

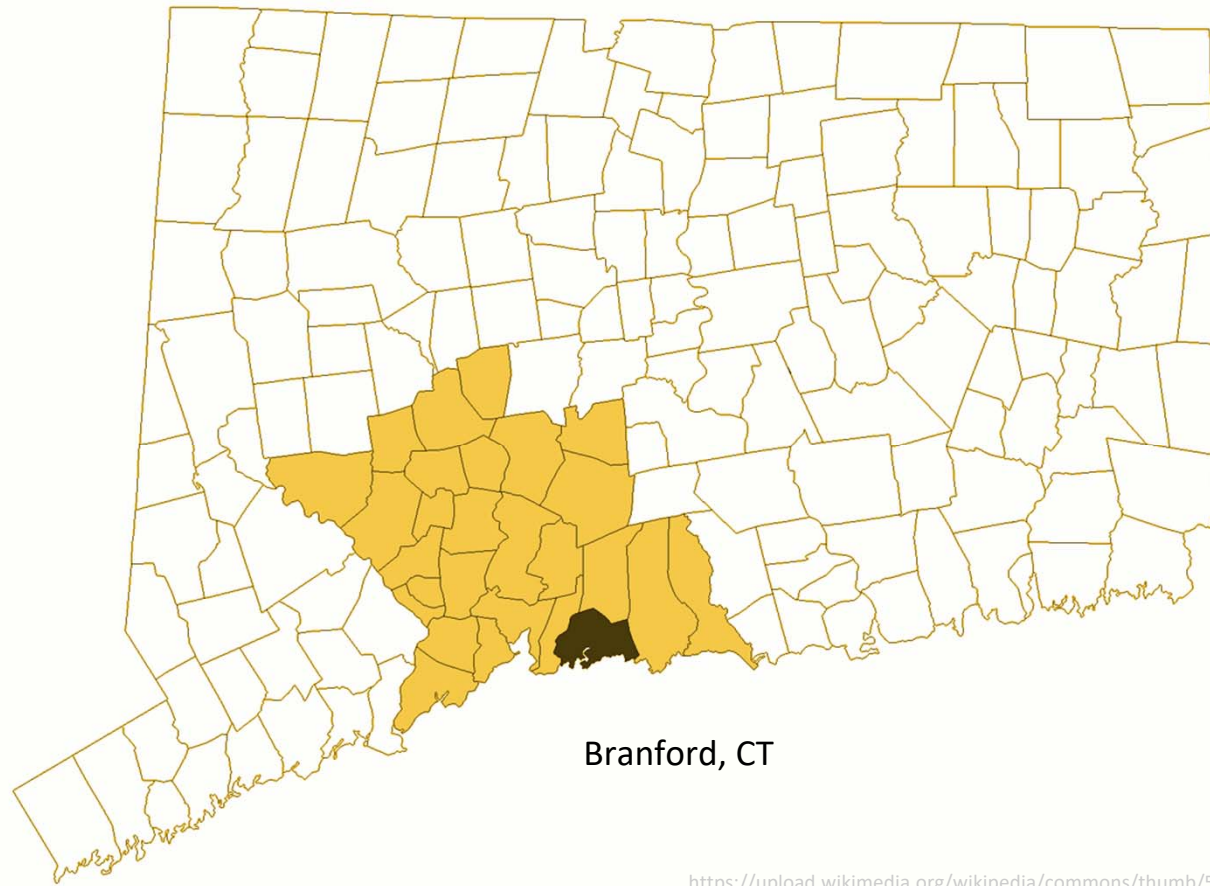
# Improving Water Quality in the Short Beach Neighborhood Branford, Connecticut



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Yale University  
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# The Project

- Compromised water quality in the Short Beach neighborhood, observed from past reports
- 5 project aims to investigate this issue



Branford, CT

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# Short Beach Neighborhood

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# Aims

- Water sampling and results analysis
- GIS map of sewage systems & sanitary survey
- Data analysis
- Collaborate with community
- Work with local & state partners

# AIM 1

Update the 2017 student report  
by examining the relationship between weather-  
related (and other) variables &  
level of bacterial contamination  
at Johnson's Beach  
& in nearby shellfish beds.

# Results

## Marine bathing water

**Table 1. Logistic regression model for Clark Avenue Beach**

	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>Tidal Stage</b>		
Flood tide	1.00	1.00
Ebb tide	2.77 (1.79, 3.75) **	<b>6.16</b> (1.38, 27.55) **
<b>Precipitation(inches)</b>		
Two-day rainfall	2.69 (2.03, 3.35) ***	<b>7.79</b> (1.80, 33.77) ***
<b>Interaction</b>		
Ebb tide*Two-day rainfall	-	0.09 (0.046, 1.27) *

p-value: \*<0.1; \*\*<0.05; \*\*\*<0.01

\*Higher odds of contamination during ebb tides

\*Significantly associated with two-day precipitation prior to sampling

\*The combined effect is less than the sum of individual effects

# Results

## Marine bathing water

- ❑ 50% PPV: 1.7 inch precipitation over 2 days
- ❑ High sensitivity(>70%) using only ebb tide
- ❑ Higher PPV using Precipitation+Ebb Tide when precipitation <0.7 inch

	PPV	Sensitivity	Specificity
0	0.19	0.79	0.46
0.1	0.22	0.71	0.61
0.4	0.22	0.38	0.79
0.7	0.33	0.38	0.88
1	0.38	0.25	0.94
...	...	...	...
<b>1.7</b>	<b>0.50</b>	<b>0.13</b>	<b>0.98</b>
2	0.67	0.08	0.99
...	...	...	...

Rain (inch)	PPV(Precipitation)	PPV (Precipitation+Ebb tide)
0.00	0.19	0.25
0.05	0.21	0.29
0.10	0.22	0.31
0.15	0.23	0.30
0.20	0.25	0.31
0.25	0.25	0.29
0.30	0.27	0.29
0.35	0.22	0.20
0.40	0.22	0.20
0.45	0.24	0.24
0.50	0.26	0.28
0.55	0.29	0.31
0.60	0.29	0.31
0.65	0.32	0.38
0.70	0.33	0.42



## Shellfish water

### Restricted

	Adjusted OR (95% CI)
Two-day Rainfall	10.75 (5.97, 19.35) ***
Temperature (10°F)	1.54 (1.33, 1.78) ***

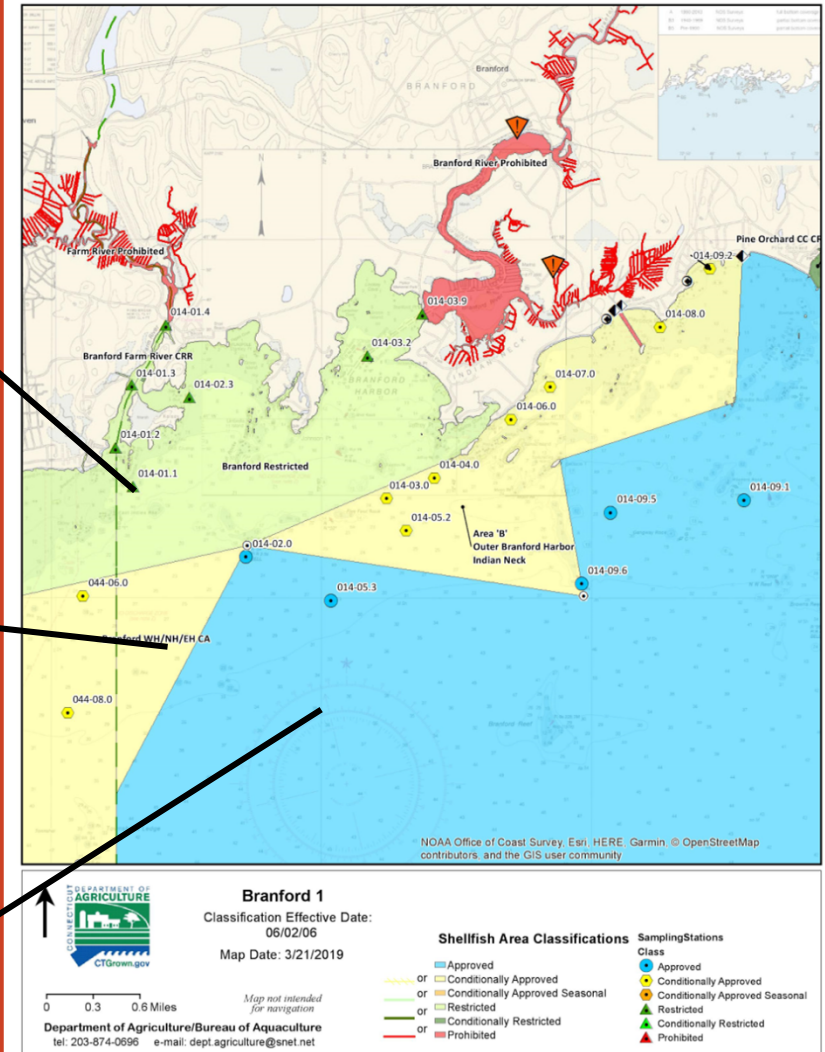
### Conditionally Approved

	Adjusted OR (95% CI)
Flood tide	11.24 (3.19, 39.64) ***
Two-day Rainfall	3.10 (1.92, 5.03) ***
Temperature (10°F)	1.49 (1.10, 2.03) **

### Approved

	Adjusted OR (95% CI)
Low tide	1.87 (1.05, 3.31) **
Two-day Rainfall	3.51 (2.67, 4.62) ***
Temperature (10°F)	1.22 (1.00, 1.48) *

p-value: \* < 0.1; \*\* < 0.05; \*\*\* < 0.01

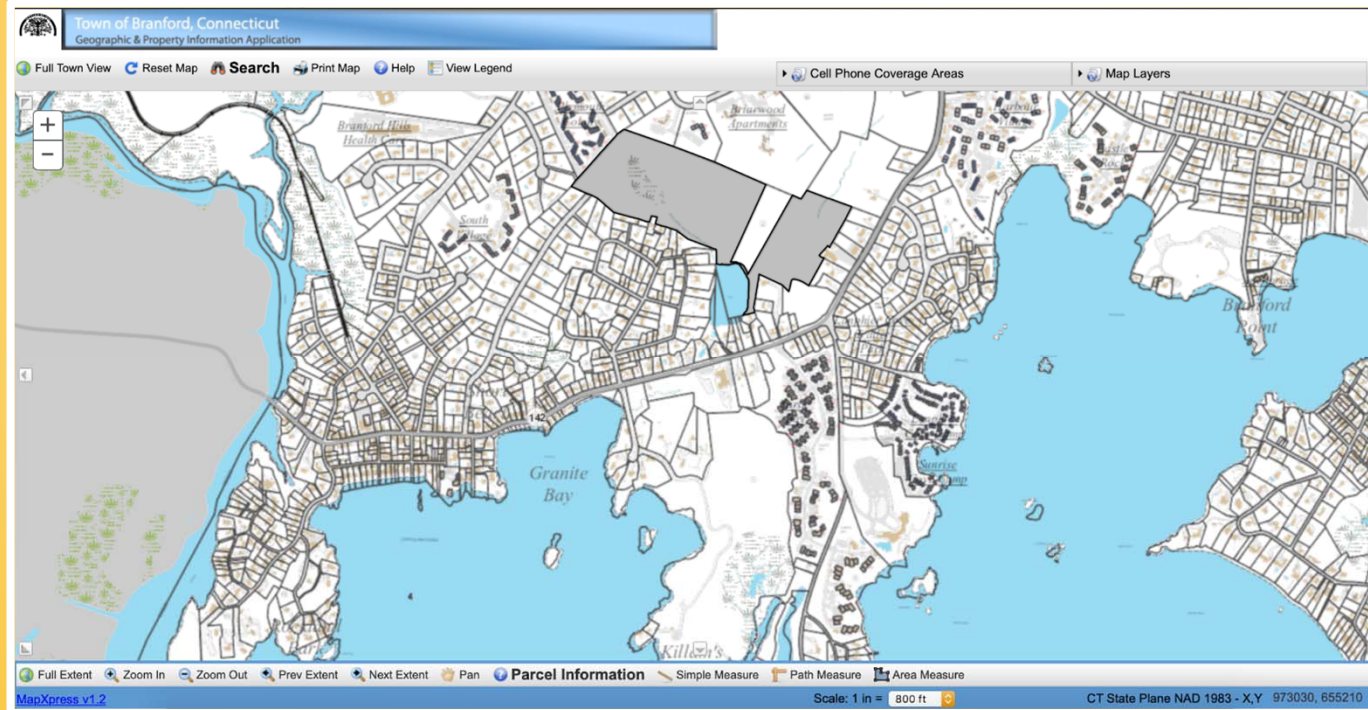


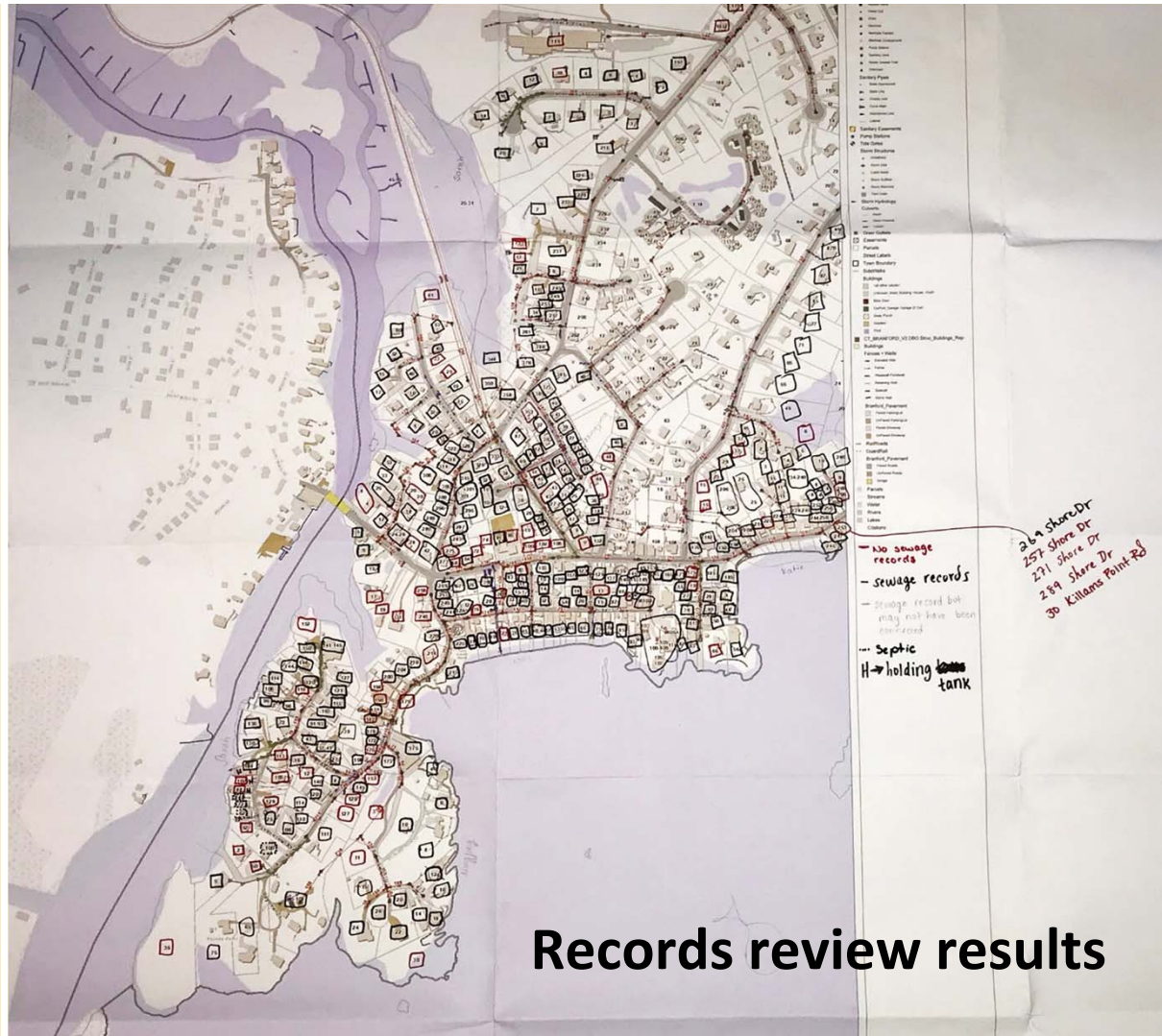
# AIM 2

**Construct a GIS map of  
Short Beach neighborhood's  
sewage systems.**



- 1) Lack of records
- 2) Town GIS system





## Records review results

# **Sewage Records Survey:**

**Mailed 7/10/2019**

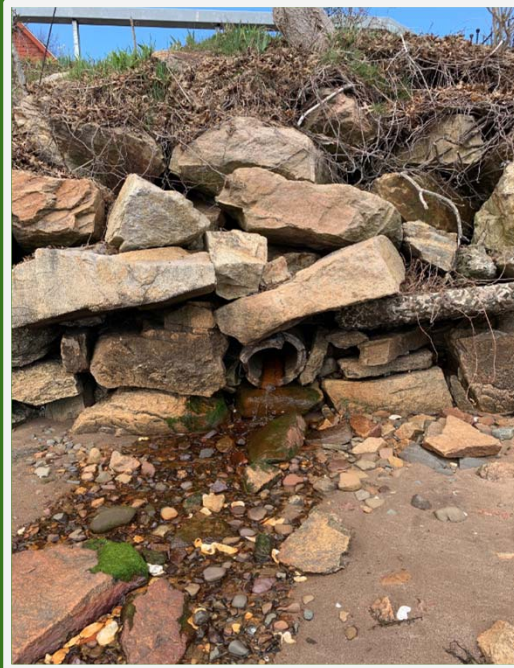


# AIM 3

**Conduct a hands-on sanitary survey &  
field water quality sampling in  
Short Beach neighborhood  
in different weather conditions.**



- 1) Sanitary survey not feasible {51}
- 2) Not enough precipitation events
- 3) Outfalls not flowing



# Water Sampling Results



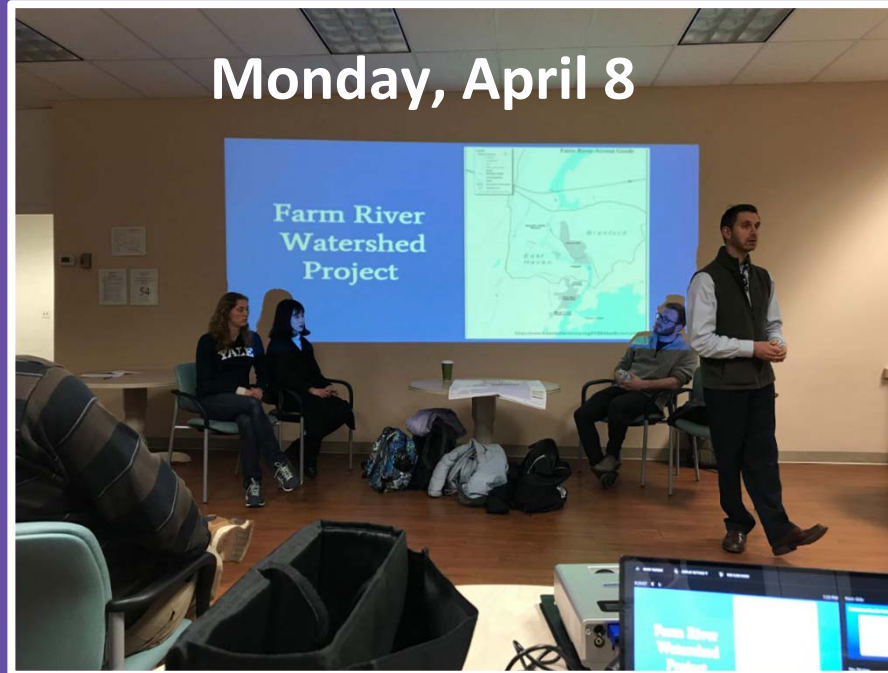
- Tests: *E.coli*, *caffeine*, *ammonia*, *chloride*, *conductivity*, *pH*
- Significant bacteria levels observed following rain events (>235 MPN/100ml *E.coli*)
- Samples mailed to Lauren Brooks laboratory for DNA markers testing



# AIM 4

**Participate in community outreach meetings to inform residents about the sanitary survey & give them an opportunity to assist ESDHD in developing fair, practical solutions & behavior changes to improve water quality in their community.**

# Civic Association of Short Beach



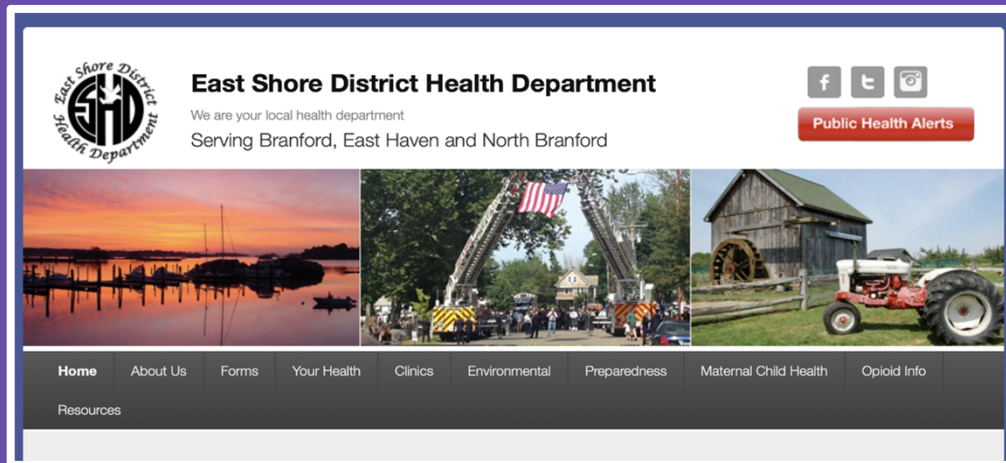
# Objectives:

**Feasibility**

**Accountability**

**Project sustainability**

**Community engagement**



# Community Engagement Protocol



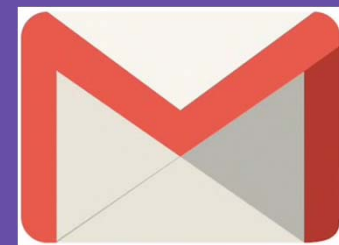
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Contacts



### Why is Pet Waste A Concern?

There are a lot of pets, producing a lot of waste, and while pet waste is not the most significant pollutant, it can contribute to pollution over time.



#### Why pick up after my dog, won't the tide wash it away?

Dog waste may pose a health threat to swimmers, wildlife, surfers and other dogs. **It can pollute the water and lead to beach closures and closure of shellfish beds.**

#### I only have a small dog; it can't really harm the water, can it?

It can be hard to picture how a single dog depositing a small amount of waste can result in water pollution. However, studies have shown that the combined impact of all pets and wildlife within a watershed can be significant when it comes to water quality and human health.

### Be Aware

- When animal waste ends up in the water it decomposes, using up oxygen. During summer months, low dissolved oxygen levels harm fish and other aquatic life.
- Beaches and shellfish beds may be closed, if evidence that disease causing bacteria and viruses might be present is found on routine water testing. Pet waste can be a cause of test results that close beaches and shellfish beds.
- The majority of water pollution comes from small sources – especially at the household level.
- Many towns have "pooper scooper" ordinances that require pet owners to pick up and remove fecal matter from public property. **This includes dumping pet waste in watercourses!** Fines can be imposed on those caught violating these laws.

**Branford Town Code: 176-17 A. It shall be unlawful for any person owning, keeping, walking, or in control of any dog or other animal to allow or permit such animal to defecate upon any private property owned by another person or a public place unless such person shall remove all feces so deposited by such animal.**  
**176-18 A. Any person who shall violate provisions of this chapter shall be deemed to have committed an infraction and be subject to a fine of \$35.00.**

### Pet Waste is Natural

However, efficient drainage systems and roads now make it easy for pet waste to reach beach waters.

Waste left on the ground either passes through storm sewers untreated or washes directly into oceans, lakes, and streams.



Pet waste is unpleasant and can pose health risks when left on beaches or in other recreational areas.

To make sure your pet isn't contributing to the problem, always clean up after your pet and deposit waste in an appropriate manner.

#### Quick Tips

Reuse old bags: grocery, sandwich, newspaper, produce and bread bags to pick up and contain pet waste.

Keep a supply of bags near your dog's leash.

Tie bags onto the leash if you don't have a pocket or pack.



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# Citizen Science Sampling

Neighborhood volunteers  
assembled by local Ann Davis  
collect samples from outfalls near  
their homes during rain events





# Citizen Science Sampling



**Ann, Bill, and high school volunteer  
Evan offer their time and their boat for  
sampling along the Farm River**

















# AIM 5

Participate in meetings with  
local & state agency partners about short-term & long-term solutions to improving Short Beach water quality.

# Meetings

- Farm River USDA-NRCS [May 2]
- ESDHD Board of Directors [May 9]
- State-wide Bathing Water Stakeholders [May 14]



**Branford** Connecticut

# Meetings



**Why is Pet Waste A Concern?**

There are a lot of pets, producing a lot of waste, and while pet waste is not the most significant pollutant, it can contribute to pollution over time.

**Why pick up after my dog, won't the tide wash it away?**

Dog waste may pose a health threat to swimmers, wildlife, surfers and other dogs. It can pollute the water and lead to beach closures and closures of shellfish beds.

**I only have a small dog. It can't really harm the water, can it?**

It can be hard to picture how a single dog depositing a small amount of waste can result in water pollution. However, studies have shown that the cumulative impact of all pets and wildlife within a watershed can be significant when it comes to water quality and human health.

**Be Aware**

- When animal waste ends up in the water it decomposes, using up oxygen. During summer months, low dissolved oxygen levels harm fish and other aquatic life.
- Bacteria and shellfish beds may be closed. E.coli bacteria that causes diarrhea, stomach pain and other ailments may be present in fecal matter in water. Pet waste can be a source of bacteria that cause diarrhea and shellfish beds.
- The majority of water pollution comes from small sources - especially at the household level.
- Many towns have "dog scopes" or "dog scopes" that require pet owners to pick up and remove fecal matter from public property. This includes dumping pet waste in watercourses. Fines can be imposed on those caught violating these laws.

**Remember:** From Code 215-17 A, it shall be unlawful for any person owning, keeping, holding, or in control of any dog or animal to deposit any fecal matter in or on any public property. This includes dumping pet waste in watercourses. Fines can be imposed on those caught violating these laws.

**Pet Waste is Natural**

However, efficient drainage systems and modern lawns make it easy for pet waste to reach beach waters.

Waste left on the ground either passes through storm sewers untreated or washes directly into oceans, lakes, and streams.

Pet waste is unpleasant and can pose health risks when left on beaches or in other recreational areas.

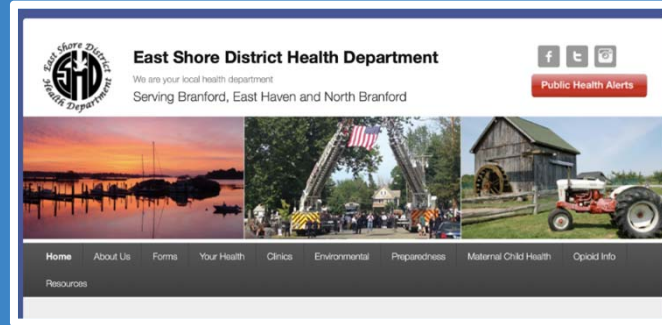
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**Quick Tip**

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Keep a supply of bags near your dog's leash.

The bags onto the beach if you don't have a pocket or pack.



# Deliverables



# Community Engagement Protocol

**Feasibility**



**Project sustainability**



**Accountability**



**Community engagement**

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Special Thanks to our Yale University Beach Team & Volunteers:

Sarah Esenther, Katie Schlick, Chris Jossart, Ningjing Wang

Ann Davis, Bob Deschamps, Bill Kelsey, Patricia Deschamps & more...