Management of Boat Gas Constituents in Whitefish Lake: 20 Years Later

What is Whitefish Lake Institute – why BTEX?

- The Whitefish Lake Institute is a nonprofit which aims to protect Whitefish Lake and local tributaries
- Studying BTEX was one of WLI's first projects in 2005
- Now, 20 years later we repeated the study to see what has changed

What are Boat Gas Constituents?

BTEX – benzene, toluene, ethylbenzene and xylene

Main source of BTEX in Whitefish Lake is boat gas

BTEX can be carcinogenic among various other negative health effects

BTEX is regulated in drinking water (MCL 5 ug/L benzene, 1,000 ug/L toluene, 700 ug/L ethylbenzene 10,000 ug/L total xylenes)

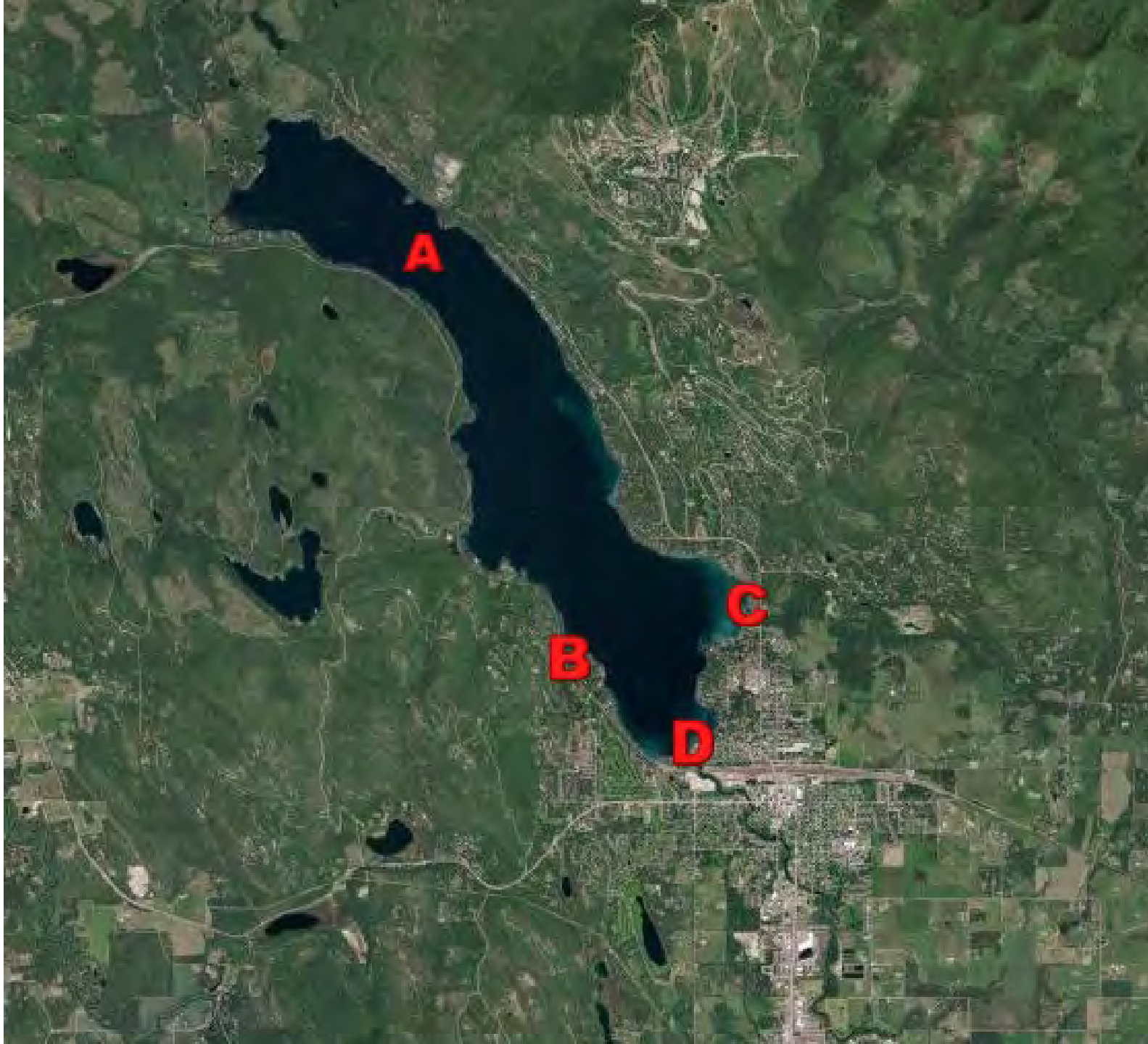
Sampling locations

A)Mid-lake reference near Hellroaring point

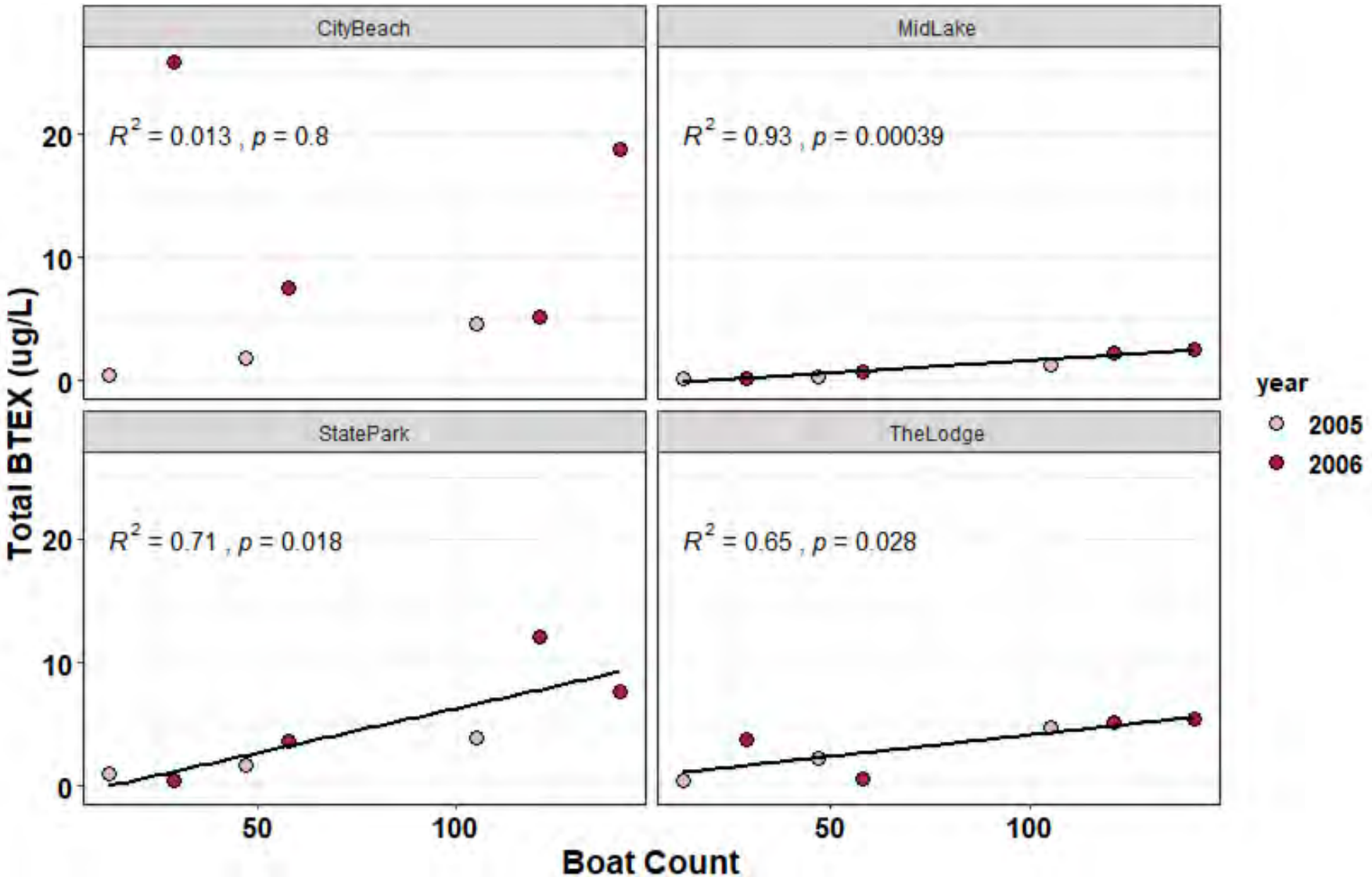
B) State Park boat launch at dog bay—between the dock and swimming area

C) The Lodge at Whitefish Lake boat dock at Monk's bay

D) City of Whitefish boat launch at city beach—between the dock and swimming area



What did the first study show?



Actions Taken after 2005/2006 BTEX Study

- Result of 2005 study was a gasoline interceptor trench in boat ramp at city beach

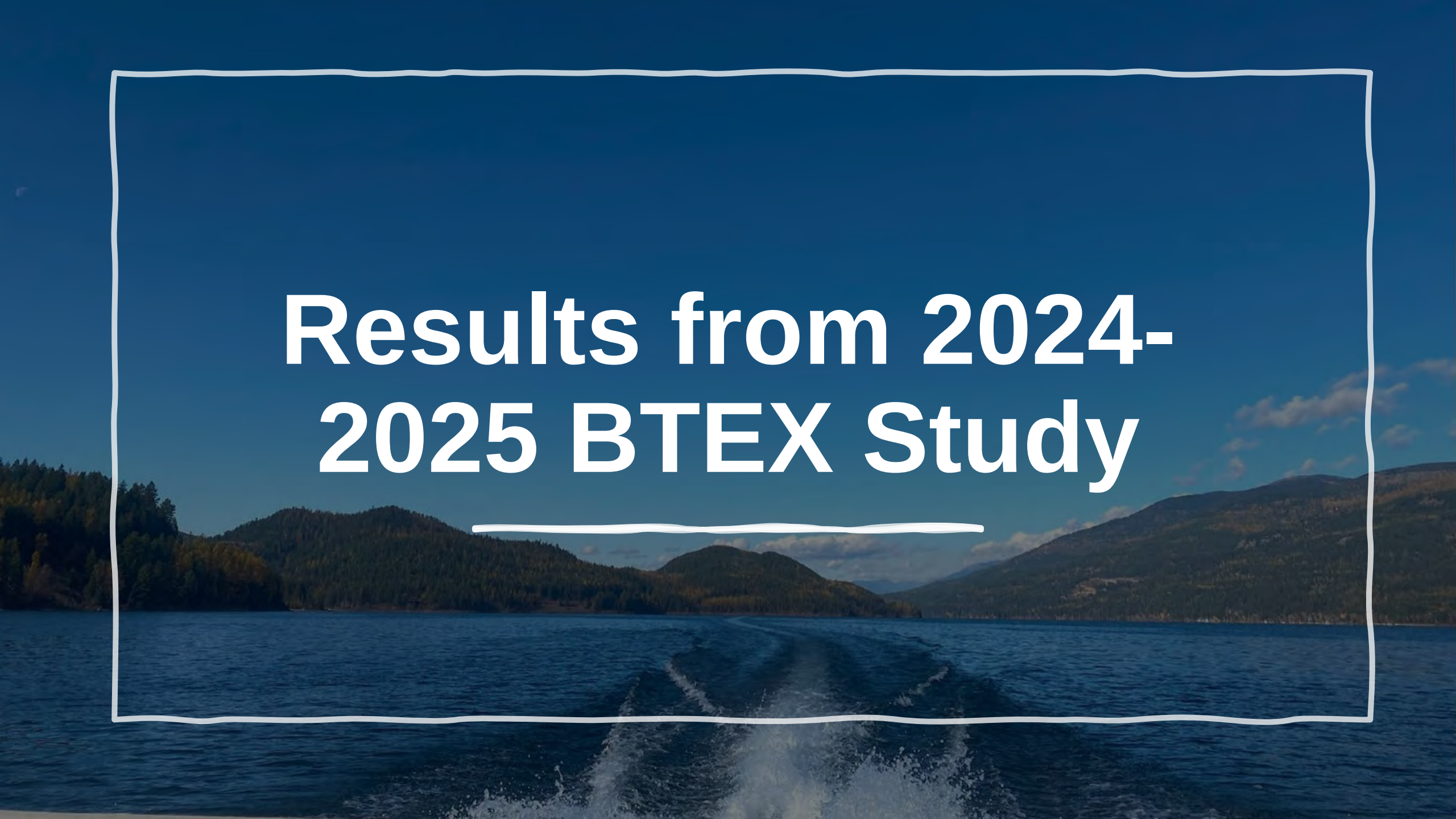
Main Questions

Have BTEX levels increased since 2005?

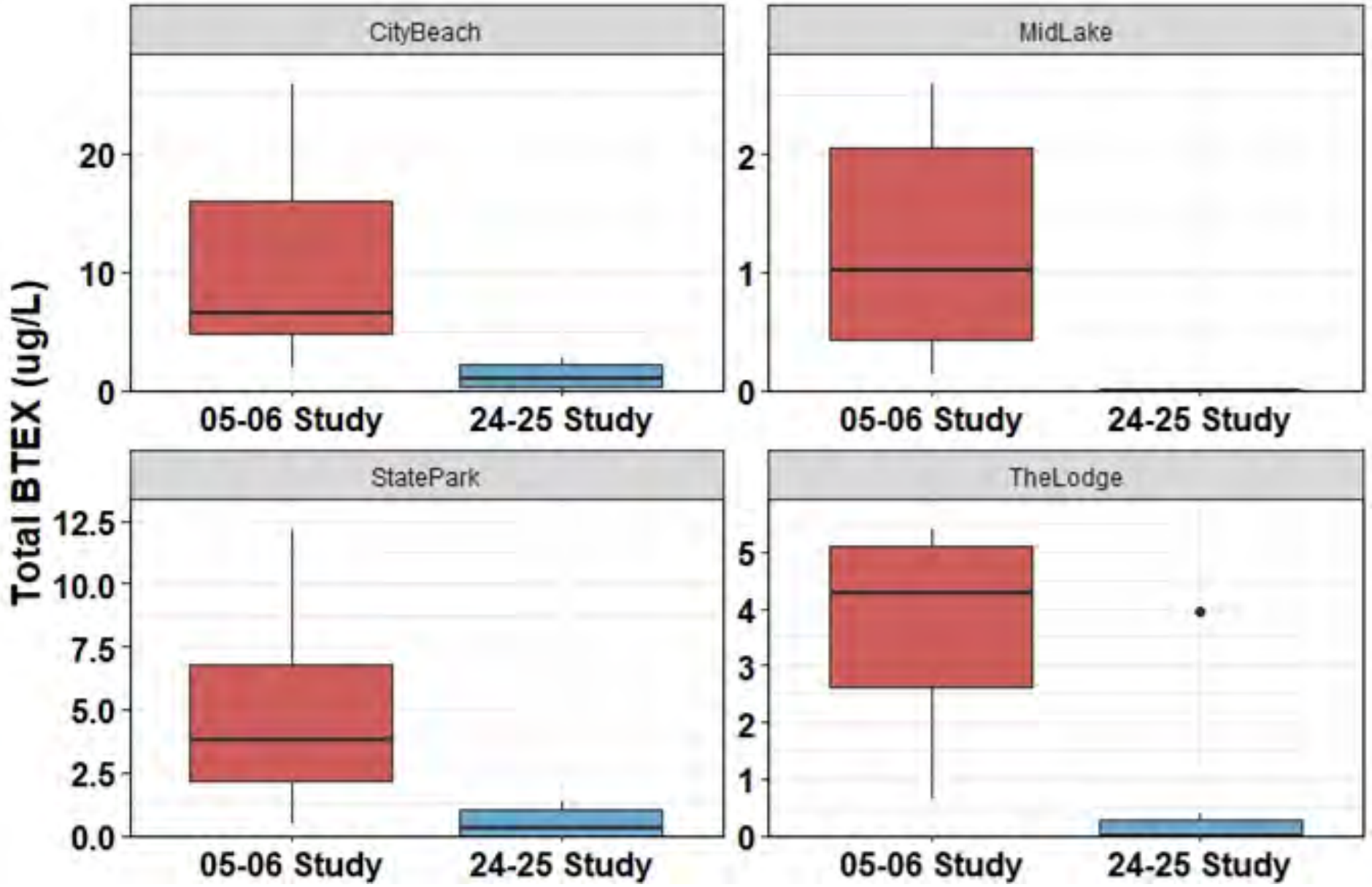
Is the interceptor trench effective at preventing BTEX in the water near city beach?

Are BTEX levels near city beach now more correlated with boat numbers/or just generally lower

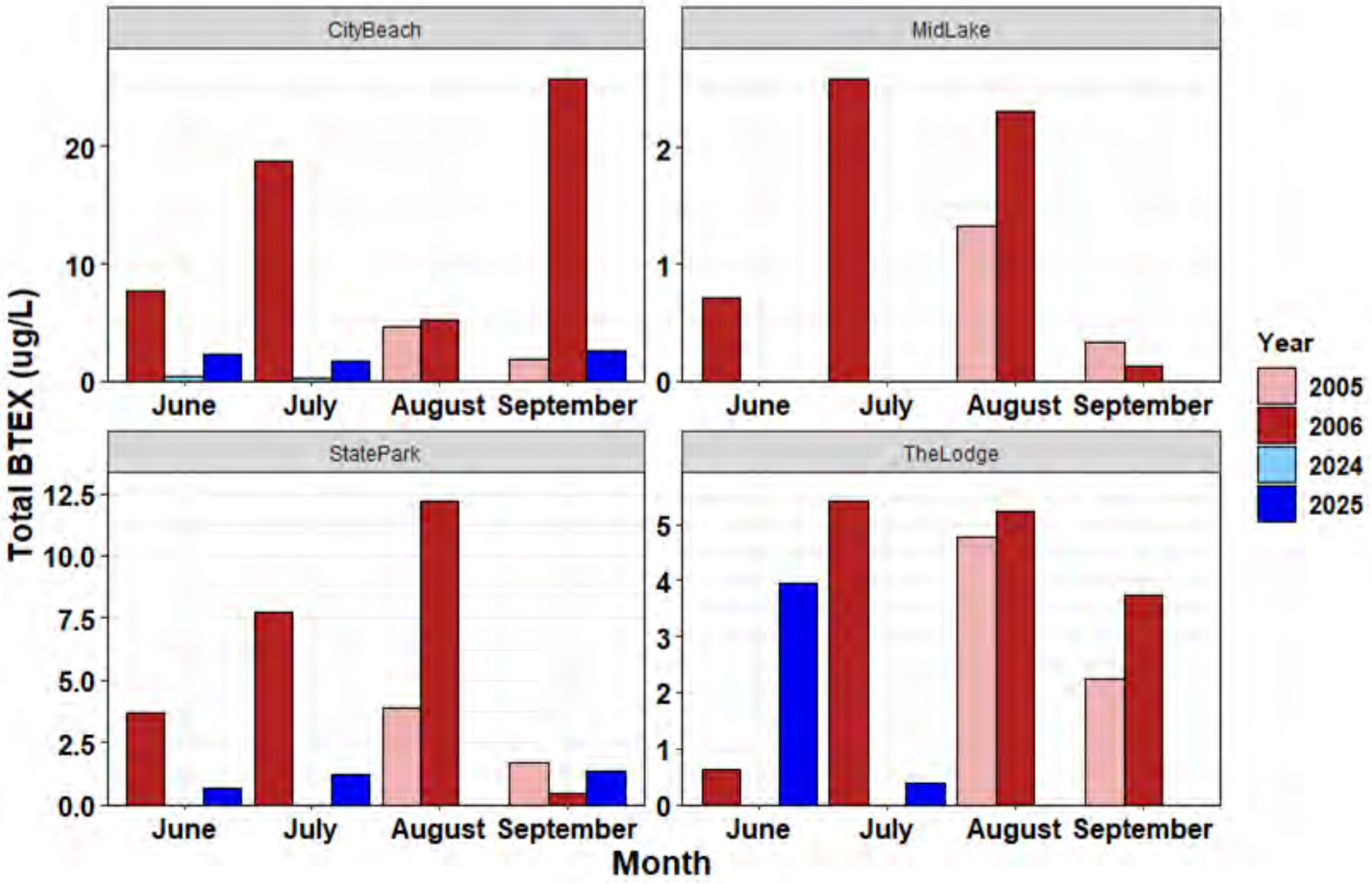
How have dock and boat numbers changed since 2005?



Results from 2024-2025 BTEX Study



Whitefish Lake BTEX levels are lower



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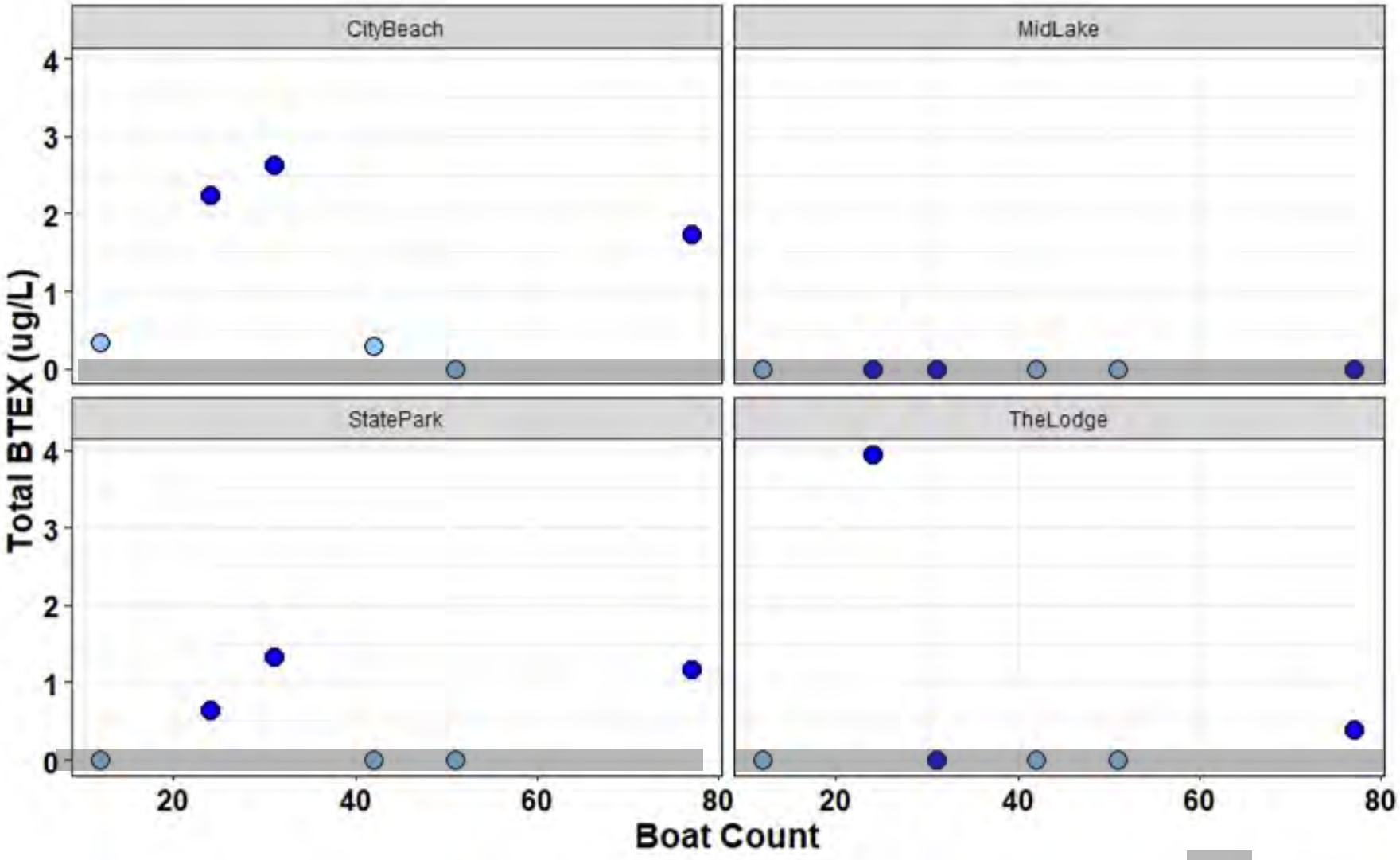


BTEX levels are no longer correlated with boat count at any site

= Non-detects

2024

2025

BTEX Study Main Takeaways

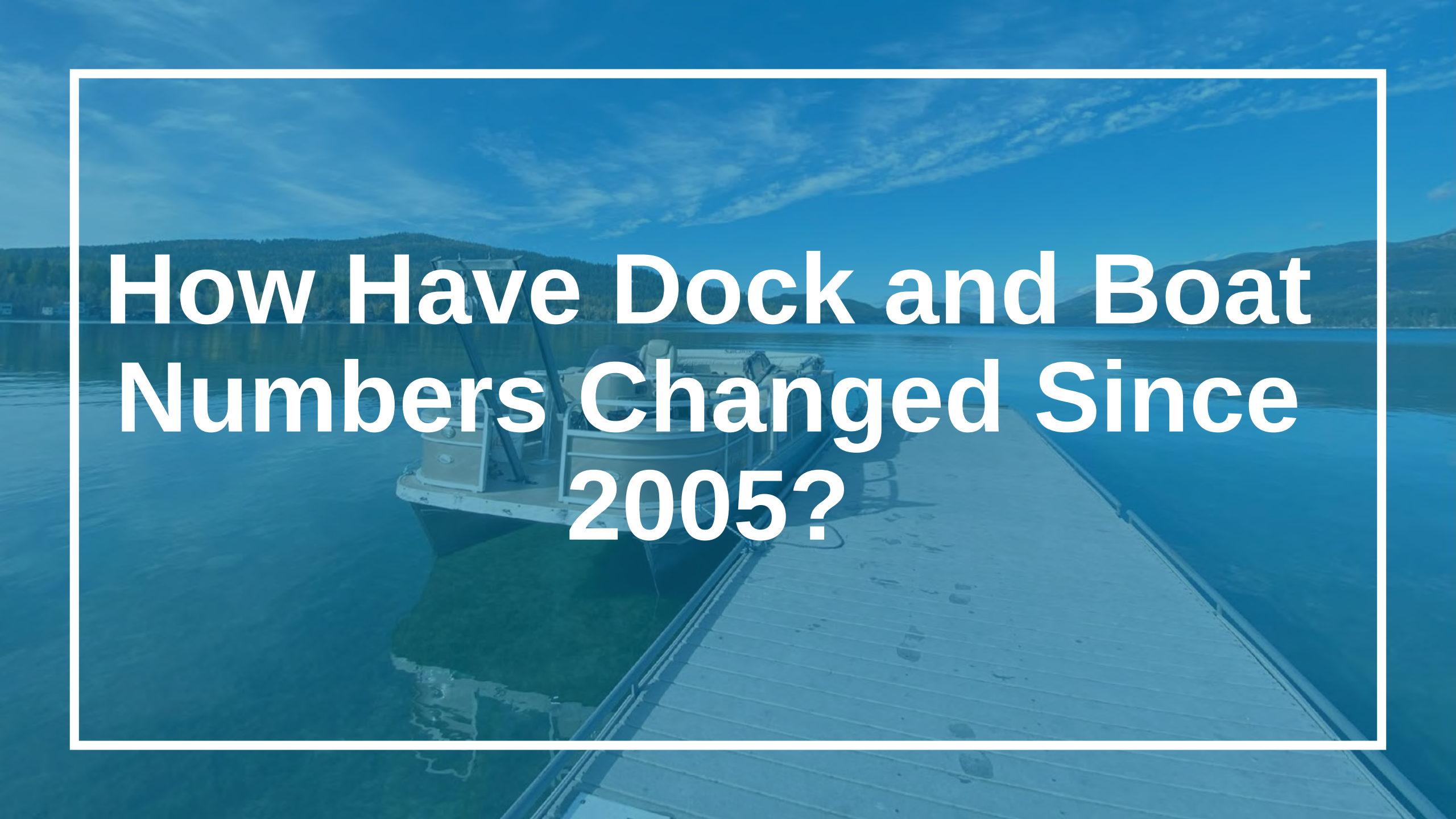
Overall, BTEX levels are much lower and there is no longer BTEX detected at the mid-lake site

- The City Beach interceptor trench is helping keep BTEX out of the lake
- Boat motors are now much more efficient and less likely to cause contamination, two stroke motors are much less common

BTEX level is no longer correlated with boat count

- Having detectable levels at sampling sites of BTEX is now much more rare and more likely due to an older boat, leaking motor, or incorrect use of the city beach drainage trench.
- A linear regression is an oversimplification of how BTEX is processed and moved through the natural environment, BTEX processing is influenced by weather, water temperature etc.

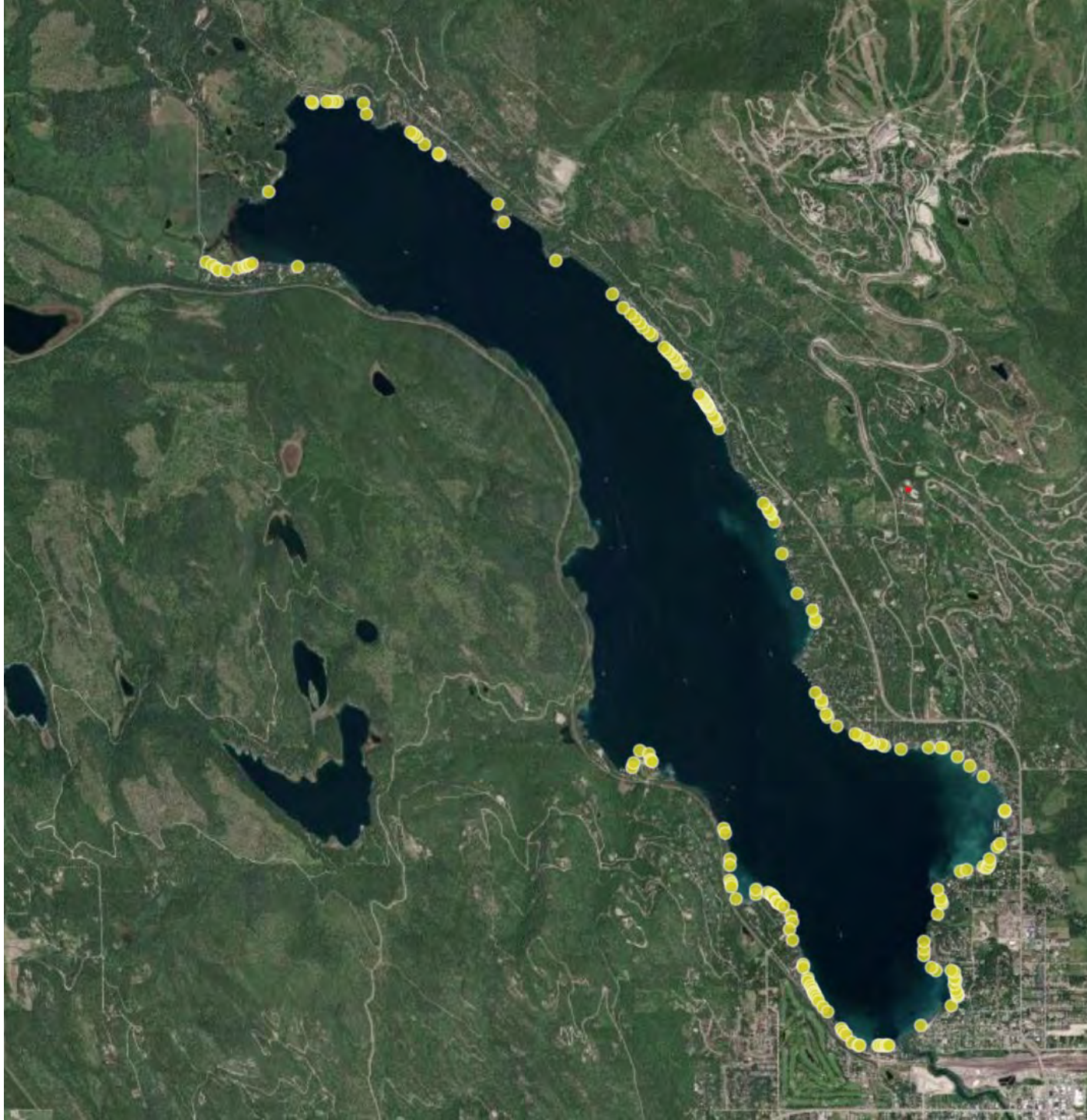
Woody Weekend at The Lodge may have an impact on BTEX levels



How Have Dock and Boat Numbers Changed Since 2005?

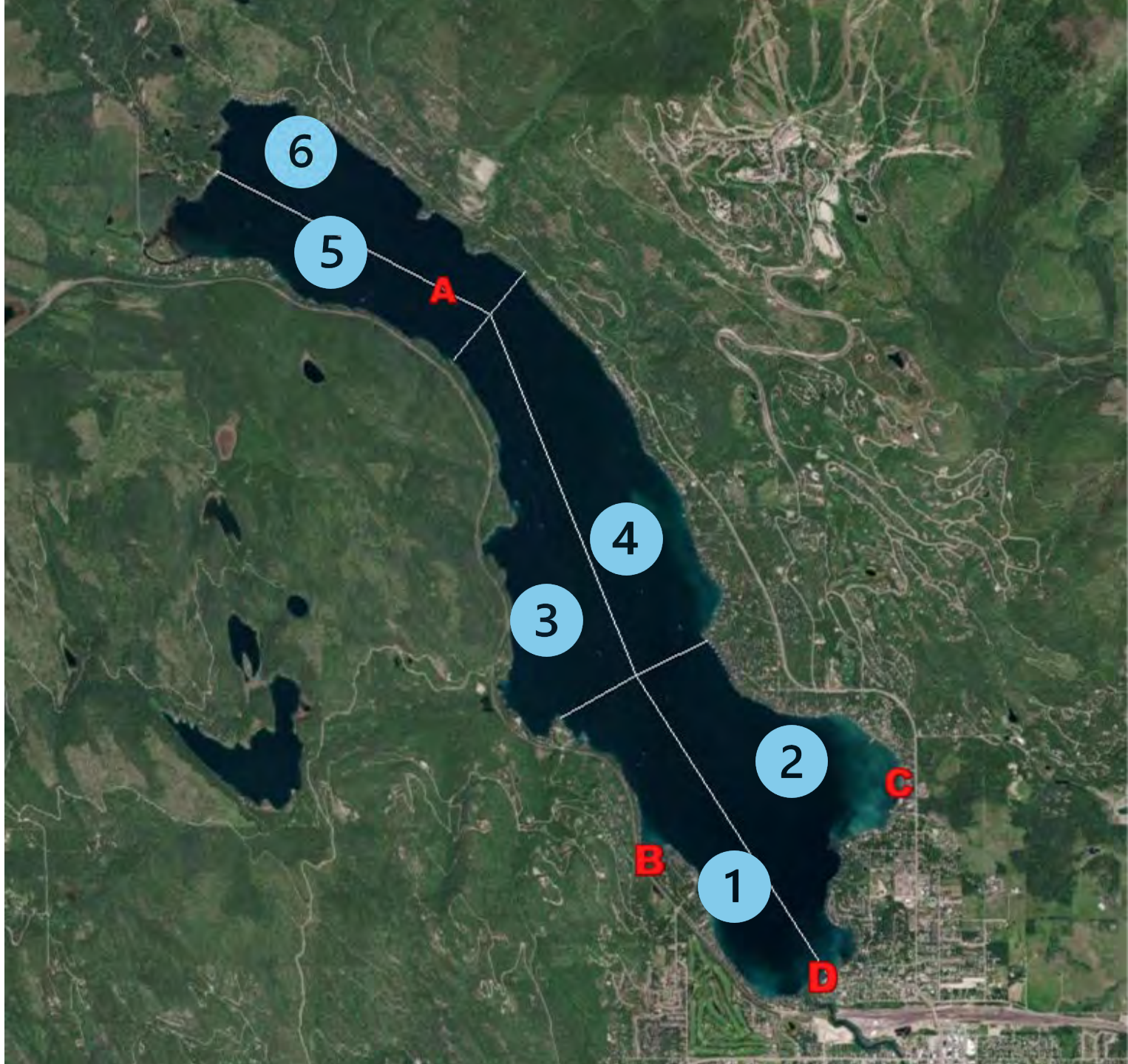
Dock Survey Methods

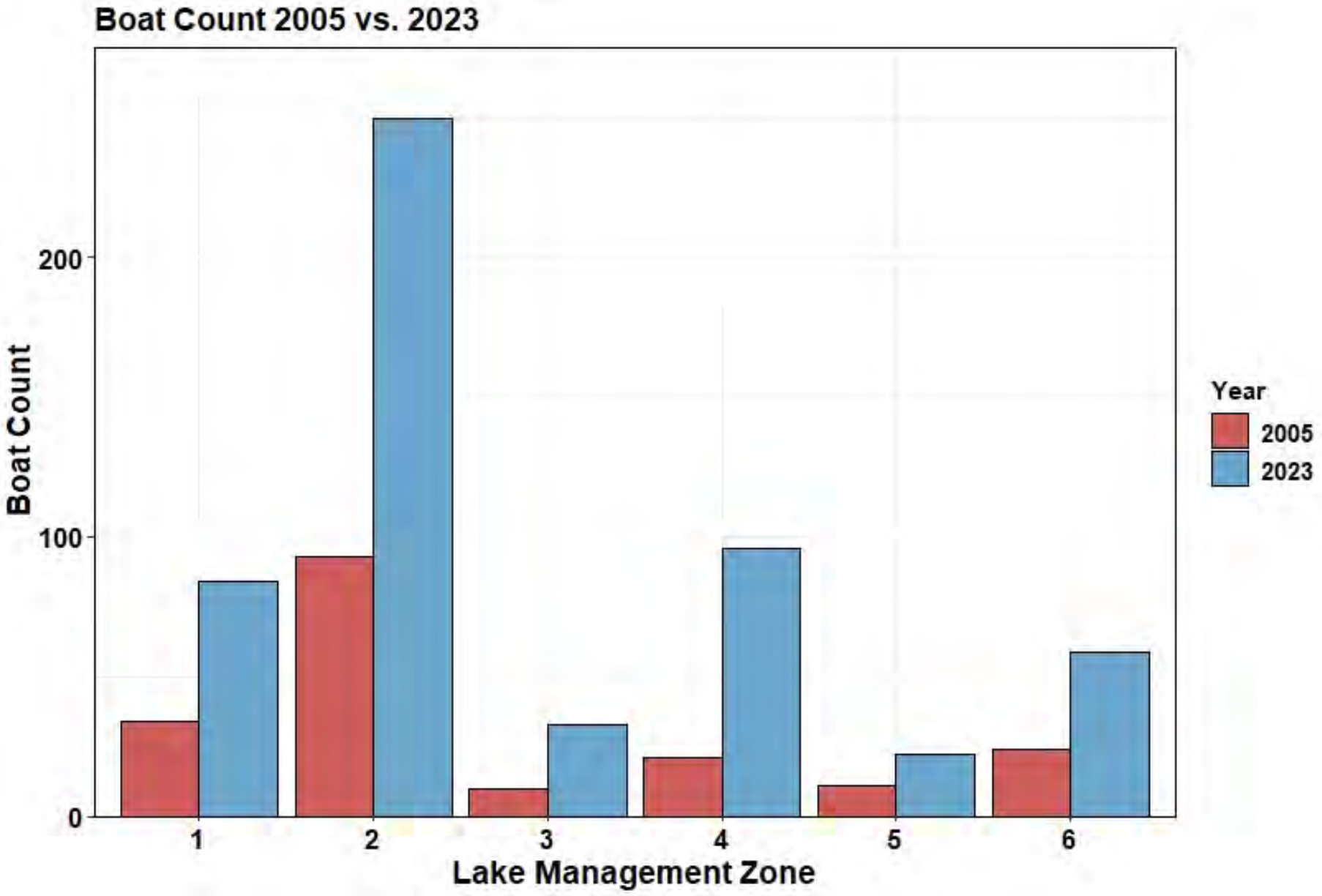
- Using satellite imagery to count boats slips and docks around the shore of the lake
- Images were taken in August of 2005 and 2023



Whitefish Lake Management Zones

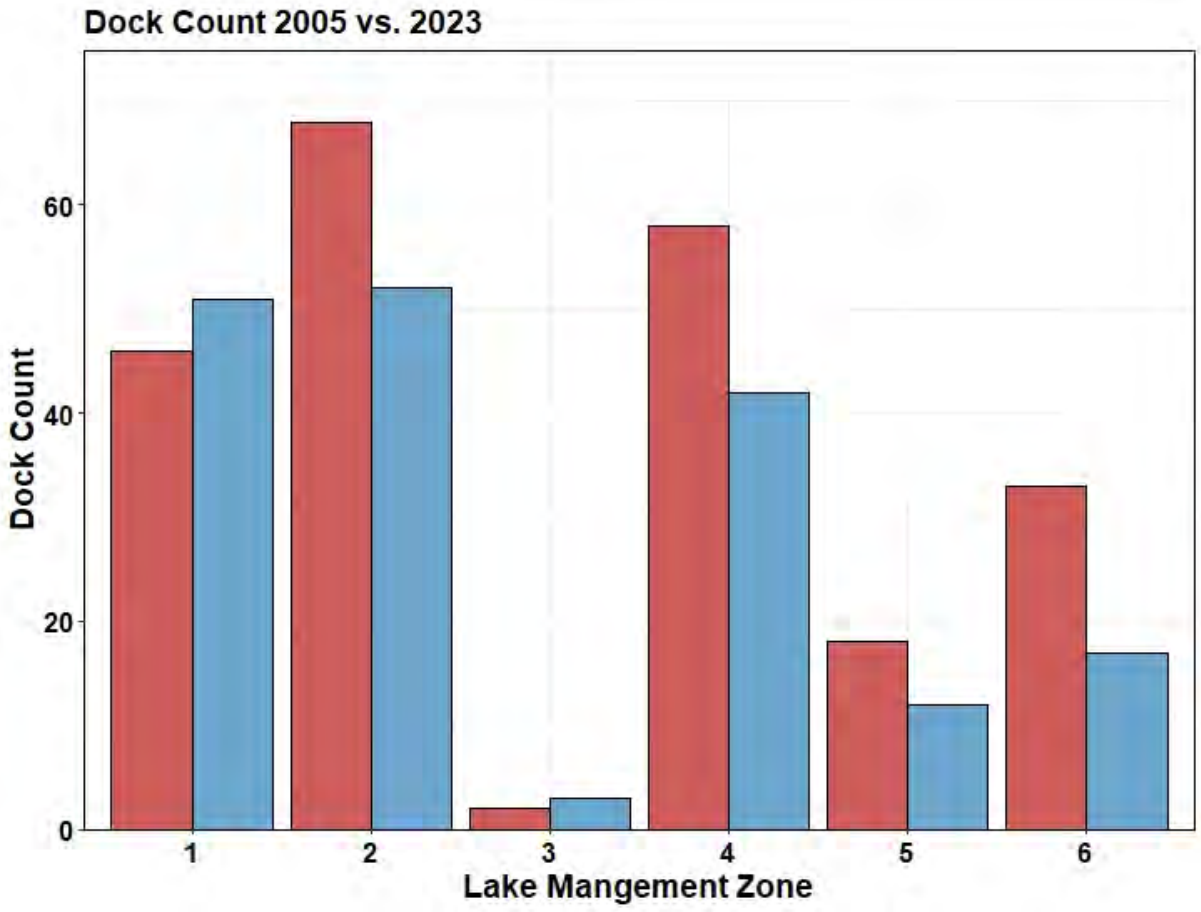
1. Southern zone highly developed includes City Beach
2. Southern zone highly developed includes The Lodge at Whitefish lake
3. Low development zone
4. Moderate development some homeowner associations
5. Northern part of the lake less developed
6. Northern part of the lake less developed

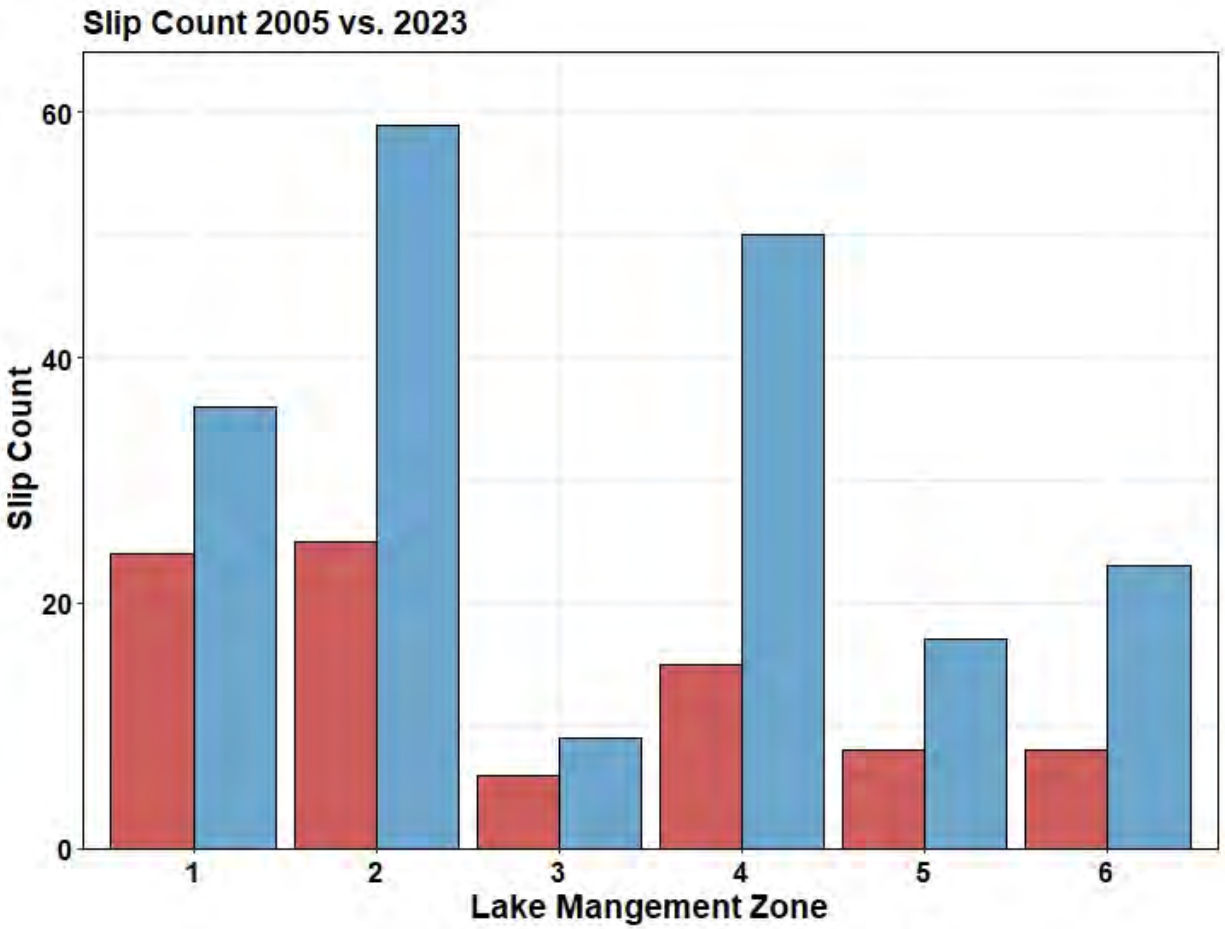




In every management zone boat numbers have increased since 2005

In every zone slip count increased, while in zones 2, 4, 5, 6 dock count decreased





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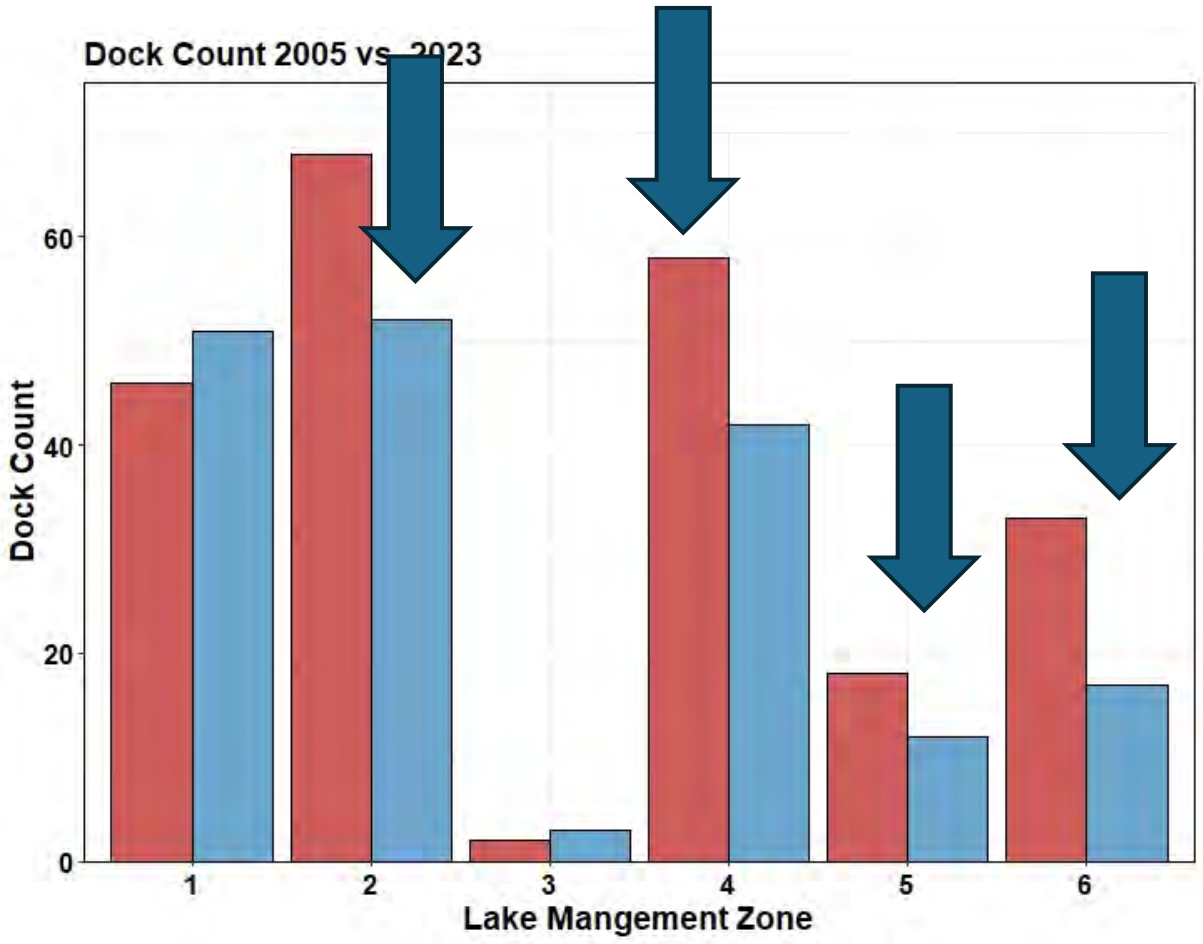
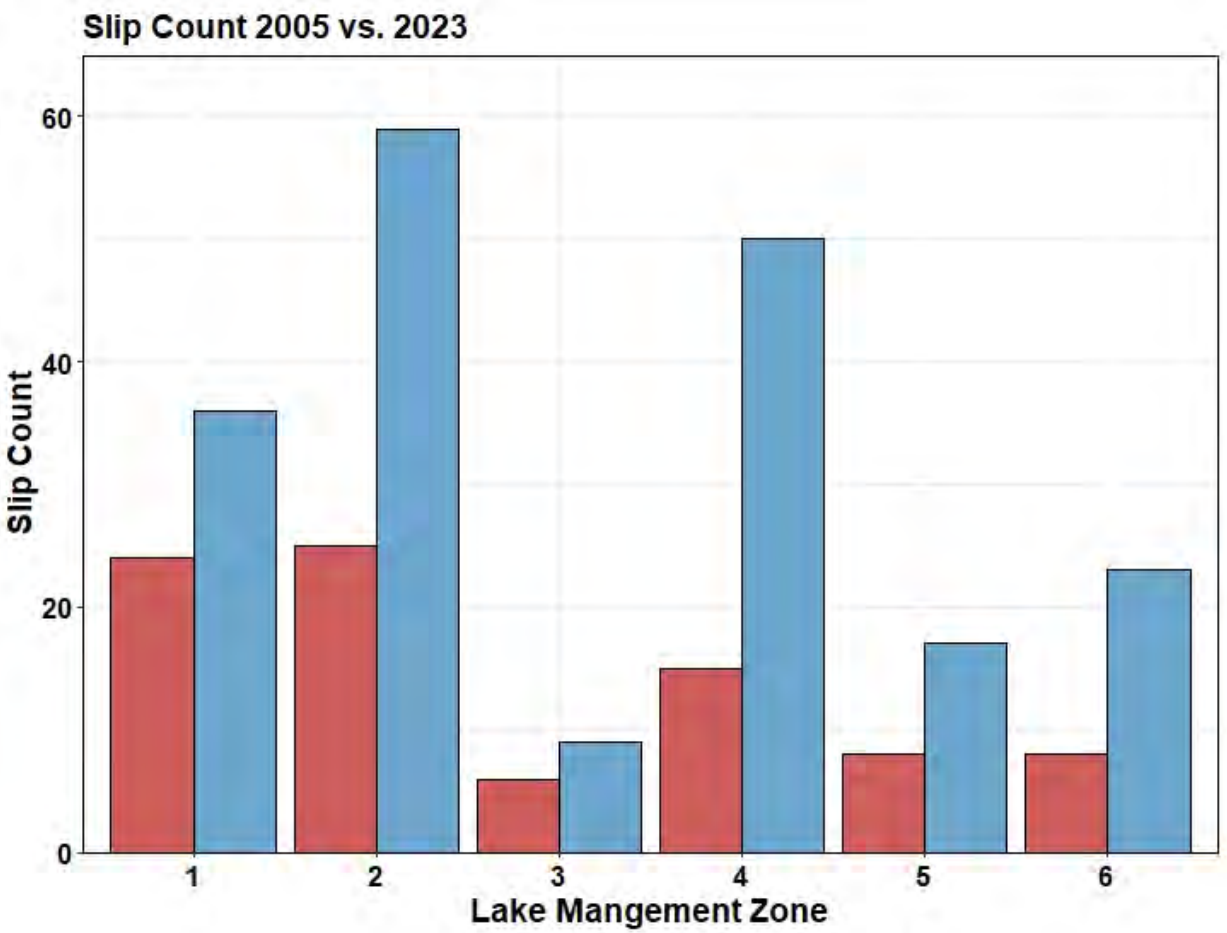




Main Takeaways

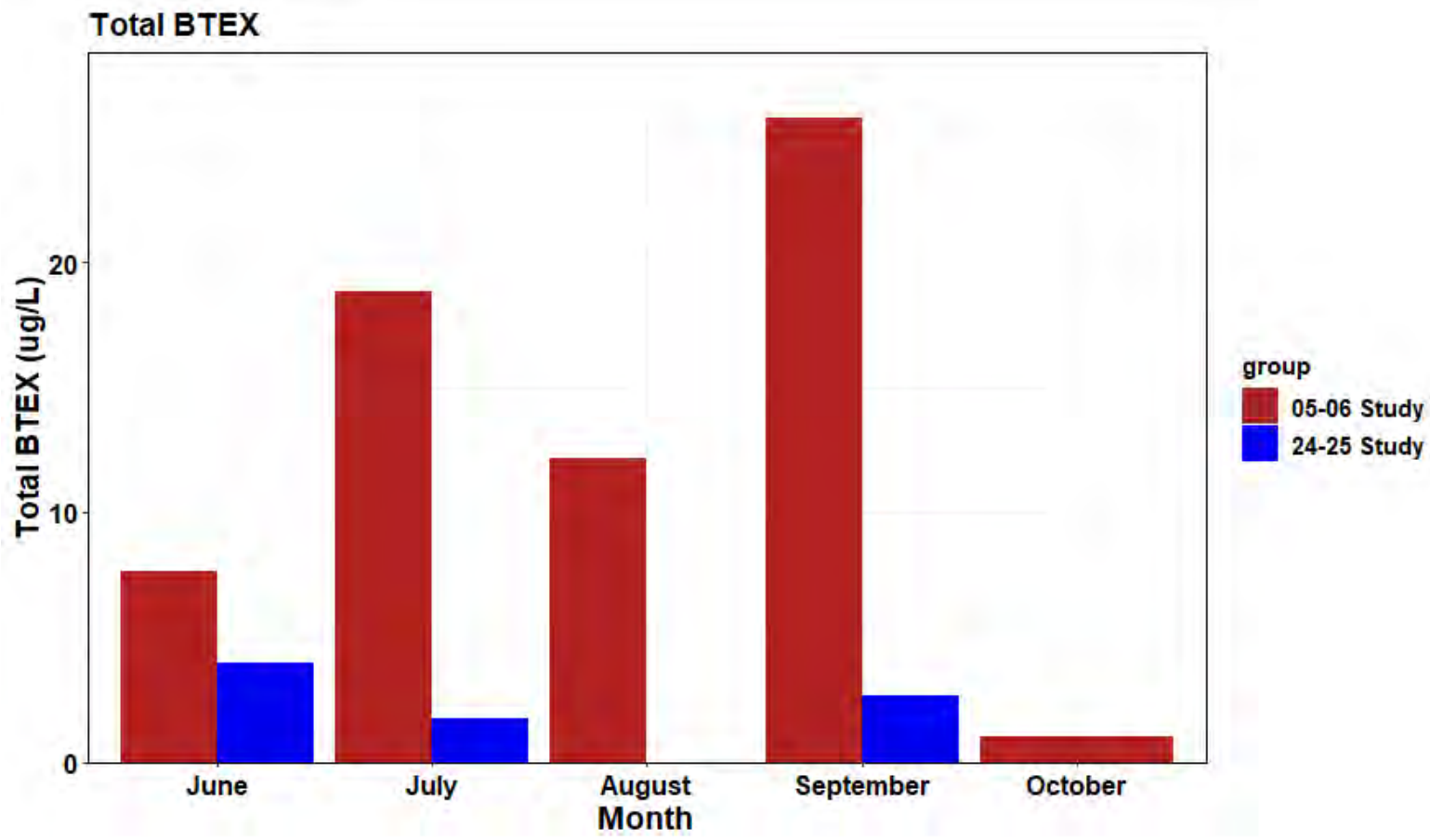
- Population increases have caused an increase in boats around the lake
- In many zones slips have increased while docks have not
  - Increase in HOA’s or group owned docks
  - Increase in median home price means people can afford to have more than one boat

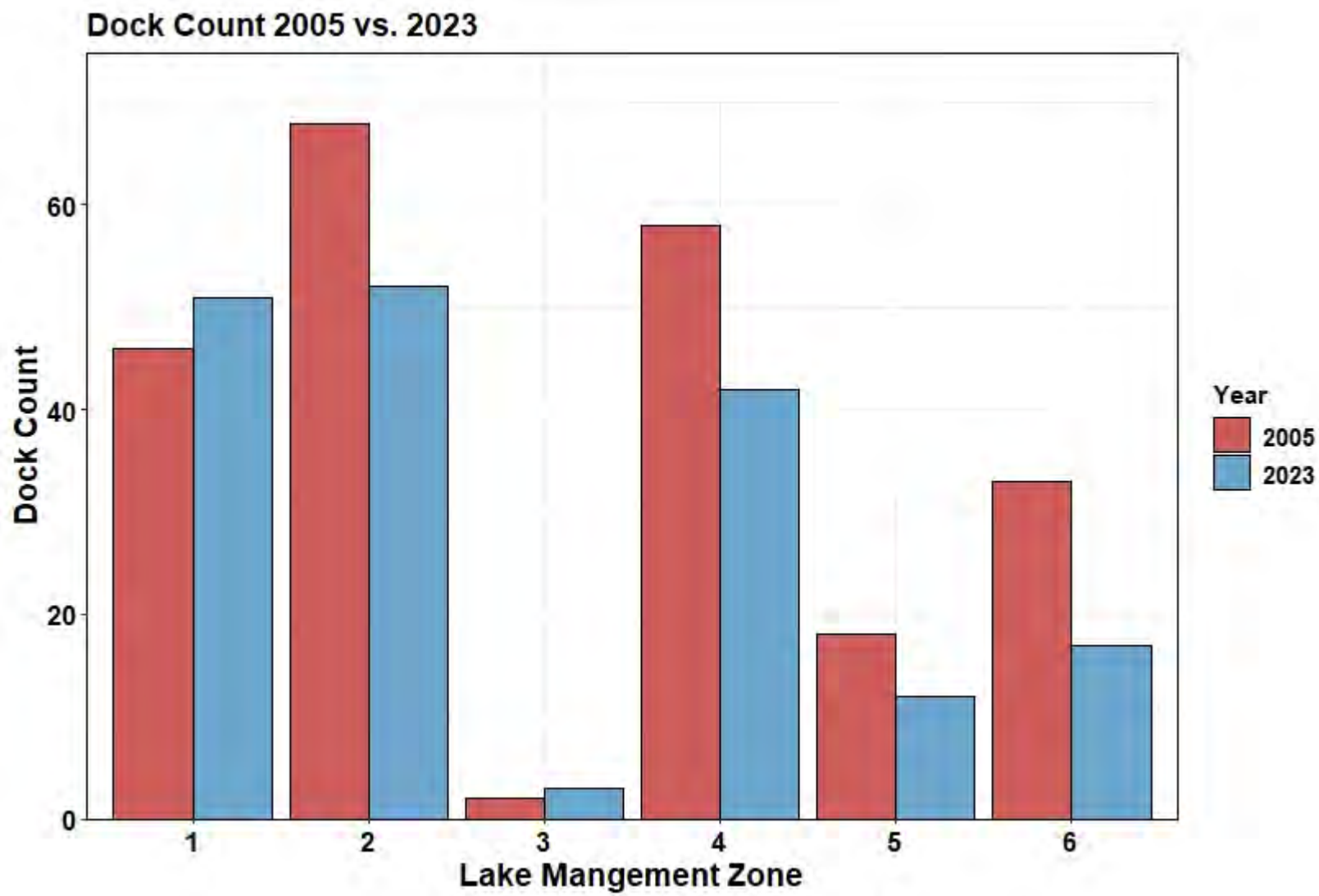
Questions?

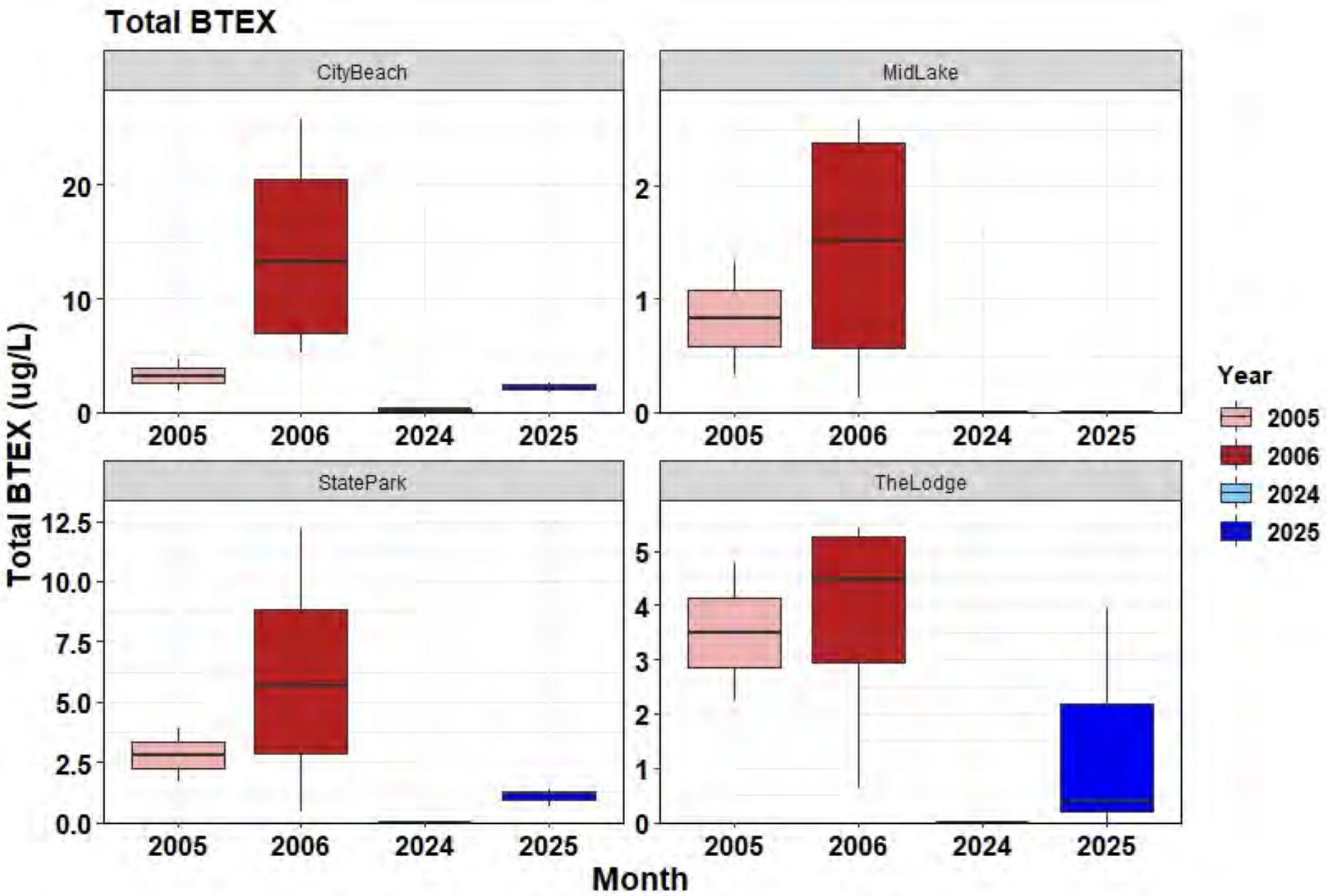
cassie@whitefishlake.org

Whitefish Lake INSTITUTE

seasonality




Dock Count 2005 vs. 2023
Dock Count
0
20
40
60
1
2
3
4
5
6
Lake Mangement Zone
Year
2005
2023


Total BTEX
CityBeach
MidLake
StatePark
TheLodge
Total BTEX (ug/L)
Month
Year
2005
2006
2024
2025

- BTEX analysis – in 2005 only city beach did not have a significant correlation between boat numbers and BTEX
- In current data midlake, never had any BTEX so analysis could not be done, statepark was still correlated, the lodge and citybeach did not have a correlation between BTEX and boats --- could this be due to woody weekend boats at the lodge, boats taking out at city beach having more off gas than just the average boat trolling around?
- Furthermore this linear regression is an oversimplification of how BTEX is processed and moved through the natural environment– other papers (cite??) used weather data such as wind and temperature as well as water temperature to create a correlation between BTEX and and boat numbers.
- With this information its possible that lack of correlation has city beach could be due to it being a busy area, or even at the southend of the lake where wind often blows towards --- true????
- ALL ABOVE ACTUAL REFERS JUST TO TOLUENE NOT TOTAL BTEX
- FOR TOTAL BTEX ANALYSIS ---
- Using just 2024 and 2025 data none of the sites are correlated (midlake has no data) this could be due to so few hits making it hard for data to be statistically significant (state park only had hits three times all in 2025, the lodge only had two hits both in 2025), and woody weekend screwing with the lodge data as a large outlier as well
- Overall I think in 2024 and 2025 data most of the BTEX in the lake is from outlier boats which may have had a recent oil change or and older motor or may have been drained incorrectly at the boat dock, unlike in 2005 and 2006 where there was a baseline of BTEX associated with all boats. what we see now is that having evidence of BTEX at any significant level is the outlier.
- When all data is used together it is correlated with boat numbers, this is most likely simply due to there being way more hits in the 05 06 data which is able to define and drive the trend

Basic methodology

Water Sampling Instructions

- Samples taken using a Van-Dorn at one foot depth 25 feet from the
- Samples should be taken from the front of the boat away from the motor
- A duplicate should be taken at each site
- Bottles should be filled to the top with no air/headspace, flip the bottle upside down and ensure there are no bubbles
- Bottles should be kept cold—put in fridge after sampling

Boat Census Instructions

- Completed before sampling
- Boat is driven from city beach to swift creek inlet
- Two observers count boats and boat type (Is boat type needed?)
  - past boat type break down was: pontoon boat (any size), large boat (over 15 feet), small boat (under 15 feet), and personal watercraft. (but boat sizes were combined in the end)
  - Boat type breakdown wake boats/ballst boats vs. other boats vs. personal watercraft