin counties and three Michigan counties, with a summer research group of more than 20 students working at more than 100 beaches. Their research interests include application of qPCR monitoring methods to remote locations, investigating novel sampling techniques, the impact of *Cladophora* on nearshore water quality, sanitary survey tool development, rainfall impacts on *E.coli*, pathogens and viruses in recreational water, and a variety of molecular source-tracking methods to aid in fecal input mitigation and beach management practices. Using these research and investigative tools, Dr. Kleinheinz and his group have conducted over $8 million of beach research projects, including reengineering more than 50 locations for the treatment of nearshore water pollution sources.

Question & Answer Session

Question 1
(Unknown): My question is for Sarah U'Ren. Were FIB [fecal indicator bacteria] levels compared before and after these treatments?

Answer 1
Sarah U'Ren: Yes, we've done about three different remediation projects and we're in the middle of testing East Bay Park to see if there is a difference in FIB levels. It's hard to test in low impact developments, but for beaches where we have done installations we have seen some difference: a decrease in advisories at East Bay Park. We have great water quality in our area though, so our exceedances might have gone from 3 to 1. After high rain we see high levels, but for normal levels it's not much of a problem.

Question 2
Adam Mednick: My question is for Richard [Whitman]. Another control variable that is relevant in the Great Lakes is water level. Gull populations, too. Did you use that in that 15-year data set, and, if so, what did you see?

Answer 2
Richard Whitman: For water level, that is easy to document because the Army Corps of Engineers measures it regularly. Water level has been relatively stable over 12 years, which is significant at a beach. We don't have bird data. It would be very interesting if we did, and I would love to see it from others.

Question 3
Adam Mednick: For Greg [Kleinheinz]. Out of the beaches you showed, I know it's anecdotal, but which is the most successful for reductions in advisories?

Answer 3
Greg Kleinheinz: For most beaches we work on closure rates that are already only 2 or 3 percent. There are some that are closed 40 percent of the time. Right Arrow in Manitowoc probably offers the most bang for your buck

Question 4
Phil Scanlan: Did the improved water clarity come from the mussels?

Answer 4
Richard Whitman: The mussels have caused problems in the Great Lakes, and I am not saying for now we should keep mussels for better water quality, but it is an ecological event. Regardless of whether it's mussels or birds, the phenomena has occurred.

Question 5
Phil Scanlan: For Greg [Kleinheinz]. Can we take that $50 loss per beachgoer and look at loss beach days per year, and use that to justify more funding? That would help.

Answer 5
Greg Kleinheinz: There are 30 beaches by us that are within 30 minutes of each other. So, it's not that people don't go near us if one is closed; instead, they just pick a different beach.

Answer 5 (follow-up)
John Wathen: The economic driver is there but it's hard to feel sometimes. It's hard to get a dollar amount aggregate. It's complicated.

Question 6

Richard Zepp: For Greg [Kleinheinz]. Every 20 years or so in the Great Lakes the water levels go up. What are the changes around that? My question is about Red Arrow Beach and their water input—Manitowoc is very proud of building that. Is there an impact to water quality coming from that?

Answer 6

Greg Kleinheinz: We can try to treat everything coming out of the pipe but it is hard to do that. We have seen some inputs to ponds being flushed back out to the beach after a rain event, so a lot of work can be done upstream in the city. They want to do that, and I wish they could go quicker, but they're working on it.