Studying the Presence and Distribution of Pollutants and Other Water Quality Parameters along the Quinnipiac River 2022-2025

Courtney McGinnis Ph.D.
August 10, 2025

Quinnipiac UNIVERSITY

The Community Foundation *for* Greater New Haven

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Endocrine Disrupting Chemicals Projects

1. Investigate the impact of per- and polyfluoroalkyl substances (PFAS) on human health.

2. Seasonal examination of the presence and distribution of pollutants and other water quality parameters along the Quinnipiac River

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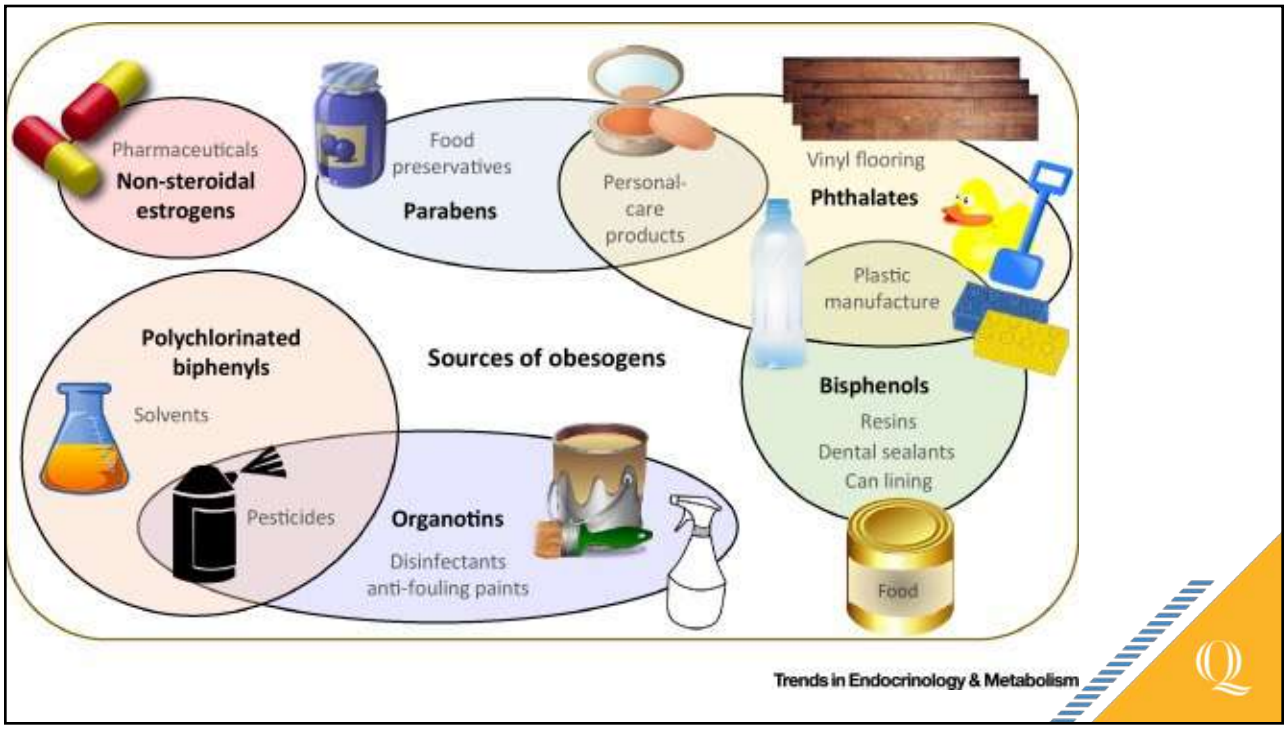

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Relevance

ENERGY & ENVIRONMENT

More CT towns are finding PFAS in their water supplies

Smaller water systems could face huge expenses to treat the 'forever chemicals,' or they could look for new sources of water

by Andrew Brown
August 27, 2023 @ 5:00 am

LOCAL NEWS

Class action lawsuit accuses major Connecticut water suppliers of supplying water contaminated with PFAS

Three lead plaintiffs represent hundreds of thousands of Connecticut Water and Aquarion customers.

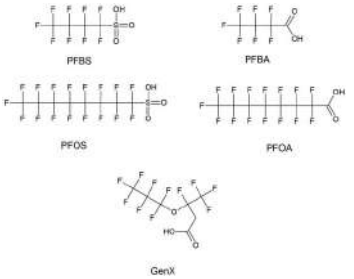
ENERGY & ENVIRONMENT

CT's public water systems may soon need to treat for PFAS

The 'forever chemicals' have already been found in water supplies across Connecticut, and a new federal regulation could establish an enforceable limit

by Andrew Brown
April 9, 2023 @ 5:00 am

- Per- and polyfluoroalkyl substances (PFAS) are an emerging pollutant
  - 2018 (Federal –AFFF ban)
  - Oct 1, 2021 (CT State)
  - March 14, 2023: drinking water standard for 6 PFAS compounds



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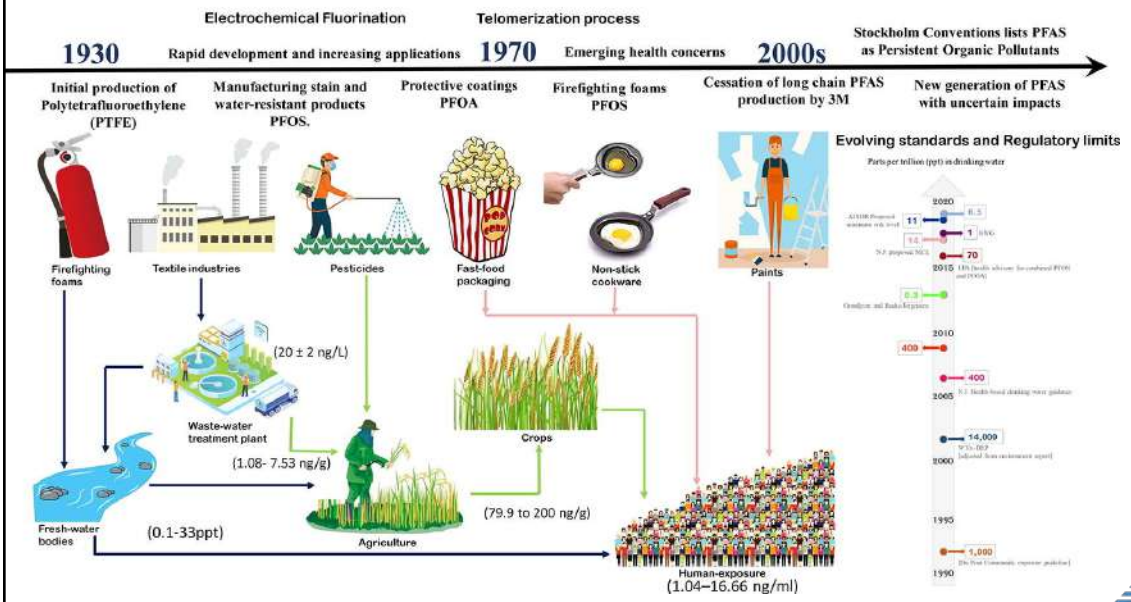
Per/polyfluoroalkyl substances : The forever chemicals



https://www.sciencedirect.com/science/article/pii/S0960852421011494

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Investigate the impact of per- and polyfluoroalkyl substances (PFAS) on human health

- My research students and I are currently investigating potential mechanism of actions (MOA) for several PFAS compounds.
  - Selection of the compound
  - Screening of nuclear hormone receptors and other genes associated with cholesterol transport
    - Cardiovascular disease
- This work is currently being carried out in *C. elegans*, but will transition to *D. rerio*.
- Students learn a variety of molecular lab techniques
- Students learn a variety of soft skills too!

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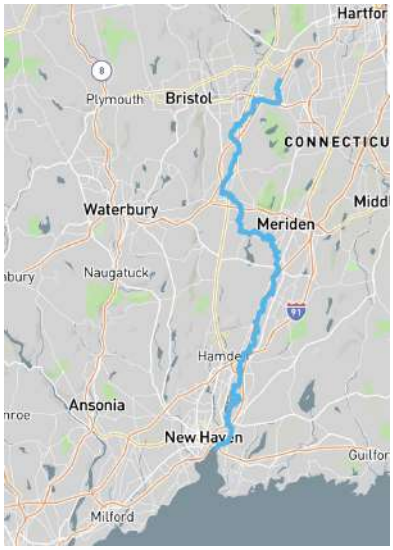
The Quinnipiac River



https://www.thequinnipiacriver.com/map

- 38-mile river that runs from New Britain-Farmington area
- The river then meanders south through Meriden and Wallingford, and ultimately drains into New Haven Harbor and Long Island Sound.
- By the Numbers:
  - 38 miles long
  - 165 square mile watershed
  - Travels through 14 municipalities
  - 913 acres of tidal marsh
  - 20 tributaries

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Endocrine Disrupting Chemicals Projects

1. Investigate the impact of per- and polyfluoroalkyl substances (PFAS) on human health.

2. Seasonal examination of the presence and distribution of pollutants and other water quality parameters along the Quinnipiac River

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Quinnipiac River Grant Objectives

Objective 1: Collect and analyze water samples for chemical pollutants and water quality parameters from established sampling locations along the Quinnipiac River from Hanover Pond (Meriden, CT) to Universal Drive (North Haven, CT) throughout the year.

- Expanded to Meriden in 2023
- Began to conduct seasonal sampling in 2023

Objective 2: Work alongside various stakeholders to remove bulk trash from two specific locations in North Haven, along Valley Service Road and along behind the shopping complex on Universal Drive.

- Began in 2024

Objective 3: Communicate findings to the community-at-large. Our results will be disseminated by the Public Relations Department at Quinnipiac University to local newspapers like the New Haven Independent, and local municipalities. Additionally, in the past we have presented our finding sat several professional scientific venues at both the regional and national levels and will continue to do so as appropriate.

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Research Overview of 2022-2023

- Focus on analyzing plasticizers, phthalates, and environmental pollutants via GC-MS
- Thirteen (13) sampling sites along the Quinnipiac River
- Sampled nine (9) times from May-August (Summer only)
- Total and Fecal Coliform Analysis

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Research Overview 2023-2024

- Focus on seasonally sampling and analyzing plasticizers, phthalates, and environmental pollutants via GC-MS
- Thirteen (13-14) sampling sites along the Quinnipiac River, depending on if the drainpipe is running
- Seasonally sampling, completed 6 sampling dates so far; goal is 12 sampling dates.
  - (3x) April- June
  - (2x) July- September
  - (3x) October-December
  - (2x) January-March
- Total and Fecal Coliform Analysis

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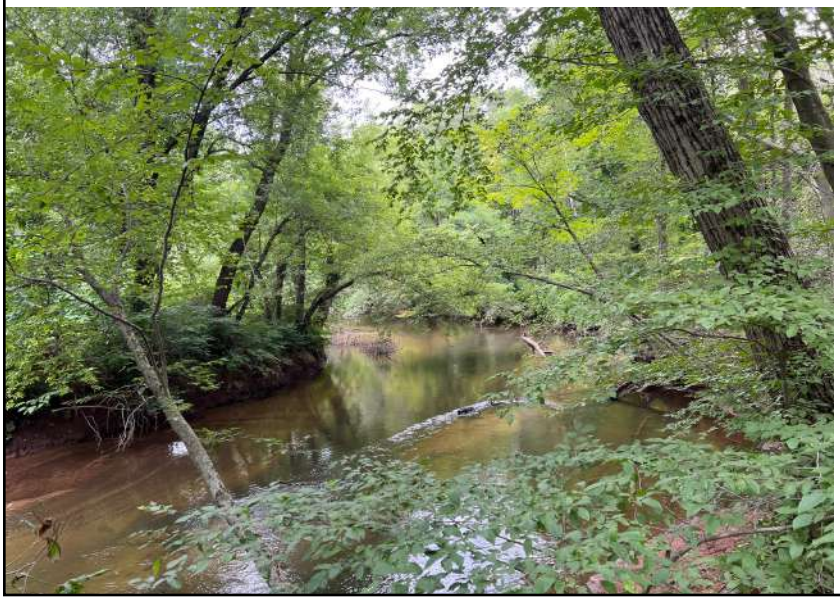
Research Overview 2024-2025



- Focus on seasonally sampling and analyzing plasticizers, phthalates, and environmental pollutants via GC-MS
- Thirteen (13-14) sampling sites along the Quinnipiac River, depending on if the drainpipe at Toelle's road is running
- Seasonally sampling
  - (3x) April- June
  - (3x) July- September
  - (3x) October-December
  - (3x) January -March
- Total and Fecal Coliform Analysis

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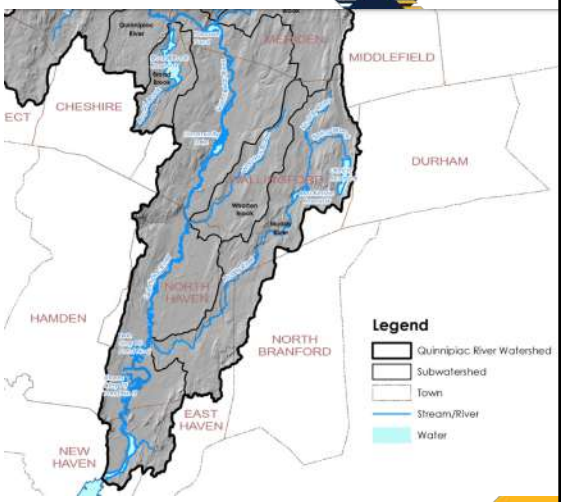
Map of Sampling Sites

Sampling locations:

- Hanover Pond, Meriden
- Pragemann Park, Wallingford
- Fishway Above & Below, Wallingford
- Hall Ave, Wallingford
- Toelles Road, Wallingford
- Drain Pipe (not always running), Wallingford
- Valley Service, North Haven
- Quinnipiac River State Park Entrance, North Haven
- River St. Tavern, North Haven
- DEEP Boat Launch, North Haven
- Sacket Point Rd, North Haven
- Best Buy, North Haven
- Target, North Haven



https://portal.ct.gov/-/media/DEEP/water/watershed_management/wm_plans/quinnipiac/quinnipiacwbpappendicespdf.pdf

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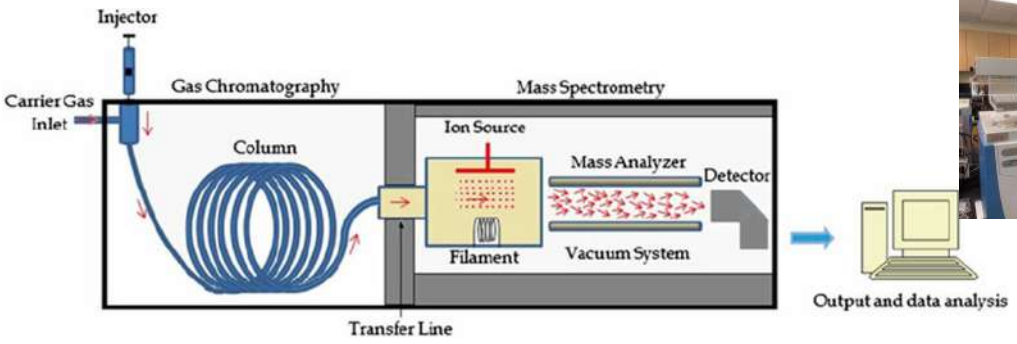
Method of Analysis

•A GC/MS was used to analyze the collected samples

•The GC (Gas Chromatographer) is used to separate the sample into smaller components so the MS (Mass Spectrometer) can measure the mass-to-charge ratio of the organic compounds and determine the <u>presence</u> of compounds



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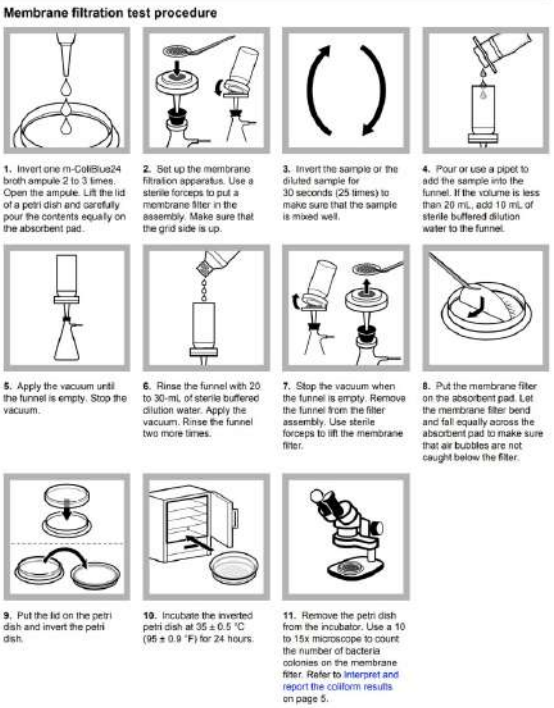

Method of Analysis

Total and **Fecal** Coliform mColiBlue

- 24-hour incubation @ 35 degrees Celsius
- EPA Method 1604

- Water Quality Criteria
  - "all recreational uses" The geometric mean density of indicator bacteria must be less than 126 colonies/100 ml and the single sample maximum is limited to 576 colonies/100 ml to comply with CT's indicator bacteria criteria. (US EPA, 2008)

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Summer 2022 Findings

- Ph range throughout all sites, for all collections
  - 7.23-8.79
- Temp range
  - 18.5-26.8 degrees Celsius
  - May17th - July 19th
- Conductivity range
  - 1500uS- 428uS
  - Target-Fishway/Whiteway

- July 12th large fish death, similar to previous years
- The drain pipe was running on <u>two</u> of the sampling days
- No Significant Findings on the GC-MS

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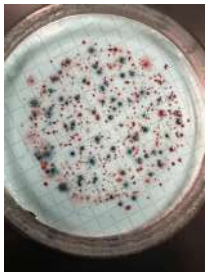
Summer 2022 Findings

- Beginning with the June collections all water samples we diluted 1:100 prior to analysis for total and fecal coliform.
- Samples prior to that were scored as either "Confluent growth with coliforms" or "Too Numerous To Count"
- **All samples exceed the EPA's STV value for recreational water (cfu/100mL)**

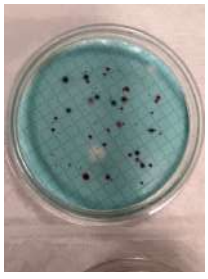
Table 4. Recommended 2012 RWQC.

Criteria Elements	Estimated Illness Rate (NGI): 36 per 1,000 primary contact recreators			Estimated Illness Rate (NGI): 32 per 1,000 primary contact recreators	
	Magnitude			Magnitude	
Indicator	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]	OR	GM (cfu/100 mL)[a]	STV (cfu/100 mL)[a]
Enterococci – marine and fresh	35	130		30	110
OR					
E. coli – fresh	126	410		100	320
Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval.					

[a] EPA recommends using EPA Method 1600 (U.S. EPA, 2002a) to measure culturable enterococci, or another equivalent method that measures culturable enterococci and using EPA Method 1603 (U.S. EPA, 2002b) to measure culturable *E. coli*, or any other equivalent method that measures culturable *E. coli*.



No dilution



1:100

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Spring & Summer 2023 Findings

7/25/23	pH	Conductivity (uS)
Target	7.75	765
Best Buy	7.39	731
Sacket Point Rd	7.67	435
DEEP	7.7	451
River St. Tavern	7.36	438
Valley Service	7.51	430
QRSP Entrance	7.59	425
Toelles Road	7.63	429
Hall Ave	7.68	420
Fishway Below Dam	7.68	371
Fishway Above Dam	7.69	421
Prageman Park	7.56	350
Hanover Pond	8.38	375

8/14/23	pH	Conductivity
Target	7.52	22mS
Best Buy	7.36	15.88mS
Sacket Point Rd	7.78	946uS
DEEP	7.59	3.47mS
River St. Tavern	8.19	465uS
Valley Service	7.8	481uS
QRSP Entrance	7.87	427uS
Drain Pipe	7.93	516uS
Toelles Road	7.93	516uS
Hall Ave	7.95	482uS
Fishway Below Dam	8.08	483uS
Fishway Above Dam	7.99	483uS
Prageman Park	8.07	465uS
Hanover Pond –(40)	8.94	458uS



- GC-MS findings, hydrocarbons present within the Quinnipiac River Marsh (Sacket point, DEEP, Best buy and Target)
- Heavy, and frequent rain events made sampling challenging this year
  - More runoff, high levels
- 36.5% of samples (May-Sept) did not have any E.coli present, only total coliform

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Fall 2023 Findings

- The rain was really challenging for our Early Fall sampling, but we managed to sample 3x in this quarter
- 15% of the samples did not have E.coli present, only total coliform
- Average across all sites: 6,053CFU/100ml
  - Range 1600 (Hall Ave)- 14,700CFU (Sacket Point Rd)




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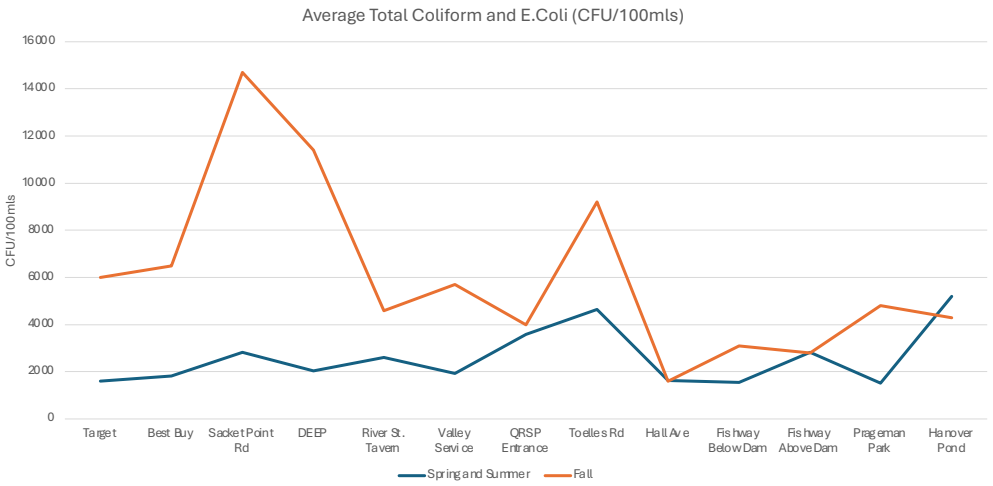
2023 Seasonal Results



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2023 Seasonal Results

Sampling Season	pH range	Temp range (°C)	Conductivity range (µS)	CFUs/100mL
1	7.44-8.2	18.4-19.3	440-1900	400-7500
2	7.36-8.94	21.6-26.4	350-1588	100-11800
3	7.16-10.37	5.5-16.7	362-2010	1600-24700
4	7.8-10.77	5.8-6.4	315-2103	5300-11200

1=April-June; 2=July-Sept; 3=Oct-Dec; 4=Jan-Mar)

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Spring & Summer 2024 Findings

June 10, 2024	Sample #	pH	Conductivity (uS)	Temp
Target	127	7.96	1129	19.6
Best Buy	126	7.63	5410	19.0
Sacket Point Rd	128	8.23	474	19.3
DEEP	125	7.98	479	19.4
River St. Tavern	124	7.47	440	19.2
Valley Service	123	7.95	424	18.0
QRSP Entrance	122	8.40	442	17.7
Toelles Road	121	8.45	455	17.8
Hall Ave	120	8.51	437	17.8
Fishway Below Dam	119	8.61	438	17.7
Fishway Above Dam	118	8.72	439	17.5
Prageman Park	117	8.69	420	17.6
Hanover Pond	116	9.17	401	18.8

- GC-MS findings, hydrocarbons present within the Quinnipiac River Marsh
  - 93% of the samples had no evidence of phthalates or plasticizers
- 30.0% of samples (May-Sept) did not have fecal coliform present, only total coliform

Kate Skidmore, sampling the QU River

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Fall 2024 Findings

- The river was very low October 11th
- 36.3% of the samples from this quarter did not have fecal coliform present.
- Average across all sites: 6,381CFU/100ml (+328 CFU from 2023)
  - Range 1300 (Fishway Below Dam)- 17,700CFU (River Street Tavern)

Dr. Encarnacao, sampling the QU River

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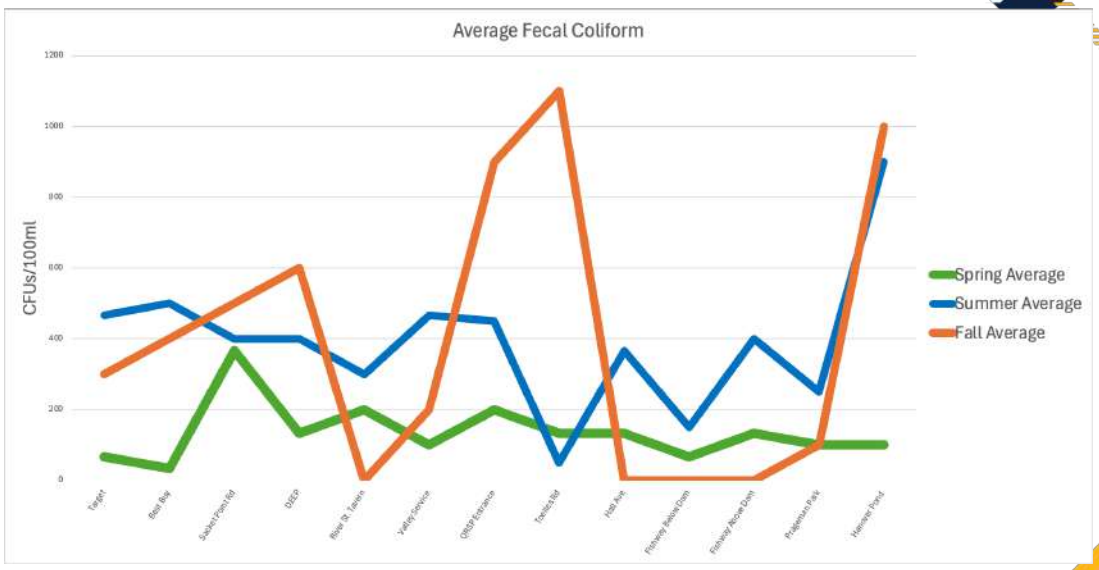
2024 Seasonal Results



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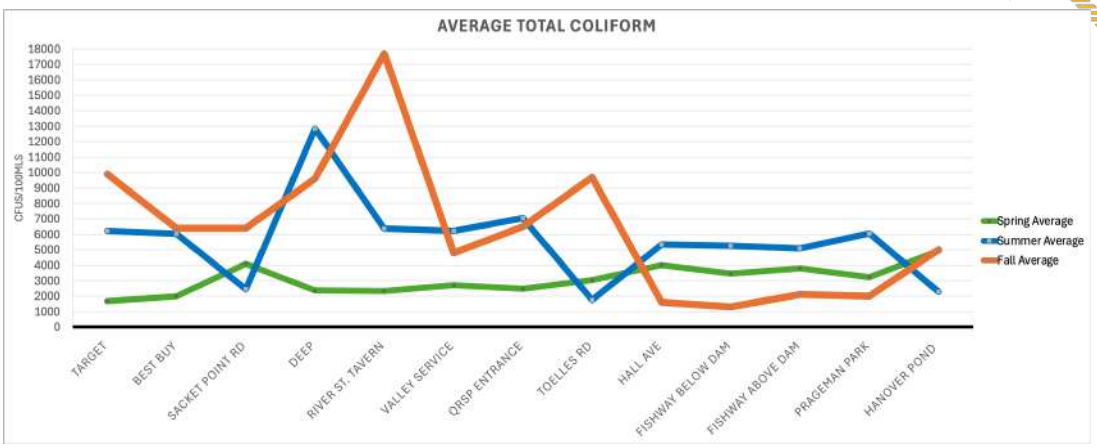
2024 Seasonal Findings



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Objective #2

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ACTION

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April 2024 Cleanup Event: QU Big Event

YOU GOT THIS, KID!
Leadership Foundation

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May 2024 Cleanup Events

HOPKINS SCHOOL
FOUNDED 1660

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May 2024 Cleanup Events






Quinnipiac
UNIVERSITY

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May 2025 Clean up Event





HOPKINS SCHOOL
FOUNDED 1660

Quinnipiac
BOBCATS

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Our Haulers

TOWN OF NORTH HAVEN CONNECTICUT

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Why is this work important?

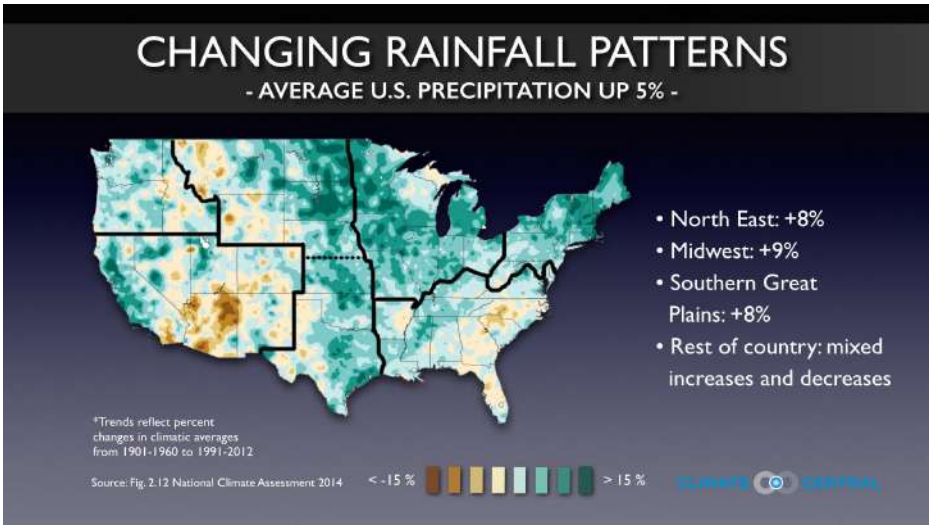

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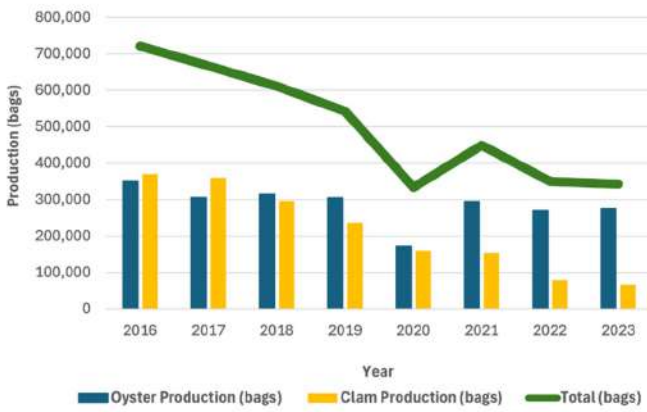
Figure 2. Connecticut shellfish production 2016 - 2023*.



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Conclusions & Future Directions

- Continue sampling the QU River through late Fall and Winter months
- Analyze river samples for total coliform, E.coli and other water quality parameters such as pH and conductivity
- Compile seasonal data for trends at each location, including rainfall
- Continue to monitor the health of the Quinnipiac River (Seasonal)
  - Plasticizers, Phthalates etc. → Source
- Developing a method for PFAS detection
- Continue to survey for Chinese mitten crab

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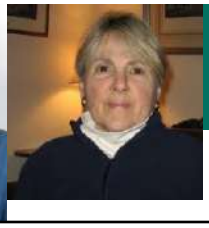
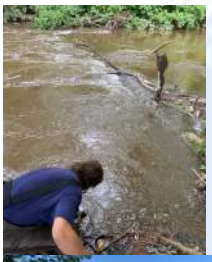
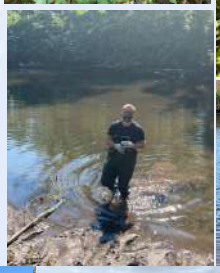
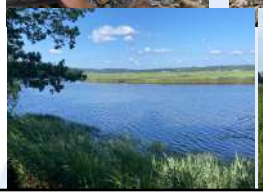
Acknowledgments

- Quinnipiac University College of Arts and Sciences
  - Undergraduate & Graduate Students
- QU River Fund, managed by the Community Foundation for Greater New Haven (2015-present)
- Harry M. Pylypiw, Ph.D.
- Nancy Alderman









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References

- https://attains.epa.gov/attains-public/api/documents/actions/CT_DEP01/34870/108088
- https://portal.ct.gov/-/media/DEEP/water/watershed_management/wm_plans/quinnipiac/quinnipiacwbpappendicespdf.pdf
- https://www.epa.gov/sites/default/files/2015-08/documents/method_1604_2002.pdf
- Casey JS, Jackson SR, Ryan J, Newton SR. 2023. The use of gas chromatography – high resolution mass spectrometry for suspect screening and non-targeted analysis of per- and polyfluoroalkyl substances. Journal of Chromatography A 1693:463884.

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