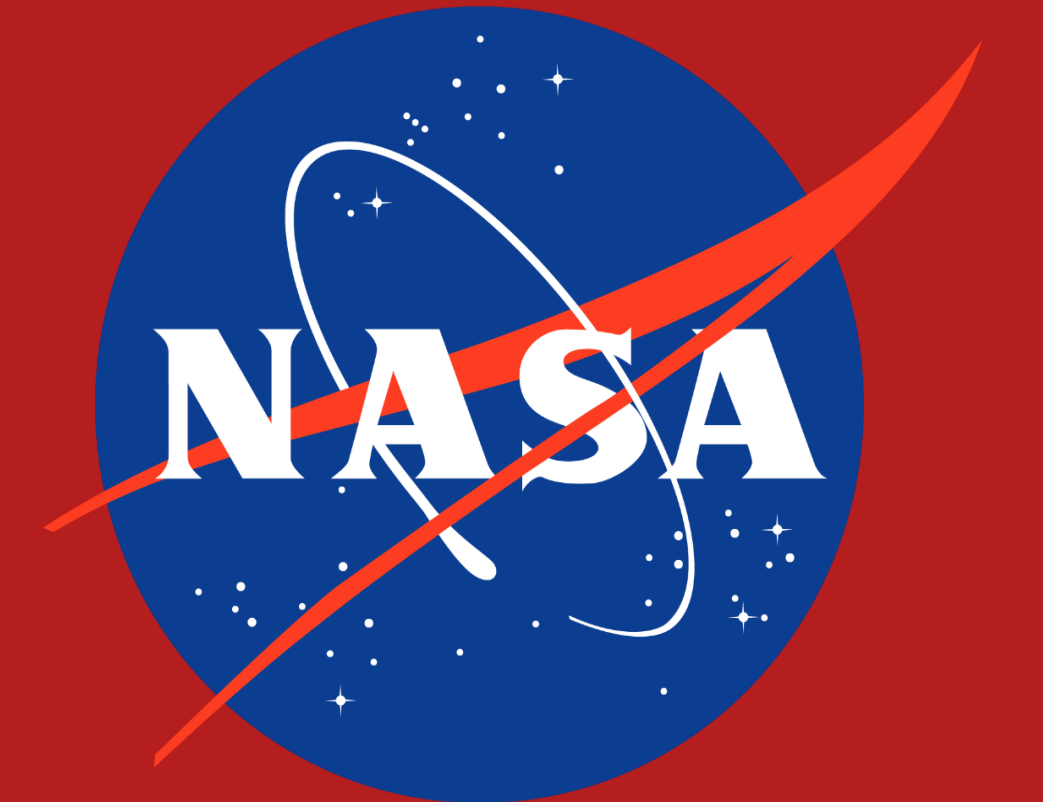


Tracking Water Storage in Lakes: Citizens and Satellites

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Introduction

Governments and other agencies around the world have developed substantial networks of river and stream gauges to track the flow of water across the land surface. Surprisingly, no similar network exists for the millions of lakes worldwide, though lakes are a key component of the global water cycle. Simple measurements can be made to monitor lake stage around the world using inexpensive staff gauges and a network of citizen scientists.

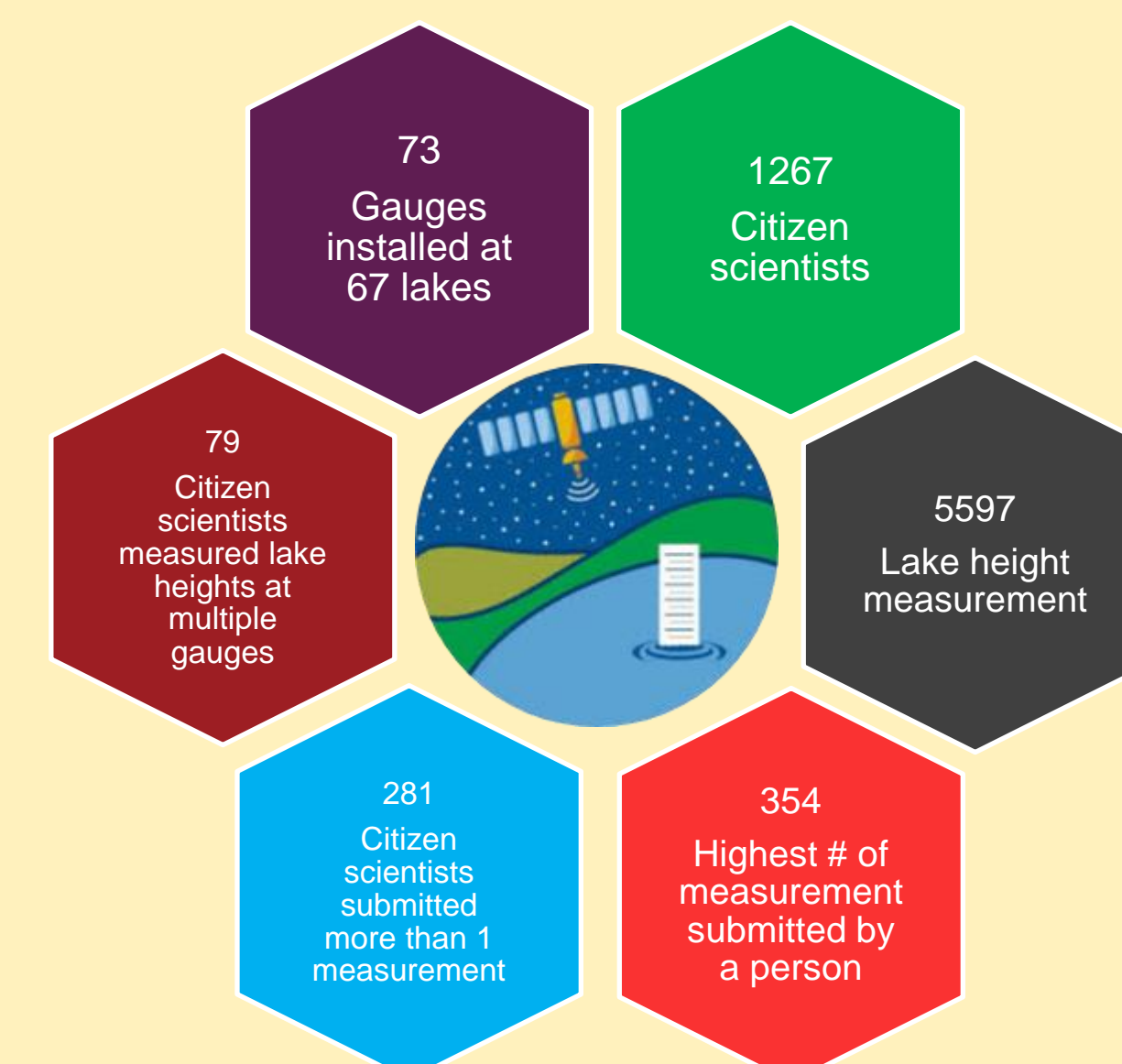


Goal

- Monitoring lake storage and their impact on climate and weather
- Determine the processes that impact lake storage
- Determine whether involving everyday people for large scale data collection is a viable option

Objective

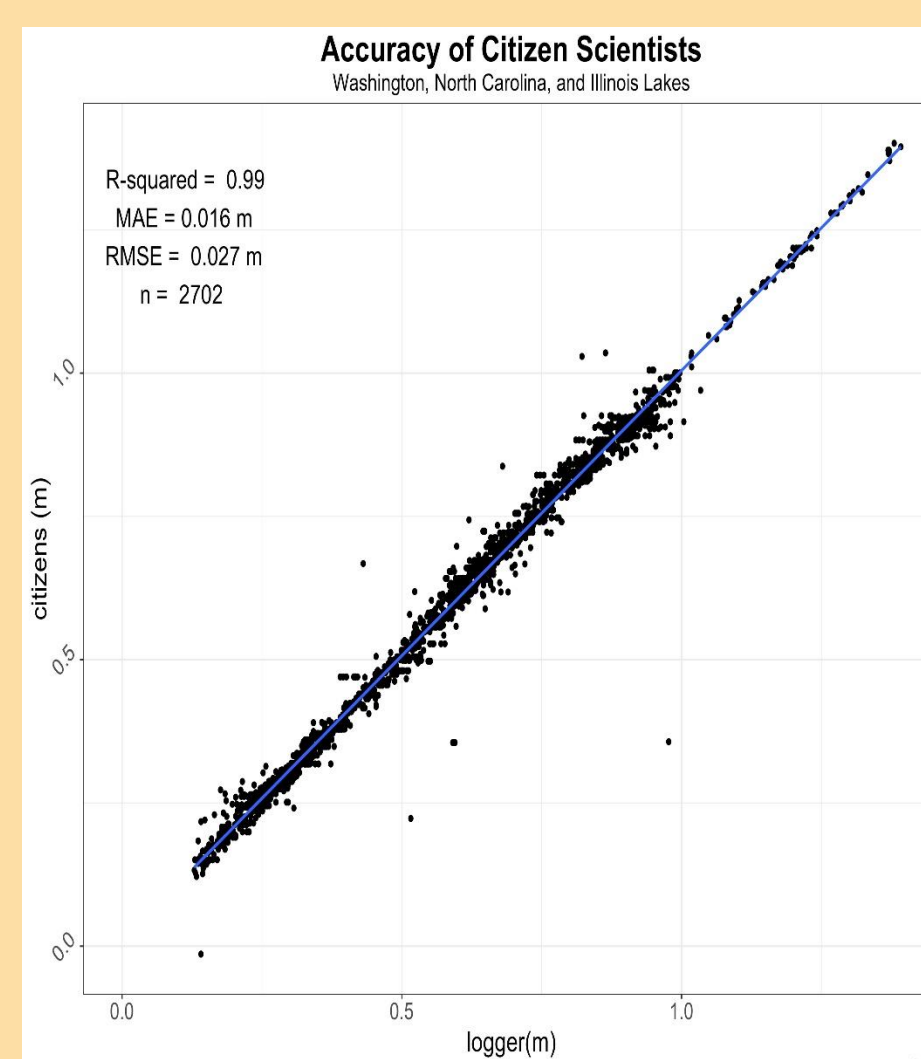
- Monitoring lake level in USA, France, Bangladesh, India, and Pakistan
- Determining change in lake stage volume using satellite images
- Involving citizen scientists to collect data
- Finding the accuracy of the data collected by citizen scientists
- Disseminate the data to the community



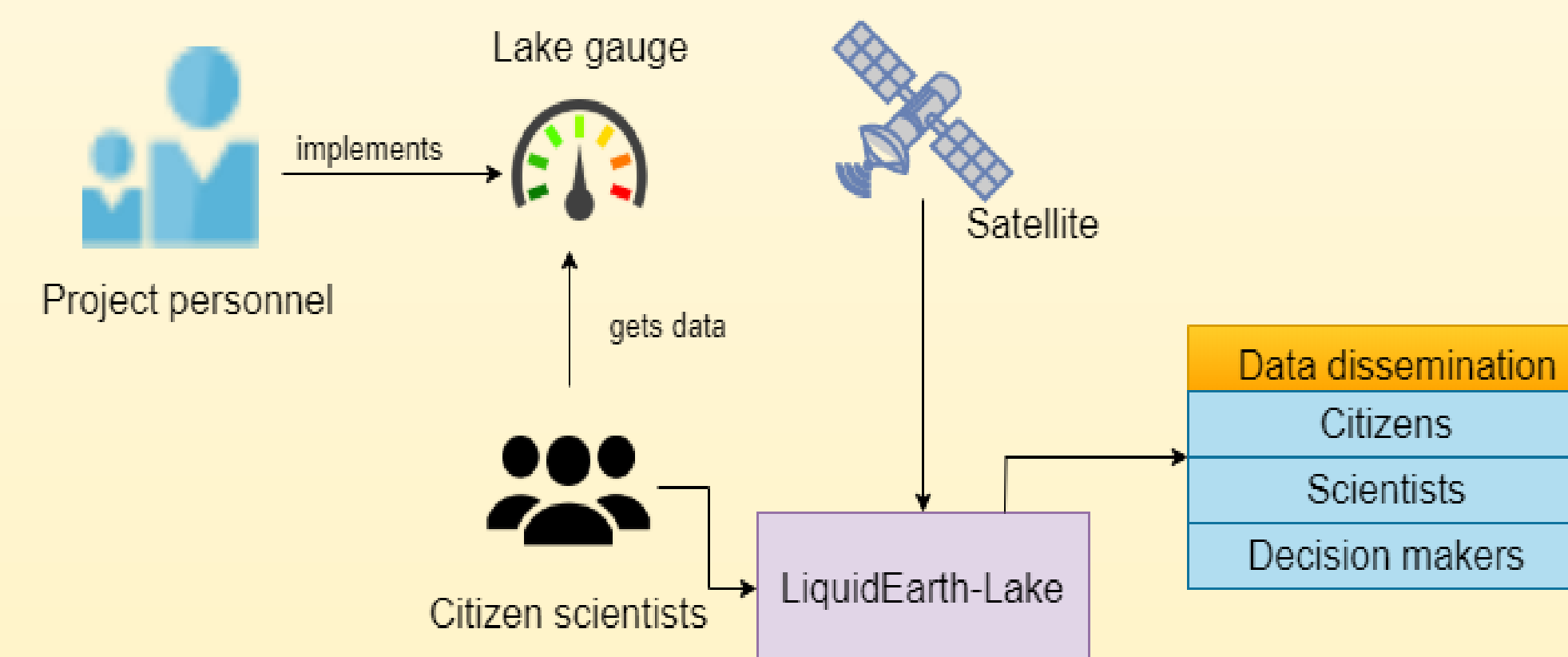
78% of LOCSS citizen scientists provide just one measurement. This accounts for 23% of all measurements. 6% of LOCSS citizen scientists provide 10+ measurements. However, this accounts for 60% of all measurements.

CITIZEN SCIENTISTS ACCURATELY MEASURE LAKE LEVEL

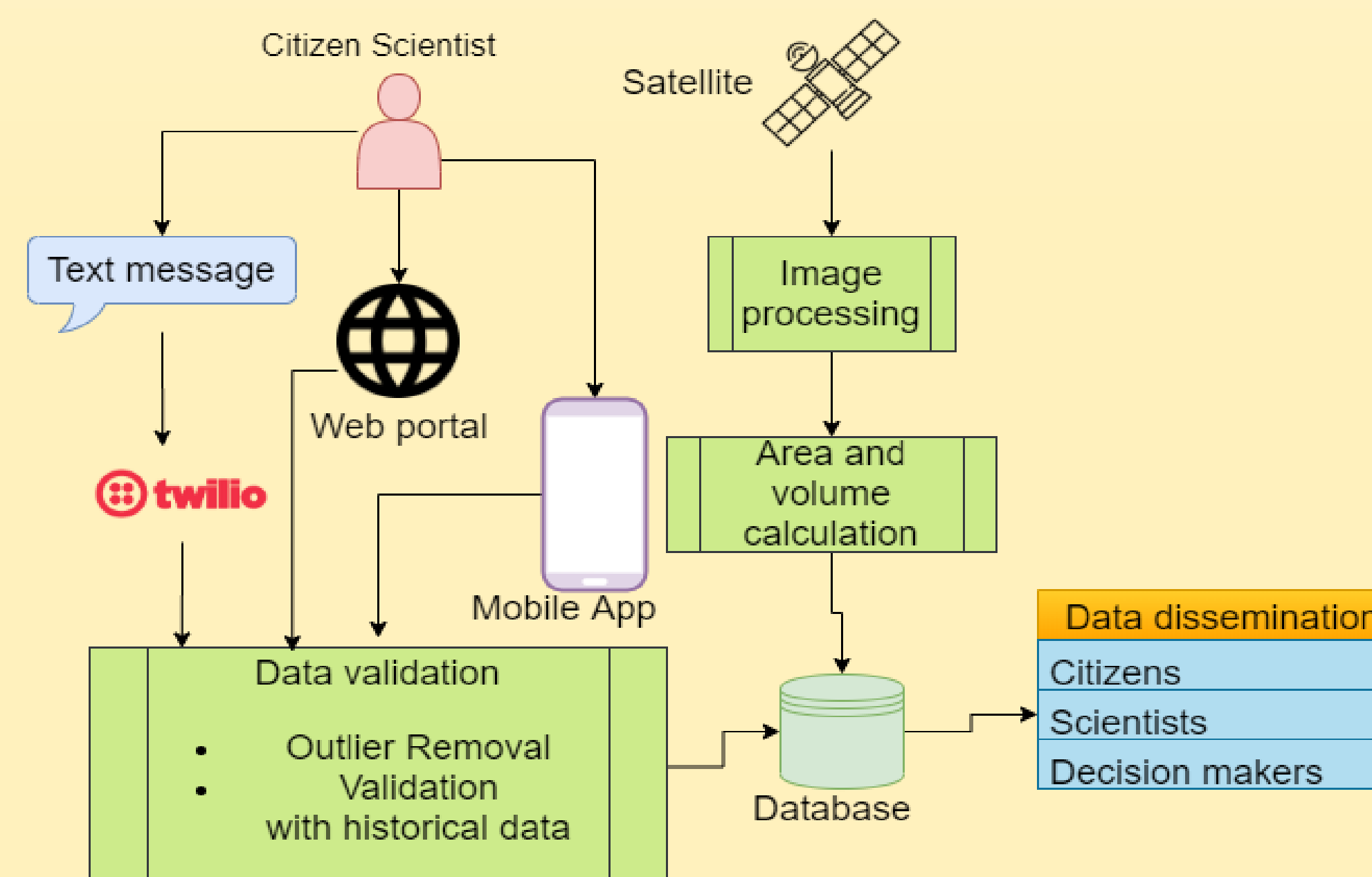
To validate the accuracy of lake height measurements submitted by citizen scientists, we installed a Solinst Levellogger alongside lake gauges in 32 lakes in North Carolina, Washington and Illinois. The Levellogger automatically measured water pressure at least every 60 minutes; those measurements were used to calculate water level with accuracy to < 1 cm. Lake height measurements submitted by citizen scientists were then compared to lake height calculations derived from the Levellogger data.



Project Architecture

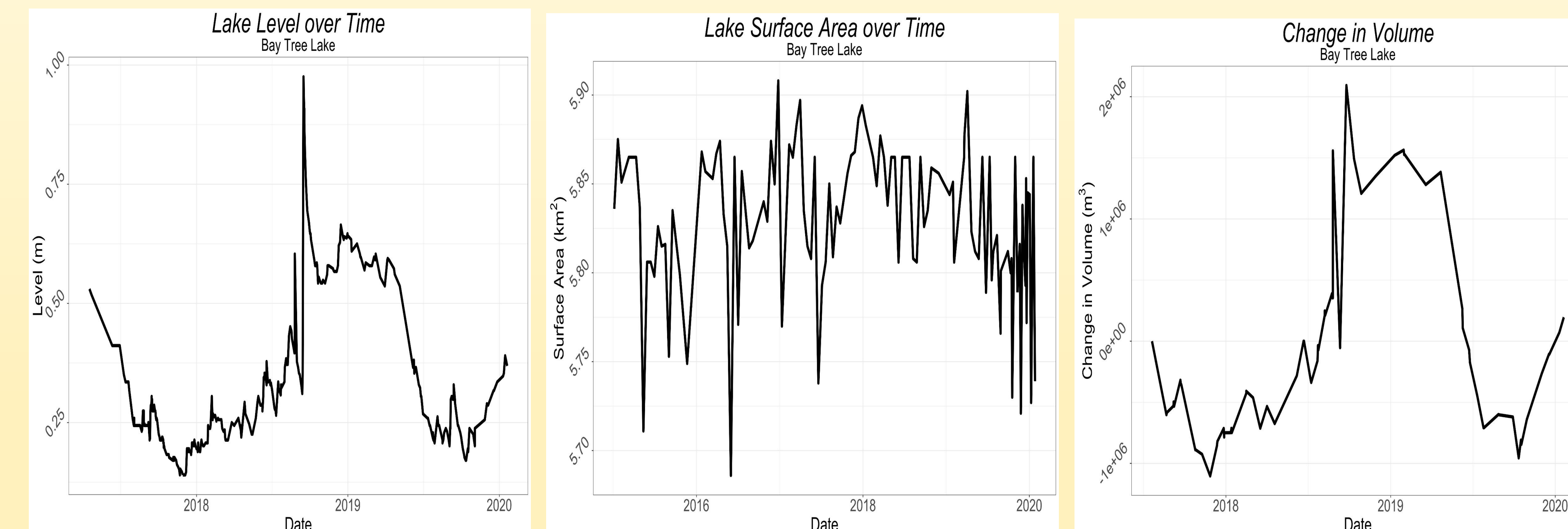


LiquidEarth-Lake Architecture



Preliminary result

LOCSS data is helping to address scientific questions about controls on lake water storage and the water cycle more broadly.

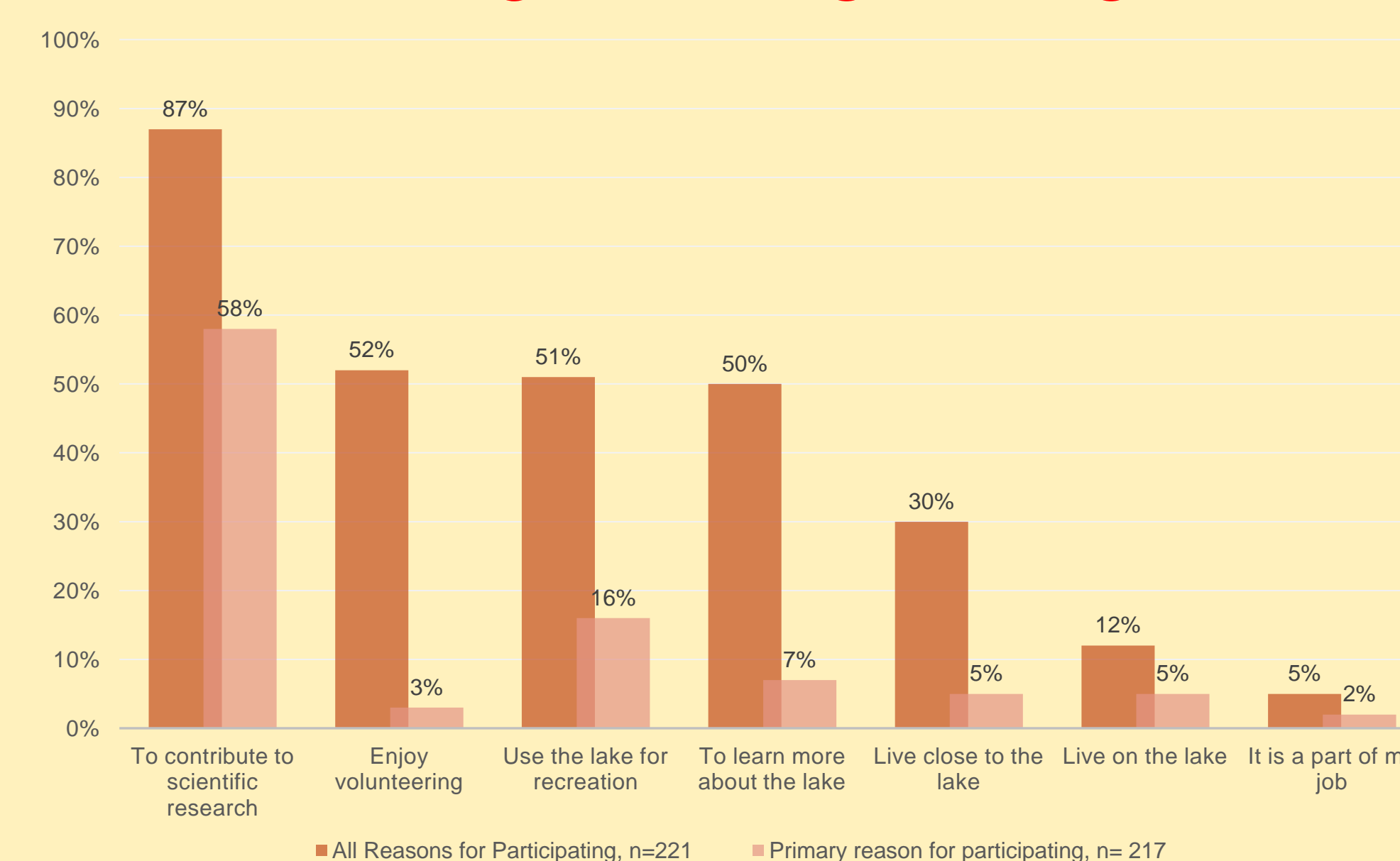


In the example timeseries above, individual lake water storage varies over time, and appears to be determined primarily by changes in lake level rather than surface area.

Understanding our citizen scientists

To gain a better understanding of who is participating in the LOCSS project and their motivations, the project team sent a survey to 928 phone numbers and 105 email addresses. The survey, open for one month in fall 2019, had a ~22% response rate (N=225). Most respondents were white (84%), well educated (84% had a college degree), with a median age of 46. Two-thirds of respondents were male.

PARTICIPANT MOTIVATION



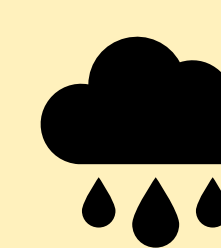
75% had never participated in a citizen science project before LOCSS



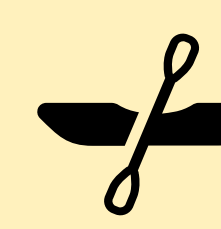
54% were with other people when submitting measurements

USING LOCSS DATA:

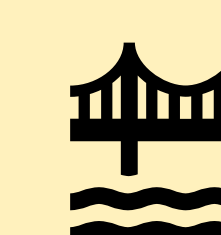
Participants are using LOCSS data in a variety of ways:



"To monitor the rate at which the level drops after a rainfall event"



"To check water level for launching our boat or kayak."



"To compare lake level increases with rainfall amounts"

Conclusion

- More than 1200 citizen scientists have submitted over 5000 readings.
- 67 lakes are being monitored in USA, France, and Bangladesh.
- Data collected by citizen scientists is 99.9% accurate.
- Involving citizens for scientific data collection is a viable option.

Acknowledgements

This project is funded by NASA's Citizen Science for Earth Systems Program (Cooperative Agreement No. 80NSSC18M0099). We would like to thank Dr. Tamlin Pavelsky, Grant Parkins, Dr. Faisal Hossain, Sarina Little, Sarah Yelton, Megan Rodgers, the citizen scientists and the partner agencies and organizations across the globe who have contributed to make the project successful.