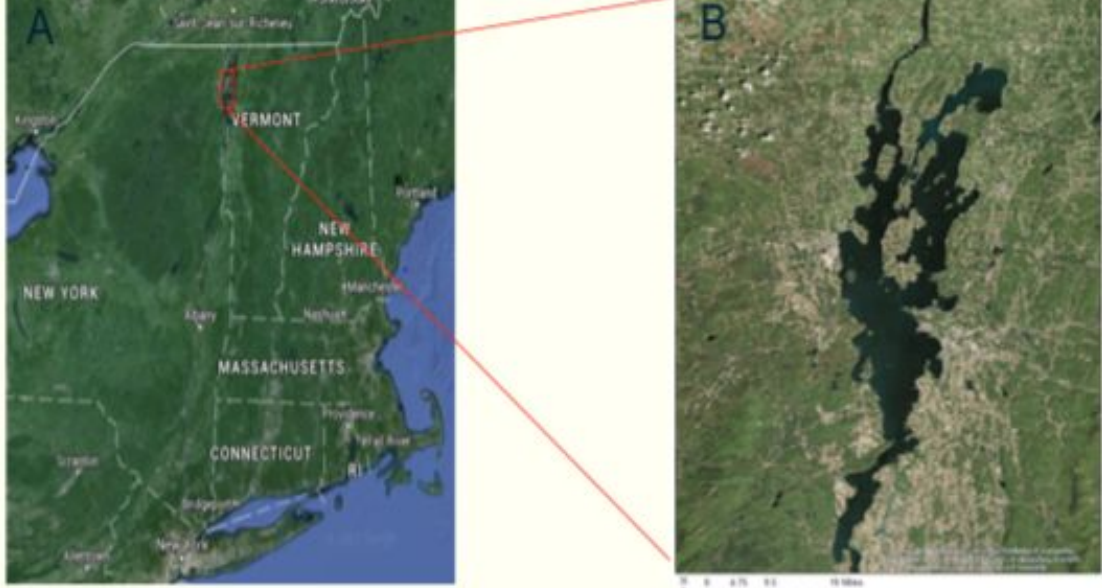


# Microplastics In Lake Champlain: Impacts, Issues, and What We Can Do

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Microplastics spilling out of a dead fish's intestines



Lake Champlain's location in Vermont

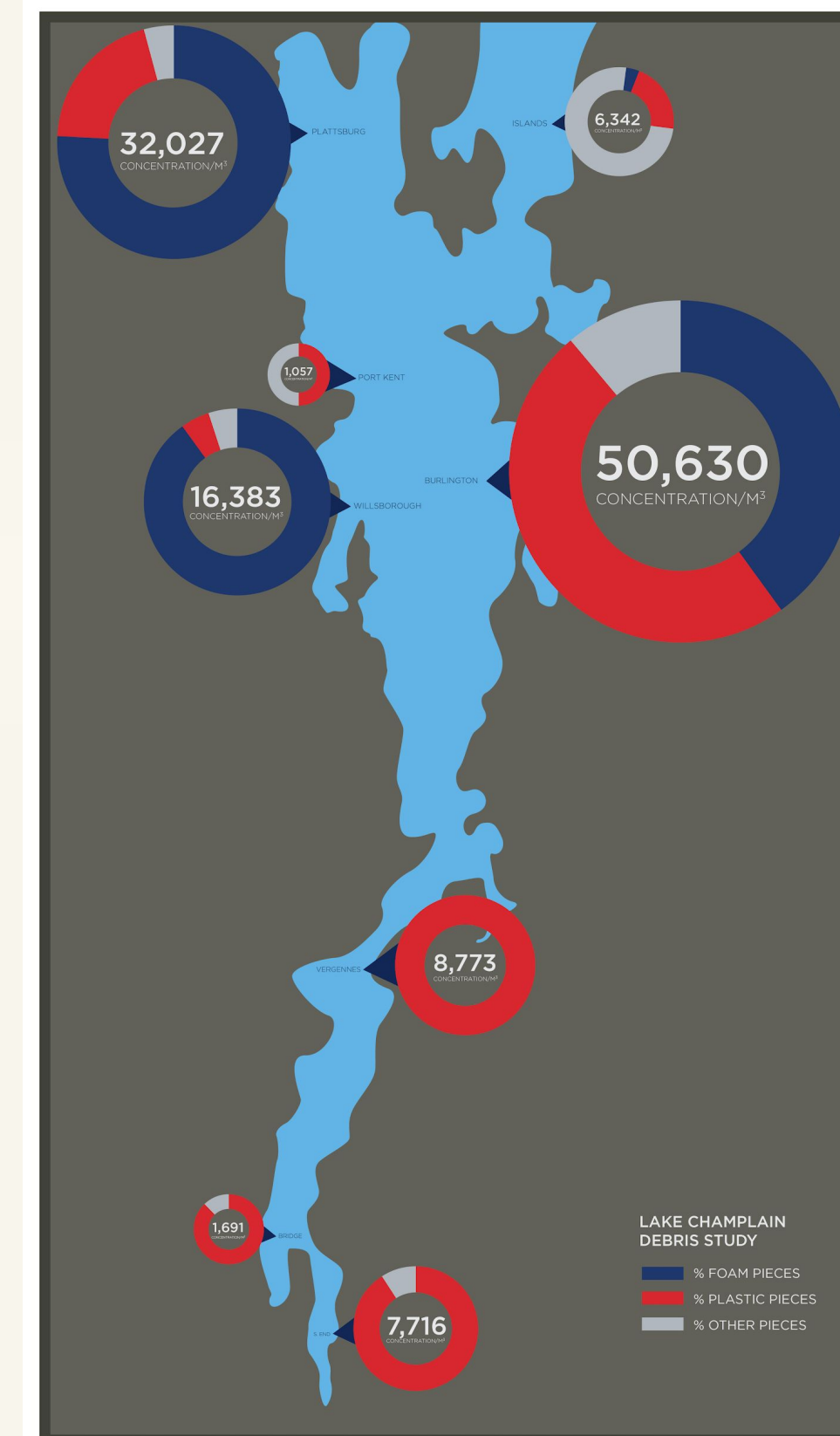


Microplastic sample from Lake Champlain

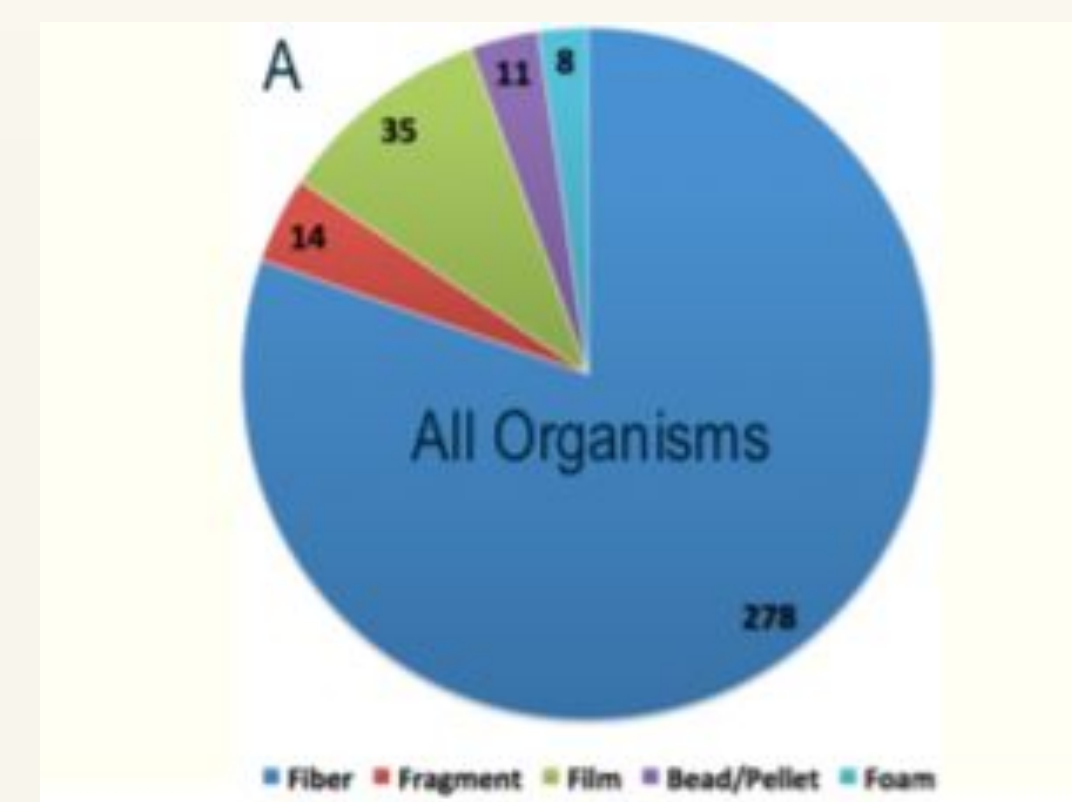
## Background: What Is The Problem?

Sunlight, wind and waves break down plastic waste into smaller pieces (aka microplastics). This is an important issue, but often does not get the attention it deserves, since microplastic is barely visible, but is having a significant impact on fish populations throughout freshwater systems, **including in Lake Champlain.**

Distribution: Microplastic distribution was **most abundant at 0-10m depth**, and at the **southernmost end** of Lake Champlain. In the **midsection of the lake**, microplastics were most abundant at both **0-10m and 40-50m**. The place in which they reside the water column is based on their size and density.



Concentration of form, plastic, and other pieces found by the Rozalia Project



Pie chart of frequency of each type of microplastic encountered in the lake.

## Study Finds Microplastics In 93% Of Bottled Water

Lowest & highest number of plastic particles found per liter of bottled water (location & brand)

Brand	Manufacturer	Country Tested	Concentration
Nestle Pure Life	Nestle	USA	6-10,390
Bisleri	Bisleri International	India	0-5,230
Gerolsteiner	Gerolsteiner Brunnen	Germany	9-5,160
Aqua	Danone	France	0-4,713
Epura	PepsiCo	USA	0-2,267
Aquafina	PepsiCo	USA	2-1,295
Minalba	Grupo Edson Queiroz	Brazil	0-863
Wahaha	Wahaha Group	China	1-731
Dasani	Coca-Cola	USA	2-335
Evian	Danone	France	0-256
San Pellegrino	Nestle	Italy	0-74

325  
Average number of plastic particles for every litre of water sold

n=259 bottles from 11 brands across nine countries. Plastic discovered included polypropylene, nylon, and polyethylene terephthalate. Source: Orb Media

Forbes statista

Forbes study showing how prevalent microplastics are in our water

## Introduction: What Are Microplastics?

Microplastics can include microfibers can leach from clothing when it is washed, microbeads used in cosmetics, and tiny, broken down particles of human trash which can originate from larger pieces of plastic that are littered or escape from landfills.

Microplastics can be divided into two categories: primary and secondary microplastics.

- **Primary microplastics** are plastics originally manufactured to be less than 5mm, and are mainly found in textiles, medicine and personal care products.
- **Secondary microplastics** come from the process of breaking down larger plastics due to physical, chemical, and biological weathering. The majority of microplastics found in aquatic systems are secondary microplastics, which is why it's hard to manage.

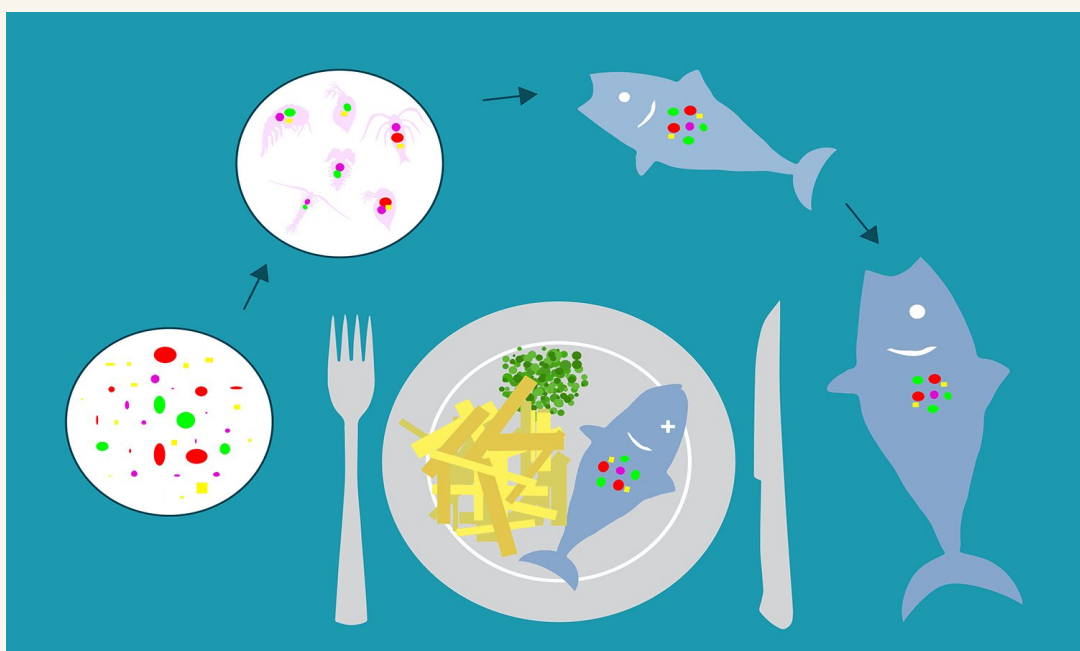


## Motivation: Why Should We Care?

*YOU could be ingesting plastic.*

Microplastics are an emerging pollutant.

There isn't yet sufficient research to know the full extent of the harm they cause. However, based on the harm we already see in individuals and ecosystems, we can continue making predictions about what the potential future damage could occur.



**Biomagnification:** The harm caused by ingesting microplastics can be amplified as the toxins they contain move up the trophic levels.

Over time, plastic particles contaminate the marine ecosystem and the food chain, **including foods intended for human consumption.**

This raises concern for human health directed toward the different toxic and carcinogenic chemicals used to make these plastics.

The distribution throughout the water is concerning because this can cause **accumulation in higher trophic levels.**

**Direct impacts** can be seen through aquatic organisms that ingest microplastics, and **indirect impacts** are seen from the role that microplastics play in **alteration of habitat structure** for the native species of the lake, **bioaccumulation and biomagnification** of toxins adsorbed and carried by microplastics, and **endangerment of ecosystem functions and services.**

## Hypothesis and Predictions

- We hypothesize that there is a relationship between microplastics in Lake Champlain and the health of the organisms that live in the lake.
- We predict that if microplastics are a problem for the health of the organisms in the lake, there will be more deaths caused by plastic ingestion than natural deaths.

Lake Champlain is an extremely important part of Vermont's wildlife ecosystems and creates lots of tourism profit, but microplastics are detrimental to wildlife due to a plethora of reasons. They cause biological accumulation which kills cornerstone species, they block digestion and prevent the uptake of nutrients when ingested, and they cause physical and toxin pollution that ruins the underwater habitat for the wildlife of Lake Champlain. Therefore, we will be addressing this problem by providing alternatives to single-use plastics, creating products that do not release toxins when they break down, and cleaning up the existing microplastics in Lake Champlain.

## Our study: Design and Analysis

- An **observational field study** will be performed by taking already deceased organisms from Lake Champlain and doing an autopsy on them to determine if plastic ingestion was the cause of death. We would choose a multitude (**at least 100**) organisms **randomly from multiple sampling areas throughout the lake.**
- The independent variable is the presence of microplastics, and the dependent variable is the number of deaths that occur.
- The number of deaths from plastic and the number of natural deaths will be compared using a **T-test** to see if that difference is statistically significant or not.
- The presence of microplastics could alter the naturally occurring ecosystem structure, favoring certain organisms over others and in turn affecting the natural progression of evolution.
- **If the number of deaths caused by the effects of microplastic pollution is statistically significantly higher than the natural deaths, it can be said that microplastics are a problem for the health of organisms in Lake Champlain.**

### Literature Cited:

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