The Nose Knows: Canine Scent Tracking

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(Photos by ECS)

Use of Canine Scent Tracking by Michigan's 319 Program

- **Galien R. monitoring**
  - **Site selection based on previous MDEQ sampling**
- **Middle Grand R. watershed management plan development**
  - **Site selection based on previous grantee *E. coli* monitoring**

Rare exception to

"Good, Fast, or Cheap – pick any two"

Tiered Bacterial Source Tracking (BST) Sampling for Human Sources

1. Collect multiple samples and screen with sniffer dog
2. Collect *E. coli* samples at sites identified by dog
3. Collect BST sample, or analyze split sample from (2), if *E. coli* > 300 CFUs/100 mL

Speakers

- **Scott Reynolds**, Project Manager for Environmental Canine Services LLC (**www.ecsk9s.com**)

- **Sarah U'Ren**, Program Director for the Grand Traverse Bay Watershed Center (**www.gtbay.org**)

Thanks!

The Nose Knows: Canine Scent Tracking

ENVIRONMENTAL CANINE SERVICES LLC

Protecting Our Precious Resources with Nature's Gift

www.ecsk9s.com

517.231.6389

EPA Webinar

February 7, 2013

The History

- Dan Christian of Tetra Tech
- IDDE/IDEP investigations
- How to be more faster and more efficient ?

In the Field

Genesee Co. MI

Lansing, MI

The Nose Knows!

- **Narcotics**
- **Evidence (guns, knifes, money, etc.)**
- **Live human search (air scent and tracking)**
- **Human remains search**
- **Drowning victims search**
- Explosives
- Arson
- Avalanche
- Toxic Molds
- DVDs
- Mercury- 1mg
- Fruits, vegetables, meats
- Fox scat
- Grizzly Bear scat
- Whale feces
- Bedbugs and termites
- Gas leaks
- Water leaks
- Abalone
- Truffles
- VOC's
- Cancer
- Diabetic alert
- Cooling fluid for underground power lines

Best Breed?

Preferred

- Sporting and working
- High drive
- Stamina
  - Mud, water, long distance

Not Ideal

- Sight-hounds
- "Smooshed Faced"
  - Boxers, pugs, etc.
  - Hot weather

Keeping an open mind, we have been surprised before!

There Are A Few Exceptions . . .

Environmental Canine Services LLC
2009

Karen, Logan, & Bella

Dan & Sky

Scott, Sable, & Jack

ECS Training Grounds

Multiple Structures and Setups

The Science Behind It.

RESEARCH

Santa Barbara, CA 2010

WERF Funded Research Study
-UCSB and City of Santa Barbara Creeks Division

- Blind study-ECS
- RV investigations

RV Illicit Discharges

Canine Scent and Microbial Source Tracking in Santa Barbara, CA.

- 26 samples collected beside K9s
- Fecal Indicator Bacteria
- Human specific waste markers
  - Bacteroidales
  - Methanobrevibacter smithii nifH gene
- Caffeine & Cotinine

- Potassium
- Fluoride
- NH3
- Surfactants

Results

SAMPLES

- 11 samples positive for at least 1 human-specific waste marker
- Strong result of correlation study was small # of false negatives
- www.santabarbaraca.gov/resident/community/creeks/reports_and_studies.htm

CANINES

- K9 responses significantly associated with several of the human-specific waste markers
  - Logan 100%
- Sample locations were both dogs responded negative there were 0 human-specific markers detected

Benefits of Canine Field Work

- Real time responses
  - Lead to locating two unmarked discharges
- Canine responses narrowed zone of interest from many blocks to a single
- Canines peaked interest and generated more cooperation than usual

Highlight

- Hope Drain Diversion
- Arroyo Burro Beach
  - AKA Hendry's Beach
- Real time results "positive results from K9s lead urgency to situation leading research team and city workers to uncover a leaking sanitary sewer"

Outstanding Stormwater Research Project 2011

California Stormwater Quality Association

A Big Step- Beach Monitoring

MDEQ QUALITY ASSURANCE PROJECT PLAN (QAPP)

CLEAN MICHIGAN INITIATIVE

GREAT LAKES RESTORATION INITIATIVE

QAPP Components

- 10% field replicates
  - Return to 10% of random selected sites
    - Or use two canines at each site
- Following lab procedures for sampling

QAPP Sniffing Options

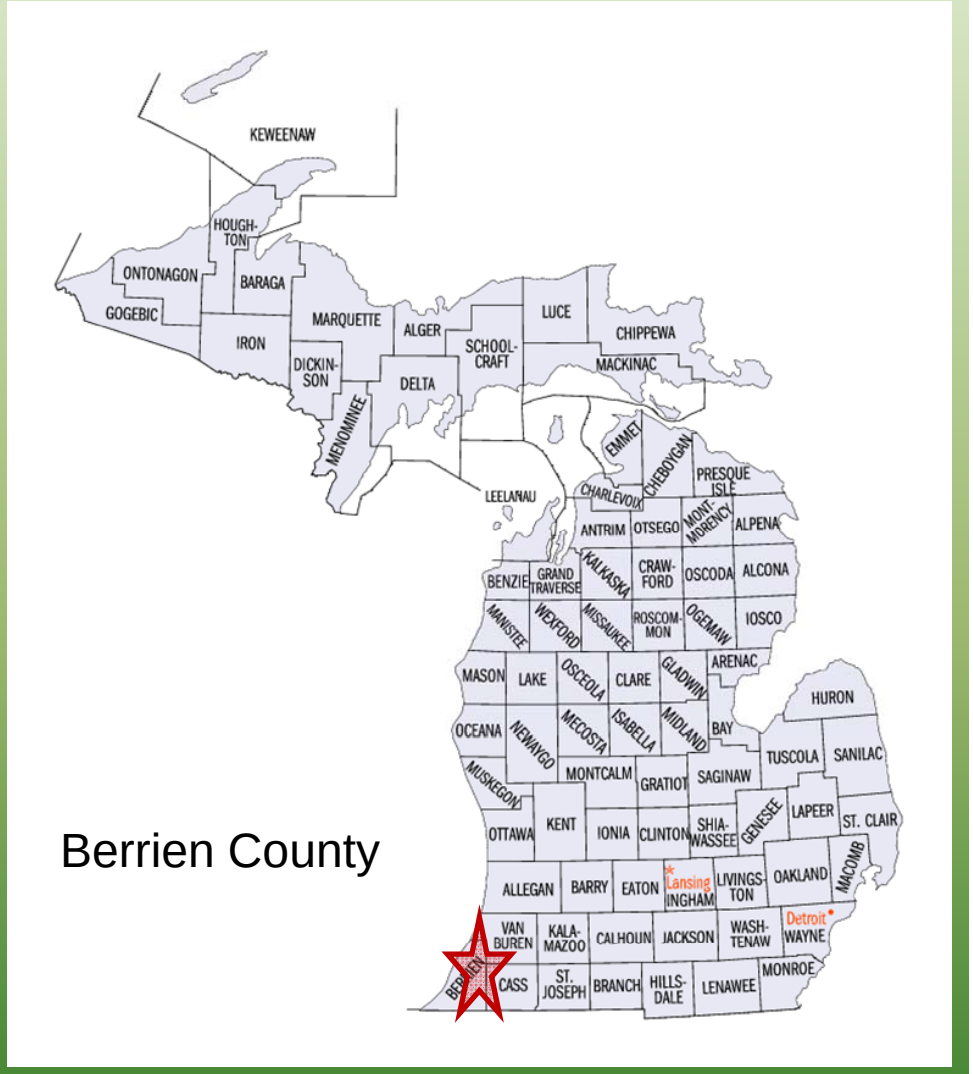
- "Bucket Samples"
- Collected at road stream crossings
- Collected in deep or wide areas
- "Bracketing"
- Coded
- Double blind

- Taken to neutral scent area
- Field blanks – distilled water

In the Field

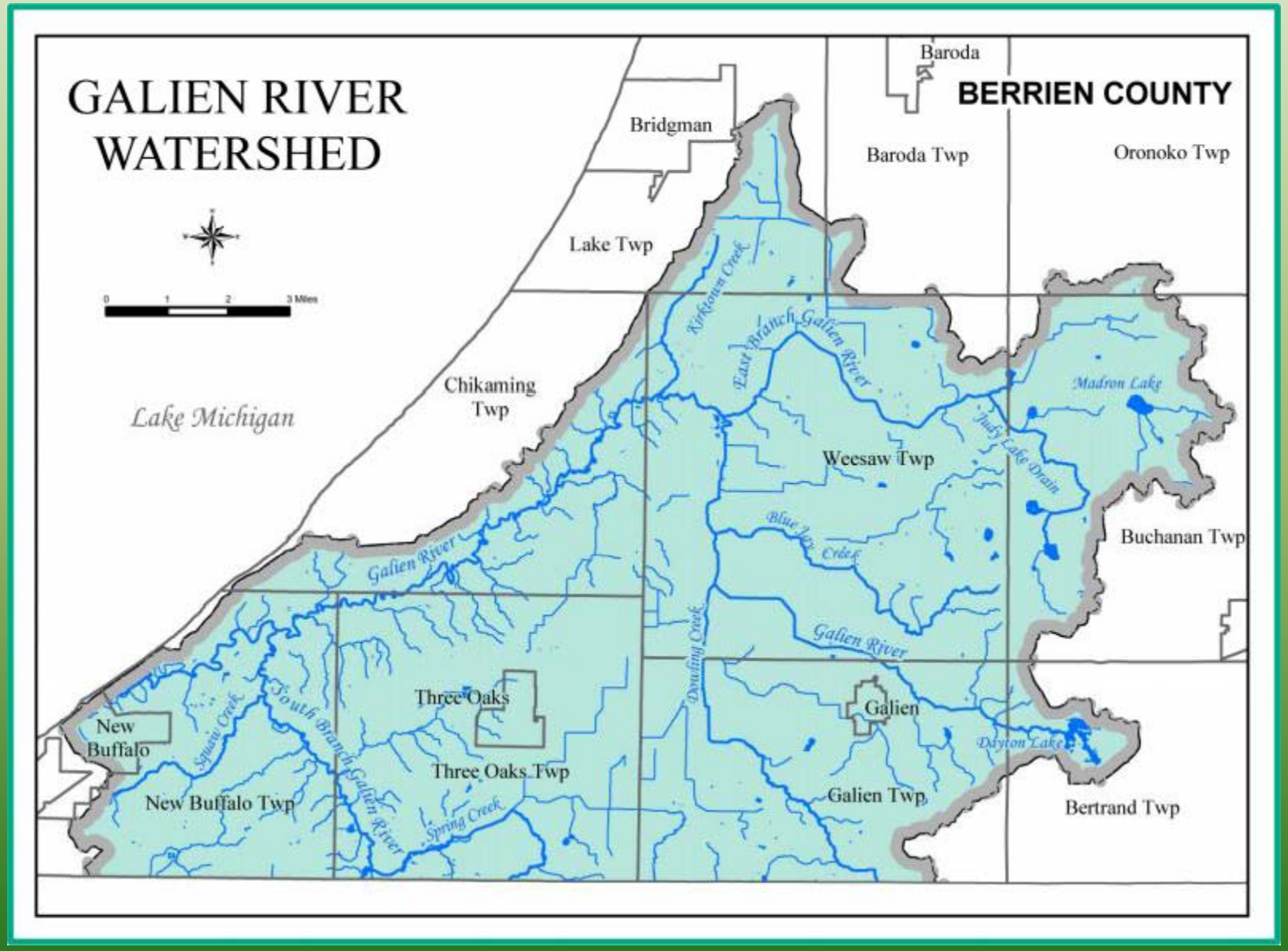
PAWS ON THE GROUND

Peg Kohring Midwest Director



Berrien County

THE CONSERVATION FUND


GALIEN RIVER
WATERSHED
BERRIEN COUNTY
Baroda
Bridgman
Baroda Twp
Oronoko Twp
Lake Twp
Chikaming
Twp
Lake Michigan
Kirkland Creek
East Branch Galien River
Madron Lake
Judy Lake Drain
Weesaw Twp
Blue Jay Creek
Buchanan Twp
Galien River
Galien River
Dowding Creek
Three Oaks
Galien
New
Buffalo
Square Creek
South Branch Galien River
Three Oaks Twp
Dayton Lake
New Buffalo Twp
Spring Creek
Galien Twp
Bertrand Twp
0
1
2
3 Miles

TMDL

- 303d Impairment WQS exceedances for *E. coli*, pathogens
- 2001 MGM ranged from 266 CFU/100 ml – 4300 CFU/100 ml

- Potential sources
  - Agriculture inputs
  - Illicit lateral connections
  - Failed/no existent septic leach fields
  - SSO sewer pump stations

Source MDEQ : TMDL for E. Coli in the Galien River, Berrien County 2002

Three Oaks, MI

Facing south- flows south

- Walking roadside ditches
- Checking all input pipes, catch basins, and seeps
- Ditches flow to tributaries of Galien River

Hidden

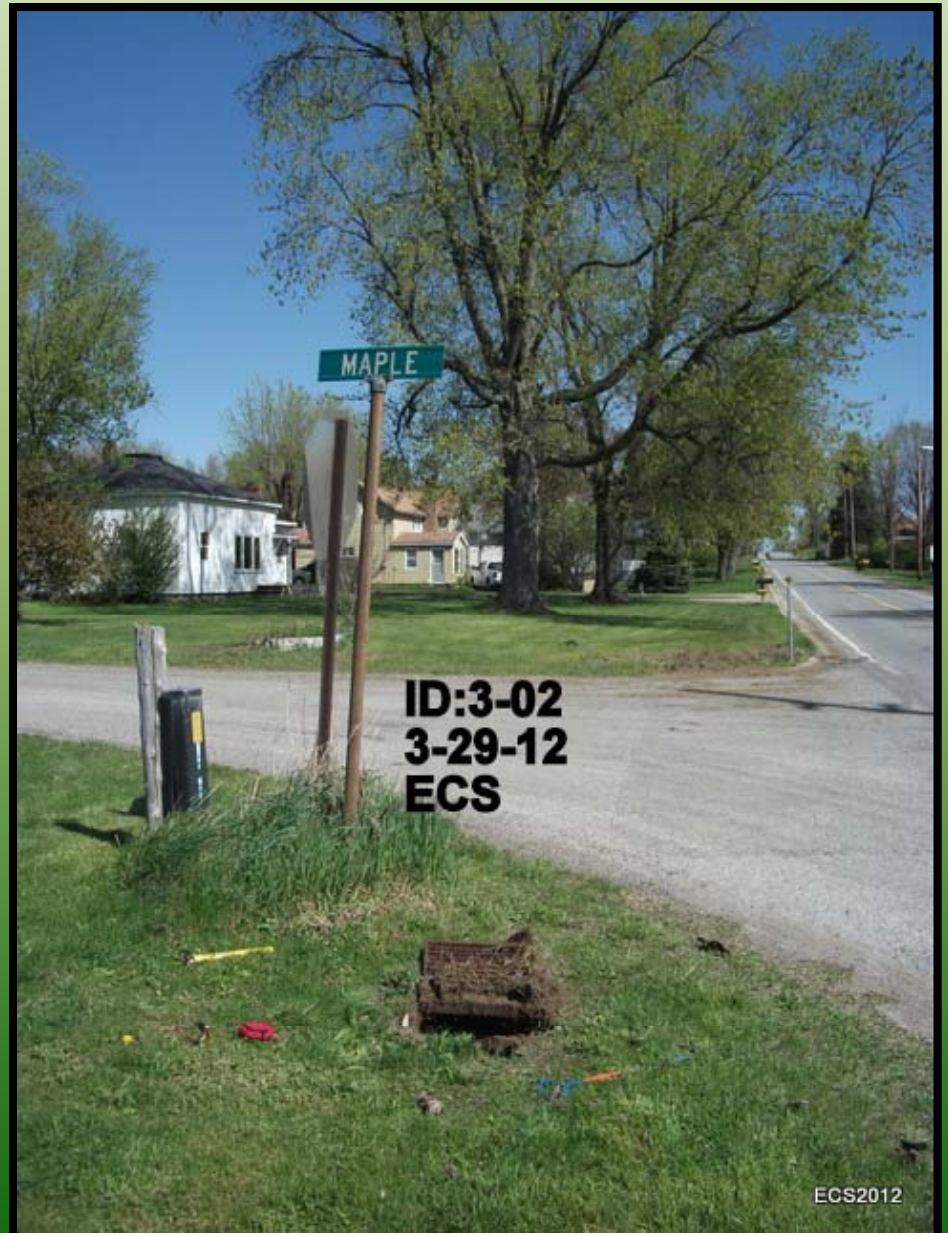
- Residential septic connected to farm field tile
- Recent rains washed away physical evidence and odors
- Dye test confirmed
- Berrien Co. HD " we never would have found it without the dog".


ID:1-02
3-29-12
ECS
ECS2012

Residential Septic to Wetland

“Always been that way since we bought it”.

Village of Glendora, MI




ID:3-02 interior facing east
sanitary staining
ECS2011

“It Smelled Bad..”


3-29-12
3-02
ECSK9S


ID: 3-03 Sanitary debris
ECSK9S


ID:3-01
3-29-12
ECS
ECS2012


ID:3-01
sanitary debris
ECS2012


Collecting water for canine sample in neutral scent area
ECS2011

Final Count -16 hours

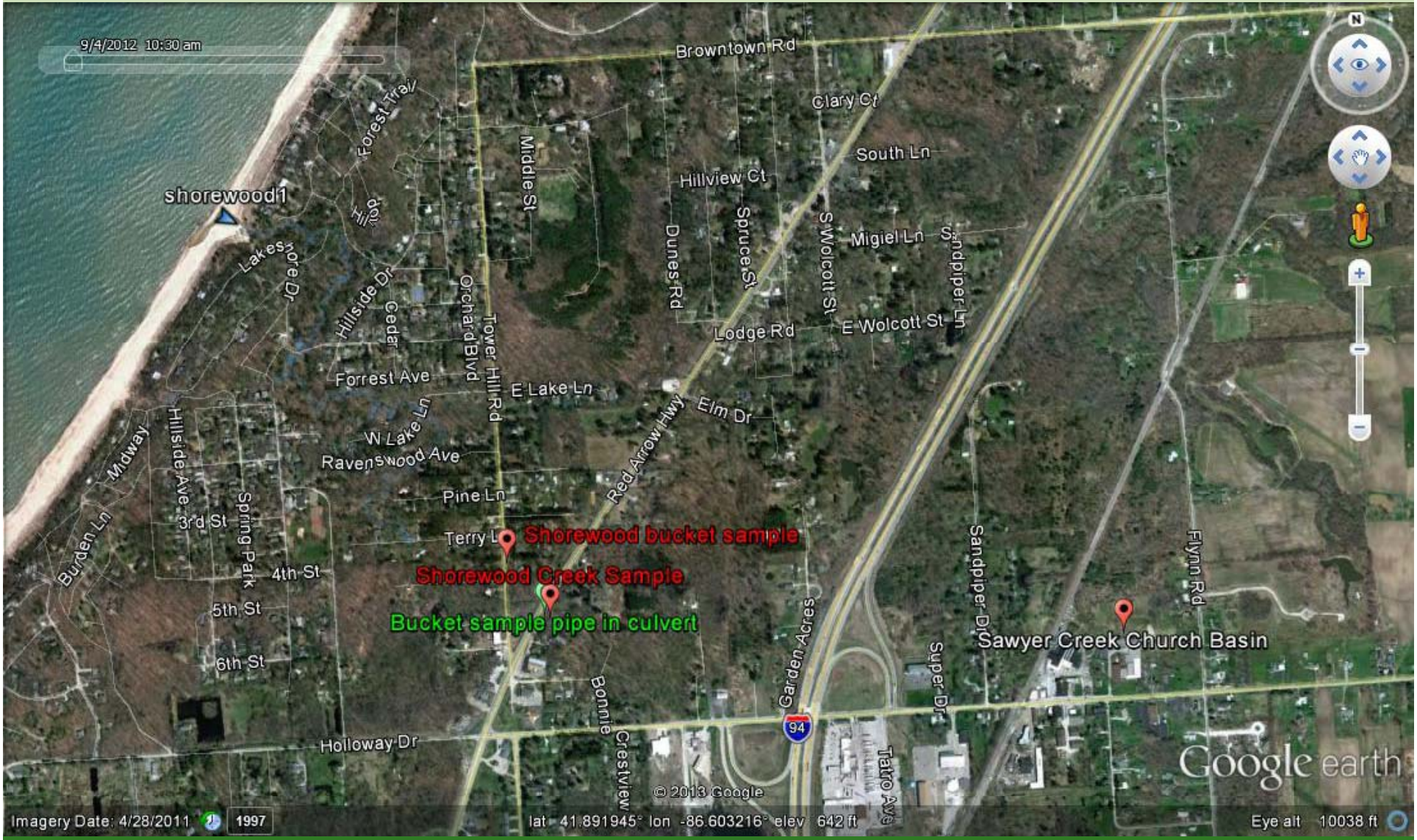
- Three residential septics confirmed by BCHD
- One illicit discharge to Village of Glendora
- Seven additional sites requiring further investigation w/I watershed
- And one bag of meth materials TOT MSP

Peg Kohring
The Conservation Fund

"You were able to accomplish what no other program we tried so far was able to".

Round 2

- Funded by the Pokagon Tribal Grant
- Focused in Chikaming Twp.
- Drains in residential areas emptying directly to Lake Michigan
- Residential on sewer


9/4/2012 10:30 am
shorewood1
Browntown Rd
Clary Ct
South Ln
Hillview Ct
Middle St
Forest Trail
Lakeshore Dr
Hillside Dr
Cedar
Orchard Blvd
Tower Hill Rd
Dunes Rd
Spruce St
S Wolcott St
Migiel Ln
Sandpiper Ln
E Wolcott St
Lodge Rd
Forrest Ave
E Lake Ln
W Lake Ln
Ravenswood Ave
Red Arrow Hwy
Elm Dr
Pine Ln
Terry Ln
Shorewood bucket sample
Shorewood Creek Sample
Bucket sample pipe in culvert
Midway
Hillside Ave
3rd St
Spring Park
4th St
5th St
6th St
Burden Ln
Holloway Dr
Bonnie Crestview
Garden Acres
Sandpiper Dr
Super Dr
Tatro Ave
Flynn Rd
Sawyer Creek Church Basin
94
© 2013 Google
Google earth
Imagery Date: 4/28/2011
1997
lat 41.891945° lon -86.603216° elev 642 ft
Eye alt 10038 ft

Findings

- Illicit pipes from residential areas NOT a significant source to beach closings on Lake Michigan
- Focus re-directed to sanitary pump stations along drains and inland sources

East Coast
FB Environmental

Coast Lines

- Coast line seeps at low tide
- Lead to discovery of old outhouse with drain pipes
- A bathhouse shower draining to beach
  - "Rub-a-dub"

Bucket Samples

Share the Knowledge

Septic to Storm

Environmental Canine Services LLC
2012 and Beyond

Western Region Team
Sonoma County, CA

The Doggie Bag

- Rapid Screening Method- Real Time Results
- Saves Time and Money
- Reduces Focus Areas to a Manageable Area
- Invites Public Interest and Cooperation
- QAPP approved!

Logan showers after a long day.
"Anybody seen my conditioner?"

Questions?

Is that mine?

Scott Reynolds
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517.231.6389

facebook

twitter

@ecsk9s

Canine Scent Tracking
A Case Study

Grand Traverse Bay Watershed
Healthy Beaches Program

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

The Watershed Center
GRAND TRAVERSE BAY

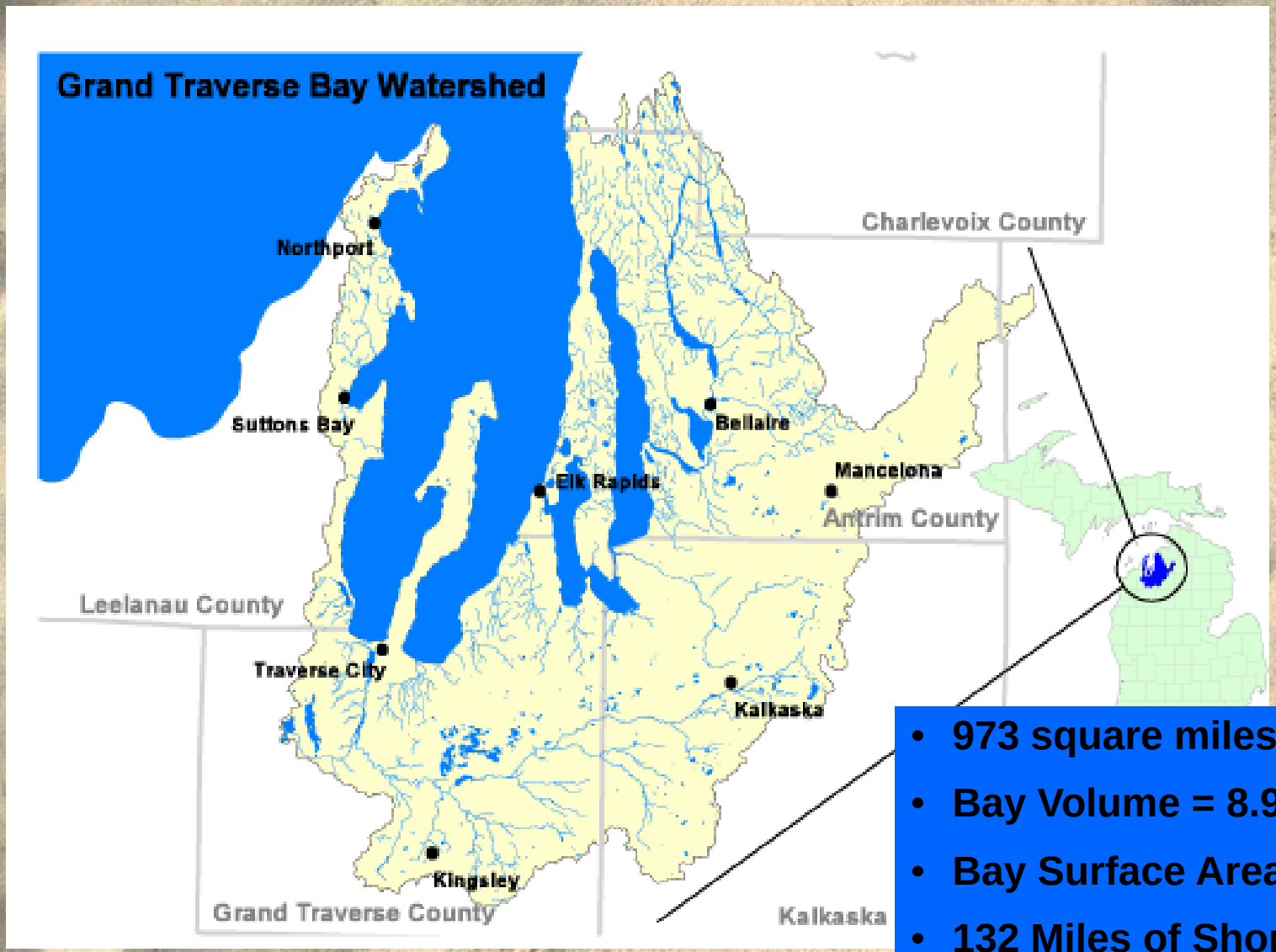
The Watershed Center

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
- Bay Volume = 8.97 mi^3
- Bay Surface Area = 277 mi^2
- 132 Miles of Shoreline
- 4 Counties, 44 Townships, 11 Municipalities

Quality of Life

Health of Water Resources

Local Economy

Beaches and tourism are key source of economy in Grand Traverse Region

Starting Our "Healthy Beaches Program"

- 2006: After a number of posted E.Coli bacteria-related advisories at area beaches, citizens called upon community leaders to 'do something'
  - Presence of E.Coli bacteria indicates fecal contamination
  - Two beaches on State Impaired Waters List for bacteria
- 2007: TWC, County and City officials, others formed Stakeholder Group which meets periodically to discuss beach issues (still meets today)
- 2007: Drafted 3-phased 'Action Plan for Healthy Beaches' – currently in Phase III

Action Plan for Healthy Beaches

Phase 1 – Ordinances, Public Education, Behavior Change

Phase 1 – Ordinances, Public Education, Behavior Change

- Prohibit feeding waterfowl
- Picking up pet waste

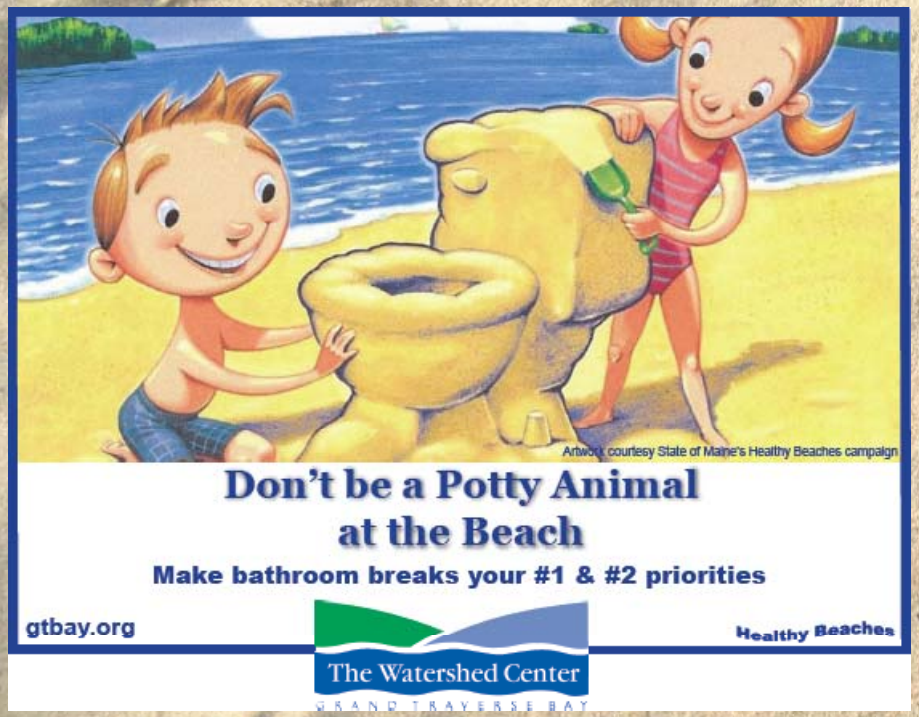
Above Photos from dogipot.com

Phase 1 – Ordinances, Public Education, Behavior Change

- Educational Signs

Phase 1 – Ordinances, Public Education, Behavior Change

- Advertising and Marketing Campaign – local newspapers, Facebook, Twitter



Phase 1 – Ordinances, Public Education, Behavior Change

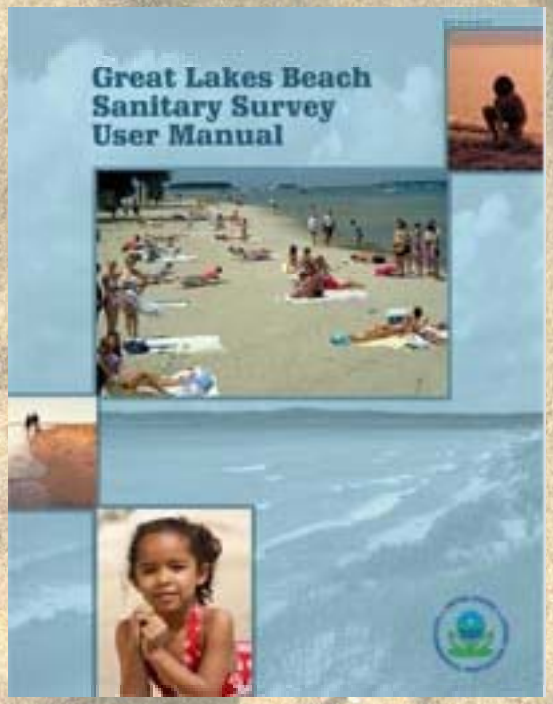
- Advertising and Marketing Campaign – radio advertisements/PSAs
  - ❖ Don't Feed the Ducks
  - ❖ Healthy Beaches #1
  - ❖ Healthy Beaches #2

Action Plan for Healthy Beaches

Phase 2 – Detailed Sanitary Survey and Source Tracking

Phase 2 –Sanitary Surveys/Source Tracking

- **Conducted EPA Sanitary Surveys at local beaches**
  - Identify known and potential sources of bacterial contamination
  - Assess the magnitude of pollution
  - Identify priority locations for water testing
- **Findings**
  - Most beaches with elevated E.Coli bacteria levels were being impacted by storm drains either at or nearby the beach
  - Samples from storm drains revealed E.Coli levels between 10,000 and 30,000 col/100mL… that's a lot!



Two problem drain outlets at beaches:
Bryant Park (left),
East Bay Park (right)

Phase 2 –Sanitary Surveys/Source Tracking

Source Tracking – Where is the fecal contamination coming from?

- Illicit connections?
- Leaks in Sanitary Sewer?
- Large congregations of ducks or geese?
- Too much dog poop?
- Animals in the storm drains?

Animal?

Or Human??

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

Phase 2 –Sanitary Surveys/Source Tracking

Determining Human Sources

Source Tracking 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
- Samples taken at beach, drain outlets, and nearby creek
- Positive results for human sources of fecal contamination found
- MSU project cost $50,000^{+} (our cost ~ $10,000)

MSU grad student taking water sample of Mitchell Creek

TWC staff taking water samples for USGS

Phase 2 –Sanitary Surveys/Source Tracking

Determining Human Sources

Source Tracking - Canine Unit

- Trained to detect human sewage and /or detergents in water
- Samples 'sniffed' up storm drain line – can pinpoint sources
- Fall 2010 and Spring 2011, results immediately

Above: Scott and Sable inspecting a drain in Traverse City

Left: TWC Staff…. Sable's 'pup-arrazi'

Phase 2 –Sanitary Surveys/Source Tracking

Determining Human Sources

Source Tracking - Canine Unit Cont'd

- Entire sampling program less than 10 days
- Our cost < $8,000

Above-right: Logan ('sits' when he detects)
Above: Sable ('barks' when he detects)
Left: TWC staff and Sky ('barks' when he detects)

Phase 2 –Sanitary Surveys/Source Tracking

Determining Human Sources

Source Tracking - Canine Unit Cont'd

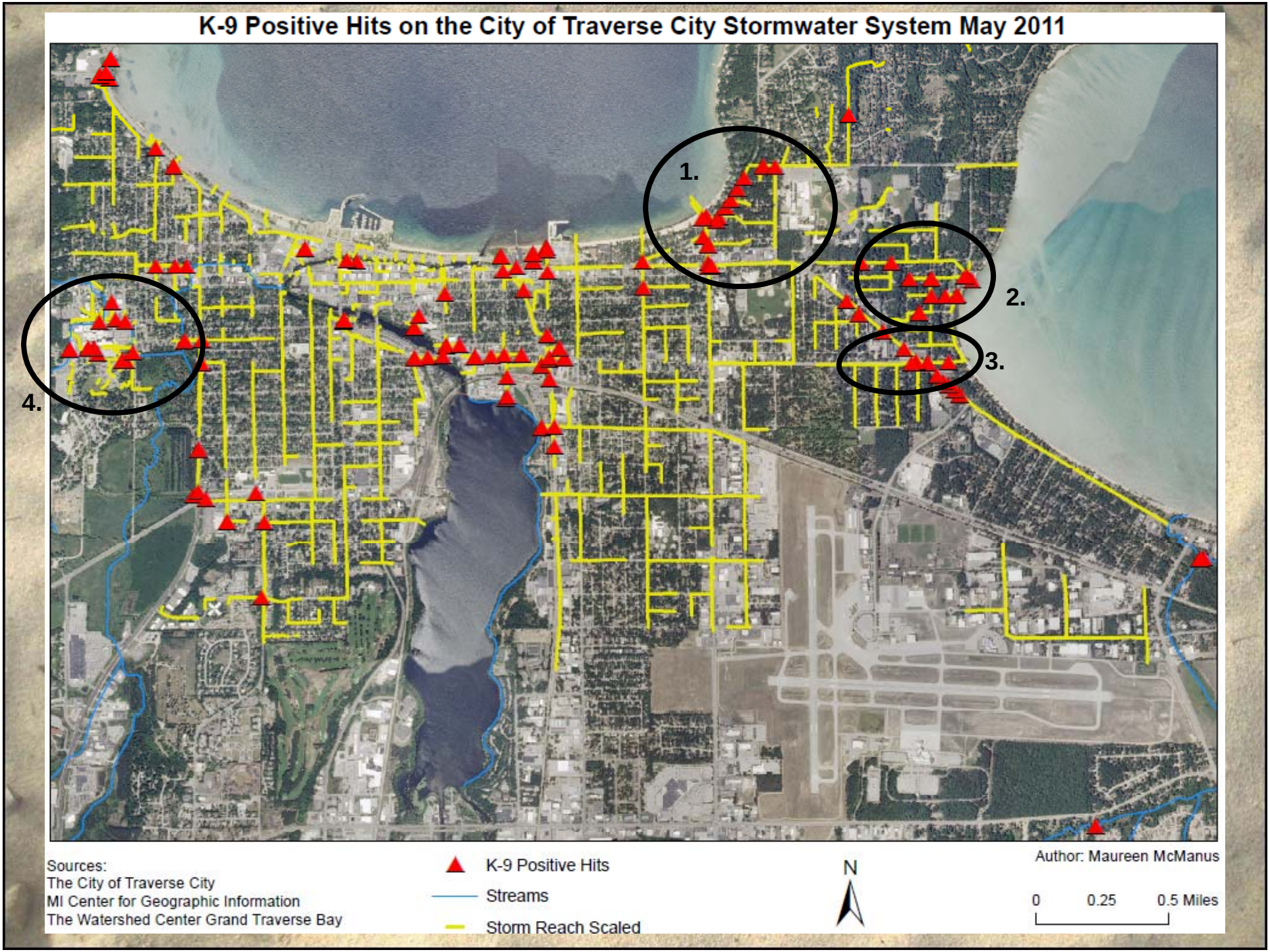
- Get 'as builts' before you go out
- Help from City's DPW was important
  - ✓ Traffic
  - ✓ Interpreting maps

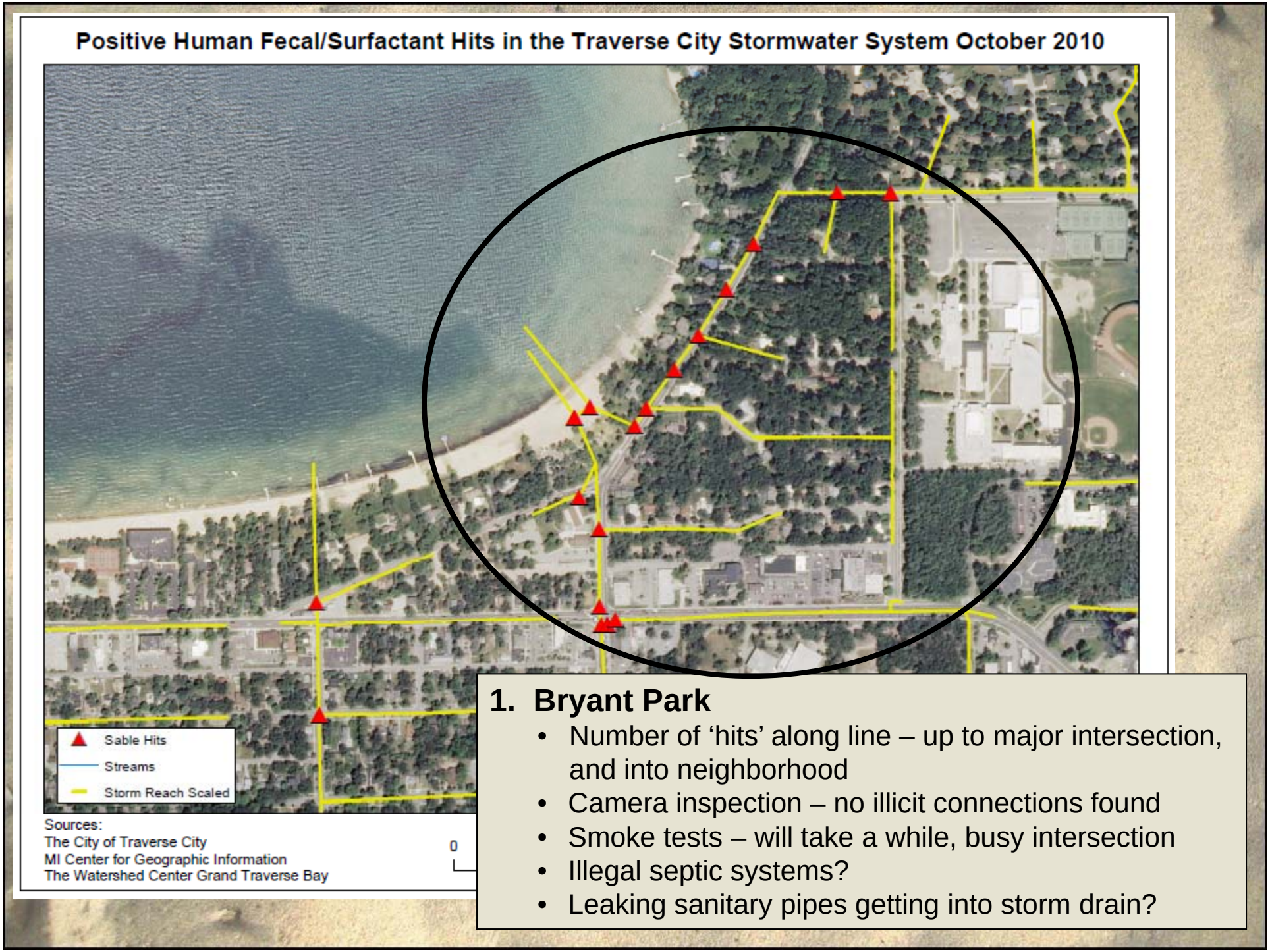
Sable in Action!

Video by Tom Buss, GT County Health Department

- **This project received A LOT of press coverage… television, newspaper, radio**
- **General public interested**
- **Lots of people stopped to ask questions**

TWC developed You Tube Videos

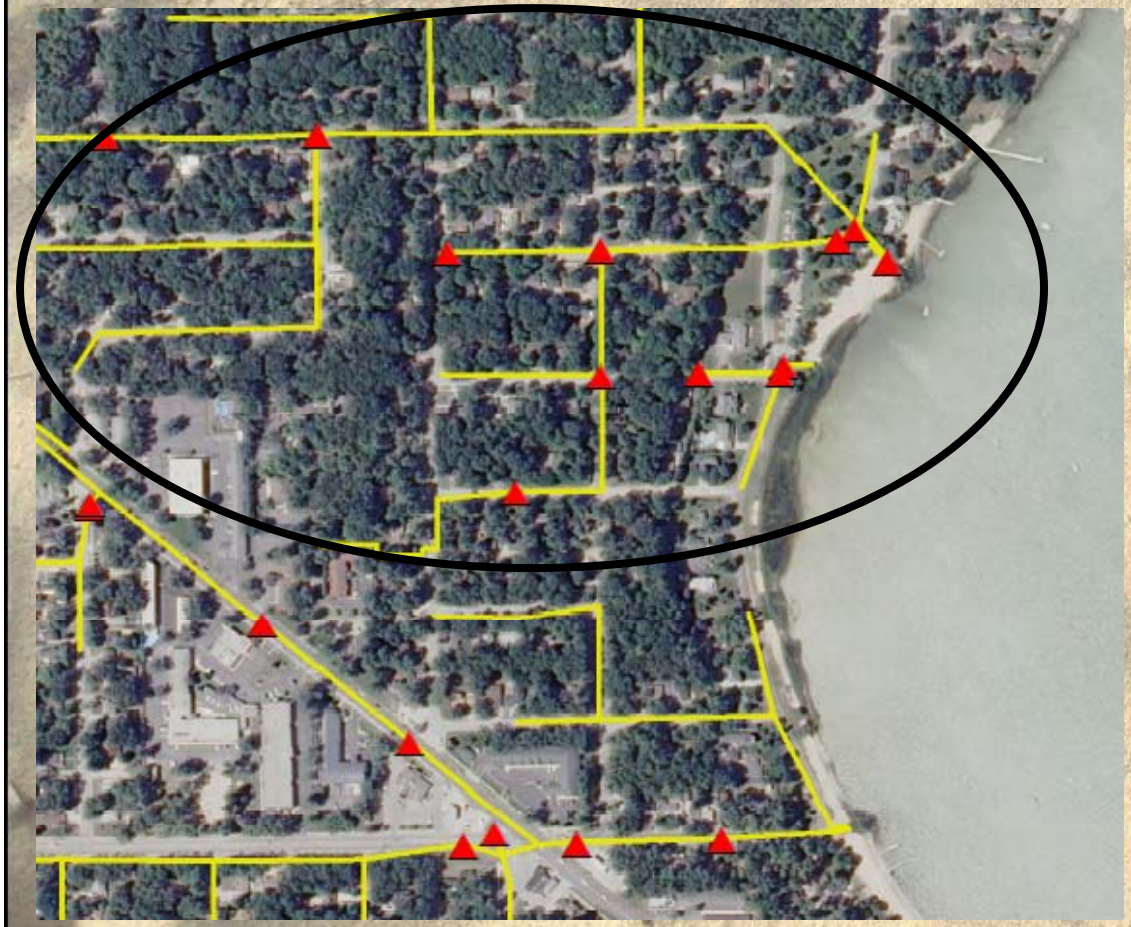




1. **Bryant Park**
   - Number of 'hits' along line – up to major intersection, and into neighborhood
   - Camera inspection – no illicit connections found
   - Smoke tests – will take a while, busy intersection
   - Illegal septic systems?
   - Leaking sanitary pipes getting into storm drain?

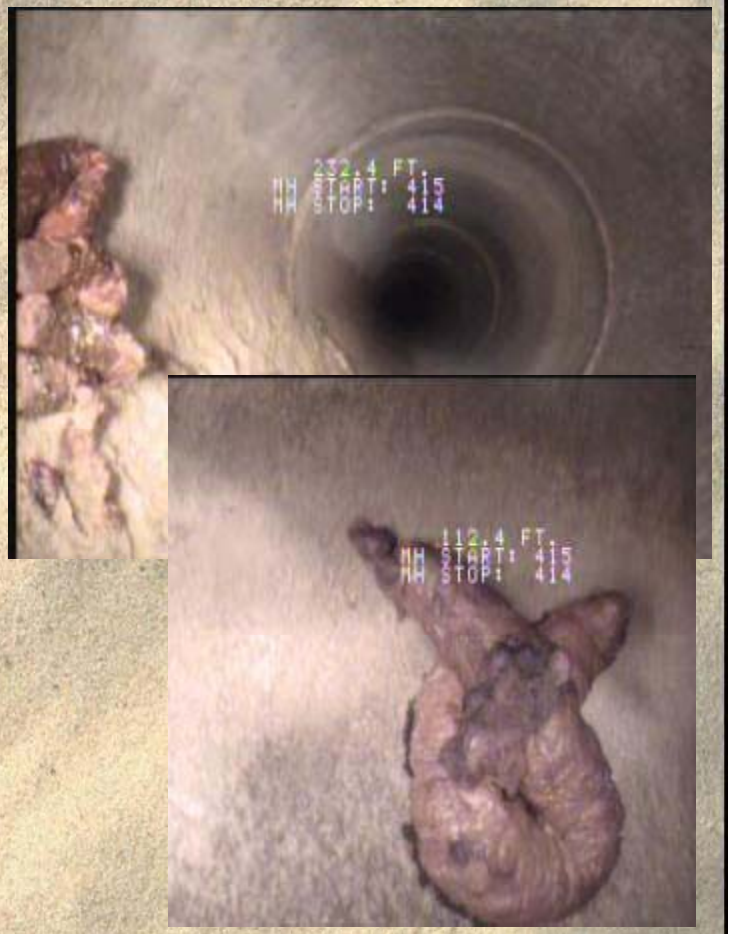
2. East Bay Park

- Number of ‘hits’ along line – up into neighborhoods
- Possible b/c of excessive car washing
- Interference from lift station in vicinity
- Camera inspection – no illicit connections found
- Leaking sanitary pipes getting into storm drain?



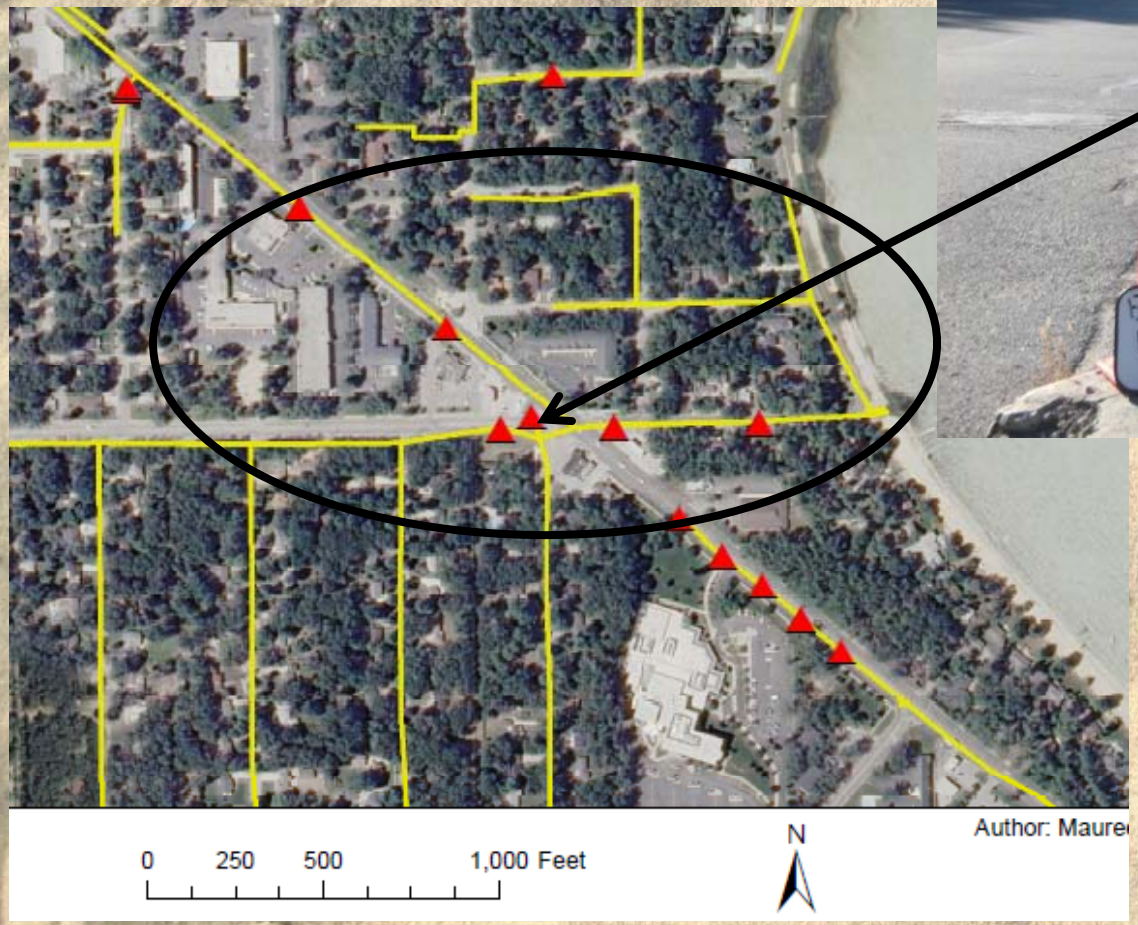
What camera inspections DID find… a greater source of E.Coli

RACOON POOP!



3. Corner of Munson Ave (US31/M72) and 8th St

- Auto detailing shop illegally discharging wash water to storm drain
- Fined by City and ordered to stop



4. Munson Hospital

- Leaking dumpster and trash compactor in loading/unloading area
- County health department and Munson officials notified
- Problem fixed within a week
- Hospital also put new cleaning measures in place (for wayward trash)

E.Coli sample taken from drain greater than 10,000 col/100mL

Action Plan for Healthy Beaches

Phase 3 – Additional Stormwater Controls and Implementation

Reminder:

Phase 1 – Ordinances, Education, and Outreach

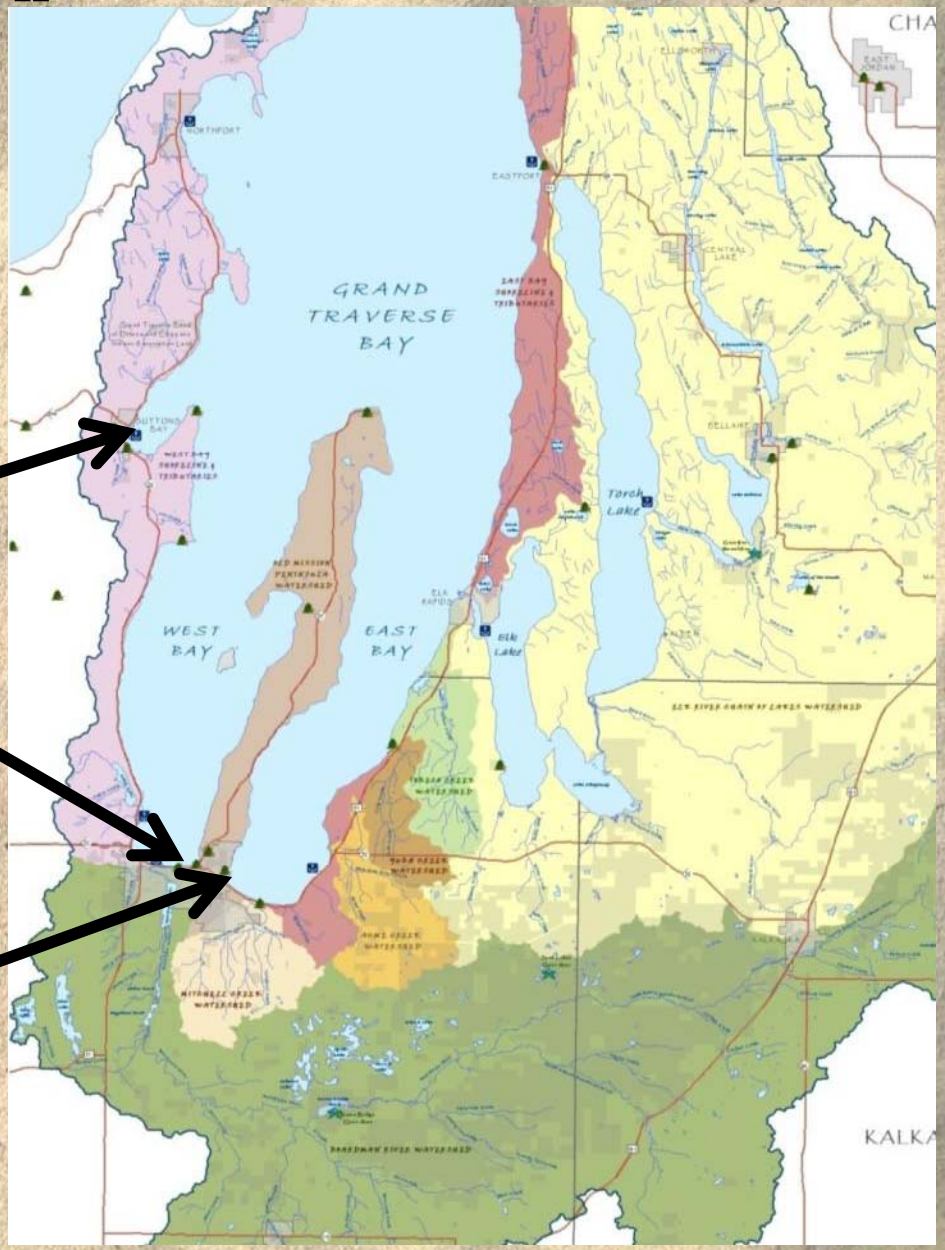
Phase 2 – Sanitary Surveys and Source Tracking

Phase 3 – Additional Stormwater Controls and Implementation

Great Lakes RESTORATION

GLRI Beach Projects in Watershed:

- **2011: Suttons Bay - $987,102**
- **2010: Bryant Park - $267,755**
  Partnership with DEQ
- **2011: East Bay Park – $767,648**



Bryant Park Beach Remediation - $267,755

On State Impaired Waters List (303(d) List) for Bacterial Contamination

Storm drain overflow at park would frequently 'blow it's top'

Issues:

- Bacterial contamination of nearshore waters
- Public health risk
- Overflowing storm drain

DEPARTMENT OF ENVIRONMENTAL QUALITY

The Watershed Center
GRAND TRAVERSE BAY

Bryant Park Beach Remediation Cont'd

Remediation Plan:

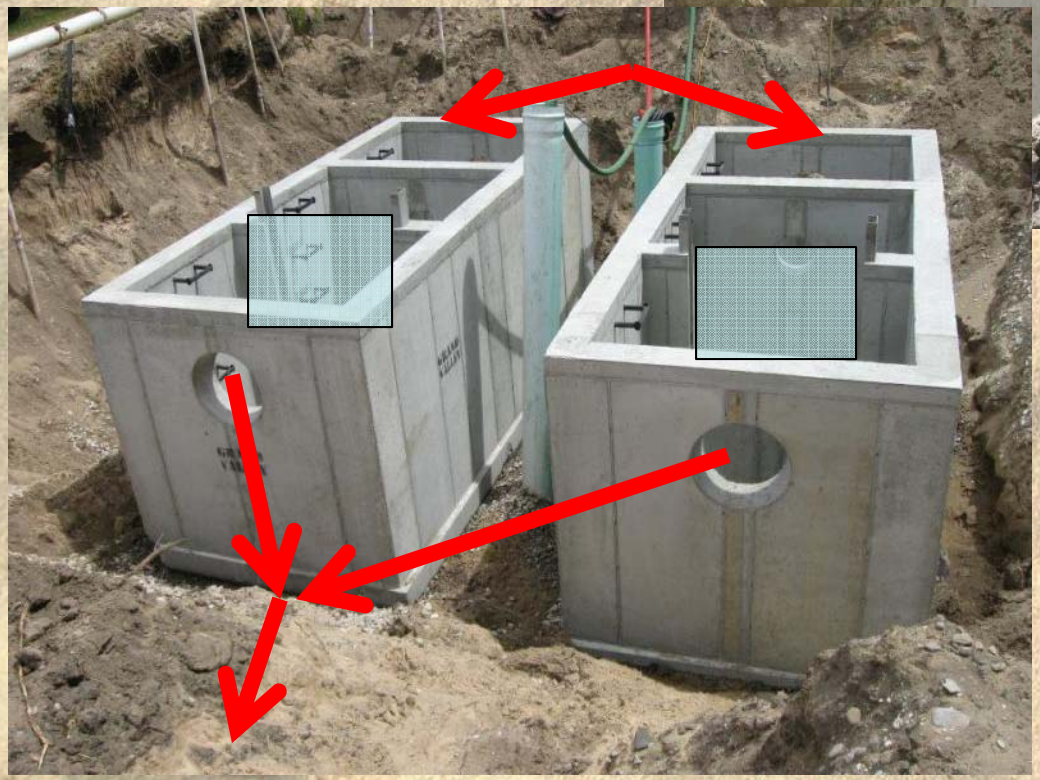
- No known illicit connections or obvious sources of human input
- Large beach area with good infiltration
- Reduce stormwater input to Bay
- Chosen BMP - end of pipe underground filtration system

Fall 2011: New drain connections installed to help prevent the system from overloading, also provide a diversion structure to treatment system

Bryant Park Beach Remediation Cont'd

Spring 2012

Right: Runoff is diverted to this oil/grit separator to settle out heavy solids



Left: Runoff then flows through these concrete structures to further settle out solids, a screen structure will be between the 2nd and 3rd chamber to filter out things such as cigarette butts and pine needles

Bryant Park Beach Remediation Cont'd

Spring 2012

Completed!

Right: V ow down the black pi g on the right (called the header tube) and then overflow into the yellow infiltration chambers to the left. The gravel will help the water filter naturally into the soil.

East Bay Park Beach Remediation - $767,648

On State Impaired Waters List (303(d) List) for Bacterial Contamination

Storm Drain Outlet

Issues:

- Bacterial contamination of nearshore waters
- Public health risk

East Bay Park Beach Remediation Cont'd

Remediation Plan – Spring 2013:

- No known illicit connections or obvious sources of human input (just raccoon poop)
- Poor infiltration and high groundwater table
- Reduce stormwater input to Bay
- Chosen BMP - end of pipe underground manufactured filter system
  - On three separate lines that outlet to Bay
    - Diversion weir and oil/grit/trash separators and filters (like Bryant Park Project)
    - Helix Cartridge Filtration System – high flow cartridge, treats pathogens, sediment hydrocarbons and nutrients
  - Combine drains, move to south edge of park away from swim area

Suttons Bay Stormwater Remediation - $987,102

Issues:

- Bacterial contamination of nearshore waters (at South Shore Park)
- Public health risk

Three main drains in village:

1. Broadway – outlets near public beach (South Shore Park)
2. Madison – outlets in marina
3. Grove – outlets near heavily used public beach (Marina Park)

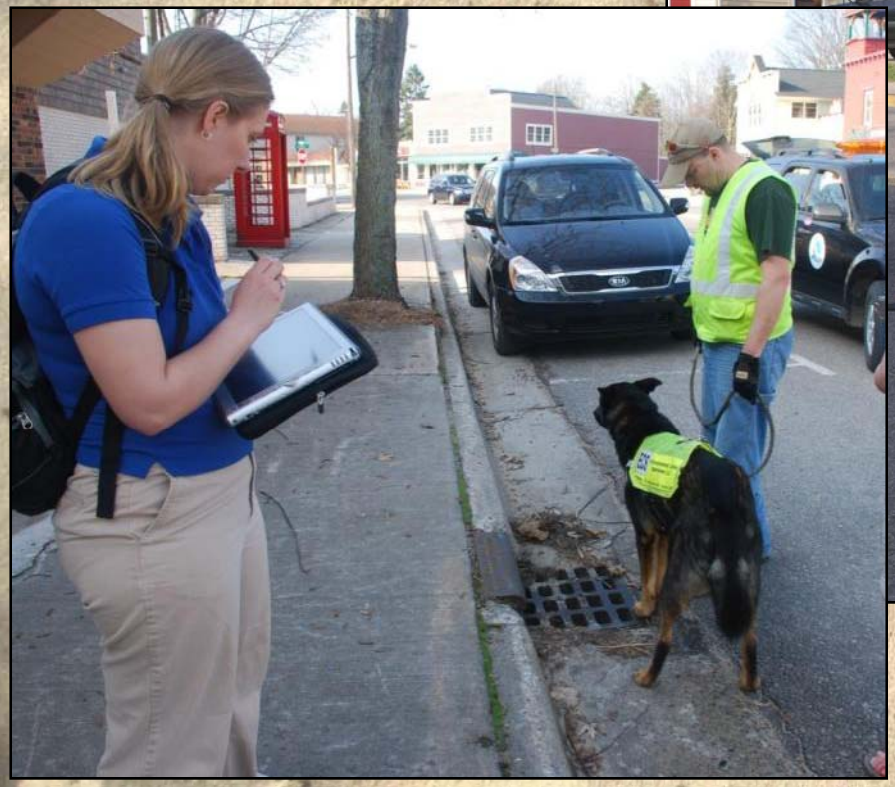
E.Coli Advisories:

- **South Shore Park** – occasional beach advisories
- **Marina Park** – not tested

Suttons Bay Stormwater Remediation Cont'd

Initial step - Canine Unit deployed (was bacteria human or animal?):

- Took ONE DAY
- No 'hits' = no human sources of E.Coli
- Quickly verified E.Coli levels are animal sourced rather than human sourced
- Remediation project developed BMPs accordingly

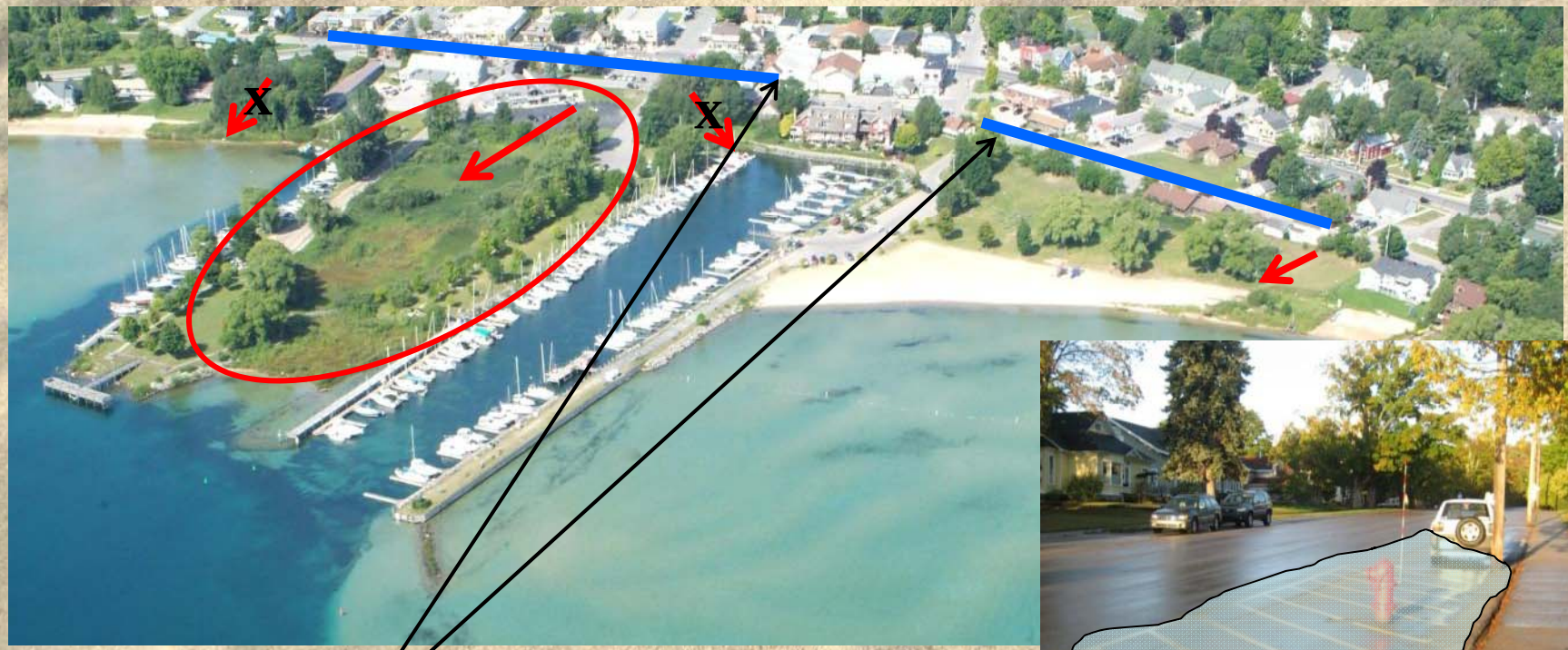


Scott and Sable inspect storm drains in Suttons Bay

Suttons Bay Stormwater Remediation Cont'd

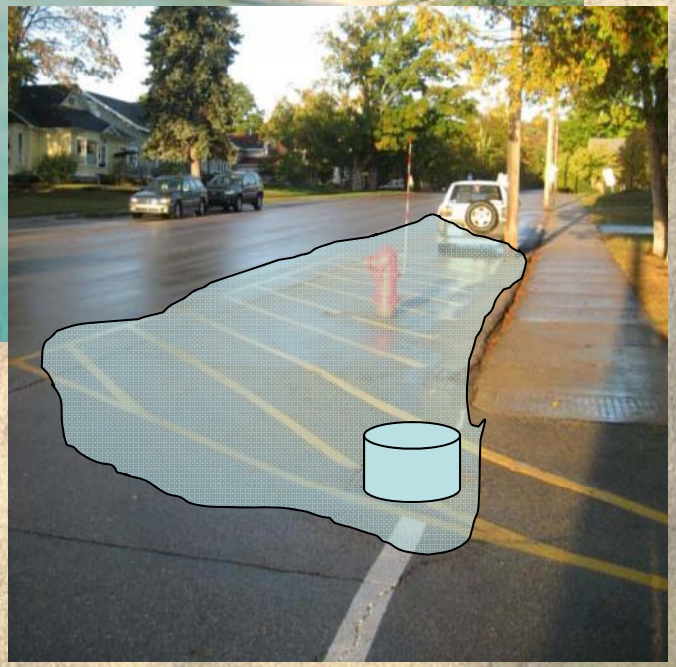
Remediation Plan – Spring 2013:

- Install series of BMPs to increase infiltration within Village and reduce amount of runoff making it to pipe outlets (rain gardens, underground infiltration trenches)
- Redirect two pipe outlets to wetland for additional treatment



Above Blue Lines: Infiltration trenches run along length of Front Street (parrallel to Bay)

Right: Diagram of proposed rain garden site along road



Questions?

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