# CYANOSLEUTH

## CITIZEN SCIENCE FOR LAKE ERIE

## Imagine if you could tell whether a body of water was free from toxins and safe for recreation in only a few minutes

That's the power of CyanoSleuth, a self-contained test kit and smartphone app that empowers swimmers, fishermen, and scientists with real-time data on water quality, algae, and toxins, all in the palm of their hand

WWW.CYANOSLEUTH.COM

# THE PROBLEM

**Lake Erie, along with other shallow lakes in Ontario, experiences regular cyanobacterial blooms.**

While some of these blooms are nothing more than a nuisance, others produce cyanotoxins that can be harmful to swimmers, destructive to summer tourism, and threatening to the water supplies of nearby communities.

Communities around these lakes can't be sure whether the algae they see is harmful or not, making water use feel scary. At the same time, scientists and researchers lack sufficient spatially referenced data to properly model nutrient triggers of harmful algae blooms and toxins to better understand how and why harmful algal blooms (HABs) form.

We need to make water testing more ubiquitous, frequent, and accessible to non-scientists. Currently, field tests for toxins consist of numerous reagents and steps, and cannot be performed quickly or cost effectively, while their results aren't collected in a common resource for researchers to access.

CyanoSleuth is intended to target both these problems, by making field testing simple and self-contained for citizen scientists and self-interested lake goers alike, all while gathering accurate, geotagged data for researchers.

# THE SOLUTION

We are developing a user-friendly, field-ready, smartphone-compatible device that allows our Sleuths (any lake-goer interested in determining the safety of the water around them) to take water quality measurements when and where they want.

**We are the Square of Lake Erie water quality data.**

## HOW IT WORKS:

1. **Sleuth takes a sample from water they want to test**
2. **Sleuth loads the sample into the test cartridge and waits**
3. **Sleuth captures and uploads a photo to get their results**
4. **Sleuth gets an instant readout of results!**

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**Results are made available to registered researchers for free, or to non-sleuths for a small fee**

# THE PRODUCT - HARDWARE

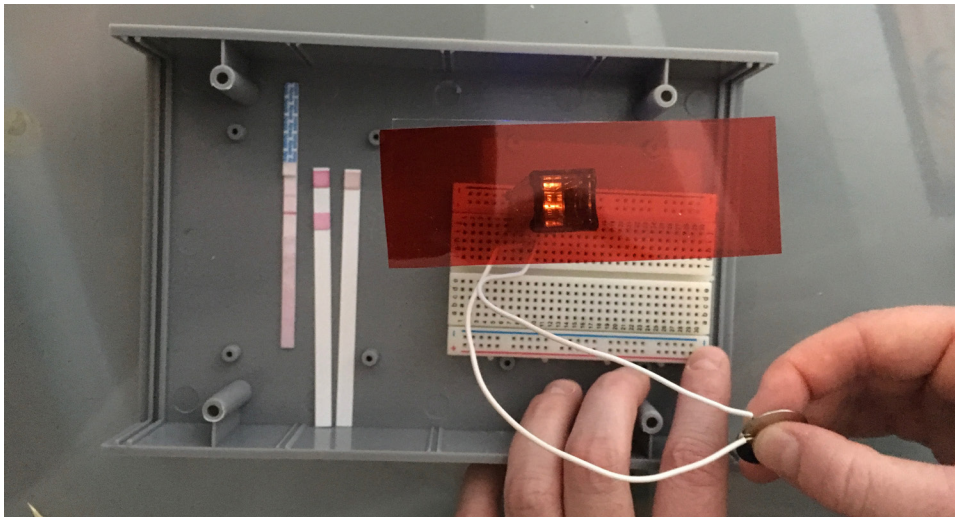
The test kit itself is composed of two pieces, a reusable casing that contains permanent components and instructions for use, and a single-use microfluidics cartridge containing three separate colour-indicator tests in one.

## REUSABLE CASING

The reusable casing ensures each test is consistent, by maintaining uniform lighting of the test cartridge and offering affordances (guidelines and supports) to Sleuths when they use their smartphones to scan the tests.

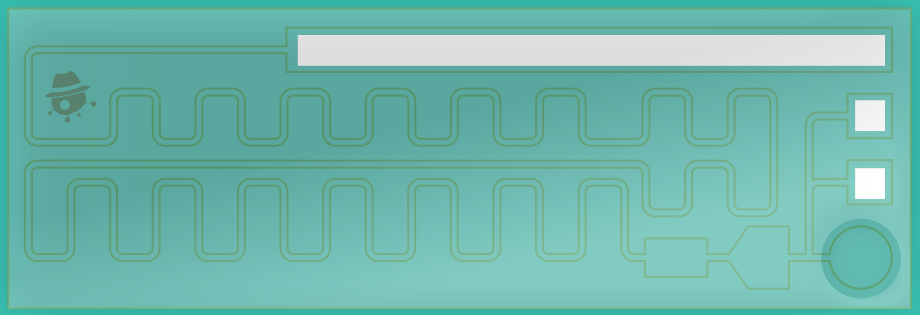
The casing also includes an integrated fluorescence test to measure chlorophyll levels as a proxy for algae concentration.

This allows for a fourth test to be conducted quickly and easily, and provides greater insight into bloom formation, by allowing researchers to distinguish between harmless and harmful blooms and the conditions that precede them.



An early prototype of the test kit shows just how tedious and finnicky these tests are today

## MICROFLUIDICS CARTRIDGE



Artistic rendering of proposed cartridge design

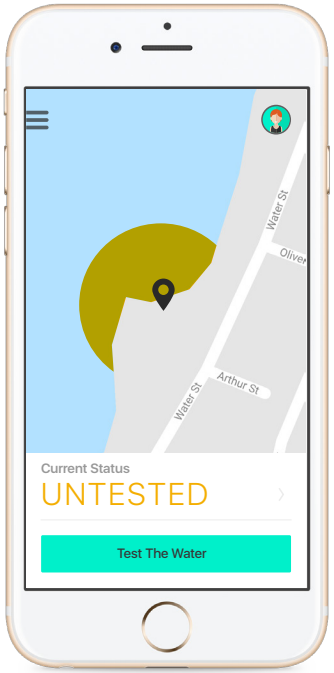
The initial test cartridge will have tests for nitrogen, phosphorus, and the toxins microcystin/nodularin

# THE PRODUCT - SOFTWARE

The mobile app brings the test kit to life, making sampling, analysis, and result tracking simple and friendly for anyone to use.

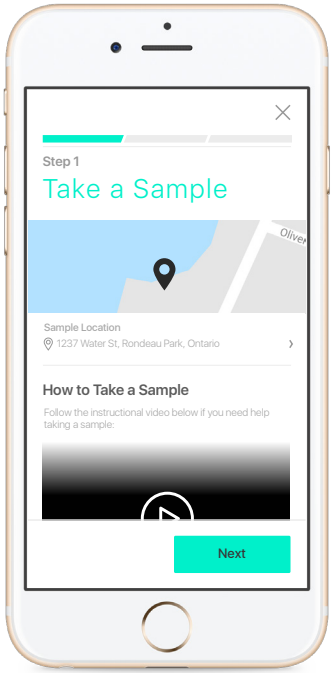

## ADVANCED ALERT

Our app will deliver a notification to Sleuths when there is increased risk of a harmful algae bloom, determined using satellite imagery and tests from nearby Sleuths



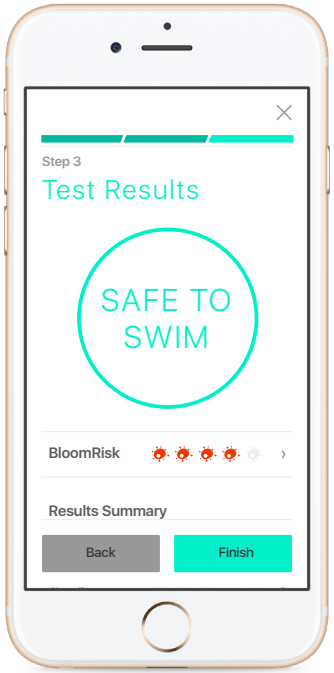

## STATUS AT A GLANCE

Opening the app shows Sleuths the status of the water around them, letting them know if it's safe to swim, or if they should test it out first




## GUIDED TESTING

Sleuths of all experience levels will have no difficulty running this test, thanks to clear, step-by-step guidance and automated test scanning




## CLEAR RESULTS

By framing the results in terms that matter to our sleuths, the app makes test results relevant. Sleuths interested in learning more can dive into the details on each test result

TRY IT OUT AT: **WWW.CYANOSLEUTH.COM/APP »**

# END USERS

Our growth strategy will involve primary and secondary markets. We envision the primary market will help to refine the product before larger scale roll out to the secondary market.

## PRIMARY CUSTOMERS

Our primary customers are lake-goers who want rapid information on recreational water quality. 12 million people live in the watershed surrounding Lake Erie, in 123 communities, with 52 beaches and parks. Here are some of the people who would like to use our device:

- Naturalists
- Cottagers
- Boaters
- Fishers (recreational and commercial)
- Tourists
- Local people using the beaches

In order to build the primary market, we will tap into our growing network of communities that actively collect information for a specific lake or area, such as cottager associations, or influence the decisions of the primary and secondary groups in purchasing. Groups that we've already connected with that are interested in our device include:

- Sunfish Lake Association (ON)
- Federation of Ontario Cottagers Association (Can)
- Morrison Lake Ratepayers Association (ON)
- Lower Thames Conservation Authority (ON)

## SECONDARY CUSTOMERS

Our secondary customers are professionals that are interested in trends in source water quality over time and the presence of toxic algae blooms, such as those working for water utilities (Union Water, Leamington, Ontario), health and environmental ministries (MOECC) and conservation authorities, and environmental policy makers. Following long-term demonstrated reliability of our device and app, we anticipate that these users will have interest in investing in either ongoing usage to show presence/absence of toxins or specific monitoring programs to characterize their water source/watershed. Some groups we've already connected with include:

- City of Toledo (OH) Utility Department
- City of Toledo (OH) Environmental Department
- Lucas County (OH) Health Department
- Avon Lake Regional Water (OH)
- Task Force of Water Managers and Parks & Wildlife (TX)
- Texas Commission on Environmental Quality
- Lower Thames Conservation Authority (ON)

## TERTIARY CUSTOMERS

Finally, our tertiary customers are professionals that are interested in trends in source water quality over time and the presence of toxic algae blooms, such as those working for water utilities (Union Water, Leamington, Ontario), health and environmental ministries (MOECC) and conservation authorities, and environmental policy makers. Following long-term demonstrated reliability of our device and app, we anticipate that these users will have interest in investing in either ongoing usage to show presence/absence of toxins or specific monitoring programs to characterize their water source/watershed. Some groups we've already connected with include:

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# THE CYANOSLEUTH BUSINESS

We have two customers: those who are collecting data (Sleuths), and those who are accessing the data (Non-Sleuths). The pricing of CyanoSleuth (the test kit and the data) is value-based - how much are users willing to pay to learn that it is safe to swim?

**Sleuths:**

- Pay for test kits
- Have free access to the app and location data

**Non-Sleuths:**

- Don't use or pay for test kits
- Pay for access to the app and its stored location data

## PROMOTION, DISTRIBUTION, AND DEVELOPMENT

CyanoSleuth will be promoted first on social media and advertising for traditional existing environmental networks, such as birding and fishing associations, not-for-profits, cottagers and conservation authorities.

After that, we plan to work with distributors who sell to the recreational market, such as MEC and SAIL.

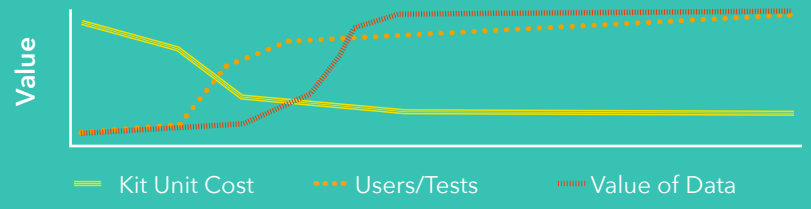
Additional opportunities for market growth lie within water utilities, public health departments, school boards and educational programs, as well as within environmental monitoring programs as the technology becomes more sophisticated.

We will continue to work on research and product development to bring in more useful tests, such as *E. coli* detection which is the most common beach water quality indicator in terms of risk of gastroenteritis, and to have our kit contract manufactured.

## MANAGING THE COST OF KITS

Initially, the cost of kits will likely be too high for mass adoption. Our initial price point of $25/test is viable for many of the organizational clients CyanoSleuth has contacted. This will support the team as partnerships, R&D investments and manufacturing economies of scale come to fruition to reduce the base price of the kit.

Once the kit has a lower base price, promotion with mass markets will begin, supporting a massive influx of current and broadly-sourced test results. Once there are consistent test results for high-traffic environments like public beaches and marinas, non-sleuth revenue is expected to climb.



# THE TEAM

## JILL CRUMB

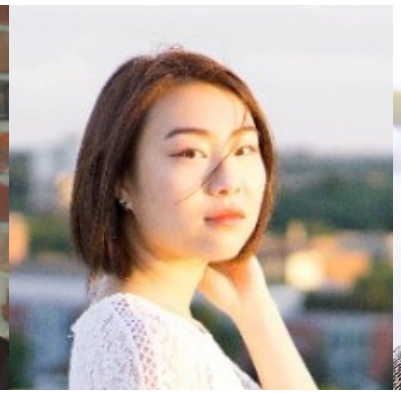
TEST KIT DEVELOPMENT

Ecologist and cyanobacteria consultant on the forefront of the water treatment revolution. Providing strategic guidance to clients across the water sector as owner and principal consultant at TreeFrog Environmental

## PETER LAST

DESIGN STRATEGY

Designer and researcher committed to using design for social good. Helping clients across North America design better, simpler, and more delightful products and services as a Senior Experience Designer with McKinsey & Company



## SUSAN LI

SOFTWARE DEVELOPMENT

Electrical & Computer Engineer-to-be with a passion for software development. Completing a BASc. at the University of Waterloo, she is bringing her talents to the Big Apple this fall

## NICOLE MCLELLAN

TEST KIT DEVELOPMENT

Water quality consultant and science educator. Advancing the threshold of understanding on microbial risks in drinking water as a PhD candidate and applying those insights to address the problems of today with Stantec Consulting Ltd

## SYLVIE SPRAAKMAN

HARDWARE DESIGN

Engineer, community activist, and water lover. Conceptualizing a more resilient future through low-impact development technologies as a PhD candidate and building grassroots engagement with water issues

# COLLABORATIONS AND PARTNERSHIPS

ENVIROLOGIX

HOSKIN SCIENTIFIC

thinXXS MICROTECHNOLOGY

cms centre for microfluidic systems in chemistry and biology

Source Molecular

Aquagenx


**Water Warriors**

3rd place, USA Erie Hack 2017, Univ. Akron